City Size and Economic Growth

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LSE Geography and Environment

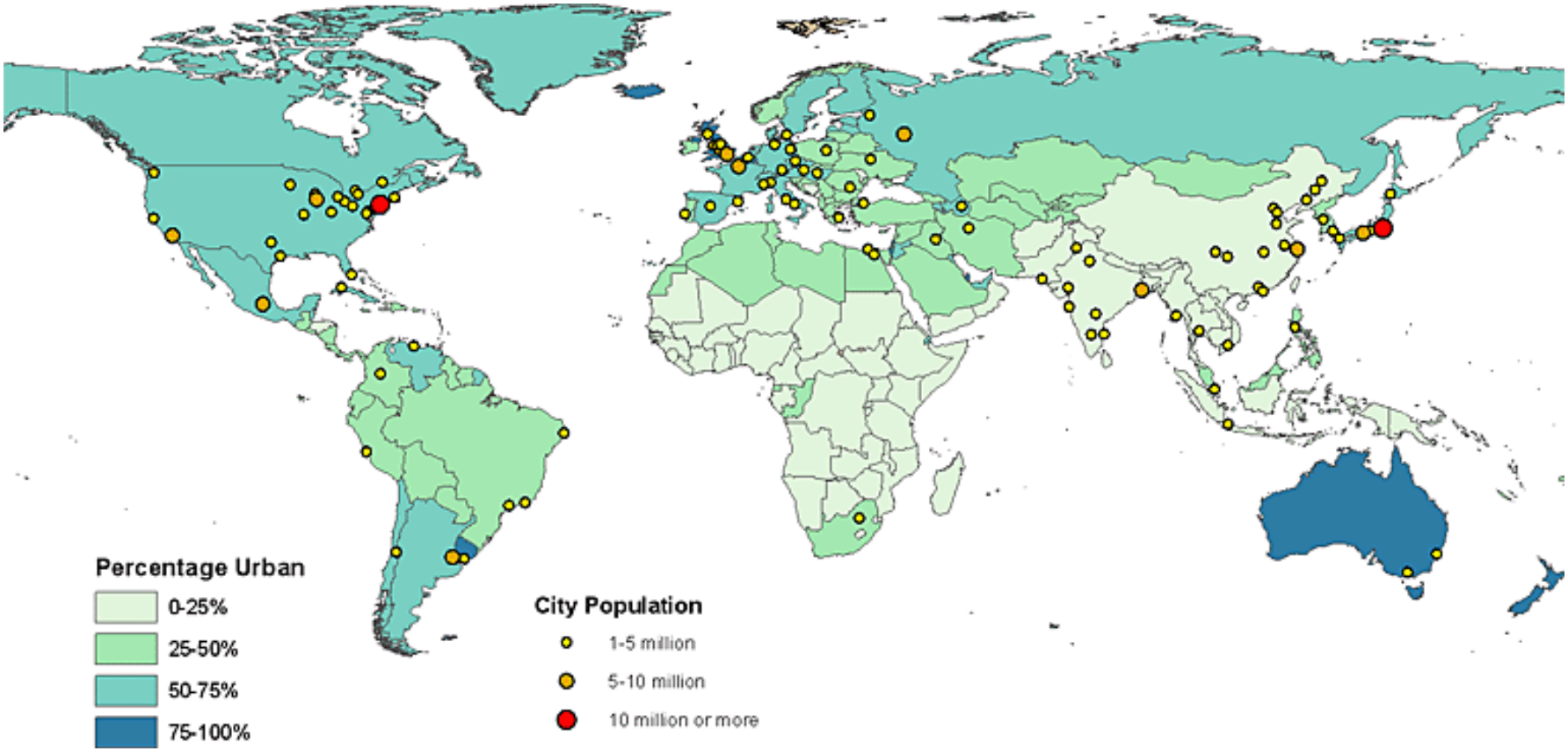
Does the size of a country's cities impact national economic growth?

Outline

- Motivation and approach
- Methodology
- Results
- Conclusion

Urbanization and the emergence of mega cities (1/2)

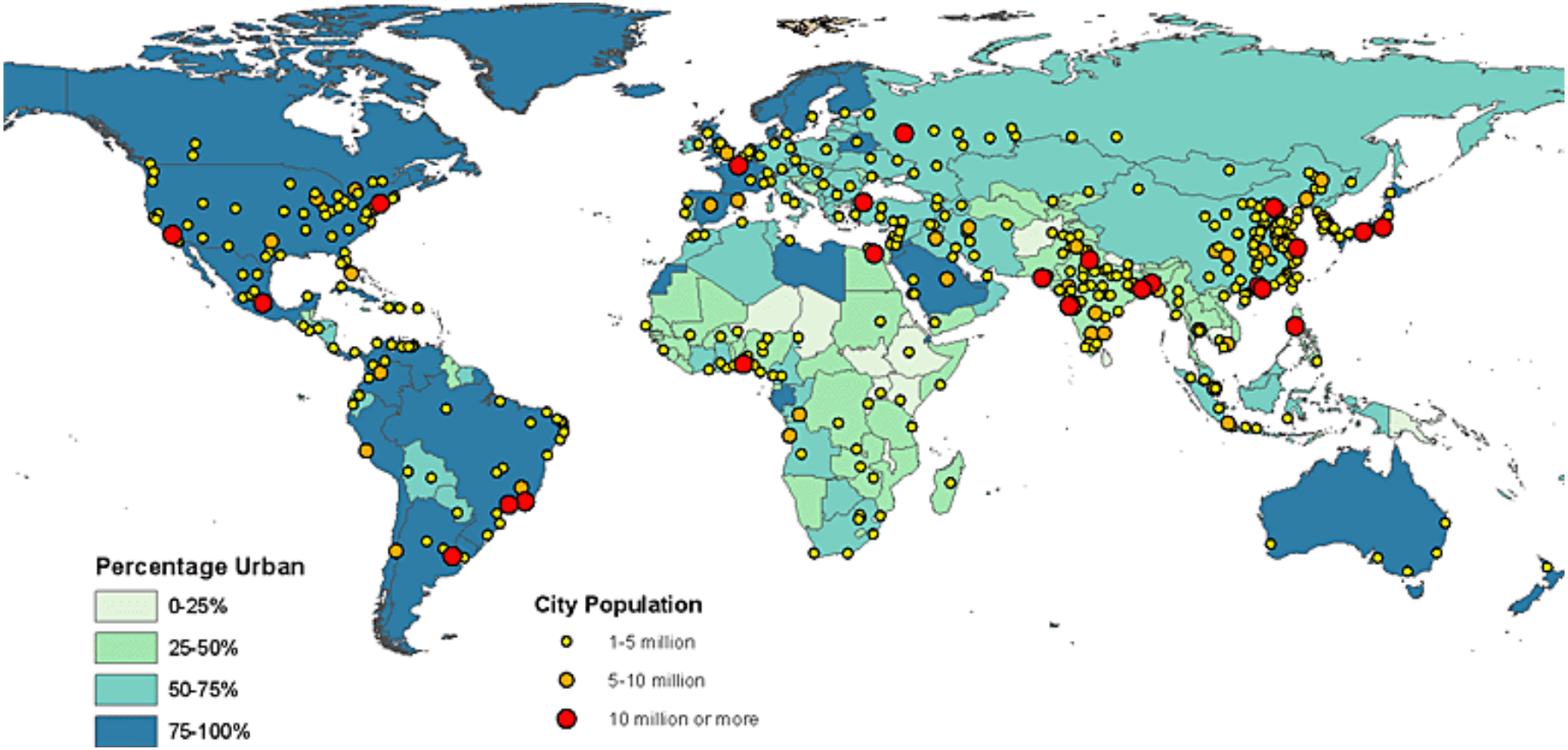
1960



Source: World Urbanization Prospects 2011

Urbanization and the emergence of mega cities (2/2)

2011



Source: World Urbanization Prospects 2011

Curse or blessing?

"Managing urban areas has become one of the most important development challenges of the 21st century“

(John Wilmoth, director of the UN's population division)

“Megacities' explosive growth poses epic challenges”

(CNBC report on the growth of cities)

Curse or **blessing**?

"No country has grown to high income without vibrant cities. The rush to cities in developing countries seems chaotic, but it is necessary. It seems unprecedented, but it has happened before"

World Development Report 2009

Focus on (large) cities as engines of growth in the literature and among policy makers

Theoretical support from different streams of literature…

- **"**Cities as engines of economic growth**"** (Lucas, 1988)
- NEG emphasis the benefits of agglomeration (e.g., Fujita & Thisse, 2003; Martin & Ottaviano, 2001)
- Urban economics literature emphasizes productivity of larger cities - up to a certain point (e.g., Duranton & Puga 2004)

… as well as empirical support

- Doubling of city size leads to an increase of productivity by 3% - 8% (Rosenthal & Strange, 2004)
- Even more important agglomeration benefits assumed in developing countries, e.g., in China between 10% and 12% (Duranton, 2014)
- % of urban population living in cities above 750K inhabitants beneficial for national growth (e.g., Bruelhart & Sbergami, 2009; Castells-Quintana & Royuela, 2014)

BUT: some gaps in the empirical literature

1) **Focus on city productivity in the urban economics literature**
   - What does it mean at the country level?

2) **City size categories used in urban concentration literature crude**
   - Unlikely that relationship is uniform above this threshold

3) **Evidence primarily from high income countries**
   - Balance between benefits and diseconomies likely very different in developing countries
   - Many cities in developing countries are actually much larger than in developed countries – at the decreasing part of the productivity curve?

Approach

- Does the size of a country's cities impact national economic growth?
- More exact aggregate indicator of city size at the country level
- Cross-country/ panel study with ~120 countries following empirical literature on urban concentration and growth
- Period: 1960 – 2010
- Testing for varying effect between high income and developing countries
- Using different estimation techniques, including Fixed effects, pooled 2SLS with lagged values, SysGMM and an IV-design

Preview of results

- Evidence for a positive effect of large cities which decreases the larger average city size
- Relationship driven by high income countries
- No such relationship in developing countries sample - in IV design coefficient is even negative

Basic Model

$$g_{ip} = \alpha + \beta\, citysize_{ip} + \gamma GDPpc_{ip} + \delta \boldsymbol{X}_{ip} + \mu_p + \varepsilon_{ip}$$

g_{ip} = GDP per capita growth rate of country i in period p

$citysize_{ip}$ = measure for city size at the country level for country i at the beginning of period p

$GDPpc_{ip}$ = log GDP per capita of country i at the beginning of period p

X_{ip} = a set of control variables for country i either measured at the beginning or as an average of period p

μ_p = time fixed effects

P = five year intervals

Indicator of city size

A country's average city size

- Population weighted average of a country's cities

  e.g. 0.9 x 900K + 0.1 x 100K = 820K vs. (900K + 100K)/2 = 500K
- Captures the size of the city in which an average urban worker lives and hence the average agglomeration (dis-) economies this person should experience

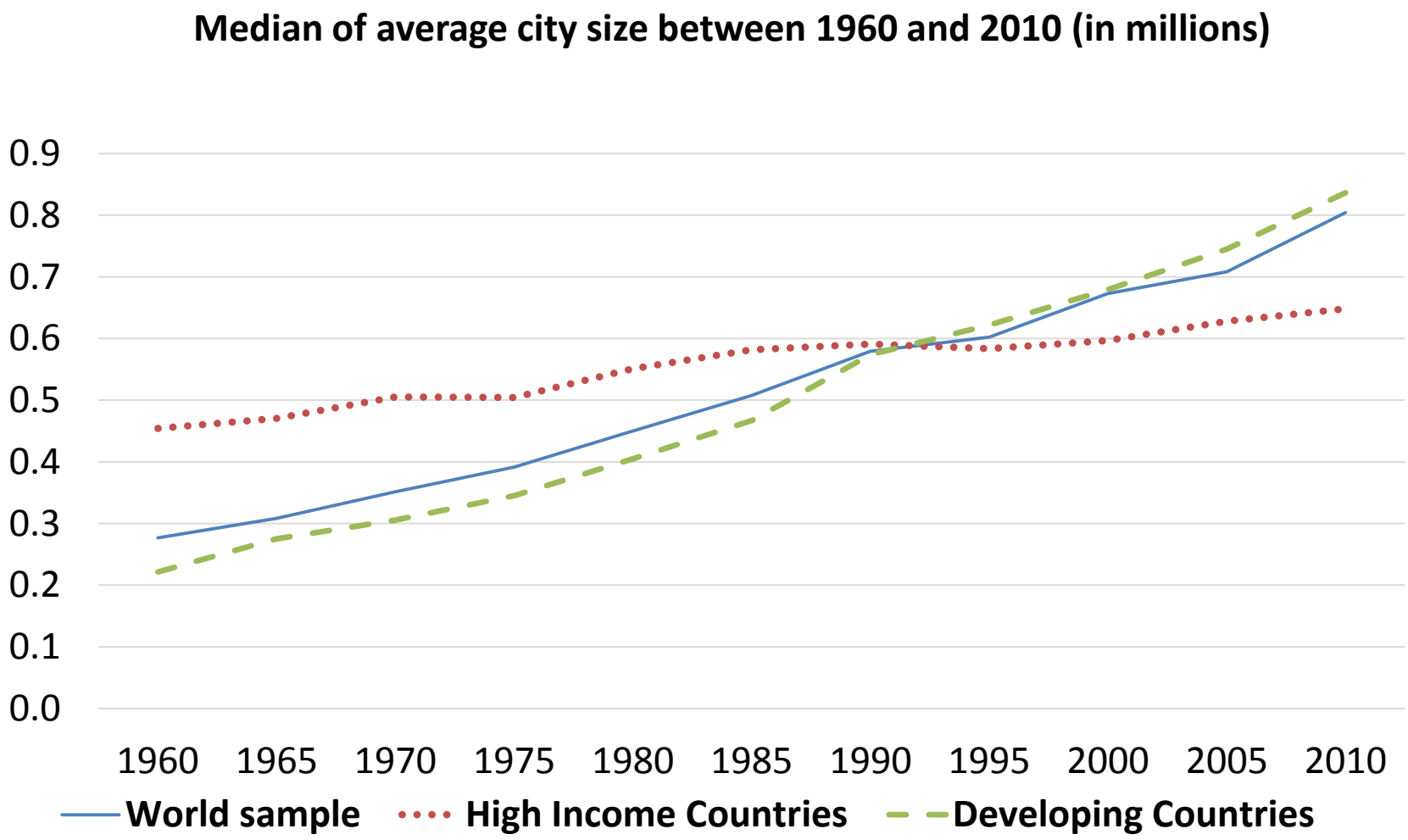
Based on data from the 2014 edition of the World Urbanization Prospects

- 112 – 122 countries
- A maximum of 1,144 observations
- 1960 – 2010

Squared term to test for potentially non-linear relationship

Calculation

Average city size has increased significantly

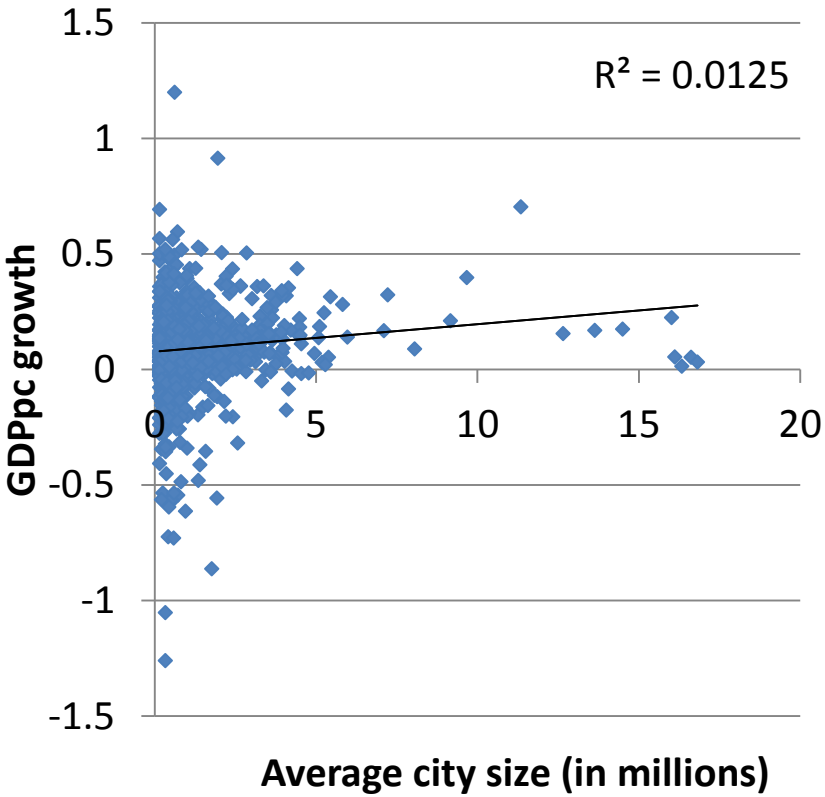


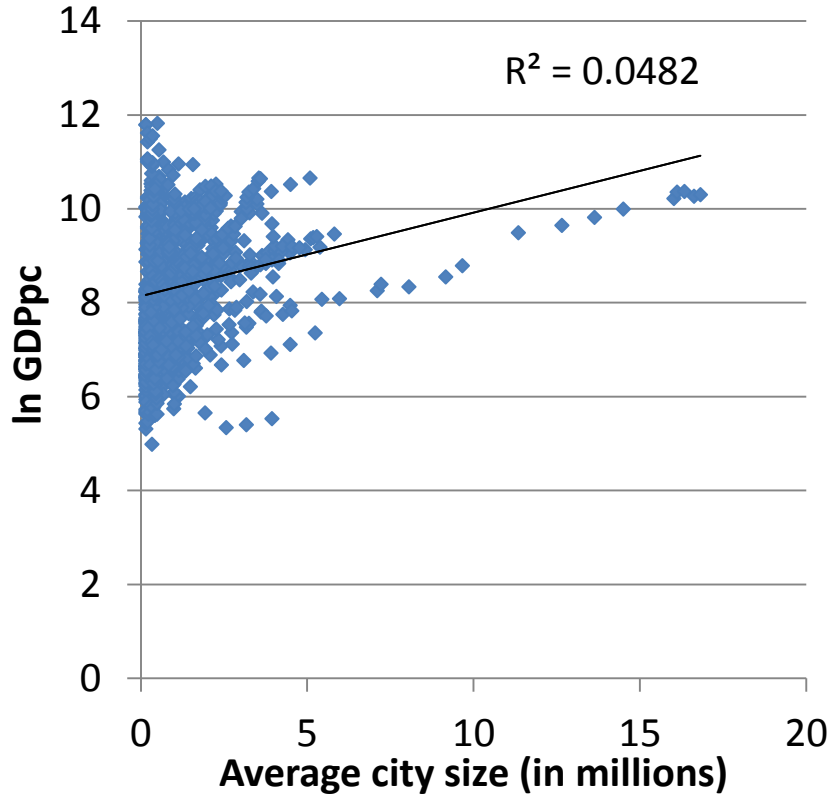
Source: Own calculation based on World Urbanization Prospects 2014

Controls and data sources

Variables	Data source
GDP per capita	Penn World Tables 8
Years of schooling	Barro & Lee dataset
Private investment as share of GDP	Penn World Tables 8
Government consumption as share of GDP	Penn World Tables 8
Openness	Penn World Tables 8
Population	Penn World Tables 8
Political system	Polity IV project

Descriptive overview





Results for average city size – global sample

VARIABLES	(1) Pooled 2SLS	(2) Pooled 2SLS	(3) FE	(4) FE	(5) SysGMM	(6) SysGMM
Average city size	**6.15e-05**	**0.0237****	**0.0122**	**0.0461****	**-0.0321***	**-0.0312**
	(0.00388)	**(0.0104)**	**(0.0126)**	**(0.0215)**	**(0.0167)**	**(0.0348)**
Average city size squared		**-0.00171*****		**-0.00221****		**0.001000**
		(0.000584)		**(0.000946)**		**(0.00185)**
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	-	-	Yes	Yes	Yes	Yes
Observations	971	971	1,058	1,058	1,058	1,058
R-squared	0.202	0.207	0.270	0.275		
Number of countries	114	114	114	114	114	114

Full results

Robust standard errors: *** p<0.01, ** p<0.05, * p<0.1

Results for average city size – high income countries

VARIABLES	(1) Pooled 2SLS	(2) Pooled 2SLS	(3) FE	(4) FE	(5) SysGMM	(6) SysGMM
Average city size	**-0.000278**	**0.0172***	**0.0119**	**0.120*****	**0.00785**	**0.0945*****
	(0.00241)	**(0.00939)**	**(0.0125)**	**(0.0434)**	**(0.0158)**	**(0.0281)**
Average city size squared		**-0.00112****		**-0.00485****		**-0.00494*****
		(0.000523)		**(0.00180)**		**(0.00141)**
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	-	-	Yes	Yes	Yes	Yes
Observations	317	317	361	361	361	361
R-squared	0.494	0.499	0.468	0.497		
Number of countries	38	38	38	38	38	38

Full results

Robust standard errors: *** p<0.01, ** p<0.05, * p<0.1

Results for average city size – developing countries

VARIABLES	(1) Pooled 2SLS	(2) Pooled 2SLS	(3) FE	(4) FE	(5) SysGMM	(6) SysGMM
Average city size	**-0.000215**	**0.0248**	**0.00956**	**0.01000**	**-0.0355**	**-0.108**
	(0.00945)	**(0.0244)**	**(0.0133)**	**(0.0437)**	**(0.0243)**	**(0.0698)**
Average city size squared		**-0.00440**		**-6.30e-05**		**0.00910**
		(0.00348)		**(0.00502)**		**(0.00967)**
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	-	-	Yes	Yes	Yes	Yes
Observations	654	654	697	697	697	697
R-squared	0.180	0.178	0.261	0.261		
Number of countries	76	76	76	76	76	76

Full results

Robust standard errors: *** p<0.01, ** p<0.05, * p<0.1

Further robustness check – IV design (1/2)

Proposed instrument:

- Number of years for which the current capital of a country has been the capital of the country since the year 0

Relevance:

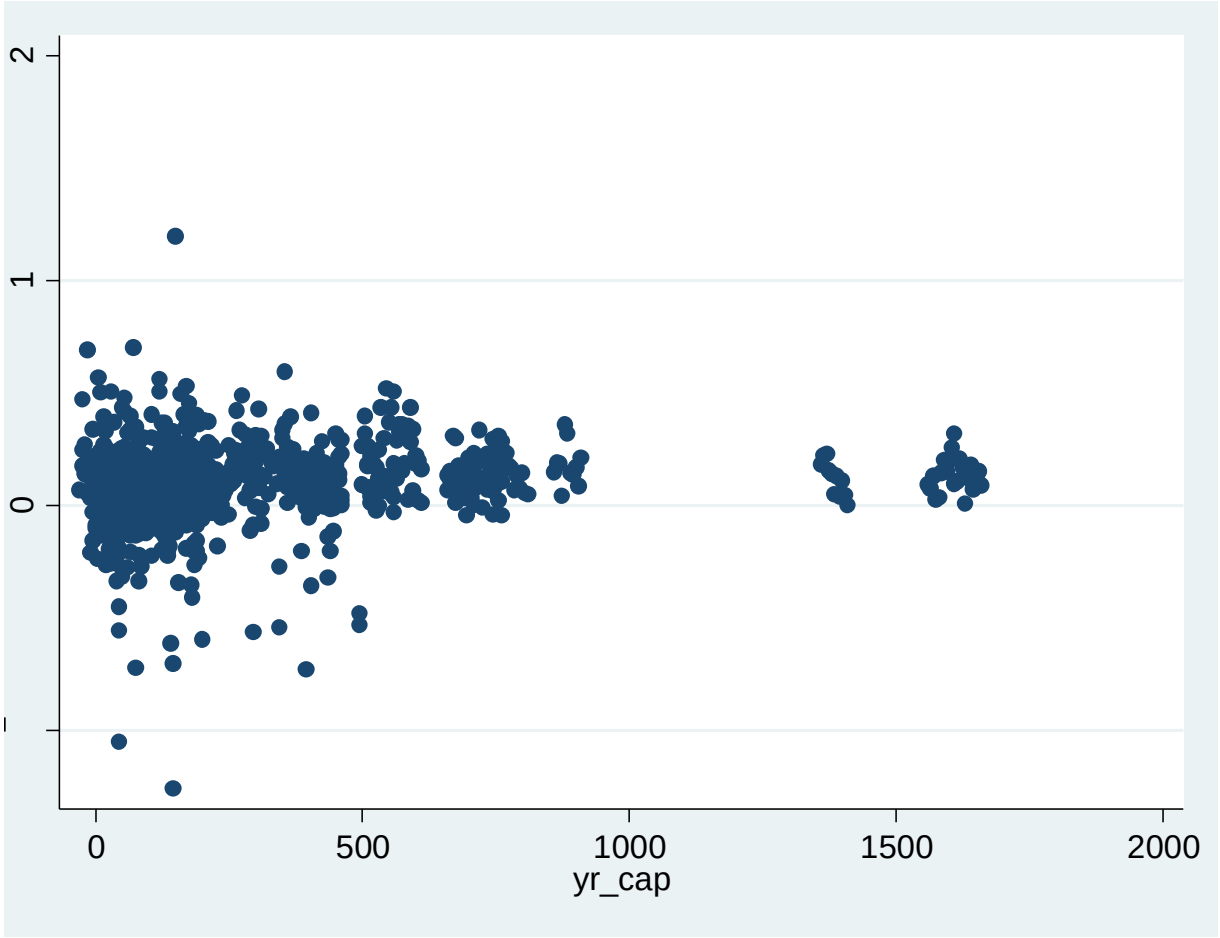
- The more years the current capital has been an important place of political (and economic) power → more concentrated urban structure with a more dominant thus larger prime city
- E.g. countries like the United Kingdom, France, Peru, Mexico, Egypt, Russia or China with large average city sizes also have longstanding capitals

Exogeneity:

- Countries with young capitals such as Germany and Australia which are highly developed
- Other countries where the capital was established a long time ago such as Peru, Nepal or Mozambique with much lower levels of economic development
- Unlikely that the existence of a longstanding capital has a direct impact on the short-period growth performance

Robustness check – IV design (2/2)

Growth in 5 year periods



Results IV – 2nd stage

VARIABLES	(1) High income countries	(2) Developing countries
Average city size	**0.0729****	**-0.232****
	(0.0359)	**(0.102)**
Initial GDPpc	-0.075***	0.047***
	(0.0242)	(0.0318)
Years of schooling	0.00685	0.0121**
	(0.00418)	(0.00585)
Private investment	0.298**	0.306**
	(0.151)	(0.143)
Government investment	0.287*	-0.151
	(0.170)	(0.175)
Openness	0.0190	0.00734
	(0.0171)	(0.0169)
Population	-0.0113	0.111***
	(0.0134)	(0.0431)
Institutions	0.00272	-0.000589
	(0.00260)	(0.00140)
Constant	0.658***	-0.353
	(0.223)	(0.234)
Observations	258	579
R-squared	0.973	0.955
First stage F-stat	10.07	9.62

First stage

Robust standard errors: *** p<0.01, ** p<0.05, * p<0.1

Conclusions

- No uniform relationship between city size and economic growth
- Evidence for positive size effect in high income countries, but not for developing countries
- NEG models seem more suitable to explain situation in high income countries, but not in developing countries - likely to underestimate urban diseconomies and overemphasize benefits
- Results are in contrast to existing empirical literature which emphasizes important benefits of agglomeration and city size at low levels of development
- Policy focus on large cities in developing countries seems misplaced