HLDI
Highway Loss Data Institute

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Convertibles versus coupes

Summary

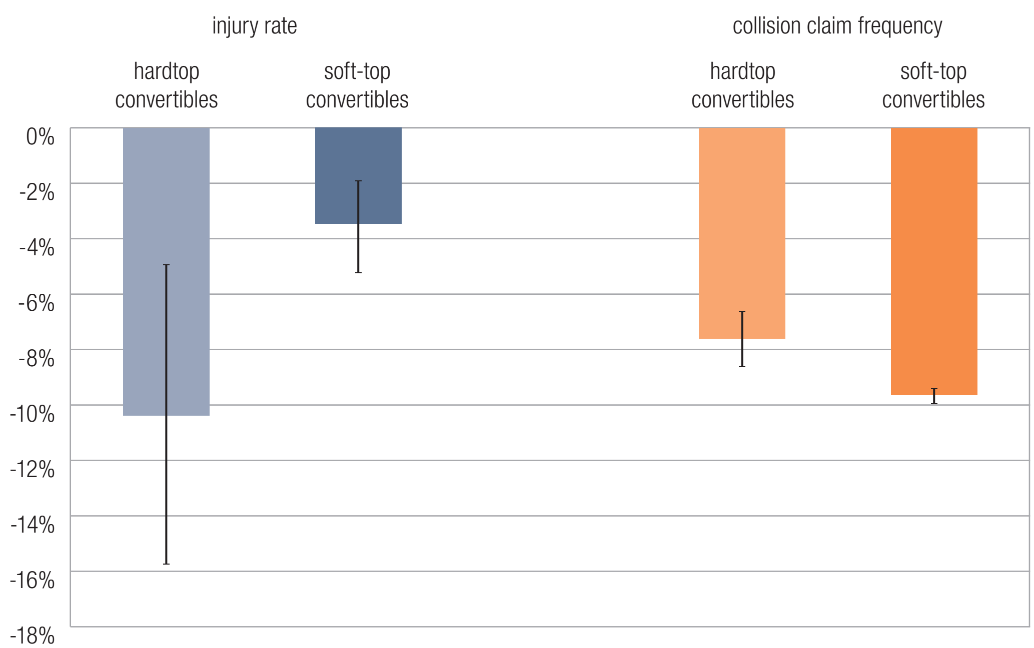
Many vehicle series are available in both a coupe and convertible body type. This Highway Loss Data Institute (HLDI) study compares the injury rates and collision claim frequencies of convertibles with those of their coupe counterparts.

Convertibles and coupes of the same vehicle series generally look similar and have identical length and width dimensions, but differ in curb weight, base price, and internal structure. Typically, coupes are more rigid and have better handling than convertibles.

The absence of a fixed roof makes it a challenge to design a convertible for safety. The roof helps to maintain the rigidity of the structure around the occupant compartment and keep the compartment intact in a serious crash. The main structures of convertibles need to be strengthened to compensate for the support that is lost in removing the roof.

The following figure shows the estimated percent change in the injury rate and in collision claim frequency due to body type when comparing convertibles with their coupe counterparts. Also shown are the respective 95 percent confidence limits. Injury rates and collision claim frequencies for both convertible types were lower than coupes, with all differences statistically significant at the 0.05 level. The lower results for convertibles compared with their corresponding coupes may be due to the convertibles' higher curb weight, the socioeconomic differences in the drivers, or how the vehicles are driven. Hardtop convertibles had lower injury rates and slightly higher collision claim frequencies than soft-tops. The types of vehicles in the groups may contribute to this difference, as BMW vehicles dominated the hardtop group and Chevrolet and Ford vehicles dominated the soft-top group. No information was available on whether the convertible's top was open or closed at the time of the crash, so the effect of a lowered roof on injuries and crash risk is unknown.

Estimated percent change in injury rate and collision claim frequency when comparing convertibles with their coupe counterparts



Introduction

Many vehicle series are available in both a coupe and convertible body type. The two body types typically have the same vehicle length and width, but convertibles generally have a higher base price, have a slightly higher curb weight, and may be driven differently. There are also structural differences to compensate for the lack of a fixed roof.

Figure 1 shows a scatterplot comparing the base price of convertibles with their corresponding coupe. All vehicle pairs had a higher base price for the convertible. The average difference in base price was around $6,000. Some of this difference may be due to convertibles only being available in the higher trim levels.

Figure 1: Base price of convertibles versus coupes

Figure 2 shows a scatterplot comparing the curb weight of convertibles with their corresponding coupes. On average, convertibles were about 250 pounds heavier than their coupe counterparts. The higher curb weight of convertibles is due primarily to the additional mechanics needed for retractable roofs and bracing added to compensate for the missing roof structure.

Figure 2: Curb weight of convertibles versus coupes

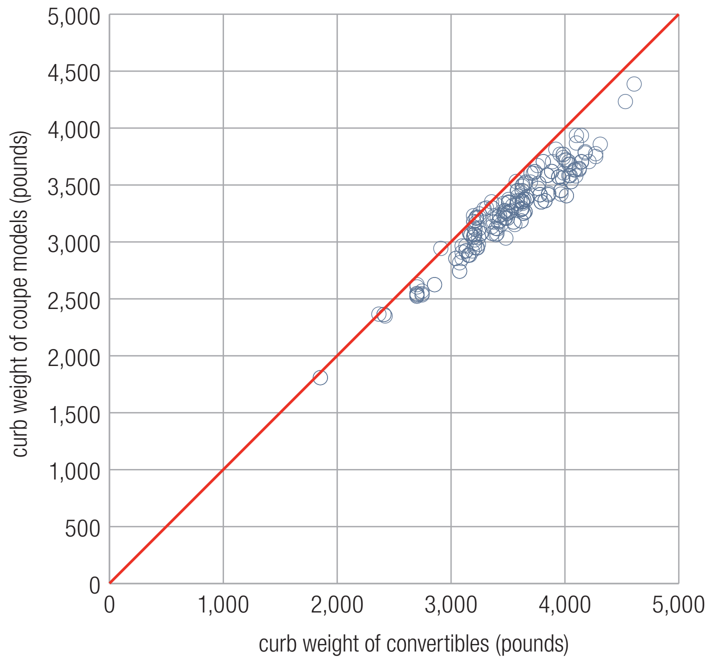
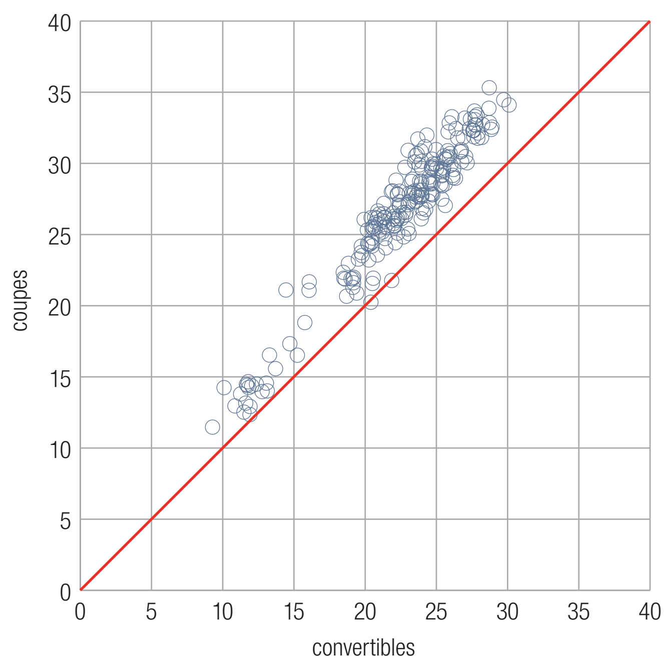


Figure 3 shows a scatterplot comparing the average miles driven per day for convertibles with their corresponding coupes. For all but two of the pairs, coupes had higher average miles per day than their convertible versions. Coupes averaged 4.1 more miles per day than their corresponding convertibles.

Figure 3: Comparison of average miles per day for convertibles and their coupe counterparts



IIHS crashworthiness evaluations of convertibles found mixed results (IIHS, 2007). Of the 10 vehicles tested, eight received good ratings on frontal tests, six received good ratings on side tests, and only two received good ratings on rear tests. IIHS's Top Safety Pick designation also requires a roll bar to preserve occupants' headroom in a rollover crash. Only two of the convertibles had a pop-up roll bar. A 2020 IIHS study compared the fatality rates and crash rates of convertibles and their non-convertible versions based on 1- to 5-year-old vehicles during 2014–18 (Teoh). The study found that convertibles had lower police reported crash rates than their non-convertible counterpart using both registered vehicle years and vehicle miles traveled as the denominators. Lower driver fatality rates were also found for convertibles, but the differences were not statistically significant.

Methods

Two analyses were done in this study. The first examined injury rates, and the second examined collision claim frequencies. For the injury rate analyses, the percentage of collision and property damage liability (PDL) claims with an associated paid personal injury protection (PIP) claim was computed for convertibles and coupes. Collision and PDL claims were matched to PIP claims using their Vehicle Identification Number (VIN) and loss date. Only collision and PDL claims with corresponding PIP coverage were used. The collision and PDL claims originated from automated damage estimates provided by CCC Information Services and Mitchell International, Inc. For the collision claim frequency analyses, exposure and claims under collision coverage in the HLDI database were used. For both analyses, only model years with at least 100 damage estimates for both the convertible and coupe were included.

Most coupes in the study were two-door cars. The exceptions were the Audi A3 and Audi A4, which were four-door cars. A list of the study vehicles is given in **Table 1** along with whether the convertible was a soft-top or hardtop. Model years ranged from 2000 to 2018. Losses were from the vehicle's introduction through October 2018 for the injury analyses and through December 2018 for the collision analyses. There were 263 vehicle series-model year pairs of convertibles and coupes included in the study, over 970,000 damage estimates in the injury analyses, and over 24 million years of exposure in the collision analyses.

Table 1: Study vehicles

Coupe/Convertible Vehicle Series	Model Years	Convertible Type
Audi A3 4d 2WD	2015	Soft-top
Audi A3 4d 4WD	2015–16	Soft-top
Audi A4 4d 2WD	2003–05	Soft-top
Audi A4 4d 4WD	2004–05	Soft-top
Audi A5 4WD	2010–16, 2018	Soft-top
Audi S5 4WD	2010	Soft-top
Audi TT 2WD	2001–05, 2008	Soft-top
Audi TT 4WD	2001–05, 2008	Soft-top
BMW 128 i	2008–13	Soft-top
BMW 135 i/is	2008–13	Soft-top
BMW 228 i 2WD	2015–16	Soft-top
BMW 228 xi 4WD	2015–16	Soft-top
BMW 323 is/ci	2000	Soft-top
BMW 328 i/is/ci	2007–13	Hardtop
BMW 330 ci	2001–06	Soft-top
BMW 335 i/is 2WD	2007–16	Hardtop
BMW 428 i 2WD	2014–16	Hardtop
BMW 428 xi 4WD	2014–16	Hardtop
BMW 430 xi 4WD	2017	Hardtop
BMW 435 i 2WD	2014–15	Hardtop

Table 1: Study vehicles		
Coupe/Convertible Vehicle Series	**Model Years**	**Convertible Type**
BMW 435 xi 4WD	2015–16	Hardtop
BMW 645 ci	2004–05	Soft-top
BMW 650 i 2WD	2012	Soft-top
BMW 650 xi 4WD	2012	Soft-top
BMW M3/M3 ci	2001–06, 2008–09, 2011–13	Soft-top
BMW M4	2015–16	Hardtop
BMW Z3 3.0	2001	Soft-top
BMW Z4 M	2007	Soft-top
Chevrolet Camaro	2011–17	Soft-top
Chevrolet Corvette	2000–11, 2013–16	Soft-top
Chrysler Crossfire	2005–07	Soft-top
Chrysler Sebring	2000–05	Soft-top
Fiat 500	2012–15	Soft-top
Ford Mustang	2000–03, 2005–17	Soft-top
Ford Mustang GT	2005–17	Soft-top
Infiniti Q60 2WD	2014–15	Hardtop
Jaguar XK	2007	Soft-top
Jaguar XKR	2007	Soft-top
Mercedes-Benz C class 4WD	2017	Soft-top
Mercedes-Benz CLK class	2000–09	Soft-top
Mercedes-Benz E class 2WD	2011–16	Soft-top
Mini Cooper	2005–17	Soft-top
Mitsubishi Eclipse 2WD	2001–05, 2007–09, 2011–12	Soft-top
Nissan 370Z	2004–08, 2010–12	Soft-top
Pontiac Firebird	2000–02	Soft-top
Pontiac G6	2006–09	Hardtop
Porsche 911	2005–09, 2011	Soft-top
Porsche 911 Carrera	2012–14	Soft-top
Saab 9-3	2001	Soft-top
Smart ForTwo	2008–09	Soft-top
Toyota Camry Solara	2000–08	Soft-top
Volkswagen New Beetle	2003–10, 2013–17	Soft-top
Volvo C70	2001–02	Hardtop

To determine the effect of vehicle body type on injury risk, a logistic regression was run. The model controlled for damage amount, point of impact, vehicle age, coverage, garaging state, rated driver age, gender, marital status, risk, and vehicle series-model year. Convertible-coupe vehicle series were split by model year to help control for new safety technology within a design cycle. To determine the effect of vehicle body type on collision claim frequency, a Poisson regression was run. The model controlled for rated driver age, gender, marital status, risk, garaging state, vehicle age, vehicle series-model year, garaging state, vehicle density, collision deductible, and average miles driven per day. The mileage data were from CARFAX, a unit of IHS Markit.

Results

Figure 4 compares the unadjusted injury rates of convertibles with their corresponding coupes. The injury rates are positively correlated ($R^2 = 0.466$) with convertibles tending to have slightly lower injury rates compared with their corresponding coupes (convertible injury rates were lower for 165 of the 263 pairs). **Figure 5** compares the unadjusted collision claim frequencies of convertibles with their corresponding coupes. For collision claim frequencies, the pairs are more strongly correlated ($R^2 = 0.8836$) than for injury rates. In all but eight of the pairs, the coupe version had a higher collision claim frequency than the convertible version.

Figure 4: Injury rate of convertibles versus coupes

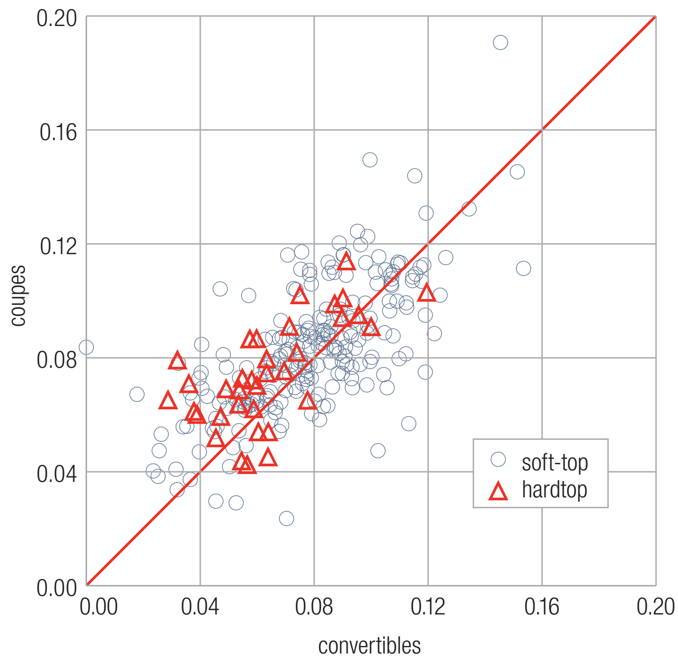
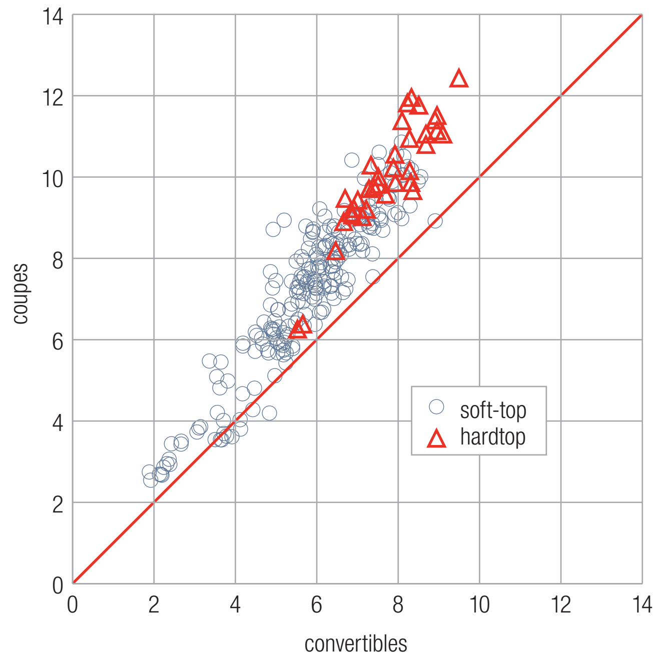
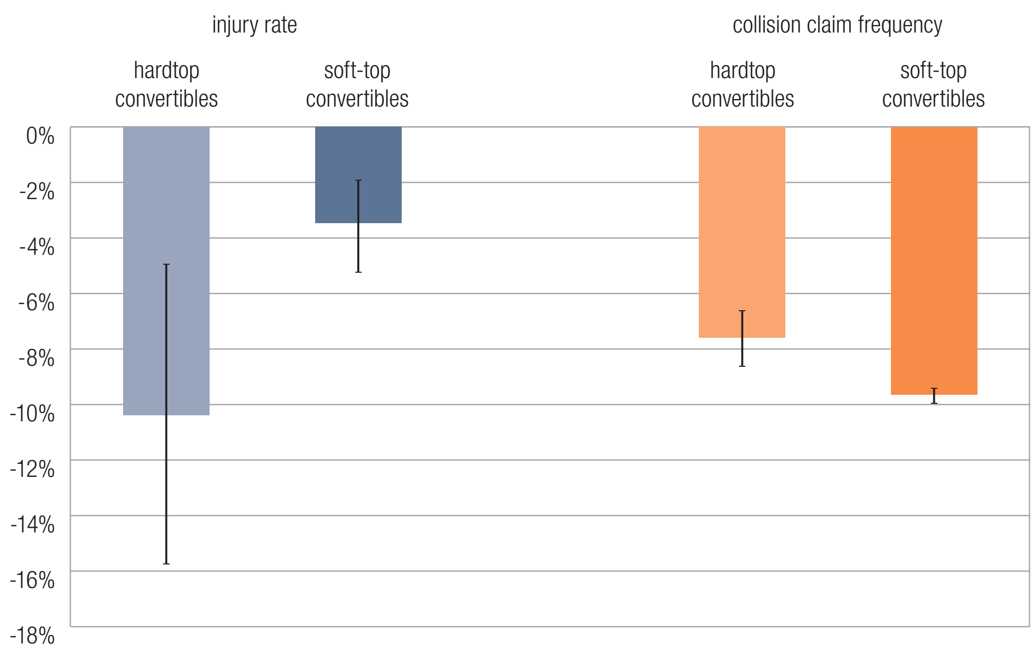


Figure 5: Collision claim frequency of convertibles versus coupes



Appendix A and B give the logistic regression results for injury rates and the Poisson regression results for collision claim frequency, respectively. The estimated percent change in the injury rate and in collision claim frequency due to body type when comparing convertibles with their coupe counterparts is shown in **Figure 6**, along with the 95 percent confidence limits. Injury rates and collision claim frequencies for hardtop and soft-top convertibles were lower than their corresponding coupes, with all differences statistically significant at the 0.05 level. The lower results for convertibles compared with their corresponding coupes may be due to the convertibles' higher curb weight, the socioeconomic differences in the drivers, or how the vehicles are driven. Hardtop convertibles had lower injury rates and slightly higher collision claim frequencies than soft-tops. The types of the vehicles in the convertible groups may contribute to this difference, as newer BMW vehicles dominated the hardtop group and Chevrolet and Ford vehicles dominated the soft-top group. No information was available on whether the convertible's top was open or closed at the time of the crash, so the effect of a lowered roof on injuries and crash risk is unknown.

Figure 6: Estimated percent change in injury rate and collision claim frequency when comparing convertibles with their coupe counterparts



Discussion

Convertibles were found to have slightly lower injury rates and collision claim frequencies than their coupe counterparts. Compared with coupes, injury rates were estimated to be 10 percent lower for hardtop convertibles and 3 percent lower for soft-top convertibles. Lower collision claim frequencies were also found for both hardtop (8 percent lower) and soft-top convertibles (10 percent lower) when compared with coupes. These results align with the 2020 IIHS study (Teoh), which found lower police-reported crash rates for convertibles than their coupe counterparts.

The overall estimated 4 percent lower injury rates for convertibles was not uniform across the vehicle series. Of the 263 convertible-coupe pairs of unadjusted injury rates, the convertible's result was lower for 165 of the pairs and higher for 98 of the pairs. There was less variability in the collision claim frequencies, with unadjusted frequencies lower for the convertible in all but eight of the 263 pairs.

Some of the difference in results between the convertibles and their corresponding coupes may be due to physical differences. The convertibles in this study weighed on average about 250 pounds more than their coupe counterparts. Heavier vehicles have been associated with lower injury rates and lower collision losses in multiple-vehicle crashes (HLDI, 2014, 2015, 2019). With the roof lowered, convertible drivers may have greater rear and side visibility than drivers of coupes, enabling them to potentially avoid crashes.

Who owns a convertible and how it is driven likely contributed to the convertibles' lower injury and collision results. Compared with coupes in the study, the convertibles had base prices around $6,000 higher and were driven on average 4 fewer miles per day (about 1,500 miles per year). The higher base price could affect the socioeconomic makeup of the owners, even after controlling for rated driver age, gender, marital status, and risk. Drivers looking for higher performance would generally choose the more rigid coupe over the convertible model. When convertibles are driven with the top down, the driver is more exposed and less likely to engage in aggressive behavior. Also, the convertible may be driven in more relaxed settings, such as on weekends and in nice weather.

No data were available on how often convertibles are driven with their tops lowered or on the status of the convertible's roof at the time of the crash. This information could provide insight on how changes in rear visibility affect crashes, occupant ejections, and occupant injuries. Most of the vehicle series included in this study were classified as sport cars or were on the sporty side. Different results may occur if the convertibles were compared with more sedan-like cars.

Insufficient data were available to run the analyses separately for each point of impact. Given the high relative injury risk in rollovers (2.46 compared with front impacts), the risk of injury in a convertible with the top lowered in a rollover crash would likely be high. The presence of a roll bar should mitigate some of the risk. Rollovers comprise a small percentage of all crashes (about 2 percent; HLDI, 2020), but their importance in convertible crashes should be investigated in more detail as additional data are available.

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Appendix

Appendix A: Logistic regression results for injury risk				
			95% Confidence Interval	
Parameter		Risk Ratio	Lower Limit	Upper Limit
Body type	hardtop convertible vs. coupe	0.896	0.843	0.951
	soft-top convertible vs. coupe	0.965	0.949	0.981
Collision/PDL damage amount	$2,000–$5,000 vs. <$2,000	2.160	2.122	2.199
	$5,000–$10,000 vs. <$2,000	4.686	4.625	4.748
	>$10,000 vs. <$2,000	7.545	7.482	7.607
Coverage	collision vs. PDL	0.750	0.738	0.763
Vehicle age	2–3 years vs. 0–1 years	0.979	0.957	1.001
	4–5 years vs. 0–1 years	1.021	0.997	1.045
	6–7 years vs. 0–1 years	1.068	1.042	1.095
	8–9 years vs. 0–1 years	1.162	1.131	1.194
	10–12 years vs. 0–1 years	1.258	1.223	1.293
	13–15 years vs. 0–1 years	1.333	1.284	1.385
	16+ years vs. 0–1 years	1.407	1.307	1.512
Rated driver gender and marital status	female — married vs. unknown	1.183	1.155	1.212
	female — single vs. unknown	1.348	1.319	1.379
	male — married vs. unknown	1.004	0.979	1.028
	male — single vs. unknown	0.865	0.843	0.887
Risk	nonstandard vs. standard	1.046	1.025	1.068
Rated driver age	15–24 vs. 45–54	0.825	0.804	0.847
	25–34 vs. 45–54	0.985	0.963	1.006
	35–44 vs. 45–54	1.062	1.039	1.087
	55–64 vs. 45–54	0.962	0.940	0.985
	65–74 vs. 45–54	0.874	0.846	0.903
	75–99 vs. 45–54	0.745	0.706	0.785
	unknown vs. 45–54	1.056	1.019	1.093
Point of impact	rear vs. front	2.276	2.241	2.311
	side vs. front	1.074	1.051	1.097
	rollover vs. front	2.463	2.283	2.654
	total vs. front	1.697	1.658	1.736
	other vs.front	0.991	0.959	1.024
Garaging state	Delaware vs. Texas	1.861	1.761	1.965
	Florida vs. Texas	2.072	2.034	2.111
	Hawaii vs. Texas	0.868	0.797	0.946
	Kansas vs. Texas	1.127	1.061	1.198
	Kentucky vs. Texas	1.902	1.826	1.980
	Massachusetts vs. Texas	1.434	1.350	1.521
	Maryland vs. Texas	1.671	1.629	1.714
	Minnesota vs. Texas	1.419	1.346	1.495
	North Dakota vs. Texas	1.004	0.790	1.267
	New Jersey vs. Texas	1.094	1.055	1.134
	New York vs. Texas	1.409	1.374	1.446

Appendix A: Logistic regression results for injury risk				
			95% Confidence Interval	
Parameter		Risk Ratio	Lower Limit	Upper Limit
	Oregon vs. Texas	1.925	1.852	2.001
	Pennsylvania vs. Texas	1.320	1.279	1.362
	Utah vs. Texas	1.555	1.465	1.650
	Washington vs. Texas	1.752	1.695	1.810
Vehicle series and model year (compared with Ford Mustang 2004)	Audi A3 2WD 2015	0.436	0.370	0.515
	Audi A3 4WD 2015	0.382	0.330	0.443
	Audi A3 4WD 2016	0.376	0.310	0.455
	Audi A4 2WD 2003	0.642	0.564	0.731
	Audi A4 2WD 2004	0.502	0.435	0.577
	Audi A4 2WD 2005	0.560	0.479	0.654
	Audi A4 4WD 2004	0.578	0.526	0.636
	Audi A4 4WD 2005	0.563	0.502	0.630
	Audi A5 4WD 2010	0.319	0.266	0.383
	Audi A5 4WD 2011	0.331	0.275	0.399
	...For consideration of space, only a sample of the model year, make, series combinations are listed.			
	Volkswagen New Beetle 2014	0.471	0.402	0.552
	Volkswagen New Beetle 2015	0.652	0.546	0.777
	Volkswagen New Beetle 2016	0.706	0.570	0.872
	Volkswagen New Beetle 2017	0.725	0.543	0.963
	Volvo C70 2001	0.796	0.630	1.004
	Volvo C70 2002	0.926	0.723	1.180

Appendix B: Poisson regression results for collision claim frequency									
						Wald 95% confidence limits			
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Lower limit	Upper limit	Chi-square	P-value
Intercept		1	-2.3714		0.0052	-2.3815	-2.3612	209097.00	<.0001
Body type	hardtop convertible vs. coupe	1	-0.0790	-8%	0.0051	-0.0890	-0.0690	240.00	<.0001
	soft-top convertible vs. coupe	1	-0.1014	-10%	0.0015	-0.1045	-0.0984	4325.81	<.0001
Gender	male vs. female	1	-0.0083	-1%	0.0015	-0.0112	-0.0054	32.13	<.0001
	unknown vs. female	1	-0.2158	-19%	0.0035	-0.2227	-0.2089	3745.70	<.0001
Risk	nonstandard vs. standard	1	0.2335	26%	0.0020	0.2295	0.2375	13173.00	<.0001
Rated driver age	15–24 vs. 45–54	1	0.4435	56%	0.0024	0.4388	0.4482	34528.80	<.0001
	25–34 vs. 45–54	1	0.1572	17%	0.0021	0.1532	0.1613	5803.07	<.0001
	35–44 vs. 45–54	1	0.0469	5%	0.0021	0.0428	0.0510	512.34	<.0001
	55–64 vs. 45–54	1	-0.1008	-10%	0.0022	-0.1050	-0.0966	2189.38	<.0001
	65–74 vs. 45–54	1	-0.0918	-9%	0.0029	-0.0974	-0.0862	1030.73	<.0001
	75–99 vs. 45–54	1	0.1349	14%	0.0044	0.1264	0.1434	957.40	<.0001
	unknown vs. 45–54	1	0.0009		0.0031	-0.0052	0.0069	0.08	0.7810
Marital status	single vs. married	1	0.2125	24%	0.0016	0.2093	0.2156	17392.00	<.0001
	unknown vs. married	1	0.2390	27%	0.0035	0.2321	0.2458	4685.31	<.0001
Vehicle density (vehicles per square mile)	≤ 100 vs. > 500	1	-0.2391	-21%	0.0021	-0.2433	-0.2350	12639.40	<.0001
	101–500 vs. > 500	1	-0.1703	-16%	0.0015	-0.1734	-0.1673	12119.40	<.0001
Vehicle age	2–3 years vs. 0–1 years	1	-0.0570	-6%	0.0019	-0.0607	-0.0532	888.78	<.0001
	4–5 years vs. 0–1 years	1	-0.0816	-8%	0.0021	-0.0857	-0.0776	1565.80	<.0001
	6–7 years vs. 0–1 years	1	-0.0905	-9%	0.0023	-0.0949	-0.0861	1605.78	<.0001
	8–9 years vs. 0–1 years	1	-0.1153	-11%	0.0025	-0.1202	-0.1103	2060.17	<.0001
	10–12 years vs. 0–1 years	1	-0.1624	-15%	0.0027	-0.1676	-0.1572	3749.69	<.0001
	13–15 years vs. 0–1 years	1	-0.3047	-26%	0.0039	-0.3124	-0.2970	6015.95	<.0001
	16+ years vs. 0–1 years	1	-0.5320	-41%	0.0081	-0.5480	-0.5161	4280.47	<.0001
Collision deductible	> $500 vs. ≤ $500	1	-0.3339	-28%	0.0018	-0.3374	-0.3304	34707.40	<.0001
Average miles per day	< 20 mpd vs. 40–49 mpd	1	-0.5729	-44%	0.0025	-0.5779	-0.5679	50955.60	<.0001
	20–39 mpd vs. 40–49 mpd	1	-0.1495	-14%	0.0023	-0.1540	-0.1450	4229.22	<.0001
	50–79 mpd vs. 40–49 mpd	1	0.1151	12%	0.0029	0.1095	0.1207	1598.63	<.0001
	≥ 80 mpd vs. 40–49 mpd	1	0.3223	38%	0.0053	0.3119	0.3327	3690.52	<.0001
	unknown vs. 40–49 mpd	1	-0.1577	-15%	0.0031	-0.1637	-0.1517	2672.74	<.0001
Garaging state	Alaska vs. Texas	1	0.0593	6%	0.0210	0.0180	0.1005	7.93	0.0049
	Alabama vs. Texas	1	0.0249	3%	0.0053	0.0145	0.0354	21.98	<.0001
	Arkansas vs. Texas	1	0.0924	10%	0.0077	0.0774	0.1074	145.85	<.0001
	Arizona vs. Texas	1	-0.0302	-3%	0.0046	-0.0392	-0.0212	43.18	<.0001
	California vs. Texas	1	0.1720	19%	0.0025	0.1670	0.1769	4656.84	<.0001
	Colorado vs. Texas	1	-0.0320	-3%	0.0057	-0.0431	-0.0209	31.76	<.0001
	Connecticut vs. Texas	1	-0.1424	-13%	0.0065	-0.1551	-0.1296	479.19	<.0001
	District Of Columbia vs. Texas	1	0.3877	47%	0.0106	0.3669	0.4085	1337.54	<.0001
	Delaware vs. Texas	1	0.0011	0%	0.0100	-0.0186	0.0207	0.01	0.9146
	Florida vs. Texas	1	-0.1517	-14%	0.0028	-0.1572	-0.1462	2897.71	<.0001
	Georgia vs. Texas	1	-0.0622	-6%	0.0038	-0.0696	-0.0547	269.58	<.0001
	Hawaii vs. Texas	1	0.1058	11%	0.0095	0.0872	0.1243	124.53	<.0001
	Iowa vs. Texas	1	-0.2412	-21%	0.0102	-0.2612	-0.2213	562.75	<.0001

Appendix B: Poisson regression results for collision claim frequency									
						Wald 95% confidence limits			
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Lower limit	Upper limit	Chi-square	P-value
	Idaho vs. Texas	1	-0.1948	-18%	0.0133	-0.2208	-0.1687	214.62	<.0001
	Illinois vs. Texas	1	-0.0491	-5%	0.0037	-0.0563	-0.0418	176.31	<.0001
	Indiana vs. Texas	1	-0.1185	-11%	0.0056	-0.1294	-0.1075	450.16	<.0001
	Kansas vs. Texas	1	-0.0829	-8%	0.0074	-0.0974	-0.0684	125.40	<.0001
	Kentucky vs. Texas	1	-0.1324	-12%	0.0065	-0.1451	-0.1196	414.42	<.0001
	Louisiana vs. Texas	1	0.2371	27%	0.0050	0.2273	0.2469	2261.53	<.0001
	Massachusetts vs. Texas	1	0.1638	18%	0.0054	0.1531	0.1744	905.23	<.0001
	Maryland vs. Texas	1	0.0423	4%	0.0041	0.0343	0.0503	107.24	<.0001
	Maine vs. Texas	1	-0.1326	-12%	0.0164	-0.1647	-0.1004	65.34	<.0001
	Michigan vs. Texas	1	0.2192	25%	0.0048	0.2098	0.2287	2070.56	<.0001
	Minnesota vs. Texas	1	-0.2638	-23%	0.0070	-0.2775	-0.2501	1418.06	<.0001
	Missouri vs. Texas	1	-0.0785	-8%	0.0052	-0.0887	-0.0683	227.60	<.0001
	Mississippi vs. Texas	1	0.1065	11%	0.0077	0.0913	0.1216	189.25	<.0001
	Montana vs. Texas	1	-0.1555	-14%	0.0199	-0.1946	-0.1164	60.81	<.0001
	North Carolina vs. Texas	1	-0.2335	-21%	0.0043	-0.2419	-0.2250	2908.82	<.0001
	North Dakota vs. Texas	1	-0.1871	-17%	0.0236	-0.2334	-0.1407	62.59	<.0001
	Nebraska vs. Texas	1	-0.2415	-21%	0.0115	-0.2641	-0.2190	441.09	<.0001
	New Hampshire vs. Texas	1	-0.0027	0%	0.0112	-0.0245	0.0192	0.06	0.8114
	New Jersey vs. Texas	1	-0.1265	-12%	0.0043	-0.1350	-0.1181	858.79	<.0001
	New Mexico vs. Texas	1	-0.0253	-2%	0.0079	-0.0408	-0.0099	10.33	0.0013
	Nevada vs. Texas	1	0.0863	9%	0.0061	0.0744	0.0982	202.33	<.0001
	New York vs. Texas	1	0.0448	5%	0.0035	0.0379	0.0518	160.71	<.0001
	Ohio vs. Texas	1	-0.1988	-18%	0.0043	-0.2073	-0.1903	2112.86	<.0001
	Oklahoma vs. Texas	1	-0.0523	-5%	0.0062	-0.0645	-0.0402	71.17	<.0001
	Oregon vs. Texas	1	-0.1112	-11%	0.0069	-0.1247	-0.0976	259.64	<.0001
	Pennsylvania vs. Texas	1	-0.0184	-2%	0.0038	-0.0259	-0.0110	23.66	<.0001
	Rhode Island vs. Texas	1	0.0086	1%	0.0115	-0.0139	0.0311	0.56	0.4545
	South Carolina vs. Texas	1	-0.1213	-11%	0.0054	-0.1319	-0.1107	502.76	<.0001
	South Dakota vs. Texas	1	-0.3090	-27%	0.0217	-0.3516	-0.2664	202.26	<.0001
	Tennessee vs. Texas	1	-0.0387	-4%	0.0046	-0.0478	-0.0296	69.80	<.0001
	Utah vs. Texas	1	-0.1678	-15%	0.0090	-0.1855	-0.1502	347.96	<.0001
	Virginia vs. Texas	1	-0.0538	-5%	0.0038	-0.0611	-0.0464	204.92	<.0001
	Vermont vs. Texas	1	-0.1356	-13%	0.0223	-0.1793	-0.0919	36.98	<.0001
	Washington vs. Texas	1	-0.0811	-8%	0.0049	-0.0906	-0.0716	278.36	<.0001
	Wisconsin vs. Texas	1	-0.2221	-20%	0.0070	-0.2358	-0.2084	1005.02	<.0001
	West Virginia vs. Texas	1	-0.1418	-13%	0.0105	-0.1623	-0.1213	184.09	<.0001
	Wyoming vs. Texas	1	-0.1585	-15%	0.0217	-0.2011	-0.1160	53.31	<.0001
Vehicle series and model year (compared with Ford Mustang 2004)	Audi A3 2WD 2015	1	0.2254	25%	0.0139	0.1982	0.2526	263.99	<.0001
	Audi A3 4WD 2015	1	0.1941	21%	0.0121	0.1704	0.2179	256.28	<.0001
	Audi A3 4WD 2016	1	0.2259	25%	0.0172	0.1922	0.2595	173.32	<.0001
	Audi A4 2WD 2003	1	0.0684	7%	0.0114	0.0461	0.0907	36.23	<.0001
	Audi A4 2WD 2004	1	0.1052	11%	0.0116	0.0825	0.1279	82.33	<.0001
	Audi A4 2WD 2005	1	0.1135	12%	0.0137	0.0866	0.1403	68.73	<.0001

Appendix B: Poisson regression results for collision claim frequency									
						Wald 95% confidence limits			
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Lower limit	Upper limit	Chi-square	P-value
	Audi A4 4WD 2004	1	0.0737	8%	0.0085	0.0571	0.0903	75.84	<.0001
	Audi A4 4WD 2005	1	0.0825	9%	0.0104	0.0621	0.1029	62.80	<.0001
	Audi A5 4WD 2010	1	0.2564	29%	0.0138	0.2295	0.2834	347.61	<.0001
	Audi A5 4WD 2011	1	0.2425	27%	0.0139	0.2154	0.2697	305.85	<.0001
	...For consideration of space, only a sample of the model year, make, series combinations are listed.								
	Volkswagen New Beetle 2014	1	0.2026	22%	0.0126	0.1780	0.2272	260.31	<.0001
	Volkswagen New Beetle 2015	1	0.1951	22%	0.0162	0.1633	0.2269	144.71	<.0001
	Volkswagen New Beetle 2016	1	0.1457	16%	0.0195	0.1074	0.1839	55.75	<.0001
	Volkswagen New Beetle 2017	1	0.1424	15%	0.0256	0.0922	0.1925	30.97	<.0001
	Volvo C70 2001	1	-0.1456	-14%	0.0202	-0.1851	-0.1060	52.00	<.0001
	Volvo C70 2002	1	-0.1127	-11%	0.0244	-0.1605	-0.0650	21.43	<.0001

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