The Shrinking Advantage of Market Potential

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May 2019

The Changing Role of Market Potential

- Geographic proximity to demand – market potential – is a locational advantage
  - U.S. Northeast & Midwest
  - Coastal areas of Brazil, India and China
  - Northwestern Europe
- Importance of market potential in shaping the spatial distribution of economic activity changes with development
  - Structural transformation: land suitability, density and connectivity (Henderson et al., 2018)
  - Falling transport costs: central vs peripheral places

Some Examples

- United States
  - Five fastest-growing US counties between 1990 and 2010
    - ★ Tunica MS, Douglas CO, Forsyth GA, Dawson GA, Williamson, TX
    - ★ All part of large metro areas (Memphis, Denver, Atlanta and Austin)
    - ★ But far from the high-market potential East Coast
  - When focusing on counties with employment above 400,000
    - ★ Top: Maricopa (Phoenix), despite isolation (30th percentile)
    - ★ Bottom: Wayne (Detroit), despite centrality (99th percentile)
- Mexico
  - Five fastest-growing municipalities between 1990 and 2010
    - ★ Areas close to Monterrey, Mexico City and the Yucatan Coast
    - ★ Well-connected: 85th percentile
- Other difference between Mexico and US: sectoral composition
  - Mexico: top-3 municipalities have secondary employment share $> 50\%$
  - US: high-manufacturing areas are at bottom of the ranking

What We Do

- Analyze the changing importance of market potential and local density for regional employment growth at global scale
  - Time frame: 1990-2010
  - 18,961 regions
  - World's main economies (three-quarters fo global GDP)
  - Both mature and emerging economies
- Accounting for observed local employment growth patterns
  - Structural transformation (Michaels, Rauch and Redding, 2012)
  - Transport costs
- In scope and detail: most comprehensive effort so far to document recent aggregate (and sectoral) local employment growth patterns

What We Find

- Empirical finding #1: for local growth in *world as a whole*
  - Market potential is becoming less important (2000s vs 1990s)
  - Local density is becoming more important (2000s vs 1900s)
- Empirical finding #2: comparing *emerging* and *mature*
  - Emerging: growth greater in high-market-potential areas
  - Mature: growth greater in low-market-potential areas
- Consistent with secular decline of centrality as locational advantage

Possible Explanations

- Explanation #1: Structural transformation
  - Accounts for (1) overall move to high density in world, and (2) shift to high market potential in emerging economies
  - Does *not* account for (1) weakening importance of market potential in world, and (2) shift away from market potential in mature economies
- Explanation #2: Falling transport costs
  - Standard economic geography model: bell-shaped relation between transport costs and growth of central locations
  - Consistent with high-market-potential areas in mature economies growing more slowly
  - Does *not* mean that centrality is not a locational advantage, but its advantage is waning

Related Literature

- Local economic growth across the world
  - Gennaioli et al (2014), Henderson et al (2012), Henderson et al (2018)
  - No sector-level data, no analysis of market potential
- Role of structural transformation in shaping economic geography
  - Michaels et al (2012), Desmet and Rossi-Hansberg (2009, 2014)
- Bell-shaped relation between trade costs and spatial concentration
  - Theory: Tabuchi (1998)
  - Evidence: Kim (1995), Forslid et al (2002), Combes et al (2011)
- Market potential as driver of development and growth
  - Redding and Venables (2004), Head and Mayer (2011), Jacks and Novy (2018)
- Market potential and gravity models of trade
  - Head and Mayer (2004), Disdier and Head (2008)

1. Data

Data I: Space and Time

- Data description
  - 18,961 regions of the world over the period 1990-2010 ▸ Details
  - 34 countries, which together make up 74% of global GDP in 2010
  - Emerging: Brazil, Central & Eastern Europe, China, India, Mexico
  - Mature: Japan, United States, Western Europe
  - Second- or third-level administrative divisions
- Mergers and breakups
- Urban areas
  - Aggregate administrative units when part of same urban area ▸ Details
  - Identify high-density areas based on nighttime lights (DMSP–OLS) and land cover data (ESA)
  - Also important to ensure results are not driven by differences in granularity across economies
    - ★ E.g., NYC metro (11 counties) vs Beijing metro (1 county)

Data II: Market Potential

- A location's attraction as a place to produce depends on the market it can access in all locations: market potential (Harris, 1954)

$$NMP_i = \sum_{j \in \mathcal{J}} Y_j d_{ij}^{-\gamma}$$

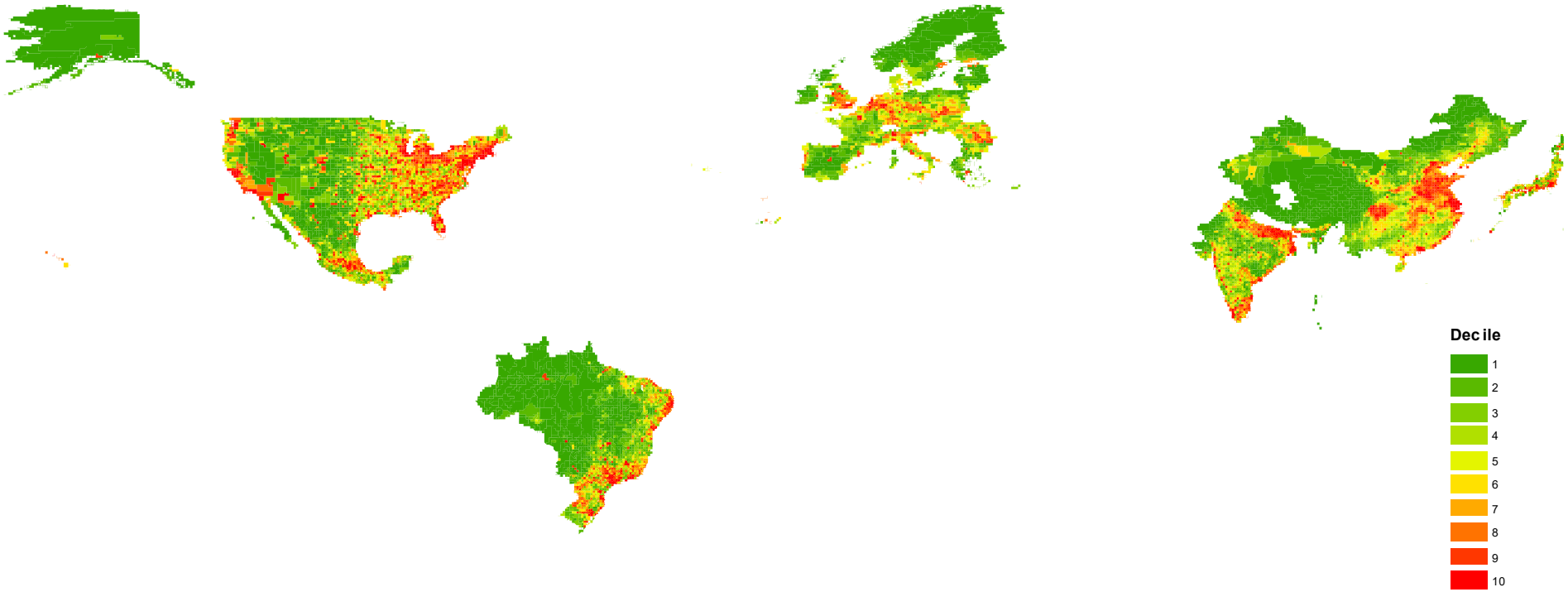
  where $\gamma = 1$ (Disdier and Head, 2008)

- Proxy for demand in different locations: nighttime lights
  - Administrative units too coarse: discretize into $6'$ by $6'$ cells
- Bilateral trade costs: Fast Marching Algorithm
  - Attach a cost to each grid cell, based on major roads, other roads, railroads and water
  - Trading with self: cost to the center of disk with same area

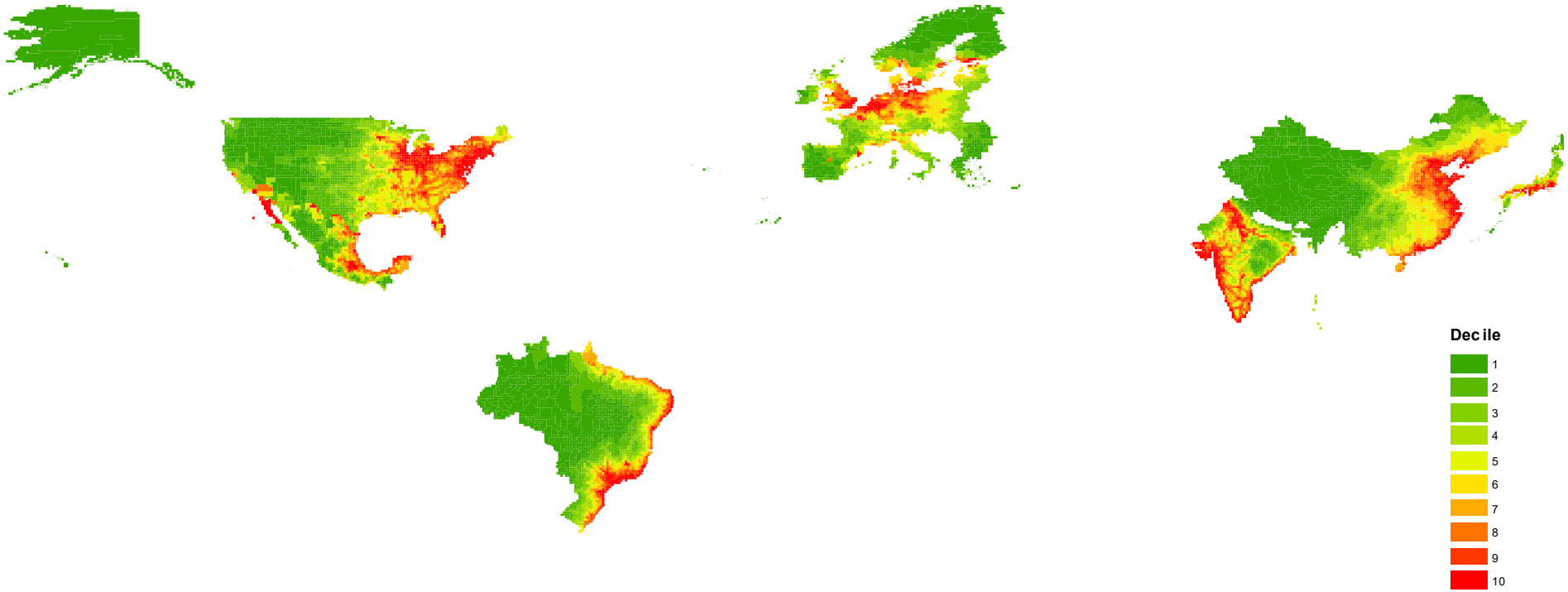
Data III: Employment Density

- Employment and density
  - Multiple statistical sources for employment
    - ★ China: county-level data from Population Census
    - ★ Mexico: municipal-level data from the General Census of Population and Housing
    - ★ US: county-level data from the County Business Patterns
    - ★ ...
  - Distinguish between primary, secondary and tertiary
  - Area: exclude areas unfit for economic activity
- Standardizing and weighting
  - Density expressed in terms of percentile within each economy
  - Same for market potential
  - Our regressions weight each economy equally

Employment Density across the Globe



Market Potential across the Globe



2. Empirical Findings

Growth, Density and Market Potential: All

Dependent Variable: Employment Growth						
	1990-2010		1990-2000		2000-2010	
	(2)	(3)	(4)	(5)	(6)	(7)
MP	**0.467*****	-0.498***	**0.707*****	0.032	**0.137****	-1.016***
	(0.045)	(0.161)	(0.064)	(0.233)	(0.054)	(0.193)
MP (sq)		0.992***		0.698***		1.198***
		(0.153)		(0.223)		(0.184)
Density	**0.015**	-1.776***	**-0.216*****	-1.666***	**0.386*****	-2.136***
	(0.045)	(0.161)	(0.064)	(0.234)	(0.054)	(0.194)
Density (sq)		1.776***		1.438***		2.498***
		(0.154)		(0.223)		(0.184)
Constant	-0.241***	0.214***	-0.246***	0.105******	-0.261***	0.344***
	(0.024)	(0.037)	(0.034)	(0.054)	(0.028)	(0.044)
Observations	18,961	18,961	18,961	18,961	18,961	18,961
R^2	0.009	0.022	0.007	0.011	0.006	0.023

Growth, Density and Market Potential: Mature

Panel a: Mature Economies

Dependent Variable: Employment Growth						
	1990-2010		1990-2000		2000-2010	
	(1)	(2)	(3)	(4)	(5)	(6)
MP	**-0.294*****	-1.620***	**-0.077**	-1.565***	**-0.627*****	-1.185***
	(0.074)	(0.246)	(0.100)	(0.332)	(0.082)	(0.231)
MP (sq)		1.279***		1.413***		0.557***
		(0.229)		(0.310)		(0.214)
Density	**0.856*****	1.892***	**0.843*****	2.605***	**1.064*****	1.210***
	(0.074)	(0.248)	(0.100)	(0.336)	(0.083)	(0.271)
Density (sq)		-0.996***		-1.706***		-0.140
		(0.230)		(0.311)		(0.251)
Constant	-0.281***	-0.229***	-0.383***	-0.423***	-0.217***	-0.150***
	(0.033)	(0.052)	(0.045)	(0.071)	(0.037)	(0.056)
Observations	5,437	5,437	5,437	5,437	5,437	5,437
R^2	0.029	0.036	0.021	0.028	0.030	0.031

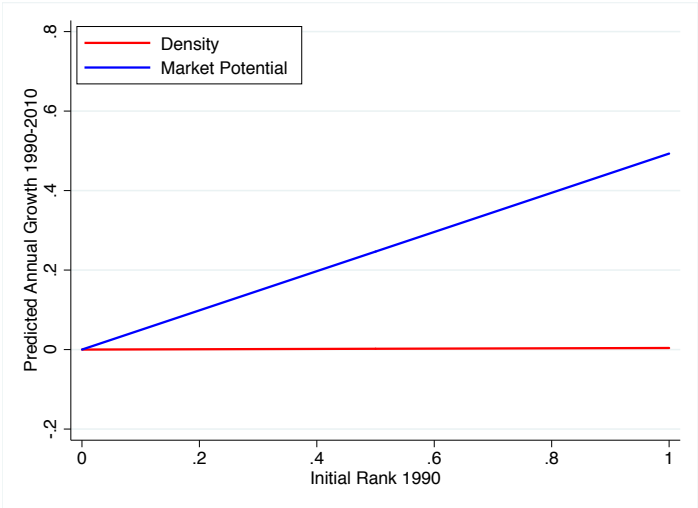
Growth, Density and Market Potential: Emerging

Panel b: Emerging Economies

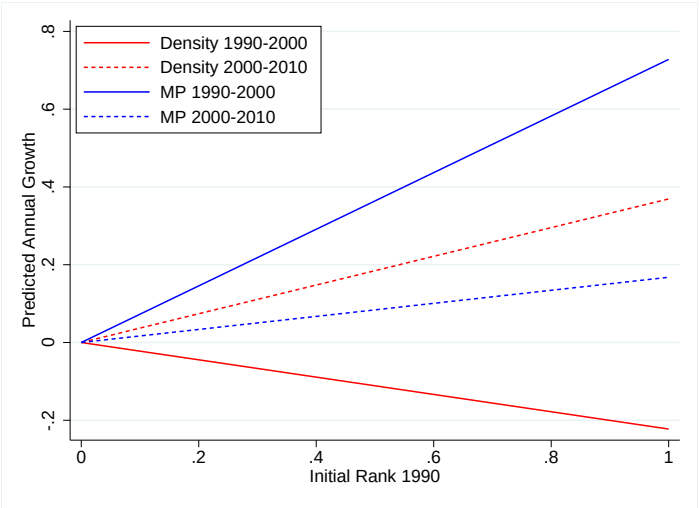
Dependent Variable: Employment Growth	1990-2010		1990-2000		2000-2010	
	(1)	(2)	(3)	(4)	(5)	(6)
MP	**0.720*****	-0.325	**0.938*****	0.391	**0.422*****	-0.573**
	(0.055)	(0.205)	(0.081)	(0.304)	(0.068)	(0.233)
MP (sq)		1.069***		0.570*		1.044***
		(0.197)		(0.292)		(0.223)
Density	**-0.290*****	-3.478***	**-0.628*****	-3.648***	**0.157****	-3.951***
	(0.055)	(0.205)	(0.081)	(0.304)	(0.068)	(0.252)
Density (sq)		3.171***		3.005***		4.084***
		(0.197)		(0.292)		(0.241)
Constant	-0.215***	0.488***	-0.155***	0.436***	-0.290***	0.552***
	(0.032)	(0.049)	(0.046)	(0.073)	(0.038)	(0.058)
Observations	13,524	13,524	13,524	13,524	13,524	13,524
R^2	0.012	0.040	0.010	0.020	0.006	0.035

Growth: All, Mature & Emerging

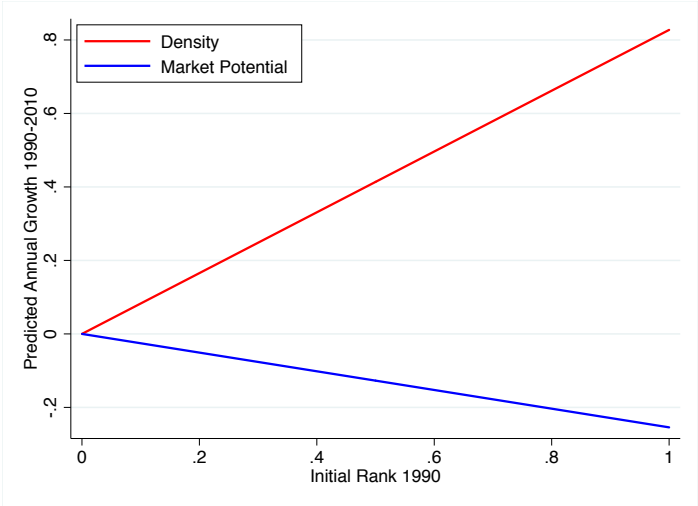
(a) All: 1990-2010



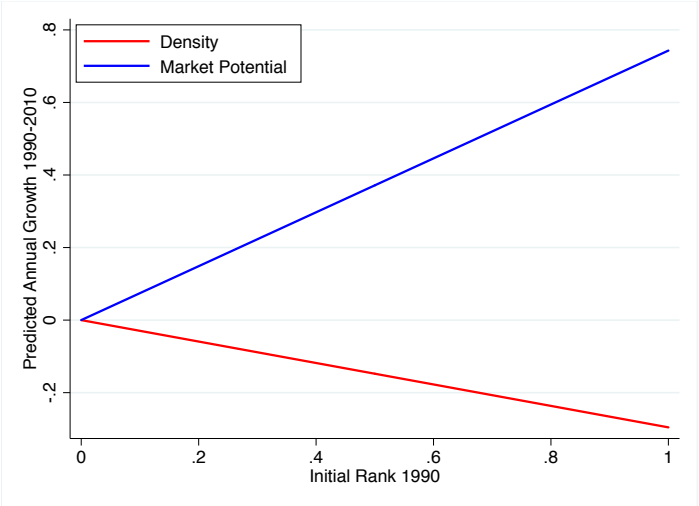
(b) All: 1990-2000 and 2000-2010



(c) Mature: 1990-2010

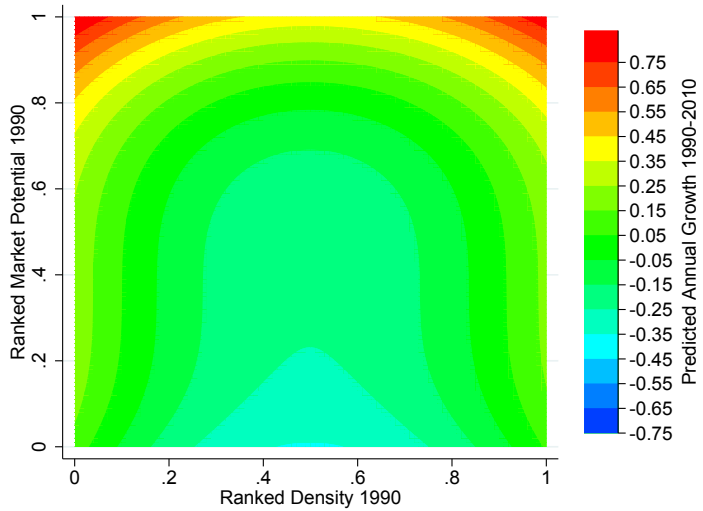


(d) Emerging: 1990-2010

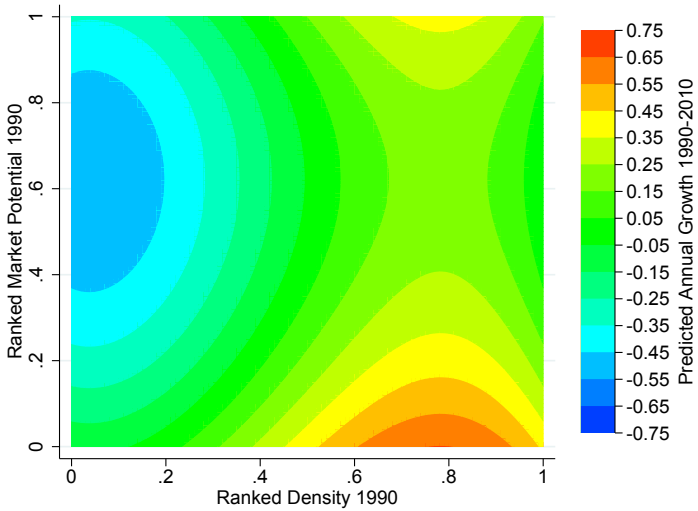


Growth: All, Mature & Emerging

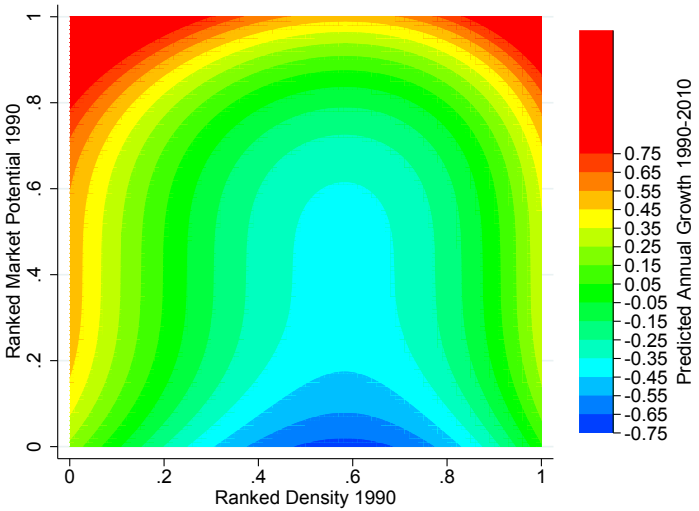
(a) All: 1990-2010



(b) Mature: 1990-2010



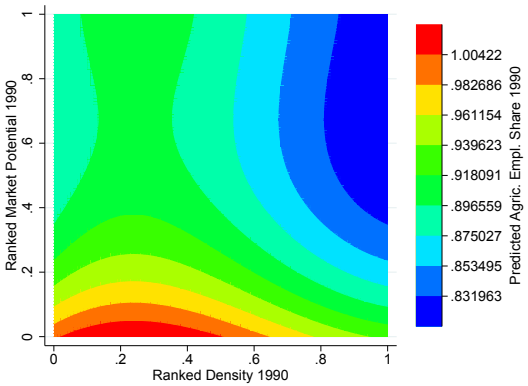
(c) Emerging: 1990-2010



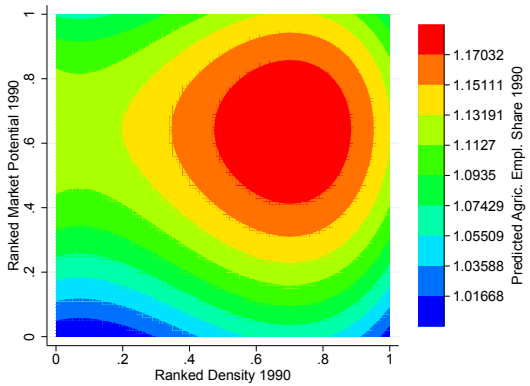
3. Possible Explanations

Structural Transformation I: Sectoral Shares 1990

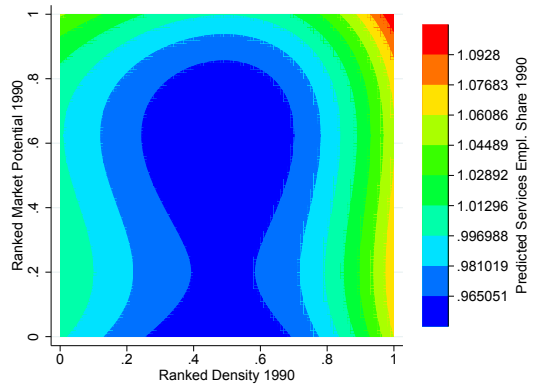
(a) Mature: Ag



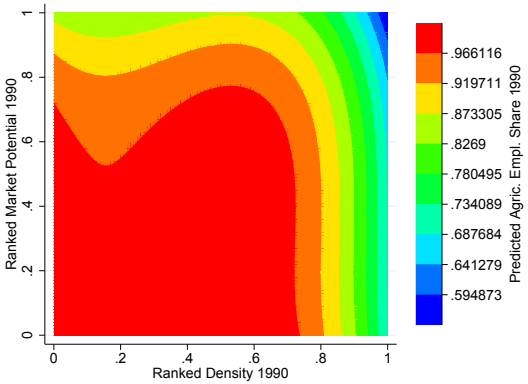
(b) Mature: Manuf



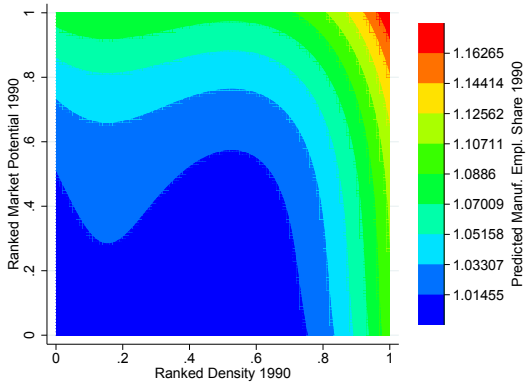
(c) Mature: Serv



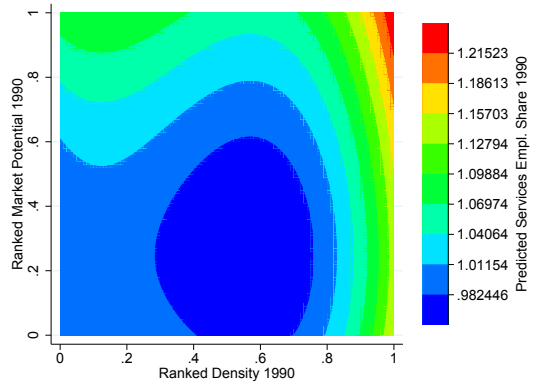
(d) Emerg: Ag



(e) Emerg: Manuf



(f) Emerg: Serv



Structural Transformation II: Counterfactual Growth

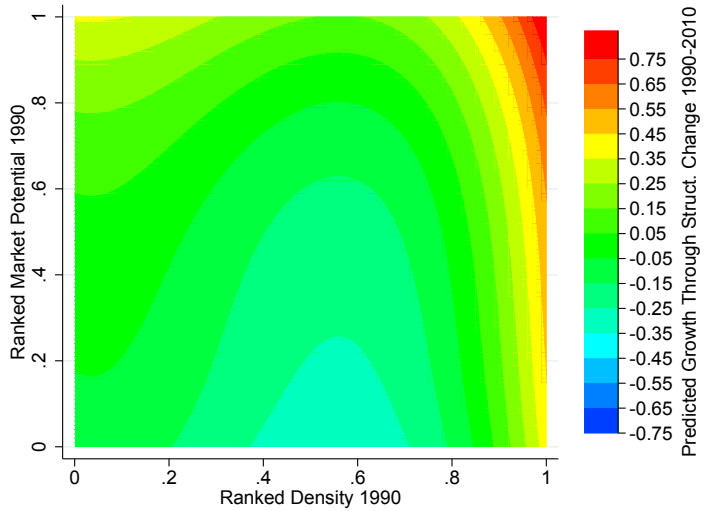
- How much of the change in the spatial distribution of economic activity can be explained by structural transformation?
  - Accounting methodology by Michaels, Rauch and Redding (2012)
- For each region, calculate what growth would have been if each of its sectors had grown at the economy-wide sectoral growth rate
  - Yields a counterfactual measure of aggregate employment in 2010 for each region i of economy c

$$\widetilde{E}^{total}_{i,c,2010} = \sum_s E^s_{i,c,1990} \frac{E^s_{c,2010}}{E^s_{c,1990}}$$

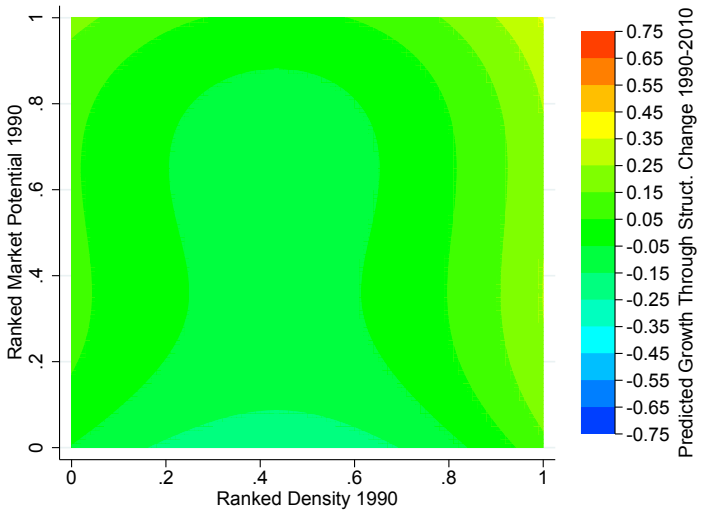
  - Use to compute a counterfactual growth rate between 1990 and 2010
- Provides a measure of how much a region would have grown if the only force were structural transformation

Structural Transformation III: Counterfactual Growth

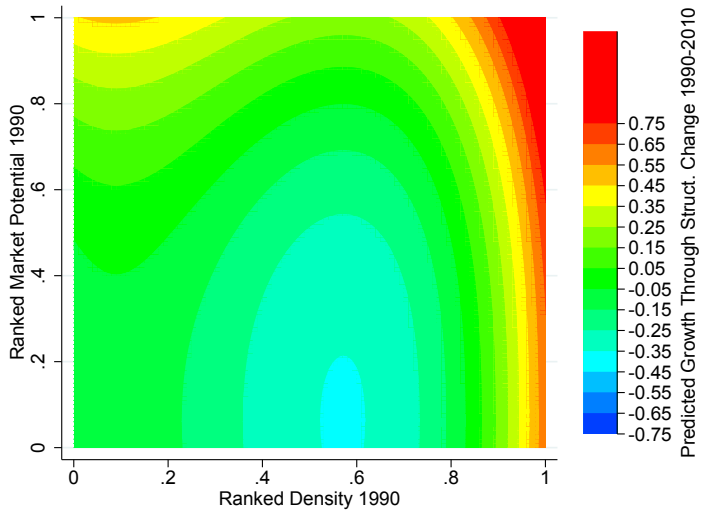
(a) All: 1990-2010



(b) Mature: 1990-2010

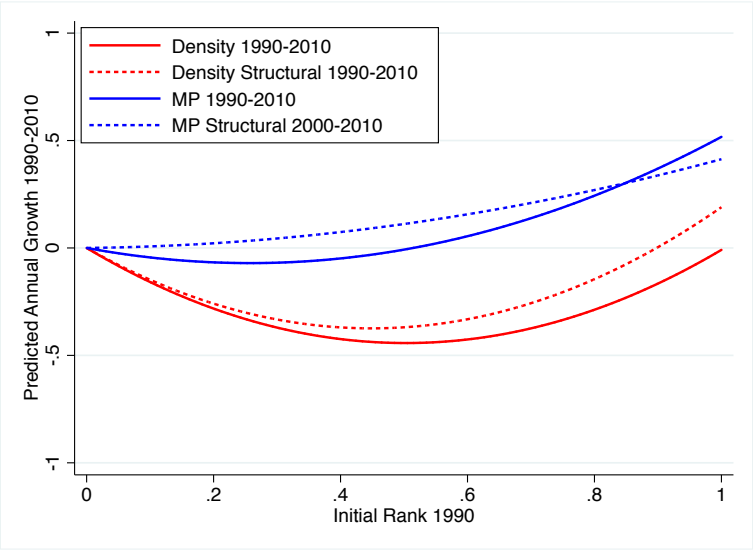


(c) Emerging: 1990-2010

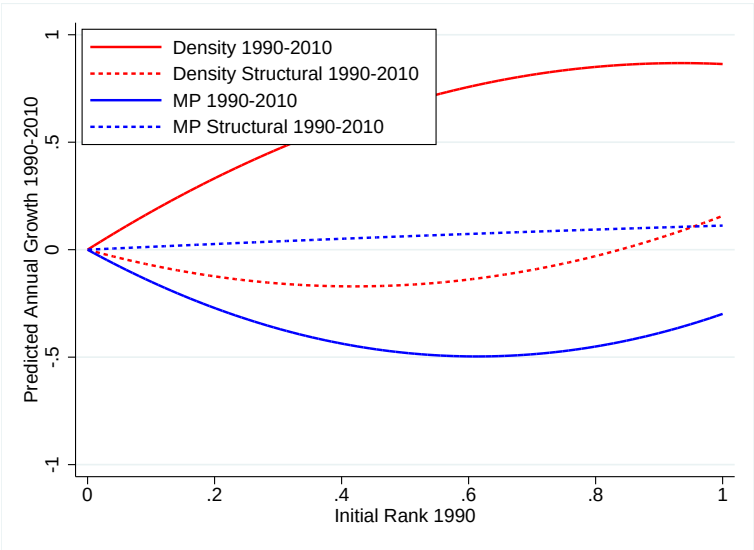


Structural Transformation IV: Counterfactual vs Observed

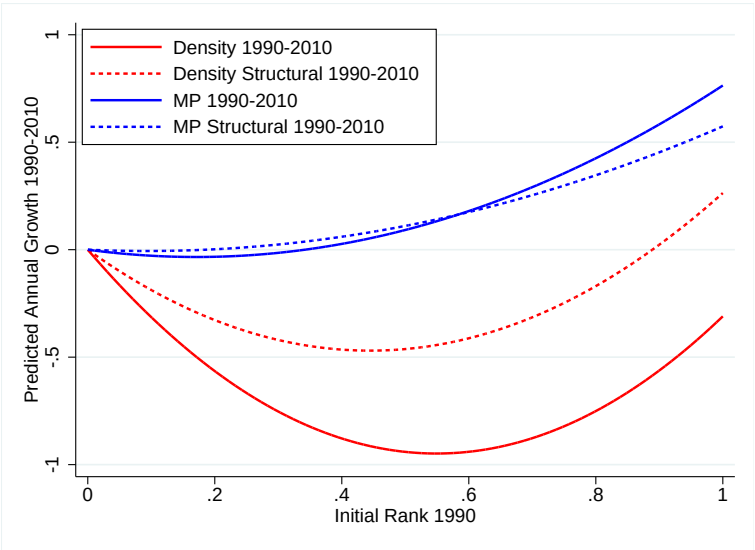
(a) All Economies: 1990-2010



(b) Mature: 1990-2010

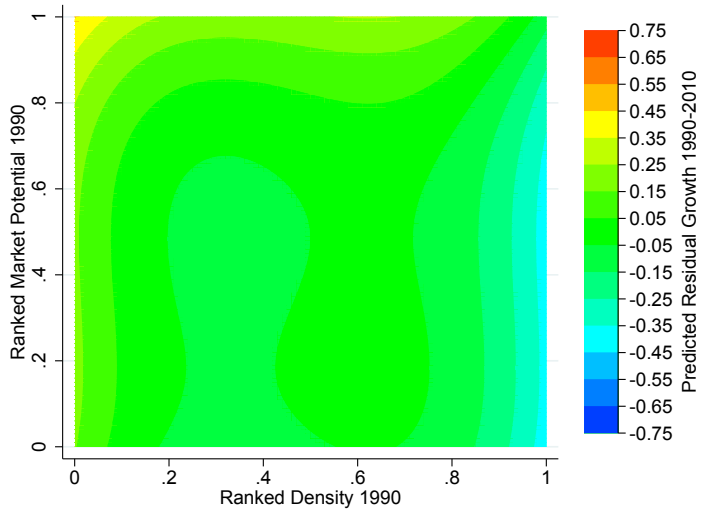


(c) Emerging: 1990-2010

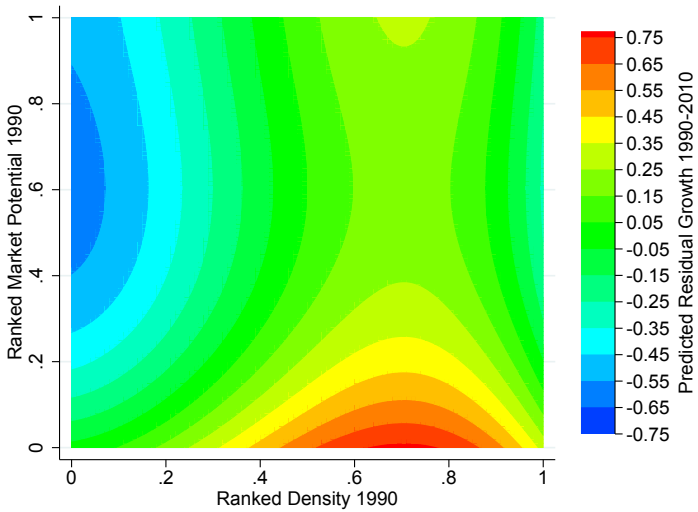


Structural Transformation V: Residual

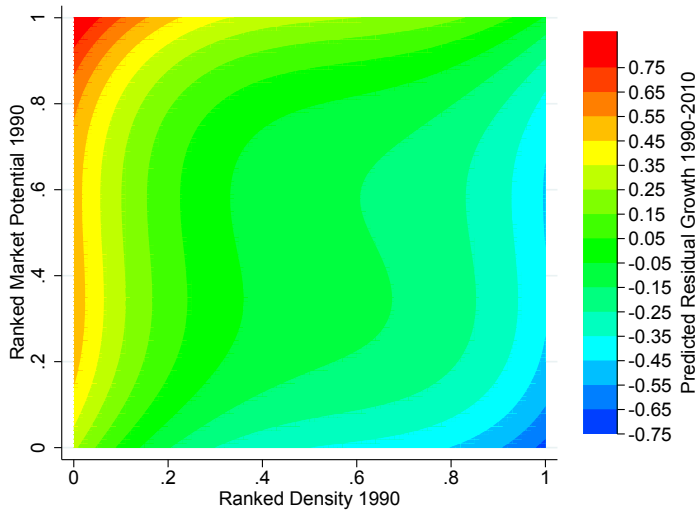
(a) All: 1990-2010



(b) Mature: 1990-2010



(c) Emerging: 1990-2010



Structural Transformation VI: Residual

Dependent Variable: Residual Employment Growth (= *Empl. Growth - Structural Empl. Growth*)	1990-2010			1990-2000	2000-2010
	All	Mature	Emerg.	All	All
	(1)	(2)	(3)	(4)	(5)
Market Potential	**0.151*****	**-0.367*****	**0.292*****	**0.526*****	**-0.440*****
	(0.045)	(0.071)	(0.057)	(0.066)	(0.055)
Density	-0.227***	0.676***	-0.644***	**-0.567*****	**0.074**
	(0.045)	(0.071)	(0.057)	(0.066)	(0.055)
Constant	0.012	-0.149***	0.130***	0.006	0.148***
	(0.023)	(0.032)	(0.032)	(0.034)	(0.029)
Observations	17,418	5,432	11,986	17,418	17,418
R^2	0.001	0.017	0.011	0.005	0.005

Structural Transformation VII: Residual

- Compare residual employment growth to actual employment growth
- World as a whole
  - Structural transformation accounts for about **two-thirds** of the positive effect of **market potential** on growth
  - And for about **all** the positive effect of **density** in recent time period
- Emerging economies
  - Structural transformation accounts for about **60 percent** of the positive effect of **market potential** on growth
- Mature economies
  - Structural transformation is **not** a significant driver of the changing economic geography
- Remains to be explained
  - Negative effect of market potential on growth in mature economies
  - Falling importance of market potential in world as a whole

Transport Costs I: Trends

- Systematic decline in transport and trade costs (World Trade Organization, 2008; Redding and Turner, 2015)
  - Cost of air transport dropped by 92 percent between 1955 and 2004
  - Cost of maritime shipping has steadily declined since mid-1980s (Hummels, 2007)
- Several factors have contributed to this trend
  - Technological improvements
  - Market liberalization
  - Infrastructure investment, especially in emerging economies

Transport Costs II: Model

- Endowments
  - One central location and two peripheral locations
  - Each location has one unit of land, owned by local population
  - Labor endowment L, freely mobile across locations
- Each location i produces a different good

$$Y_i = (\bar{A}_i L_i^{\varepsilon}) L_i^{\alpha}$$

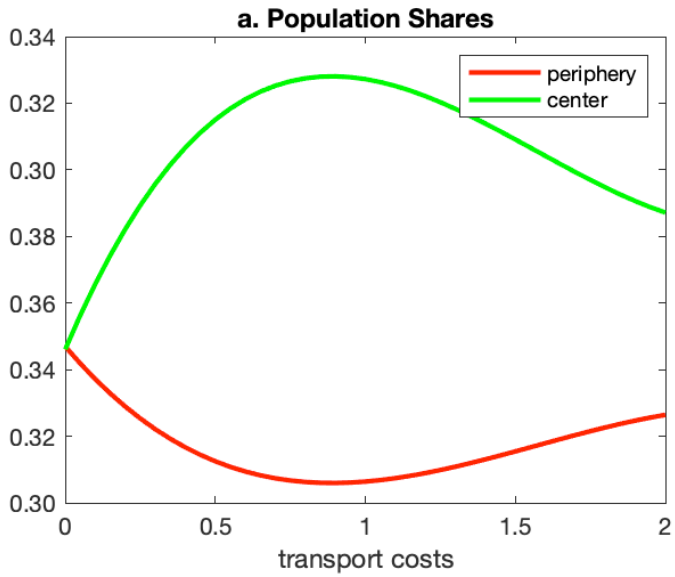
  where $\varepsilon < 1 - \alpha$
- When 1 unit is shipped from i to j, $(1 + d_{ij})^{-\gamma}$ units arrive
- Consumers in location i have CES preferences over the 3 goods

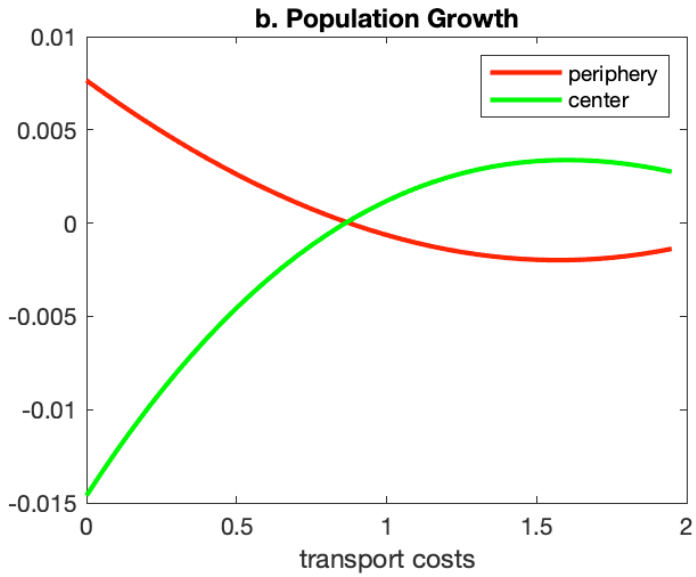
$$u_i = \left(\sum_j c_j^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

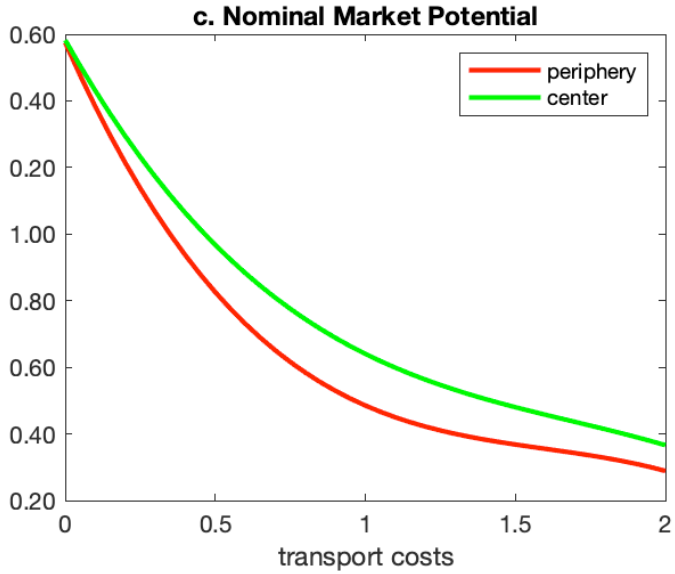
Transport Costs III: Model

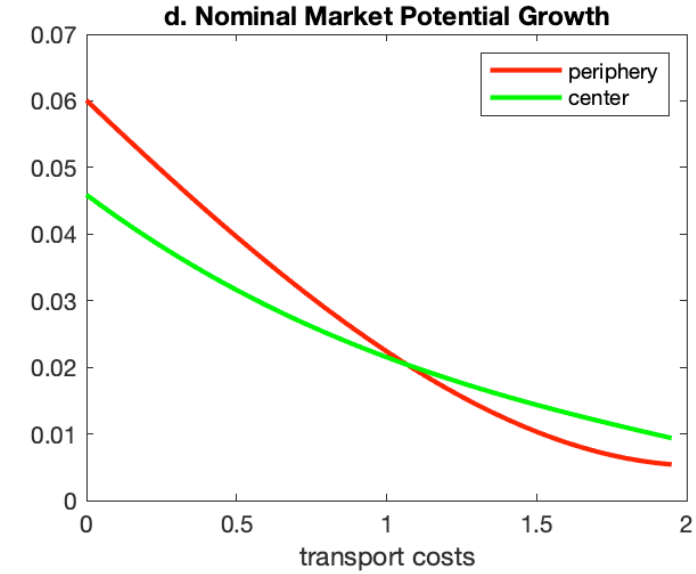
- Equilibrium: utility equalizes across space
- No multiplicities because $1 - \alpha > \varepsilon$
- Transport cost and centrality
  - Prohibitive: employment equally spread across space
  - Intermediate: central (high-market potential) larger employment
  - Zero: employment equally spread across space
- Bell-shaped relation between employment of high-market-potential location and the level of trade costs

Transport Costs IV: Model

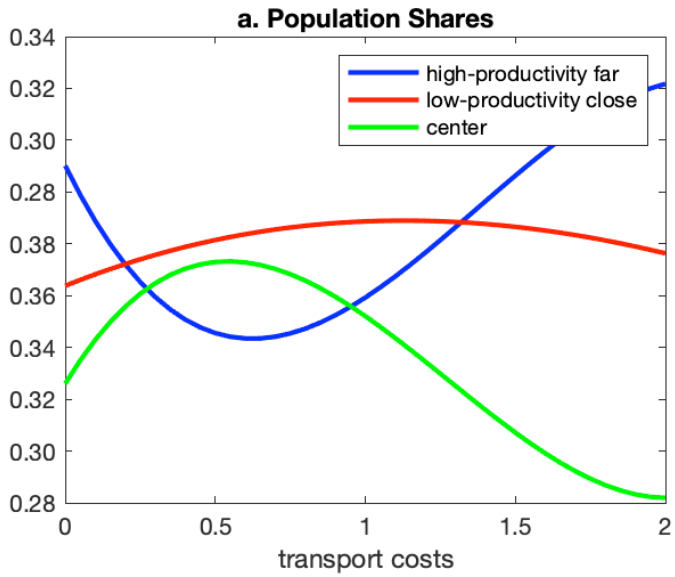


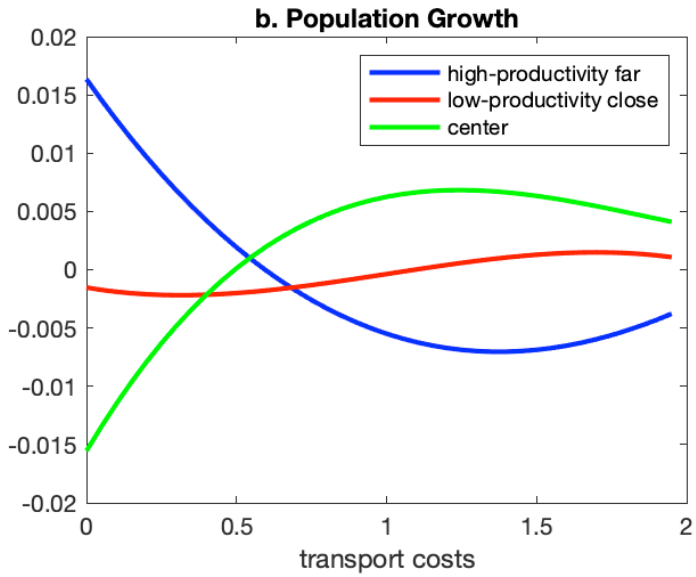


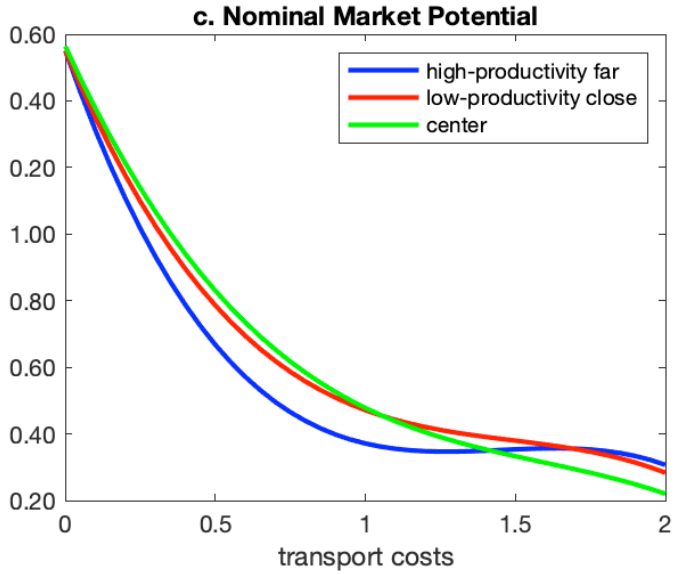


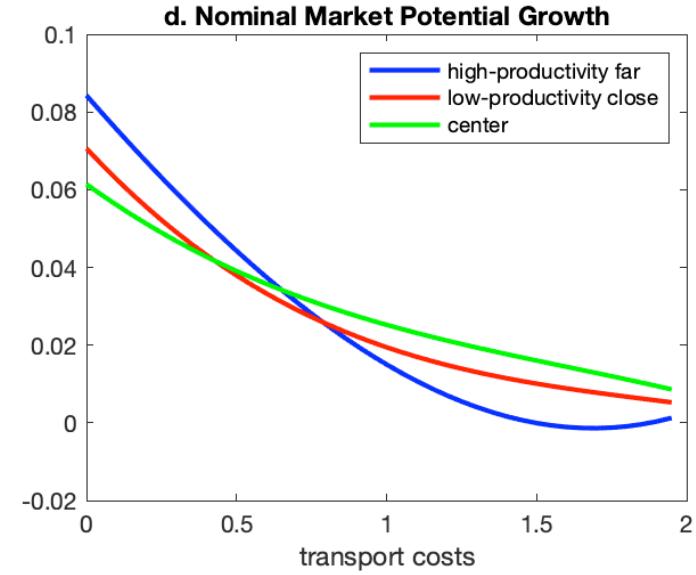


Transport Costs V: Model









Transport Costs VI: Model

- Drop in (already) low transport costs generates negative relation between MP and growth
  - Does *not* imply that there is a disadvantage to market access
  - Instead, advantage of centrality is weakening
  - *Growth* in MP is greater in locations with initially *low* MP
- Might this help to explain
  - Negative effect of MP on growth in mature economies?
  - Weakening importance of MP in world?
- No measure of drop in transport costs across space for 1990-2010
  - No direct way to test theory
  - Indirect way if willing to make assumption that drop in transport costs across the board
  - Less likely to be a reasonable assumption for emerging economies

Transport Costs VII: Simulation Mature

Dependent Variable: Residual Employment Growth				
	(1)	(2)	(3)	(4)
Δ Market Potential 1	**0.226*****			
	(0.109)			
Δ Market Potential 2		**0.202**		
		(0.233)		
Δ Market Potential 3			**0.225****	
			(0.109)	
Δ Market Potential 4				**0.198**
				(0.233)
Density	0.517***	0.462***	0.517***	0.462***
	(0.069)	(0.070)	(0.070)	(0.070)
Constant	-0.782***	-0.404*	-0.780***	-0.400*
	(0.280)	(0.231)	(0.280)	(0.230)
Observations	5,436	5,436	5,436	5,436
R^2	0.013	0.012	0.013	0.012

Δ MP 1: decay parameter $\gamma = 0.5$;
Δ MP 2: decay parameter $\gamma = 0.8$;
Δ MP 3: decay parameter $\gamma = 0.5$ (except w.r.t. own region);
Δ MP 4: decay parameter $\gamma = 0.8$ (except w.r.t. own region).

Transport Costs VIII: Why Not in Emerging?

- If model is consistent with negative relation between MP and growth, why don't we see the same negative relation in emerging economies?
- Bell-shaped prediction of relation between growth of high MP locations and transport costs
  - Transport costs are higher in emerging economies (World Bank, 2009)
  - E.g., maritime freight costs were 20-50% higher in developing countries of Asia and America than in developed world (UNCTAD, 2012)
- Transport infrastructure investment has been a big driver of falling transport costs in emerging economies
  - Unlikely to have led to uniform improvements across space
  - Likely more concentrated in locations with already high MP
- Structural transformation was the main determinant of growth in high MP locations in emerging economies
  - See earlier figures

4. Conclusions

Conclusions

- Paper has documented employment growth patterns in 18,978 regions across the world for the period 1990 to 2010
- Two stylized facts
  - World as a whole: market potential is becoming less important and density more important
  - Market potential has a positive effect on growth in emerging economies, while the opposite is true in mature economies
- Structural transformation accounts for
  - Increasing importance of local density in the world
  - Local growth patterns in emerging economies
- Falling transport costs consistent with
  - Shrinking advantage of market potential in mature economies and in world as a whole

Summary Statistics I

		Employment and Area			Sectoral Shares		
	Year	Mean	Std. Dev.	Median	Agric.	Manuf.	Serv.
All economies	1990	73,448	232,263	16,509	49.9	19.1	30.9
(18,961 obs.)	2000	87,177	295,831	20,072	45.8	19.0	35.2
	2010	97,044	358,880	22,537	36.8	22.5	40.7
Administrative unit	Area	1,778	6,523	712			
Mature	1990	60,201	289,702	11,983	4.2	28.1	67.7
(5,437 obs.)	2000	66,253	304,685	13,704	2.7	23.6	73.7
	2010	67,254	302,517	13,185	2.2	19.0	78.8
Administrative unit	Area	2,345	9,023	1,229			
Emerging	1990	78,763	204,508	19,147	64.1	16.4	19.5
(13,522 obs.)	2000	95,572	291,794	24,650	57.7	17.7	24.6
	2010	108,997	378,497	28,541	45.4	23.3	31.3
Administrative unit	Area	1,551	5,174	558			
Brazil	1991	13,157	112,630	4,346	23.1	24.8	52.1
(4,204 obs.)	2000	15,616	125,059	4,992	18.7	21.8	59.5
	2010	22,248	178,019	6,419	15.2	22.0	62.8
Municipality	Area	1,990	8,406	466			
Central & Eastern Europe	1991	182,486	176,506	140,991	21.6	34.9	43.5
(311 obs.)	2000	163,980	164,224	127,113	22.2	28.6	49.2
	2010	164,297	181,282	118,022	12.9	28.8	58.3
NUTS3	Area	3,763	2,979	3,384			
China	1990	285,373	354,255	206,068	72.2	15.0	12.9
(2,268 obs.)	2000	330,156	567,629	237,874	64.2	16.9	18.9
	2010	360,498	759,377	250,530	48.1	24.1	27.9
County	Area	2,915	4,129	1,933			
India	1991	62,527	117,468	40,566	65.6	13.0	21.4
(4,541 obs.)	2001	87,003	168,980	57,902	60.0	16.2	23.8
	2011	103,751	221,944	69,123	52.4	21.6	26.0
Subdistrict	Area	643	672	425			

Summary Statistics II

		Employment and Area			Sectoral Shares		
	Year	Mean	Std. Dev.	Median	Agric.	Manuf.	Serv.
Japan	1990	42,646	403,704	11,855	7.2	34.0	58.8
(1,431 obs.)	2000	43,505	413,555	11,594	5.1	30.4	64.5
	2010	41,291	406,675	10,232	4.2	25.7	70.1
Subprefecture	area	255	293	160			
Mexico	1990	10,512	109,303	2,695	23.4	28.8	47.8
(2,200 obs.)	2000	15,140	151,738	3,532	16.3	28.7	55.0
	2010	19,165	179,822	4,125	13.2	25.1	61.7
Municipality	Area	872	2,224	264			
United States	1990	37,030	212,462	6,692	0.2	22.8	77.0
(3,066 obs.)	2000	44,152	230,477	8,303	0.1	18.2	81.6
	2010	43,425	219,688	8,116	0.1	13.0	86.9
County	Area	2,953	11,320	1,625			
Western Europe	1990	160,917	280,456	95,573	6.0	29.7	64.4
(940 obs.)	2000	171,271	301,316	99,349	4.0	25.4	70.6
	2010	182,623	323,343	104,599	3.1	21.4	75.4
NUTS3	Area	3,509	6,593	1,501			

▸ Return

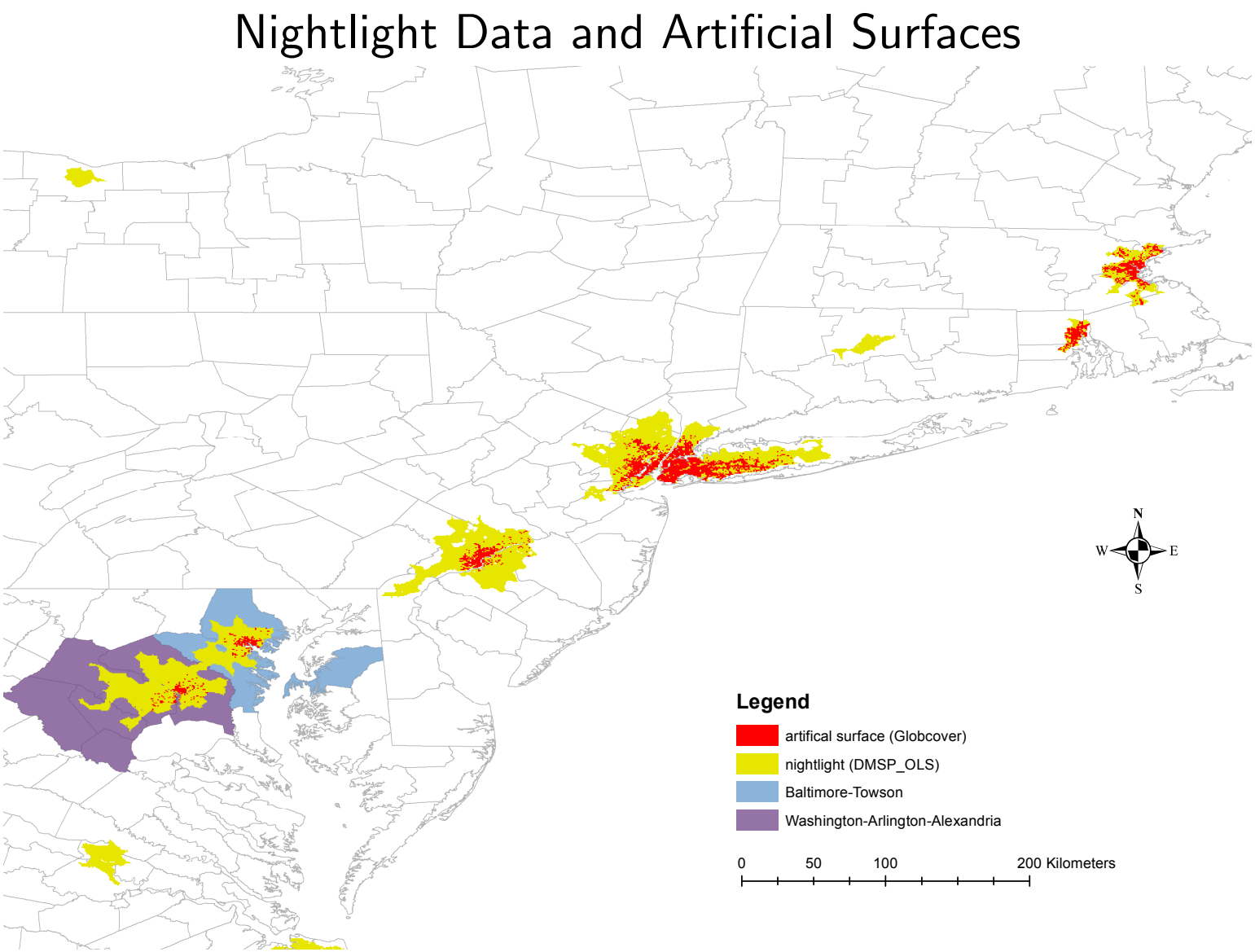
Construction of Metro Areas

- Defense Meteorological Satellites Program – Operational Linescan System (DMSP–OLS) nighttime lights of 2010
  - Correct for over-glow following Pinkovskiy (2017)
  - To capture high-density areas, we form polygons based on the top most luminous grids of night light
  - See yellow polygons on next page
- For polygon to qualify as an urban: minimum size
- For administrative unit to be included in urban area: minimum share of its area covered by polygon
- Minimum size and share: calibration targeting high-density part of large MSAs
  - Counties with at least 20% of their surface covered by night light polygons of at least 200 square kilometers

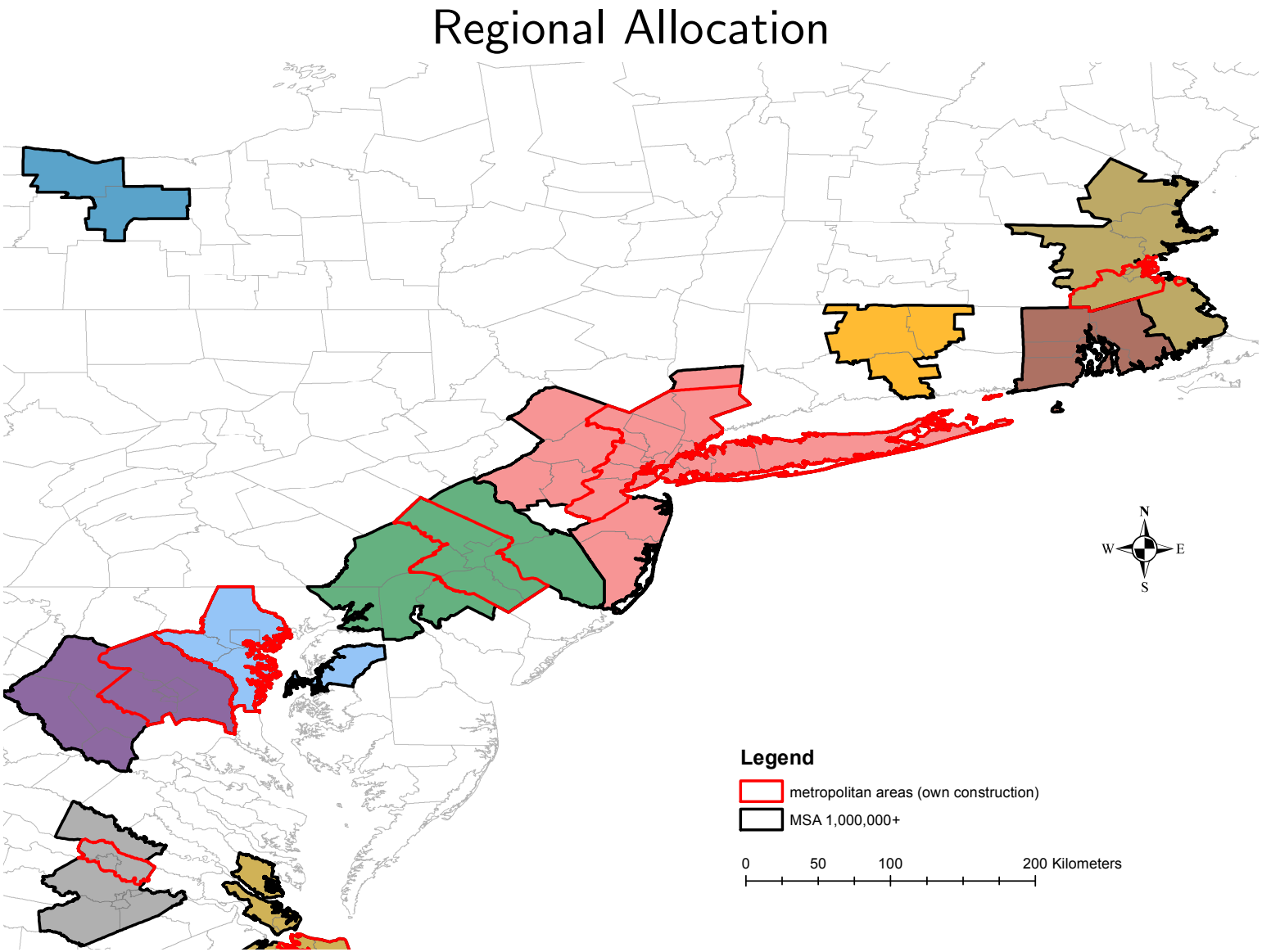
Construction of Metro Areas

- One issue is that some night light polygons generate continuous urban areas that are unreasonably large
  - For example, Washington-Arlington-Alexandria and Baltimore-Towson
  - Identify urban cores using *Artificial surfaces and associated areas (Urban areas >50%)* from ESA's Globcover project
- Applying this algorithm, we identify in the U.S. 37 urban areas covering 77 counties
  - All are assigned to the correct MSAs
- Our aim is to capture the high-density parts of large MSAs
  - We exclude certain counties that enter into the definition of an MSA
  - E.g., a county with a large low-density hinterland and small high-density cluster
  - Including such a county would downward bias the density of urban areas
- Our procedure generally does not capture the full extent of the MSAs

Construction of Metro Areas



Construction of Metro Areas



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