

Appendix J – Results with Ukrainian Closed Cities

The F values in this section is the test results on conducting Wald tests on *closed_city* + *country_ind* = 0.

TABLE J.1: LN URBAN LIGHT LUMINOSITY SUM REGRESSIONS FOR FIVE ECONOMIC PERIODS, ADJACENT CITY COMPARISON, RUSSIA AND UKRAINE

	(1)	(2)	(3)	(4)	(5)
Insum	1992 – 1998	1999 – 2007	2008 – 2009	2010 – 2012	2013–
closed_city	0.568*** (0.0858)	0.588*** (0.0696)	0.612*** (0.161)	0.454*** (0.113)	0.542*** (0.0818)
urban_settle ment	-4.008*** (0.203)	-4.090*** (0.166)	-4.110*** (0.384)	-4.103*** (0.270)	-4.196*** (0.193)
Trip_Advis or	-0.202 (0.208)	-0.130 (0.168)	-0.0279 (0.381)	-0.127 (0.268)	-0.312 (0.198)
sci_related	0.546** (0.180)	0.568*** (0.146)	0.732* (0.341)	0.637** (0.240)	0.540** (0.171)
country_ind	-0.634*** (0.176)	-0.599*** (0.142)	-0.574 (0.332)	-0.639** (0.234)	-0.712*** (0.167)

_cons	9.429*** (0.210)	9.425*** (0.169)	9.049*** (0.384)	9.530*** (0.270)	9.625*** (0.200)
<i>N</i>	1349	1730	390	585	1351
<i>R</i> ²	0.446	0.523	0.502	0.528	0.547
F	0.17	0.01	0.02	0.74	1.21

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE J.2: LN URBAN LIGHT LUMINOSITY COUNT REGRESSIONS FOR FIVE ECONOMIC PERIODS,
ADJACENT CITY COMPARISON, RUSSIA AND UKRAINE

	(1)	(2)	(3)	(4)	(5)
	lncount	lncount	lncount	lncount	lncount
closed_city	0.286*** (0.0797)	0.313*** (0.0667)	0.380* (0.149)	0.182 (0.111)	0.271*** (0.0778)
urban_settle ment	-4.356*** (0.188)	-4.465*** (0.159)	-4.531*** (0.354)	-4.538*** (0.264)	-4.503*** (0.183)
Trip_Advis or	-0.395* (0.193)	-0.306 (0.161)	-0.210 (0.351)	-0.333 (0.262)	-0.483* (0.188)

sci_related	0.522** (0.167)	0.503*** (0.140)	0.617 (0.315)	0.537* (0.235)	0.445** (0.163)
country_ind	-0.742*** (0.163)	-0.695*** (0.136)	-0.653* (0.307)	-0.772*** (0.229)	-0.761*** (0.159)
_cons	7.048*** (0.195)	7.061*** (0.162)	6.694*** (0.355)	7.293*** (0.265)	7.350*** (0.190)
<i>N</i>	1349	1730	390	585	1351
<i>R</i> ²	0.490	0.549	0.528	0.570	0.573
F	9.19**	9.18**	0.93	7.82**	11.15***
Standard errors in parentheses					
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$					

TABLE J.3: LN URBAN LIGHT LUMINOSITY SUM REGRESSIONS FOR FIVE ECONOMIC PERIODS,
SIMILAR CITY COMPARISON, RUSSIA AND UKRAINE

	(1)	(2)	(3)	(4)	(5)
lnsum	1992 – 1998	1999 – 2007	2008 – 2009	2010 – 2012	2013–
closed_city	0.340*** (0.0930)	0.382*** (0.0778)	0.354* (0.179)	0.294* (0.123)	0.421*** (0.0789)
urban_settl	-0.0707	-0.158	-0.183	-0.136	-0.259*

ement	(0.147)	(0.123)	(0.284)	(0.196)	(0.124)
Trip_Advis	-0.422*	-0.323	-0.374	-0.292	-0.444*
or	(0.207)	(0.172)	(0.387)	(0.267)	(0.176)
sci_related	-0.0628	-0.0363	0.0469	0.0300	-0.0701
	(0.165)	(0.138)	(0.319)	(0.220)	(0.140)
country_ind	-0.693***	-0.672***	-0.562	-0.489	-0.502**
	(0.189)	(0.158)	(0.366)	(0.252)	(0.160)
_cons	9.320***	9.304***	9.180***	9.317***	9.400***
	(0.210)	(0.174)	(0.392)	(0.270)	(0.178)
<i>N</i>	674	866	196	294	674
<i>R</i> ²	0.838	0.852	0.840	0.873	0.883
F	3.65	3.51	0.34	0.63	0.26
Standard errors in parentheses					
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$					

TABLE J.4: LN URBAN LIGHT LUMINOSITY COUNT REGRESSIONS FOR FIVE ECONOMIC PERIODS,
SIMILAR CITY COMPARISON, RUSSIA AND UKRAINE

	(1)	(2)	(3)	(4)	(5)
lncount	1992 – 1998	1999 – 2007	2008 – 2009	2010 – 2012	2013–
closed_city	0.233** (0.0760)	0.267*** (0.0652)	0.249 (0.147)	0.167 (0.101)	0.279*** (0.0644)
urban_settl ement	-0.238* (0.120)	-0.279** (0.103)	-0.306 (0.234)	-0.245 (0.160)	-0.315** (0.101)
Trip_Advis or	-0.444** (0.169)	-0.322* (0.144)	-0.430 (0.319)	-0.330 (0.219)	-0.476*** (0.143)
sci_related	-0.0105 (0.135)	-0.0165 (0.116)	0.0471 (0.263)	0.0214 (0.180)	-0.0614 (0.114)
country_ind	-0.387* (0.154)	-0.404** (0.133)	-0.335 (0.302)	-0.307 (0.207)	-0.338** (0.131)
_cons	6.438*** (0.172)	6.412*** (0.146)	6.369*** (0.324)	6.557*** (0.221)	6.631*** (0.145)
<i>N</i>	674	866	196	294	674
<i>R</i> ²	0.904	0.913	0.907	0.935	0.938

F	1.04	1.12	0.08	0.47	0.21
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Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The next step is to explore Soviet-era closed cities in Ukraine to determine potential differences between closed cities in Russia and Ukraine.¹ Unlike Russia, the Ukrainian government appears not to have implemented special policies toward these cities, resulting in potential post-Soviet divergences. It is also possible that Ukrainian formerly closed cities had a more challenging time in the transition, as their previous city functions would have been more integrated with the Russian rather than Ukrainian military-industrial and science complexes. After the collapse of the USSR, many of their former functions became meaningless, further hindering these cities' transitions and economic growth.

Some closed cities in Ukraine were abandoned after the collapse of the USSR, and the rest are mainly relatively bigger cities. For consistency with the Russia dataset, we select those closed cities with population between 10,000 and 200,000. This yields five cities out of around 20 Ukrainian closed cities: Uzyn, Zhovti Vody, Uman, Pervomaisk, Kamianets-Podilskyi; we identify paired cities as explained in Appendix E.

Table J.1 and Table J.2 show reveal a Ukrainian closed city coefficient that is negative and very close to the positive closed city indicator values for Russia and Ukraine combined. We conduct Wald tests on $closed_city + country_ind = 0$ for all five periods. The results show that the

¹ We add a new independent variable named **country_ind**, an interaction term between closed city's country (1 for Ukraine; 0 for Russia) and the closed city indicator.

coefficients of closed city indicator plus the coefficients of country indicator is generally equal to zero for ULLS. In brief, Ukrainian closed cities appear to have had neither a development advantage nor disadvantage relative to their adjacent pairs. We reiterate that the causal reason for this is unclear and may reflect either Soviet or Ukrainian government policies. That said, we do know the Ukrainian government did not provide special federal funding to formerly closed cities. However, the coefficients of closed city indicator plus the coefficients of country indicator are generally negative for ULL COUNT, showing that the Ukrainian closed cities even did worse than their adjacent areas with respect to city expansion.

Results for similar city matches are similar to those using adjacent cities: Ukraine's formerly closed cities have neither development nor city expansion advantages after the collapse of the USSR. Wald tests indicate that for ULLS, the sum of the two coefficients remained negative until 2008-2009 period. By implication, prior to 2008, Ukrainian closed cities are actually hindered by their previous closeness status. Note from Table J.3 and Table J.4 that the Ukrainian coefficient decreases substantially from 2008 onward. However, this declining relative disadvantage may have reflected greater relative stagnation in other Ukrainian cities after 2008, since, unlike Russia, Ukraine did not have a huge sovereign wealth fund to tap to offset the global recession. As for ULL COUNT, no significant result appears, which shows that Ukrainian closed cities have no difference from other cities with respect to city expansion.