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ORIGINAL ARTICLE

Lowering acquisition costs with a commission cap? Evidence from the German private health insurance market

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Abstract
When consumers are neither particularly financially literate nor price sensitive, insurers have a strong incentive to pay high commissions to intermediaries for profitable new business. As a part of cost reduction regulation in the German private substitutive health insurance market, a commission cap and a minimum cancelation liability period for insurance intermediaries were introduced in 2012. Despite the fact that the commission cap lowered commissions paid to intermediaries, we provide evidence that the reform was only partly effective, as it led to a decrease in reshuffling of new business in the substitutive market, but did not significantly reduce total acquisition costs of health insurers. Our findings confirm that cost regulation is tricky and can be easily circumvented by insurers, as commission payments are only a part of total acquisition costs.

Keywords Insurance regulation · Health insurance · Commission cap

1 Introduction

Private insurance markets play a significant role in covering essential personal risks related to longevity and health care costs. As these risks are typically complex and the financial literacy of consumers is limited, a critical goal of insurance regulation is consumer protection, specifically, to ensure that insurance products meet minimum standards. The costs of insurance products are a crucial driver for

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insurance coverage being valuable to consumers. Due to regulatory market barriers to entry, insurance markets are imperfectly competitive, and insurers typically have significant market power. Hence, typical premium regulation in personal lines, like the minimum requirement on insurers' medical loss ratio (MLR) approach of the Affordable Care Act and similar rate of return regulation, introduces caps on insurers' profit margins but not on firms' costs.

In insurance markets, consumers typically rely on information and advice provided by intermediaries: independent contractors who serve as matchmakers between companies and consumers. When consumers are neither financially literate nor price sensitive, high commissions can be a very effective marketing instrument for insurance providers to attract profitable new business, especially for those insurers that utilize independent intermediaries, as they are more sensitive to changes in commission payments than are tied agents. Inderst and Ottaviani (2012a) show that a commission cap can help restrict the exploitation of consumers by insurers. When commissions are insurers' only marketing instrument, a commission cap can be a reasonable means through which to regulate (commission-related) costs of insurance products. However, as insurers also use other marketing instruments, like sports sponsoring and TV or online ads, it is unclear whether total acquisition costs should decrease after the introduction of the commission cap. Nevertheless, it is straightforward that a commission cap negatively affects the efficiency of marketing instruments and consequently companies' ability to attract new business.

In Germany, a commission cap for private (substitutive) health insurance contracts was introduced in 2012 to limit commissions and insurers' acquisition costs. While the vast majority of the German population is covered by statutory health insurance (SHI), approximately 12% of the population is privately insured and covered by individual long-term insurance contracts. The latter is called substitutive health insurance, or SubstHI. Private health insurance companies also offer supplemental health insurance contracts (SuppHI) to close the coverage gaps of SHI, e.g., for outpatient or hospital treatments. SubstHI contracts are particularly complex and difficult for consumers to compare, as the offered health insurance coverage differs significantly between insurers. The comprehensive premium regulation allows insurers to increase premiums in the private health insurance market when overall claims increase by 10% or when mortality increases by 5%. Hence, health insurers' business risk is limited, and contracts are relatively profitable. As access to the SubstHI market is limited to a few small consumer groups, like civil servants, self-employed individuals, or employees with salaries above an income threshold, there is fierce competition for new customers. Whereas the total number of SubstHI contracts in place between 2007 and 2018 ranged from 8.5 to almost 9 million, the yearly new entry from SHI was just 115,500 to 288,200 contracts per year in that period (German Association of Private Insurers, 2020).

Insurers rely on intermediaries for new business. According to the overview in Tica and Weißenberger (2022), tied agents—those who represent a single insurer—receive lower commissions, independent brokers typically receive commissions of 6 or 7 monthly premiums (approximately 1500 Euros to 1800 Euros) for a new SubstHI contract. Some brokers have even successfully negotiated commissions up to 21 monthly premiums for one new SubstHI contract. As intermediaries were

previously able to keep the whole commission after the end of a 1-year cancelation liability period, some insurance intermediaries began reshuffling: steering consumers from one company to another, almost on a yearly basis, to maximize their commission income (see, i.e., Tica and Weißenberger 2022, for further details). The latter behavior led to intense competition for new customers and increasing acquisition costs. Due to intense discussions within the industry and the general public and as insurers cannot self-commit to lowering commissions because of anticompetition laws, health insurers themselves urged regulators to reform commissions (Schmitt 2010). This reform, after being agreed upon in 2011, came into force in April 2012 (Gesetz zur Novellierung des Finanzanlagenvermittler- und Vermögensanlagenrechts). The reform had two main features: a commission cap for new SubstHI contracts, which effectively limits commission payments to intermediaries in the year of contract signing to nine monthly premiums and overall to 9.9 monthly premiums, and a minimum cancelation liability period of 5 years, such that insurance intermediaries have to repay a portion of their commission if a contract is canceled within this time period.

We study both parts of the reform. First, we descriptively analyze the overall market effect of the minimum cancelation liability period, which was binding for all health insurers in the market. Secondly, we estimate the additional effect of the commission cap, which was only binding for insurers that paid commissions above the commission cap threshold. We use survey data from Beenken (2011) to determine which firms paid commissions above the cap prior to the reform. This allows us to approximately determine which firms were directly affected by the commission cap (treated firms), and which were not. Insurers whose maximum reported commission was above the cap (above 10 monthly premiums) are considered treated, while insurers whose maximum reported commission was at or below the cap are considered untreated. We then use a differences-in-differences framework to estimate the effect of the commission cap on treated firms. Although our treatment assignment is imperfect, we believe that our estimators represent a fair approximation of the overall effect of the commission cap on the treated health insurers.

The German Federal Ministry of Finance perceived the reform as a success because, in its view, insurers complied with the regulation by reducing their commissions and acquisition costs (Deutscher Bundestag 2018, p. 27). Indeed, the reform led to a market decrease of an important key performance indicator (KPI) for the insurance industry: relative acquisition costs (total acquisition costs for 1 year divided by total premiums of that year) decreased from 8.5% in 2010 to 6.8% in 2018. However, another measure of cost—the industry-wide total acquisition cost per year—only declined slightly, from 2.649 billion Euros in 2010 to 2.544 billion Euros in 2018.[1]

The aim of our study is to evaluate the efficacy of this regulatory reform; in particular, we focus on the impact of the commission cap on the total acquisition costs of insurers. In our analysis, we take a closer look at the apparent success story,

[1] The data on industry-wide relative and total acquisition costs are published on a yearly basis by the German Association of Private Health Insurers ("PKV-Zahlenportal").

which is particularly interesting, as insurance companies typically differ with respect to their distribution strategy and use different combinations of distribution channels. Hence, insurers are differently affected by the reform; for example, insurers that only use tied agents are typically not affected by the commission cap. We analyze the impact of the reform on companies' overall acquisition costs, relative acquisition costs, new business, and acquisitions costs per new contracts using a difference-in-differences event-study approach.

In our analysis, we face four main empirical challenges. First, as all insurers operate in the same market, we lack a perfect control group for our differences-in-differences analysis.[2] We assume that the commission cap is binding for insurers who had previously paid commissions above the cap. However, even insurers for whom the cap is not binding may be indirectly affected, as these firms may also adjust their business strategy given the new market environment. This indicates that spillover effects may be present in our results. The second empirical challenge is that commissions do not have to be reported, so we are also unable to observe the actual commissions paid to intermediaries. As a proxy for commissions paid, we use a survey of insurance intermediaries, in which agents and brokers report the commissions they received from particular insurers before the reform (in 2011). Therefore, our treatment assignment is based on a noisy proxy. Third, the number of observations is quite small due to the limited number of firms operating in the SubstHI market. We observe only 30 insurers that offer SubstHI contracts, but as of 2018, these 30 insurers had a combined total market share of approximately 95% of total premiums in the German private health insurance market. Therefore, although our estimation strategy is limited by the small number of observations, the inference benefits from the fact that we are able to observe nearly the entire population of firms in the market. Finally, distribution strategies are part of insurers' business decision-making. We address this possible endogeneity in a robustness check where we use propensity score matching to generate a matched sample using pre-reform average total acquisition costs. Due to the small number of observations, our ability to execute rigorous matching with statistical power is limited. However, the results using our matched sample are in line with our main results.

We find evidence that the introduction of the minimum cancelation liability period may have had its intended effect of decreasing reshuffling in the market: untreated firms had, on average, 4500 fewer new SubstHI contracts per year after the reform. This baseline effect of the minimum cancelation liability period implies a relative reduction of about 30% for untreated firms compared to the pre-reform level; however, the difference is only significant at the ten percent level. In addition, the commission cap did not appear to have a significant effect on total acquisition costs or acquisition costs per new contract. This finding is particularly surprising, as our analysis indicates that the commission cap contributed to a decrease of up to 48% in new SubstHI business for treated companies compared to 2010 averages.

[2] The SHI market cannot serve as a control group, as the insurance coverage offered by sickness funds (providers of SHI) is standardized, such that intermediaries play no role in the market.

This substantial effect is in line with the industry-wide observation of a 46.9% decrease in new SubstHI-entry from SHI and a decrease of 42.2% of total new SubstHI contracts.

However, we cannot conclude that the commission cap is unambiguously responsible for the dramatic decrease in new SubstHI business for treated companies. Our results rely on the assumption that no other reform or trend affected the treated and untreated insurers differently. Because, for example, a 2009 reform that introduced the partial transferability of old-age provisions for SubstHI contracts may have had long-term effects on new business, it is possible that this reform confounds our results.[3] For contracts written before 2009, consumers completely lost their old-age provision when switching insurers within the SubstHI market. This non-transferability of old-age provisions led to a significant lock-in effect, as the savings of consumers for higher health care costs at later ages were lost when switching within the SubstHI market to another insurer. The transferability of old-age provisions only applies to new contracts established in 2009 or later. However, in examining the effects of the 2009 reform, Atal et al. (2019) find that the reform did not lead to a significant increase in insurer switching. Therefore, while the 2009 reform may have some confounding effect on our results, we believe the effects are likely minimal. In fact, to the extent that the 2009 reform should have increased switching behavior, the decline in new business after the 2012 reform is perhaps even more surprising.

We also want to call attention to increases in the income eligibility threshold for entrance into the SubstHI market (Jahresarbeitsentgeltgrenze, JAEG), as the JAEG was increased regularly over the time period in question. Adjusted for inflation, JAEG increased by a modest 4.41% over the total time period (German Association of Private Insurers 2020). This is in line with the fact that the threshold is increased annually based on the change in average gross salary per employee for the previous calendar year (see § 6 Sozialgesetzbuch V). In our view, it is unlikely that regular adjustment of the JAEG to changes in gross salaries substantially affected new business nor do we have any indication that the increases have affected treated and untreated insurers differently.[4] Therefore, although we remain cautious in our interpretation, our results do provide evidence that the 2012 commission cap significantly and negatively affected new SubstHI business. However, our results should be interpreted with caution commensurate with the strong identifying assumptions for our empirical approach.

Generally, we conclude that the minimum cancelation liability period appeared to reduce reshuffling, while the commission cap was likely able to trim a small share of commission peaks but was unable to affect the overall level of acquisition costs. This finding implies that insurers may have adjusted their acquisition costs through

[3] This transferability is partial, as only parts of the total old-age provisions are transferred when switching within the SubstHI market to another insurer. The remaining part is bequeathed to the old risk pool of consumers with the previous insurer.

[4] See Appendix A for a graphical comparison of the development of inflation-adjusted JAEG and new SubstHI business.

other components, like marketing expenses, resulting in an additional significant reduction in new SubstHI contracts for treated firms.

The remainder of this paper proceeds as follows. The next section reviews the institutional background and provides an economic rationale for the observed changes in market behavior. In Sect. 3, we introduce our data and examine the descriptive evidence. In Sect. 4, we provide our empirical analysis using a difference-in-differences event-study methodology. In Sects. 5 and 6, we discuss the results of our analysis.

2 Institutional background and economic reasoning

2.1 Private health insurance in Germany and the reform

As mentioned in the introduction, the German private health insurance market is primarily comprising of SubstHI and SuppHI, where new business in the SubstHI market is limited by institutional factors, such that only employed individuals above an income threshold (Jahresarbeitsentgeltgrenze (JAEG) in 2019: 60.750 Euros per year), civil servants, and the self-employed are eligible for the SubstHI market. Only these consumer groups can opt out of SHI for their basic health insurance coverage. For 2019, the German Association of Private Health Insurers (PKV-Verband) reported that for their 50 member companies (17 mutual and 33 stock insurers), 8.7 million SubstHI contracts and 26.7 million SuppHI contracts were in place, which led to a yearly premium income of 27.8 billion Euros (SubstHI) and 9.1 billion Euros (SuppHI). Average monthly premiums are consequently significantly higher for SubstHI contracts (266.28 Euros) than for SuppHI (28.40 Euros).[5] The market concentration in the German private health insurance market is moderate. Based on their yearly premium incomes in 2019, the top four (eight) health insurers had a joint market share of 43.78% (64.36%).[6]

Contracts in SubstHI and SuppHI are front loaded in the spirit of long-term guaranteed renewable contracts (Pauly et al. 1995). SubstHI contracts cover costs for outpatient, hospital, and dental treatment. SuppHI contracts can, for example, cover gaps in SHI for outpatient and hospital treatments or dental services. Insurers have no right to cancel contracts (one-sided commitment) but are able to adjust premiums to cost increases based on the whole risk pool.

As in many other insurance markets, German health insurers use different distribution channels to acquire new business. A market survey by Tower Watson (2012) highlights the relative importance of different distribution channels for the new SubstHI and SuppHI business before the reform (Table 1).

In both SubstHI and SuppHI, intermediaries (tied agent, nonexclusive agents, and brokers) are the major distribution channels. Tied agents represent one insurer, nonexclusive agents offer products from a limited number of insurers, and brokers—the

[5] See the German Association of Private Health Insurers (2020).

[6] See the Federal Financial Supervisory Authority (2020).

Table 1 Market share of distribution channels for new business between 2009 and 2011

	SubstHI			SuppHI		
Year	2009	2010	2011	2009	2010	2011
Tied agents	48.8%	48.9%	46.1%	40.4%	38.4%	40.8%
Nonexclusive agents	7.7%	6.6%	7.0%	4.7%	6.0%	3.6%
Brokers	39.6%	40.4%	42.7%	28.7%	30.6%	32.2%
Banks	3.3%	3.5%	3.6%	5.5%	5.1%	6.0%
Direct selling	–	–	–	10.9%	10.6%	9.8%
Sickness funds	–	–	–	6.1%	6.3%	6.6%
Others	0.6%	0.6%	0.6%	3.6%	3.0%	0.7%
Total	100.0%	100.0%	100.0%	99.9%	100.0%	99.7%

Shows the market share of distribution channels for new businesses between 2009 and 2011. Data are from a market survey by Tower Watson (2012). Direct selling plays no role in the SubstHI market

most independent type of intermediary—typically offer all products from all insurers. One important specialty in SubstHI is that direct selling (via internet or phone) plays virtually no role. This is mainly driven by the complexity of SubstHI contracts and the very important decision to opt out of SHI, as there is almost no way back into SHI once opting out.[7] In SuppHI, contracts are sold directly or via sickness funds, which are SHI providers.

Premium regulation for SubstHI contracts is comprehensive (see, e.g., Hofmann and Browne 2013), the main objective of which is insurers' permanent ability to settle claims and therefore to prevent insolvency. Premiums are risk based only at the date of contract signing and are calculated to remain basically constant over time, such that in early years, parts of the premiums are accumulated in old-age provisions for higher future health care costs. Premiums are a function of the expected per capita health care claims (Kopfschäden), assumed guaranteed interest rate (Rechnungszins), probability to lapse (Stornowahrscheinlichkeit), life expectancy (Sterbewahrscheinlichkeit), and expected administrative and acquisition costs. Moreover, premiums include various safety margins (e.g., at least 5% of total premiums). Insurers have to share their profits with policyholders via premium rebates, which are calculated on a yearly basis. According to the Mindestzuführungsverordnung (minimum funding ordinance), minimum refund shares for interest rate and risk calculation profits are 90%, whereas the minimum refund shares for profits from other sources (including costs) are only 50%. In this respect, premium regulation entails incentives similar to those of the MLR approach since higher (calculated) costs result in higher absolute profits for insurers (Cicala et al. 2019).

[7] One exception is if a policyholder is employed and his or her yearly income drops below the JAEG, e.g., due to part-time employment or because the JAEG is increased and then exceeds the actual income of the insured.

Subsequently, we want to explicitly illustrate why insurers have weak incentives to keep their acquisition costs low. Commissions paid by insurers are direct AC, which are (together with indirect AC, like marketing expenses and administrative costs) ultimately financed by the premium payments of policyholders. Premiums paid by customers include an absolute surcharge for acquisition and administrative costs.[8] Suppose that the net claim costs per month of a contract are 200 Euros. If an insurer charges 5 Euros per month for administrative costs and 10 Euros for acquisition costs, then the safety margin (5% of the total premium of 226.32 Euros) is 11.32 Euros. If the insurer increases the commission in a way that the acquisition costs per contract per month increases from 10 to 15 Euros, then the new safety margin (5% of total premium) is 11.58 Euros, and the total premium rises to 231.58 Euros. As policyholders receive 90% of absolute profit (which, in our example, corresponds to the safety margin), the insurer's profit increases with higher costs (from 1.13 to 1.16 Euros per month). As SubstHI contracts are complex and market transparency is rather low, insurers have weak incentives to cut costs. However, insurers differ in their business strategies: some insurers try to keep costs low to become cost leaders, while other insurers try to realize competitive advantages by superior customer service or product leadership. However, as acquisition costs reduce the value of insurance for consumers, there is some competitive and public pressure toward lowering total costs, ultimately leading to commission cap regulation.

Due to premium regulation, contracts are relatively profitable, and private health insurers face limited business risk. Hence, some insurers have paid high commission for new SubstHI contracts. Typically, agents and brokers are predominantly remunerated at the date of contract signing (signing commission). In 2011, the average cancelation liability period for brokers was 1.5 years, such that brokers had to pay back parts of their signing commissions in the case of an early cancelation of a policyholder in the first 1.5 years (Beenken 2011, p. 28). The earlier the contract is canceled by the policyholder, the higher the repayment. Given this setup, brokers and nonexclusive agents were engaging in reshuffling activities by placing their customers with different insurers almost on a yearly basis to maximize their commission income. Tica and Weißenberger (2022) present a detailed analysis of how this reshuffling practice led to the regulatory changes that we analyze. One of the major and very prominent players in this scandal was one broker (Mehmet E. Göker and his MEG Aktiengesellschaft) who was rumored to have received commissions of up to 21 monthly premiums for new SubstHI contracts. MEG typically sold SubstHI contracts with a short cancelation liability period between 1 and 2 years and were, thus, able to offer policyholders new contracts after 1 year, therefore generating a new broker commission for the same customer.

The reform was first initiated in April 2010 when a representative of the federal regulator (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) criticized commission levels and announced an initiative to decrease them. Market experts

[8] In fact, there are four other potential ways to finance direct AC (see Milbrodt and Röhrs 2016, pp. 204–243). For example, insurers can use surpluses from cost reductions or the old-age provisions via the Zillmer method by using a net premium reserve method (Asher 2006).

estimated that approximately 30 to 40% of all new contracts were related to switching insurers within the SubstHI market.[9] Due to public pressure, health insurers also expressed their goal to reduce commission levels in November 2010 but urged the federal regulator to implement appropriate regulation (commission cap and a minimum cancelation liability period). The association of health insurers argued that they were not able to implement lower commissions based on voluntary self-commitment due to potential conflicts with anticompetition laws.[10] In February 2011, Parliament members proposed legislation to limit commissions to 12 monthly premiums and to introduce a minimum cancelation liability for agents of 5 years. At this point in time, due to discussions between regulators, legislators, and insurers, insurers had reliable information that the reform would pass. Finally, the reform was indeed passed with minimum cancelation period of 5 years and a commission cap of nine monthly premiums at contract signing and 9.9 monthly premiums for overall commission payments to agents and brokers, effective on April 1, 2012.

2.2 Economic reasoning and related literature

This study is related to those focusing on the effectiveness of regulatory instruments, like the MLR in US health insurance, which aim to limit the profits of insurance companies. In general, there is evidence that price or premium regulation is tricky and may have unintended effects. The early work of Averch and Johnson (1962) highlights that firms that are constrained with respect to their rate of return adopt an inefficient production plan and accumulate an excessive amount of capital as a reaction to the regulation. In addition, Knittel and Stango (2003) find that price ceilings, which have the goal of lowering market prices, ultimately serve as a focal point, which leads to tacit collusive price setting by firms. Depending on the composition of the market in question, such a focal point could ultimately lead to higher rather than lower prices.

Related to insurance markets, there is substantial evidence that prior approval premium regulation in property and casualty markets, where state insurance commissioners review filed rates and then approve or deny the proposed rate change, may lead to unintended effects. This kind of rate regulation attempts to increase insurance affordability by denying or limiting rate increases. For example, Danzon and Harrington (2001) find a significant adverse impact of regulatory premium distortions on costs for workers' compensation insurance, showing that rate suppression is positively associated with higher loss cost growth, ultimately leading to higher premiums. Weiss et al. (2010) find that the presence of rate regulation in US auto insurance markets is associated with a positive and significant increase in average loss costs and insurance claim frequency. These results highlight that regulations that are designed to enhance insurance affordability by lowering premiums have no

[9] See Lier (2010).

[10] See ÄrzteZeitung (2010, p. 4).

material effect on decreasing average premiums (Harrington 2002) and may instead lead to higher average costs.

Our study is also related to the literature on insurance distribution, financial advice, and problems of commissions that are paid by product providers. As indicated above, health insurers need to utilize insurance intermediaries to sell particularly SubstHI contracts but can choose different distribution strategies. In the spirit of Trigo-Gamarra and Growitsch (2010), we distinguish three different strategies. Some insurers use a multichannel approach (M-type insurers) that combines at least two distribution channels. These firms are mainly comprised of exclusive and independent agents or insurance brokers. In contrast, firms can also use only one distribution channel. Independent agency insurers (I-type insurers) are distributed exclusively through independent agencies and insurance brokers, whereas other companies only use tied agents and employee sales representatives (T-type insurers). The distribution mix is a long-term strategy choice. To adopt new channels or to abandon major channels is costly and takes several years.

Some theoretical papers, like those of Posey and Yavaş (1995), Posey and Tennyson (1998), Seog (1999) and Eckardt (2007), explain the coexistence of brokers and tied agents in the same market by search cost arguments. Consumers with lower search costs prefer searching sequentially for appropriate insurance products by obtaining offers from different tied agents, and consumers with high search costs prefer the costlier broker channel, where the independent intermediary provides multiple offers at one time. As independent intermediaries can offer a greater variety of contracts, they are—according to Regan (1997) and Regan and Tennyson (1996)—more specialized in assessing the risk of consumers and matching them with appropriate insurance products. Moreover, Inderst and Ottaviani (2012b) and Focht et al. (2013) show that independent intermediaries can execute their market power via commissions, as providers have an incentive to pay substantial commissions for profitable new business.

Some empirical studies find mixed evidence related to the performance of insurers using different distribution strategies or channels. Berger et al. (1997) find that US insurers using tied agents are more cost efficient but do not have higher profitability. Brockett et al. (2005) find that US property-liability insurers that use independent intermediaries are more revenue efficient than are those insurers using tied agents or selling directly to customers. Klumpes (2004) analyzes a sample of UK life insurance firms and finds that insurers using independent intermediaries are both less cost efficient and less profit efficient compared to those insurers using tied agents. Finally, Trigo-Gamarra and Growitsch (2010) analyze the German life insurance market, which is structurally similar to the health insurance market, for the years 1997–2005 and do not find any performance advantages of specialized insurers that use just one distribution channel. Their results can explain why different distribution strategies can coexist in one market.

In the specific context of SubstHI with complex and long-term contracts, insurers rely on intermediaries to attract new business. Obviously, intermediaries have to be compensated for their services related to risk assessment and matching. For insurers, commissions are investments in new long-run business. Commissions of independent intermediaries are significantly higher than those of tied agents, as

their services are more complex, and they have the ability to steer the consumer toward different insurers. Therefore, M- and I-type insurers should be more likely to pay commission above the cap and have a higher probability of being treated. For treated insurers, the commission cap limits their optimal marketing-instrument mix consisting of commissions and other marketing instruments, like sports sponsorship or TV ads.

The reform has two parts: the increased minimum cancelation liability period, which affects all firms, and the commission cap, which only directly affects treated firms. The increased minimum cancelation liability period makes the reshuffling of consumers within the SubstHI market less attractive since consumers can be contacted after 5 years at the earliest, instead of 1 or 2 years. Because the minimum cancelation liability period directly affects all insurers in the market, we make the following prediction:

Prediction 1a Following the introduction of the minimum cancelation liability period, new SubstHI business decreases for all insurers in the market, as incentives for reshuffling decrease.

Over and above the market-level effect of the minimum cancelation liability period, the commission cap reduces intermediaries' compensation for acquiring new business in the newly regulated line of business (related to both new entry from SHI and switching within the SubstHI market). Many findings in the literature suggests that intermediaries focus their efforts on products with the highest commissions (see for example Inderst and Ottaviani 2012a) in order to maximize their profit. Therefore, whether the commission cap acts as an incentive or a disincentive for selling SubstHI contracts depends on whether intermediaries are active in other lines of business; in the case of Germany, intermediaries sell across diverse lines of business, including workers compensation, life insurance, and supplemental health insurance. Following this line of reasoning, intermediaries would respond to a commission cap on new SubstHI contracts by focusing their selling efforts on other, unregulated lines of business in order to maximize their profit. Of course, insurers could use other marketing instruments to compensate for the restriction in commission payments. However, the new marketing-instrument mix can only be second-best efficient. Based on this economic reasoning, it is straightforward to see that the commission cap and the resulting second-best efficient marketing-mix reduce the new business of treated insurers, as intermediaries' compensation for acquiring new business, related to both new entry from SHI and switching within the SubstHI market, is reduced. Therefore, we develop the following prediction:

Prediction 1b The commission cap should lead to an additional decrease in new SubstHI business for treated companies, as intermediaries' incentives for acquiring both new business from SHI and from reshuffling consumers within the SubstHI market decrease.

The idea of the commission cap was to lower commission expenses per new contract. If Prediction 1b is correct, then total acquisition costs should—ceteris paribus—significantly decrease for treated companies due to the resulting lower level of new business. Of course, treated companies are likely to readjust their optimal marketing-instrument mix given that they are constrained with respect to their commission payments after the reform. In the spirit of Averch and Johnson (1962), treated insurers can only reach a second-best situation. Given that insurers' marketing budgets are flexible, it is not clear how treated insurers optimally readjust their marketing-instrument mix. Under reasonable assumptions, insurers could cut, increase, or leave their total AC unchanged after the reform. Related to Prediction 2, we are conservative and test regulators' initial idea that the reform should lead to a decrease in the total AC of treated insurers.

Prediction 2 Due to lower commission costs, the commission cap should lead to lower total acquisition costs for treated companies.

3 Data and descriptive evidence

3.1 Data

To examine the effect of the reform, we use a rich dataset that includes the majority of insurers in the German private health insurance market from 2007 to 2018. We only consider health insurers that offer SubstHI contracts. New business data come from the Zeitschrift für Versicherungswesen (ZfV), an academic journal for the German insurance industry (Surminski 2019). Data on acquisition costs come from federal regulators' (BaFin) annual statistics. All other company-specific data, such as annual premiums, number of insured persons, and loss ratios, are taken from ZfV, BaFin annual statistics, and insurers' financial statements. All monetary values are adjusted for inflation with the German Consumer Price Index (Federal Statistical Office 2023) using 2007 as a baseline year. Monetary values (JAEG, premiums, and AC) are therefore shown in 2007 prices.

As insurers are not required to report commissions, there is a distinct lack of publicly available data on annual commissions and commissions per contract. To approximate the level of commissions paid by each insurer, we utilize a survey of insurance intermediaries, in which agents and brokers report the commissions they received from particular insurers in 2011, 2015, and 2017 (Beenken 2011; Beenken and Radtke 2015, 2017). We use the results of the survey in 2011 to determine whether companies should be included in the treatment group. Insurers whose maximum reported commission was above the cap (at or above 10 monthly premiums) are considered treated, while insurers whose maximum reported commission was at or below the cap are considered untreated. For companies that have SubstHI contracts but are not included in the survey, we additionally use publicly available

information about distribution strategies (PKV-Wiki 2022). Of these four companies, none use brokers (T-type distribution strategy) and are therefore considered untreated.[11]

In all, we observe rich panel data from 2007 to 2018 for 30 insurers. As of 2018, these 30 insurers have a combined total market share of approximately 95% of total premiums in the German private health insurance market. Furthermore, while some of these insurers do not report new business to ZfV, we are able to observe the majority of new contracts in the market (see Appendix B). On average, we observe over 70% of all new contracts. The sample, excluding those insurers who do not report new business, represents 85% of the market in 2018. In addition, to ensure that the voluntary reporting of new business does not lead to selection bias in our treatment group, we analyze the characteristics of reporting and non-reporting firms. We find that there are no substantive differences with respect to assignment to the treatment group. For the related analysis, see Appendix C.

3.2 Descriptive analysis

We specifically focus on total acquisition cost (total AC) and relative acquisition costs (RelAC). Total AC includes a number of different expenses that insurers incur directly or indirectly related to new business. Direct costs are, for example, commissions for intermediaries, costs for risk assessment of new customers or costs for processing new contracts. Indirect costs are marketing expenses, general costs for the handling of new contracts that are not directly related to specific contracts or training costs for intermediaries. Apart from total AC, which measures the absolute cost for the new business of a company in a given year, both insurers and regulators also use RelAC as a relative cost measure, which is defined for company i in year t as follows:

$$RelAC_{i,t} = \frac{AC_{i,t}}{\text{TotalPremiums}_{i,t}}$$

One well-known problem of RelAC is that it relates the cost of new business in a year to the total premiums of an existing business in the same year. New companies with increasing new and relatively low existing business therefore typically have relatively large RelAC values, whereas larger companies with stable new and typically large existing business have low RelAC.[12]

In the first step of our analysis, we want to analyze the reform's impact at the market level. Table 2 highlights the impact of the reform on the market for SubstHI. The yearly number of new policyholders that opt out of SHI (Column 2) into

[11] Our results are robust to different specifications of the treatment threshold. Additional specifications are available upon request.

[12] Some companies relate total AC to the (expected) premium volume of new business to use a more accurate relative cost measure that directly relates the cost for new business to the generate revenue of the related new business. However, this measure heavily relies on accurate expectations about contract duration.

Table 2 Development in the German SubstHI market between 2007 and 2018

Year	(1) JAEG	(2) New from SHI	(3) Exit to SHI	(4) Total SubstHI contracts	(5) Net change in SubstHI contracts	(6) New SubstHI contracts	(7) Early cancel-ation rate	(8) Total premiums	(9) Total AC	(10) RelAC
2007	47,700	233,700	154,700	8,549,000	59,900	517,200	0.17	27,578.40	2,383.40	0.086
2008	46,930	244,900	151,000	8,639,300	90,300	534,600	0.18	27,641.62	2,464.52	0.089
2009	47,230	288,200	146,500	8,810,900	171,600	566,100	0.15	28,565.31	2,593.29	0.091
2010	48,075	227,700	153,200	8,895,500	84,600	498,000	0.20	30,004.14	2,549.57	0.085
2011	46,654	232,000	157,600	8,976,400	80,900	488,300	0.19	30,690.20	2,597.74	0.085
2012	47,083	159,900	162,400	8,956,300	− 20,100	413,200	0.21	31,126.76	2,396.57	0.077
2013	47,671	123,900	161,200	8,890,100	− 66,200	316,400	0.18	31,040.00	2,229.50	0.072
2014	48,462	115,500	145,700	8,834,400	− 55,700	267,800	0.13	31,049.59	2,132.58	0.069
2015	49,459	120,400	140,200	8,787,300	− 47,100	265,400	0.12	31,194.86	2,149.73	0.069
2016	50,448	129,100	130,600	8,772,700	− 14,600	280,200	0.10	31,473.72	2,188.70	0.070
2017	50,973	129,300	133,000	8,753,400	− 19,300	280,600	0.11	32,260.71	2,183.10	0.068
2018	51,742	133,700	132,900	8,736,300	− 17,100	284,600	0.12	32,444.60	2,216.38	0.068
Mean 2007–11	47,318	245,300	152,600	8,774,220	97,460	520,840	0.18	28,895.93	2,517.70	0.087
Mean 2012–18	49,406	130,257	143,714	8,818,643	− 34,300	301,171	0.14	31,512.89	2,213.79	0.070
Absolute differ-ence	2088	− 115,043	− 8886	44,423		− 219,669	0.04	2,616.96	− 303.91	− 0.017
Relative change	4.41%	− 46.9%	− 5.8%	0.5%		− 42.2%	− 23.14%	9.1%	− 12.1%	− 19.5%

Reports the development of new business, total premiums, and total AC in the German SubstHI market between 2007 and 2018. Data are from the website of the German Association of Private Insurers ("PKV Zahlenportal"). JAEG are reported in Euros. Total premiums and total AC are reported in million Euros and adjusted for inflation using the German CPI with 2007 as a baseline year. Table is based on data for the entire PKV market

Table 3 Summary statistics—prior to the reform (2007–2010)

	Mean Untreated	Std. dev	Min	Max	*n*	Mean Treated	Std. dev	Min	Max	*n*
Total premiums*	805.34	1173.81	5.83	4580.15	21	1296.91	846.66	218.02	3123.13	9
Loss ratio	0.60	0.12	0.31	0.84	21	0.64	0.08	0.53	0.77	9
Total AC*	54.72	74.31	0.60	338.83	21	122.24	65.46	26.45	285.18	9
RelAC	0.09	0.05	0.02	0.23	21	0.11	0.04	0.06	0.21	9
Total SubstHI^{+}	252.58	459.39	0.79	2148.96	21	337.94	227.36	41.36	737.57	9
Total SuppHI^{+}	506.56	652.78	0.08	3449.22	21	811.08	470.04	227.27	1717.60	9
New SubstHI^{+}	14.79	20.84	0.61	87.24	13	26.15	15.51	6.55	69.95	7
New SuppHI^{+}	43.07	33.65	3.17	174.63	13	67.95	46.44	7.17	209.37	7
Stock	0.71	0.45	0.00	1.00	21	0.78	0.42	0.00	1.00	9
I-Type	0.29	0.45	0.00	1.00	21	0.44	0.50	0.00	1.00	9
M-Type	0.24	0.43	0.00	1.00	21	0.56	0.50	0.00	1.00	9
T-Type	0.45	0.50	0.00	1.00	21	0.00	0.00	0.00	0.00	9

*In million Euros

$^{+}$In thousands

Shows summary statistics prior to the reform. Data are from the website of the German Association of Private Insurers ("PKV Zahlenportal") as well as Beenken (2011). Total premiums and total AC are adjusted for inflation using the German CPI with 2007 as a baseline year. Table is based on the full sample

SubstHI has an absolute decrease of 115,043, which is significantly lower after the reform. While some of this decrease could be explained by the regular increases in the annual eligibility threshold (JAEG, Column 1), the sharply decreasing trend after 2011 is much stronger than the slow and steady rate of annual increases in the JAEG.

In contrast, the yearly exit from SubstHI to SHI (Column 3) is just slightly reduced, by − 8,886. As there is no voluntary option for policyholders to exit SubstHI, these policyholders are mainly employed individuals who fall below the income threshold. Column 4 shows the total number of SubstHI contracts, and Column 5 displays the total change compared to the previous year. As Column 6 indicates, the total number of new SubstHI per year is − 219,669, which is also notably lower after the reform. While more than half of this decline is due to fewer new entrants from SHI (Column 2), the other half is hence of this decline is caused by less switching within the SubstHI market. This finding is supported by the development of the annual early cancelation rate (Column 7), which represents the percentage of contracts which were canceled in that year within 24 months of signing. This measure, which gives an indication of the extent of reshuffling, declines dramatically (− 23.14%) after the introduction of the reform. Taken together, these developments provide support for Prediction 1a, indicating that the minimum cancelation liability period decreased reshuffling.

The market-level data indicate that the reform had a significant effect on new SubstHI business for insurers. However, total AC (Column 9) decrease only moderately after the reform by − 12.1% (adjusted for inflation). Compared with the

substantial decrease in total new SubstHI contracts of − 219,669 (− 42.2%), this modest decrease is surprising, implying that companies adjusted to the reform by increasing the utilization of other marketing instruments. For RelAC (Column 10), there was a relative reduction of − 19.51% after the reform. However, this decrease was clearly driven both by the substantial premium increase for existing business of health insurers of 9.1% and the decrease in total AC of − 12.1%. This substantial change in RelAC highlights why this KPI can be misleading, as it relates the total AC of a new business to the total premiums of the existing business. Furthermore, we note that the effects of the 2009 reform of old-age provisions are noticeable in Table 2. As the new regulation introduced more flexibility for consumers, the highest number of new SubstHI contracts and the highest increase in net new SubstHI contracts (Column 5) occurred in 2009. As Table 2 indicates, although the years before and after 2009 are quite comparable, 2009 is an exceptional year, though the 2009 reform predates and is unrelated to the reform examined in this paper.

Table 3 displays summary statistics for the entire sample in the four sample years (2007–2010) before the announcement of the commission cap (2011).[13] On average, untreated firms are smaller in terms of total premiums, with 805.34 million in average total premiums compared with 1,296.91 million in average total premiums for treated companies. Similarly, total AC is, on average, lower for firms in the control group. Loss ratios (ratio of loss expenses to total premiums) are somewhat lower for untreated firms. However, the treated and untreated groups have similar RelAC before the commission cap, with ratios of 11 and 9%, respectively.

In terms of absolute enrollment, the treatment group has somewhat more total insured persons in the SubstHI line (337,940 compared to 252,580 for untreated firms). The treatment group has a higher number of insured persons in the SuppHI line, with 811,080, on average, compared to 506,560 for untreated insurers. In addition, on average, treated firms' business mix includes a somewhat higher proportion of SuppHI (71% SuppHI) compared to that of untreated firms (67%). New SubstHI contracts are somewhat higher in the treatment group, with an average of 26,150 annual new contracts compared to 14,790 in the untreated group. The number of new SuppHI contracts is also higher for firms in the treatment group. The legal form between the two groups is comparable, where treated firms are slightly more likely to be stock insurers. With regard to business strategy, untreated firms are mostly of T-type (45% of firms) with smaller proportions of I-type (29%) and M-type (24%) firms. Treated firms are either M-type (56%) or I-type (44%). None of the treated firms exclusively used tied agents before the introduction of the reform. For the summary statistics by business strategy, see Appendix D.

Figures 1A and 1B confirm the conclusions from the analysis of market-wide data (Table 2). Both treated and untreated firms have increasing annual premiums, on which the reform did not have a major impact. For untreated firms, total AC is quite stable over the whole observation period. However, total AC for treated firms increased substantially before the reform and appeared to decrease

[13] We use the announcement date (2011), as insurers had reliable information and could act accordingly on that date.

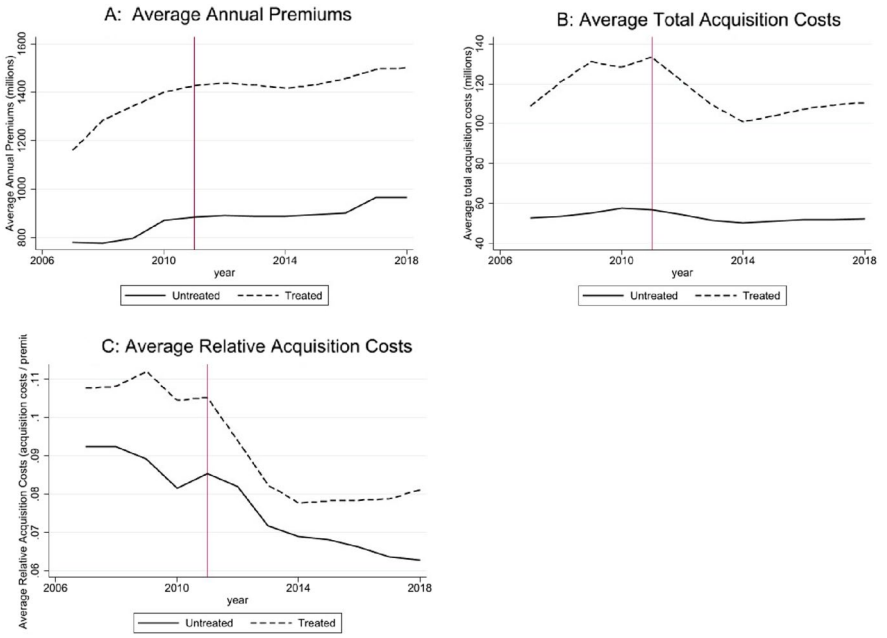


Fig. 1 Descriptive statistics—development of variables of interest. Note: shows the trends for the variables of interest between 2007 and 2018. Treated firms are shown with dashed lines, and untreated firms are shown with solid lines. The reform is indicated with the vertical line in 2011. All monetary values are inflation adjusted with the German CPI using 2007 as a baseline year

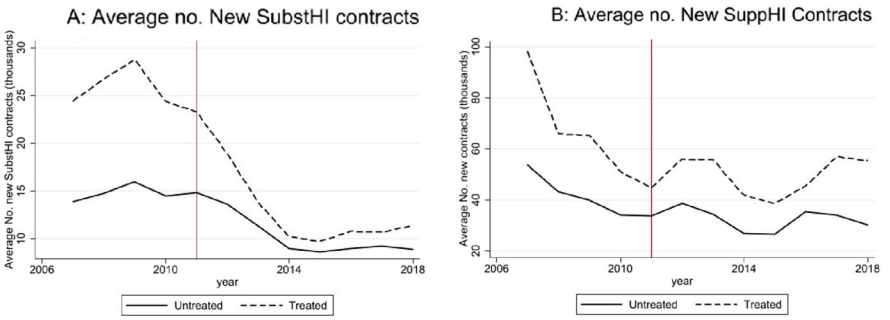


Fig. 2 Descriptive statistics—development of new business. Note: shows the trends for the variables of interest between 2007 and 2018. Treated firms are shown with dashed lines, and untreated firms are shown with solid lines. The reform is indicated with the vertical line in 2011

following the reform up until 2014 and increase thereafter. For RelAC (Fig. 1C), there was a brief decreasing trend after the cap; this effect appears to diminish after 2014. This development is in line with the general consensus of regulators that the reform has been successful in dampening commission costs.

Table 4 Mean difference comparison in new SubstHI for untreated firms

	Obs	Mean	Std. Err	Std. Dev	[95% Conf. Interval]	
Pre-reform	50	14.794	2.947	20.836	8.873	20.716
Post-reform	111	10.243	1.924	20.267	6.431	14.056
Difference		4.5510*	3.519		− 2.438	11.540

Shows the mean difference comparison in new SubstHI business for untreated firms. T test significance is denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.Values are in thousands. The data represent the sample who report new SubstHI business

Figure 2A illustrates the effect of the reform on the new SubstHI business. The substantial decrease for all firms—including untreated firms—can be attributed to the minimum cancelation liability period, which may have resulted in less short-term reshuffling of contracts by intermediaries. We test Prediction 1a with a t test of the means for the untreated group before and after the introduction of the minimum cancelation liability cancelation period. The results are shown in Table 4.

On average, untreated firms have about 4500 fewer new SubstHI contracts following the reform, which implies a reduction of 30.8% of new SubstHI business for untreated insurers. We consider this a rough estimation of the baseline effect of the minimum cancelation liability period. However, this difference is only significant at the 10% level. As can be seen in Fig. 2A, the treated firms experience a more dramatic decline in SubstHI compared to untreated firms. This can be explained by the commission cap, which only directly affects treated firms, in addition to the effect from the minimum cancelation liability period. The apparent convergence of the new SubstHI business could be triggered by the smaller difference in commissions paid by insurers. New SuppHI business (Fig. 2B) already decreased in the years prior to the reform. After the reform, the development is similar, but treated firms still have, on average, a higher number of new contracts per year than do untreated firms.

Based on this descriptive analysis, it appears that the reform dramatically reduced new SubstHI business overall and for treated firms in particular. However, total AC only decreased in the first years after the reform before it increased again to nearly pre-reform levels. RelAC decreased both for treated and untreated firms, but this reduction was driven by increasing premiums for existing business. Figures 1 and 2 highlight that untreated firms are also affected by the minimum cancelation liability period, but for the whole observation period, the total AC of untreated firms remains more or less unchanged. Furthermore, treated companies' new SubstHI business decreases much more dramatically than that of untreated companies. Hence, this much larger decrease is likely due to the commission cap, which only directly affects treated firms, while the overall market decrease in the new SubstHI can be explained by the fact that all firms are directly affected by the minimum cancelation liability period.

Table 5 Distribution strategy

	I-type			M-type			T-type		
	2011	2015	2017	2011	2015	2017	2011	2015	2017
Untreated	6	2	3	5	5	3	10	7	8
%	*29%*	*14%*	*21%*	*24%*	*36%*	*21%*	*48%*	*50%*	*57%*
N	21	14	14	21	14	14	21	14	14
Treated	4	0	1	5	7	4	0	1	3
%	*44%*	*0%*	*13%*	*56%*	*88%*	*50%*	*0%*	*13%*	*38%*
N	9	8	8	9	8	8	9	8	8

Shows the percentage of firms using the I-, M-, and T-type distribution strategies based on the results of the 2011, 2015, and 2017 surveys from Beenken 2011; Beenken and Radtke 2015; and Beenken and Radtke 2017. Table is based on the full sample

4 Empirical analysis

4.1 Difference-in-differences event study approach

To examine the effect of the commission cap on new SubstHI business (Prediction 1b) and total AC (Prediction 2), we use an event-study-style approach within a difference-in-differences framework. This approach allows us to control for the initial differences between the treatment and control groups as well as the effect of time. As a result, this empirical approach should allow us to isolate the effect of the commission cap on treated insurers in each year following the reform.

To measure the average effect of the reform on treated insurers, we estimate the following equation:

$$y_{it} = \alpha_i(i = \text{treated}) + \sum_{j=2007, j\neq 2010}^{2018} \beta_j I(t = j) * I(i = \text{treated}) + FE_{\text{year}*\text{company}} + \varepsilon_{it}, \tag{1}$$

where $I(t = j)$ is the year indicator and $I(i = treated)$ is the treatment indicator. The reference year is 2010. The interaction of these indicators, $\beta_j I(t = j) * I(i = treated)$, gives us an estimate of the average effect of the commission cap on treated firms for each year in the sample. Therefore, β_j is a yearly difference-in-differences estimator. Our fully specified model includes two-way fixed effects on year and company.

4.2 Notes on empirical limitations

Before presenting our results, we wish to address the possible limitations of this empirical approach that are specific to our case. First, we must address the possible issue of the endogeneity of treatment. We identify distribution channels as the most likely cause of endogeneity, as each insurer develops its own distribution strategy based on individual firm objectives. Therefore, we analyze data from intermediary

surveys (Beenken and Radtke 2015, 2017) to determine whether distribution channels represent a variable that varies either by group or time but not by both.

As seen in Table 5, the group of untreated firms had higher concentrations of T-type distribution strategies in all waves of the survey, while the treatment group had higher concentrations of M-type distribution strategies in all waves. This finding can explain some of the heterogeneity in total AC at the outset, as treated firms, compared to untreated firms, have, on average, higher total AC, likely due to the use of more costly distribution channels. Furthermore, although both groups appear to shift away from M- and I-type strategies and toward T-type strategies, the underlying structural differences across the groups do not change. Therefore, distribution strategies represent a variable that is group invariant, which indicates that the difference-in-differences approach can adequately control for this effect.

Furthermore, it is likely that spillover effects exist in this analysis: because all firms are active in the SubstHI market, both treated and untreated firms are, technically, subject to the reform. We have already addressed the direct effect of the reform on untreated companies in our analysis of Prediction 1a, where the minimum cancelation liability period led to a decrease in the new SubstHI for all firms (the overall decrease shown in Fig. 2A). However, the commission cap may also have an indirect effect on untreated firms, resulting from the changing business strategies of treated firms, which may lead to strategic changes in untreated firms. For firms whose pre-reform commissions were already below the commission cap (in our analysis, untreated firms), the cap is simply not binding. However, this does not mean that the cap had no effect on the business decisions of these firms. Unfortunately, due to the small number of firms in the market, our data do not allow us to robustly analyze spillover effects or even the intensity of treatment because when the data are grouped by different levels of maximum reported commissions, the number of observations quickly becomes small. For example, only one firm fell into the category of maximum commissions lower than 6 monthly premiums. Therefore, our analysis is unable to control for the spillover effects of the commission cap, which presents a limitation that must be taken into account when interpreting our results. However, as shown in Figs. 1a–c and 2b, the trends for untreated firms exhibit relatively stable development.

5 Results

In Table 6 and Fig. 3, we display the results of the full specification of our model, which includes time and company fixed effects.[14] The pre-reform difference-in-differences (DD) estimators represent an explicit test of the parallel trend assumption; if the estimators are significant, then the pre-reform slopes for treated and untreated firms are significantly different from one another in that year. The fact that the pre-reform estimators are not significant indicates that the parallel trends assumption holds for our variables of interest. We consider the estimator for new SuppHI in

[14] The results without fixed effects can be found in Appendix F.

Table 6 Fully specified model

VARIABLES	(1) Annual premiums (millions)	(2) Total AC (millions)	(3) RelAC	(4) No. new SubstHI contracts (thousands)	(5) No. new SuppHI contracts (thousands)
DD 2007	− 147.49*	− 14.46	− 0.00777	− 1.277	40.48***
	(76.11)	(9.65)	(0.00839)	(3.907)	(13.85)
DD 2008	− 21.46	− 3.25	− 0.00729	1.326	18.20
	(76.11)	(9.65)	(0.00839)	(3.768)	(13.37)
DD 2009	17.30	5.3492	− 0.000123	2.704	13.09
	(76.11)	(9.65)	(0.00839)	(3.664)	(13.02)
DD 2011	12.35	5.81	− 0.00314	− 1.431	− 6.101
	(76.11)	(9.65)	(0.00839)	(3.701)	(13.17)
DD 2012	18.05	− 3.89	− 0.0110	− 4.654	2.225
	(76.11)	(9.65)	(0.00839)	(3.701)	(13.33)
DD 2013	14.35	− 12.78	− 0.0123	− 10.20***	− 2.552
	(76.11)	(9.65)	(0.00839)	(3.779)	(13.72)
DD 2014	− 0.76	− 20.10**	− 0.0144*	− 11.11***	− 7.072
	(76.11)	(9.65)	(0.00839)	(3.638)	(12.91)
DD 2015	7.01	− 17.57*	− 0.0128	− 11.73***	− 10.05
	(76.11)	(9.65)	(0.00839)	(3.624)	(12.85)
DD 2016	26.33	− 15.05	− 0.0109	− 10.93***	− 4.462
	(76.11)	(9.65)	(0.00839)	(3.613)	(13.17)
DD 2017	2.032	− 13.44	− 0.00789	− 11.23***	6.940
	(76.11)	(9.65)	(0.00839)	(3.613)	(12.81)
DD 2018	5.86	− 12.10	− 0.00484	− 10.18***	9.294
	(76.11)	(9.65)	(0.00839)	(3.613)	(12.81)
Observations	360	360	360	241	225
R-squared	0.258	0.057	0.420	0.426	0.267
No. companies	30	30	30	25	24
Controls	No	No	No	No	No
Fixed effects	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses

*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$

Displays the results of the fully specified differences-in-differences model

2007 to be noncritical for the validity of the estimation, as the effect occurred long before the introduction of the commission cap and the other estimators are statistically insignificant.

The DD estimators for new SubstHI contracts (Column 4 and Fig. 3D) show significant and economically substantial average annual decreases in new SubstHI business following the introduction of the commission cap. The DD estimators are large and highly significant beginning in 2013 and remain significant until the end of the period of measurement. The effect of the cap is largest in 2015, where the

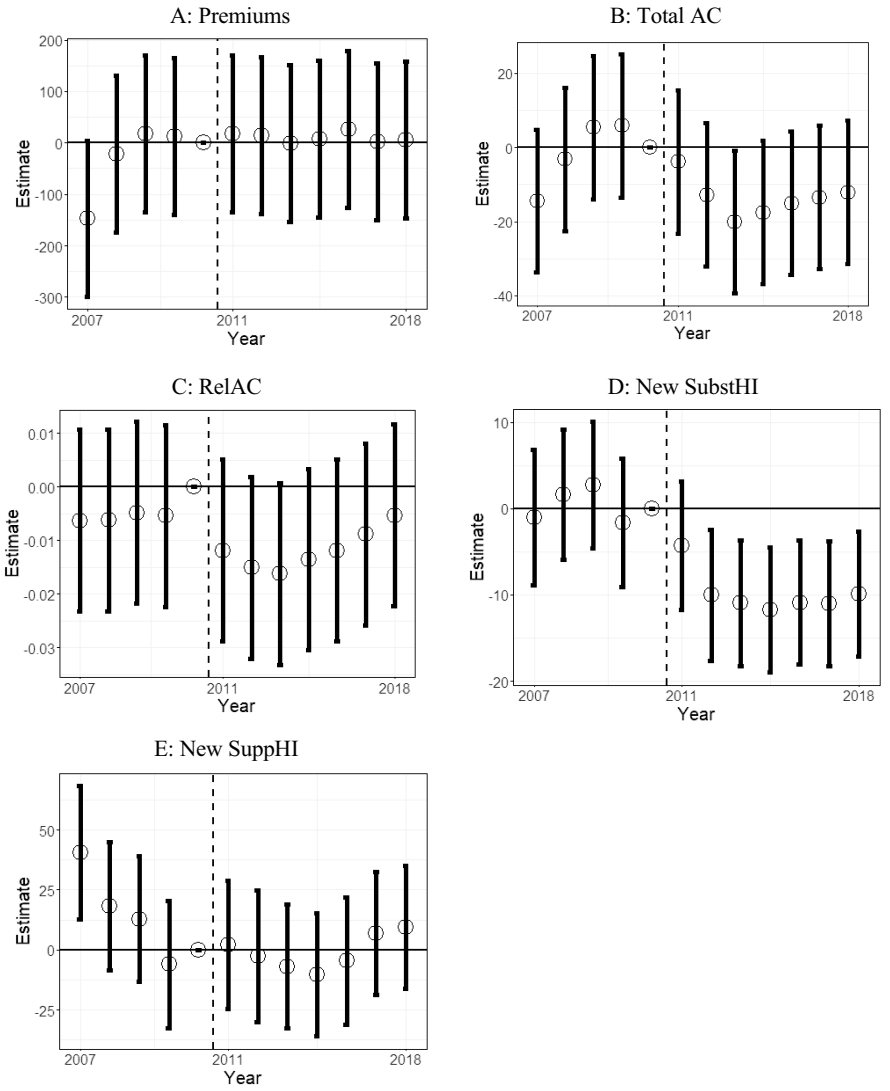


Fig. 3 **A** Premiums. **B** Total AC. **C** RelAC. **D** New SubstHI. **E** New SuppHI. Note: depicts the event-study figures of our full specification, where 2010 is the baseline year. The circles represent the coefficient of the DD estimator in each time period. The black bars indicate 99% confidence intervals. Confidence intervals which include 0 in pre-event periods indicate parallel trends

coefficients correspond to a decrease of 11,730 contracts for treated firms compared to that in 2011. Compared to the pre-reform average annual new SubstHI business of treated firms of 24,370 contracts per year in 2010 (see Appendix G), this figure represents an average decrease in new business for treated companies of up to 48%. Although this effect is large, it is in line with the reported industry-wide reduction of 42.2%, which we show in Table 2 (Column 6). It is important to note that the

Table 7 Percentage of maximum reported commissions (monthly premiums) for treated companies

Monthly premiums	< 10	10–12	12–14	14–16	16–18	No. companies
2011	0%	67%	11%	11%	11%	9
2015	100%	0%	0%	0%	0%	8
2017	100%	0%	0%	0%	0%	8

Shows the maximum reported commissions (reported in monthly premiums) for treated firms from the 2011, 2015, and 2017 surveys from Beenken 2011; Beenken and Radtke 2015; and Beenken and Radtke 2017. Table is based insurers from the full sample who appear in the Beenken surveys

estimators measure the difference in new SubstHI due to the commission cap, which only directly affected treated firms. Therefore, we find evidence in support of Prediction 1b; we conclude that the commission cap has substantially contributed to an additional decrease in new SubstHI business for treated firms. We find no significant effect on new SuppHI business. Hence, we do not see that intermediaries switched toward selling more SuppHI.

However, Prediction 2 is rejected, as the DD estimators in Table 6 for total AC (Column 2 and Fig. 3b) are never strongly significantly different from zero. The weakly significant results in 2014 and 2015 are interesting; we find that the coefficients of 20.1 and 17.6 million Euros are large in economic terms but that this effect is only present briefly and is never significant above the 5% level. The results of a matched sample DD regression (Appendix E), where we match based on pre-reform average total AC, also lead to a nonsignificant effect on total AC. The results in Table 6 show nonsignificant effects for premiums (Column 1 and Fig. 3a) and RelAC (Column 3 and Fig. 3c). Finally, it is worth mentioning that these results are robust to other assignments of the treatment and control groups.

The event-study analysis with respect to new business and total AC only indirectly allows for limited conclusions with respect to the change in commissions and the marketing-instrument mix of insurers. In the next section, we try to infer how commissions per new contract changed based on the observed total AC and new SubstHI and SuppHI business.

5.1 Commission cap—a success?

To provide more insight into the effect of the success of the commission cap on commissions per contract, we analyze the results of the 2015 and 2017 follow-up surveys of commissions from before the cap (Beenken 2011; Beenken and Radtke 2015, 2017). Table 7 shows treated companies' maximum reported commissions before and after the cap.[15]

[15] The company that was included in 2011 but not in 2015 or 2017 had a maximum reported commission of 10–12 monthly premiums.

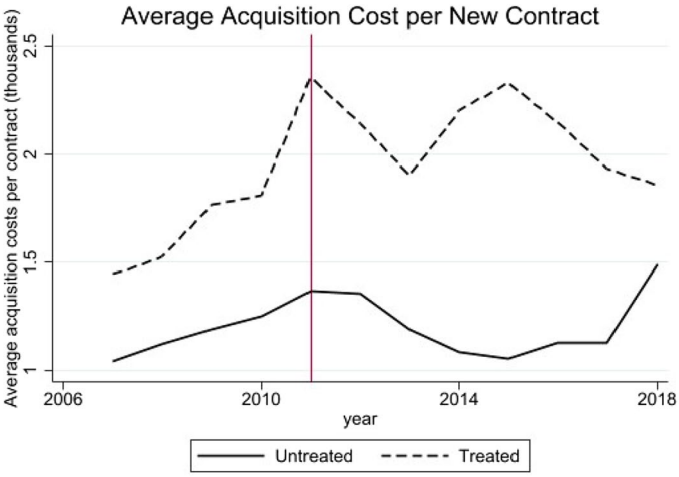


Fig. 4 Descriptive analysis—alternative measure of acquisition costs. Note: shows the trends in average AC per new HI contract between 2007 and 2018. Treated firms are shown with dashed lines, and untreated firms are shown with solid lines. The reform is indicated with the vertical line in 2011. AC are inflation adjusted with the German CPI using 2007 as a baseline year

Table 8 Summary statistics—pre-reform

	Mean Untreated	Std. dev	Min	Max	*n*	Mean Treated	Std. dev	Min	Max	*n*
AC per new HI[1]	1.14	0.81	0.35	3.21	13	1.76	0.95	0.43	4.43	7

[1]In thousand Euros

Displays pre-reform summary statistics for the variable AC per new HI. Data are calculated based on data from the website of the German Association of Private Insurers ("PKV Zahlenportal"). AC are inflation adjusted using 2007 prices according to the German CPI. The table is based on the sample of firms who report new SubstHI before the reform

As seen in Table 7, the commission cap seemingly had the effect of decreasing the maximum commissions paid; in 2011, the highest maximum reported commission for a treated firm was between 16 and 18 monthly premiums. In contrast, the maximum reported commission in 2015 and 2017 was 9 monthly premiums, which corresponds to the maximum allowable commission after the reform. Indeed, eight of the nine treated firms included in both surveys reported a maximum commission of 9 monthly premiums in 2017. Therefore, unsurprisingly, the level of commissions appears unchanged, as the average reported commission decreased only slightly, from 7.79 monthly premiums in 2011 to 7.53 monthly premiums in 2017. Eight out of nine reporting firms reported a decrease in average commission, with one firm reporting no change in average commission. Of those firms whose reported commissions decreased, the average decrease was 0.25 monthly premiums. Ultimately, it

appears that the commission cap did not affect the level of commissions per contract but, rather, simply trimmed away the few high commissions.[16]

Based on this analysis and the results of the regression, we find that a deeper analysis of the commission cap is necessary. RelAC is a good measure if the business environment is stable, in terms of both the business mix and the number of new contracts. However, this is not the case in the German PHI market. If the goal is the accurate measurement of acquisition cost per contract, then one must look at acquisition cost per premium volume of new business, and lines should be reported separately. However, such data are not publicly reported.

To attempt to imperfectly measure acquisition costs per contract, we analyze how AC per new contract changed with the reform. This measure is defined as the total AC of insurer i in year t divided by the sum of the new SubstHI and SuppHI contracts of insurer i in year t:

$$\mathrm{ACpernew}HI_{i,t} = \frac{\mathrm{TotalAC}_{i,t}}{\mathrm{No.New}SubstHI_{i,t} + \mathrm{No.New}SuppHI_{i,t}}$$

This approach has the benefit of tying acquisition costs to the new business in that period. However, there is no way to determine which lines of business drive acquisition costs, as only total acquisition costs are reported. This measure, although imperfect, is better equipped to assess the efficacy of the commission cap. As shown in Fig. 4, AC per new HI appears to have a generally increasing trend over time for both groups. Furthermore, as shown in Table 8, AC per new HI contract are notably higher for the treatment group than for the control group.

To analyze the effect of the commission cap on our new measure of AC per new contract, we apply the same empirical approach as that outlined in Sect. 3, where we conduct a difference-in-differences analysis using an event-study framework. The results of the regression are shown in Table 9 (Column 6) and Fig. 5.

The nonsignificant DD estimators before 2011 indicate that the parallel trends assumption holds. If the commission cap had its intended effect, then AC per new HI should decrease significantly. However, the effect is weak and ambiguous, as there is a weakly positive effect in 2016 and a weakly negative effect in 2018. Moreover, the estimators are, in general, both economically and statistically insignificant, indicating that the commission cap did not have a meaningful or lasting effect on the average AC per new HI. Based on this additional analysis, we conclude that the commission cap was not entirely effective, as there is no evidence that the cap effectively lowered commissions with respect to new business.

[16] These data are available upon request.

Table 9 Fully specified model

VARIABLES	(1) Annual premiums (millions)	(2) Total AC (millions)	(3) RelAC	(4) No. new SubstHI contracts (thousands)	(5) No. new SuppHI contracts (thousands)	(6) AC per new HI (thousands)
DD 2007	− 147.49*	− 14.46	− 0.00777	− 1.277	40.48***	− 0.970
	(76.11)	(9.65)	(0.00839)	(3.907)	(13.85)	(1.410)
DD 2008	− 21.46	− 3.25	− 0.00729	1.326	18.20	− 0.749
	(76.11)	(9.65)	(0.00839)	(3.768)	(13.37)	(1.360)
DD 2009	17.30	5.3492	− 0.000123	2.704	13.09	− 0.224
	(76.11)	(9.65)	(0.00839)	(3.664)	(13.02)	(1.322)
DD 2011	12.35	5.81	− 0.00314	− 1.431	− 6.101	− 0.221
	(76.11)	(9.65)	(0.00839)	(3.701)	(13.17)	(1.336)
DD 2012	18.05	− 3.89	− 0.0110	− 4.654	2.225	− 0.597
	(76.11)	(9.65)	(0.00839)	(3.701)	(13.33)	(1.336)
DD 2013	14.35	− 12.78	− 0.0123	− 10.20***	− 2.552	− 1.815
	(76.11)	(9.65)	(0.00839)	(3.779)	(13.72)	(1.364)
DD 2014	− 0.76	− 20.10**	− 0.0144*	− 11.11***	− 7.072	− 0.432
	(76.11)	(9.65)	(0.00839)	(3.638)	(12.91)	(1.313)
DD 2015	7.01	− 17.57*	− 0.0128	− 11.73***	− 10.05	− 0.102
	(76.11)	(9.65)	(0.00839)	(3.624)	(12.85)	(1.308)
DD 2016	26.33	− 15.05	− 0.0109	− 10.93***	− 4.462	2.445*
	(76.11)	(9.65)	(0.00839)	(3.613)	(13.17)	(1.304)
DD 2017	2.032	− 13.44	− 0.00789	− 11.23***	6.940	− 0.697
	(76.11)	(9.65)	(0.00839)	(3.613)	(12.81)	(1.304)
DD 2018	5.86	− 12.10	− 0.00484	− 10.18***	9.294	− 2.197*
	(76.11)	(9.65)	(0.00839)	(3.613)	(12.81)	(1.304)

Table 9 (continued)

VARIABLES	(1) Annual premiums (millions)	(2) Total AC (millions)	(3) RelAC	(4) No. new SubstHI contracts (thousands)	(5) No. new SuppHI contracts (thousands)	(6) AC per new HI (thousands)
Observations	360	360	360	241	225	241
R-squared	0.258	0.057	0.420	0.426	0.267	0.08
No. companies	30	30	30	25	24	25
Controls	No	No	No	No	No	No
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses

*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$

Displays the results of the fully specified differences-in-differences model including the variable AC per new HI

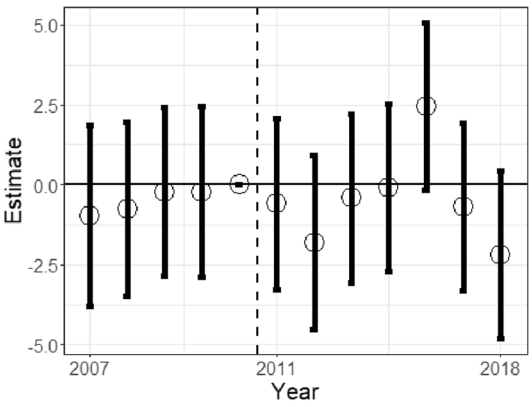


Fig. 5 AC per new HI. Note: depicts the event-study figures of our full specification for total AC per new HI, with time = 0 on the x-axis representing 2011. The circles represent the coefficient of the DD estimator in each time period. The black bars indicate 99% confidence intervals. Confidence intervals including 0 pre-event periods indicate parallel trends

6 Discussion

In insurance markets, consumers, consumer protection agencies, and regulators are particularly concerned about the cost of insurance products, as these are a crucial driver for the value of insurance. However, another important goal of insurance regulation is the financial stability of insurance companies. One problem specific to the German market for SubstHI is that the general premium regulation, which is outlined in Sect. 2, is aimed at reducing the insolvency probability of insurance companies by mandating cautious premium calculation with sufficient safety margins. This regulatory approach leads almost certainly to profits, which in turn have to be shared with policyholders through a premium rebate system. The considered reform with the commission cap and a minimum cancelation liability period aims, among other things, at reducing the cost of insurance. However, as our analysis indicates, this reform is only partly effective, as such cost-based premium regulation only induces weak or even no incentives for insurance companies to keep their cost level down. This result is in line with the MLR approach in US health insurance; where, for example, higher costs lead to higher absolute profits for health insurance companies (Cicala et al. 2019).

The reform had its predicted effect with respect to new SubstHI business, as it contributed to a significantly negative effect on new SubstHI business for all firms, and for treated firms in particular. The relative reduction of over 40% is substantial—though this should be interpreted cautiously, as the identifying assumptions for the study are strong. As the descriptive analysis indicates, all companies experienced a baseline reduction in new SubstHI business due to the introduction of the minimum cancelation liability period and its reduction of reshuffling. From an economic perspective, the minimum cancelation liability period can help reduce those unnecessary costs from reshuffling of business by intermediaries that want to maximize their commission income. Of course, switching insurers can be beneficial for consumers, but it is unlikely that such a switch is objectively necessary in the first years of a SubstHI contract. We

conclude that the minimum cancelation period was able to limit the reshuffling of business, which was tantamount to a market failure.

However, whether or not the commission cap is economically reasonable is more difficult to assess. Our results highlight that the commission cap may negatively affect intermediaries' incentive to search for new business, which is important because it is unclear whether the high commissions before the reform represented a market failure. If insurers optimally trade off the cost for a new business (Total AC) and the future profit generated by that new business, then if future profits are large, high commissions are reasonable. However, as the SubstHI market is not very transparent, market discipline is quite low, such that insurers can pass on higher costs via premiums to consumers. Therefore, consumers ultimately bear higher costs through higher premiums. Our results show that the reform did not have the intended effect of reducing Total AC, as these costs decreased only immediately after the reform until 2014 and then increased again. Considering the whole post-reform period, treated insurers did not significantly reduce their Total AC. Instead, insurers may have reacted to the reform by readjusting their optimal marketing-instrument mix. As the result of the reform was stable Total AC paired with dramatically fewer new contracts, our results imply that the resulting mix of marketing instruments may be less efficient.

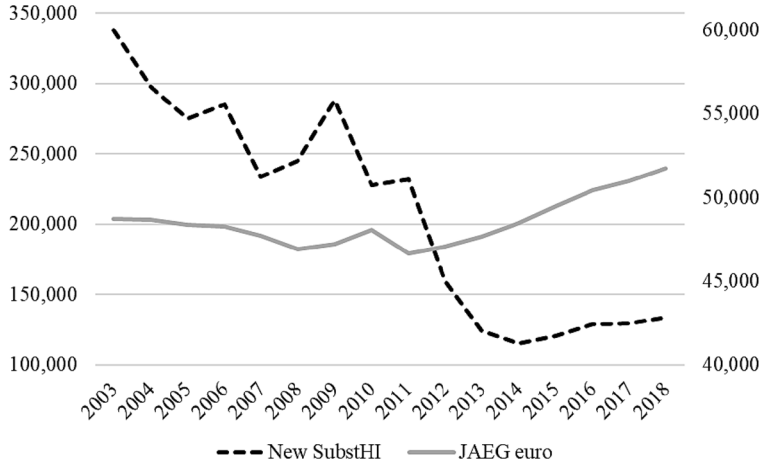
7 Conclusions

We find evidence that the reform was only partially successful. The introduction of a minimum cancelation liability period of 5 years led to a decrease in reshuffling in the SubstHI market: we estimate a baseline reduction of approximately 4500 new SubstHI contracts per year after the reform, although we note that this effect is only weakly significant. We find that the commission cap was successful in the sense that treated insurers seemingly reduced their commission below the cap threshold, but neither the minimum cancelation liability period nor the commission cap appeared to significantly reduce Total AC. Furthermore, we find evidence that the commission cap contributed to a substantial decrease of over 40% in new SubstHI business. As treated insurers had significantly fewer new SubstHI contracts but little change in Total AC, this indicates that resulting mix of marketing instruments of insurers may be less efficient.

Our analysis of the commission cap in the German PHI market indicates that directly regulating commission costs is not a very effective tool for increasing value of insurance for consumers. These findings are consistent with those of Cicala et al. (2019), Danzon and Harrington (2001), and others who find that effective cost regulation is difficult to implement. A potential tool could be regulating loss ratios in the spirit of MLR regulation in the United States. However, Cicala et al. (2019) show that this approach also has imperfections, and, in the German PHI market, regulation of loss ratios would conflict with existing premium regulation. Further research should examine the tradeoffs involved with other potential tools for increasing value of insurance for consumers.

Appendix

Appendix A: Development of inflation-adjusted JAEG and new SubstHI business



Appendix A shows the development of the inflation adjusted JAEG (shown in solid gray) and the development of new SubstHI business (shown in dotted black). Data are from the website of the German Association of Private Insurers ("PKV Zahlenportal") Although the drop in New SubstHI appears to coincide with an increase in the slope of the JAEG, the two variables are not highly correlated (overall correlation coefficient of − 0.43). More importantly, from an institutional perspective, changes in the JAEG are simply intended to keep up with wage growth and the calculation method was not affected by the 2012 reform. Furthermore, any remaining effect of the JAEG on New SubstHI should also controlled for by the two-way fixed effects model.

Appendix B: New SubstHI Contracts in the Market (thousands)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	534.6	517.2	566.1	498	488.3	413.2	316.4	267.8	265.4	280.2	280.6	284.6
Reported	302.5	353.7	410.9	331.2	327	283.2	219.1	198	198.1	220	222.6	221
Percent reported	56.6%	68.4%	72.6%	66.5%	67.0%	68.5%	69.3%	74.0%	74.7%	78.0%	79.3%	77.6%

Appendix B reports the total new SubstHI contracts in the market as well as the number of new SubstHI contracts that are reported (i.e., that are available for the empirical analysis of this paper). We are able to observe between approximately 60% and up to nearly 80% of total new contracts in the market

Appendix C: Reporting vs. Non-reporting firms pre-reform

	Mean Non-reporting	Std. Dev	Min	Max	*n*	Mean Reporting	Std. Dev	Min	Max	*n*
Total Premiums[1]	867.6	1239.7	5.8	4580.2	14	1004.0	1022.6	34.7	4512.3	20
AC[1]	68.5	92.7	0.6	338.8	14	78.9	68.0	3.4	285.2	20
Relative AC (original)	0.10	0.05	0.02	0.23	14	0.09	0.04	0.02	0.21	20
Total SubstHI[2]	216.1	291.0	0.8	911.3	14	315.4	457.8	8.7	2149.0	20
Total SuppHI[2]	542.4	776.2	0.1	3449.2	14	631.2	502.8	71.2	1717.6	20
New SubstHI[2]	–	–	–	–	0	18.58	19.86	0.61	87.24	20
New SuppHI[2]	–	–	–	–	0	51.83	40.13	3.17	209.37	20
Stock	0.82	0.39	0.00	1.00	14	0.68	0.47	0.00	1	20
Treatment group	0.24	0.43	0.00	1.00	14	0.33	0.47	0.00	1	20
AC per new HI[3]	–	–	–	–	0	1.35	0.91	0.36	4.44	20
Loss Ratio	60.2	13.3	30.7	83.5	14	60.8	9.7	41.6	77.1	20

[1]In million Euros

[2]In thousands

[3]In thousand Euros

Appendix C displays an analysis of firms that report new business and firms who do not. Data are from the website of the German Association of Private Insurers ("PKV Zahlenportal") as well as Beenken (2011). Total premiums and total AC are inflation adjusted with the German CPI using 2007 as a baseline year. Table is based on the full sample. Some firms began reporting new business data after 2007 and therefore have firm-year observations in both non-reporting and reporting.

Appendix D: Summary statistics—pre-reform by business strategy

	Mean I-Type	Std. Dev	Min	Max	n	Mean M-Type	Std. Dev	Min	Max	n	Mean T-Type	Std. Dev	Min	Max	n
Total premiums*	589.29	514.75	34.69	2077.94	10	1529.32	1169.79	187.99	4580.15	10	739.82	1255.14	5.83	4512.29	10
Loss ratio	0.56	0.06	0.45	0.67	10	0.67	0.08	0.50	0.77	10	0.59	0.15	0.31	0.84	10
Total AC*	57.69	67.42	3.43	285.17	10	113.05	72.82	9.83	302.52	10	40.86	55.91	0.60	195.88	10
Relative AC	0.09	0.03	0.02	0.15	10	0.10	0.04	0.06	0.21	10	0.09	0.06	0.02	0.23	10
Total SubstHI+	147.34	132.29	8.71	508.99	10	373.83	271.59	34.68	911.30	10	313.40	617.06	0.79	2148.96	10
Total SuppHI+	401.56	370.71	71.17	1332.44	10	1018.64	747.68	126.47	3449.22	10	373.56	442.59	0.08	1579.59	10
New SubstHI+	13.06	17.08	0.61	69.95	8	19.13	10.84	5.02	45.82	7	26.55	29.51	2.58	87.24	6
New SuppHI+	35.46	31.12	3.17	106.23	7	66.30	43.23	5.16	209.37	7	54.44	40.33	10.64	174.63	6
Stock	0.80	0.41	0.00	1.00	10	0.60	0.50	0.00	1.00	10	0.80	0.41	0.00	1.00	10

*In million Euros

+In thousands

Note: Appendix D displays the pre-reform summary statistics by different business strategies. Data are from the website of the German Association of Private Insurers ("PKV Zahlenportal") as well as Beenken (2011). Total premiums and total AC are inflation adjusted with the German CPI using 2007 as a baseline year. Table is based on the full sample.

Appendix E: Matched sample DD regression

VARIABLES	(1) Annual premiums (millions)	(2) Total AC (millions)	(3) RelAC	(4) No. new SubstHI Contracts (thousands)	(5) No. new SuppHI contracts (thousands)	(6) AC per new HI (thousands)
DD 2007	15.57	− 4.075	0.00312	1.619	10.92	− 0.364
	(132.6)	(18.33)	(0.0101)	(7.486)	(21.85)	(1.897)
DD 2008	149.9	5.106	− 0.00226	2.956	1.011	− 0.361
	(132.6)	(18.33)	(0.0101)	(7.337)	(21.42)	(1.860)
DD 2009	159.4	11.29	0.00267	1.000	0.209	− 0.148
	(132.6)	(18.33)	(0.0101)	(7.228)	(21.10)	(1.832)
DD 2011	− 0.539	12.82	0.00443	− 2.203	− 3.768	0.0875
	(132.6)	(18.33)	(0.0101)	(7.591)	(22.16)	(1.924)
DD 2012	0.820	7.618	− 0.00504	− 3.821	12.76	− 0.199
	(132.6)	(18.33)	(0.0101)	(7.591)	(22.16)	(1.924)
DD 2013	15.89	0.432	− 0.0154	− 8.413	8.148	− 0.391
	(132.6)	(18.33)	(0.0101)	(7.694)	(22.46)	(1.950)
DD 2014	1.085	− 6.893	− 0.0168*	− 8.171	6.241	− 0.199
	(132.6)	(18.33)	(0.0101)	(7.591)	(22.16)	(1.924)
DD 2015	9.671	− 6.960	− 0.0174*	− 9.553	4.603	− 0.147
	(132.6)	(18.33)	(0.0101)	(7.591)	(22.16)	(1.924)
DD 2016	24.06	− 7.140	−0.0193*	− 9.918	5.341	2.602
	(132.6)	(18.33)	(0.0101)	(7.366)	(21.81)	(1.867)
DD 2017	− 141.9	− 5.984	− 0.0142	− 11.13	20.77	− 0.589
	(132.6)	(18.33)	(0.0101)	(7.366)	(21.50)	(1.867)
DD 2018	− 131.4	− 4.613	− 0.0125	− 9.080	16.11	− 0.625
	(132.6)	(18.33)	(0.0101)	(7.366)	(21.50)	(1.867)
Observations	180	180	180	125	124	125
R-squared	0.535	0.119	0.460	0.435	0.416	0.180
No. Comp	15	15	15	13	13	13
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

Note: Appendix E displays the results of the matched sample differences-in-differences model including the variable AC per new HI

Appendix F: DD regression without fixed effects

VARIABLES	(1) Annual premiums (millions)	(2) Total AC (millions)	(3) Relative AC	(4) No. new SubstHI contracts (thousands)	(5) No. new SuppHI contracts (thousands)	(6) AC per new HI (thousands)
DD 2007	− 147.5*	− 14.64	− 0.00777	− 1.272	38.88***	− 0.696
	(76.11)	(9.664)	(0.00839)	(3.850)	(14.47)	(1.389)
DD 2008	− 21.41	− 3.282	− 0.00729	1.324	16.64	− 0.605
	(76.11)	(9.664)	(0.00839)	(3.713)	(13.97)	(1.341)
DD 2009	17.28	5.258	− 0.000123	2.697	12.10	− 0.375
	(76.11)	(9.664)	(0.00839)	(3.611)	(13.60)	(1.305)
DD 2011			− 0.00314	− 1.431	− 6.101	
	12.38	5.946	(0.00839)	(3.648)	(13.78)	0.0521
DD 2012	(76.11)	(9.664)	− 0.0110	− 4.654	2.077	(1.323)
	18.01	− 3.766	(0.00839)	(3.648)	(13.95)	− 0.521
DD 2013	(76.11)	(9.664)	− 0.0123	− 10.17***	− 2.021	(1.323)
	14.51	− 12.85	(0.00839)	(3.724)	(14.35)	− 1.792
DD 2014	(76.11)	(9.664)	− 0.0144*	− 11.07***	− 6.342	(1.349)
	− 0.818	− 20.19**	(0.00839)	(3.586)	(13.50)	− 0.200
DD 2015	(76.11)	(9.664)	− 0.0128	− 11.68***	− 9.234	(1.298)
	7.231	− 17.73*	(0.00839)	(3.571)	(13.44)	− 0.0899
DD 2016	(76.11)	(9.664)	− 0.0109	− 10.88***	− 4.954	(1.291)
	26.25	− 15.10	(0.00839)	(3.560)	(13.76)	2.597**
DD 2017	(76.11)	(9.664)	− 0.00789	− 11.19***	6.516	(1.286)
	2.111	− 13.32	(0.00839)	(3.560)	(13.39)	− 0.597
DD 2018	(76.11)	(9.664)	− 0.00484	− 10.14***	8.869	(1.286)
	5.971	− 12.19	(0.00839)	(3.560)	(13.39)	− 2.196*
Constant	(76.11)	(9.664)	0.0814***	11.88**	37.34***	(1.286)
	870.4***	57.62***	(0.00796)	(4.725)	(8.493)	1.111*
Observations	360	360	360	241	225	241
R-squared	0.351	0.100	0.420	0.423	0.266	0.168
No. Comp	30	30	30	25	24	25
Controls	No	No	No	No	No	No
Fixed Effects	No	No	No	No	No	No

Standard errors in parentheses

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

Appendix F displays the results of the differences-in-differences model without fixed effects including the variable AC per new HI.

Appendix G: Summary statistics—2010

	Mean Untreated	Std. Dev	Min	Max	n	Mean Treated	Std. Dev	Min	Max	n
Total premiums*	870.43	1317.86	8.66	4580.15	21	1399.92	898.04	274.90	3074.96	9
Loss ratio	0.59	0.11	0.31	0.76	21	0.64	0.08	0.56	0.77	9
Total AC*	57.61	82.57	0.64	338.82	21	128.29	71.64	34.12	258.20	9
RelAC	0.08	0.04	0.02	0.15	21	0.10	0.05	0.06	0.21	9
Total SubstHI^{+}	261.57	483.62	1.04	2148.96	21	358.87	243.67	45.28	737.57	9
Total SuppHI^{+}	567.41	797.03	0.14	3449.22	21	860.45	487.71	229.41	1717.60	9
New SubstHI^{+}	14.50	23.34	0.61	80.92	11	24.37	15.95	6.55	45.99	7
New SuppHI^{+}	33.95	24.01	3.17	80.96	10	51.04	28.43	7.17	86.93	7
Stock	0.71	0.46	0.00	1.00	21	0.78	0.44	0.00	1.00	9
AC per new HI^{3}	1.30	0.90	0.46	3.33	11	2.27	1.10	1.28	4.61	7

*In million Euros

$^{+}$In thousands

Appendix G displays summary statistics for the 2010, which is the baseline year before the reform. Data are from the website of the German Association of Private Insurers ("PKV Zahlenportal") as well as Beenken (2011). Total premiums and total AC are inflation adjusted with the German CPI using 2007 as a baseline year. Table is based on the full sample

Appendix H: List of abbreviations

AC: Acquisition costs

BaFin: Bundesanstalt für Finanzdienstleistungsaufsicht – Federal Financial Supervisor Authority

DD: Differences-in-differences

HI: Health insurance

JAEG: Jahresarbeitsentgeltgrenze – substitutive health insurance eligibility threshold

KPI: Key performance indicator

MLR: Medical loss ratio

PHI: Private health insurance

RelAC: Relative acquisition costs

SHI: Statutory health insurance

SubstHI: Substitutive health insurance

SuppHI: Supplemental health insurance

Total AC: Total acquisition costs

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