Appendix I – Regressing Urban Light Luminosity Sum Growth Rate and Count Growth Rate

The Regression Model

$$GRULS_{iy} = \beta_0 + \beta_1 CI + \beta_2\, year_y + \beta_3\, PC_i + \beta_4 OI + \epsilon$$

- $GRULS_{iy}$ measures the growth rates of urban light estimators, including the urban light luminosity sum, the urban light counts of year y, and the paired closed city i.

- CI is the close city indicator which is one if it is or contains a closed city, and is zero otherwise.

- β_2 measures the time fixed effect.

- β_3 measures the geographical fixed effect, and PC_i means the paired closed city.

- OI are other useful indicators, such as, urban-type settlement indicator, the TripAdvisor indicator, the sci-related indicator.

Table I.1 and Table I.2 shows that the coefficients of both Urban Light Luminosity SUM Growth Rate and Urban Light COUNT Growth Rate for adjacent cities are not significantly different from zero. Furthermore, by partitioning the whole period into three zones: before 1998, between 1999 and 2008, after 2009, which represents three different development periods of Russia, the results are still not significantly different from zero. Briefly, although the urban light trend is close to the trend of GDP, the values of both GDP and urban lights without having immediate effects, leading to little correlation in first differences.

Tables I.3 and Table I.4 show comparable results for similar cities: once again, coefficients of growth rates for both two terms are not significantly different from zero. Moreover, dividing the post-Soviet era into eras does not affect this result.

TABLE I.1: RESULTS FROM REGRESSING URBAN LIGHT LUMINOSITY SUM GROWTH RATE

sum_growth	Coefficient	Std. err.	t	P>t	[95% conf. interval]
closed_city	-.0029389	0.0059986	-0.49	0.624	[-0.0146995, 0.0088217]
urban_settlement	-.0000128	0.0123686	0	0.999	[-0.0242624, 0.0242368]
Trip_Advisor	.0013394	0.0127595	0.1	0.916	[-0.0236765,0.0263553]
sci_related	.008583	0.0110575	0.78	0.438	[-0.0130961, 0.0302622]
_cons	-.0061299	0.0129002	-0.48	0.635	[-0.0314218, 0.0191619]

TABLE I.2: RESULTS FROM REGRESSING URBAN LIGHT COUNT GROWTH RATE

count_growth	Coefficient	Std. err.	t	P>t	[95% conf. interval]
closed_city	-.0258024	0.0625173	-0.41	0.68	[-0.1483765, 0.0967717]
Trip_Advisor	.0390049	0.1305167	0.3	0.765	[-0.2168915, 0.2949014]
sci_related	-.0083764	0.1248319	-0.07	0.947	[-0.2531271, 0.2363742]
_cons	.067296	0.1320177	0.51	0.61	[-0.1915435, 0.3261354]

TABLE I.3: RESULTS FROM REGRESSING URBAN LIGHT LUMINOSITY SUM GROWTH RATE

sum_growth	Coefficient	Std. err.	t	P>t	[95% conf. interval]
closed_city	.0159125	0.0298146	0.53	0.594	[-0.0425551, 0.07438]
urban_settlement	-.0289524	0.0514182	-0.56	0.573	-0.1297853
Trip_Advisor	.0305913	0.0650641	0.47	0.638	-0.0970017
sci_related	-.0151723	0.0515843	-0.29	0.769	-0.1163309
_cons	.006923	0.0660143	0.1	0.916	-0.1225335

TABLE I.4: RESULTS FROM REGRESSING URBAN LIGHT COUNT GROWTH RATE

count_growth	Coefficient	Std. err.	t	P>t	[95% conf. interval]

closed_city	.0000497	0.0005454	0.09	0.927	[-0.0010201, 0.0011194]
Trip_Advisor	.0000703	0.0011604	0.06	0.952	[-0.0022057, 0.0023463]
sci_related	.0001792	0.0010392	0.17	0.863	[-0.0018591, 0.0022176]
_cons	.0002	0.0011846	0.17	0.866	[-0.0021236, 0.0025236]