An Assessment of the Impact of Institutional Capacity, Educational Outcomes and Political Leadership in the Economic Growth of Municipalities of Nepal

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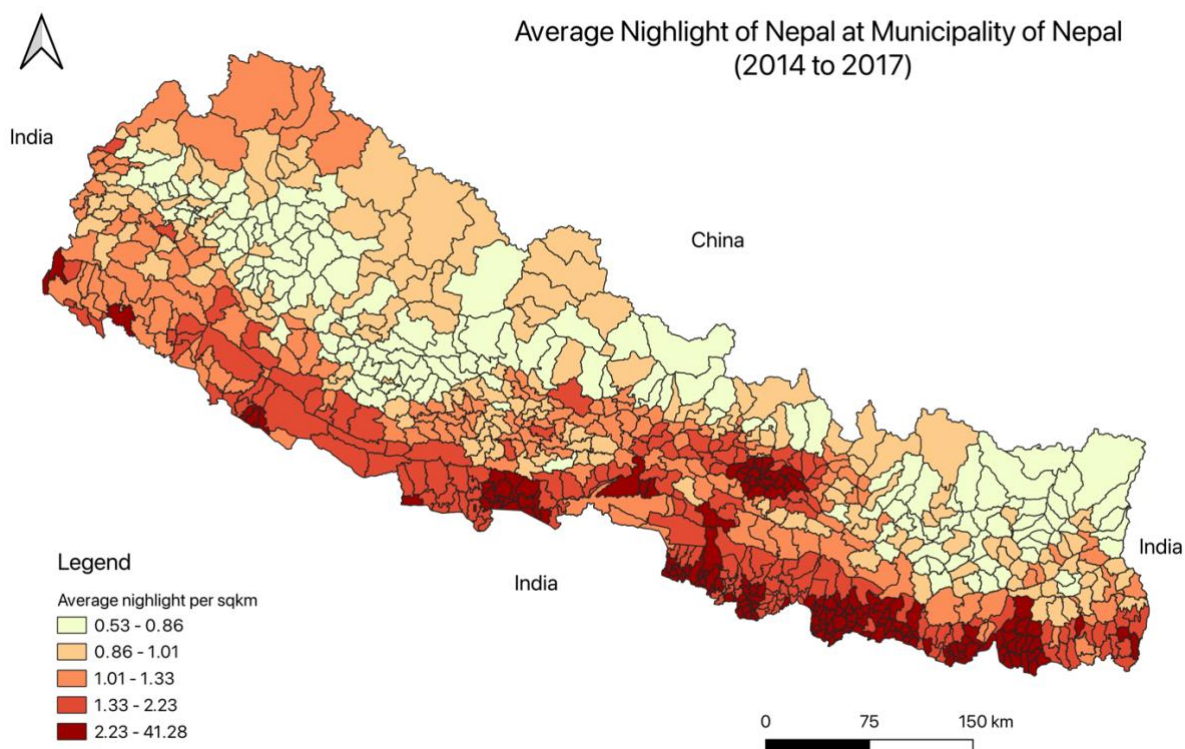
Baseline Visuals

Figure 1: Average nightlight per sq.km for Nepal at municipality level from 2014 to 2017
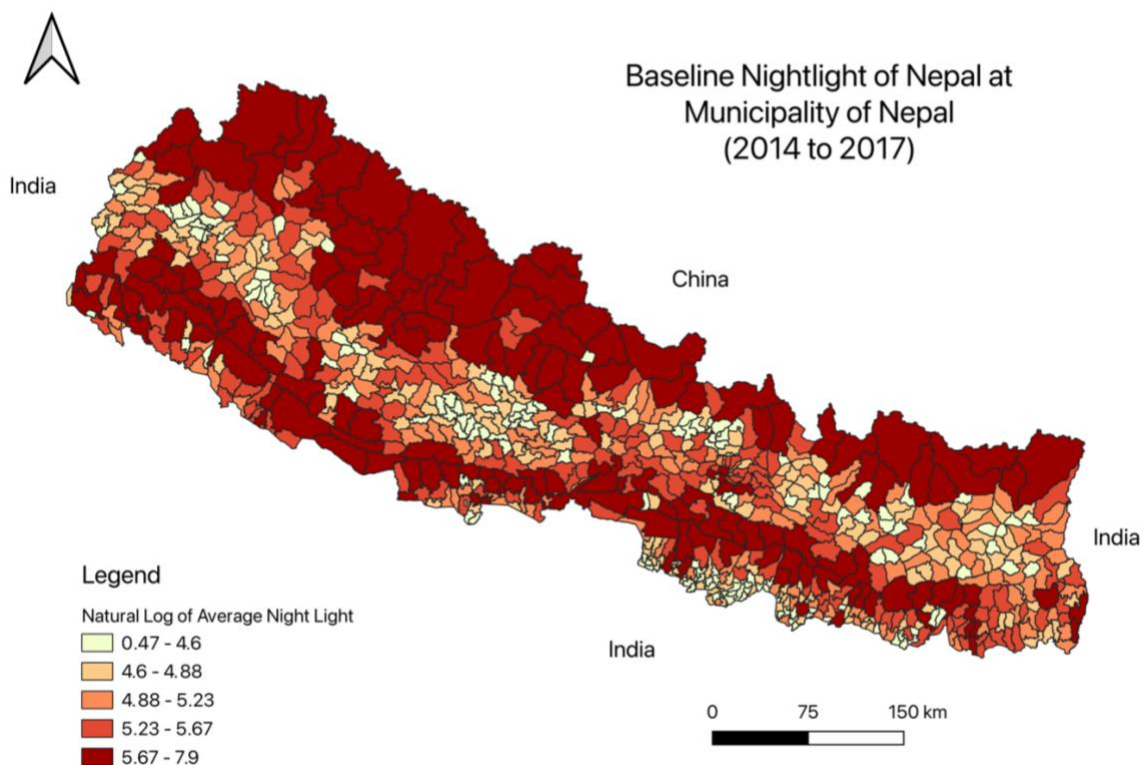

Figure 2: Natural log of average nightlight for Nepal at municipality level from 2014 to 2017

The above figures capture two distinct stories: the dark patches in figure 1 (average nightlight per sq km) capture the urban centers of Nepal whereas the dark patches in figure 2 (log of average nightlight) capture the biggest municipalities of Nepal (which are often the most rural and least developed) alongside the urban centers.

The baseline variable primarily has two objectives. First, to control for the existing level of nightlight in a municipality. Second, to check for convergence: whether municipalities with lower nightlight initially have a higher growth as they catch up. The two potential variables for baseline are as follows:

1. **ln_baseline_nl_km:** log [(average of sum of night light of 2014, 2015, 2016, 2017)/area of municipality]
2. **log_baseline_nl:** log (average of sum of night light of 2014, 2015, 2016, 2017)

So far, I have been using the log_baseline_nl. However, the visual reveal that log_baseline_nl_km (where density of nighlight is accounted for) might be a better variable to mee the outline objectives of baseline variable.

Variables and Date Sources

1. **rel_chgnl**: log (sum of night light of 2021) – log (sum of nightlight of 2017)
   Extracted from [VIIRS Nighttime Lights dataset](#) using QGIS software

2. **ln_baseline_nl_km:** log [(average of sum of night light of 2014, 2015, 2016, 2017)/area of municipality]
   Extracted from [VIIRS Nighttime Lights dataset](#) using QGIS software

3. **log_baseline_nl:** log (average of sum of night light of 2014, 2015, 2016, 2017)
   Extracted from [VIIRS Nighttime Lights dataset](#) using QGIS software

4. **lisa_avg**: average LISA score of 2020/21 and 2021/22 (In case, LISA score of 2020/21 was not available, LISA score of 20 21/22 is considered to be the average)
   Downloaded from [LISA website](#) of the government of Nepal

5. **rel_lisa_avg**: calculated as follows:
   a. ben_mark_lisa = lisa_avg of benchmark municipality (Municipality named "Mohanyal" with a LISA score of 66.25)
   b. generate rel_lisa = lisa_avg - ben_mark_lisa

6. **high_school_percentage:** percentage of population who have completed high school (to be changed to percentage of population who have completed high school or above)
   Manually constructed dataset from datasets of each province from [National Population and Housing Census 2021](#)

7. **ageatelection**: age of chairperson at election in 2017
   Manually constructed dataset from [the election result pdfs](#) published in Nepali

8. **gov_coalition**: dummy variable Government Coalition = 1 if the chairperson of the municipality is affiliated with the parties in the federal government coalition
   Manually constructed dataset from [the election result pdfs](#) published in Nepali and then coded in Stata

9. **female**: dummy variable female = 1if the chairperson is a female
   Manually constructed dataset from [the election result pdfs](#) published in Nepali and then coded in Stata

10. **ln_popn**: log of population as per census of 2021
    Extracted from the [Preliminary Data of National Population and Housing Census 2021](#)

11. LISA sub-categories averages of 2020/21 and 2021/22

SN	Category Title	Points	Coded variable
1	Governance Management	9	gov_magm_avg
2	Organization & Administration	8	org_admin_avg
3	Budget Plan Management	11	budg_magm_avg
4	Fiscal Economic Management	11	fiscal_magm_avg
5	Service Delivery	16	service_dev_avg
6	Judicial Execution	9	jud_exe_avg
7	Physical Infrastructure	13	phy_infra_avg
8	Social Inclusion	10	soc_inc_avg
9	Environmental Protection and Disaster Management	10	env_protec_avg
10	Cooperation and Coordination	6	cop_cor_avg
	Total	**100**	

Scatter of LISA scores

Figure 3: Scatter plot with fitted line of relative change in nightlight in natural logarithm from 2017 to 2021 over average LISA score of 2020/21 and 2021/22

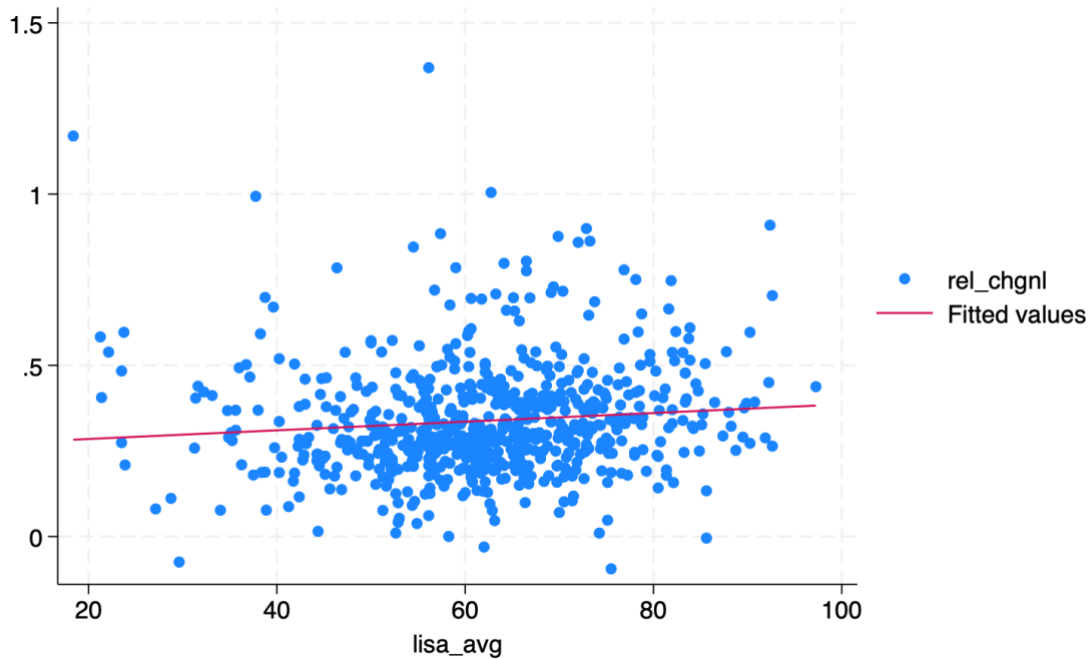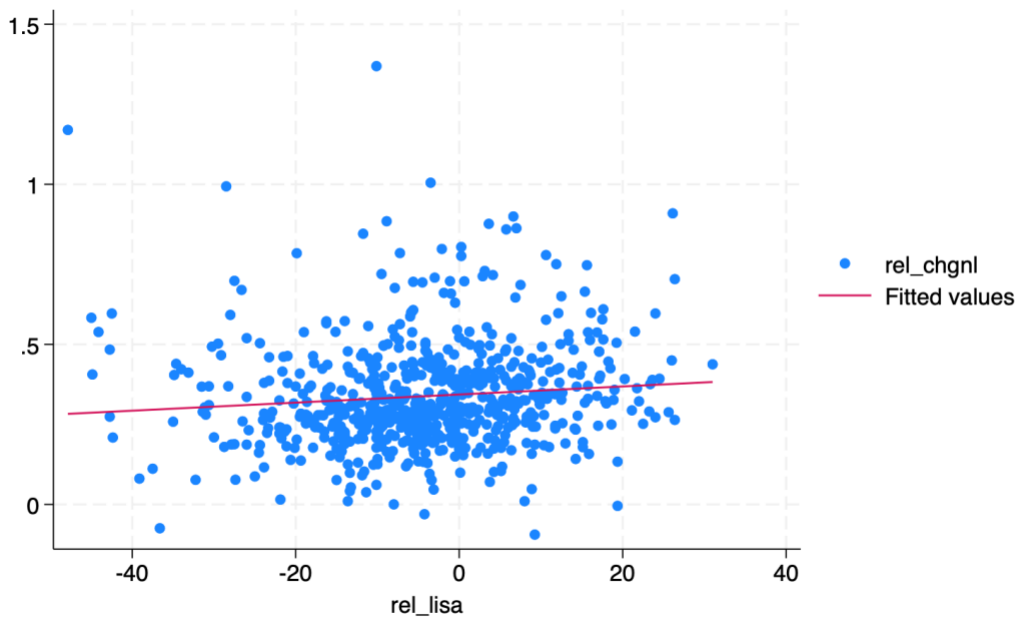*Figure 4: Scatter plot with fitted line of relative change in nightlight in natural logarithm from 2017 to 2021 over benchmarked LISA score of "Mohanyal" municipality*

The above two figures show that the scatter plots of average LISA and relative LISA are very similar. It makes sense mathematically as I have subtracted a constant (benchmark LISA score) from all of the LISA scores.

CASE I (relative LISA and baseline of sum per area)

- **rel_lisa** = lisa_avg - ben_mark_lisa
- **ln_baseline_nl_km** = log [(average of sum of night light of 2014, 2015, 2016, 2017)/area of municipality]

Initial Regression

VARIABLES	(1) rel_chgnl	(2) rel_chgnl	(3) rel_chgnl	(4) rel_chgnl	(5) rel_chgnl	(6) rel_chgnl	(7) rel_chgnl	(8) rel_chgnl	(9) rel_chgnl
ln_baseline_nl_km	0.081***	0.082***	0.053***	0.053***	0.053***	0.052***	0.053***	0.008	0.006
	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.016)	(0.017)
lisa_avg		0.001**	0.000	0.000	0.000	0.000	0.000	-0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
high_school_percent			0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ageatelection					-0.000	-0.000	-0.000	-0.000	-0.000
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
gov_coalitiion						-0.017	-0.016	-0.018	-0.019
						(0.012)	(0.012)	(0.012)	(0.012)
female							0.066	0.060	0.058
							(0.049)	(0.050)	(0.050)
ln_popn								0.050***	0.060***
								(0.009)	(0.011)
urban_num									-0.023
									(0.017)
Constant	0.313***	0.225***	0.216***	0.216***	0.220***	0.231***	0.227***	-0.235**	-0.322***
	(0.005)	(0.037)	(0.036)	(0.036)	(0.047)	(0.049)	(0.049)	(0.094)	(0.117)
Observations	692	692	692	692	692	692	692	692	692
R-squared	0.080	0.092	0.153	0.153	0.153	0.156	0.159	0.189	0.192

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CASE II (baseline of sum per area)

- **lisa_avg =** average LISA score of 2020/21 and 2021/22
- **ln_baseline_nl_km =** log [(average of sum of night light of 2014, 2015, 2016, 2017)/area of municipality]

Initial Regression

VARIABLES	(1) rel_chgnl	(2) rel_chgnl	(3) rel_chgnl	(4) rel_chgnl	(5) rel_chgnl	(6) rel_chgnl	(7) rel_chgnl	(8) rel_chgnl	(9) rel_chgnl
log_baseline_nl	0.014	0.011	0.003	0.003	0.003	0.002	0.002	-0.013	-0.012
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)
lisa_avg		0.001*	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
high_school_percent			0.011***	0.011***	0.011***	0.012***	0.012***	0.009***	0.009***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ageatelection					0.000	0.000	0.000	-0.000	-0.000
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
gov_coalitiion						-0.020	-0.020	-0.019	-0.020*
						(0.012)	(0.012)	(0.012)	(0.012)
female							0.055	0.061	0.059
							(0.049)	(0.051)	(0.050)
ln_popn								0.057***	0.065***
								(0.008)	(0.010)
urban_num									-0.022
									(0.017)
Constant	0.265***	0.211***	0.219***	0.219***	0.208***	0.225***	0.223***	-0.235***	-0.310***
	(0.049)	(0.062)	(0.058)	(0.058)	(0.067)	(0.071)	(0.071)	(0.075)	(0.099)
Observations	692	692	692	692	692	692	692	692	692
R-squared	0.003	0.012	0.124	0.124	0.124	0.128	0.130	0.191	0.194

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Final Regression

VARIABLES	(1) rel_chgnl	(2) rel_chgnl	(3) rel_chgnl	(4) rel_chgnl	(5) rel_chgnl	(6) rel_chgnl	(7) rel_chgnl	(8) rel_chgnl	(9) rel_chgnl
ln_baseline_nl_km	0.081***	0.076***	0.046***	0.047***	0.048***	0.047***	0.047***	0.001	-0.003
	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.016)	(0.016)
gov_magm_avg		-0.004	-0.007	-0.006	-0.007	-0.006	-0.006	-0.007	-0.007
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
org_admin_avg		-0.010	-0.005	-0.005	-0.005	-0.005	-0.005	-0.001	-0.001
		(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
budg_magm_avg		-0.000	0.001	0.001	0.001	0.002	0.002	0.001	0.001
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
fiscal_magm_avg		-0.005	-0.006	-0.006	-0.006	-0.006	-0.006	-0.005	-0.006
		(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
service_dev_avg		0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.005
		(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
jud_exe_avg		-0.001	-0.008	-0.007	-0.007	-0.007	-0.007	-0.010*	-0.011*
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
phy_infra_avg		0.006	0.005	0.005	0.005	0.006*	0.006*	0.003	0.004
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
soc_inc_avg		0.001	-0.000	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
env_protec_avg		-0.002	-0.007	-0.007	-0.007	-0.007	-0.007	-0.011**	-0.011**
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
cop_cor_avg		0.017***	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***
		(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
high_school_percent			0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.010***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ageatelection				-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
				(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
female					0.068	0.068	0.068	0.060	0.058
					(0.050)	(0.051)	(0.051)	(0.051)	(0.050)
gov_coalitiion						-0.016	-0.016	-0.016	-0.018
						(0.011)	(0.011)	(0.011)	(0.011)
ln_popn								0.053***	0.064***
								(0.009)	(0.012)
urban_num									-0.030*
									(0.017)
Constant	0.313***	0.318***	0.308***	0.321***	0.318***	0.327***	0.327***	-0.171	-0.274**
	(0.005)	(0.060)	(0.059)	(0.067)	(0.067)	(0.068)	(0.068)	(0.106)	(0.127)
Observations	692	692	692	692	692	692	692	692	692
R-squared	0.080	0.117	0.175	0.175	0.178	0.180	0.180	0.211	0.215

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CASE III (baseline of sum)

- **lisa_avg = average LISA score of 2020/21 and 2021/22**
- **log_baseline_nl =** log (average of sum of night light of 2014, 2015, 2016, 2017)

Initial Regression

VARIABLES	(1) rel_chgnl	(2) rel_chgnl	(3) rel_chgnl	(4) rel_chgnl	(5) rel_chgnl	(6) rel_chgnl	(7) rel_chgnl	(8) rel_chgnl	(9) rel_chgnl
log_baseline_nl	0.014	0.011	0.003	0.003	0.003	0.002	0.002	-0.013	-0.012
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)
lisa_avg		0.001*	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
high_school_percent			0.011***	0.011***	0.011***	0.012***	0.012***	0.009***	0.009***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ageatelection					0.000	0.000	0.000	-0.000	-0.000
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
gov_coalitiion						-0.020	-0.020	-0.019	-0.020*
						(0.012)	(0.012)	(0.012)	(0.012)
female							0.055	0.061	0.059
							(0.049)	(0.051)	(0.050)
ln_popn								0.057***	0.065***
								(0.008)	(0.010)
urban_num									-0.022
									(0.017)
Constant	0.265***	0.211***	0.219***	0.219***	0.208***	0.225***	0.223***	-0.235***	-0.310***
	(0.049)	(0.062)	(0.058)	(0.058)	(0.067)	(0.071)	(0.071)	(0.075)	(0.099)
Observations	692	692	692	692	692	692	692	692	692
R-squared	0.003	0.012	0.124	0.124	0.124	0.128	0.130	0.191	0.194

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

LISA Regression

VARIABLES	(1) rel_chgnl	(2) rel_chgnl	(3) rel_chgnl	(4) rel_chgnl	(5) rel_chgnl	(6) rel_chgnl	(7) rel_chgnl	(8) rel_chgnl	(9) rel_chgnl
log_baseline_nl	0.014	0.006	0.002	0.002	0.001	0.001	0.001	-0.011	-0.010
	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
gov_magm_avg		-0.006	-0.009	-0.008	-0.009	-0.008	-0.008	-0.006	-0.007
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
org_admin_avg		-0.012*	-0.005	-0.005	-0.005	-0.005	-0.005	-0.001	-0.002
		(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
budg_magm_avg		0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.001
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
fiscal_magm_avg		-0.011*	-0.009	-0.009	-0.009*	-0.009	-0.009	-0.006	-0.006
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
service_dev_avg		0.006	0.005	0.005	0.005	0.004	0.004	0.004	0.004
		(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
jud_exe_avg		-0.005	-0.011*	-0.011*	-0.011*	-0.010*	-0.010*	-0.010*	-0.010*
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
phy_infra_avg		0.008**	0.006*	0.006*	0.006*	0.007**	0.007**	0.003	0.004
		(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
soc_inc_avg		-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.000	-0.000
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
env_protec_avg		0.002	-0.005	-0.005	-0.005	-0.006	-0.006	-0.010**	-0.010**
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
cop_cor_avg		0.018***	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
high_school_percent			0.011***	0.011***	0.011***	0.011***	0.011***	0.009***	0.010***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ageatelection				-0.000	0.000	-0.000	-0.000	-0.000	-0.001
				(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
female					0.061	0.061	0.061	0.062	0.060
					(0.049)	(0.050)	(0.050)	(0.051)	(0.051)
gov_coalitiion						-0.019	-0.019	-0.017	-0.018
						(0.012)	(0.012)	(0.011)	(0.011)
ln_popn								0.055***	0.064***
								(0.008)	(0.010)
urban_num									-0.028*
									(0.017)
Constant	0.265***	0.356***	0.332***	0.332***	0.332***	0.347***	0.347***	-0.141	-0.225**
	(0.049)	(0.082)	(0.079)	(0.087)	(0.087)	(0.090)	(0.090)	(0.095)	(0.114)
Observations	692	692	692	692	692	692	692	692	692
R-squared	0.003	0.054	0.154	0.154	0.157	0.160	0.160	0.213	0.217

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1