

Table 1 - Summary Statistics for Our Main Hpms  
and Public Transportation Variables

	1983	1993	2003
Mean daily VKT (IH, 1'000 km)	7,776.63	11,904.95	15,960.58
Standard deviations	16,623.98	24,251.06	31,579.29
Mean AADT (IH)	4,832.08	7,174.15	9,360.78
Standard deviations	2,726.30	3,413.23	4,091.54
Mean lane km (IH)	1,140.27	1,208.16	1,279.75
Standard deviations	1,649.76	1,729.43	1,857.58
Mean lane km (IH, per 10,000 population)	1,140.27	1,208.16	1,279.75
Standard deviations	1,649.76	1,729.43	1,857.58
Mean daily VKT (MRU, 1'000 km)	14,553.36	22,449.55	31,242.38
Standard deviations	36,303.49	49,132.38	70,691.90
Mean AADT (MRU)	3,146.14	3,646.52	3,934.20
Standard deviations	846.75	947.42	1,059.11
Mean lane km (MRU)	3,884.81	5,071.38	6,471.45
Standard deviations	7,925.68	9,118.73	12,426.76
Mean VKT share urbanized (IHU/IH)	0.38	0.44	0.48
Mean lane km share urbanized (IHU/IH)	0.30	0.36	0.40
Mean share truck AADT (IH)	0.11	0.12	0.13
Peak service large buses per 10,000 population	1.20	1.09	1.34
Standard deviations	1.02	0.98	0.98
Peak service large buses	168.88	165.26	217.16
Standard deviations	562.93	561.72	741.98
Number MSAs	228.00	228.00	228.00
Mean MSA population	753,726.62	834,290.29	950,054.31

Notes: IH denotes interstate highways for the entire MSA. IHU denotes interstate highways for the urbanized areas within an MSA. MRU denotes major roads for the urbanized areas within an MSA.

Table 1: Vkt as a Function of Lane Kilometers, Univariate Ols by Decade

Year:	(1) 1983	(2) 1993	(3) 2003
<i>Panel A. Dep. var.: ln VKT for interstate highways, entire MSAs</i>			
ln (IH lane km)	1.240*** (0.042)	1.254*** (0.024)	1.232*** (0.022)
$R^2$	0.863	0.868	0.876
<i>Panel B. Dep. var.: ln VKT for interstate highways, urbanized areas within MSAs</i>			
ln (IHU lane km)	1.263*** (0.020)	1.227*** (0.018)	1.199*** (0.019)
<i>Panel C. Dep. var.: ln VKT for major roads, urbanized areas within MSAs</i>			
ln (MRU lane km)	1.079*** (0.017)	1.129*** (0.014)	1.141*** (0.013)
<i>Panel D. Dep. var.: ln VKT for interstate highways, outside urbanized areas within MSAs</i>			
ln (IHNU lane km)	1.060*** (0.034)	1.026*** (0.033)	1.004*** (0.036)

Notes: The same regressions for different types of roads are performed in all four panels. All regressions include a constant. Robust standard errors in parentheses; 228 observations for each regression in panel A and 192 in panels B–D.  
\*\*\* Significant at the 1 percent level.  
\*\* Significant at the 5 percent level.  
\* Significant at the 10 percent level.

Table 2: Vkt as a Function of Lane Kilometers, Ols by Decade

Year:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	1983	1983	1983	1993	1993	1993	2003	2003	2003
<i>Panel A. Dep. var.: ln VKT for interstate highways, entire MSAs</i>									
ln (IH lane km)	0.923*** (0.058)	0.941*** (0.056)	0.918*** (0.054)	0.728*** (0.045)	0.762*** (0.039)	0.769*** (0.039)	0.709*** (0.046)	0.750*** (0.042)	0.764*** (0.042)
ln (population)	0.434*** (0.043)	0.419*** (0.048)	1.014** (0.370)	0.544*** (0.042)	0.513*** (0.039)	0.465 (0.255)	0.532*** (0.044)	0.492*** (0.042)	0.390 (0.346)
Elevation range		-0.057 (0.060)	-0.076 (0.054)		-0.027 (0.056)	-0.038 (0.054)		-0.026 (0.053)	-0.030 (0.048)
Ruggedness		6.807 (3.458)	5.290 (3.239)		5.863 (2.998)	3.899 (3.000)		5.717 (3.061)	3.456 (3.109)
Heating degree days		-0.014** (0.004)	-0.015** (0.005)		-0.012*** (0.003)	-0.013*** (0.004)		-0.011** (0.003)	-0.013*** (0.004)
Cooling degree days		-0.019 (0.010)	-0.027* (0.012)		-0.019** (0.007)	-0.022* (0.009)		-0.019* (0.008)	-0.020* (0.009)
Sprawl		0.006 (0.003)	0.006 (0.004)		0.003 (0.003)	0.002 (0.003)		0.002 (0.003)	0.002 (0.003)
Census divisions		Y	Y		Y	Y		Y	Y
Past populations			Y			Y			Y
Socioeconomic Characteristics			Y			Y			Y
R <sup>2</sup>	0.926	0.943	0.947	0.937	0.953	0.960	0.941	0.955	0.962
<i>Panel B. Dep. var.: ln VKT for interstate highways, urbanized areas within MSAs</i>									
ln (IHU lane km)	1.043*** (0.030)	1.053*** (0.029)	1.060*** (0.032)	0.947*** (0.033)	0.973*** (0.032)	0.995*** (0.035)	0.923*** (0.031)	0.945*** (0.034)	0.970*** (0.037)
<i>Panel B. Dep. var.: ln VKT for interstate highways, urbanized areas within MSAs</i>									
ln (IHU lane km)	0.896*** (0.033)	0.886*** (0.031)	0.877*** (0.032)	0.716*** (0.044)	0.778*** (0.039)	0.797*** (0.039)	0.661*** (0.042)	0.666*** (0.041)	0.704*** (0.044)
<i>Panel B. Dep. var.: ln VKT for interstate highways, urbanized areas within MSAs</i>									
ln (IHU lane km)	0.828*** (0.046)	0.853*** (0.037)	0.836*** (0.034)	0.806*** (0.038)	0.834*** (0.031)	0.823*** (0.028)	0.820*** (0.031)	0.836*** (0.027)	0.832*** (0.027)

*Notes:* The same regressions for different types of roads are performed in all four panels. All regressions include a constant. Robust standard errors in parentheses; 228 observations for each regression in panel A and 192 in panels B–D.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Table 3: VKT as a Function of Lane Kilometers, Pooled ols

MSA sample:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	All	All	All	All	All	All	w.IHU	Big	Small
<i>Dependent variable: ln VKT for interstate highways, entire MSAs</i>										
ln (IH lane km)	1.242*** (0.024)	0.820*** (0.050)	0.860*** (0.046)	0.853*** (0.044)	1.053*** (0.045)	1.058*** (0.047)	1.048*** (0.046)	0.952*** (0.031)	1.050*** (0.044)	1.124*** (0.093)
ln (population)		0.476*** (0.042)	0.438*** (0.042)	0.322** (0.120)		0.336*** (0.099)	0.394*** (0.098)	0.321** (0.106)	0.444*** (0.130)	0.307* (0.138)
Geography			Y	Y						
Census divisions			Y	Y						
Socioeconomic										
Characteristics				Y			Y			
Past populations				Y						
MSA fixed effects					Y	Y	Y	Y	Y	Y
$R^2$	0.877	0.936	0.950	0.955	0.938	0.943	0.946	0.936	0.959	0.927

*Notes:* All regressions include year effects. Robust standard errors in parentheses (clustered by MSA in columns 1–4). Complete sample of 228 MSAs (684 observations) with interstate highways in columns 1–7; 192 MSAs (576 observations) with urban interstate highways in column 8; 114 MSAs (342 observations) above the median population size in 1990 in column 9; 114 MSAs (342 observations) below the median population size in 1990 in column 10.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Table 4: Change in VKT as a Function of Change in Lane Kilometers

	(1) All	(2) All	(3) All	(4) All	(5) All	(6) Lane ↑	(7) Lane ↑	(8) Lane ↓	(9) All	(10) All
<i>Dependent variable: ln VKT for interstate highways, entire MSAs</i>										
$\Delta \ln$ (IH lane km)	1.045*** (0.046)	1.048*** (0.047)	1.019*** (0.040)	0.998*** (0.040)	0.929*** (0.038)	1.086*** (0.058)	0.902*** (0.056)	0.822*** (0.092)	1.027*** (0.054)	1.027*** (0.050)
$\Delta \ln$ (population)		0.341*** (0.101)	0.396*** (0.098)	0.439*** (0.110)	0.393** (0.130)	0.310 (0.165)	0.450* (0.206)	0.165 (0.215)		0.515* (0.200)
$\ln$ (initial VKT)			-0.047*** (0.006)	-0.057*** (0.007)	-0.124*** (0.019)		-0.153*** (0.034)	-0.129** (0.041)		
Geography				Y	Y		Y	Y		
Census divisions										
Socioeconomic					Y		Y			
Characteristics							Y	Y		
Past populations					Y					
MSA fixed effects				Y					Y	Y
$R^2$	0.865	0.873	0.890	0.897	0.906	0.912	0.941	0.689	0.934	0.940
<i>Panel B. Dependent variable: <math>\Delta \ln</math> VKT for interstate highways, entire MSAs, TSLS</i>										
$\Delta \ln$ (IH lane km)	1.045*** (0.046)	1.046*** (0.046)	1.019*** (0.040)	0.998*** (0.040)	0.923*** (0.037)	1.074*** (0.056)	0.897*** (0.052)	0.825*** (0.086)	1.027*** (0.038)	1.027*** (0.035)
$\Delta \ln$ (population)		0.093 (0.180)	0.342* (0.160)	0.454 (0.321)	1.018* (0.445)	-0.162 (0.288)	1.139 (0.719)	1.495 (1.452)		0.617 (0.366)
FSS	.	63.287	54.273	29.198	23.865	45.668	12.314	4.053	.	20.058

*Notes:* All regressions include a constant and decade effects. Robust standard errors clustered by MSA in parentheses. 456 observations for each regression in columns 1–5 and 9–10, 205 in columns 6–7 which consider only increases in lane kilometers of more than 5 percent, and 115 in column 8 which considers declines in lane kilometers greater than 5 percent. Instrument for  $\Delta \ln$  (population) is expected population growth based on initial composition of economic activity.

FSS: First stage statistic

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Table 5: VKT as a Function of Lane Kilometers, IV

	(1)	(2)	(3)	(4)	(5)
<i>Panel A (TSLs)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1835 exploration routes, ln 1898 railroads, and ln 1947 planned interstates					
ln (IH lane km)	1.316*** (0.042)	0.924*** (0.099)	1.032*** (0.114)	1.009*** (0.124)	1.040*** (0.134)
ln (population)		0.405*** (0.074)	0.300*** (0.090)	0.344*** (0.098)	0.233 (0.124)
Geography			Y	Y	Y
Census divisions			Y	Y	Y
Socioeconomic					
Characteristics				Y	Y
Past populations					Y
FSS	42.840	16.484	11.829	11.480	8.836
OpV	0.599	0.107	0.255	0.245	0.289
<i>Panel B (LIML)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1835 exploration routes, ln 1898 railroads, and ln 1947 planned interstates					
ln (IH lane km)	1.317*** (0.042)	0.937*** (0.110)	1.049*** (0.124)	1.025*** (0.135)	1.060*** (0.148)
OpV	0.599	0.109	0.263	0.253	0.297
<i>Panel C (TSLs)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1947 planned interstates					
ln (IH lane km)	1.334*** (0.047)	1.000*** (0.112)	1.103*** (0.126)	1.081*** (0.135)	1.121*** (0.150)
FSS	99.681	41.464	29.769	29.477	26.673
<i>Panel D (TSLs)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1898 railroads					
ln (IH lane km)	1.314*** (0.063)	0.831*** (0.150)	1.026*** (0.178)	1.000*** (0.176)	1.022*** (0.217)
FSS	23.715	25.812	19.048	21.070	11.869
<i>Panel E (TSLs)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1835 exploration routes					
ln (IH lane km)	1.250*** (0.079)	0.634*** (0.171)	0.747*** (0.182)	0.677** (0.207)	0.718*** (0.215)
FSS	53.605	13.789	9.913	7.152	6.321
<i>Panel F (LIML)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1898 railroads, and ln 1947 planned interstates					
ln (IH lane km)	1.389*** (0.043)	1.089*** (0.103)	1.183*** (0.114)	1.151*** (0.132)	1.202*** (0.158)
FSS	37.866	17.730	12.113	14.370	9.506
OpV	0.691	0.095	0.308	0.251	0.290
<i>Panel G (LIML)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1898 railroads, and ln 1947 planned interstates					
ln (IH lane km)	1.333*** (0.049)	0.975*** (0.128)	1.128*** (0.161)	1.081*** (0.155)	1.134*** (0.173)
FSS	53.105	22.655	14.396	15.764	11.681
OpV	0.905	0.532	0.971	0.877	0.807
<i>Panel H (LIML)</i> . Dependent variable: ln VKT for interstate highways, entire MSAs					
<i>Instruments:</i> ln 1898 railroads, and ln 1947 planned interstates					
ln (IH lane km)	1.259*** (0.047)	0.817*** (0.114)	0.929*** (0.128)	0.921*** (0.130)	0.971*** (0.156)
FSS	52.216	20.995	14.250	14.386	9.764
OpV	0.768	0.551	0.960	0.977	0.926

*Notes:* All regressions include a constant (and year effects for panels A–E). Robust standard errors in parentheses (clustered by MSA in panels A–E); 684 observations corresponding to 228 MSAs for each regression for panels A–E and 228 observations for panels F–H.

FSS: First stage statistic

OpV: Overidentification p-value

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Table 6: Vkt as a Function of Lane Kilometers and Buses, Pooled Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	OLS	OLS	OLS	OLS	LIML	LIML	LIML	LIML
<i>Dependent variable: ln VKT for interstate highways, entire MSAs</i>										
ln (IH lane km)	1.068*** (0.036)	0.819*** (0.049)	0.863*** (0.046)	0.863*** (0.045)	1.057*** (0.046)	1.060*** (0.047)	1.378*** (0.076)	0.955*** (0.104)	1.093*** (0.128)	1.178*** (0.165)
ln (bus)	0.137*** (0.019)	-0.023 (0.017)	0.026 (0.019)	0.039* (0.018)	0.021* (0.008)	0.012 (0.007)	-0.035 (0.049)	-0.081 (0.046)	0.119 (0.097)	0.209 (0.137)
ln (population)		0.511*** (0.050)	0.397*** (0.054)	0.259* (0.122)		0.322** (0.099)		0.502*** (0.118)	0.079 (0.207)	-0.149 (0.273)
Geography			Y	Y					Y	Y
Census divisions			Y	Y						
Socioeconomic										Y
Characteristics										Y
Past populations										
MSA fixed effects					Y	Y				
R2	0.901	0.936	0.951	0.956	0.939	0.943	0.859	0.930	0.937	0.931
FSS	.	.	.	.	.	.	23.309	21.056	9.531	5.684
OpV	.	.	.	.	.	.	0.904	0.457	0.467	0.384

*Notes:* All regressions include a constant and year effects. Robust standard errors clustered by MSA in parentheses; 684 observations corresponding to 228 MSAs for each regression. Instruments for buses and lane kilometers are ln 1898 railroads, ln 1947 planned interstates, and 1972 presidential election share of democratic vote.

FSS: First stage statistic ; OpV: Overidentification p-value ; R2 =  $R^2$

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Table 7: Convergence in Daily Traffic

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	OLS	OLS, FE	TSLS
<i>Dependent variable: ln VKT for interstate highways, entire MSAs</i>						
Initial ln IH AADT level	-0.111*** (0.019)	-0.117*** (0.020)	-0.165*** (0.021)	-0.216*** (0.029)	-0.978*** (0.045)	-0.166*** (0.020)
$\Delta \ln(\text{population})$		0.380*** (0.104)	0.475*** (0.108)	0.293* (0.137)		0.692* (0.305)
Geography			Y	Y		Y
Census divisions			Y	Y		Y
Initial share manufacturing				Y		Y
Past populations				Y		
Socioeconomic Characteristics				Y		
R2	0.258	0.317	0.389	0.443	0.816	0.394
FSS	.	.	.	.	.	47.571

*Notes:* All regressions include decade effects. Robust standard errors in parentheses (clustered by MSA); 456 observations corresponding to 228 MSAs for each regression. Instruments for  $\Delta \ln(\text{population})$  is expected population growth based on initial composition of economic activity, interacted with the national growth of sectors.

FSS: First stage statistic ;  $R2 = R^2$

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Table 8: Vkt as a Function of Lane Kilometers and Buses, Pooled Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	OLS	OLS	OLS	OLS	LIML	LIML	LIML	LIML
<i>Dependent variable: ln VKT for interstate highways, entire MSAs</i>										
ln (IH lane km)	1.305*** (0.072)	1.160*** (0.130)	1.199*** (0.134)	1.246*** (0.134)	1.194*** (0.140)	1.455*** (0.261)	1.483*** (0.273)	1.521*** (0.269)	2.089*** (0.442)	2.319*** (0.435)
ln (population)		0.163 (0.084)	0.133 (0.109)	0.227* (0.099)	1.787* (0.787)		2.139* (0.942)	2.022* (0.905)	-0.481 (0.307)	-0.766* (0.344)
Geography			Y	Y					Y	Y
Census divisions			Y	Y					Y	Y
Socioeconomic										
Characteristics				Y						Y
Past populations				Y						Y
MSA fixed effects					Y	Y				
R <sup>2</sup>	0.535	0.538	0.577	0.589	0.614	0.307	0.338	0.342	0.447	0.461
FSS	.	.	.	.	.	.	.	.	16.484	11.829
OpV	.	.	.	.	.	.	.	.	0.267	0.185

*Notes:* All regressions include a constant and year effects. Robust standard errors clustered by MSA in parentheses. Instruments are ln 1835 exploration routes, ln 1898 railroads, and ln 1947 planned interstates; 684 observations corresponding to 228 MSAs for each regression.

FSS: First stage statistic ; OpV: Overidentification p-value ; R<sup>2</sup> = R<sup>2</sup>

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.



Table 9: Vkt as a Function of Lane Kilometers

	(1)	(2)	(3)	(4)	(5)
<i>Panel A. Dependent variable: ln VKT for interstate highways, urbanized areas within MSAs</i>					
ln (IHU lane km)	1.090*** (0.030)	1.010*** (0.026)	1.036*** (0.025)	1.031*** (0.027)	1.040*** (0.029)
ln (IHNU lane km)	-0.026 (0.031)	-0.083** (0.025)	-0.086*** (0.024)	-0.087*** (0.024)	-0.099*** (0.022)
ln (MRU lane km)	0.219*** (0.041)	-0.133* (0.055)	-0.122* (0.057)	-0.121* (0.051)	-0.100* (0.049)
ln (population)		Y	Y	Y	Y
Geography			Y	Y	Y
Census divisions			Y	Y	Y
Socioeconomic Characteristics				Y	Y
Past populations					Y
$R^2$	0.961	0.970	0.974	0.975	0.978
<i>Panel B. Dependent variable: ln VKT for interstate highways, outside urbanized areas within MSAs</i>					
ln (IHU lane km)	0.873*** (0.036)	0.815*** (0.034)	0.842*** (0.026)	0.847*** (0.024)	0.833*** (0.023)
ln (IHNU lane km)	0.032 (0.037)	-0.049 (0.034)	-0.030 (0.031)	-0.030 (0.030)	-0.013 (0.032)
ln (MRU lane km)	0.218*** (0.050)	-0.141* (0.055)	-0.053 (0.052)	-0.046 (0.050)	-0.013 (0.050)
$R^2$	0.854	0.879	0.917	0.921	0.930
<i>Panel C. Dependent variable: ln VKT for major roads, urbanized areas within MSAs</i>					
ln (IHU lane km)	0.873*** (0.036)	0.815*** (0.034)	0.842*** (0.026)	0.847*** (0.024)	0.833*** (0.023)
ln (IHNU lane km)	0.032 (0.037)	-0.049 (0.034)	-0.030 (0.031)	-0.030 (0.030)	-0.013 (0.032)
ln (MRU lane km)	0.218*** (0.050)	-0.141* (0.055)	-0.053 (0.052)	-0.046 (0.050)	-0.013 (0.050)
$R^2$	0.854	0.879	0.917	0.921	0.930

*Notes:* All regressions include a constant and year effects. Robust standard errors clustered by MSA in parentheses; 572 observations corresponding to 192 MSAs for each regression.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.