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Collision claim severity for aluminum intensive vehicles

This study investigates the effects on collision claim severity of using aluminum instead of steel to build vehicle bodies. Results indicate that aluminum is associated with increases in collision claim severities and that the higher the aluminum content, the greater the increase in severity.

Introduction

The use of aluminum as a material in the manufacturing of automotive vehicles is on the rise. According to a recent survey by Ducker Worldwide (2011), automakers are expected to increase their use of aluminum from 343 pounds per vehicle in 2012 to 550 pounds in 2025. Aluminum is seen as an attractive material by automakers due to its light weight compared with steel, resulting in improved fuel economy. Currently, aluminum is primarily used in engines and wheels, although its use in hoods, trunks, and doors has been steadily increasing (Ducker Worldwide, 2011). Full-bodied aluminum and aluminum intensive vehicles thus far have been largely limited to high-end luxury and performance vehicles. The announcement by Ford Motor Co. that the 2015 F-150 would be constructed largely from aluminum has signaled a potential shift towards aluminum in the manufacturing of high-volume vehicles. With the Corporate Average Fuel Economy mandate of 35.5 miles per gallon by 2016 and 54.5 miles per gallon by 2025 (Vlasic, 2012), the F-150 could be the first of many vehicles switching to aluminum in order to save weight and improve fuel economy.

However, aluminum use is not without its disadvantages. The properties of aluminum are different than steel, and repairing the material can require different techniques and tools. Repairing extreme damage may require a clean room to prevent contamination of the metal. If aluminum is contaminated, it will corrode faster than normal. Aluminum parts are often more expensive than steel parts, and many body shop owners say the repairs take longer, resulting in increased labor and total repair costs (Stoklosa, 2014; Truett, 2014; Wernie, 2014). The purpose of this study is to examine the effect aluminum has had on repair costs for high-end luxury vehicles.

Method

Insurance data

Automobile insurance covers damage to vehicles and property as well as injuries to people involved in crashes. Different insurance coverages pay for vehicle damage versus injuries, and different coverages may apply depending on who is at fault. The current study is based on collision coverage. Collision coverage insures against vehicle damage to an at-fault driver's vehicle sustained in a crash with an object or other vehicle; this coverage is common to all 50 states. Data are supplied to HLDI by its member companies.

Vehicle Data

Large and very large luxury vehicles from model years 1997 through 2013 were selected for this study, as many of the vehicles in this segment incorporate extensive use of aluminum in their construction. A vehicle's age was calculated as the difference between the calendar year and model year. Many manufacturers release new models in the calendar year prior to the vehicle's model year. For example, a vehicle's 2008 model year may be released during the 2007 calendar year. For the purposes of this analysis, such a vehicle is considered to have an age of -1 in calendar year 2007, 0 in calendar year 2008, 1 in calendar year 2009, etc. In order to maintain a consistent distribution of vehicle ages across calendar years, the analysis was restricted to vehicles aged -1 to 2 years old. Data were also collected on engine

horsepower, vehicle weight, and manufacturer's suggested retail price for each vehicle variant. Horsepower per 100 pounds (power-to-weight ratio) was calculated and studied as a continuous variable. Vehicle prices were grouped in $5,000 ranges beginning with vehicles priced less than $40,000 and ending with vehicles priced more than $100,000.

Analysis methods

Regression analysis was used to quantify the effect of aluminum on claim severity (average loss payment per claim) while controlling for other covariates. Covariates included demographic and vehicle factors. Demographic factors included calendar year, garaging state, vehicle density (number of registered vehicles per square mile), rated driver age group, rated driver gender, rated driver marital status, deductible range, and risk. Vehicle factors may include the vehicle age, base price band, wheelbase (long or short), drive type (4WD or 2WD), high performance variant (Mercedes-Benz AMG, Audi S8, Jaguar VDP, etc.), aspiration (regular, turbocharger, or supercharger), and power-to-weight ratio.

Since for a total loss claim the payment amount does not necessarily reflect the cost of repairs, separate analyses were conducted for all collision claim severity and repairable claim severity. Claim severity was modeled using a Gamma distribution with a logarithmic link function. Logistic regression was used to estimate the odds ratio of a claim being a total loss.

For space reasons, full regression results are found in the **Appendix**. To further simplify the presentation here, the exponent of the parameter estimate was calculated, 1 was subtracted, and the result multiplied by 100. The resulting number corresponds to the effect of the feature on that loss measure. For example, the parameter estimate for high aluminum content vehicles was 0.180; thus, collision claim severity for vehicles with high aluminum content is expected to be 20 percent higher than for vehicles with low aluminum content ((exp(0.180) -1)*100 = 20).

Results

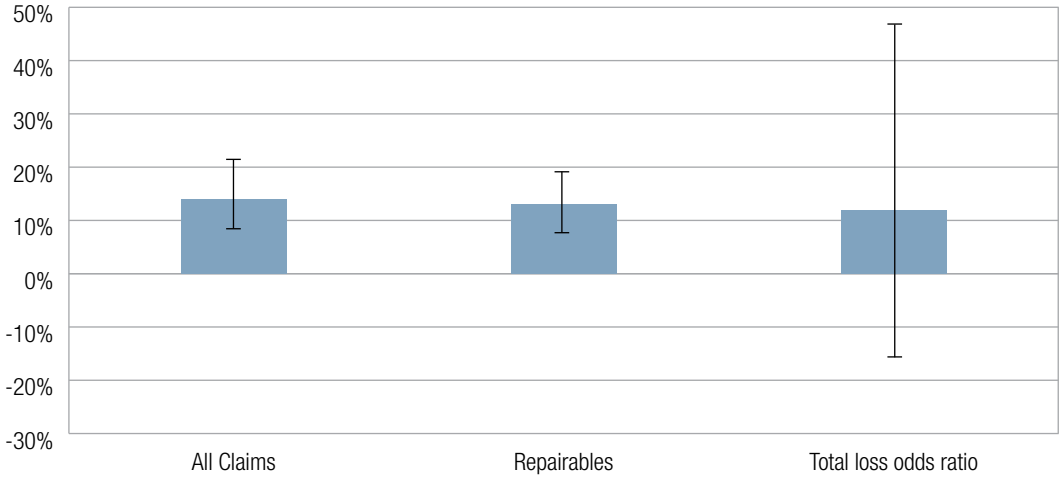
Three separate analyses were conducted in order to estimate the effect of aluminum on repair costs as measured by claim severity. The first analysis compared the Audi A8 with the BMW 7 series and Mercedes-Benz S class for model years 1997-2013. This analysis is based on 932,939 years of exposure and 67,756 collision claims. The Audi A8 was the first mass-market car with a weight saving aluminum chassis (Ulrich, 2010). Claim severities for the A8 were compared with severities for the BMW 7 series and Mercedes-Benz S class. While the 7 series and S class incorporate aluminum components into their design, unlike the A8 their chassis are still constructed out of steel. In order to account for changes to a vehicle after a redesign, vehicles were categorized by their redesign generation as shown in **Table 1**. The redesign generation was included as an additional covariate in the regression analysis.

Table 1: Model years by redesign generation

	1	2	3
Audi A8	1997–2003	2004–2010	2011–2013
BMW 7	1997–2001	2002–2008	2009–2013
Mercedes-Benz S-Class	1997–1999	2000–2006	2007–2013

Figure 1 shows the results of the regression analysis on collision claim severities. The black bars correspond to the 95 percent confidence intervals. The aluminum chassis Audi A8 is associated with 14 percent higher overall claim severities compared with its steel chassis counterparts. For repairable claims, claim severity for the Audi A8 was 13 percent higher than the comparison vehicles. Both results are statistically significant. While not statistically significant, the odds of a collision claim for the Audi A8 being a total loss was 1.12 times higher than for the BMW 7 series and Mercedes-Benz S class. In general, at low percentages (less than 10 percent), the odds ratio is a reasonable approximation of the risk ratio. Salvage rates for these vehicles were all below 10 percent. Full regression results for the all claim severity are located in the Appendix.

Figure 1: Estimated effect on collision claim severity and total loss odds ratio for aluminum Audi A8 compared with steel chassis counterparts

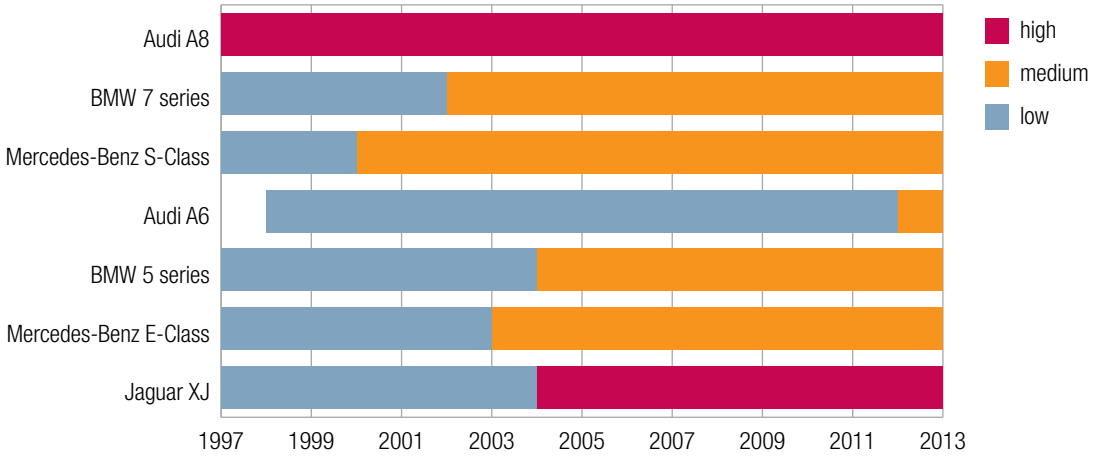


The second analysis included other large luxury sedans such as the Audi A6, BMW 5 series, Mercedes-Benz E class, and Jaguar XJ for model years 1997–2013. It also examined different levels of aluminum use. This analysis included 3,735,821 years of exposure and 281,093 claims. Similar to the Audi A8, the Jaguar XJ was redesigned for model year 2004 to incorporate a weight saving aluminum chassis (Jensen, 2003). The aluminum content of the other vehicles also changed across the model years examined. In order to control for this, vehicles were categorized by their aluminum content by model year according to the following definitions:

- Low — Only a few components are made with aluminum such as engine block, hood, or fenders.
- Medium — Significant use of aluminum in body or chassis such as roof, rails, suspension, doors, etc.
- High — Almost all of body and/or chassis is constructed out of aluminum.

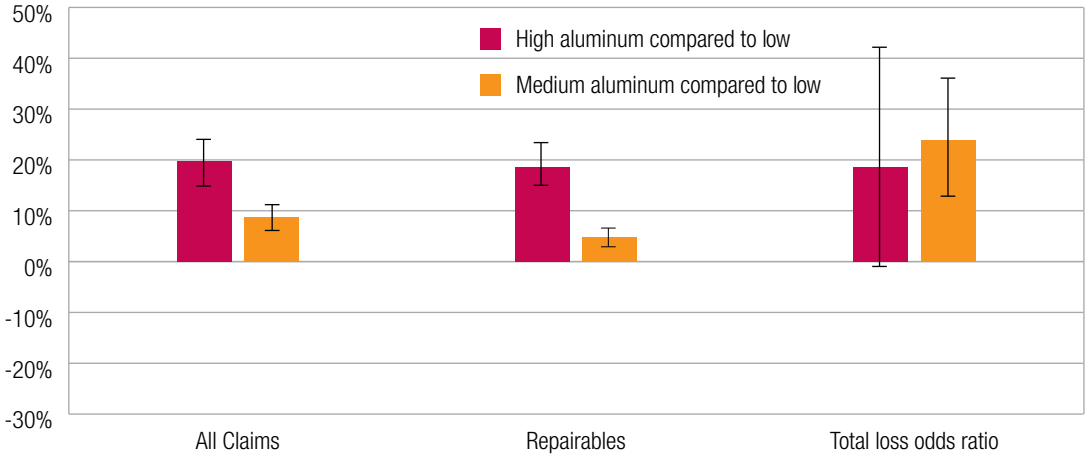
Figure 2 shows the result of this categorization. Sources used in making these determinations are included in the Reference section.

Figure 2: Aluminum content of large and very large European luxury sedans



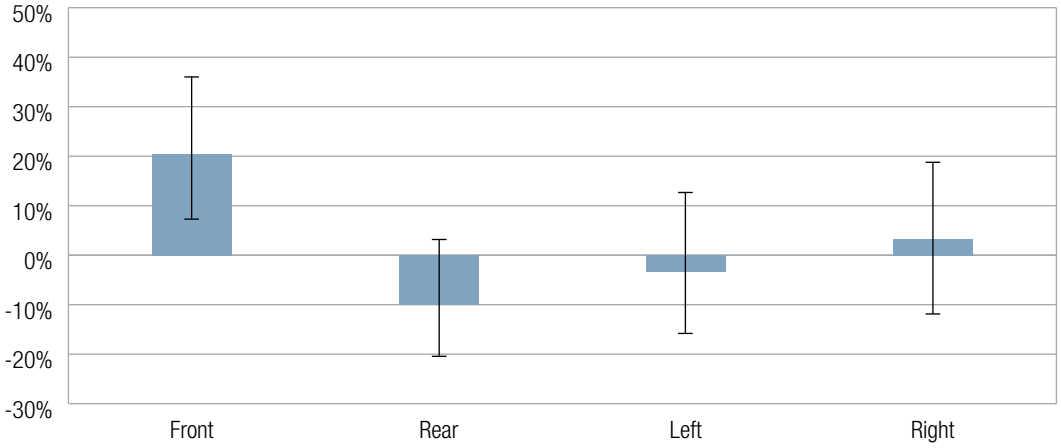
Since multiple vehicles of the same make but different sizes (large and very large) are incorporated in this analysis, the vehicle make and size were included as covariates in the regression. Figure 3 shows that the claim severity for vehicles with a high aluminum content was 20 percent higher than for vehicles with low aluminum content. Severity for vehicles with medium aluminum content was 9 percent higher. Similarly, for repairable claims, collision severity was 19 percent higher for high aluminum content vehicles and 5 percent higher for medium aluminum content vehicles. These results were statistically significant. In addition, although not statistically significant, the odds of a collision claim for high aluminum content vehicles being a total loss was 1.19 times higher than for low aluminum content vehicles. The odds for medium aluminum content vehicles was 1.24 times higher than low aluminum content vehicles and statistically significant.

Figure 3: Estimated effect on collision claim severity and total loss odds ratio by aluminum content



The final analysis examined the BMW 5 series, which was redesigned in 2004 so that the front of the vehicle from the cowl forward was all aluminum, while the rest of the structure remained steel (I-Car, 2003). Collision claim severities for this generation of 5 series (model years 2004–2010) were compared with the prior generation (model years 1997–2003) by point of impact. Only repairable claims with available point of impact information corresponding to a front, rear, right, or left side impact were included in this analysis. This included 821,790 years of exposure and 27,953 claims. The point of impact and the interaction between point of impact and model generation were included as factors in the regression in order to determine the effect on severity of the model generation by point of impact. Figure 4 shows the regression results. Severity for front collisions for the latest design with an aluminum front was 20 percent higher than for its predecessor and this result was statistically significant. Rear collisions showed a 10 percent decrease in severity but this result was not statistically significant. Differences in severity for right and left collisions were also not statistically significant.

Figure 4: Estimated effect on collision claim severity by point of impact for BMW 5 Series 2004-2010 model years compared with 1997-2003 model years



Discussion

The results of the three analyses indicate that aluminum intensive vehicles are associated with higher collision claim severities than their steel counterparts. In addition, the higher the aluminum content in the vehicle, the higher the associated severity increase. While the increased use of aluminum was a consistent factor across the analyses, there are other possible reasons for the severity increase. When comparing the Audi A8 with the BMW 7 series and Mercedes-Benz S class, other differences between these vehicles may also have contributed to the observed higher severity for the A8. In the analysis examining different levels of aluminum content it is also possible that other changes coincident with the change in aluminum content may have contributed as well. Often new and expensive technology is added during a redesign that, if damaged, could be expensive to repair. Including the base price of the vehicle as a factor in the regression helps to control for some of those differences.

In addition, the introduction of a mass-market, high-selling vehicle such as the Ford F-150 could change the dynamics of the auto repair market for aluminum. As more repair shops become equipped and receive training to handle aluminum, the increased volume could drive costs down. In addition, Ford has stated that they plan to incorporate modular designs to facilitate replacement of damaged parts which may save on labor costs (Henkel, 2014). Future research is needed to determine how the introduction of an aluminum F-150 affects the repair market.

Appendix A: Regression results - collision claim severity for aluminum Audi A8 versus steel counterparts									
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Intercept		1	10.1309		0.2472	9.6464	10.6154	1679.60	<0.0001
Calendar year	1996	1	-0.3273	-28%	0.1502	-0.6216	-0.0330	4.75	0.0293
	1997	1	-0.3212	-27%	0.0674	-0.4534	-0.1890	22.69	<0.0001
	1998	1	-0.1827	-17%	0.0577	-0.2958	-0.0695	10.01	0.0016
	1999	1	-0.2808	-24%	0.0525	-0.3837	-0.1780	28.66	<0.0001
	2000	1	-0.2182	-20%	0.0485	-0.3133	-0.1232	20.27	<0.0001
	2001	1	-0.2342	-21%	0.0463	-0.3250	-0.1434	25.54	<0.0001
	2002	1	-0.1926	-18%	0.0444	-0.2796	-0.1056	18.83	<0.0001
	2003	1	-0.1067	-10%	0.0449	-0.1946	-0.0188	5.66	0.0174
	2004	1	-0.1529	-14%	0.0446	-0.2403	-0.0656	11.77	0.0006
	2005	1	-0.1042	-10%	0.0441	-0.1905	-0.0178	5.59	0.0181
	2006	1	-0.1080	-10%	0.0425	-0.1912	-0.0248	6.47	0.0110
	2007	1	-0.1231	-12%	0.0392	-0.1999	-0.0463	9.88	0.0017
	2008	1	-0.1461	-14%	0.0373	-0.2191	-0.0731	15.39	<0.0001
	2009	1	-0.1184	-11%	0.0356	-0.1882	-0.0486	11.04	0.0009
	2010	1	-0.0610	-6%	0.0352	-0.1300	0.0080	3.00	0.0831
	2011	1	-0.1194	-11%	0.0327	-0.1836	-0.0552	13.30	0.0003
	2012	1	-0.0445	-4%	0.0303	-0.1038	0.0149	2.15	0.1423
	2013	0	0	0	0	0	0		
Rated driver age	< 25	1	0.0304	3%	0.0424	-0.0527	0.1135	0.51	0.4732
	25–65	1	-0.0667	-6%	0.0287	-0.1229	-0.0104	5.40	0.0202
	> 65	1	-0.1711	-16%	0.0311	-0.2322	-0.1101	30.21	<0.0001
	Unknown	0	0	0	0	0	0		
Gender	Female	1	0.1134	12%	0.0213	0.0717	0.1552	28.40	<0.0001
	Male	1	0.1378	15%	0.0209	0.0969	0.1788	43.56	<0.0001
	Unknown	0	0	0	0	0	0		
Marital	Married	1	-0.0611	-6%	0.0206	-0.1015	-0.0207	8.79	0.0030
	Single	1	0.0289	3%	0.0218	-0.0138	0.0717	1.76	0.1845
	Unknown	0	0	0	0	0	0		
State	Alabama	1	-0.5872	-44%	0.2219	-1.0222	-0.1522	7.00	0.0081
	Arizona	1	-0.4571	-37%	0.2188	-0.8858	-0.0283	4.36	0.0367
	Arkansas	1	-0.3460	-29%	0.2400	-0.8163	0.1243	2.08	0.1494
	California	1	-0.4150	-34%	0.2157	-0.8378	0.0078	3.70	0.0544
	Colorado	1	-0.5890	-45%	0.2201	-1.0204	-0.1576	7.16	0.0074
	Connecticut	1	-0.4716	-38%	0.2182	-0.8994	-0.0439	4.67	0.0307
	Delaware	1	-0.7838	-54%	0.2330	-1.2406	-0.3271	11.31	0.0008
	Dist of Columbia	1	-1.1689	-69%	0.2317	-1.6231	-0.7147	25.45	<0.0001
	Florida	1	-0.4560	-37%	0.2159	-0.8792	-0.0328	4.46	0.0347
	Georgia	1	-0.2908	-25%	0.2176	-0.7172	0.1357	1.79	0.1814
	Hawaii	1	-0.9874	-63%	0.2380	-1.4538	-0.5209	17.21	<0.0001
	Idaho	1	-0.1245	-12%	0.3188	-0.7493	0.5004	0.15	0.6962
	Illinois	1	-0.5403	-42%	0.2163	-0.9643	-0.1163	6.24	0.0125
	Indiana	1	-0.4784	-38%	0.2235	-0.9164	-0.0404	4.58	0.0323
	Iowa	1	-0.3115	-27%	0.2687	-0.8381	0.2151	1.34	0.2462

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Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
	Kansas	1	-0.3611	-30%	0.2341	-0.8199	0.0978	2.38	0.1230
	Kentucky	1	-0.2290	-20%	0.2337	-0.6870	0.2290	0.96	0.3270
	Louisiana	1	-0.4267	-35%	0.2192	-0.8564	0.0030	3.79	0.0516
	Maine	1	-0.9110	-60%	0.2952	-1.4895	-0.3324	9.52	0.0020
	Maryland	1	-0.5103	-40%	0.2177	-0.9369	-0.0837	5.50	0.0190
	Massachusetts	1	-0.6460	-48%	0.2195	-1.0762	-0.2157	8.66	0.0033
	Michigan	1	-0.6343	-47%	0.2180	-1.0615	-0.2071	8.47	0.0036
	Minnesota	1	-0.6697	-49%	0.2234	-1.1076	-0.2319	8.99	0.0027
	Mississippi	1	-0.3523	-30%	0.2293	-0.8017	0.0971	2.36	0.1244
	Missouri	1	-0.5269	-41%	0.2218	-0.9617	-0.0921	5.64	0.0175
	Montana	1	-0.8791	-58%	0.3171	-1.5006	-0.2575	7.68	0.0056
	Nebraska	1	-0.1699	-16%	0.2642	-0.6878	0.3479	0.41	0.5201
	Nevada	1	-0.3378	-29%	0.2185	-0.7659	0.0904	2.39	0.1221
	New Hampshire	1	-0.7002	-50%	0.2397	-1.1699	-0.2304	8.53	0.0035
	New Jersey	1	-0.3971	-33%	0.2164	-0.8212	0.0270	3.37	0.0665
	New Mexico	1	-0.5513	-42%	0.2555	-1.0520	-0.0505	4.66	0.0309
	New York	1	-0.3851	-32%	0.2159	-0.8082	0.0380	3.18	0.0744
	North Carolina	1	-0.4344	-35%	0.2194	-0.8645	-0.0044	3.92	0.0477
	North Dakota	1	-0.8587	-58%	0.4808	-1.8010	0.0837	3.19	0.0741
	Ohio	1	-0.6552	-48%	0.2191	-1.0846	-0.2259	8.95	0.0028
	Oklahoma	1	-0.5866	-44%	0.2286	-1.0346	-0.1386	6.59	0.0103
	Oregon	1	-0.2020	-18%	0.2264	-0.6457	0.2417	0.80	0.3722
	Pennsylvania	1	-0.4004	-33%	0.2167	-0.8251	0.0244	3.41	0.0647
	Rhode Island	1	-0.3605	-30%	0.2387	-0.8284	0.1073	2.28	0.1309
	South Carolina	1	-0.4722	-38%	0.2231	-0.9095	-0.0350	4.48	0.0343
	South Dakota	1	-0.9023	-59%	0.3435	-1.5756	-0.2290	6.90	0.0086
	Tennessee	1	-0.5033	-40%	0.2213	-0.9371	-0.0695	5.17	0.0230
	Texas	1	-0.3498	-30%	0.2163	-0.7737	0.0741	2.62	0.1058
	Utah	1	-0.1512	-14%	0.2369	-0.6155	0.3131	0.41	0.5233
	Vermont	1	-1.1798	-69%	0.2957	-1.7593	-0.6004	15.92	<0.0001
	Virginia	1	-0.6680	-49%	0.2177	-1.0946	-0.2414	9.42	0.0021
	Washington	1	-0.3502	-30%	0.2211	-0.7835	0.0831	2.51	0.1132
	West Virginia	1	-1.1573	-69%	0.2569	-1.6609	-0.6538	20.29	<0.0001
	Wisconsin	1	-0.5793	-44%	0.2275	-1.0253	-0.1334	6.48	0.0109
	Wyoming	1	-0.7592	-53%	0.4019	-1.5469	0.0284	3.57	0.0589
	Alaska	0	0	0	0	0	0		
Density	< 50	1	0.0406	4%	0.0457	-0.0489	0.1301	0.79	0.3736
	50–99	1	0.0054	1%	0.0288	-0.0510	0.0617	0.03	0.8524
	100–249	1	-0.0108	-1%	0.0201	-0.0502	0.0287	0.29	0.5923
	250–499	1	-0.0237	-2%	0.0185	-0.0599	0.0126	1.64	0.2006
	500–999	1	0.0002	0%	0.0148	-0.0287	0.0292	0	0.9886
	> 999	0	0	0	0	0	0		
Risk	Non-standard	1	0.0834	9%	0.0172	0.0496	0.1172	23.38	<0.0001
	Standard	0	0	0	0	0	0		

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Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Deductible Range	0	1	-0.3036	-26%	0.0737	-0.4480	-0.1592	16.99	<0.0001
	1–50	1	-1.0379	-65%	0.1009	-1.2357	-0.8401	105.78	<0.0001
	51–100	1	-0.4930	-39%	0.0515	-0.5940	-0.3920	91.59	<0.0001
	101–200	1	-0.7274	-52%	0.0570	-0.8391	-0.6157	162.99	<0.0001
	201–250	1	-0.6783	-49%	0.0497	-0.7757	-0.5809	186.30	<0.0001
	251–500	1	-0.4639	-37%	0.0479	-0.5578	-0.3700	93.79	<0.0001
	501–1000	1	-0.2376	-21%	0.0482	-0.3321	-0.1431	24.30	<0.0001
	> 1000	0	0	0	0	0	0		
Vehicle age	-1	1	0.1433	15%	0.0312	0.0823	0.2044	21.17	<0.0001
	0	1	0.0282	3%	0.0141	0.0007	0.0558	4.02	0.0448
	1	1	0.0080	1%	0.0118	-0.0152	0.0311	0.45	0.5002
	2	0	0	0	0	0	0		
Wheelbase	Long	1	0.0127	1%	0.0154	-0.0174	0.0429	0.69	0.4078
	Short	0	0	0	0	0	0		
Aspiration	Super Charged	1	0.0204	2%	0.0574	-0.0920	0.1329	0.13	0.7216
	Turbo Charged	1	-0.0562	-5%	0.0248	-0.1047	-0.0076	5.14	0.0234
	Regular	0	0	0	0	0	0		
DriveType	2WD	1	-0.0183	-2%	0.0207	-0.059	0.0223	0.78	0.3764
	4WD	0	0	0	0	0	0		
High performance variant	No	1	-0.0279	-3%	0.0444	-0.1150	0.0592	0.39	0.5307
	Yes	0	0	0	0	0	0		
Redesign generation	1	1	-0.0639	-6%	0.0368	-0.1360	0.0081	3.03	0.0819
	2	1	0.0224	2%	0.0269	-0.0302	0.0751	0.70	0.4038
	3	0	0	0	0	0	0		
Price band	55,000–59,999	1	-1.6926	-82%	0.3565	-2.3914	-0.9939	22.54	<0.0001
	60,000–64,999	1	-0.4852	-38%	0.0538	-0.5907	-0.3797	81.27	<0.0001
	65,000–69,999	1	-0.5647	-43%	0.0477	-0.6582	-0.4712	140.21	<0.0001
	70,000–74,999	1	-0.4784	-38%	0.0447	-0.5660	-0.3908	114.61	<0.0001
	75,000–79,999	1	-0.4175	-34%	0.0442	-0.5041	-0.3310	89.37	<0.0001
	80,000–84,999	1	-0.3347	-28%	0.0447	-0.4223	-0.2471	56.08	<0.0001
	85,000–89,999	1	-0.2661	-23%	0.0414	-0.3473	-0.1849	41.27	<0.0001
	90,000–94,999	1	-0.3601	-30%	0.0438	-0.4459	-0.2742	67.57	<0.0001
	95,000–99,999	1	-0.1828	-17%	0.0480	-0.2768	-0.0888	14.53	0.0001
	≥ 100,000	0	0	0	0	0	0		
Power to weight ratio		1	0.0163	2%	0.0090	-0.0014	0.0340	3.26	0.0708
Chassis	Aluminum	1	0.1321	14%	0.0284	0.0763	0.1878	21.57	<0.0001
	Steel	0	0	0	0	0	0		

Appendix B: Regression results - collision claim severity by aluminum content									
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Intercept		1	9.4554		0.1087	9.2424	9.6683	7571.35	<0.0001
Calendar year	1996	1	-0.1953	-18%	0.0733	-0.3390	-0.0516	7.10	0.0077
	1997	1	-0.2185	-20%	0.0274	-0.2721	-0.1649	63.76	<0.0001
	1998	1	-0.1984	-18%	0.0212	-0.2399	-0.1569	87.81	<0.0001
	1999	1	-0.2368	-21%	0.0184	-0.2730	-0.2007	164.87	<0.0001
	2000	1	-0.1757	-16%	0.0173	-0.2096	-0.1417	102.98	<0.0001
	2001	1	-0.2196	-20%	0.0164	-0.2518	-0.1873	178.22	<0.0001
	2002	1	-0.1479	-14%	0.0159	-0.1791	-0.1166	86.12	<0.0001
	2003	1	-0.0947	-9%	0.0157	-0.1254	-0.0640	36.54	<0.0001
	2004	1	-0.0519	-5%	0.0149	-0.0812	-0.0227	12.13	0.0005
	2005	1	-0.0248	-2%	0.0140	-0.0522	0.0025	3.16	0.0752
	2006	1	-0.0526	-5%	0.0135	-0.0791	-0.0261	15.17	<0.0001
	2007	1	-0.0319	-3%	0.0130	-0.0575	-0.0064	6.02	0.0141
	2008	1	-0.0606	-6%	0.0126	-0.0853	-0.0359	23.12	<0.0001
	2009	1	-0.0306	-3%	0.0128	-0.0558	-0.0055	5.72	0.0168
	2010	1	-0.0091	-1%	0.0130	-0.0346	0.0163	0.49	0.482
	2011	1	-0.0536	-5%	0.0132	-0.0794	-0.0278	16.61	<0.0001
	2012	1	-0.0217	-2%	0.0123	-0.0459	0.0024	3.11	0.0777
	2013	0	0	0	0	0	0		
Rated driver age	< 25	1	0.0878	9%	0.0209	0.0468	0.1288	17.59	<0.0001
	25–65	1	-0.0548	-5%	0.0153	-0.0848	-0.0248	12.83	0.0003
	> 65	1	-0.1271	-12%	0.0164	-0.1593	-0.0949	59.85	<0.0001
	Unknown	0	0	0	0	0	0		
Gender	Female	1	0.0752	8%	0.0108	0.0540	0.0964	48.17	<0.0001
	Male	1	0.1131	12%	0.0109	0.0918	0.1345	107.78	<0.0001
	Unknown	0	0	0	0	0	0		
Marital	Married	1	-0.0755	-7%	0.0107	-0.0964	-0.0546	50.03	<0.0001
	Single	1	0.0211	2%	0.0110	-0.0005	0.0426	3.67	0.0555
	Unknown	0	0	0	0	0	0		
State	Alabama	1	-0.1078	-10%	0.0903	-0.2848	0.0691	1.43	0.2323
	Arizona	1	0.0021	0%	0.0885	-0.1714	0.1757	0.00	0.9809
	Arkansas	1	-0.0430	-4%	0.0994	-0.2378	0.1517	0.19	0.6649
	California	1	-0.0991	-9%	0.0867	-0.2689	0.0708	1.31	0.253
	Colorado	1	-0.2337	-21%	0.0885	-0.4072	-0.0601	6.97	0.0083
	Connecticut	1	-0.1257	-12%	0.0879	-0.2979	0.0464	2.05	0.1523
	Delaware	1	-0.3584	-30%	0.0959	-0.5464	-0.1704	13.96	0.0002
	Dist of Columbia	1	-0.4571	-37%	0.0932	-0.6396	-0.2745	24.07	<0.0001
	Florida	1	-0.1096	-10%	0.0868	-0.2797	0.0605	1.59	0.2066
	Georgia	1	-0.0012	0%	0.0877	-0.1730	0.1707	0.00	0.9894
	Hawaii	1	-0.4794	-38%	0.0942	-0.6640	-0.2948	25.91	<0.0001
	Idaho	1	-0.1256	-12%	0.1284	-0.3773	0.1261	0.96	0.3281
	Illinois	1	-0.2367	-21%	0.0870	-0.4073	-0.0662	7.40	0.0065
	Indiana	1	-0.1181	-11%	0.0913	-0.2970	0.0608	1.67	0.1957
	Iowa	1	-0.4106	-34%	0.1054	-0.6171	-0.2041	15.19	<0.0001

Appendix B: Regression results - collision claim severity by aluminum content									
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
	Kansas	1	-0.0314	-3%	0.0962	-0.2199	0.1571	0.11	0.7439
	Kentucky	1	-0.0878	-8%	0.0957	-0.2754	0.0997	0.84	0.3585
	Louisiana	1	-0.1432	-13%	0.0889	-0.3173	0.0310	2.60	0.1071
	Maine	1	-0.4745	-38%	0.1201	-0.7099	-0.2392	15.62	<0.0001
	Maryland	1	-0.2219	-20%	0.0875	-0.3935	-0.0504	6.43	0.0112
	Massachusetts	1	-0.3602	-30%	0.0881	-0.5329	-0.1875	16.71	<0.0001
	Michigan	1	-0.3676	-31%	0.0878	-0.5397	-0.1956	17.54	<0.0001
	Minnesota	1	-0.3075	-26%	0.0900	-0.4840	-0.1310	11.66	0.0006
	Mississippi	1	0.0029	0%	0.0952	-0.1836	0.1894	0.00	0.9754
	Missouri	1	-0.2088	-19%	0.0903	-0.3857	-0.0319	5.35	0.0207
	Montana	1	0.0261	3%	0.1356	-0.2397	0.2919	0.04	0.8474
	Nebraska	1	-0.2111	-19%	0.1087	-0.4241	0.0020	3.77	0.0521
	Nevada	1	0.0381	4%	0.0891	-0.1366	0.2128	0.18	0.6689
	New Hampshire	1	-0.4119	-34%	0.0969	-0.6018	-0.2220	18.08	<0.0001
	New Jersey	1	-0.1099	-10%	0.0870	-0.2803	0.0606	1.60	0.2065
	New Mexico	1	-0.1998	-18%	0.1028	-0.4013	0.0017	3.78	0.0520
	New York	1	-0.0306	-3%	0.0867	-0.2005	0.1393	0.12	0.7242
	North Carolina	1	-0.1429	-13%	0.0887	-0.3168	0.0310	2.59	0.1073
	North Dakota	1	-0.1317	-12%	0.2063	-0.5362	0.2727	0.41	0.5232
	Ohio	1	-0.2669	-23%	0.0882	-0.4399	-0.0940	9.15	0.0025
	Oklahoma	1	-0.0697	-7%	0.0945	-0.2548	0.1154	0.54	0.4606
	Oregon	1	-0.1520	-14%	0.0917	-0.3317	0.0277	2.75	0.0974
	Pennsylvania	1	-0.1109	-10%	0.0871	-0.2816	0.0598	1.62	0.2029
	Rhode Island	1	-0.0981	-9%	0.0959	-0.2860	0.0898	1.05	0.3061
	South Carolina	1	-0.0896	-9%	0.0908	-0.2677	0.0885	0.97	0.3240
	South Dakota	1	-0.5601	-43%	0.1459	-0.8460	-0.2742	14.74	0.0001
	Tennessee	1	-0.1698	-16%	0.0899	-0.3461	0.0065	3.57	0.0590
	Texas	1	-0.0310	-3%	0.0870	-0.2016	0.1395	0.13	0.7212
	Utah	1	-0.0564	-5%	0.0968	-0.2461	0.1333	0.34	0.5598
	Vermont	1	-0.3798	-32%	0.1209	-0.6167	-0.1429	9.88	0.0017
	Virginia	1	-0.3630	-30%	0.0875	-0.5345	-0.1915	17.21	<0.0001
	Washington	1	-0.1564	-14%	0.0890	-0.3309	0.0182	3.08	0.0791
	West Virginia	1	-0.5851	-44%	0.1056	-0.7920	-0.3782	30.72	<0.0001
	Wisconsin	1	-0.2527	-22%	0.0926	-0.4343	-0.0712	7.45	0.0063
	Wyoming	1	-0.6371	-47%	0.1769	-0.9839	-0.2904	12.97	0.0003
	Alaska	0	0	0	0	0	0		
Density	< 50	1	0.0484	5%	0.0211	0.0070	0.0897	5.26	0.0218
	50–99	1	0.0049	0%	0.0137	-0.0219	0.0318	0.13	0.7185
	100–249	1	-0.0289	-3%	0.0097	-0.0478	-0.0099	8.90	0.0028
	250–499	1	-0.0295	-3%	0.0087	-0.0465	-0.0125	11.56	0.0007
	500–999	1	-0.0084	-1%	0.0071	-0.0223	0.0054	1.43	0.2316
	> 999	0	0	0	0	0	0		
Risk	Non-standard	1	0.0436	4%	0.0083	0.0273	0.0599	27.47	<0.0001
	Standard	0	0	0	0	0	0		

Appendix B: Regression results - collision claim severity by aluminum content									
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Deductible Range	0	1	-0.3552	-30%	0.0432	-0.4398	-0.2705	67.67	<0.0001
	1–50	1	-0.8929	-59%	0.0498	-0.9905	-0.7952	320.95	<0.0001
	51–100	1	-0.5263	-41%	0.0333	-0.5916	-0.4610	249.64	<0.0001
	101–200	1	-0.7185	-51%	0.0347	-0.7865	-0.6505	428.47	<0.0001
	201–250	1	-0.6918	-50%	0.0325	-0.7555	-0.6281	453.23	<0.0001
	251–500	1	-0.4572	-37%	0.0320	-0.5199	-0.3946	204.62	<0.0001
	501–1000	1	-0.2075	-19%	0.0322	-0.2705	-0.1444	41.56	<0.0001
	> 1000	0	0	0	0	0	0		
Vehicle age	-1	1	0.1101	12%	0.0157	0.0794	0.1408	49.36	<0.0001
	0	1	0.0471	5%	0.0062	0.0349	0.0592	57.77	<0.0001
	1	1	0.0155	2%	0.0056	0.0046	0.0264	7.73	0.0054
	2	0	0	0	0	0	0		
Wheelbase	Long	1	0.0192	2%	0.0123	-0.005	0.0433	2.42	0.1201
	Short	0	0	0	0	0	0		
Aspiration	Carburated	1	0.0368	4%	0.0286	-0.0192	0.0929	1.66	0.1975
	Super Charged	1	0.0746	8%	0.0176	0.0401	0.1091	17.98	<0.0001
	Turbo Charged	1	0.0328	3%	0.0090	0.0152	0.0505	13.28	0.0003
	Regular	0	0	0	0	0	0		
DriveType	2WD	1	0.0042	0%	0.0081	-0.0116	0.02	0.27	0.6025
	4WD	0	0	0	0	0	0		
High performance variant	No	1	-0.1308	-12%	0.0197	-0.1694	-0.0922	44.04	<0.0001
	Yes	0	0	0	0	0	0		
Make	Audi	1	-0.0054	-1%	0.0130	-0.0309	0.0201	0.17	0.6793
	Jaguar	1	0.0583	6%	0.0267	0.0059	0.1106	4.76	0.0291
	Mercedes-Benz	1	0.0075	1%	0.0068	-0.0058	0.0208	1.21	0.2706
	BMW	0	0	0	0	0	0		
Size	Large	1	0.0128	1%	0.0232	-0.0326	0.0582	0.31	0.5792
	Very large	0	0	0	0	0	0		
Price band	< 40,000	1	-0.5507	-42%	0.0562	-0.6608	-0.4406	96.15	<0.0001
	40,000–44,999	1	-0.5030	-40%	0.0542	-0.6092	-0.3968	86.24	<0.0001
	45,000–49,999	1	-0.4329	-35%	0.0512	-0.5333	-0.3326	71.50	<0.0001
	50,000–54,999	1	-0.3985	-33%	0.0483	-0.4931	-0.3038	68.11	<0.0001
	55,000–59,999	1	-0.3683	-31%	0.0469	-0.4602	-0.2763	61.66	<0.0001
	60,000–64,999	1	-0.3419	-29%	0.0418	-0.4239	-0.2600	66.83	<0.0001
	65,000–69,999	1	-0.3467	-29%	0.0372	-0.4196	-0.2737	86.77	<0.0001
	70,000–74,999	1	-0.2925	-25%	0.0346	-0.3603	-0.2247	71.50	<0.0001
	75,000–79,999	1	-0.2494	-22%	0.0339	-0.3158	-0.1830	54.22	<0.0001
	80,000–84,999	1	-0.1727	-16%	0.0343	-0.2400	-0.1054	25.29	<0.0001
	85,000–89,999	1	-0.1473	-14%	0.0320	-0.2100	-0.0845	21.17	<0.0001
	90,000–94,999	1	-0.2449	-22%	0.0334	-0.3104	-0.1793	53.64	<0.0001
	95,000–99,999	1	-0.0624	-6%	0.0372	-0.1352	0.0104	2.82	0.0931
	≥ 100,000	0	0	0	0	0	0		
Power to weight ratio		1	0.0341	3%	0.0042	0.0258	0.0423	65.66	<0.0001

Appendix B: Regression results - collision claim severity by aluminum content									
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Aluminum content	High	1	0.1806	20%	0.0193	0.1427	0.2185	87.27	<0.0001
	Medium	1	0.0839	9%	0.0099	0.0646	0.1033	72.04	<0.0001
	Low	0	0	0	0	0	0		

Appendix C: Regression results - collision claim severity by point of impact for BMW 5 Series 2004–2010 model years compared with 1997–2003 model years									
Parameter		Degrees of freedom	Estimate	Effect	Standard Error	Wald 95% Confidence Limits		Chi-Square	P-value
Intercept		1	8.3134		0.5432	7.2487	9.3782	234.19	<0.0001
Calendar year	1998	1	0.4875	63%	0.3280	-0.1553	1.1303	2.21	0.1372
	1999	1	-0.2470	-22%	0.1430	-0.5272	0.0332	2.99	0.084
	2000	1	0.0438	4%	0.1257	-0.2026	0.2903	0.12	0.7275
	2001	1	-0.2246	-20%	0.1078	-0.4359	-0.0133	4.34	0.0372
	2002	1	-0.1427	-13%	0.0974	-0.3335	0.0482	2.15	0.1429
	2003	1	-0.0258	-3%	0.0921	-0.2063	0.1547	0.08	0.7795
	2004	1	-0.0448	-4%	0.0848	-0.2111	0.1215	0.28	0.5974
	2005	1	0.0455	5%	0.0763	-0.1040	0.1950	0.36	0.5509
	2006	1	0.0158	2%	0.0635	-0.1087	0.1404	0.06	0.8033
	2007	1	0.0819	9%	0.0561	-0.0281	0.1918	2.13	0.1446
	2008	1	0.1110	12%	0.0480	0.0170	0.2050	5.36	0.0206
	2009	1	0.0708	7%	0.0433	-0.0142	0.1557	2.67	0.1025
	2010	1	0.0711	7%	0.0405	-0.0083	0.1504	3.08	0.0793
	2011	1	0.0695	7%	0.0453	-0.0192	0.1583	2.36	0.1245
	2012	0	0	0	0	0	0		
Rated driver age	< 25	1	0.0160	2%	0.0598	-0.1012	0.1332	0.07	0.7891
	25–65	1	-0.0225	-2%	0.0474	-0.1154	0.0704	0.23	0.6345
	> 65	1	-0.0728	-7%	0.0528	-0.1764	0.0307	1.90	0.168
	Unknown	0	0	0	0	0	0		
Gender	Female	1	0.0572	6%	0.0372	-0.0158	0.1301	2.36	0.1244
	Male	1	0.1257	13%	0.0374	0.0525	0.1990	11.32	0.0008
	Unknown	0	0	0	0	0	0		
Marital	Married	1	-0.0350	-3%	0.0363	-0.1060	0.0361	0.93	0.335
	Single	1	0.0142	1%	0.0364	-0.0571	0.0856	0.15	0.696
	Unknown	0	0	0	0	0	0		
State	Alabama	1	-0.1873	-17%	0.3420	-0.8575	0.4830	0.30	0.5839
	Arizona	1	0.1104	12%	0.3398	-0.5556	0.7763	0.11	0.7454
	Arkansas	1	-0.3144	-27%	0.3630	-1.0259	0.3970	0.75	0.3864
	California	1	-0.0566	-6%	0.3361	-0.7153	0.6022	0.03	0.8663
	Colorado	1	-0.3469	-29%	0.3429	-1.0191	0.3252	1.02	0.3117
	Connecticut	1	-0.1875	-17%	0.3388	-0.8516	0.4766	0.31	0.58
	Delaware	1	-0.2940	-25%	0.3520	-0.9839	0.3960	0.70	0.4037

Appendix C: Regression results - collision claim severity by point of impact for BMW 5 Series 2004–2010 model years compared with 1997–2003 model years									
Parameter		Degrees of freedom	Estimate	Effect	Standard Error	Wald 95% Confidence Limits		Chi-Square	P-value
	Dist of Columbia	1	-0.5080	-40%	0.3471	-1.1883	0.1722	2.14	0.1432
	Florida	1	-0.1459	-14%	0.3364	-0.8052	0.5134	0.19	0.6645
	Georgia	1	-0.1716	-16%	0.3380	-0.8341	0.4909	0.26	0.6116
	Hawaii	1	-0.2545	-22%	0.3475	-0.9355	0.4266	0.54	0.4640
	Idaho	1	-0.5390	-42%	0.3981	-1.3192	0.2413	1.83	0.1758
	Illinois	1	-0.2013	-18%	0.3375	-0.8628	0.4602	0.36	0.5508
	Indiana	1	-0.0730	-7%	0.3470	-0.7531	0.6070	0.04	0.8333
	Iowa	1	-0.1321	-12%	0.4392	-0.9928	0.7287	0.09	0.7636
	Kansas	1	-0.4671	-37%	0.3592	-1.1712	0.2370	1.69	0.1935
	Kentucky	1	-0.1830	-17%	0.3592	-0.8871	0.5211	0.26	0.6105
	Louisiana	1	-0.0987	-9%	0.3415	-0.7680	0.5706	0.08	0.7726
	Maine	1	-0.2806	-24%	0.4395	-1.1419	0.5807	0.41	0.5231
	Maryland	1	-0.2625	-23%	0.3375	-0.9239	0.3990	0.60	0.4368
	Massachusetts	1	-0.4553	-37%	0.3422	-1.1260	0.2155	1.77	0.1834
	Michigan	1	-0.1236	-12%	0.3401	-0.7902	0.5430	0.13	0.7163
	Minnesota	1	-0.3994	-33%	0.3442	-1.0739	0.2752	1.35	0.2459
	Mississippi	1	-0.2096	-19%	0.3542	-0.9039	0.4847	0.35	0.5540
	Missouri	1	-0.0724	-7%	0.3455	-0.7495	0.6048	0.04	0.8341
	Montana	1	0.0760	8%	0.6992	-1.2944	1.4464	0.01	0.9135
	Nebraska	1	-0.1879	-17%	0.3714	-0.9158	0.5400	0.26	0.6128
	Nevada	1	0.1387	15%	0.3416	-0.5308	0.8083	0.16	0.6847
	New Hampshire	1	-0.8192	-56%	0.3547	-1.5145	-0.1240	5.33	0.0209
	New Jersey	1	-0.1020	-10%	0.3369	-0.7622	0.5583	0.09	0.7621
	New Mexico	1	-0.0362	-4%	0.3625	-0.7467	0.6744	0.01	0.9206
	New York	1	0.0101	1%	0.3362	-0.6489	0.6691	0.00	0.9760
	North Carolina	1	-0.2460	-22%	0.3387	-0.9099	0.4179	0.53	0.4677
	North Dakota	1	-2.2170	-89%	1.1131	-4.3986	-0.0353	3.97	0.0464
	Ohio	1	-0.2204	-20%	0.3390	-0.8849	0.4440	0.42	0.5156
	Oklahoma	1	-0.3951	-33%	0.3580	-1.0969	0.3066	1.22	0.2698
	Oregon	1	-0.3232	-28%	0.3449	-0.9992	0.3528	0.88	0.3488
	Pennsylvania	1	-0.1166	-11%	0.3370	-0.7772	0.5440	0.12	0.7293
	Rhode Island	1	0.0432	4%	0.3537	-0.6501	0.7365	0.01	0.9028
	South Carolina	1	-0.1805	-17%	0.3441	-0.8550	0.4939	0.28	0.5998
	South Dakota	1	-1.2345	-71%	0.5511	-2.3146	-0.1543	5.02	0.0251
	Tennessee	1	-0.3256	-28%	0.3420	-0.9959	0.3447	0.91	0.3411
	Texas	1	-0.1778	-16%	0.3369	-0.8381	0.4824	0.28	0.5975
	Utah	1	-0.0818	-8%	0.3653	-0.7978	0.6342	0.05	0.8227
	Vermont	1	0.0393	4%	0.4278	-0.7991	0.8778	0.01	0.9267
	Virginia	1	-0.4714	-38%	0.3374	-1.1327	0.1900	1.95	0.1624
	Washington	1	-0.1833	-17%	0.3412	-0.8520	0.4854	0.29	0.5910
	West Virginia	1	-0.0914	-9%	0.3813	-0.8387	0.6558	0.06	0.8105
	Wisconsin	1	-0.2816	-25%	0.3573	-0.9820	0.4187	0.62	0.4306
	Wyoming	1	-0.3161	-27%	0.8229	-1.9289	1.2967	0.15	0.7009
	Alaska	0	0	0	0	0	0		

Appendix C: Regression results - collision claim severity by point of impact for BMW 5 Series 2004–2010 model years compared with 1997–2003 model years									
Parameter		Degrees of freedom	Estimate	Effect	Standard Error	Wald 95% Confidence Limits		Chi-Square	P-value
Density	< 50	1	-0.0330	-3%	0.0654	-0.1612	0.0952	0.25	0.6142
	50–99	1	-0.0830	-8%	0.0377	-0.1569	-0.0091	4.85	0.0276
	100–249	1	-0.1056	-10%	0.0268	-0.1582	-0.0531	15.53	<0.0001
	250–499	1	-0.0634	-6%	0.0249	-0.1121	-0.0146	6.49	0.0108
	500–999	1	0.0103	1%	0.0195	-0.0280	0.0486	0.28	0.5993
	> 999	0	0	0	0	0	0		
Risk	Non-standard	1	-0.0150	-1%	0.0186	-0.0515	0.0214	0.65	0.4189
	Standard	0	0	0	0	0	0		
Deductible Range	0	1	-0.2187	-20%	0.1661	-0.5442	0.1068	1.73	0.1879
	1–50	1	-0.4863	-39%	0.1609	-0.8016	-0.1711	9.14	0.0025
	51–100	1	-0.3579	-30%	0.1257	-0.6044	-0.1115	8.10	0.0044
	101–200	1	-0.5287	-41%	0.1282	-0.7800	-0.2774	17.00	<0.0001
	201–250	1	-0.4773	-38%	0.1229	-0.7181	-0.2364	15.08	0.0001
	251–500	1	-0.2614	-23%	0.1216	-0.4998	-0.0230	4.62	0.0316
	501–1000	1	-0.0146	-1%	0.1222	-0.2542	0.2250	0.01	0.9049
	> 1000	0	0	0	0	0	0		
Vehicle age	-1	1	0.1510	16%	0.0531	0.0470	0.2551	8.10	0.0044
	0	1	0.0918	10%	0.0243	0.0442	0.1394	14.28	0.0002
	1	1	0.0545	6%	0.0179	0.0195	0.0896	9.32	0.0023
	2	0	0	0	0	0	0		
Aspiration	Turbo Charged	1	0.1471	16%	0.1138	-0.0759	0.3702	1.67	0.196
	Regular	0	0	0%	0	0	0		
Series variant	525 I 4D	1	-0.1002	-10%	0.2245	-0.5402	0.3398	0.20	0.6554
	525 XI 4D 4WD	1	-0.1291	-12%	0.2316	-0.583	0.3248	0.31	0.5771
	528 I 4D 2WD	1	-0.0741	-7%	0.2208	-0.5068	0.3586	0.11	0.7371
	528 XI 4D 4WD	1	-0.0528	-5%	0.2318	-0.5072	0.4015	0.05	0.8197
	530 I 4D	1	-0.0842	-8%	0.2008	-0.4778	0.3094	0.18	0.6750
	530 XI 4D 4WD	1	0.1040	11%	0.1259	-0.1428	0.3507	0.68	0.4090
	535 I/535 IS 4D 2WD	1	-0.0210	-2%	0.0415	-0.1024	0.0603	0.26	0.6126
	535 XI 4D 4WD	0	0	0	0	0	0		
	540 I 4D	1	0.1512	16%	0.1115	-0.0673	0.3697	1.84	0.1750
	545 I 4D	1	0.2214	25%	0.0629	0.0981	0.3446	12.38	0.0004
	550 I 4D 2WD	0	0	0%	0	0	0		
Price band	< 40,000	1	0.1643	18%	0.2025	-0.2326	0.5611	0.66	0.4172
	40,000–44,999	1	0.1361	15%	0.1894	-0.2352	0.5073	0.52	0.4725
	45,000–49,999	1	0.0833	9%	0.1834	-0.2763	0.4428	0.21	0.6499
	50,000–54,999	1	-0.0763	-7%	0.0910	-0.2546	0.1020	0.70	0.4016
	55,000–59,999	1	-0.0387	-4%	0.0556	-0.1478	0.0704	0.48	0.4866
	60,000–64,999	0	0	0	0	0	0		

Appendix C: Regression results - collision claim severity by point of impact for BMW 5 Series 2004–2010 model years compared with 1997–2003 model years									
Parameter		Degrees of freedom	Estimate	Effect	Standard Error	Wald 95% Confidence Limits		Chi-Square	P-value
Power to weight ratio		1	0.0118	1%	0.0411	-0.0687	0.0924	0.08	0.7733
Impact location	Front	1	0.2500	28%	0.0511	0.1498	0.3502	23.92	<0.0001
	Left	1	-0.0052	-1%	0.0676	-0.1378	0.1273	0.01	0.9384
	Rear	1	-0.2505	-22%	0.0544	-0.3572	-0.1437	21.16	<0.0001
	Right	0	0	0	0	0	0		
Impact location: Generation	Front: New	1	0.1857	20%	0.0574	0.0732	0.2982	10.47	0.0012
	Front: Old	0	0	0	0	0	0		
	Left: New	1	-0.0342	-3%	0.0752	-0.1816	0.1133	0.21	0.6495
	Left: Old	0	0	0	0	0	0		
	Rear: New	1	-0.1054	-10%	0.0613	-0.2256	0.0148	2.96	0.0856
	Rear: Old	0	0	0	0	0	0		
	Right: New	1	0.0320	3%	0.0730	-0.1111	0.1751	0.19	0.6614
	Right: Old	0	0	0	0	0	0		

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