Deregulation, competition, and consumer choice of insurer:

Evidence from liberalization reform in China's automobile insurance market

Abstract:

In 2015, the China Insurance Regulatory Commission initiated a liberalization reform in the automobile insurance industry to grant insurers more discretion in policy design, underwriting, and ratemaking. The deregulation intended to increase competition and choices for the consumer; yet, there was little scientific evidence on how the insurance market responded to the reform. This article examines the effectiveness of this deregulation reform in China. Leveraging a large industry dataset of more than seven million automobile insurance policies from 63 major automobile insurers operating in China, we study policyholders' switching behavior among insurance providers. To better understand the heterogeneity in the impact of deregulation on market performance and consumer choice, we further analyze the switching pattern among different types of insurers according to the insurer's size, the company's business structure, the jurisdiction's market power, and the customer's risk type. Overall, the empirical results suggest that the reform has met its original goal, leading to higher market competition and more diversified consumer choices. We further confirm that the average premium dropped significantly after the reform for all three jurisdictions implementing the reform; yet, the insurers' pricing strategy was risk type-dependent, i.e., the average premium for the high risk customers increased, while the average premium for the low risk customers decreased substantially.

Introduction

Deregulation, in general, leads to enhanced competition. This trend has been observed in various industries, such as airline, telecommunication, and healthcare. The new low-cost entrants pose a threat to incumbent firms, leading to lower prices, improvements in the quality of service, and incentives to invest in new technology (Winston, 1993; Joskow and Noll, 1994; Kole and Lehn, 1997). Similar effects are found in the insurance industry as well. Scholars have investigated the impact of deregulation on market competition using a variety of measurements, such as efficiency and productivity, market structure, pricing strategy, and consumers' switching decisions (see Table 1).

Some scholars have focused on the impact of deregulation on the competitiveness of the automobile insurance market in developed countries (districts), including the U.S., Japan, Italy, and Taiwan. In terms of efficiency and productivity, Weiss and Choi (2008) concluded that the U.S. automobile insurers in rate-regulated states are less revenue and cost-scale efficient than those in competitive states. The experience in the Spanish automobile insurance market also showed significant growth in total factor productivity (Cummins and Misas, 2006). Turchetti and Daraio (2004) address market structure and observe a significant reduction in the total number of motor insurers operating in Italy following deregulation, accompanied by an increase in total factor productivity. As far as pricing strategies, lowered rates or increased dispersion of pricing strategies were observed following deregulation in the U.S., Japan, and Taiwan's automobile insurance markets (see Grabowski et al., 1989, Peng et al., 2016, and Pope and Ma, 2005 for details). In essence, regulation creates material economic inefficacies (in the form of reduced availability of coverage, increased price volatility, reduced quality, and higher cost of capital for insurer) to provide cross-subsidies to the drivers who impose the highest costs on the automobile insurance system, according to a synopsis of findings in the U.S. automobile insurance market (Cummins, 2002).

Another stream of literature uses the consumer's choice to switch insurers to measure market reaction to deregulation. For instance, scholars have performed empirical studies using reform data in the Dutch health insurance market (Van Rooijen et al., 2011; de Jong et al., 2008). Although they did not consistently find an increase in the percentage of customers who switched insurers after the market reform, the results cannot be naturally applied to the insurance market at large (or to the automobile insurance market in specific). Indeed, they can be more reasonably explained by the high switching cost in the health insurance market.[1]

To the best of our knowledge, there is no existing research that uses insurer switching in the automobile insurance industry to measure the impact of deregulation. In this paper, we fill this gap by examining the effects of rate deregulation on market competition and the consumer choice to switch insurers in China's automobile insurance market. Compared with insurer switching in the health insurance market, using automobile insurer switching to measure the impact of deregulation has its advantages. First, it is not a group policy that ties an individual to the employer's preferences. Second, automobile insurance is not as restricted by service providers (such as automobile repair shops) as health insurance. Third, the switching cost in automobile insurance is relatively low.[2]

As the world's second-largest nonlife insurance market and the largest among developing countries, China's automobile insurance market provides rich data to test the effects of deregulation. In 2015, the China Insurance Regulatory Commission (CIRC)[3] initiated a liberalization reform in the automobile insurance industry to grant

---

[1] It is well established in the literature that information, search cost, and switching cost are important determinants for the customer to switch their insurance providers (Schlesinger and von der Schulenburg, 1991, 1993).

[2] Honka (2014) estimated the average switching cost in the U.S. automobile insurance industry to be about $40.

[3] CIRC was combined with China Bank Regulatory Commission in 2018 and is now known as China Bank and Insurance Regulatory Commission (CBIRC).

insurers more discretion in policy design, underwriting, and ratemaking. The reform serves as a quasi-experiment and provides a natural context for us to investigate how the market responds to regulation changes.

Leveraging a large panel dataset of more than seven million automobile insurance policies from 63 major automobile insurers operating in China, we study policyholders' switching behavior among insurance providers. To better understand the heterogeneity in the impact of deregulation on market performance and consumer choice, we further analyze the switching pattern among different types of insurers. Overall, the empirical results suggest that the reform has met its original goal, leading to higher market competition and more diversified consumer choice.

Though rate deregulation is, in general beneficial, it should be noted that intensive regulation is still warranted in certain aspects when serious market imperfection exists. Thus, in the process of rate deregulation, which may lead to concerns on price war, colluded pricing, or excessive rates for high risk customer, solvency regulation and customer protection become crucial. The government should help increase the availability of information on price and quality. Besides, the regulation regarding policy form and fraud prevention should also be emphasized while deregulating the automobile insurance industry (Cummins, 2002).

In China's automobile insurance market, a strict rate regulation was imposed on all insurers in 2006, allowing at most 30% off the standard rate for any customer. With little variation in policy form in the industry, the insurers cannot compete on price for the good customers directly because of the rate floor enforced by regulation; thus, the insurers turn to compete for channels to obtain customers by offering higher commissions, leading to decreased efficiency, and high market power. In this context, liberalization reform is needed to increase competition in 2015.[4]

We contribute to the literature in the following ways. One, we are the first to study the impact of deregulation on the consumer's choice to switch auto insurers. The previous studies use data from the health insurance market, where consumer choice of insurer is restricted.[5] Therefore, using experience from the automobile insurance market is helpful when attempting to examine individual consumer choice. Two, we use individual-level data from the automobile insurance industry. This is in contrast with the existing literature on automobile insurance, which usually uses aggregate data from the industry, such as the number of automobile insurers in operation or total factor productivity, to study the impact of deregulation on market performance. Three, our study is the first to examine the impact of deregulation on China's insurance market – the largest insurance market among developing countries. Our findings complement existing studies supporting the deregulation of insurance markets in developed economies, such as in the U.S., Japan, Italy, and others (see Cummins, 2002, for a review).

The remainder of the paper is structured as follows. Section 2 describes China's automobile insurance products and the liberalization reform in China's automobile insurance industry. Section 3 summarizes the insurance data and sample construction process. Section 4 presents the research methodology, and Section 5 shows the regression results and discussions. Section 6 concludes.

---

[4] The regulatory system for insurance industry in China was also switching to a risk-oriented solvency system with three pillars focusing on quantitative measure, qualitative measure and market constraint starting in 2015

[5] First, many individuals get access to health insurance using group policies provided by their employers. Thus, which insurer to choose is not entirely up to the individual. It is further found that for firms, the cost to switch health insurance plans remains high (Dafny, 2010). Second, many health insurance plans, such as HMOs and PPOs, restrict services to a specific health provider network, which imposes additional costs and barriers for customers to switch plans. Third, specific groups, especially those with chronic disease and other preexisting conditions, face additional barriers to switching insurers (Hendriks et al., 2009; Van Rooijen et al., 2011).

Table 1. Empirical Evidence on the Impact of Deregulation

	Efficiency and Productivity			Market Structure	Pricing Strategy			Switching Insurer		
	Weiss &Choi (2008)	Cummins &Misas (2006)	Turchetti &Daraio (2004)	Turchetti &Daraio (2004)	Grabowski et al. (1989)	Peng et al. (2016)	Pope &Ma (2005)	Van Rooijen et al. (2011)	de Jong et al. (2008)	Our paper
Product Market Measure	Auto U.S. Cost efficiency	Auto Spain TFP*	Auto Italy TFP*	Auto Italy # of insurers	Auto U.S. Inverse loss ratio	Auto Taiwan Loading factor	Auto Japan Rate deviation from bureau rate	Health Netherlands % of switcher	Health Netherlands % of switcher	Auto China Actual switching
Data	7,833 insurer-year obs.	10-year annual data	19-year annual data	19-year annual data	240 state-year obs.	84 insurer-year obs.	202 insurer-year obs.	3,000 respondents	3,800 respondents	7 million+ individual-year obs.
Impact	More efficient	More productive	More productive	More insurers	Lower price	Lower price	Increased dispersion	Stable	Increased mobility	More competitive

Note: TFP stands for total factor productivity.

Automobile Insurance in China

Insurance Products

China was the world's second-largest nonlife insurance market in terms of premium income in 2018, with an 11.02% share of the world market.[6] Domestically, automobile insurance is the dominant business line in the nonlife insurance market, accounting for 72.7% of nonlife premiums in 2018.[7]

There are two types of automobile insurance coverage in China: the compulsory traffic accident liability insurance (CTALI) required by the government and the voluntary personal automobile insurance policy (PAI) offered by commercial insurance companies. The CTALI policy provides coverage for third parties' financial losses (both bodily injury and property damage) that the policyholder is liable for while operating the vehicle. It provides 110,000 yuan (roughly 16,000 USD) in liability coverage for death and disability compensation, 2,000 yuan (roughly 300 USD) in property damage, and 10,000 yuan (roughly 1,500 USD) in medical expenses. The government directly set and regulated the CTALI policy rate, and the commercial insurers provide the product to consumers, without any remaining discretion in rate making. On top of CTALI, the insured could purchase a PAI policy voluntarily. The PAI is a standardized contract that provides comprehensive coverage by combining multiple insurance agreements, similar to the common practice in developed markets. Besides the third-party liability coverage, it is common to include physical damage (for collision protection), liability coverage to occupants of the insured vehicle, and whole-vehicle theft. Commercial property insurance companies provide the PAI policy with a choice of insurance amount.[8] Each private insurer sets the rate for its PAI policies, subject to the constraints of and approval by the CIRC.

Most drivers purchase the PAI policy to obtain comprehensive protection. According to the Insurance Report of Private Car Drivers 2017 released by the Chinese Insurance Information Technology Management Company (CIITMC)[9], 75.48% of drivers purchased a PAI policy in 2017 in addition to their CTALI policy, while the remaining 24.52% of drivers only purchased a CTALI policy.

Liberalization Reform

China Insurance Regulatory Commission (CIRC) initiated liberalization reform in the automobile insurance industry in June 2015, on a step-by-step basis. Specifically, it divided the 36 jurisdictions into three groups, with the first group of 6 jurisdictions implementing the reform starting on June 1st, 2015, the second group of 12 jurisdictions on January 1st, 2016, and the remaining 18 jurisdictions on July 1st, 2016. Figure 1 shows the geographic locations of these three groups of jurisdictions. The detailed list of jurisdictions in the three groups can be found in Appendix Table 1.

---

[6] World Insurance: The Great Pivot East Continues, Sigma Report, Swiss Re Institute, No.3, 2019.
[7] China Insurance Market Report 2019, Peking University Press.
[8] The coverage of third-party liability is chosen by the insured, but the coverage of physical damage (collision) line is set to equal to the car's actual cash value automatically.
[9] The CIITMC became the China Banking and Insurance Information Technology Management Company (CBIITMC) after the merge of CIRC and CBRC into CBIRC.
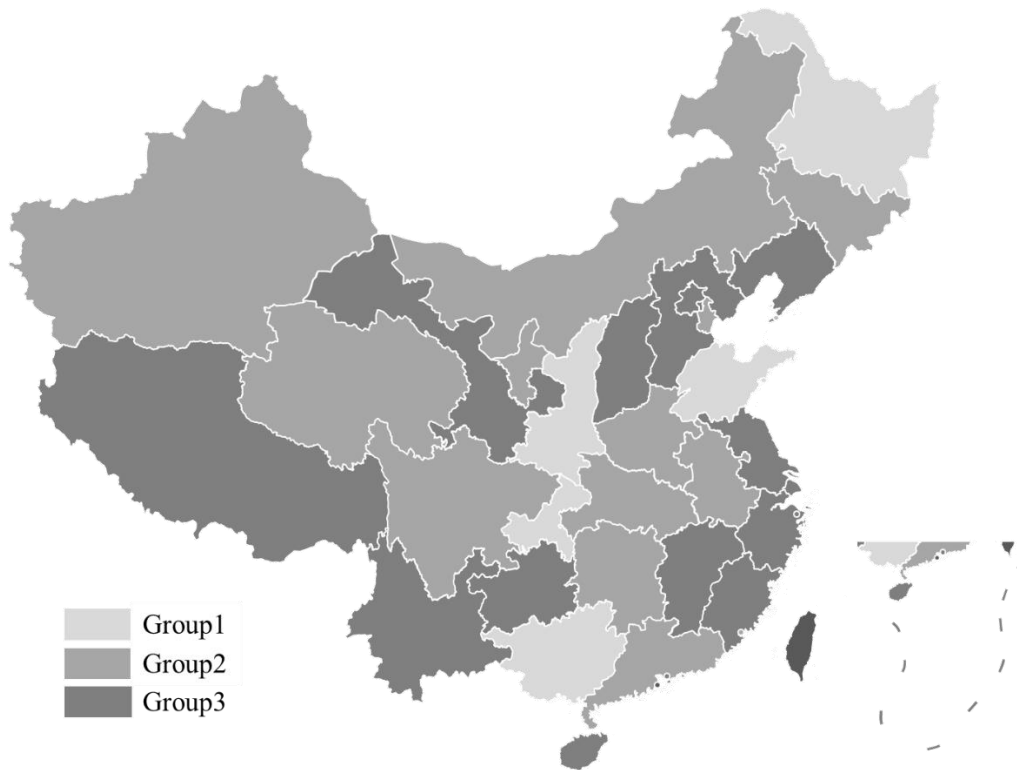
Figure 1. Geographic Location of Three Groups of Jurisdictions Implementing the Reform

Table 2. Comparison of Commercial Automobile Insurance Policy Prior to versus After the Reform

	Ratemaking			Policy Design
	Base Premium	Multipliers		
		NCD factor	Other factors	
Before	The base premium is standardized for the whole industry for the same risk class.	NCD factor ranges from 0.7 to 1.3.	The maximum discount is set to be 30% for all insurers.	An industry standardized policy form is enforced.
After	The base premium is standardized for the whole industry for the same risk class. It considers more refined risk classification, including the geographic location and vehicle characteristics such as make and model, age, price, and usage of the car.	NCD factor ranges from 0.6 to 2, allowing for a wider range of adjustments to award the low-risk drivers and punish the high-risk ones to a larger extent. Details are provided in Appendix Table 2.	The insurer determines both the insurer underwriting (IU) factor, and the insurer sales channel (ISC) factor for each policyholder, and the range for both factors should be within 0.85 to 1.15.	An industry standardized automobile policy is updated. And the insurance company could also design its innovative automobile policy, subject to approval by CIRC.

The liberalization reform only applies to the PAI policy. Table 2 summarizes the comparison of the PAI policy in terms of ratemaking and policy design both before and after liberalization. Prior to the reform, both the rate and policy form of the PAI policy in China had been strictly regulated. The government enforced an industry-standard policy and a strict price range.[10] The reform's overall objective was to facilitate the marketization of the automobile insurance industry in China by granting the insurer more discretion in policy design, underwriting, and ratemaking. Specifically, the Insurance Association of China designed a model automobile

---

[10] As to the ratemaking, the CIRC regulates the maximum discount for the policyholder, setting at 30% for all insurers prior to the reform.

policy and submitted it to the CIRC for approval. The insurance company was also allowed to design its innovative automobile policy, subject to the CIRC's approval.[11]

In terms of changes in rate-making, the insurance company was allowed to adjust the base premium, which is determined by the average industry experience, by three additional factors: the no-claim-discount (NCD) factor (also known as bonus-malus system), the insurer underwriting (IU) factor, and the insurer sales channel (ISC) factor after the reform. The NCD factor is a set of pre-determined discount factors used by the industry for experience rating. After the reform, the factors allow for a wider range of adjustments to reward low-risk drivers and punish high-risk ones. The detailed information regarding the NCD factors, both prior to and after the reform, can be found in Appendix Table 2. Besides, both the IU and ISC factors for each policyholder are determined by the insurer, subject to the ranges specified by the CIRC.[12]

Specifically, the post-reform premium is defined as follows:

$$\text{base premium} = \frac{pure\ risk\ premium}{1-loading\ fee\ percentage} \tag{1}$$

$$\text{premium} = \text{base premium} \times NCD\ factor \times IU\ factor \times ISC\ factor \tag{2}$$

Here, the pure risk premium is determined using the industry average loss cost of the policy, taking into account the geographic location and vehicle characteristics, including make and model, age, price, and usage of the car. The loading fee percentage is also determined using the industry average. Therefore, all insurers in the market use a universal base premium for the same risk class; however, the base premium considers more refined risk classification than pre-reform.

Prior to the reform, for the policyholder with the best claim history (i.e., no claim filed in the previous three years), the best rate that could be offered by any insurer was equal to $0.7 \times 0.7 = 0.49$ of the base premium due to the NCD factor and price discount regulation rules,[13] while the minimum rate after the reform turns out to be $0.6 \times 0.85 \times 0.85 = 0.4335$ of the base premium, which represents a decrease of roughly 11.5% in this specific case.[14] In our sample, we observe the average premium to be 3,027 yuan in 2015. In 2016, it decreased 13.4% with an average premium of 2,622 yuan.[15]

Data and Descriptive Statistics

Data and Sampling

We utilize a large dataset obtained from the automobile insurance data platform of the Chinese Insurance

---

[11] Till the end of our sampling period, no such new policy has been approved by the CIRC.

[12] In the reform starting in June 2015, the CIRC specified the range of the insurer underwriting factor and the insurer sales channel factor to be both within [0.85, 1.15]. For example, the lowest risk policyholder that the insurer wants to attract could enjoy a 27.75% additional discount off the base premium (0.85x0.85=0.7225).

[13] The maximum NCD discount is 30% off and the maximum discount that the insurer can grant to a policyholder prior to the reform is also 30% off.

[14] This example is used to illustrate a crude calculation of premiums. Please note the base premium after the reform may be different from the previous case, so the 11.5% decrease may not be accurate.

[15] To provide socioeconomic context for these premiums, the average disposable annual income in China in 2016 was 23,821 yuan and the average annual consumption per capita was 17,111 yuan. We note it would not be reasonable to compare the average premium with the average disposable income directly because the underlying populations are not the same. A more accurate estimation can be derived as follows. There were 194 million automobiles in China and there were 36 cars for every 100 households in 2016 (http://www.stats.gov.cn/tjsj/zxfb/201702/t20170228_1467424.html). If we assume the wealthiest 20% of the population own private cars, then the average premium of automobile insurance in 2016 accounts for approximately 4.4% of the average income for individuals in the top 20% of the income distribution. This percentage will increase to 8.2% if we assume people in the top 40% income distribution percentile are car owners.

Information Technology Management Company (CIITMC). Per regulation, all insurance companies operating in China must report their underwriting and claims data to CIITMC to support experience rate making. The CIITMC, which is owned and managed by the CIRC, gathers and manages the insurance industry's data to assist policy making for the CIRC.

To study the impact of automobile insurance rate deregulation on consumer switching between insurers, we randomly sampled 5% of all automobile insurance policies issued between June 1st, 2013 (two years before the reform) and June 30th, 2017 (one year after the reform) in China.[16] We further restrict our sample to those cars which have at least one observation both before and after the reform was implemented. By applying this restriction, we avoid the potential impact of the general increase in automobile ownership during the sample period on our results. We further require that the car owner remain the same during the sample period to avoid the possibility that the car's new owner switched their insurance. Besides, China's standard automobile insurance policy provides coverage for one year; therefore, we exclude policies with abnormal policy periods.[17]

Excluding observations with missing values, we obtain a sample size of 1.97 million insured cars, with approximately 7.33 million policy-year observations. Figure 2 illustrates the sample period as well as the timing of the reforms. Our sample includes automobile insurance policies issued by 46 major insurers in 2013 and policies issued by another 17 companies who joined the market from 2014-2016.[18] Altogether, the sample was collected from 63 insurance companies. A list of insurance companies is provided in Appendix Table 5.
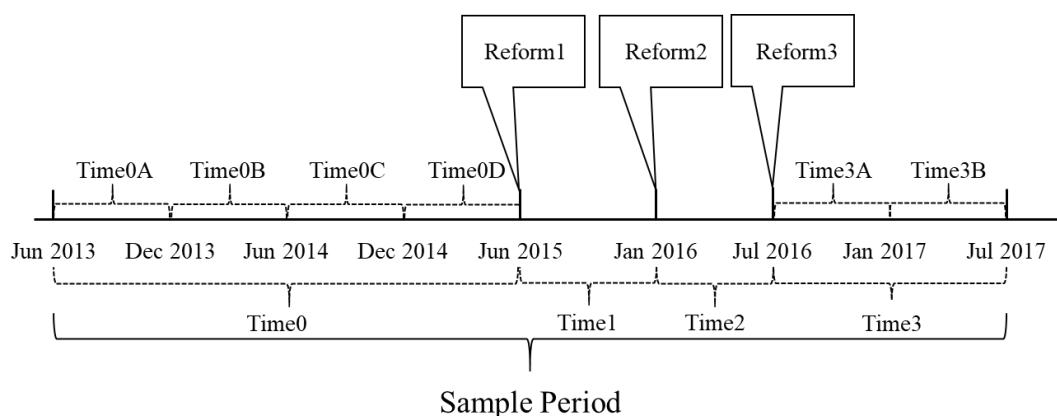
Figure 2. Illustration of Sample Period and Timing of Reform

Here, we create four dummy variables to denote the time period regarding the reform. Time0 represents the two-year pre-reform period between June 1st, 2013 and May 31st, 2015. Time1 represents the initial stage of reform when the first 6 jurisdictions implemented the reform between June 1st, 2015 and Dec. 31st, 2015. Time2 represents the expanding stage, when another 12 jurisdictions implemented the reform between January 1st, 2016 and June 30th, 2016. Time3 represents the final stage, when all jurisdictions implemented the reform between July 1st, 2016 and July 1st, 2017.

Because Time0 and Time3 are much longer than Time1 and Time2, as an alternative way to define the time period, we further divide the four-year sampling period into eight periods, denoted by Time0A, Time0B,

---

[16] We sampled 32 out of 36 jurisdictions in China, excluding Beijing, Shanghai, Shenzhen and Ningbo, because their regulatory and data recording rules are different from all the other jurisdictions.

[17] Specifically, we include the policy in our sample only if the length of the policy period is between 335 days and 395 days, i.e., we allow at most 30 days deviation from the normal length of the policy.

[18] There were 53 property/casualty insurance companies operating in the automobile insurance industry in China in 2013, according to the China Insurance Yearbook 2014. The other seven insurers not included in our sample underwrote very few businesses in 2013; thus, we did not obtain enough observations from the 5% random sampling process.

Time0C, Time0D, Time1, Time2, Time3A and Time 3B, with each period lasting for roughly half a year. The detailed definitions are presented in Table 2.

Summary Statistics

Our data is a roughly four-year unbalanced panel dataset. It is composed of all available data from the automobile insurance policies, including underwriting and claims information. The data include the policyholder's age, gender and previous claim history; the type, usage type, the age of the insured car; whether the car is registered in the local province, whether it belongs to a fleet, whether it is a new car, and the purchasing price of the car. The dataset also contains policy-level information on the name of the insurer and the sales channel. Detailed definitions of variables and summary statistics are presented in Table 3 and Table 4, respectively.

It should be noted that our key variable of interest, Switch, is a dummy variable that equals one if the current policy's insurer is different from the insurer of the previous policy; otherwise, it equals zero. It does not include insurer switching in the middle of a policy term, because we restrict our sample to policies that last for a full year. In practice, it is uncommon for policyholders to switch insurers in the middle of the policy term because the PAI policy is usually sold together with the CTALI policy by the same insurer, both lasting for a year. The CTALI policy cannot be refunded unless the consumer sells the vehicle. For the first insurance policy of a new car, the dummy variable Switch equals zero.

Table 3. Variable Definition

Category	Variable Name	Definition
Characteristics of Policyholder		
Age group	AgeUnder25	= 1 if the insured's age is under 25, otherwise, it equals 0.
	Age25_29	= 1 if the insured's age is between 25 and 39, otherwise, it equals 0.
	Age30_39	= 1 if the insured's age is between 30 and 39, otherwise, it equals 0.
	Age40_59	= 1 if the insured's age is between 40 and 59, otherwise, it equals 0.
	AgeAbove60	= 1 if the insured is older than 59, otherwise, it equals 0.
Gender	Female	= 1 if the insured is female, otherwise, it equals 0.
Bonus-malus system	ThreeYearsNoClaim	= 1 if there is no claim in the previous three years, otherwise, it equals 0.
	TwoYearsNoClaim	= 1 if there is no claim in the previous two years, otherwise, it equals 0.
	OneYearNoClaim	= 1 if there is no claim in the previous year, otherwise, it equals 0.
	LastYearClaims1_3	= 1 if the number of claims was between 1 and 3 in the previous year, otherwise, it equals 0.
	LastYearClaimsAbove3	= 1 if the number of claims was above 3 in the previous year, otherwise, it equals 0.
Characteristics of car		
Type of car	SeatsUnder6	= 1 if the vehicle has less than 6 seats, otherwise, it equals 0.
	Seats6_9	= 1 if the vehicle has seat number between 6 and 10, otherwise, it equals 0.
	Seats10_36	= 1 if the vehicle has more than 36 seats, otherwise, it equals 0.
	Truck	= 1 if the vehicle is a truck, otherwise, it equals 0.
	OtherType	= 1 if the vehicle does not belong to any of the above types, otherwise, it equals 0.
Use of car	Business	= 1 if the vehicle can only be used for business, otherwise, it equals 0.
	NonBusiness	= 1 if the vehicle can only be used for non-business, otherwise, it equals 0.
	MixUse	= 1 if the vehicle is used for both business and non-business purposes, otherwise, it equals 0.
Age of car	CarAge0_2	= 1 if the vehicle's age is less than 2 years, otherwise, it equals 0.
	CarAge3_5	= 1 if the vehicle's age is between 2 and 5 years, otherwise, it equals 0.
	CarAge6_8	= 1 if the vehicle's age is between 6 and 8, otherwise, it equals 0.
	CarAgeAbove8	= 1 if the vehicle's age is above 8, otherwise, it equals 0.
Local	LocalCar	= 1 if the vehicle is registered in the local province, otherwise, it equals 0.
Non-new	NonNewCar	= 1 if the vehicle was bought for more than 365 days, otherwise, it equals 0.
Price	CarPrice	A continuous variable equals the price of the insured's car (in 10,000 yuan).

Characteristics of insurance		
Sales channel	TraditionalSale	= 1 if the policy is sold over the counter, otherwise, it equals 0.
	DirectSale	= 1 if the policy is sold by an insurance company directly, otherwise, it equals 0.
	EcommerceSale	= 1 if the policy is sold online, otherwise, it equals 0.
	AgentSale	= 1 if the policy is sold by an individual agent, otherwise, it equals 0.
	PartTimeAgent	= 1 if the policy is sold by a part-time agent (such as an automobile dealer), otherwise, it equals 0.
	ProfessionalAgent	= 1 if the policy is sold by a professional agent company, otherwise, it equals 0.
	BrokerSale	= 1 if the policy is sold by an insurance broker company, otherwise, it equals 0.
	CallSale	= 1 if the policy is sold by a call center, otherwise, it equals 0.
Time	Time0	= 1 if the policy commenced between June 1st, 2013 and May 31st, 2015, otherwise, it equals 0.
	Time0A	= 1 if the policy commenced between June 1st, 2013 and November 30th, 2013, otherwise, it equals 0.
	Time0B	= 1 if the policy commenced between December 1st, 2013 and May 31st, 2014, otherwise, it equals 0.
	Time0C	= 1 if the policy commenced between June 1st, 2014 and November 30th, 2014, otherwise, it equals 0.
	Time0D	= 1 if the policy commenced between December 1st, 2014 and May 31st, 2015, otherwise, it equals 0.
	Time1	= 1 if the policy commenced between June 1st, 2015 and December 31st, 2015, otherwise, it equals 0.
	Time2	= 1 if the policy commenced between January 1st, 2016 and June 30th, 2016, otherwise, it equals 0.
	Time3	= 1 if the policy commenced between July 1st, 2016 and June 30th, 2017, otherwise, it equals 0.
	Time3A	= 1 if the policy commenced between July 1st, 2016 and December 31st, 2016, otherwise, it equals 0.
	Time3B	= 1 if the policy commenced between January 1st, 2017 and June 30th, 2017, otherwise, it equals 0.
Reform	Group 1	= 1 if the policy commenced after the reform in the 1st group of 6 jurisdictions, otherwise, it equals 0.
	Group 2	= 1 if the policy commenced after the reform in the 2nd group of 12 jurisdictions, otherwise, it equals 0.
	Group 3	= 1 if the policy commenced after the reform in the 3rd group of 18 jurisdictions, otherwise, it equals 0.
Switch	Switch	= 1 if the insurer of the current policy is different from the insurer of the previous policy, otherwise, it equals 0. It does not include insurer switching in the middle of a policy term, because we restrict our sample to policies that last for a full year. For the first insurance policy of a new car, the dummy variable switch=0.

Table 4. Summary Statistics of Key Variables (N=7,257,470)

Variable	Mean	Standard deviation
Switch	0.2902	0.4538
AgeUnder25	0.0452	0.2077
Age25_29	0.1504	0.3575
Age30_39	0.3507	0.4772
Age40_59	0.4337	0.4956
AgeAbove60	0.0201	0.1403
Female	0.2538	0.4352
ThreeYearsNoClaim	0.2066	0.4049
TwoYearsNoClaim	0.1639	0.3702
OneYearNoClaim	0.2468	0.4311
LastYearClaims1_3	0.3806	0.4855
LastYearClaimsAbove3	0.0021	0.0461
SeatsUnder6	0.8310	0.3748
Seats6_9	0.1084	0.3108
Seats10_36	0.0005	0.0232
Truck	0.0574	0.2326
OtherType	0.0027	0.0522
Business	0.0254	0.1575
NonBusiness	0.9737	0.1599
MixUse	0.0008	0.0289
CarAge0_2	0.4955	0.5000
CarAge3_5	0.3380	0.4730
CarAge6_8	0.1250	0.3307
CarAgeAbove8	0.0415	0.1994
LocalCar	0.9812	0.1356
NonNewCar	0.8965	0.3046
CarPrice	11.4167	7.9164
TraditionalSale	0.0466	0.2108
DirectSale	0.0069	0.0829
EcommerceSale	0.1625	0.3689
AgentSale	0.1632	0.3695
PartTimeAgent	0.2078	0.4058
ProfessionalAgent	0.1029	0.3038
BrokerSale	0.0071	0.0839
CallSale	0.3030	0.4561
Group1	0.1049	0.3064
Group2	0.3534	0.4780
Group3	0.5418	0.4983

Note: All variables are dummy variables, except for CarPrice; therefore, we did not report minimum value and maximum value. The minimum of CarPrice in our sample is 5,960 yuan (equivalent to approximately 855 USD), and the maximum of CarPrice is 17,000,000 yuan (equivalent to approximately 2,441,000 USD).

Research Methodology

Given that there are three groups of jurisdictions implementing the reforms at different times, we use a difference-in-difference framework to analyze the impact of automobile insurance reform on a given policyholder's choice of switching between insurers. We estimate the coefficients using a linear probability model. The detailed model form is shown in equation (3).

$$Switch_{i,t} = \beta_{0,i} + \beta_{1,i}Time1_{i,t} + \beta_{2,i}Time2_{i,t} + \beta_{3,i}Time3_{i,t} + \beta_{4,i}Group1_{i,t} + \beta_{5,i}Group2_{i,t}$$

$$+\beta_{6,i}Group3_{i,t} + \beta_{7,i}(Time1_{i,t} + Time2_{i,t} + Time3_{i,t})Group1_{i,t} + \beta_{8,i}(Time2_{i,t} + Time3_{i,t})Group2_{i,t}$$

$$+\beta_{9,i}Time3_{i,t}Group3_{i,t} + \gamma X + \varepsilon_i > 0 \tag{3}$$

The dependent variable is a dummy variable indicating that policyholder i switched into the current insurer during policy year t: i.e., their insurer in the previous year was different from their current insurer. $Time1_{i,t}, Time2_{i,t}$ and $Time3_{i,t}$ are three dummy variables specifying the three time phrases of reform (Time1, Time2 and Time 3 in Figure 2), while $Group1_{i,t}, Group2_{i,t},$ and $Group3_{i,t}$ are three dummy variables specifying three groups of jurisdictions implementing the reform. X is a vector of control variables including age, gender, claim history, car type, usage type, age of the car, whether it is registered in the local province, whether it is a new car, the purchasing price of the car, and the sales channel of insurance policy. The key coefficients of interest, $\beta_{7,i}, \beta_{8,i}$ and $\beta_{9,i}$ capture the treatment effect, i.e., the impact of the three-stage reform on policyholders' tendency to switch between insurers.

Results and Discussions

Key Results

To ensure these three groups are comparable in terms of pre-reform insurance switching, we provide evidence regarding both the pre-reform and post-reform trends in insurer switching in these three groups of jurisdictions in Table 5. The detailed list of jurisdictions is provided in Appendix Table 1. We further illustrate the time trend of insurer switching among these three groups of jurisdictions in Figure 3.

Table 5 shows that the proportion of policyholders who switched insurers increases after the reform for all three groups. The trends in the proportion of switched customers are comparable across all three groups before the reform. Figure 3 also confirms these consistent trends before the reform. Detailed data for the entire sample period (from Time 0A till Time 3B) are included in Appendix Table 3.

Table 5. Comparison of Trends in Insurer Switching in Three Groups of Jurisdictions

		1st Group		2nd Group		3rd Group	
		Switch	Non-Switch	Switch	Non-Switch	Switch	Non-Switch
Pre-reform	Count	85,002	268,822	421,773	1,136,466	806,217	2,088,288
	%	24.02	75.98	27.07	72.93	27.85	72.15
Post-reform	Count	131,048	276,164	336,019	670,257	325,961	711,453
	%	32.18	67.82	33.39	66.61	31.42	68.58
Total	Count	216,050	544,986	757,792	1,806,723	1,132,178	2,799,741
	%	28.39	71.61	29.55	70.45	28.79	71.21

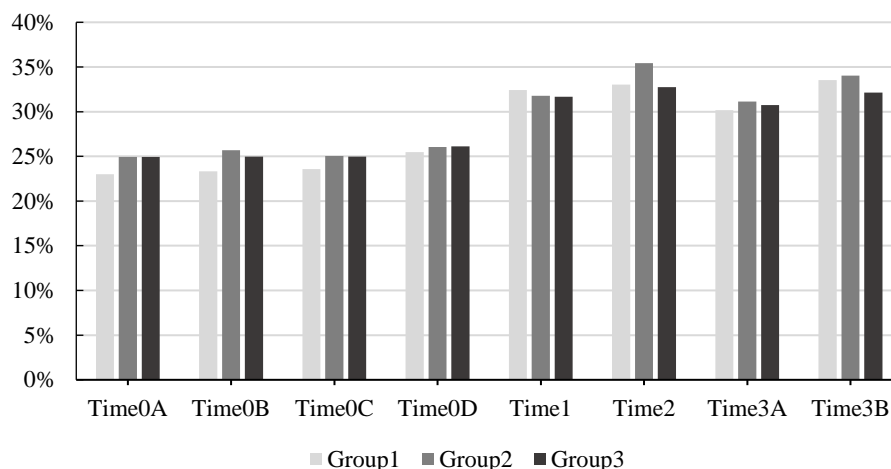Proprotion of Policyholders Who Switched Insurers

Figure 3. Time Trend of Switching Insurers among Three Groups of Jurisdictions

Table 6 shows the key coefficients capturing the impact of reform on the trend of insurer switching. The complete regression results can be found in Appendix Table 4. For the panel data, we use five fixed-effects models to control the effect of time-invariant unobservables on various levels. The dependent variable is a dummy variable indicating that the policyholder's current insurer is different from the previous year. The results in column (1) control for fixed effects on the person, area (jurisdiction) and time. Specifically, we divide the roughly four-year sampling period into eight time variables, according to the timing of the three-step reform.[19] The eight time variables are roughly evenly distributed, each lasts for around six months. This could measure the impact of time more accurately than using the calendar year, given that some reforms were taking place in the middle of a year. In column (2), instead of using time, we use the calendar year as an alternative way to depict time. We also control fixed effects on the person level and area (jurisdiction) level in column (2). The results reported in column (3) control fixed effects on the person, company, and time. Those reported in column (4) and (5) control for fixed effects on all four levels: person, company, jurisdiction, and calendar year (or time).

The five different fixed-effects specifications yield consistent results regarding the impact of reform on insurer switching. The signs and magnitude of coefficients are robust to various model specifications. We use the results in column (5) to make our interpretations, and the key coefficients of interest are highlighted in bold. We find the reforms in the first group of six jurisdictions in June 2015 increased the probability of insurer switching by 0.8 of a percentage point. With an additional 12 jurisdictions joining the reform in January 2016, the second reform also increased the probability of insurer switching by 1.2 percentage points. The last step of reform in July 2016 to implement in all jurisdictions further increased the probability of insurer switching by 0.7 of a percentage point. Overall, the impact is consistent with both our expectations and the goal of the reforms.[20] The magnitude of the impact is relatively moderate and makes sense, given that the reform was performed on a step by step basis, and the change in rate regulation by CIRC was carried out gradually.[21]

---

[19] In particular, the eight time variables are Time0A, Time0B, Time0C, Time0D, Time1, Time2, Time3A, and Time3B. The detailed definitions are given in Table 1.

[20] Another factor that may cause insurer switching is the insured moving to another territory where the original insurer is not operating. In our sample, 2.48% of policyholders moved to a different jurisdiction during the sampling period. It is a relatively small portion and the results excluding these observations are available upon request.

[21] To date, there are three regulatory reforms in the automobile insurance market in China since 2015. The first reform took place from June 2015 to July 2016 and our paper focuses on the impact of the first reform. The price ranges allowed by the CIRC for IU factor and ISC factor are both [0.85, 1.15] for all jurisdictions in this reform. Later on, the second reform in July 2017 allowed pilot jurisdictions to further expand the price ranges to [0.70, 1.25]. The third reform in March 2018 allowed for price ranges to be [0.65, 1.15] for specific

Table 6. The Effect of the Three-Stage Reforms in Consumer Switching Behavior (Key Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Treatment1	0.0097***	0.0103***	0.0089***	0.0088***	**0.0082*****
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Treatment2	0.0086***	0.0093***	0.0116***	0.0124***	**0.0117*****
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Treatment3	0.0057***	0.0062***	0.0069***	0.0074***	**0.0069*****
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Person level FE	Yes	Yes	Yes	Yes	Yes
Company level FE			Yes	Yes	Yes
Area level FE	Yes	Yes		Yes	Yes
Time level FE	Yes		Yes		Yes
Year level FE		Yes		Yes	
Adjusted R^2	0.2032	0.2027	0.2150	0.2148	0.2153

Note: The dependent variable is a dummy variable indicating that the policyholder's current insurer is different from the previous year. Standard errors are shown in parentheses. We use a linear probability model to estimate the coefficients. The treatment effect of the three-stage reforms implementing in three geographical areas are summarized as key results, and the full regression results are provided in Appendix Table 4. Key coefficients of interest are highlighted in bold.
* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

Heterogeneity

Size of Insurer

To further analyze the heterogeneity of the reform's impact, we divide all 63 insurers in our sample into three groups, according to their premium income in 2014: the large insurers (the top three players), the medium-large insurers (the top 10 biggest players excluding the top three), and the small insurers (those remaining insurers which ranked below 10th in the market).[22] The market share in terms of the automobile insurance premium in 2014 for large insurers, medium-large insurers, and small insurers was approximately 67%, 22%, and 11%, respectively.

Figure 4 shows the market share trend for the large insurers, medium-large insurers, and small insurers in the sample period. The large insurers' market share dropped from 68% in 2013 to 64.7% in 2017, while the share of the medium-large insurers increased from 21.4% to 24.7%. The market share of the small insurers remained at around 10%. A list of insurance companies, their premium income in 2014, their premium ranking, and their category by size is provided in Appendix Table 5.

---

jurisdictions. We would expect the level of market competitiveness to further increase as deregulation continues.
[22] We adopted the typical rule to categorize automobile insurance insurers in China. The large companies (the top three) all had a market share above 10%, and the medium-large companies (4th to 10th) all had a market share between 1% and 6%, and the remaining smaller companies (11th and below) all had market share less than 1% in 2014.
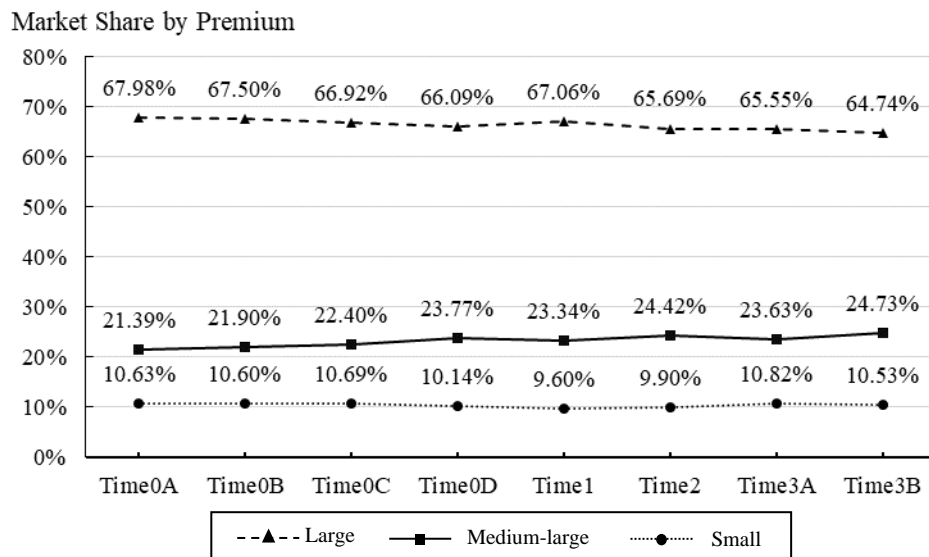
Figure 4. The Trend of Market Share for Large, Medium-Large and Small Insurers

We further calculate the Herfindahl-Hirschman Index (HHI) of the market during the entire sample period and show the results in Table 7. It is apparent that the HHI decreases over the sample period, suggesting the market is getting more competitive.

Table 7. HHI for Automobile Insurance Market in China (2013-2017)

Year	2013	2014	2015	2016	2017
HHI	0.1937	0.1912	0.1894	0.1883	0.1885

The goal of deregulation is to allow for more market mechanisms in rate making and underwriting; however, it is unclear whether the impact of deregulation would be the same for insurers of different sizes (or market power). Prior to the reforms, the rate was strictly regulated, and the market concentration measurement was high, as shown by the top three players jointly occupying 68% of the market. With deregulation, the smaller insurance companies were presented with the option to diversify their pricing strategies and compete with the larger companies. The larger companies also have advantages in financial resources, distribution channels, research expertise, and brand name.[23] Therefore, it is essential to evaluate the impact of deregulation empirically.

Table 8 shows the impact of the reforms on insurer switching by the size of the insurer. We categorize all insurers into three groups, i.e., the large insurers, medium-large insurers, and small insurers. The complete regression results can be found in Appendix Table 6.

Combining the results in Table 8, we observe that fewer customers were switching into the top three insurers in both the first and the third groups implementing the reforms. Meanwhile, the reforms facilitate more switching into the medium-large insurers and small insurers in general. The positive impact on small insurers is the highest. The results support the positive impact of reform, as it enhances the market competition by encouraging insurer switching into the medium-large and small insurers. We further show preliminary evidence suggesting that the reforms weaken the largest three insurers' market power.

---

[23] As shown in Bajtelsmit and Bouzouita (1998), a positive impact of market power on profitability is found in the private passenger automobile insurance in the U.S..

Table 8. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by Insurer Size (Key Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Treatment1_Large	-0.0085***	-0.0081***	-0.0043***	-0.0040***	**-0.0045*****
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)
Treatment2_Large	-0.0038***	-0.0033***	0.0004	0.0010	0.0004
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Treatment3_Large	-0.0159***	-0.0156***	-0.0109***	-0.0106***	**-0.0109*****
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Treatment1_Medium	0.0249***	0.0258***	0.0250***	0.0246***	**0.0236*****
	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)
Treatment2_Medium	0.0119***	0.0129***	0.0144***	0.0155***	**0.0145*****
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)
Treatment3_Medium	0.0111***	0.0118***	0.0109***	0.0118***	**0.0110*****
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)
Treatment1_Small	0.0433***	0.0442***	0.0353***	0.0343***	**0.0334*****
	(0.0025)	(0.0025)	(0.0026)	(0.0026)	(0.0026)
Treatment2_Small	0.0745***	0.0754***	0.0610***	0.0622***	**0.0612*****
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)
Treatment3_Small	0.1022***	0.1029***	0.0921***	0.0930***	**0.0923*****
	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)
Person level FE	Yes	Yes	Yes	Yes	Yes
Company level FE			Yes	Yes	Yes
Area level FE	Yes	Yes		Yes	Yes
Time level FE	Yes		Yes		Yes
Year level FE		Yes		Yes	
Adjusted R^2	0.2128	0.2123	0.2158	0.2156	0.2161

Note: The dependent variable is a dummy variable indicating that the policyholder's current insurer is different from the previous year. Standard errors are shown in parentheses. The key results of the treatment effect by large, medium-large and small insurers are summarized. The full regression results are provided in Appendix Table 6. Key coefficients of interest are highlighted in bold.
* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

We also investigate the impact of reform on insurer switching for each company separately for the three largest insurers. In general, the results are consistent with those reported in Table 8, showing there are fewer customers switched into these large insurers after the reforms.[24]

Dominance Level of Automobile Insurance Line within the Company

We suspect another heterogeneity may lie in the importance of the automobile insurance product line for the specific insurance company. To test the heterogeneity, we divide 41 major companies operating in China in 2014 for which we have valid data into two groups, according to the share of automobile insurance premiums in the overall premium income.[25] The average share of automobile insurance premiums in China's property/casualty business in 2014 was 72.24%. The first group includes 27 companies whose share of automobile insurance was

---

[24] PICC, Ping An and CPIC are the top three insurers in the market. The detailed regression results are available upon request.
[25] The observations from these 41 companies account for 99.79% in our full sample. There were another 22 companies who either joined the market after 2014 or had missing data in the China Insurance Yearbook. We performed the same analysis on these companies. Due to constraints on space, we did not report it in the paper. The results are available upon request.

higher than the industry average, and we define those as the automobile insurance line being "dominant" in the company. The other group includes 14 companies whose share lies below the industry average, and we label it as the automobile insurance line being "less dominant." A list of insurance companies with their automobile insurance premium proportions in 2014 and category by automobile premium proportion is provided in Appendix Table 5.

The key regression results by the dominant level of automobile insurance line within the insurer are presented in Table 9, while the corresponding complete results are provided in Appendix Table 7. Our statistically significant results confirm that after the reform, the policyholders are more likely to switch insurers in both types of insurers. The positive impact is smaller among automobile insurance-dominant companies. For all three groups of jurisdictions implementing the reform, we observe a consistent increase in the probability of switching for various fixed effects setups, and the coefficients of the less dominant insurers are larger than those for the automobile insurance-dominant insurers, manifesting the effect of deregulation on the competition.

Table 9. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by the Dominant Level of Automobile Insurance Line within the Insurer (Key Results, N=7,242,031)

	(1)	(2)	(3)	(4)	(5)
Treatment1_Dominant	0.0045***	0.0051***	0.0058***	0.0058***	**0.0052*****
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Treatment2_Dominant	0.0064***	0.0070***	0.0093***	0.0101***	**0.0094*****
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Treatment3_Dominant	0.0008	0.0013	0.0022**	0.0027***	**0.0022****
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Treatment1_LessDominant	0.0658***	0.0668***	0.0505***	0.0502***	**0.0492*****
	(0.0034)	(0.0034)	(0.0035)	(0.0035)	(0.0035)
Treatment2_LessDominant	0.0438***	0.0446***	0.0362***	0.0373***	**0.0365*****
	(0.0022)	(0.0022)	(0.0022)	(0.0022)	(0.0022)
Treatment3_LessDominant	0.1013***	0.1021***	0.0923***	0.0932***	**0.0924*****
	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0023)
Person level FE	Yes	Yes	Yes	Yes	Yes
Company level FE			Yes	Yes	Yes
Area level FE	Yes	Yes		Yes	Yes
Time level FE	Yes		Yes		Yes
Year level FE		Yes		Yes	
Adjusted R^2	0.2030	0.2025	0.2137	0.2135	0.2140

Note: The dependent variable is a dummy variable indicating that the policyholder's current insurer is different from the previous year. Standard errors are shown in parentheses. The key results of the treatment effect by automobile insurance-dominant and the less dominant insurer are summarized. The full regression results are provided in Appendix Table 7. Key coefficients of interest are highlighted in bold.
* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

Degree of Market Power within the Geographic Area

We further examine the heterogeneity in the impact of reform by market power within the jurisdiction prior to the reform. Specifically, we calculated the HHI in 2014 for all 32 jurisdictions available in our sample, and we

use the median HHI value (0.206) as the threshold to divide them into two groups. The first group includes 16 jurisdictions where the HHI are relatively high prior to the reform. We label this group as "jurisdictions with high market power," and the second group includes 16 jurisdictions where the HHI is relatively low prior to the reform. We label this group as "jurisdictions with low market power." A list of jurisdictions with their HHI in 2014, ranking by HHI, and category by market power is included in Appendix Table 8.

The key regression results by the degree of market power within a jurisdiction are presented in Table 10, while the corresponding complete results are provided in Appendix Table 9. We expected more insurer switching after the reform in general for all jurisdictions. We find a consistent increasing tendency to switch insurers after the reform for the jurisdictions with high market power prior to reform. The probability of insurer switching increased 1.03, 1.17, and 1.06 percentage points for the first, second, and third groups to implement the reform, respectively. These results are consistent with various fixed-effects specifications. As to jurisdictions with low market power prior to reform, the increasing tendency to switch is only shown in the second and third groups, by 1.18 and 0.45 percentage points, respectively. These results suggest the reform is valid in disrupting the high market power by enabling more diversified consumer's choices.

Table 10. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by the Degree of Market Power within a Jurisdiction Prior to Reforms (Key Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Treatment1_LMP	-0.0188***	-0.0169***	-0.0226***	-0.0214***	**-0.0232*****
	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)
Treatment2_LMP	0.0118***	0.0125***	0.0113***	0.0125***	**0.0118*****
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
Treatment3_LMP	0.0057***	0.0061***	0.0047***	0.0049***	**0.0045*****
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Treatment1_HMP	0.0117***	0.0122***	0.0110***	0.0109***	**0.0103*****
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Treatment2_HMP	0.0078***	0.0085***	0.0117***	0.0124***	**0.0117*****
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Treatment3_HMP	0.0058***	0.0063***	0.0101***	0.0112***	**0.0106*****
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Person level FE	Yes	Yes	Yes	Yes	Yes
Company level FE			Yes	Yes	Yes
Area level FE	Yes	Yes		Yes	Yes
Time level FE	Yes		Yes		Yes
Year level FE		Yes		Yes	
Adjusted R^2	0.2032	0.2027	0.2151	0.2149	0.2154

Note: The dependent variable is a dummy variable indicating that the policyholder's current insurer is different from the previous year. Standard errors are shown in parentheses. The key results of the treatment effect by jurisdictions with low market power and high market power prior to the reform are summarized. The full regression results are provided in Appendix Table 9. Key coefficients of interest are highlighted in bold.
* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

Consumer's Risk Type

To test the impact of reform on consumers of different risk types, we divide all consumers into two categories. The low risk consumer is defined as those who did not file any claim in the most recent policy year prior to the reform, and the high risk consumer is defined as those filing at least one claim in the most recent policy year prior to the reform.

We run the regression on switching decision by risk type, and the key results are summarized in Table 11. We find that the reform increases the probability of switching for the low risk customers consistently (1.07%, 2.36% and 0.98% for the three groups). The impact on the high risk customers is less obvious and smaller (not significant for the second group, increases switching by 0.56% for the first group and 0.32% for the third group). The full regression results are provided in Appendix Table 10.

Table 11: The Effect of the Three-Stage Reforms in Consumer Switching Behavior by Consumer's Risk Type (Key Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Treatment1_LowRisk	0.0118***	0.0107***	0.0113***	0.0096***	**0.0107*****
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
Treatment2_LowRisk	0.0211***	0.0201***	0.0234***	0.0226***	**0.0236*****
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Treatment3_LowRisk	0.0077***	0.0071***	0.0097***	0.0092***	**0.0098*****
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Treatment1_HighRisk	0.0075***	0.0098***	0.0064***	0.0079***	**0.0056*****
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
Treatment2_HighRisk	-0.0054***	-0.0028**	-0.0017	0.0009	-0.0017
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Treatment3_HighRisk	0.0029**	0.0047***	0.0033***	0.0050***	**0.0032*****
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Person level FE	Yes	Yes	Yes	Yes	Yes
Company level FE			Yes	Yes	Yes
Area level FE	Yes	Yes		Yes	Yes
Time level FE	Yes		Yes		Yes
Year level FE		Yes		Yes	
Adjusted R^2	0.2033	0.2028	0.2151	0.2149	0.2154

Note: The dependent variable is a dummy variable indicating that the policyholder's current insurer is different from the one in the previous year. Standard errors are shown in parentheses. The key results of the treatment effect by customer's risk type are summarized. The full regression results are provided in Appendix Table 10. Key coefficients of interest are highlighted in bold.
* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

The results in Table 11 imply that the incumbent insurer may increase the high risk customers' rate to motivate them to switch. For the first and third groups implementing the reform, high risk customers' switching probability also increases. At the same time, all insurers are offering much better rates to compete for good business from the low risk consumers, thus leading to significantly higher switching probability among the low risk customers consistently, compared with the high risk customers.

The Impact of Reform on the Average Premium by Customer's Risk Type

We try to confirm the trend of premium change for high risk and low risk subsamples after the reform to provide direct evidence supporting the above hypothesis. We divide all policyholders into groups according to NCD factors, area, time, and insurer. Then we take the policy level average premium within each group and use this as the dependent variable.[26] We perform a diff-in-diff regression for the average premium within the group in the same manner as our main regression regarding switching behavior. On the right-hand side, we control the specific NCD category,[27] and we also incorporate fixed effects on the company, area and time. The key coefficients of interest are highlighted in bold in Table 12.

Using the full sample, we find that the reform decreases the average premium significantly by 9.5%, 6.8% and 5.4%, respectively, for the three groups jurisdictions implementing the reform. Focusing on the impact of reform on average premium by risk type, we find the reform decreases the average premium of low risk customers by 18.6%, 15.6% and 15%, respectively; while the average premium increases by 7.6%, 10.4% and 12.6%, respectively, for the high risk customers. All results are statistically significant.

Table 12: The Effect of the Three-Stage Reforms in Average Premium by Risk Type (Complete Results)

	Full Sample	Low Risk	High Risk
Treatment1	**-0.0947*****	**-0.1858*****	**0.0764*****
	(0.0103)	(0.0111)	(0.0203)
Treatment2	**-0.0682*****	**-0.1556*****	**0.1035*****
	(0.0098)	(0.0105)	(0.0195)
Treatment3	**-0.0542*****	**-0.1500*****	**0.1264*****
	(0.0105)	(0.0112)	(0.0214)
ThreeYearsNoClaim	-0.7601***	-0.3427***	
TwoYearsNoClaim	-0.5762***	-0.1595***	
OneYearNoClaim	-0.4157***		
LastYearClaims1_3	-0.1835***		-0.1824***
Interpret	8.3462***	7.9637***	8.2862***
Fixed Effects	Company, Area, Time	Company, Area, Time	Company, Area, Time
N	21,539	14,173	7,366
Adjusted R^2	0.5706	0.4762	0.2853

With the average premium trend analysis, we confirm our hypothesis that the insurers' pricing strategy is risk type dependent. In general, the insurers cut price more aggressively for the low risk consumers (16.3%, i.e., the average of 18.58%, 15.56%, 15%). They also raise the rate for high risk consumers moderately (10.2%, i.e., the average of 7.64%, 10.35%, 12.64%). And the results are consistent with the trend we observe in switching decision, i.e., a higher proportion of the low risk consumers become more likely to switch after the reform because their rates are reduced quite significantly (by 16.3%); at the same time, a relatively milder positive impact was found among the high risk consumers, because their rates are increased but to a smaller extent (by 10.2%).

---

[26] We didn't use individual premium because the fluctuation would incorporate noise; by using the average premium on company, jurisdiction, time and NCD level, we cancel out those noises and the average premium would be representative of the pricing strategy of local insurer at the time for the specific risk type customers when the reform took place.

[27] We omit the ThreeYearNoClaim as the base group.

Conclusion

The rate deregulation reform during 2015-2016 remains an important milestone in China's automobile insurance industry. It was intended to increase competition and consumers' choices, and represents the first step in the marketization and liberalization of the automobile insurance industry in China. Given that China has the largest nonlife insurance market of all developing countries, the effects of deregulation are a worthwhile area of study.

Using a large dataset sampled from all major automobile insurers operating in China, we find evidence of deregulation leading to a higher tendency of consumers to switch their insurer. The evidence also suggests an increased level of market competition. Moreover, our results are consistent with the trend of the Herfindahl-Hirschman Index over the same period. We further analyzed the pattern of switching among different types of insurers, in order to test for heterogeneity as regards insurer size, the importance of the automobile insurance line in the company, the degree of market power within the geographic area, and customer's risk type.

Our results suggest that in terms of company size, more customers are switching into the medium-large and small insurers after the reform, and fewer customers switching into the top three insurers. This is consistent with the reform's intent to promote a more competitive market. In terms of company business structure, our results also show more customer switching, regardless of the dominant level of automobile insurance business within the company prior to the reform. In terms of a given jurisdiction's market power profile, there is a consistent increasing tendency to switch insurers after the reform for the jurisdictions with high market power prior to reform, which implies the reform is valid in disrupting the high market power by enabling more diversified consumer's choices. In terms of customer's risk type, the reform in general increases the probability of switching for the low risk customers consistently, and the impact on the high risk customers is less obvious and smaller.

Overall, we found consistent evidence that the liberalization reform met its original goal of deregulation, leading to more diversified consumer choices and increased market competitiveness. With the average premium trend analysis, we confirmed that the insurers' pricing strategy was risk type dependent. Overall, the average premium dropped significantly after the reform for all three jurisdictions implementing the reform. The average premium for the high risk customers increased, while the average premium for the low risk customers decreased substantially.

One limitation of our study is that the sample period ends one year after the reform was fully implemented in all jurisdictions. Thus, the long-term impact of reform on the market may not manifest fully in this paper. Future research could focus on a longer period to complement our findings. Another topic for future research is to test empirically the impact of reform on the insurer's ability to underwrite and its implications for the level of information asymmetry in this market.

Appendix

Appendix Table 1. Three Groups of Jurisdictions Implementing the Reform

Group	Timing of Reform	Number of Jurisdictions	List of Jurisdictions
1st	June 1st, 2015	6	Heilongjiang, Shandong, Tsingtao, Guangxi, Shaanxi, Chongqing
2nd	January 1st, 2016	12	Tianjin, Inner Mongolia, Jilin, Anhui, Henan, Hubei, Hunan, Guangdong, Sichuan, Tsinghai, Ningxia, Xinjiang
3rd	July 1st, 2016	18	Beijing, Hebei, Shanxi, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Jiangxi, Hainan, Guizhou, Yunnan, Tibet, Gansu, Shenzhen, Dalian, Ningbo, Xiamen

Appendix Table 2. Bonus-Malus System (NCD Factor) and the Corresponding Multiplier for Base Premium

Variable Name	Definition	The Multiplier for Base Premium Prior to the reform	The Multiplier for Base Premium after the Reform
ThreeYearsNoClaim	Filed no claim for three consecutive years.	0.7	0.6
TwoYearsNoClaim	Filed no claim for two consecutive years.	0.8	0.7
OneYearNoClaim	Filed no claim in the last year.	0.9	0.85
	Filed one claim in the last year.	1	1
LastYearClaims1_3	Filed two claims in the last year.	1	1.25
	Filed three claims in the last year.	1.1	1.5
LastYearClaimsAbove3	Filed four claims in the last year.	1.2	1.75
	Filed five or more claims in the last year.	1.3	2

Note: To maintain consistency, we combine those insured who filed more than three claims in the last year into one category named "LastYearClaimsAbove3" because there was an insurance company using this rule in its practice prior to the reform.

Appendix Table 3. Detailed Time Trend of Proportion of Policyholders Switching Insurer During the Sampling Period for Three Groups of Jurisdictions

Time	Group1	Group2	Group3
Time0A	23.01%	24.95%	24.93%
Time0B	23.32%	25.69%	24.97%
Time0C	23.56%	25.03%	24.98%
Time0D	25.48%	26.06%	26.12%
Time1	32.41%	31.79%	31.68%
Time2	33.02%	35.43%	32.73%
Time3A	30.16%	31.12%	30.73%
Time3B	33.54%	34.02%	32.15%

Appendix Table 4. The Effect of the Three-Stage Reforms in Consumer Switching Behavior (Complete Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Age25_29	-0.0071***	-0.0085***	-0.0067***	-0.0084***	-0.0069***
Age30_39	-0.0151***	-0.0182***	-0.0144***	-0.0179***	-0.0149***
Age40_59	-0.0172***	-0.0224***	-0.0166***	-0.0222***	-0.0171***
AgeAbove60	-0.0186***	-0.0261***	-0.0181***	-0.0258***	-0.0184***
ThreeYearsNoClaim	-0.1151***	-0.1183***	-0.1114***	-0.1139***	-0.1107***
TwoYearsNoClaim	-0.1268***	-0.1291***	-0.1231***	-0.1250***	-0.1227***
OneYearNoClaim	-0.0521***	-0.0534***	-0.0484***	-0.0496***	-0.0483***
LastYearClaims1_3	-0.0116***	-0.0126***	-0.0090**	-0.0101***	-0.0091**
SeatsUnder6	0.1606***	0.1612***	0.1468***	0.1423***	0.1418***
Seats6_9	0.1365***	0.1371***	0.1238***	0.1197***	0.1192***
Seats10_36	0.0455	0.0452	0.0202	0.0147	0.0150
Truck	0.0846***	0.0847***	0.0757***	0.0701***	0.0700***
Business	-0.0805***	-0.0801***	-0.0286***	-0.0290***	-0.0294***
NonBusiness	-0.0686***	-0.0685***	-0.0068	-0.0084	-0.0084
CarAge0_2	-0.0888***	-0.0733***	-0.0927***	-0.0774***	-0.0927***
CarAge3_5	-0.0984***	-0.0878***	-0.1008***	-0.0903***	-0.1007***
CarAge6_8	-0.0455***	-0.0402***	-0.0471***	-0.0417***	-0.0470***
LocalCar	-0.0569***	-0.0575***	-0.0491***	-0.0487***	-0.0480***
NonNewcar	0.5062***	0.5018***	0.4975***	0.4930***	0.4974***
TraditionalSale	0.0130***	0.0130***	-0.0069*	-0.0066***	-0.0066***
DirectSale	0.0215***	0.0213***	-0.0211***	-0.0214***	-0.0212***
EcommerceSale	-0.0201***	-0.0208***	-0.0262***	-0.0265***	-0.0259***
AgentSale	0.0147***	0.0147***	0.0167***	0.0163***	0.0162***
PartTimeAgent	0.0594***	0.0597***	0.0478***	0.0482***	0.0479***
ProfessionalAgent	0.0992***	0.0991***	0.0797***	0.0799***	0.0800***
BrokerSale	0.0937***	0.0938***	0.0885***	0.0887***	0.0887***
Group1			0.0597***		
Group2			0.0557***		
Time1	-0.0258***	-0.0188***	-0.0228***	-0.0165***	-0.0224***
Time2		0.0187***		0.0181***	
Treatment1	0.0097***	0.0103***	0.0089***	0.0088***	0.0082***
Treatment2	0.0086***	0.0093***	0.0116***	0.0124***	0.0117***
Treatment3	0.0057***	0.0062***	0.0069***	0.0074***	0.0069***
Interpret	-0.0550*	-0.0610**	-0.1245***	-0.0983***	-0.0927***
Fixed Effects	Person, Area, Time	Person, Area, Year	Person, Company, Time	Person, Company, Area, Year	Person, Company, Area, Time
Adjusted R^2	0.2032	0.2027	0.2150	0.2148	0.2153

Note: We use a linear probability model to estimate the coefficients. The dependent variable is a dummy variable indicating the policyholder's current insurer is different from the previous year. Standard errors are shown in parentheses. For the age group, "AgeUnder25" is used as the omitted category. For the bonus-malus system, "lastYearClaimsAbove3" is used as the omitted category. For the type of car, "OtherType" is the base category. For the use of the car, "MixUse" is the base category. For the age of the car, "CarAgeAbove8" is the omitted category. In terms of sales channel, "CallSale" is the omitted category. For group and time dummy variables, "Group 3" and "Time 3" serve as the base category for comparison, respectively.

* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

Appendix Table 5. Categories of Insurance Companies by Size (Premium) and Dominance Level of Automobile Insurance Premium (Automobile Premium %)

Company Code	Company	Premium (2014)	Ranking	Market Share	Category by Size	Auto Premium %	Category by Auto Premium %
PICC	PICC P&C Company	252,419.50	1	34.90%	Big	73.3%	1
PAIC	PingAn P&C Insurance Company of China	142,879.50	2	19.75%	Big	77.4%	1
CPIC	China Pacific Property Insurance Company	92,837.33	3	12.84%	Big	78.8%	1
GPIC	China Life P&C Insurance Company	40,397.42	4	5.59%	Medium	86.6%	1
CICP	China Insurance Company	34,865.20	5	4.82%	Medium	68.1%	2
CCIC	China Continent P&C Insurance Company	22,358.05	6	3.09%	Medium	79.8%	1
YGBX	Sunshine P&C Insurance Company	21,173.41	7	2.93%	Medium	77.5%	1
TPIC	Taiping General Insurance Company	13,350.28	8	1.85%	Medium	81.9%	1
TAIC	TianAn Property Insurance Company	11,152.56	9	1.54%	Medium	85.5%	1
HAIC	Sinosafe General Insurance Company	7,762.87	10	1.07%	Medium	86.1%	1
YAIC	YongAn Property Insurance Company	6,993.97	11	0.97%	Small	79.1%	1
TPBX	AXA Tianping P&C Insurance Company	6,639.55	12	0.92%	Small	94.7%	1
HTIC	Huatai P&C Insurance Company	6,516.48	13	0.90%	Small	55.3%	2
YDCX	Yingda Taihe Property Insurance Company	6,511.81	14	0.90%	Small	53.6%	2
AICS	Alltrust Insurance Company of China	5,889.18	15	0.81%	Small	70.1%	2
BOCI	Bank of China Insurance Company	5,365.24	16	0.74%	Small	40.5%	2
ABIC	Anbang P&C Insurance Company	5,294.55	17	0.73%	Small	90.0%	1
DBIC	Dubon Property Insurance Company	3,578.20	18	0.49%	Small	87.1%	1
XDCX	Guoren P&C Insurance Company	3,516.48	19	0.49%	Small	84.2%	1
ZKIC	Zking P&C Insurance Company	3,372.69	20	0.47%	Small	79.0%	1
ZSIC	Zheshang P&C Insurance Company	3,293.36	21	0.46%	Small	89.5%	1
AHIC	Anhua Agricultural Insurance Company	3,262.91	22	0.45%	Small	45.9%	2
MACN	MinAn P&C Insurance Company	2,772.28	23	0.38%	Small	83.5%	1
ACIC	Ancheng P&C Insurance Company	2,495.54	24	0.35%	Small	86.3%	1
CAIC	China Chang An Property & Liability Insurance Company	2,457.31	25	0.34%	Small	84.3%	1
DHIC	Dinghe Property Insurance Company	2,444.97	26	0.34%	Small	57.3%	2
BPIC	Bohai Property Insurance Company	2,176.16	27	0.30%	Small	87.4%	1
AMIC	Groupama-AVIC Property Insurance Company	1,525.06	28	0.21%	Small	19.8%	2

TSBX	Taishan P&C Insurance Company	1,114.37	29	0.15%	Small	80.7%	1
AAIC	Anxin Agricultural Insurance Company	1,109.09	30	0.15%	Small	26.1%	2
JTIC	Jintai P&C Insurance Company	1,093.69	31	0.15%	Small	66.8%	2
BGIC	Beibu Gulf P&C Insurance Company	911.27	32	0.13%	Small	63.5%	2
SPIC	Samsung P&C Insurance Company (China)	868.36	33	0.12%	Small	25.7%	2
LIHI	Liberty Insurance Company	818.14	34	0.11%	Small	89.6%	1
ZMBX	China Coal Insurance Company	813.65	35	0.11%	Small	72.0%	2
FPIC	Fubon P&C Insurance Company	692.54	36	0.10%	Small	77.4%	1
CATH	Cathy P&C Insurance Company	547.48	37	0.08%	Small	79.5%	1
HNIC	China Huanong P&C Insurance Company	526.32	38	0.07%	Small	85.1%	1
CJCX	Changjiang P&C Insurance Company	506.38	39	0.07%	Small	46.6%	2
CRIC	Funde P&C Insurance Company	501.29	40	0.07%	Small	90.6%	1
CHAC	Champion P&C Insurance Company	486.25	41	0.07%	Small	75.7%	1

Note: We ranked the insurance companies by premium income in 2014 and defined the largest three companies to be large insurers; the 4th to 10th companies were defined as medium-large insurers while the remaining ones were small insurers. We calculated the proportion of automobile insurance premiums, i.e., automobile insurance premium divided by gross insurance premium for each company. We used the average automobile insurance premium proportion in 2014 (72.2%) as the threshold, and we defined those companies with a higher than average automobile insurance premium ratio to be an automobile insurance dominated company, while those with a lower than average ratio to be an automobile insurance less dominated company. The premium income and automobile insurance premium in 2014 were collected from China Insurance Yearbook 2015. There were 52 companies operating in automobile insurance in 2014, and the China Insurance Yearbook included 41 companies who publicly released their data.

Appendix Table 6. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by Insurer Size (Complete Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Age25_29	-0.0061***	-0.0076***	-0.0066***	-0.0083***	-0.0069***
Age30_39	-0.0131***	-0.0161***	-0.0139***	-0.0174***	-0.0144***
Age40_59	-0.0155***	-0.0205***	-0.0161***	-0.0216***	-0.0166***
AgeAbove60	-0.0170***	-0.0243***	-0.0177***	-0.0253***	-0.0180***
ThreeYearsNoClaim	-0.1077***	-0.1109***	-0.1111***	-0.1136***	-0.1104***
TwoYearsNoClaim	-0.1199***	-0.1222***	-0.1227***	-0.1247***	-0.1223***
OneYearNoClaim	-0.0459***	-0.0472***	-0.0482***	-0.0493***	-0.0480***
LastYearClaims1_3	-0.0073*	-0.0083**	-0.0088**	-0.0099***	-0.0089**
SeatsUnder6	0.1534***	0.1539***	0.1507***	0.1462***	0.1457***
Seats6_9	0.1308***	0.1313***	0.1277***	0.1237***	0.1232***
Seats10_36	0.0360	0.0358	0.0265	0.0211	0.0214
Truck	0.0747***	0.0748***	0.0792***	0.0736***	0.0735***
Business	-0.0688***	-0.0685***	-0.0371***	-0.0377***	-0.0379***
NonBusiness	-0.0556***	-0.0556***	-0.0177**	-0.0193**	-0.0193**
CarAge0_2	-0.0903***	-0.0753***	-0.0924***	-0.0773***	-0.0924***
CarAge3_5	-0.0984***	-0.0881***	-0.1000***	-0.0896***	-0.0999***
CarAge6_8	-0.0455***	-0.0403***	-0.0463***	-0.0410***	-0.0462***
LocalCar	-0.0507***	-0.0514***	-0.0482***	-0.0478***	-0.0472***
NotNewcar	0.5052***	0.5009***	0.4995***	0.4951***	0.4994***
TraditionalSale	-0.0021**	-0.0021**	-0.0012	-0.0010	-0.0009
DirectSale	-0.0216***	-0.0218***	-0.0234***	-0.0238***	-0.0235***
EcommerceSale	-0.0126***	-0.0132***	-0.0222***	-0.0226***	-0.0220***
AgentSale	0.0178***	0.0178***	0.0199***	0.0196***	0.0195***
PartTimeAgent	0.0624***	0.0627***	0.0514***	0.0518***	0.0515***
ProfessionalAgent	0.0906***	0.0906***	0.0845***	0.0848***	0.0848***
BrokerSale	0.0926***	0.0926***	0.0893***	0.0895***	0.0895***
Group1			0.0595***		
Group2			0.0559***		
Time1	-0.0234***	-0.0160***	-0.0226***	-0.0164***	-0.0222***
Time2		0.0177***		0.0179***	
Large	-0.1119***	-0.1119***			
Medium	0.0067***	0.0065***			
Treatment1_Large	-0.0085***	-0.0081***	-0.0043***	-0.0040***	-0.0045***
Treatment2_Large	-0.0038***	-0.0033***	0.0004	0.0010	0.0004
Treatment3_Large	-0.0159***	-0.0156***	-0.0109***	-0.0106***	-0.0109***
Treatment1_Medium	0.0249***	0.0258***	0.0250***	0.0246***	0.0236***
Treatment2_Medium	0.0119***	0.0129***	0.0144***	0.0155***	0.0145***
Treatment3_Medium	0.0111***	0.0118***	0.0109***	0.0118***	0.0110***
Treatment1_Small	0.0433***	0.0442***	0.0353***	0.0343***	0.0334***
Treatment2_Small	0.0745***	0.0754***	0.0610***	0.0622***	0.0612***
Treatment3_Small	0.1022***	0.1029***	0.0921***	0.0930***	0.0923***
Constant	0.0000	-0.0057	-0.1236***	-0.0972***	-0.0918***
Fixed Effects	Person, Area, Time	Person, Area, Year	Person, Company, Time	Person, Company, Area, Year	Person, Company, Area, Time
Adjusted R^2	0.2128	0.2123	0.2158	0.2156	0.2161

Appendix Table 7. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by the Dominant Level of Automobile Insurance Line within the Insurer (Complete Results, N=7,242,031)

	(1)	(2)	(3)	(4)	(5)
Age25_29	-0.0072***	-0.0086***	-0.0067***	-0.0084***	-0.0069***
Age30_39	-0.0149***	-0.0180***	-0.0142***	-0.0177***	-0.0147***
Age40_59	-0.0170***	-0.0221***	-0.0164***	-0.0220***	-0.0169***
AgeAbove60	-0.0188***	-0.0263***	-0.0183***	-0.0260***	-0.0186***
ThreeYearsNoClaim	-0.1146***	-0.1179***	-0.1113***	-0.1139***	-0.1107***
TwoYearsNoClaim	-0.1265***	-0.1288***	-0.1232***	-0.1251***	-0.1228***
OneYearNoClaim	-0.0519***	-0.0532***	-0.0485***	-0.0496***	-0.0484***
LastYearClaims1_3	-0.0117***	-0.0127***	-0.0092**	-0.0103***	-0.0093**
SeatsUnder6	0.1563***	0.1569***	0.1472***	0.1426***	0.1421***
Seats6_9	0.1324***	0.1330***	0.1248***	0.1207***	0.1202***
Seats10_36	0.0471	0.0468	0.0247	0.0191	0.0194
Truck	0.0809***	0.0810***	0.0759***	0.0702***	0.0702***
Business	-0.0786***	-0.0783***	-0.0323***	-0.0328***	-0.0331***
NonBusiness	-0.0672***	-0.0671***	-0.0117	-0.0133	-0.0133
CarAge0_2	-0.0883***	-0.0729***	-0.0922***	-0.0769***	-0.0921***
CarAge3_5	-0.0976***	-0.0871***	-0.1001***	-0.0896***	-0.1000***
CarAge6_8	-0.0447***	-0.0395***	-0.0465***	-0.0411***	-0.0464***
LocalCar	-0.0561***	-0.0567***	-0.0488***	-0.0483***	-0.0477***
NotNewcar	0.5060***	0.5016***	0.4971***	0.4926***	0.4969***
TraditionalSale	0.0108***	0.0108***	-0.0066***	-0.0064***	-0.0063***
DirectSale	0.0233***	0.0231***	-0.0171***	-0.0174***	-0.0172***
EcommerceSale	-0.0180***	-0.0186***	-0.0249***	-0.0253***	-0.0246***
AgentSale	0.0127***	0.0128***	0.0163***	0.0159***	0.0159***
PartTimeAgent	0.0606***	0.0609***	0.0485***	0.0488***	0.0485***
ProfessionalAgent	0.0973***	0.0973***	0.0804***	0.0807***	0.0808***
BrokerSale	0.0937***	0.0938***	0.0889***	0.0891***	0.0891***
Group1			0.0592***		
Group2			0.0560***		
Time1	-0.0250***	-0.0188***	-0.0228***	-0.0167***	-0.0224***
Time2		0.0188***		0.0182***	
AutoInsurance_Dominant	-0.0161***	-0.0159***			
Treatment1_Dominant	0.0045***	0.0051***	0.0058***	0.0058***	0.0052***
Treatment2_Dominant	0.0064***	0.0070***	0.0093***	0.0101***	0.0094***
Treatment3_Dominant	0.0008	0.0013	0.0022**	0.0027***	0.0022**
Treatment1_LessDominant	0.0658***	0.0668***	0.0505***	0.0502***	0.0492***
Treatment2_LessDominant	0.0438***	0.0446***	0.0362***	0.0373***	0.0365***
Treatment3_LessDominant	0.1013***	0.1021***	0.0923***	0.0932***	0.0924***
Constant	-0.0396	-0.0456	-0.1219***	-0.0956***	-0.0901***
Fixed Effects	Person, Area, Time	Person, Area, Year	Person, Company, Time	Person, Company, Area, Year	Person, Company, Area, Time
Adjusted R^2	0.2030	0.2025	0.2137	0.2135	0.2140

Appendix Table 8. Market Power Category of Jurisdictions by HHI Prior to Reforms

Ranking by HHI	HHI	Jurisdiction	Reform Group	Market Power Category
1	0.1343	Tsingdao	1	Low
2	0.1469	Shandong	1	Low
3	0.1603	Henan	2	Low
4	0.1662	Zhejiang	3	Low
5	0.1822	Hunan	2	Low
6	0.1832	Sichuan	2	Low
7	0.1856	Tianjin	2	Low
8	0.1871	Shanxi	3	Low
9	0.1877	Inner Mongolia	2	Low
10	0.1885	Yunnan	3	Low
11	0.1889	Guangdong	2	Low
12	0.1969	Hubei	2	Low
13	0.1988	Guangxi	1	Low
14	0.2009	Guizhou	3	Low
15	0.2039	Shaanxi	1	Low
16	0.2042	Chongqing	1	Low
17	0.2096	Hebei	3	High
18	0.2101	Jiangxi	3	High
19	0.2148	Jilin	2	High
20	0.2170	Gansu	3	High
21	0.2221	Anhui	2	High
22	0.2340	Jiangsu	3	High
23	0.2352	Fujian	3	High
24	0.2354	Xinjiang	2	High
25	0.2363	Hainan	3	High
26	0.2529	Heilongjiang	1	High
27	0.2654	Liaoning	3	High
28	0.2699	Xiamen	3	High
29	0.2930	Dalian	3	High
30	0.3150	Tsinghai	2	High
31	0.4334	Ningxia	2	High
32	0.5079	Tibet	3	High

Appendix Table 9. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by the Degree of Market Power within a Jurisdiction Prior to Reforms (Complete Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Age25_29	-0.0071***	-0.0086***	-0.0066***	-0.0084***	-0.0069***
Age30_39	-0.0152***	-0.0183***	-0.0144***	-0.0179***	-0.0149***
Age40_59	-0.0173***	-0.0225***	-0.0167***	-0.0223***	-0.0172***
AgeAbove60	-0.0186***	-0.0261***	-0.0181***	-0.0259***	-0.0184***
ThreeYearsNoClaim	-0.1150***	-0.1183***	-0.1113***	-0.1138***	-0.1106***
TwoYearsNoClaim	-0.1267***	-0.1290***	-0.1230***	-0.1250***	-0.1226***
OneYearNoClaim	-0.0521***	-0.0533***	-0.0484***	-0.0495***	-0.0482***
LastYearClaims1_3	-0.0115***	-0.0126***	-0.0090**	-0.0101***	-0.0091**
SeatsUnder6	0.1606***	0.1613***	0.1449***	0.1425***	0.1419***
Seats6_9	0.1365***	0.1371***	0.1219***	0.1198***	0.1193***
Seats10_36	0.0455	0.0452	0.0185	0.0147	0.0150
Truck	0.0845***	0.0846***	0.0731***	0.0700***	0.0700***
Business	-0.0802***	-0.0798***	-0.0285***	-0.0289***	-0.0293***
NonBusiness	-0.0684***	-0.0683***	-0.0065	-0.0082	-0.0082
CarAge0_2	-0.0888***	-0.0733***	-0.0925***	-0.0772***	-0.0925***
CarAge3_5	-0.0984***	-0.0878***	-0.1006***	-0.0901***	-0.1006***
CarAge6_8	-0.0455***	-0.0402***	-0.0470***	-0.0416***	-0.0469***
LocalCar	-0.0568***	-0.0575***	-0.0498***	-0.0487***	-0.0481***
NotNewcar	0.5062***	0.5018***	0.4976***	0.4930***	0.4974***
TraditionalSale	0.0130***	0.0130***	-0.0068***	-0.0066***	-0.0066***
DirectSale	0.0215***	0.0213***	-0.0211***	-0.0214***	-0.0212***
EcommerceSale	-0.0201***	-0.0208***	-0.0261***	-0.0265***	-0.0259***
AgentSale	0.0147***	0.0147***	0.0166***	0.0162***	0.0162***
PartTimeAgent	0.0594***	0.0597***	0.0479***	0.0482***	0.0479***
ProfessionalAgent	0.0992***	0.0991***	0.0798***	0.0800***	0.0801***
BrokerSale	0.0937***	0.0937***	0.0886***	0.0887***	0.0887***
Group1			0.0751***		
Group2			0.0661***		
Time1	-0.0258***	-0.0188***	-0.0228***	-0.0165***	-0.0224***
Time2		0.0187***		0.0181***	
LowMarketPower			0.0319***		
Treatment1_LMP	-0.0188***	-0.0169***	-0.0226***	-0.0214***	-0.0232***
Treatment2_LMP	0.0118***	0.0125***	0.0113***	0.0125***	0.0118***
Treatment3_LMP	0.0057***	0.0061***	0.0047***	0.0049***	0.0045***
Treatment1_HMP	0.0117***	0.0122***	0.0110***	0.0109***	0.0103***
Treatment2_HMP	0.0078***	0.0085***	0.0117***	0.0124***	0.0117***
Treatment3_HMP	0.0058***	0.0063***	0.0101***	0.0112***	0.0106***
Constant	-0.0553*	-0.0613**	-0.1406***	-0.0988***	-0.0932***
Fixed Effects	Person, Area, Time	Person, Area, Year	Person, Company, Time	Person, Company, Area, Year	Person, Company, Area, Time
Adjusted R^2	0.2032	0.2027	0.2151	0.2149	0.2154

Appendix Table 10. The Effect of the Three-Stage Reforms in Consumer Switching Behavior by Consumer's Risk Type (Complete Results, N=7,257,470)

	(1)	(2)	(3)	(4)	(5)
Age25_29	-0.0066***	-0.0082***	-0.0062***	-0.0080***	-0.0064***
Age30_39	-0.0143***	-0.0176***	-0.0136***	-0.0173***	-0.0141***
Age40_59	-0.0166***	-0.0220***	-0.0159***	-0.0218***	-0.0164***
AgeAbove60	-0.0182***	-0.0259***	-0.0176***	-0.0256***	-0.0179***
ThreeYearsNoClaim	-0.1158***	-0.1190***	-0.1121***	-0.1146***	-0.1114***
TwoYearsNoClaim	-0.1234***	-0.1266***	-0.1195***	-0.1223***	-0.1191***
OneYearNoClaim	-0.0500***	-0.0518***	-0.0463***	-0.0479***	-0.0461***
LastYearClaims1_3	-0.0111***	-0.0122***	-0.0085**	-0.0097**	-0.0086**
SeatsUnder6	0.1605***	0.1611***	0.1468***	0.1423***	0.1418***
Seats6_9	0.1364***	0.1370***	0.1238***	0.1197***	0.1192***
Seats10_36	0.0447	0.0446	0.0195	0.0141	0.0142
Truck	0.0845***	0.0846***	0.0757***	0.0700***	0.0700***
Business	-0.0806***	-0.0801***	-0.0288***	-0.0292***	-0.0296***
NonBusiness	-0.0691***	-0.0688***	-0.0075	-0.0089	-0.0090
CarAge0_2	-0.0872***	-0.0719***	-0.0911***	-0.0758***	-0.0910***
CarAge3_5	-0.0967***	-0.0864***	-0.0990***	-0.0887***	-0.0990***
CarAge6_8	-0.0448***	-0.0396***	-0.0464***	-0.0411***	-0.0463***
LocalCar	-0.0569***	-0.0576***	-0.0491***	-0.0487***	-0.0481***
NotNewcar	0.5075***	0.5027***	0.4988***	0.4939***	0.4987***
TraditionalSale	0.0128***	0.0129***	-0.0070***	-0.0068***	-0.0067***
DirectSale	0.0216***	0.0213***	-0.0210***	-0.0213***	-0.0211***
EcommerceSale	-0.0202***	-0.0208***	-0.0262***	-0.0266***	-0.0260***
AgentSale	0.0145***	0.0146***	0.0165***	0.0161***	0.0161***
PartTimeAgent	0.0594***	0.0597***	0.0478***	0.0481***	0.0478***
ProfessionalAgent	0.0992***	0.0992***	0.0797***	0.0800***	0.0800***
BrokerSale	0.0935***	0.0935***	0.0883***	0.0885***	0.0885***
Group1			0.0595***		
Group2			0.0573***		
Time1	-0.0261***	-0.0187***	-0.0231***	-0.0164***	-0.0227***
Time2		0.0177***		0.0171***	
LowRisk	-0.1594***	-0.1573***	-0.1825***	-0.1579***	-0.1601***
Treatment1_LowRisk	0.0118***	0.0107***	0.0113***	0.0096***	0.0107***
Treatment2_LowRisk	0.0211***	0.0201***	0.0234***	0.0226***	0.0236***
Treatment3_LowRisk	0.0077***	0.0071***	0.0097***	0.0092***	0.0098***
Treatment1_HighRisk	0.0075***	0.0098***	0.0064***	0.0079***	0.0056***
Treatment2_HighRisk	-0.0054***	-0.0028**	-0.0017	0.0009	-0.0017
Treatment3_HighRisk	0.0029**	0.0047***	0.0033***	0.0050***	0.0032***
Constant	0.0260	0.0199	-0.0318	-0.0173	-0.0115
Fixed Effects	Person, Area, Time	Person, Area, Year	Person, Company, Time	Person, Company, Area, Year	Person, Company, Area, Time
Adjusted R^2	0.2033	0.2028	0.2151	0.2149	0.2154

References

1. Bajtelsmit, V. L., Bouzouita, R., (1998). "Market structure and performance in private passenger automobile insurance." *The Journal of Risk and Insurance*, 65(3), 503-514.
2. Boonen, L. H., H., M., Laske-aldershof, T., and Schut, F. T. (2016). "Switching health insurers: The role of price, quality and consumer information search." *The European Journal of Health Economics*, 17(3), 339-353.
3. Cummins, J.D., Rubio-Misas, M., (2006). "Deregulation, consolidation, and efficiency: Evidence from the Spanish insurance industry." *Journal of Money, Credit, and Banking*, 38(2), 323-355.
4. Cummins, J.D., (2002). "*Deregulating Property-Liability Insurance*," Brookings Institution Press.
5. Dafny, L.S. (2010). "Are health insurance markets competitive?" *American Economic Review*, 100(3), 1399-1431.
6. de Jong, J. D., van den Brink-Muinen, A., and Groenewegen, P.P. (2008). "The Dutch health insurance reform: switching between insurers, a comparison between the general population and the chronically ill and disabled." *BMC Health Services Research*, 8(1), 58-67.
7. Grabowski, H., Viscusi, W., K., and Evans, W., N., (1989). "Price and availability tradeoffs of automobile insurance regulation." *The Journal of Risk and Insurance*, 56(2), 275-299.
8. Hendriks, M., de Jong, J. D., van den Brink-Muinen, A., and Groenewegen, P. P. (2009). "The intention to switch health insurer and actual switching behavior: Are there differences between groups of people?" *Health Expectations*, 13(2), 195-207.
9. Honka, E. (2014). "Quantifying search and switching costs in the U.S. automobile insurance industry." *RAND Journal of Economics*, 45(4), 847-884.
10. Jaskow, P.L., Noll, R.G., (1994). "Deregulation and regulatory reform during the 1980s." In *American Economic Policy in the 1980s*, edited by Martin Feldstein, 367-440. University of Chicago Press.
11. Kole, S. R., Lehn, K., (1997). "Deregulation, the evolution of corporate governance structure, and survival." *American Economic Review*, 87(2), 421-425.
12. Peng, S. C., Li, C. S., and Liu, C. C., (2016). "Deregulation, pricing strategies, and claim behavior in the Taiwan automobile insurance market." *Emerging Markets Finance and Trade*, 52(4), 869-885.
13. Pope, N., Ma, Y. L., (2005). "Market deregulation and insurer pricing strategies: The Japanese experience." *The Geneva Papers on Risk and Insurance Issues and Practice*, 30(2), 312-326.
14. Pope, N., Ma, Y. L., (2008). "The market structure-performance relationship in the international insurance sector." *The Journal of Risk and Insurance*, 75(4), 947-966.
15. Schlesinger, H., von der Schulenburg, J.M (1991). "Search costs, switching costs and product heterogeneity in an insurance market." *Journal of Risk and Insurance*, 58(1), 109-120.
16. Schlesinger, H., von der Schulenburg, J.M (1993). "Consumer information and decisions to switch insurers." *Journal of Risk and Insurance*, 60(4), 591-616.
17. Turchetti, G., Daraio, C., (2004). "How deregulation shapes market structure and industry efficiency: The case of the Italian motor insurance industry." *The Geneva Papers on Risk and Insurance - Issues and Practice*, 29(2), 202-218.
18. Van Rooijen, M.R., de Jong, J. D., and Rijken, M. (2011). "Regulated competition in health care: Switching and barriers to switching in the Dutch health insurance system." *BMC Health Services Research*, 11(1), 95-105.
19. Weiss, M.A., Choi, P.B., (2008). "State regulation and the structure, conduct, efficiency and performance of U.S. automobile insurers." *Journal of Banking and Finance*, 32(1), 134-156.
20. Winston, C., (1993). "Economic deregulation: Days of reckoning for microeconomists." *Journal of Economic Literature*, 31(3): 1263-1289.