A Note on Commuting Times and City Size: Testing Variances as well as Means

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ABSTRACT

An extensive literature provides evidence for the co-location of workers and jobs hypothesis; average commute times do not rise appreciably as metropolitan population increases, suggesting that many employers and employees have co-located to accommodate metropolitan area growth. However, there has been much less attention paid to the relationship between commute time variances and city size. That would be a stronger test of the co-location hypothesis because variances are more sensitive to outlier values. In this study, we utilize 2009 Nationwide Highway Travel Survey data and test the relationship between area commute time means as well as variances with metropolitan area size. We include tests for metropolitan areas as a whole and for residents from urban, suburban, second city and town and county areas. The regression analysis shows all estimated slopes are statistically significant, but not much greater than zero; they are also invariant with respect to the place of residence. It is also found that commute time means and variances are highly correlated. These results are additional evidence for the co-location hypothesis.

INTRODUCTION

There have been many doomsayers through history and most have been wrong. Matt Ridley in *The Rational Optimist* (2010) documents much of this. Julian Simon (1995) explains why "impending doomsday" is always impeding. He also lays out the case why forecasts of future doom are likely to

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be wrong.

The longstanding version of this discussion with respect to cities is summarized in the "costs of sprawl" debate. "Sprawl" is vague and pejorative. The critics refer to outward metropolitan growth, but with this understanding, we use the term throughout the paper. Ana (2012) provides a succinct and timely introduction. Bruegmann (2005) reminds us that sprawl is long-standing and almost universal. As cities grow, they expand outward and the costs of the resulting sprawl are thought to dominate and also limit further growth. Increased transportation costs are often cited as a major component of urban growth costs. A simple rendering of the story defines the original static model of optimal urban size, in which the costs of city size increase at an increasing rate, but the benefits increase at a decreasing rate. The two curves cross denoting the optimal urban scale. See Figure 1. Putting aside the discussion of how such curves might shift in a dynamic setting, it is also of interest to question their hypothesized shape. See Harry Richardson (1973) for the full critique.

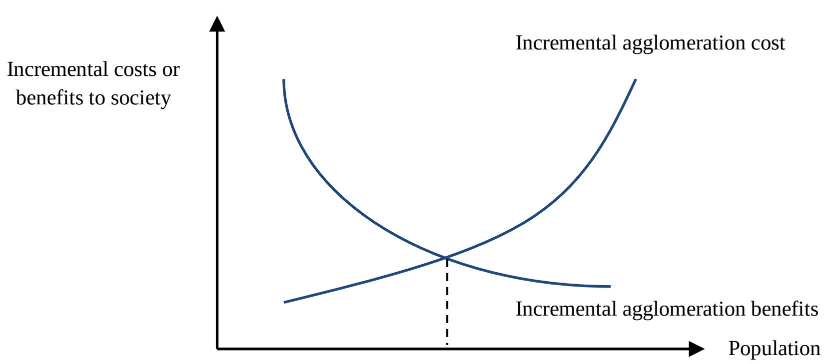


Figure 1. Incremental Costs and Benefits of Agglomeration.

THE ROLE OF "SPRAWL"

The market failures associated with highway traffic congestion are well known. When access is unpriced, congestion is the default rationing mechanism. Beyond this, the extra commuting costs associated with urban growth and expansion have been studied for many years by investigators interested in the costs of sprawl. But, the association between sprawl and commuting costs has also been challenged. Employers as well as population suburbanize almost everywhere. This simple recognition suggests that it is likely that employers and employees each have incentives to co-locate to the suburbs in ways that reduce the costs of interacting with each other. To be sure, each locator trades off a large number of attractors and repellers associated with a large number of possible locations, but firms' access to labor is important for both employees and employers. With enough such co-location, urban sprawl can be thought of as an accommodation to urban growth, scale and spread. From this point of view, it is a solution instead of the problem. Much of this literature is cited and discussed in Gordon and Richardson (2012).

We refer to "cities," but emphasize the entire metropolitan area. Cities do get bigger. We now observe larger metropolitan regions (and even mega-regions) around the world. Growing cities are strong evidence of the net advantages they provide. Lee's work (2011) provides strong evidence for the benign co-location view. Using U.S. Census journey-to-work data, he analyzes commuting trip times for a cross-section of 79 large U.S. metro areas. Within each area, he categorizes workers by their place of work:

(i) the central business district (accounting for 7 percent of workers in the 14 metro areas above 5-million population in 2000),

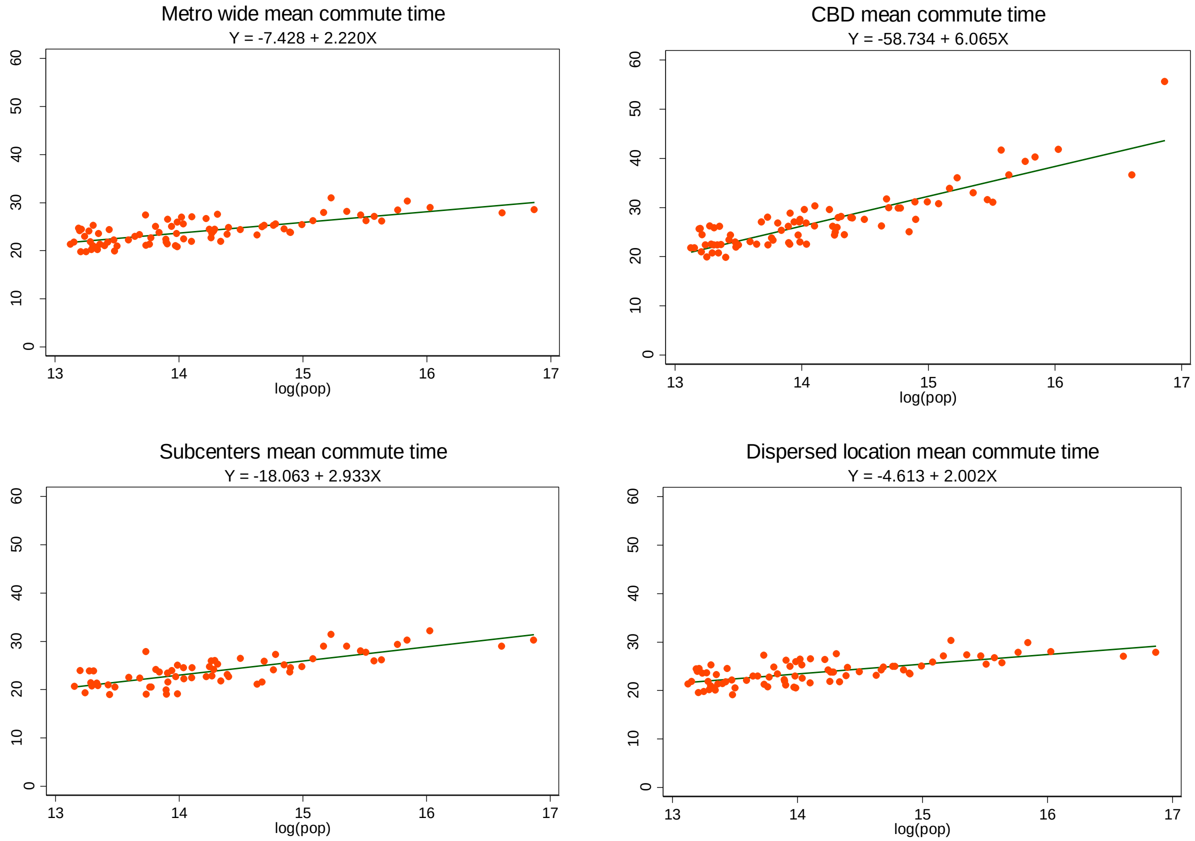
(ii) the various subcenters (accounting for 15 percent), or

(iii) "dispersed" (accounting for 78 percent; census tracts with employment densities too low to qualify as subcenters).

Two of the key findings are:

(i) as metro area populations get larger, average trip times increase, but the slope associated with this increase is quite shallow; and

(ii) the slope is even shallower if only subcenter workers are considered, and shallowest if only dispersed workers are considered.



Note: Mean commuting time was calculated only for the drive-alone mode.

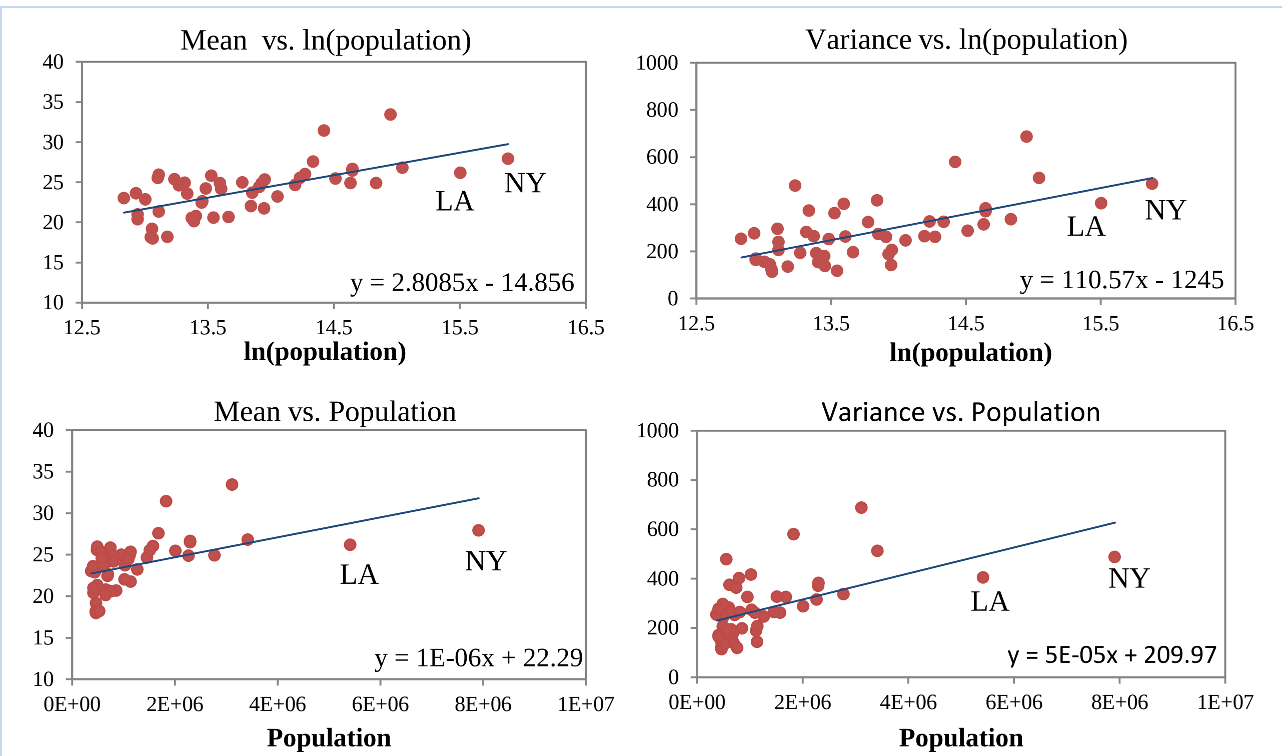
Figure 2. Mean Commute Time by Workplace Location Type versus Metro Population Size (Lee, 2011)

TRAVEL TIME VARIANCE

If the relationship between mean travel times and city size provides some support for the accommodation view, what do we expect when studying travel time variances and their relationship to city size? Estimated means are less sensitive to outlier values than are estimated variances. This suggests that a stronger test of the accommodation hypothesis involves variances.

We use data from self-reported trip diaries from the 2009 Nationwide Highway Travel Survey (NHTS, http://nhts.ornl.gove/). NHTS describes the place of residence of interviewees along an urban continuum from “most central” to most “suburban-exurban.” We adopt their categories, “urban,” “suburban,” “second city,” and “town and country;” and examine data for these four categories as well as for each metropolitan area as a whole.

We have estimated relationships between mean one-way worktrip travel time (in minutes) and city size. We do the same thing for the variance of travel time and city size. We restricted the analysis to data for solo-, privately operated vehicles only. There are ten relationships of interest. There are 47 observations, one for each largest U.S. metropolitan areas, for each case except the "urban" category. The number of responses for each metropolitan area is shown in Appendix 1. The following Figures show these estimated relationships: Figure 3 is for means and variances for the metropolitan areas as a whole. Figure 4 is for "urban" residents, Figure 5 for "suburban" residents, Figure 6 for "second city" residents, and Figure 7 is for "town and country" residents. More detailed statistics are shown in Appendices 2 and 3. Regression results for tests that use the log of population and compress the horizontal axis are also given.



Note: NHTS populations and metropolitan area designations are slightly smaller than those conventionally used.

Figure 3. Metropolitan (Pooled)

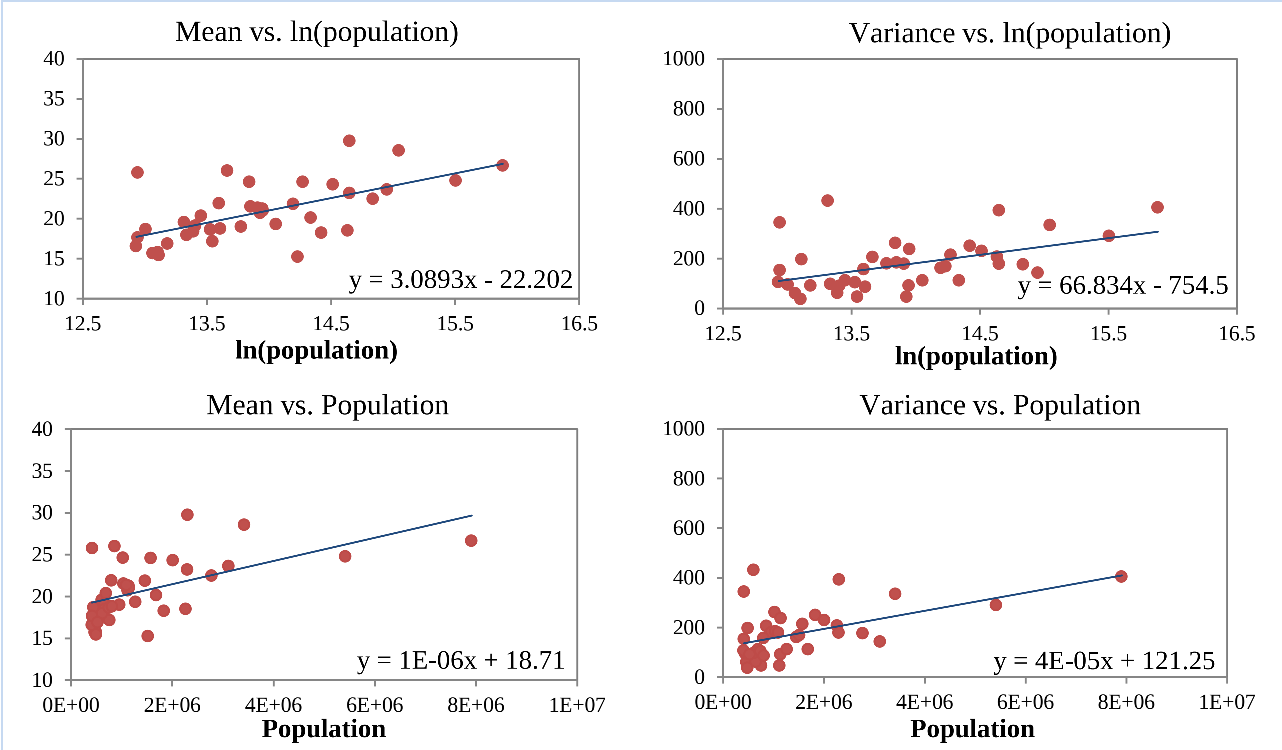


Figure 4.Urban

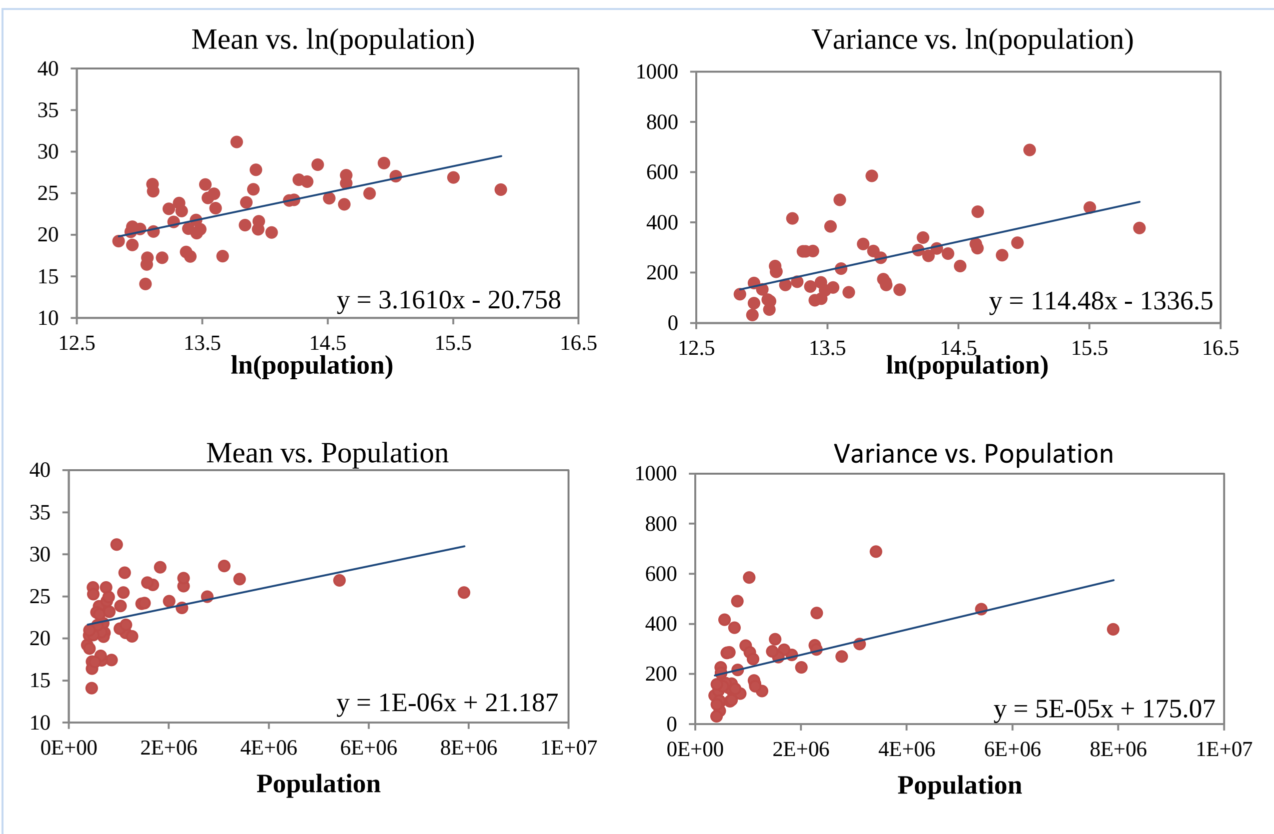


Figure 5.Suburban means

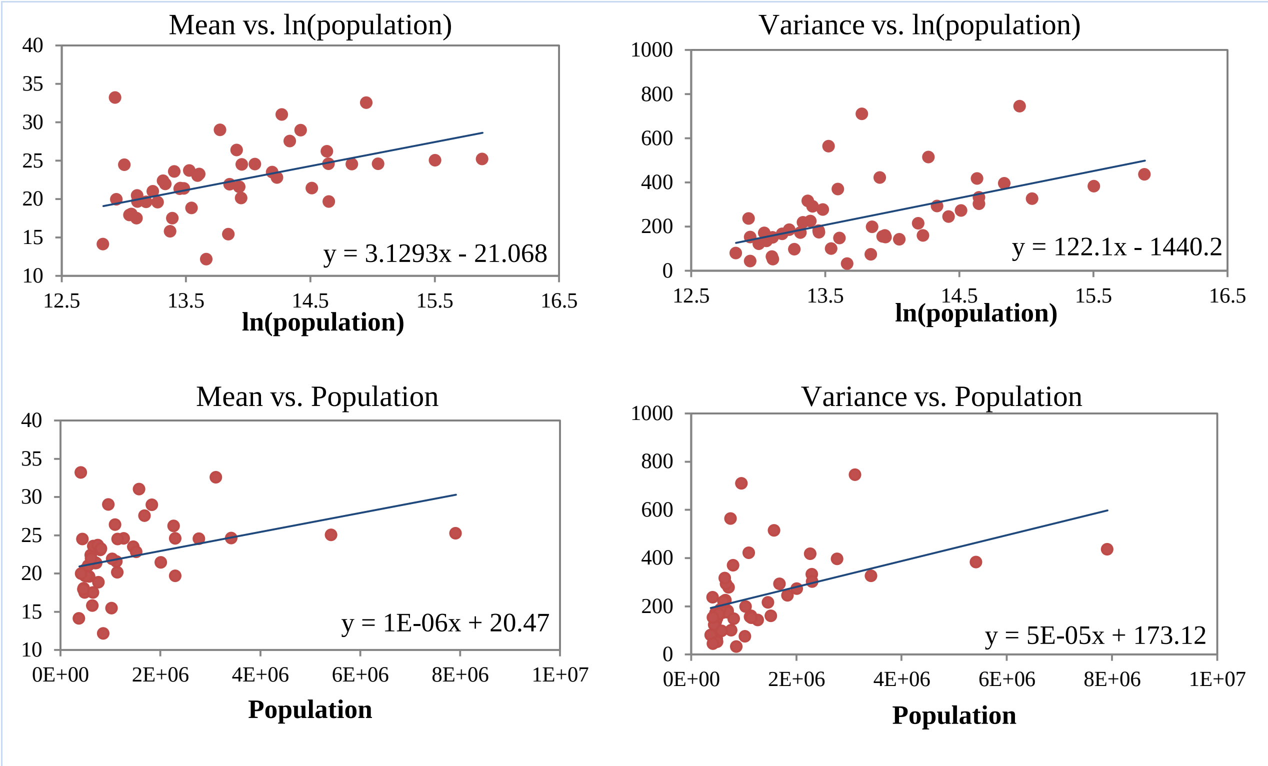


Figure 6.Second city

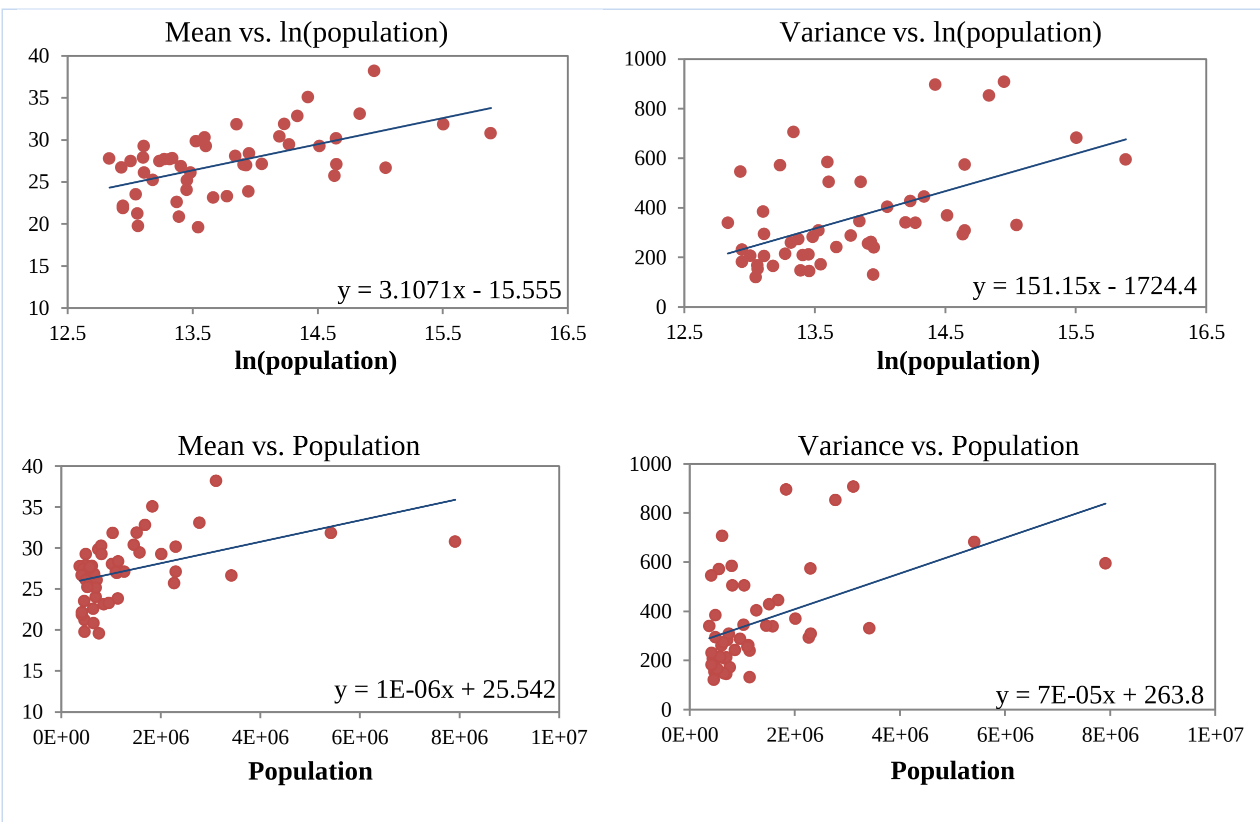


Figure 7.Town and country means

These results reveal the following.

(i) All of the estimated slopes are statistically different from zero.

(ii) All of the slopes are not much greater than zero. They are surprisingly flat.

(iii) These slopes are almost invariant to (NHTS) place of residence.

(iv) The slopes for plots of mean travel time against population are just slightly smaller than the slopes for the plots of variances vs. population.

(v) The ln(population) coefficients are consistent with Lee's results (2011).

(vi) Mega cities Los Angeles and New York appear to have much lower means and variances compared to the regression line using population as the independent variable.

The slopes for worktrip means and variances are summarized in Table 1 and Table 2. When using population as the independent variable, all coefficients are approximately 1.3E-06 for mean commute time, which implies that an increase in city population of 1 million leads to an increase in average commute times by only increase by 1.3 minutes. When using ln (population) as the independent variable, all coefficients for mean commute time are around 3.0, which are quite consistent with Lee's (2011) work summarized in Figure 2.

Regressions with regard to variances show very similar results. For metropolitan areas as a whole, urban, suburban, second city and town and country, the correlation between worktrip means and variances are 0.824, 0.665, 0.618, 0.679 and 0.788 respectively. Further, the small slopes for variances also indicate that as cities expand, the variation only increases slightly. The close association between average worktrip times and variances and the increases in both worktrip times and variances with population suggests a decrease in travel time reliability in the largest cities. Higher travel time reliability means fewer trade-offs between the risks of early and late arrivals. The expected network performance losses associated with a decrease in travel time reliability are mitigated by co-locaton strategies.   Thus the data suggest a further incentive for co-location, and support for the co-location hypothesis.

Another important observation consists of the relatively low means and variances for Los Angeles and New York. When using ln (population) as independent variable, these two cities are below the estimated regression line. The size effect is *most* muted for the largest places.

In addition to the results shown here, regressions using density as the independent variable, and regressions using population and density as independent variables were also performed. When density alone is used as the independent variable, only half of the coefficient estimates in the various regressions are statistically significant. When both density and population are used as independent variables, none of the coefficients for density are statistically significant, most likely the result of collinearity.

CONCLUSIONS

All five sets of regression results provide strong evidence for the co-location hypothesis. Mean travel times do *not* rise appreciably with metro area population or location, but neither do the variances of travel times which are much more sensitive to outlier values. Sprawl, at least as measured by commuting costs, appears to be less of a market failure amplifying efficiency losses in larger cities than it is a co-location mechanism for mitigating externalities.

Tables 1 and 2 summarize the estimated coefficients for the population and log population variables, respectively. The comparisons demonstrate how small the slope coefficients are in either set of regressions, and how minor the differences are across geographic residence. A second set of ten regressions added census divisions as indicator variables, providing a rough proxy for city development vintage. See Appendix 3. Even with this set of controls in place, the estimation results provide no evidence to modify our conclusions with respect to area population explaining either the variation of travel time means or travel time variances.

Table 1. Summary of Estimated Population Coefficients

Area	DV: Means	DV: Variances	DV: Means with Census Division Controls	DV: Variances with Census Division Controls
Metro	0.0000012	0.0000526	0.0000014	0.0000550
Urban	0.0000014	0.0000365	0.0000013	0.0000316
Suburban	0.0000012	0.0000505	0.0000012	0.0000440
Second City	0.0000012	0.0000537	0.0000016	0.0000526
Town and Country	0.0000013	0.0000726	0.0000015	0.0000747

Table 2. Summary of Estimated Log Population Coefficients

Area	DV: Means	DV: Variances	DV: Means with Census Division Controls	DV: Variances with Census Division Controls
Metro	2.8085	100.57	3.3887	122.65
Urban	3.0893	66.83	2.8650	59.86
Suburban	3.1610	114.48	3.3453	105.61
Second City	3.1293	122.10	3.9241	130.07
Town and Country	3.1071	151.15	3.4662	157.21

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APPENDIX 1: Number of responses for each metropolitan area

	Metro	Urban	Suburban	Second City	Town and County
Atlanta	649	12	295	35	307
Austin--San Marcos	958	95	333	111	419
Boston--Worcester—Lawrence	365	12	120	48	185
Buffalo—Niagara	428	58	171	58	141
Charlotte--Gastonia—Rock	399		93	52	254
Chicago--Gary—Kenosha	538	58	275	68	137
Cincinnati—Hamilton	99	5	30	8	56
Cleveland--Akron	140	16	60	17	47
Columbus,	75	10	37	9	19
Dallas—Fort	3969	312	1560	1134	963
Denver--Boulder--Greeley	107	7	32	38	30
Detroit--Ann Arbor	201	14	83	38	66
Grand Rapids--Muskegon—Holland	54		20		32
Greensboro--Winston-Salem—High	3612		705	615	2292
Hartford	77	5	21	8	43
Houston--Galveston—Brazoria	2589	301	977	665	646
Indianapolis	634	35	290	87	222
Jacksonville	673		264	135	274
Kansas City	86		29	20	37
Las Vegas	97	25	36	22	14
Los Angeles-Riverside-Orange County	4105	1497	1452	832	323
Louisville	101		36	11	53
Memphis	218	35	89	33	61
Miami	1658	754	784	100	20
Milwaukee	328	51	123	28	126
Minneapolis	189	19	81	15	74
Nashville	427		118	61	248
New Orleans	48	18	6	11	13
New York-Northern New Jersey--Long Island	3806	598	1208	360	1640
Norfolk--Virginia Beach--Newport News	2158	153	684	727	594
Oklahoma	60		17	29	14

Orlando	711	82	391	74	164
Philadelphia--Wilmington--Atlantic City	297	32	137	31	97
Phoenix	2788	748	1123	380	537
Pittsburgh	89	5	16	8	60
Portland—Salem	107	18	54	17	18
Providence--Fall River—Warwick	151	27	66	9	49
Raleigh--Durham--Chapel Hill,	361		129	41	191
Rochester	535	19	210	5	301
Sacramento-Yolo	695	199	230	119	147
St. Louis	130	9	37	21	63
Salt Lake City-Ogden	103	37	41	16	9
San Antonio	1177	124	484	291	278
San Diego	3631	758	1571	932	370
San Francisco--Oakland--San Jose	2312	885	723	431	273
Seattle--Tacoma—Bremerton	136	9	54	33	40
Tampa--St. Petersburg—Clearwater	1022	374	283	171	194
Washington—Baltimore	1661	105	443	384	729
West Palm Beach--Boca Raton	433	8	249	114	62

Note: The empty cells have no or too few surveys which fit the "solo privately operated vehicles" criterion

APPENDIX 2: ANOVA tables with population as the independent variable

Metropolitan area

	Mean Time to Work ~ Population					**Variance ~ Population**				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	1.87E+01	6.98E-01	26.802	<2.0E-16	***	1.21E+02	1.98E+01	6.114	3.98E-07	***
Population	1.39E-06	3.38E-07	4.111	2.03E-04	***	3.65E-05	9.60E-06	3.803	5.04E-04	***
	Multiple R-squared: 0.3078, Adjusted R-squared: 0.2896, F-statistic: 16.9 on 1 and 38 DF, p-value: 0.0002031					Multiple R-squared: 0.2757, Adjusted R-squared: 0.2566, F-statistic: 14.46 on 1 and 38 DF, p-value: 0.0005041				

Urban

	Mean Time to Work ~ Population					Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	1.87E+01	6.98E-01	26.802	<2.0E-16	***	1.21E+02	1.98E+01	6.114	3.98E-07	***
Population	1.39E-06	3.38E-07	4.111	2.03E-04	***	3.65E-05	9.60E-06	3.803	5.04E-04	***
	Multiple R-squared: 0.3078, Adjusted R-squared: 0.2896, F-statistic: 16.9 on 1 and 38 DF, p-value: 0.0002031					Multiple R-squared: 0.2757, Adjusted R-squared: 0.2566, F-statistic: 14.46 on 1 and 38 DF, p-value: 0.0005041				

Suburban

	Mean Time to Work ~ Population					Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	2.12E+01	6.64E-01	31.909	<2.00E-16	***	1.75E+02	2.41E+01	7.265	3.25E-09	***
Population	1.24E-06	3.53E-07	3.507	1.01E-03	**	5.05E-05	1.28E-05	3.946	2.64E-04	***
	Multiple R-squared: 0.2074, Adjusted R-squared: 0.1905, F-statistic: 12.3 on 1 and 47 DF, p-value: 0.001009					Multiple R-squared: 0.2489, Adjusted R-squared: 0.2329 F-statistic: 15.57 on 1 and 47 DF, p-value: 0.0002637				

Secondary city

	Mean Time to Work ~ Population					Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	2.05E+01	9.08E-01	22.558	<2.00E-16	***	1.73E+02	2.91E+01	5.952	3.42E-07	***
Population	1.24E-06	4.77E-07	2.596	0.0126	*	5.37E-05	1.53E-05	3.513	0.00101	**
	Multiple R-squared: 0.1278, Adjusted R-squared: 0.1088, F-statistic: 6.739 on 1 and 46 DF, p-value: 0.01262					Multiple R-squared: 0.2115, Adjusted R-squared: 0.1944, F-statistic: 12.34 on 1 and 46 DF, p-value: 0.001005				

Town and country

Mean Time to Work ~ Population						Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	2.55E+01	6.98E-01	36.622	<2.00E-16	***	2.64E+02	3.53E+01	7.464	1.62E-09	***
Population	1.31E-06	3.70E-07	3.538	9.19E-04	***	7.26E-05	1.88E-05	3.865	3.39E-04	***
	Multiple R-squared: 0.2103, Adjusted R-squared: 0.1935 F-statistic: 12.52 on 1 and 47 DF, p-value: 0.0009193					Multiple R-squared: 0.2412, Adjusted R-squared: 0.2251 F-statistic: 14.94 on 1 and 47 DF, p-value: 0.0003393				

*Note: Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

APPENDIX 3: ANOVA tables with population and census division as the independent variables

Metropolitan

	Mean Time to Work ~ Population					Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	2.16E+01	1.19E+00	18.157	<2.00E-16	***	2.43E+02	4.61E+01	5.279	5.17E-06	***
Population	1.41E-06	2.88E-07	4.882	1.81E-05	***	5.50E-05	1.12E-05	4.917	1.63E-05	***
D1	8.15E-01	1.79E+00	0.454	0.6521		-3.19E+01	6.96E+01	-0.458	0.6496	
D2	-1.39E+00	1.52E+00	-0.914	0.3664		-8.17E+01	5.89E+01	-1.387	0.1733	
D3	-8.03E-01	1.34E+00	-0.599	0.5529		-9.01E+01	5.21E+01	-1.73	0.0916	.
D4	6.57E-02	2.73E+00	0.024	0.981		-1.45E+02	1.06E+02	-1.369	0.1789	
D5	2.45E+00	1.30E+00	1.878	0.0678	.	2.72E+01	5.06E+01	0.539	0.5933	
D6	1.52E+00	1.83E+00	0.829	0.4121		2.64E+01	7.11E+01	0.372	0.7122	
D7	1.10E+00	1.48E+00	0.745	0.4607		-2.48E+01	5.73E+01	-0.432	0.6679	
D8	-7.19E-01	1.55E+00	-0.465	0.6446		-1.11E+02	6.00E+01	-1.841	0.0732	.
D9	NA	NA	NA	NA		NA	NA	NA	NA	
	Multiple R-squared: 0.4671, Adjusted R-squared: 0.3442, F-statistic: 3.799 on 9 and 39 DF, p-value: 0.001634					Multiple R-squared: 0.5131, Adjusted R-squared: 0.4007, F-statistic: 4.566 on 9 and 39 DF, p-value: 0.0003781				

Urban

	Mean Time to Work ~ Population					Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	1.90E+01	1.42E+00	13.377	2.04E-14	***	1.40E+02	4.30E+01	3.244	0.00282	**
Population	1.32E-06	3.50E-07	3.762	0.000704	***	3.16E-05	1.06E-05	2.987	0.00546	**
D1	-3.84E+00	2.14E+00	-1.797	0.082147	.	-2.74E+01	6.47E+01	-0.423	0.67523	
D2	-4.29E-01	1.81E+00	-0.237	0.813861		2.21E+01	5.47E+01	0.404	0.68903	
D3	1.63E+00	1.63E+00	1.002	0.323987		-1.16E+01	4.94E+01	-0.236	0.81524	
D4	NA	NA	NA	NA		NA	NA	NA	NA	
D5	1.03E+00	1.73E+00	0.595	0.556347		1.91E+01	5.25E+01	0.364	0.7184	
D6	-8.84E-01	3.27E+00	-0.271	0.788523		-5.92E+01	9.90E+01	-0.597	0.55454	
D7	-9.57E-01	1.75E+00	-0.545	0.589349		-4.74E+00	5.32E+01	-0.089	0.92947	
D8	-1.16E+00	1.84E+00	-0.632	0.532302		-8.10E+01	5.58E+01	-1.452	0.15642	
D9	NA	NA	NA	NA		NA	NA	NA	NA	
	Multiple R-squared: 0.4702, Adjusted R-squared: 0.3334, F-statistic: 3.439 on 8 and 31 DF, p-value: 0.006044					Multiple R-squared: 0.3696, Adjusted R-squared: 0.2069, F-statistic: 2.272 on 8 and 31 DF, p-value: 0.04849				

Note: There's no observation for cities in D4.

Suburban

Mean Time to Work ~ Population						Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	2.18E+01	1.62E+00	13.427	3.31E-16	***	3.12E+02	5.63E+01	5.536	2.28E-06	***
Population	1.22E-06	3.94E-07	3.102	0.00356	**	4.40E-05	1.37E-05	3.219	0.00259	**
D1	2.71E-01	2.45E+00	0.111	0.91245		-1.12E+02	8.50E+01	-1.314	0.19649	
D2	-7.66E-01	2.07E+00	-0.37	0.71346		-1.59E+02	7.20E+01	-2.206	0.03334	*
D3	-2.44E+00	1.83E+00	-1.334	0.19006		-1.51E+02	6.37E+01	-2.375	0.02254	*
D4	-2.43E+00	3.73E+00	-0.652	0.51805		-2.47E+02	1.30E+02	-1.904	0.06429	.
D5	9.47E-01	1.78E+00	0.532	0.59767		-1.24E+02	6.18E+01	-2.013	0.05109	.
D6	-1.33E+00	2.50E+00	-0.532	0.5978		-1.12E+02	8.68E+01	-1.287	0.20557	
D7	-7.19E-01	2.01E+00	-0.357	0.72294		-1.56E+02	7.00E+01	-2.222	0.03215	*
D8	-2.67E-01	2.11E+00	-0.127	0.89981		-1.80E+02	7.33E+01	-2.457	0.01857	*
D9	NA	NA	NA	NA		NA	NA	NA	NA	
	Multiple R-squared: 0.309, Adjusted R-squared: 0.1495, F-statistic: 1.938 on 9 and 39 DF, p-value: 0.07477					Multiple R-squared: 0.3998, Adjusted R-squared: 0.2613, F-statistic: 2.887 on 9 and 39 DF, p-value: 0.0103				

Secondary city

Mean Time to Work ~ Population						Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	1.87E+01	2.10E+00	8.924	7.31E-11	***	1.52E+02	6.73E+01	2.262	0.0295	*
Population	1.62E-06	5.11E-07	3.168	0.00303	**	5.26E-05	1.64E-05	3.21	0.0027	**
D1	6.53E-01	3.16E+00	0.206	0.83756		-3.20E+01	1.02E+02	-0.316	0.754	
D2	-2.32E+00	2.68E+00	-0.868	0.39106		4.57E+01	8.59E+01	0.533	0.5974	
D3	-2.20E-01	2.42E+00	-0.091	0.92799		-1.75E+01	7.75E+01	-0.226	0.8225	
D4	1.56E+00	4.82E+00	0.323	0.7482		-1.59E+01	1.55E+02	-0.102	0.9189	
D5	3.32E+00	2.30E+00	1.444	0.15682		1.27E+02	7.38E+01	1.723	0.093	.
D6	3.92E-01	3.23E+00	0.121	0.90419		-4.80E+01	1.04E+02	-0.463	0.6462	
D7	4.38E+00	2.60E+00	1.683	0.1005		1.76E+01	8.35E+01	0.211	0.8342	
D8	1.22E+00	2.73E+00	0.448	0.65656		-5.10E+01	8.75E+01	-0.583	0.5635	
D9	NA	NA	NA	NA		NA	NA	NA	NA	
	Multiple R-squared: 0.3039, Adjusted R-squared: 0.139, F-statistic: 1.843 on 9 and 38 DF, p-value: 0.09187					Multiple R-squared: 0.3698, Adjusted R-squared: 0.2205, F-statistic: 2.477 on 9 and 38 DF, p-value: 0.02468				

Town and country

	Mean Time to Work ~ Population					Variance ~ Population				
	Estimate	Std. Error	T value	Pr(>|t|)		Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	2.80E+01	1.39E+00	20.161	<2.00E-16	***	4.09E+02	7.39E+01	5.536	2.29E-06	***
Population	1.52E-06	3.37E-07	4.497	6.03E-05	***	7.47E-05	1.79E-05	4.161	0.000169	***
D1	-3.06E+00	2.10E+00	-1.458	0.152937		-1.96E+02	1.12E+02	-1.76	0.086308	.
D2	-7.09E+00	1.77E+00	-3.995	0.000278	***	-2.75E+02	9.45E+01	-2.908	0.005979	**
D3	-4.94E+00	1.57E+00	-3.145	0.003173	**	-2.74E+02	8.35E+01	-3.277	0.002212	**
D4	-3.88E+00	3.19E+00	-1.213	0.232273		-3.17E+02	1.70E+02	-1.863	0.06998	.
D5	-9.62E-01	1.52E+00	-0.631	0.531455		-6.63E+01	8.11E+01	-0.817	0.418641	
D6	-1.11E+00	2.14E+00	-0.519	0.606604		-7.14E+01	1.14E+02	-0.626	0.534861	
D7	-1.22E+00	1.73E+00	-0.704	0.485476		-7.91E+01	9.19E+01	-0.861	0.394371	
D8	-3.68E+00	1.81E+00	-2.039	0.048317	*	-2.17E+02	9.62E+01	-2.259	0.029563	*
D9	NA	NA	NA	NA		NA	NA	NA	NA	
	Multiple R-squared: 0.5422, Adjusted R-squared: 0.4365, F-statistic: 5.132 on 9 and 39 DF, p-value: 0.0001353					Multiple R-squared: 0.5146, Adjusted R-squared: 0.4026, F-statistic: 4.594 on 9 and 39 DF, p-value: 0.0003591				