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Appendix to “Joint Ventures and Technology Adoption: A Chinese Industrial Policy that Backfired”

Table A1: China’s Fuel Economy Standards

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

Note: This table shows China’s fuel economy standards by curb weight class (CM=curb mass), in liters per 100 kilometers. Source: Zhao et al. (2010).

Table A2: Characteristic Correlation Matrix

|              | Sales<br>volume | Torque | Horsepower | Weight | Height | Length |
|--------------|-----------------|--------|------------|--------|--------|--------|
| Price        | -0.13           | 0.51   | 0.54       | 0.67   | 0.02   | 0.58   |
| Sales volume | 1.00            | -0.12  | -0.12      | -0.14  | 0.00   | -0.06  |
| Torque       |                 | 1.00   | 0.96       | 0.54   | 0.12   | 0.45   |
| Horsepower   |                 |        | 1.00       | 0.51   | 0.05   | 0.46   |
| Weight       |                 |        |            | 1.00   | 0.40   | 0.79   |
| Height       |                 |        |            |        | 1.00   | 0.02   |
| Length       |                 |        |            |        |        | 1.00   |

*Note:* This table shows correlations between characteristics (at the model-year level).  
Units are as in Table 1.

Table A3: Model-Level Summary Statistics by Domestic Firm Type

|                                                     | Price (RMB)* | Sales Volume | Sales-Wtd Price (RMB) | Sales-Wtd Price (\$) | Torque <sup>†</sup> | Normalized Torque <sup>††</sup> | Weight (kg) | Height (mm) | Length (mm) | RCL Quality |
|-----------------------------------------------------|--------------|--------------|-----------------------|----------------------|---------------------|---------------------------------|-------------|-------------|-------------|-------------|
| <i>Panel 1: Private domestic firms with JVs</i>     |              |              |                       |                      |                     |                                 |             |             |             |             |
| Mean                                                | 95534        | 16934        | 84607                 | 10774                | 152                 | 3.62                            | 1371        | 1538        | 4559        | -.063       |
| Median                                              | 89600        | 10871        | 79438                 | 11736                | 151                 | 3.50                            | 1390        | 1460        | 4648        | .11         |
| Std Dev                                             | 42865        | 19933        | 36484                 | 4643                 | 39                  | 0.85                            | 268         | 183         | 356         | 1.18        |
| N                                                   | 79           | 82           | 82                    | 75                   | 64                  | 70                              | 60          | 63          | 63          | 63          |
| <i>Panel 2: State-owned domestic firms with JVs</i> |              |              |                       |                      |                     |                                 |             |             |             |             |
| Mean                                                | 79338        | 39019        | 70857                 | 9032                 | 134                 | 3.57                            | 1215        | 1628        | 4243        | .041        |
| Median                                              | 65900        | 9957         | 61819                 | 7882                 | 133                 | 3.00                            | 1170        | 1550        | 4308        | -.066       |
| Std Dev                                             | 45962        | 105596       | 42110                 | 5875                 | 45                  | 1.89                            | 279         | 189         | 462         | 1.42        |
| N                                                   | 424          | 456          | 451                   | 390                  | 321                 | 314                             | 303         | 311         | 312         | 308         |
| <i>Panel 3: State-owned domestic firms (SOEs)</i>   |              |              |                       |                      |                     |                                 |             |             |             |             |
| Mean                                                | 77188        | 33907        | 70346                 | 8966                 | 136                 | 3.46                            | 1231        | 1614        | 4239        | .20         |
| Median                                              | 65800        | 11760        | 61355                 | 8168                 | 136                 | 3.11                            | 1180        | 1530        | 4310        | .22         |
| Std Dev                                             | 43552        | 84265        | 37081                 | 5314                 | 43                  | 1.63                            | 275         | 221         | 462         | 1.38        |
| N                                                   | 761          | 797          | 795                   | 726                  | 614                 | 597                             | 579         | 598         | 599         | 591         |
| <i>Panel 4: Private domestic firms</i>              |              |              |                       |                      |                     |                                 |             |             |             |             |
| Mean                                                | 80888        | 24671        | 75501                 | 10540                | 151                 | 4.01                            | 1312        | 1568        | 4406        | .30         |
| Median                                              | 69800        | 10049        | 70545                 | 10157                | 145                 | 3.53                            | 1220        | 1485        | 4533        | .21         |
| Std Dev                                             | 44822        | 35732        | 36650                 | 4999                 | 46                  | 1.93                            | 310         | 165         | 411         | 1.28        |
| N                                                   | 469          | 486          | 484                   | 454                  | 401                 | 409                             | 376         | 401         | 401         | 396         |
| <i>Panel 5: All domestic firms</i>                  |              |              |                       |                      |                     |                                 |             |             |             |             |
| Mean                                                | 78515        | 30533        | 72315                 | 9567                 | 142                 | 3.68                            | 1262        | 1594        | 4307        | .25         |
| Median                                              | 67850        | 10880        | 64932                 | 8866                 | 140                 | 3.29                            | 1205        | 1495        | 4393        | .22         |
| Std Dev                                             | 43928        | 69926        | 36855                 | 5224                 | 45                  | 1.77                            | 291         | 201         | 448         | 1.34        |
| N                                                   | 1242         | 1295         | 1291                  | 1192                 | 1027                | 1018                            | 964         | 1011        | 1012        | 999         |

*Note:* This table shows summary statistics at the model-year level. \*Nominal RMB. †Maximum torque, in nanometers. †† Torque specified at a particular speed, or rotations per minute (rpm). More power at lower speed is better, so lower RPM is better.

Table A4: Parallel Trends among Foreign and Domestic Firms prior to the Policy, 1999-2008

| <i>Panel 1: Domestic vs. Foreign</i>              |                  |                   |              |                  |
|---------------------------------------------------|------------------|-------------------|--------------|------------------|
| Dep. Variable:                                    | Log Torque       | Log Price         | Weight       | RCL Quality      |
|                                                   | I.               | II.               | III.         | IV.              |
| $Year_t \cdot Domestic_j$                         | .0015<br>(.017)  | -.0073<br>(.016)  | -.82<br>(10) | .061<br>(.049)   |
| $Year_t$                                          | .017**<br>(.008) | -.019*<br>(.0099) | 8.5<br>(7.2) | .086**<br>(.038) |
| Firm f.e.                                         | Y                | Y                 | Y            | Y                |
| N                                                 | 1001             | 1026              | 985          | 991              |
| $R^2$                                             | 0.06             | 0.35              | 0.04         | 0.069            |
| <i>Panel 2: JV vs. non-JV (within Domestic)</i>   |                  |                   |              |                  |
|                                                   | I.               | II.               | III.         | IV.              |
| $Year_t \cdot Has JV_j$                           | -.016<br>(.024)  | -.018<br>(.026)   | -6.3<br>(13) | -.0056<br>(.071) |
| $Year_t$                                          | .023<br>(.023)   | -.02<br>(.019)    | 8.8<br>(11)  | .15***<br>(.027) |
| Firm f.e.                                         | Y                | Y                 | Y            | Y                |
| N                                                 | 333              | 336               | 312          | 321              |
| $R^2$                                             | .01              | .01               | .01          | 0.044            |
| <i>Panel 3: SOE vs. Private (within Domestic)</i> |                  |                   |              |                  |
|                                                   | I.               | II.               | III.         | IV.              |
| $Year_t \cdot SOE_j$                              | -.035<br>(.028)  | -.035<br>(.028)   | -15<br>(16)  | -.021<br>(.06)   |
| $Year_t$                                          | .037<br>(.023)   | -.0063<br>(.026)  | 15<br>(14)   | .16***<br>(.04)  |
| Firm f.e.                                         | Y                | Y                 | Y            | Y                |
| N                                                 | 333              | 336               | 312          | 321              |
| $R^2$                                             | .04              | .01               | .03          | 0.039            |

*Note:* This table reports tests of whether the model characteristics of foreign and domestic firms were on different growth paths prior to the 2009 fuel economy policy. Specifications are variants of Equation 8. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

Table A5: Parallel Trends among Foreign and Domestic Firms prior to the Policy with Year Effects, 1999-2008

| Dep. Variable:               | $X_j = \text{Domestic}_j$ |                  |               |                  | $X_j = \text{Domestic w/ } JV_j$ |                  |                |                  |
|------------------------------|---------------------------|------------------|---------------|------------------|----------------------------------|------------------|----------------|------------------|
|                              | Log Torque                | Log Price        | Weight        | RCL Quality      | Log Torque                       | Log Price        | Weight         | RCL Quality      |
|                              | I.                        | II.              | III.          | IV.              | V.                               | VI.              | VII.           | VIII.            |
| Year <sub>2006</sub> · $X_j$ | 0<br>(.)                  | -0.004<br>(.06)  | 0<br>(.)      | .26<br>(.19)     | .029<br>(.14)                    | .09<br>(.067)    | -23<br>(66)    | .44*<br>(.25)    |
| Year <sub>2007</sub> · $X_j$ | -0.0045<br>(.036)         | 0<br>(.)         | -25<br>(31)   | 0<br>(.)         | .0091<br>(.16)                   | 0<br>(.)         | -36<br>(68)    | 0<br>(.)         |
| Year <sub>2008</sub> · $X_j$ | -0.028<br>(.046)          | .023<br>(.06)    | -23<br>(37)   | .11<br>(.17)     | .028<br>(.14)                    | .11<br>(.078)    | -50<br>(59)    | .12<br>(.25)     |
| Year <sub>2009</sub> · $X_j$ | -0.12**<br>(.061)         | -0.06<br>(.053)  | -59<br>(42)   | -0.27<br>(.19)   | -0.095<br>(.12)                  | -0.0079<br>(.07) | -94*<br>(51)   | -0.33<br>(.26)   |
| Year <sub>2010</sub> · $X_j$ | -0.11<br>(.07)            | -0.072<br>(.062) | -75*<br>(44)  | -0.36*<br>(.21)  | -0.06<br>(.12)                   | -0.054<br>(.076) | -89*<br>(51)   | -0.53*<br>(.31)  |
| Year <sub>2011</sub> · $X_j$ | -0.097<br>(.068)          | -0.13*<br>(.074) | -78*<br>(44)  | -0.53**<br>(.24) | -0.078<br>(.12)                  | -0.13<br>(.1)    | -108**<br>(51) | -0.67**<br>(.32) |
| Year <sub>2012</sub> · $X_j$ | -0.11<br>(.072)           | -0.13*<br>(.078) | -56<br>(50)   | -0.39*<br>(.23)  | -0.076<br>(.12)                  | -0.075<br>(.1)   | -64<br>(53)    | -0.44<br>(.3)    |
| Year <sub>2013</sub> · $X_j$ | -0.11<br>(.073)           | -0.07<br>(.089)  | -101*<br>(56) | -0.18<br>(.27)   | -0.073<br>(.12)                  | -0.04<br>(.11)   | -124**<br>(54) | .0021<br>(.33)   |
| Year f.e.                    | Y                         | Y                | Y             | Y                | Y                                | Y                | Y              | Y                |
| Firm f.e.                    | Y                         | Y                | Y             | Y                | Y                                | Y                | Y              | Y                |
| N                            | 2350                      | 2378             | 2284          | 2336             | 2338                             | 2366             | 2275           | 2324             |
| $R^2$                        | 0.09                      | 0.34             | 0.04          | 0.11             | 0.024                            | 0.12             | 0.026          | 0.075            |

*Note:* This table reports tests of whether the model characteristics of foreign and domestic firms were on different growth paths prior to the 2009 fuel economy policy. Specifications are variants of Equation 8. Standard errors are robust and clustered by firm. \*\*\* indicates  $p < .01$ .

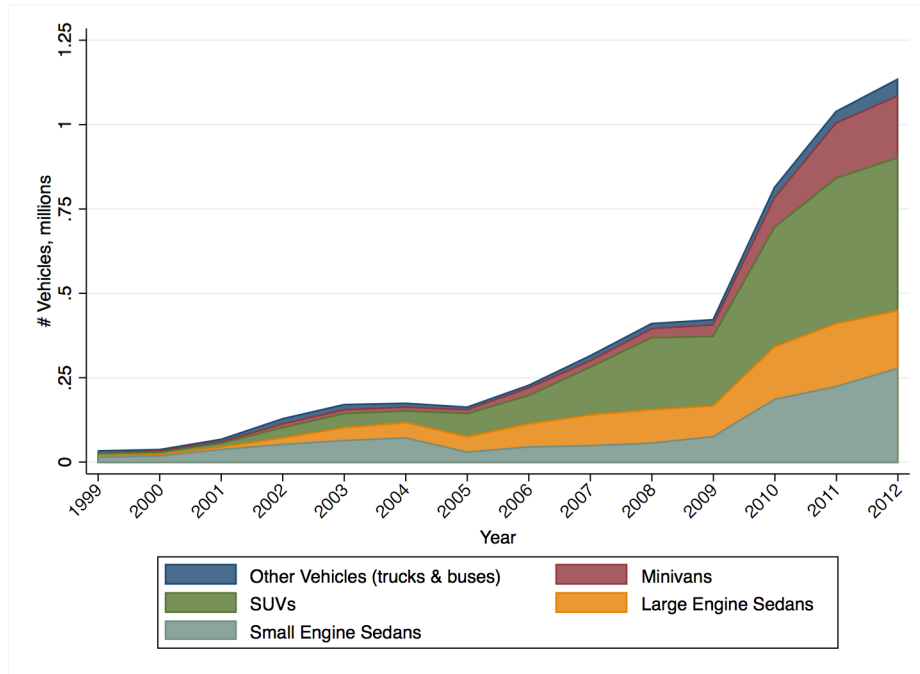


Figure A1: China Light Duty Vehicle Imports

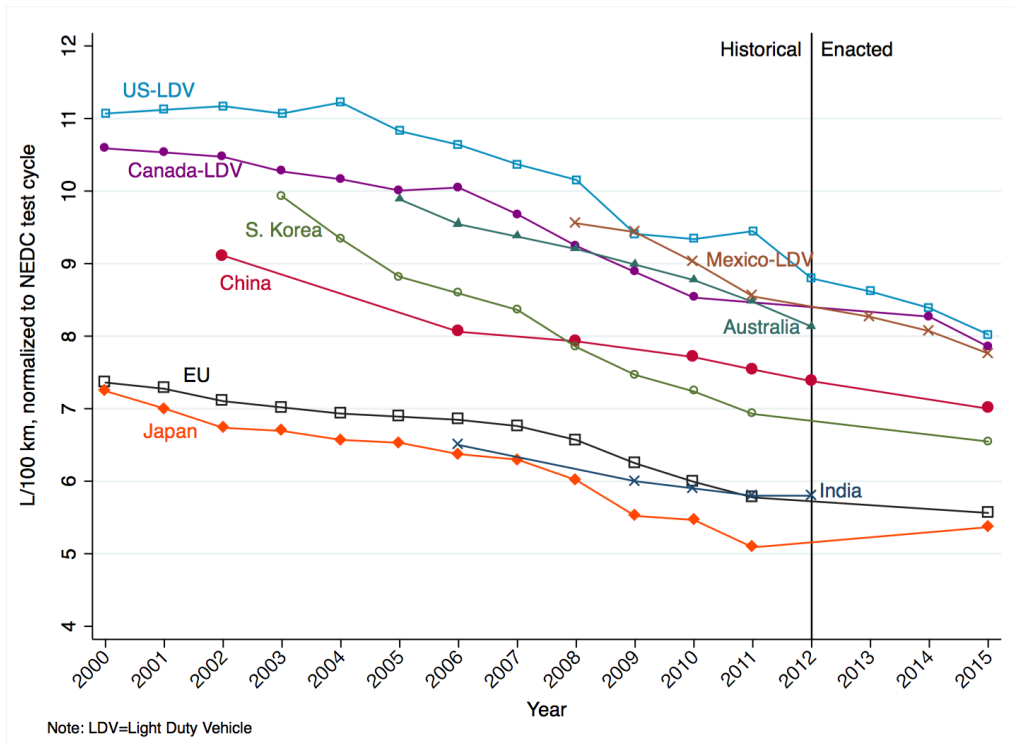


Figure A2: Fuel Economy Standards by Country, 2000-2015

Note: This figure shows historical and enacted fuel economy standards by country, in liters of gasoline per kilometer. Data from ICET (2013).

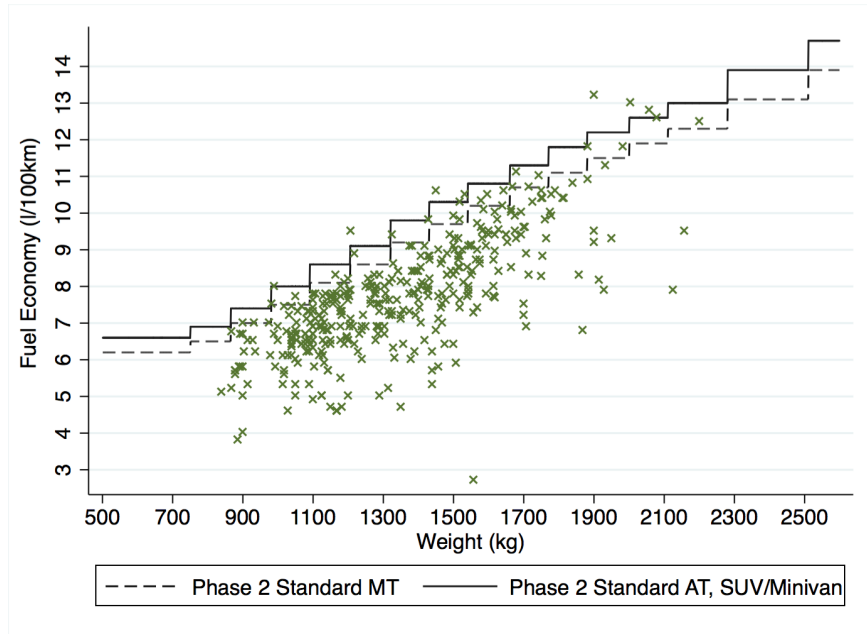


Figure A3: Model Fuel Economy and Weight, with Phase 2 Standards, 2010  
*Note:* This figure shows China's 2009 Phase 2 fuel economy standards. Dotted line is for manual transmission, line is for automatic and all SUVs/minivans.

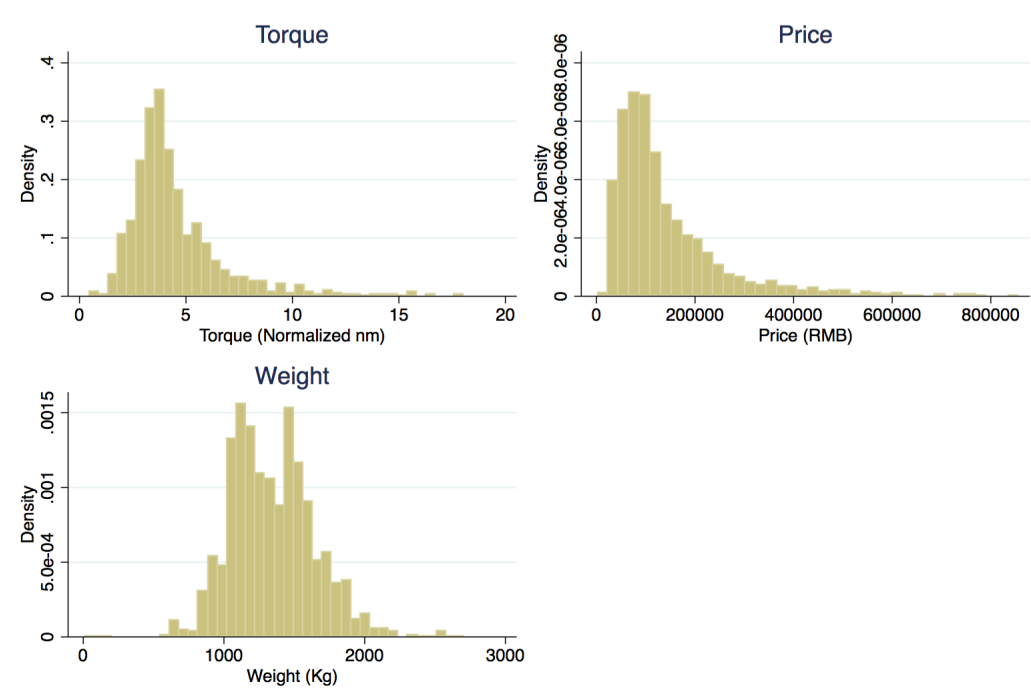


Figure A4: Characteristic Densities  
*Note:* This figure shows the densities of torque, weight, and price. Each observation is a new model-year.