



# Essays in Energy Economics and Entrepreneurial Finance

## Citation

Howell, Sabrina T. 2015. Essays in Energy Economics and Entrepreneurial Finance. Doctoral dissertation, Harvard University, Graduate School of Arts & Sciences.

## Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:17467337>

## Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

## Share Your Story

The Harvard community has made this article openly available.  
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

Figure 5:

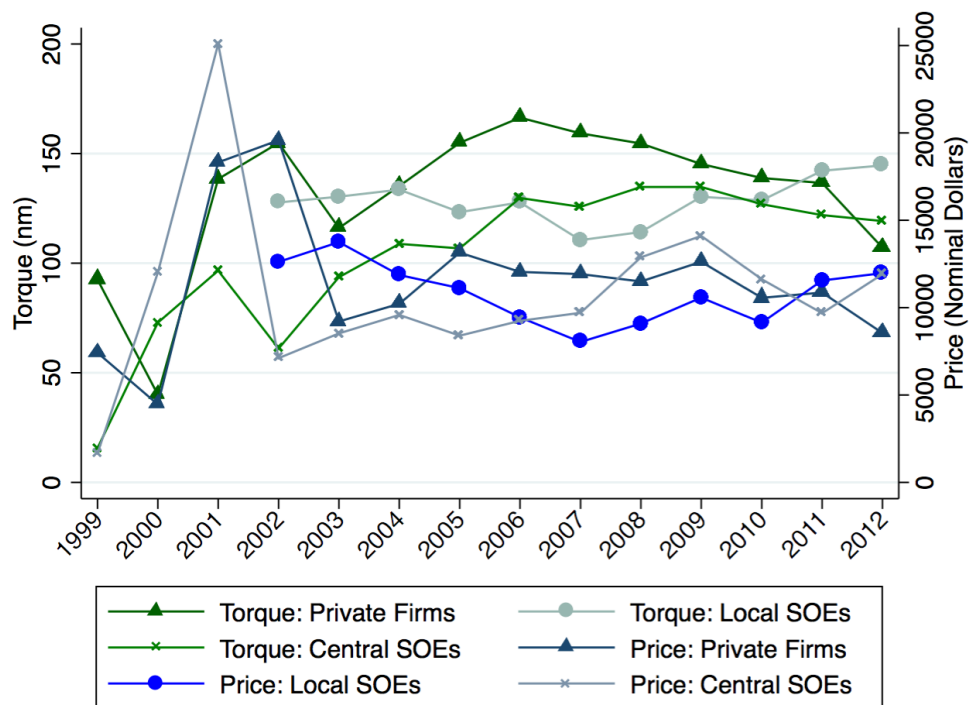
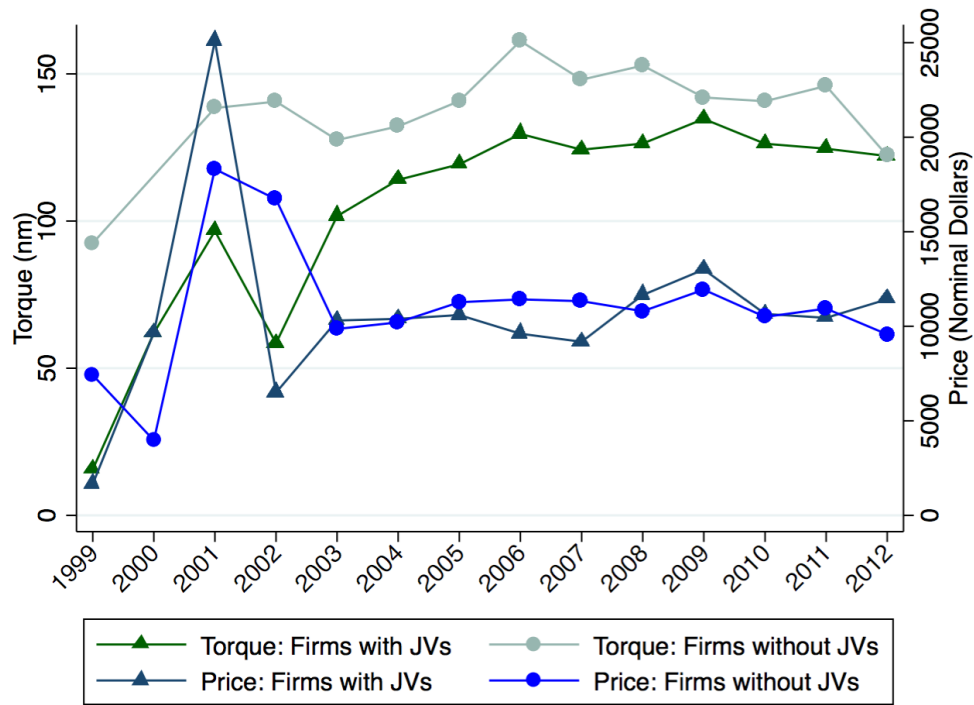


Figure 6: China LDV Exports, 1999-2012

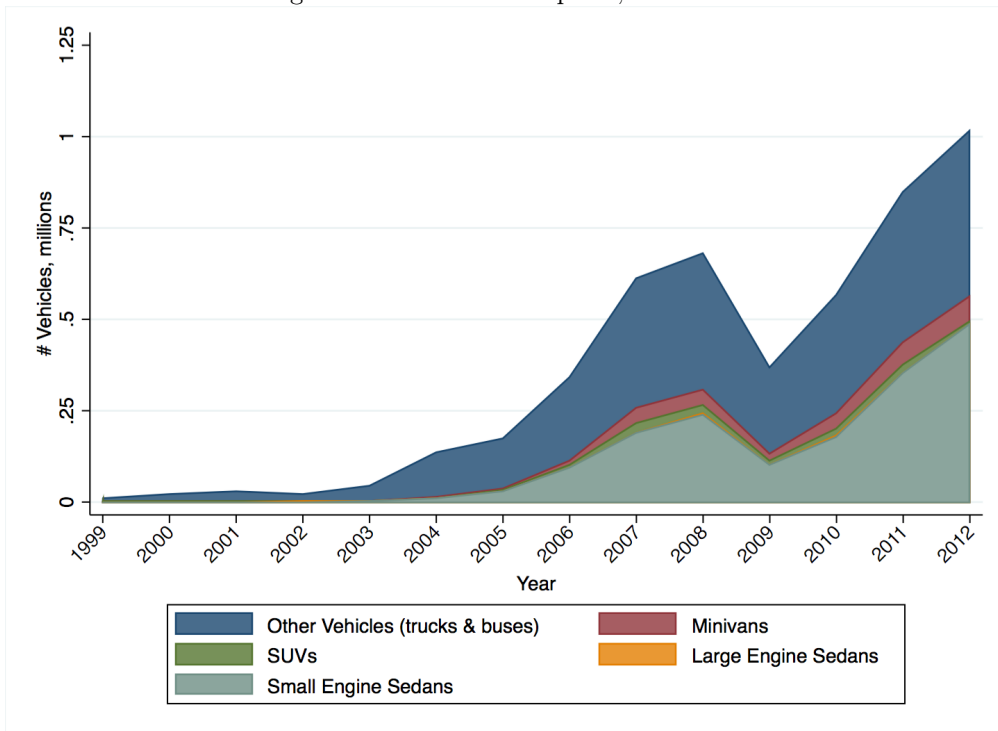
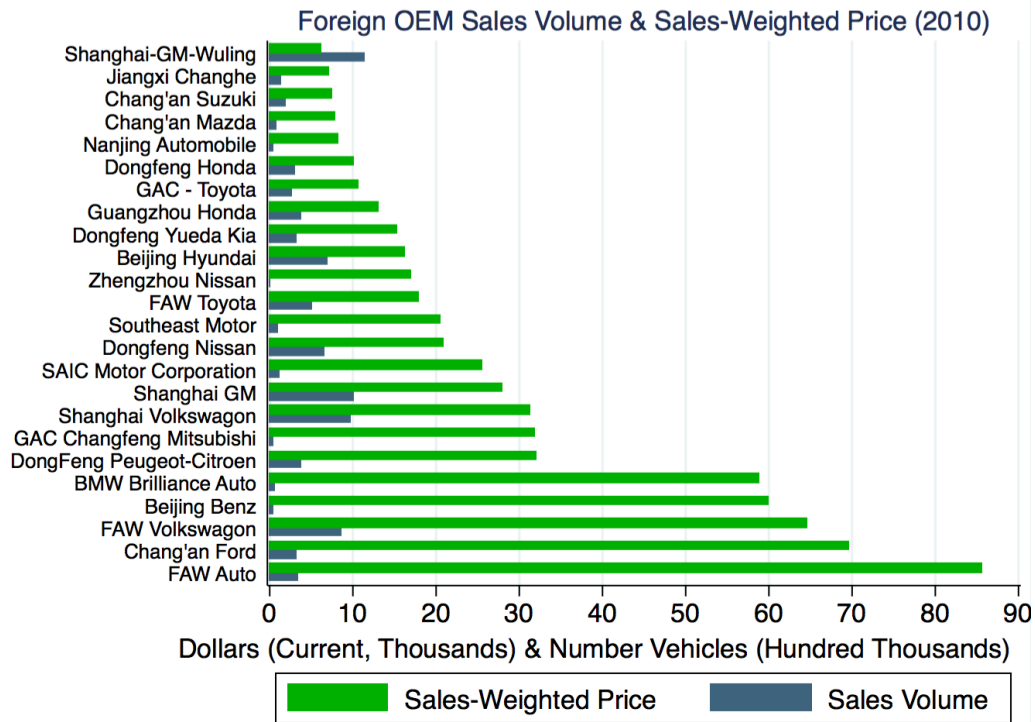
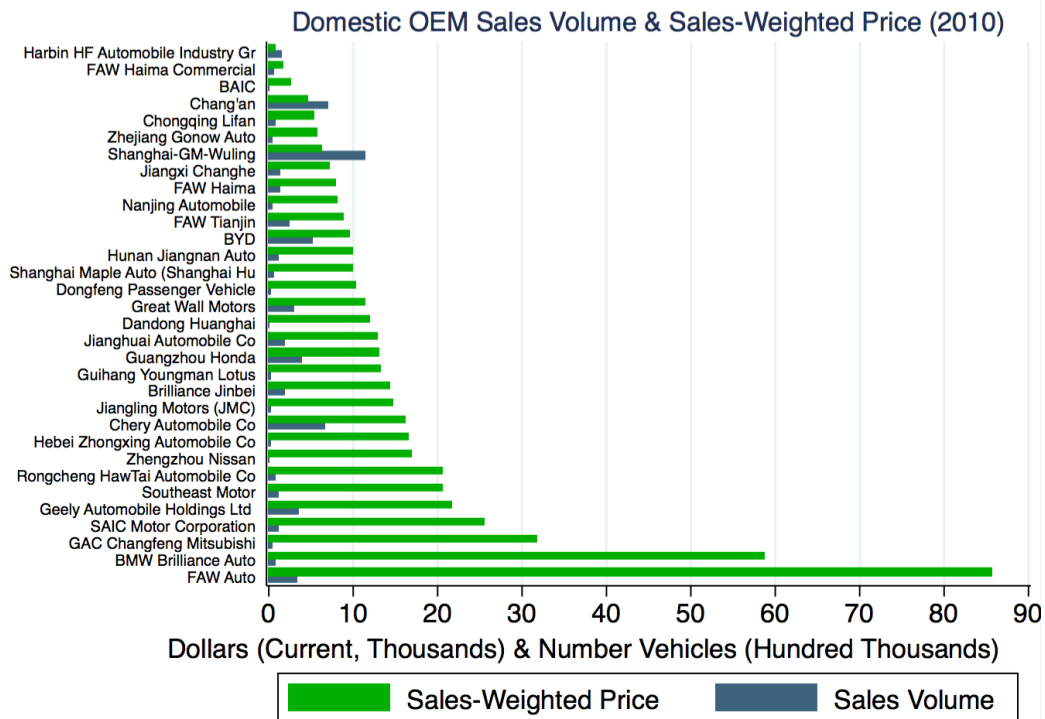


Figure 7:



Note: Only OEMs w/ sales>10,000 vehicles shown



Note: Only OEMs w/ sales>10,000 vehicles shown

Figure 8: Distribution of Sales by Weight Class

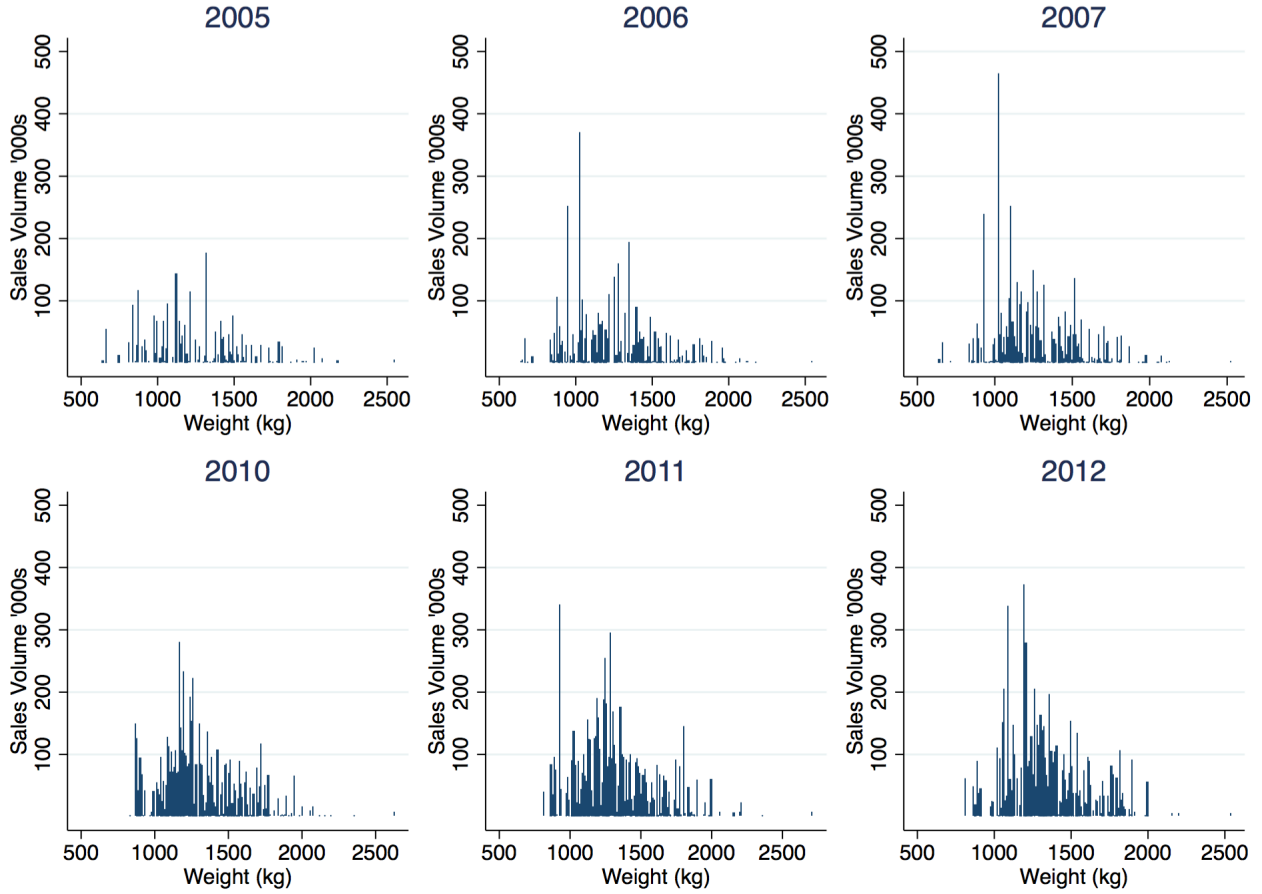


Table 1: China's Fuel Economy Standards (Phases I & II, in L/100 km) (Zhao et al. 2010)

Curb Mass (CM), kg	Phase I: 2005-06		Phase II: 2008-09	
	General	Special Structure	General	Special Structure
CM ≤ 750	7.2	7.6	6.2	6.6
750 < CM ≤ 865	7.2	7.6	6.5	6.9
865 < CM ≤ 980	7.7	8.2	7.0	7.4
980 < CM ≤ 1,090	8.3	8.8	7.5	8.0
1,090 < CM ≤ 1,205	8.9	9.4	8.1	8.6
1,205 < CM ≤ 1,320	9.5	10.1	8.6	9.1
1,320 < CM ≤ 1,430	10.1	10.7	9.2	9.8
1,430 < CM ≤ 1,540	10.7	11.3	9.7	10.3
1,540 < CM ≤ 1,660	11.3	12.0	10.2	10.8
1,660 < CM ≤ 1,770	11.9	12.6	10.7	11.3
1,770 < CM ≤ 1,880	12.4	13.1	11.1	11.8
1,880 < CM ≤ 2,000	12.8	13.6	11.5	12.2
2,000 < CM ≤ 2,110	13.2	14.0	11.9	12.6
2,110 < CM ≤ 2,280	13.7	14.5	12.3	13.0
2,280 < CM ≤ 2,510	14.6	15.5	13.1	13.9
2,510 < CM	15.5	16.4	13.9	14.7

Note: Special structure vehicles are either a) automatic transmission; b) 3 or more rows of seats c) are SUVs. General type vehicles are all other manual transmission passenger vehicles.

Table 2: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics Varying Model Sales Volume

Minimum Model Sales Volume:		>5000				>500			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)	
Policy-Domestic	<b>-19***</b> (6.1)	<b>-6.7**</b> (3.3)	<b>-3453***</b> (1232)	<b>-92*</b> (49)	<b>-16***</b> (4.8)	<b>-5.4**</b> (2.5)	<b>-2459***</b> (675)	<b>-51*</b> (31)	
Policy	13*** (3.8)	7.2*** (2.2)	3589*** (1075)	65*** (22)	11*** (2.8)	6*** (1.6)	2730*** (485)	31*** (12)	
Domestic	-34*** (10)	-21*** (5.7)	-11010*** (2255)	-49 (68)	59*** (2.3)	70*** (1.3)	4258*** (397)	245*** (9.6)	
Firm f.e.	N	N	N	N	Y	Y	Y	Y	
N	1180	1185	1177	1147	1766	1770	1775	1715	
$R^2$	.16	.17	.21	.043	.5	.48	.64	.47	

Minimum Model Sales Volume:		>100			
Dependent Variable:	IX. Torque (nm)	X. Power (kw)	XI. Price (nominal dollars)	XII. Weight (kg)	
Policy-Domestic	<b>-12**</b> (5.5)	<b>-3.7</b> (2.8)	<b>-1805**</b> (843)	<b>-48</b> (34)	
Policy	11*** (3.2)	5.8*** (2)	2573*** (593)	40*** (13)	
Domestic	62*** (2.5)	72*** (1.5)	4787*** (456)	277*** (10)	
Firm f.e.	Y	Y	Y	Y	
N	1927	1933	1939	1875	
$R^2$	.5	.49	.65	.46	

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, with a bandwidth of three years around the 2009 policy. Sales volume is the number of units sold of that model-year vehicle. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. Regressions I through IV omit brand dummies because they generate collinearity with the variables of interest. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

Table 3: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics Varying Fixed Effects (Part 2)

Fixed Effects:	OEM				Class			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)
Policy-Domestic	<b>-16***</b> (5.6)	<b>-6.1**</b> (2.5)	<b>-2416**</b> (915)	<b>-35</b> (33)	<b>-15**</b> (5.8)	<b>-4.5</b> (2.8)	<b>-2386**</b> (1028)	<b>-44</b> (35)
Policy	11** (4)	5.6*** (1.6)	2745*** (745)	19 (15)	9.4** (3.8)	5.8*** (2)	2839*** (842)	26 (17)
Domestic	-25** (9.6)	-17*** (6.2)	-7287*** (2315)	-58 (57)	-38*** (8.7)	-23*** (4.8)	-12692*** (2241)	-110** (53)
Minivan					51*** (12)	26*** (6.6)	8965*** (2298)	420*** (91)
SUV					82*** (14)	37*** (6.6)	14038*** (3409)	548*** (70)
Sedan					47*** (8.1)	27*** (4.3)	7969*** (2011)	254*** (52)
Firm f.e.	N	N	N	N	Y	Y	Y	Y
OEM f.e.	Y	Y	Y	Y	N	N	N	N
N	1646	1651	1653	1599	1646	1651	1653	1599
$R^2$	.42	.41	.49	.45	.23	.22	.24	.24

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, with a bandwidth of three years around the 2009 policy. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Regressions I-IV cluster standard errors at the OEM level, and regressions V-VIII cluster them at the firm level. \*\*\* indicates  $p < .01$ .



Table 4: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics Varying Clustering of Standard Errors

Standard Error Cluster Level:		Year				Firm-Year			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)	
Policy-Domestic	<b>-17***</b> (1.1)	<b>-6.3***</b> (1.3)	<b>-2784***</b> (549)	<b>-55***</b> (6.7)	<b>-17***</b> (3.7)	<b>-6.3***</b> (1.8)	<b>-2784***</b> (644)	<b>-55***</b> (18)	
Policy	11*** (2.2)	5.9** (1.5)	2821** (789)	29** (11)	11*** (2.7)	5.9*** (1.4)	2821*** (570)	29*** (11)	
Domestic	59*** (6.4)	70*** (3.5)	4479** (1420)	248*** (39)	59*** (5.2)	70*** (2.8)	4479*** (927)	248*** (35)	
Firm f.e.	Y	Y	Y	Y	Y	Y	Y	Y	
N	1646	1651	1653	1599	1646	1651	1653	1599	
$R^2$	.5	.48	.63	.47	.5	.48	.63	.47	
Standard Error Cluster Level:		Robust (no clusters)				Homoscedasticity (OLS)			
Dependent Variable:	IX. Torque (nm)	X. Power (kw)	XI. Price (nominal dollars)	XII. Weight (kg)	XII. Torque (nm)	XIV. Power (kw)	XV. Price (nominal dollars)	XVI. Weight (kg)	
Policy-Domestic	<b>-17***</b> (4.4)	<b>-6.3***</b> (2.3)	<b>-2784***</b> (806)	<b>-55**</b> (23)	<b>-17***</b> (4.7)	<b>-6.3**</b> (2.6)	<b>-2784***</b> (1050)	<b>-55**</b> (24)	
Policy	11*** (3.1)	5.9*** (1.7)	2821*** (728)	29* (15)	11*** (2.8)	5.9*** (1.5)	2821*** (611)	29** (14)	
Domestic	59*** (14)	70*** (6.5)	4479* (2370)	248*** (66)	59 (45)	70*** (24)	4479 (10004)	248 (228)	
Firm f.e.	Y	Y	Y	Y	Y	Y	Y	Y	
N	1646	1651	1653	1599	1646	1651	1653	1599	
$R^2$	.5	.48	.63	.47	.5	.48	.63	.47	

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, with a bandwidth of three years around the 2009 policy. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Standard errors are as specified. \*\*\* indicates  $p < .01$ .

Table 5: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Domestic vs. Foreign Model Characteristics, with Year Dummies and Clustering Standard Errors at Firm-Year level

<b>B. All years (1999-2012), with standard error clustering at firm level</b>					
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Height (mm)
Policy-Domestic	<b>-17**</b> (6.9)	<b>-5.9**</b> (2.9)	<b>-3704***</b> (1083)	<b>-49</b> (40)	<b>-22</b> (22)
Policy	15*** (5.2)	8.6*** (1.8)	3772*** (936)	48** (19)	16*** (4)
Domestic	65*** (4.1)	74*** (1.5)	5852*** (749)	277*** (15)	-42*** (3.2)
Firm f.e.	Y	Y	Y	Y	Y
N	2339	2349	2367	2274	2332
$R^2$	.48	.48	.63	.46	.4
<b>B. All years (1999-2012), with year fixed effects and standard error clustering at firm-year level</b>					
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Height (mm)
Policy-Domestic	<b>-15***</b> (3.5)	<b>-4.5***</b> (1.7)	<b>-3489***</b> (591)	<b>-40**</b> (19)	<b>-22*</b> (13)
Domestic	61*** (6.9)	71*** (3.5)	5873*** (1384)	253*** (40)	-51*** (9.4)
Firm f.e.	Y	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y	Y
N	2339	2349	2367	2274	2332
$R^2$	.49	.48	.64	.47	.4

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics after the policy. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Only models with at least 1,000 units sold are included. \*\*\* indicates  $p < .01$ .

Table 6: Placebo tests for Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics

Placebo (Artificial Policy Year):		2005				2006			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)	
Policy-Domestic	<b>19*</b> (11)	<b>5</b> (5.4)	<b>1646</b> (1916)	<b>134**</b> (64)	<b>-.44</b> (7.3)	<b>2.1</b> (3.9)	<b>-877</b> (1418)	<b>9.6</b> (43)	
Policy	3.6 (5.5)	4.2 (3.4)	-1409 (1521)	28 (25)	3.2 (5.1)	3.6 (2.7)	671 (1175)	.41 (31)	
Domestic	-52*** (14)	-28*** (7.6)	-12835*** (3416)	-198** (86)	46*** (7.3)	61*** (3.9)	3366** (1418)	218*** (43)	
Firm f.e.	N	N	N	N	Y	Y	Y	Y	
N	660	664	687	653	825	829	835	811	
$R^2$	.095	.13	.17	.032	.52	.51	.62	.55	
Placebo (Artificial Policy Year):		2007				2008			
Dependent Variable:	IX. Torque (nm)	X. Power (kw)	XI. Price (nominal dollars)	XII. Weight (kg)	XIII. Torque (nm)	XIV. Power (kw)	XV. Price (nominal dollars)	XVI. Weight (kg)	
Policy-Domestic	<b>-6.6</b> (5.6)	<b>-1.5</b> (2.7)	<b>-1659</b> (1135)	<b>-28</b> (35)	<b>-11*</b> (5.9)	<b>-2.7</b> (2.9)	<b>-1397</b> (950)	<b>-44</b> (35)	
Policy	5.1 (3.4)	4.5*** (1.6)	2256*** (836)	13 (17)	6.3* (3.3)	3.6** (1.7)	2386*** (740)	16 (13)	
Domestic	54*** (5.6)	66*** (2.7)	3183*** (1135)	277*** (35)	53*** (3.3)	68*** (1.7)	4083*** (740)	225*** (13)	
Firm f.e.	Y	Y	Y	Y	Y	Y	Y	Y	
N	1055	1059	1068	1016	1283	1286	1291	1238	
$R^2$	.5	.5	.61	.5	.49	.49	.63	.47	

*Note:* This table reports regression estimates placebo tests, with the policy placed in various years, using a bandwidth of three years around the policy. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. Regressions I through IV omit brand dummies because they generate collinearity with the variables of interest. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

Table 7: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics Varying Individual Effects and Interaction

Dependent Variable:	No individual effects					No interaction				
	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Height (mm)	VI. Torque (nm)	VII. Power (kw)	VIII. Price (nominal dollars)	IX. Weight (kg)	X. Height (mm)
Policy-Domestic	<b>-40***</b> (7.2)	<b>-20***</b> (4)	<b>-11050***</b> (1977)	<b>-99***</b> (37)	<b>60***</b> (18)					
Policy						<b>4</b> (3.5)	<b>4.2**</b> (1.7)	<b>1998***</b> (666)	<b>12</b> (17)	<b>2.2</b> (8.6)
Domestic						<b>-44***</b> (9.1)	<b>-25***</b> (5)	<b>-</b> (2441)	<b>-</b> (51)	<b>83***</b> (23)
Firm f.e.	N	N	N	N		N	N	N	N	
N	1646	1651	1653	1599	1630	1646	1651	1653	1599	1630
R <sup>2</sup>	.084	.076	.096	.021	.026	.13	.15	.19	.028	.065

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, with a bandwidth of three years around the 2009 policy. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Standard errors are robust and clustered at the firm level. \*\*\* indicates  $p < .01$ .

Table 8: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics Varying Fixed Effects (Part 1)

Fixed Effects:	None				Year			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)
Policy-Domestic	<b>-20***</b> (6.2)	<b>-6.6**</b> (3)	<b>-3220***</b> (1064)	<b>-75*</b> (42)	<b>-20***</b> (6.2)	<b>-6.5**</b> (3)	<b>-3214***</b> (1060)	<b>-75*</b> (42)
Policy	11*** (4.1)	6.7*** (2.2)	3179*** (889)	39** (19)	15** (6)	11*** (2.7)	4930*** (1115)	56** (27)
Domestic	-32*** (9.9)	-21*** (5.3)	-11622*** (2298)	-54 (64)	-32*** (9.9)	-21*** (5.3)	-11653*** (2293)	-54 (64)
Firm f.e.	N	N	N	N	N	N	N	N
Year f.e.	N	N	N	N	Y	Y	Y	Y
N	1646	1651	1653	1599	1646	1651	1653	1599
$R^2$	.14	.16	.19	.032	.14	.16	.2	.033
Fixed Effects:	Firm and Year							
Dependent Variable:	IX. Torque (nm)	X. Power (kw)	XI. Price (nominal dollars)	XII. Weight (kg)				
Policy-Domestic	<b>-17***</b> (5.3)	<b>-6.1**</b> (2.8)	<b>-2717***</b> (750)	<b>-55*</b> (32)				
Policy	15*** (5.5)	9.8*** (2.4)	4473*** (923)	49** (21)				
Domestic	58*** (2.9)	69*** (1.7)	4837*** (751)	239*** (13)				
Firm f.e.	Y	Y	Y	Y				
Year f.e.	Y	Y	Y	Y				
N	1646	1651	1653	1599				
$R^2$	.5	.49	.63	.47				

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, with a bandwidth of three years around the 2009 policy. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Standard errors are robust and clustered at the firm level. \*\*\* indicates  $p < .01$ .

Table 9: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Characteristics with Bandwidth of 1 Year

Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Height (mm)	VI. Length (mm)
Policy-Domestic	<b>-18***</b> (5.5)	<b>-5.8*</b> (3.1)	<b>-2036</b> (1306)	<b>-33</b> (36)	<b>22</b> (29)	<b>-59</b> (58)
Policy	7.3* (4.3)	3.6 (2.4)	1912 (1147)	16 (23)	8.6 (6.3)	6.9 (23)
Domestic	<b>-33***</b> (9.6)	<b>-22***</b> (5.2)	<b>-11976***</b> (2265)	<b>-71</b> (59)	<b>86***</b> (30)	<b>-132</b> (90)
Firm f.e.	N	N	N	N	N	N
N	757	757	752	723	742	743
$R^2$	.12	.14	.18	.02	.068	.032

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, using only data from 2009 and 2008 (bandwidth of 1 year). The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. The unit of observation is the model-year. The specifications are variants of the model in Equation 1. Only models with at least 1,000 units sold are included. Firm fixed effects are omitted because they are collinear with the domestic variable. Standard errors are robust and clustered at the firm level. \*\*\* indicates  $p < .01$ .

Table 10: Difference-in-Difference Estimation of the Fuel Economy Standard’s Impact on New Vehicle Characteristics with Additional Covariates

Dependent Variable:	I. Torque (nm)	I. Torque (nm)	II. Power (kw)	II. Power (kw)	III. Price (nominal dollars)	III. Price (nominal dollars)
Policy-Domestic	<b>-7.6**</b> (3.3)	<b>-7.9**</b> (3.3)	<b>-1.7</b> (2.2)	<b>-1.7</b> (2.2)	<b>-1655*</b> (884)	<b>-1758**</b> (837)
Policy	6.7*** (2.4)	7.1*** (2.5)	4.1*** (1.4)	4.2*** (1.4)	2016*** (562)	2125*** (549)
Domestic	17*** (3.1)	17*** (3.2)	47*** (1.6)	47*** (1.7)	-3181*** (1098)	-3110*** (1138)
Weight (kg)	.16*** (.022)	.16*** (.022)	.084*** (.009)	.082*** (.0094)	38*** (8.4)	38*** (8.4)
Height (mm)	-.03 (.023)	-.04* (.022)	-.025 (.017)	-.032** (.016)	-8** (3.8)	-9.9** (4.2)
Length (mm)	.0032 (.0093)	.003 (.0093)	.0032 (.0047)	.0039 (.0043)	-4.7 (3.5)	-5.1 (3.5)
Minivan	-11 (7)		-5.1 (4.1)		-2969 (1990)	
SUV	-.55 (8)		-2.2 (4.6)		-5.6 (2005)	
Sedan	.79 (3.3)		.94 (1.9)		-348 (1131)	
Firm f.e.	Y	Y	Y	Y	Y	Y
N	1589	1589	1594	1594	1597	1597
$R^2$	.81	.81	.78	.78	.82	.81

*Note:* This table reports regression estimates of the effect of the 2009 fuel economy standards on new model characteristics, with a bandwidth of three years around the 2009 policy. In regression III, there are fixed effects for 4 vehicle classes: Compact, Minivan, SUV and Sedan. The coefficients shown are relative to the omitted dummy, Compact. In regression V, brand fixed effects generate collinearity with Domestic, and are omitted. The unit of observation is the model-year. The specifications are variants of the model in Equation X. Standard errors are robust and clustered at the firm level. \*\*\* indicates  $p < .01$ .

Table 11: Triple Difference Estimation of the 2008 Policy on New vs. Continuing Models Varying Required Model Sales Volume

Minimum Model Sales Volume:	>100				>500			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)
Policy <sub>t</sub> <sup>2008</sup> ·Domestic· Continuing	<b>14**</b> (1.5)	<b>8**</b> (1.6)	<b>2150*</b> (573)	<b>131***</b> (10)	<b>19*</b> (4.7)	<b>9.5***</b> (.28)	<b>3434***</b> (296)	<b>111**</b> (25)
Policy <sub>t</sub> <sup>2008</sup> ·Domestic	-11*** (.39)	-4.3** (.56)	-2316** (405)	-115*** (6.8)	-15** (2.7)	-5.6** (.63)	-3215*** (303)	-93** (20)
Domestic · Continuing	-7.3 (.97)	-3.4 (2.1)	-631 (224)	-26** (3.3)	1.2 (5.7)	-2* (.58)	-314 (518)	-15 (30)
Policy <sub>t</sub> <sup>2008</sup> · Continuing	2 (3.5)	-5 (4.3)	85 (245)	9.5 (4.1)	-6.5 (2.9)	-6.5 (4)	-1016* (280)	-3.8 (2.3)
Policy <sub>t</sub> <sup>2008</sup>	-2.6 (1.4)	4.3 (1.5)	1618 (605)	-8.7 (3.5)	5.9 (2.1)	5.9 (2.3)	2602** (405)	4 (1.7)
Domestic Continuing	57*** (1.5)	71*** (1.7)	6389** (727)	299*** (5.2)	40*** (2)	61*** (2.2)	4071** (533)	247*** (3.8)
	-4.4 (4.2)	-4.3 (4.6)	361* (111)	19*** (1.7)	-5.8 (2.8)	-1.2 (3.9)	-3 (319)	18** (2.1)
Firm f.e.	N	N	N	N	Y	Y	Y	Y
N	752	756	762	737	693	695	702	681
R <sup>2</sup>	.57	.55	.67	.58	.53	.52	.65	.56

*Note:* This table reports regression estimates of the effect of the 2008 fuel economy standards on model characteristics. The 2008 policy applied only to new models, not continuing models. The Policy<sub>t</sub><sup>2008</sup> variable is 1 if the year is 2008, and 0 if 2007 or 2006. The Continuing variable is 1 if the model is a continuing model in 2008 (i.e. one that was already sold in 2007, like the VW Jetta, and 0 if the model is new, like the Great Wall Peri. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The unit of observation is the model-year. The specifications are variants of the model in Equation 2. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .



Table 12: Triple Difference Estimation of the 2008 Policy on New vs. Continuing Models Varying Fixed Effects (Part 1)

Fixed Effects:	None				OEM			
Dependent Variable:	I. Torque (nm)	II. Power (kw)	III. Price (nominal dollars)	IV. Weight (kg)	V. Torque (nm)	VI. Power (kw)	VII. Price (nominal dollars)	VIII. Weight (kg)
Policy <sub>t</sub> <sup>2008</sup> ·Domestic· Continuing	<b>14***</b> (.88)	<b>5.9</b> (2.8)	<b>-494</b> (1195)	<b>163**</b> (22)	<b>12</b> (5.7)	<b>2.8</b> (4.1)	<b>-320</b> (1757)	<b>123**</b> (21)
Policy <sub>t</sub> <sup>2008</sup> ·Domestic	<b>-18***</b> (.83)	<b>-6.3</b> (3.5)	<b>-1778</b> (1277)	<b>-159***</b> (8.8)	<b>-13*</b> (3.9)	<b>-1.5</b> (3)	<b>-1049</b> (1059)	<b>-136**</b> (19)
Domestic · Continuing	<b>-4.9**</b> (.88)	<b>-3.2</b> (2.8)	<b>958</b> (1195)	<b>-84*</b> (22)	<b>2</b> (4)	<b>-2.7</b> (5)	<b>485</b> (1489)	<b>-21</b> (11)
Policy <sub>t</sub> <sup>2008</sup> · Continuing	<b>2.4***</b> (.17)	<b>-1.7</b> (1.1)	<b>2487**</b> (511)	<b>21</b> (37)	<b>4.1</b> (4.1)	<b>.13</b> (4)	<b>1879</b> (1437)	<b>27</b> (10)
Policy <sub>t</sub> <sup>2008</sup>	<b>-1.2*</b> (.29)	<b>3.8***</b> (.34)	<b>763</b> (294)	<b>-11</b> (38)	<b>-2.2</b> (1.2)	<b>.51</b> (1.3)	<b>624</b> (660)	<b>-11</b> (5.7)
Domestic	<b>-28***</b> (.83)	<b>-20**</b> (3.5)	<b>-12515**</b> (1277)	<b>15</b> (8.8)	<b>-27**</b> (4.9)	<b>-15</b> (8.4)	<b>-6049**</b> (1234)	<b>-44</b> (22)
Continuing	<b>-5.3***</b> (.17)	<b>-2.6</b> (1.1)	<b>-489</b> (511)	<b>-8.7</b> (37)	<b>-7.5</b> (5.8)	<b>-1.5</b> (5.3)	<b>-226</b> (1352)	<b>-5.6</b> (14)
Firm f.e.	N	N	N	N	N	N	N	N
OEM f.e.	N	N	N	N	Y	Y	Y	Y
N	752	756	762	737	752	756	762	737
R <sup>2</sup>	.07	.11	.15	.016	.47	.44	.52	.56

*Note:* This table reports regression estimates of the effect of the 2008 fuel economy standards on model characteristics. The 2008 policy applied only to new models, not continuing models. The Policy<sub>t</sub><sup>2008</sup> variable is 1 if the year is 2008, and 0 if 2007 or 2006. The Continuing variable is 1 if the model is a continuing model in 2008 (i.e. one that was already sold in 2007, like the VW Jetta, and 0 if the model is new, like the Great Wall Peri. The Domestic variable is 1 if the brand is domestic (Chinese), and 0 if foreign. The unit of observation is the model-year. The specifications are variants of the model in Equation 2. Only models with at least 100 units sold are included. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

Table 13: Placebo tests for Triple Difference Estimation of the 2008 Policy on New vs. Continuing Models, Part 1

Placebo (Artificial Policy Year):		2005				2007			
Dependent Variable:	I. Torque (nm)	II. Weight (kg)	III. Power (kw)	IV. Price (nominal dollars)	V. Torque (nm)	VI. Weight (kg)	VII. Power (kw)	VIII. Price (nominal dollars)	
Policy <sub>t</sub> <sup>2008</sup> · Domestic · Continuing	<b>-32*</b> (8.2)	<b>-149</b> (56)	<b>-4.9</b> (1.8)	<b>-4047</b> (1491)	<b>6.9</b> (10)	<b>44</b> (32)	<b>-6.6*</b> (1.8)	<b>899**</b> (128)	
Policy <sub>t</sub> <sup>2008</sup> · Domestic	28* (9.3)	155 (68)	1.8 (1.4)	5156 (2275)	-8.2 (8.4)	-38 (23)	5.8** (.99)	-2225** (362)	
Domestic · Continuing	-7 (4.6)	-41* (11)	.48 (1.7)	300 (324)	-9 (10)	-64 (43)	-3.2 (1.2)	-1649 (1060)	
Policy <sub>t</sub> <sup>2008</sup> · Continuing	29*** (2.3)	131*** (6.8)	9.7** (1.8)	5149*** (273)	4.6 (10)	-18 (37)	11* (3.1)	-676* (186)	
Policy <sub>t</sub> <sup>2008</sup>	-21*** (.7)	-91*** (2.9)	-6.6 (2.4)	-6076** (809)	.54 (9)	27 (25)	-5.7 (3.2)	2231*** (88)	
Continuing	-6 (5.4)	-15 (19)	-4 (2.3)	-2086** (307)	.089 (9.8)	40 (29)	-1.5 (3.2)	966 (910)	
Firm f.e.	Y	Y	Y	Y	Y	Y	Y	Y	
N	280	277	281	293	577	568	582	595	
R <sup>2</sup>	.63	.65	.61	.72	.58	.61	.56	.62	

*Note:* This table reports regression estimates of the effect of the 2008 fuel economy standards on model characteristics. The 2008 policy applied only to new models, not continuing models. The Policy<sub>t</sub><sup>2008</sup> variable is 1 if the year is 2008, and 0 if 2007 or 2006. The Continuing variable is 1 if the model is a continuing model in 2008 (i.e. one that was already sold in 2007, like the VW Jetta, and 0 if the model is new, like the Great Wall Peri. The Domestic variable is omitted as is collinear with the brands, once the two interactions are included. The unit of observation is the model-year. The specifications are variants of the model in Equation 2. Only models with at least 100 units sold are included. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

Table 14: Placebo tests for Triple Difference Estimation of the 2008 Policy on New vs. Continuing Models, Part 2

Placebo (Artificial Policy Year):	2009				2011			
Dependent Variable:	I. Torque (nm)	II. Weight (kg)	III. Power (kw)	IV. Price (nominal dollars)	V. Torque (nm)	VI. Weight (kg)	VII. Power (kw)	VIII. Price (nominal dollars)
Policy <sub>t</sub> <sup>2008</sup> ·Domestic· Continuing	<b>27</b> (7.8)	<b>123</b> (92)	<b>12</b> (2.9)	<b>3785*</b> (511)	<b>9.8</b> (5.9)	<b>249</b> (56)	<b>8.9</b> (3.2)	<b>3549</b> (909)
Policy <sub>t</sub> <sup>2008</sup> ·Domestic	-37* (3.9)	-157 (75)	-14* (1.4)	-4650** (90)	-11 (5.5)	-229 (48)	-10 (3)	-4734 (855)
Domestic · Continuing	5.5 (12)	45 (103)	4.1 (4.6)	1024 (733)	-9.7 (4.3)	-22 (69)	-6.5 (1.4)	-558 (963)
Policy <sub>t</sub> <sup>2008</sup> · Continuing	-14* (1.8)	-91 (33)	-4.4 (1.3)	-2638** (113)	-13 (3.2)	-202 (50)	-14* (1.2)	-3969* (611)
Policy <sub>t</sub> <sup>2008</sup> Continuing	21** (.68)	99 (28)	7.4* (.79)	3432* (312)	18 (2.9)	218 (43)	17** (1.1)	5919* (585)
Firm f.e.	Y	Y	Y	Y	Y	Y	Y	Y
N	652	618	652	651	810	800	812	806
R <sup>2</sup>	.53	.48	.53	.7	.48	.45	.48	.64

*Note:* This table reports regression estimates of the effect of the 2008 fuel economy standards on model characteristics. The 2008 policy applied only to new models, not continuing models. The Policy<sub>t</sub><sup>2008</sup> variable is 1 if the year is 2008, and 0 if 2007 or 2006. The Continuing variable is 1 if the model is a continuing model in 2008 (i.e. one that was already sold in 2007, like the VW Jetta, and 0 if the model is new, like the Great Wall Peri. The Domestic variable is omitted as is collinear with the brands, once the two interactions are included. The unit of observation is the model-year. The specifications are variants of the model in Equation 2. Only models with at least 100 units sold are included. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

Table 15: Model Characteristics Summary Statistics by Domestic Firm Type

	I. 1999-2004		II. 2005-2008		III. 2009-2012		IV. All Years	
	Mean (Std Dev)	N	Mean (Std Dev)	N	Mean (Std Dev)	N	Mean (Std Dev)	N
<b>A. All Domestic (Chinese) Firms</b>								
Max Torque (nm)	129 (50.0)	78	151 (57.0)	350	147 (46.0)	653	147 (50.3)	1081
Max Power (kw)	65.5 (26.5)	80	76.2 (27.8)	354	79.0 (22.4)	658	77.1 (24.8)	1092
Curb Weight (kg, '000s)	1.16 (0.35)	70	1.30 (0.35)	335	1.29 (0.28)	617	1.29 (0.31)	1022
Height (m)	1.54 (0.19)	77	1.61 (0.19)	344	1.59 (0.20)	643	1.59 (0.20)	1064
Length (m)	4.19 (0.58)	77	4.33 (0.50)	344	4.35 (0.43)	644	4.33 (0.47)	1065
Price ('000s)	12.20 (7.64)	87	12.09 (8.45)	354	12.30 (6.70)	651	12.2 (7.38)	1092
<b>B. Domestic Firms where OEM has JV</b>								
Max Torque (nm)	131 (46.4)	41	149 (53.6)	150	145 (48.2)	300	145 (50)	491
Max Power (kw)	67.1 (25.6)	42	77.9 (30.6)	153	78.2 (24.8)	303	77.2 (26.9)	498
Curb Weight (kg, '000s)	1.16 (0.30)	37	1.28 (0.31)	143	1.28 (0.28)	280	1.27 (0.29)	480
Height (m)	1.53 (0.18)	40	1.62 (0.20)	147	1.61 (0.18)	293	1.61 (0.19)	480
Length (m)	4.34 (0.61)	40	4.35 (0.51)	147	4.35 (0.42)	294	4.35 (0.47)	481
Price ('000s)	13.4 (7.11)	48	13.0 (9.96)	153	12.88 (7.72)	297	13.0 (8.4)	498
<b>C. Domestic Firms that are Privately Owned</b>								
Max Torque (nm)	120 (59.6)	24	161 (61.6)	155	151 (45.4)	256	153 (53.2)	435
Max Power (kw)	60.4 (31.3)	25	78.5 (26.3)	156	80.0 (20.3)	258	78.5 (23.8)	439
Curb Weight (kg, '000s)	1.01 (0.41)	22	1.36 (0.40)	150	1.30 (0.27)	245	1.31 (0.34)	417
Height (m)	1.50 (0.20)	25	1.59 (0.19)	153	1.55 (0.15)	259	1.56 (0.16)	437
Length (m)	3.95 (0.53)	25	4.39 (0.50)	153	4.41 (0.37)	259	4.38 (0.44)	437
Price ('000s)	10.1 (9.05)	27	12.3 (7.76)	158	12.5 (6.36)	261	12.3 (7.10)	446
<b>D. Domestic Firms that are Central SOEs</b>								
Max Torque (nm)	129 (45.2)	38	140 (58.6)	111	136 (48.7)	187	137 (51.8)	336
Max Power (kw)	66.3 (25.4)	39	72.4 (33.7)	113	72.7 (24.3)	190	71.9 (27.9)	342
Curb Weight (kg, '000s)	1.16 (0.28)	38	1.23 (0.31)	105	1.22 (0.27)	176	1.21 (0.29)	319
Height (m)	1.54 (0.17)	40	1.64 (0.19)	109	1.63 (0.18)	182	1.62 (0.18)	332
Length (m)	4.26 (0.60)	40	4.22 (.53)	109	4.24 (0.43)	183	4.24 (0.48)	332
Price ('000s)	13.3 (7.17)	44	12.5 (11.0)	112	11.6 (7.93)	185	12.2 (8.95)	341
<b>E. Domestic Firms that are Local SOEs</b>								
Max Torque (nm)	144 (44.4)	16	147 (41.6)	84	152 (42.8)	210	150 (42.5)	310
Max Power (kw)	71.5 (19.7)	16	78.4 (20.9)	85	82.4 (21.9)	210	80.8 (21.66)	311
Curb Weight (kg, '000s)	1.38 (0.37)	10	1.28 (0.28)	80	1.34 (0.27)	196	1.33 (0.28)	286
Height (m)	1.59 (0.22)	12	1.59 (0.18)	82	1.60 (0.27)	202	1.59 (0.24)	296
Length (m)	4.48 (0.49)	12	4.35 (0.46)	82	4.36 (0.47)	202	4.36 (0.47)	296
Price ('000s)	12.90 (5.75)	16	11.1 (5.29)	84	12.7 (5.82)	205	12.3 (5.70)	305

Note: The unit of observation is the model-year. Prices are in nominal US dollars, at the average annual current exchange rate. In the regressions, height is in millimeters. JV= joint venture between foreign and domestic firm. SOE=state owned enterprise. I define firm at the brand level.

Table 16: Difference-in-Difference Estimation of the Fuel Economy Standard's Impact on Power and Weight with Firm Type Subsamples Collapsed into a Single Regression

Dependent Variable:	Torque (nm)			Price (nominal dollars)		
	I.	II.	III.	IV.	V.	VI.
Policy-Domestic <sup>JV</sup>	<b>-9.6**</b>		<b>-9.6**</b>	<b>-89***</b>		<b>-88***</b>
	(4.2)		(4.2)	(31)		(31)
Policy-Domestic <sup>no JV</sup>	-3.5			-33		
	(2.9)			(50)		
Policy-Domestic <sup>SOE</sup>		<b>-8**</b>			<b>-66**</b>	
		(3.3)			(28)	
Policy-Domestic <sup>Private</sup>		<b>-3.9</b>			-44	
		(3.4)			(61)	
Policy-Domestic <sup>SOE no JV</sup>			<b>-7.7**</b>			<b>-62</b>
			(2.9)			(58)
Policy-Domestic <sup>Priv. no JV</sup>			<b>-1.1</b>			<b>-16</b>
			(3.3)			(73)
Policy	5.9***	5.9***	5.9***	30**	30**	30**
	(1.9)	(1.9)	(1.9)	(14)	(14)	(14)
Domestic <sup>JV</sup>	70***		70***	250***		250***
	(1.5)		(1.5)	(11)		(11)
Domestic <sup>no JV</sup>	69***			240***		
	(3.9)			(43)		
Domestic <sup>SOE</sup>		70***			250***	
		(1.5)			(11)	
Domestic <sup>Private</sup>		68***			374***	
		(3.1)			(27)	
Domestic <sup>SOE no JV</sup>			69***			214***
			(3.8)			(28)
Domestic <sup>Priv. no JV</sup>			67***			352***
			(4)			(29)
Firm f.e.	Y	Y	Y	Y	Y	Y
N	1651	1651	1651	1599	1599	1599
R <sup>2</sup>	.49	.49	.49	.47	.47	.47

*Note:* This table reports regression estimates of the effect of the fuel economy standards on model torque and price, using a bandwidth of three years around the policy. Only models with at least 1,000 units sold are included. The Domestic<sup>JV</sup> variable is 1 if the brand is domestic (Chinese) and has a joint venture with a foreign firm, and 0 if otherwise. Similarly for the other variables; i.e. Domestic<sup>Priv. no JV</sup> is 1 if the firm is privately owned and does not have a JV. The Policy variable is 1 if the year is 2009 or later, and 0 if 2008 or before. The unit of observation is the model-year. The specifications are variants of the model in Equation 2. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

## References

- International** Center for Clean Transportation. 2013. "Global passenger vehicle standards." Info and Tools. Available at: <http://www.theicct.org/info-tools/global-passenger-vehicle-standards>
- Zhao** Wang, Yuefu Jin, Michael Wang, Wei Wu. 2010. New fuel consumption standards for Chinese passenger vehicles and their effects on reductions of oil use and CO2 emissions of the Chinese passenger vehicle fleet. *Energy Policy*, Vol 38.

## Appendix B: China's Auto Sector in Sectoral and International Perspective

### 1 Autos in Perspective: Comparison with Other Sectors

Foreign brands dominate the Chinese auto sector, and Chinese firms do not export. This is quite anomalous in the Chinese industrial landscape - even in sectors that similarly have large domestic markets and large state-owned firms. Chinese firms in sectors with roughly similar levels of technical difficulty have been successful in building major domestic brands with large volumes of exports to industrialized countries; examples include shipbuilding, mobile phones, computers, solar panels, wind turbines, and white goods. Figure 1 shows Chinese firms' global market share, mostly in terms of revenue, for a number of high-tech sectors. While the figure is constructed from a variety of data sources, it provides a sense of the extent to which autos have not followed the exponential trends of other Chinese industries. Figure 2 shows 2012 sales from Chinese shipbuilders in 2012 (Clarkson 2013). State-owned firms have been very successful in this sector both domestically and abroad, even though they compete with private domestic firms.

It is, in fact, important to understand how pervasive state ownership is - the vast majority of listed enterprises in China have a significant portion of their shares owned by the state, even though a portion of the firm is privately traded (Szamosszegi and Kyle 2011). The SOE share of the economy is estimated at 30 to 40 percent (Lee 2009). Most of the state-owned auto firms in my data are partially listed. For example, the Chinese wind turbine company Goldwind is partially listed but majority state-owned, and in 2013 achieved a 10% global market share, second only to Vestas, with its share of revenue from non-Chinese projects at about 16% (Goldwind 2013). This provides anecdotal evidence that the failure of domestic Chinese auto firms is not simply due to the fact that (1) they operate in a protected and large domestic market nor that (2) many of them remain majority state-owned. Recent work suggests Chinese SOEs are gaining in size and profits relative to the private sector.

Further, the high proportion of SOEs in the domestic auto sector does not immediately imply very low performance. SOEs are concentrated in certain sectors, such as telecom, mining and minerals, aviation, construction and steel; 11 "pillar" and "strategic" sectors (which include automotive manufacturing) account for over 50% of state assets (Batson 2014). In the first part of the reform period, between 1978 and 1998, Brandt and Zhang

(2010) find that that the state-owned sector was vastly less productive than the non-state non-agriculture sector. However, this gap narrowed after 2007, and they find essentially the same productivity growth for both SOEs and private firms between 1998 and 2007. Brandt et al. 2012's aggregate growth decomposition found *higher* productivity growth among state-owned firms between 1998 and 2007 than either private or foreign firms (12.5% compared to 11.3% and 11.8%, respectively). They suggest that one reason is a reallocation of inputs towards more productive SOEs, as well as entry by much more productive SOEs. New SOEs between 1998 and 2007 - which includes most of the locally owned automotive SOEs in my data - produced almost almost five times the value-added of exiting SOEs, despite much lower employment and low growth of real capital stock (Brandt et al. 2012). More recent work confirms that Chinese SOEs appear to be gaining in size and profits relative to the private sector. Hsieh and Song (2015) show that in the 2000s SOEs had faster total factor productivity growth than private firms and higher labor productivity, but lower capital productivity.

## 2 China in Comparison to other Countries

Compared to other countries, China's passenger vehicle consumption level is grossly disproportionate to vehicle export share. Figure 3 shows the share of vehicles in 15 countries' total exports (UNIDO 2013). Although in 2010 China was the largest consumer of vehicles by value, at around \$375 billion, the share of motor vehicles in its exports is negligible. This contrasts strongly with every other country that has a significant auto industry. Cross-sectionally, China's auto industry is not only an outlier both among manufacturing sectors in China, but also among countries that produce autos.

In a panel sense, China's auto development also contrasts with that of Japan and Korea in previous decades. China's industrial policy in the reform period shares important characteristics with its two largest East Asian neighbors: heavy state involvement, considerable protection, and reliance on acquiring technology by learning from foreign firms. All three countries prioritized the auto sector in their industrial policies from the beginning of their growth periods. Japan and Korea generated world-class automakers whose lean manufacturing capabilities and innovative skills disrupted the global industry. Table 1 shows production by country in the first year of each decade from 1960 (Chinese production is divided by foreign and domestic brand). From zero in their respective starting years of 1960 and 1980,



Japan and Korea became major players in the global auto industry within two decades, and they both exported within one decade. Thirty years after initiating their auto industrial policy, both had overseas production. For example, by 1999 South Korea's Kia had dealerships in all 50 U.S. states; only nine years earlier, South Korea produced merely 1.5 million vehicles. Chinese firms did not produce significant volumes until their third decade, and no Chinese brand is sold in meaningful quantities in Europe, Japan or the U.S. No Chinese firm has overseas LDV production, although this may change soon. (BYD has built an electric bus factory in California.)

Japanese and Korean automotive firm development in the 1960s and 1980s, respectively, both relied on learning from foreign counterparts in large part via technology licensing (Kim 2001, Bell and Pavitt 1997). Neither encouraged FDI via JVs with foreign enterprises. Specifically, the Japanese and Korean auto development had five important characteristics:

1. Licensing foreign component technologies
2. Protecting the small domestic market from foreign imports
3. Restricting FDI
4. Local firm indigenous model development
5. Learning-by-exporting

In contrast, China's industrial policy has relied on the JV structure, imitating, and reverse engineering. An unintended consequence of the JV structure is that the domestic firms were able to earn large profits from car sales while doing little themselves. Chinese firms' reliance on JVs for vehicle design and the ability to serve a large, growing, and unsophisticated domestic market are key differences from the Japanese and Korean experiences. As the Chinese market has matured and grown more competitive, there is increasingly less room for poor quality vehicles, and this is reflected in domestic automakers' consistent failure to gain market share.

Figure 1:

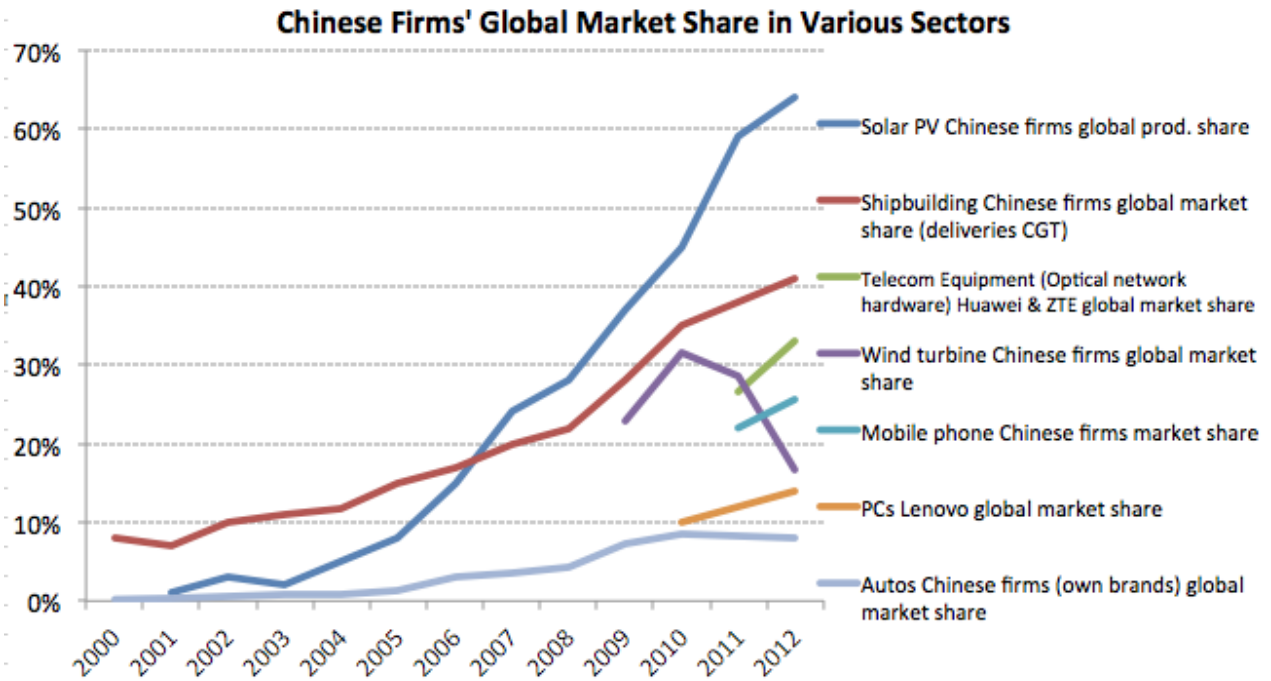


Figure 2:

### Chinese Shipbuilders 2012 Sales in DWT

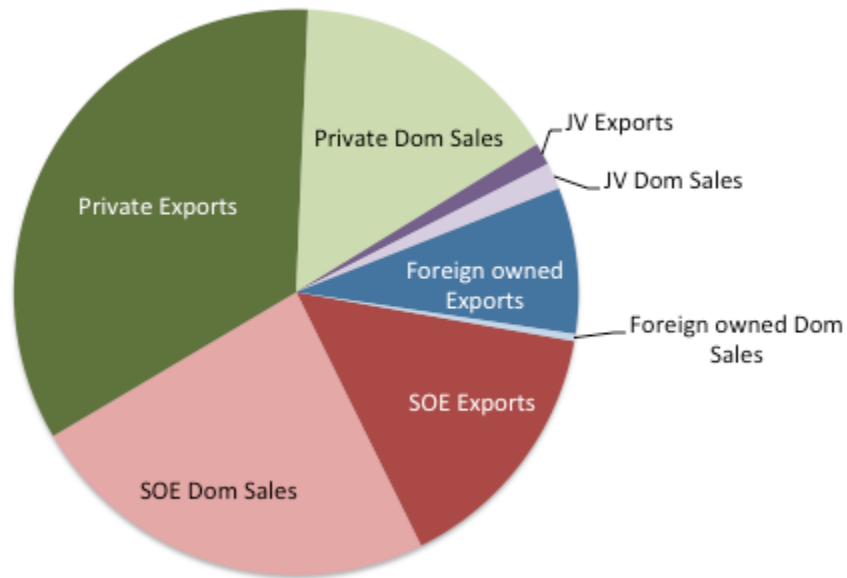
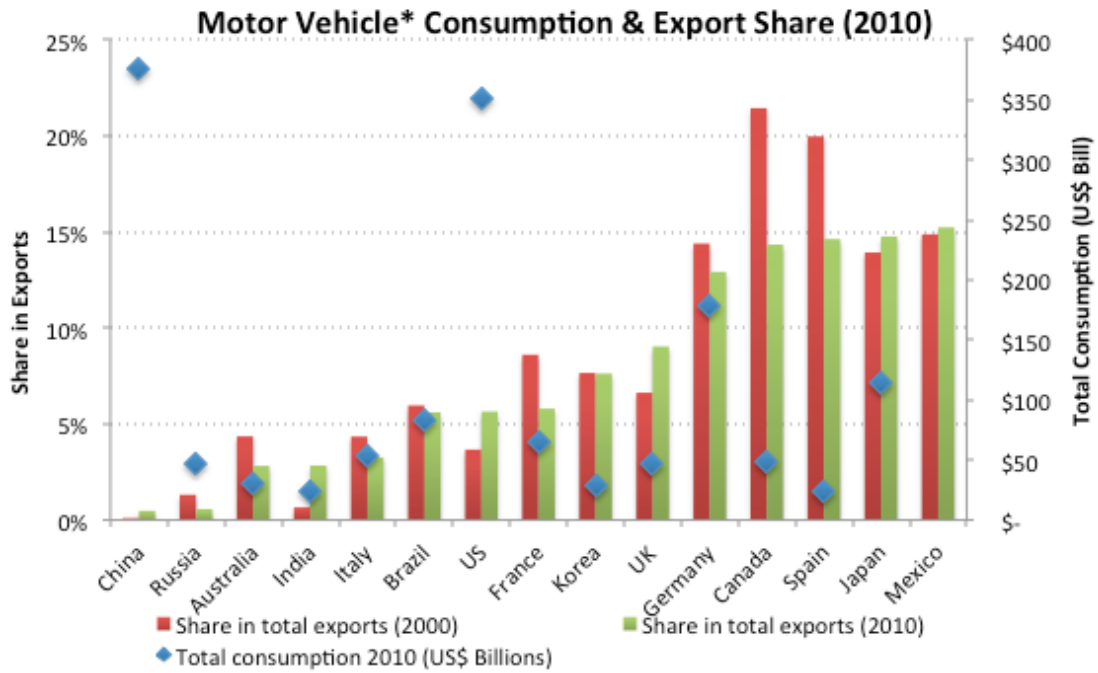


Figure 3:



\*SITC 3-digit codes 781-783 and ISIC 4-digit codes 3410,3420

Table 1: Domestic brand in-country production (millions of vehicles)

	1960	1970	1980	1990	2000	2010	First export yr (>1000)	First overseas prod yr	First car prod yr
Japan	0.1	1.6	3.4	4.9	5.2	8.3	1970	1982	1917
Korea	0	0	0.123	1.5	3.1	3.9	1986	1997	1974
China dom. brand	0	0	0.005	-	0.1	6.3	2004	None	1958
China for. brand	0	0	0	-	0.5	7.6	-	-	-

## References

- Batson**, Andrew. 2014. Fixing China's State Sector Paulson Policy Memorandum. Paulson Institute.
- Bell**, M. and K. Pavitt. 1997. Technological accumulation and industrial growth: contrasts between developed and developing countries. Chapter 4 in Archibugi, D. and J. Michie, eds. *Technology, globalisation and economic performance*. Cambridge, UK: Cambridge University Press.
- Brandt**, L., Van Biesebroeck, J., & Zhang, Y. (2012). Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. *Journal of Development Economics*, 97(2), 339-351.
- Clarkson** Asia. 2013. Shipbuilding Market Overview. Presentation to Marine Money, Hong Kong, March. <http://www.marinemoney.com>
- Goldwind** Press Office. 2013. "Goldwind Announces 2013 Interim Results." <http://www.goldwindglobal.com/web/news.do?action=detail>
- Kim**, L. 1997. *Imitation to innovation: The dynamics of Korea's technological learning*. Cambridge: Harvard Business Press.
- Lee**, Junyeop. State Owned Enterprises in China: Reviewing the Evidence. Organization for Economic Cooperation and Development, 2009.
- Szamosszegi**, Andrew and Cole Kyle. 2011. An Analysis of State-owned Enterprises and State Capitalism in China U.S.-China Economic and Security Review Commission.
- United Nations Industrial Development Organization (UNIDO)**. 2013. Industrial Statistics Databases. Available at <http://www.unido.org/statistics.html>