Regional Deindustrialization in Turkey

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Motivation

- Path of industrial production is linked with development (Kaldorian setting: Dasgupta, Singh, 2007)
- Global trends show declining trends in manufacturing production: aspects among developed and developing countries can not be identical (Rodrik, 2016)

- Turkey realizes continuous declines in manufacturing production
- Regional disparities has been densely investigated in Turkey, but not from industrial point of view

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Objective

- Observing the spatiality of industrial production in Turkey
  - construction of a historical data set
  - evaluating the spatial pattern of industrial production
- Assessing the impact of industrial production
  - Markov Chains
  - Conditional analyses of Markov Chains
  - Spatial analyses of Markov Chains

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Prior Literature

- On the side of regional dimension of deindustrialization: Dogruels (various years), Mecik, Aytun (2018)
- On the side of regional disparities: Filiztekin (1998), Dogruel and Dogruel (2003)
- On the side of spatial battery: Gezici and Hewings (2004, 2007), Karahasan and Bilgel (2018)

Central Hypotheses

- (H_1) National trends in manufacturing will have inevitable reflections at spatial level.
- (H_2) Regions that are manufacturing intensive will have better economic performance in terms of regional growth.

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Data at national and regional level

National Level Data

- National data set is from TurkStat covers 1923-2018 (for VA), 1988-2018 (for employment)

Regional Level Data

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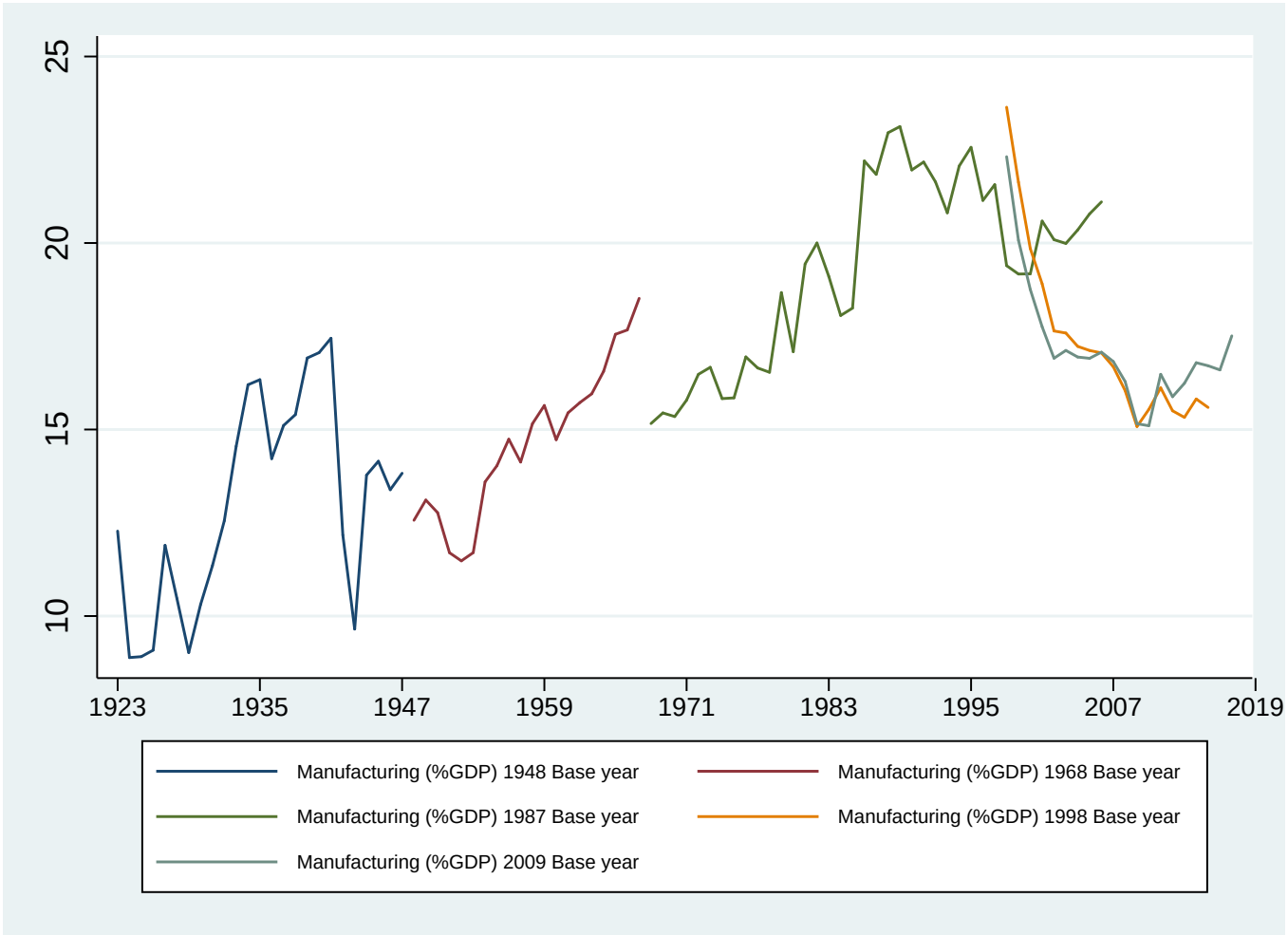
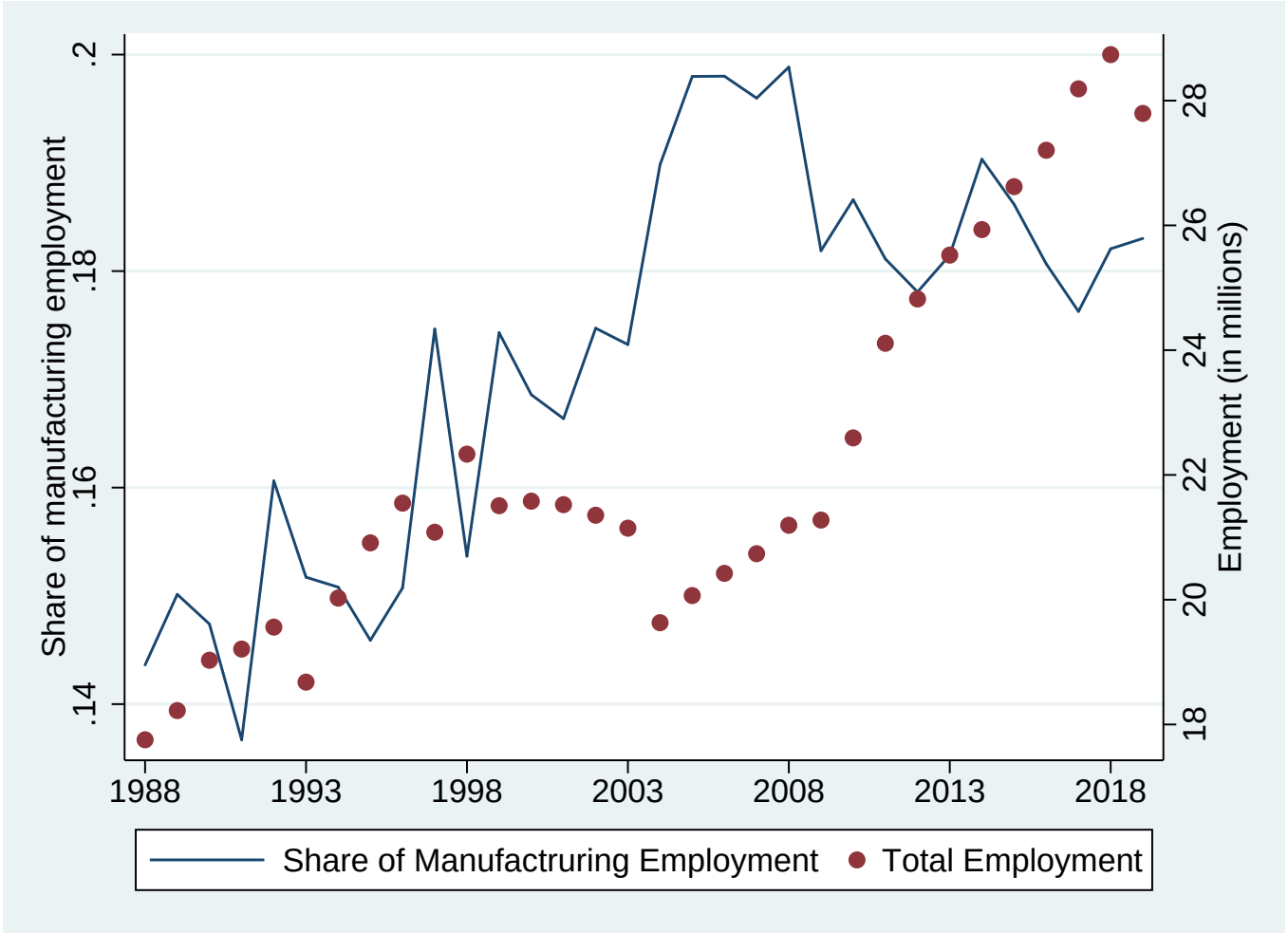
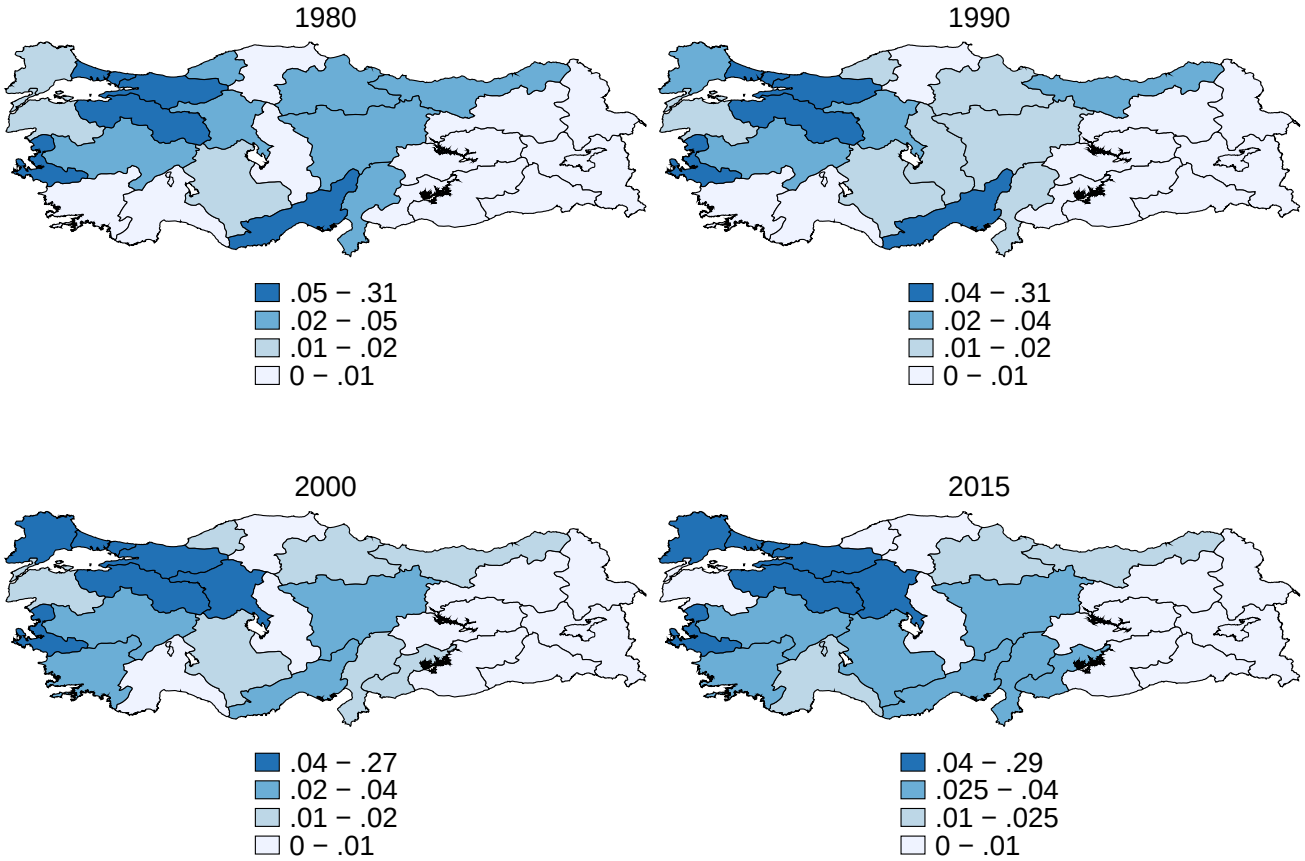
Path of Industrial Production (VA % GDP)



Path of Industrial Production (Employment %total)



Path of Industrial Production (Employment %total)

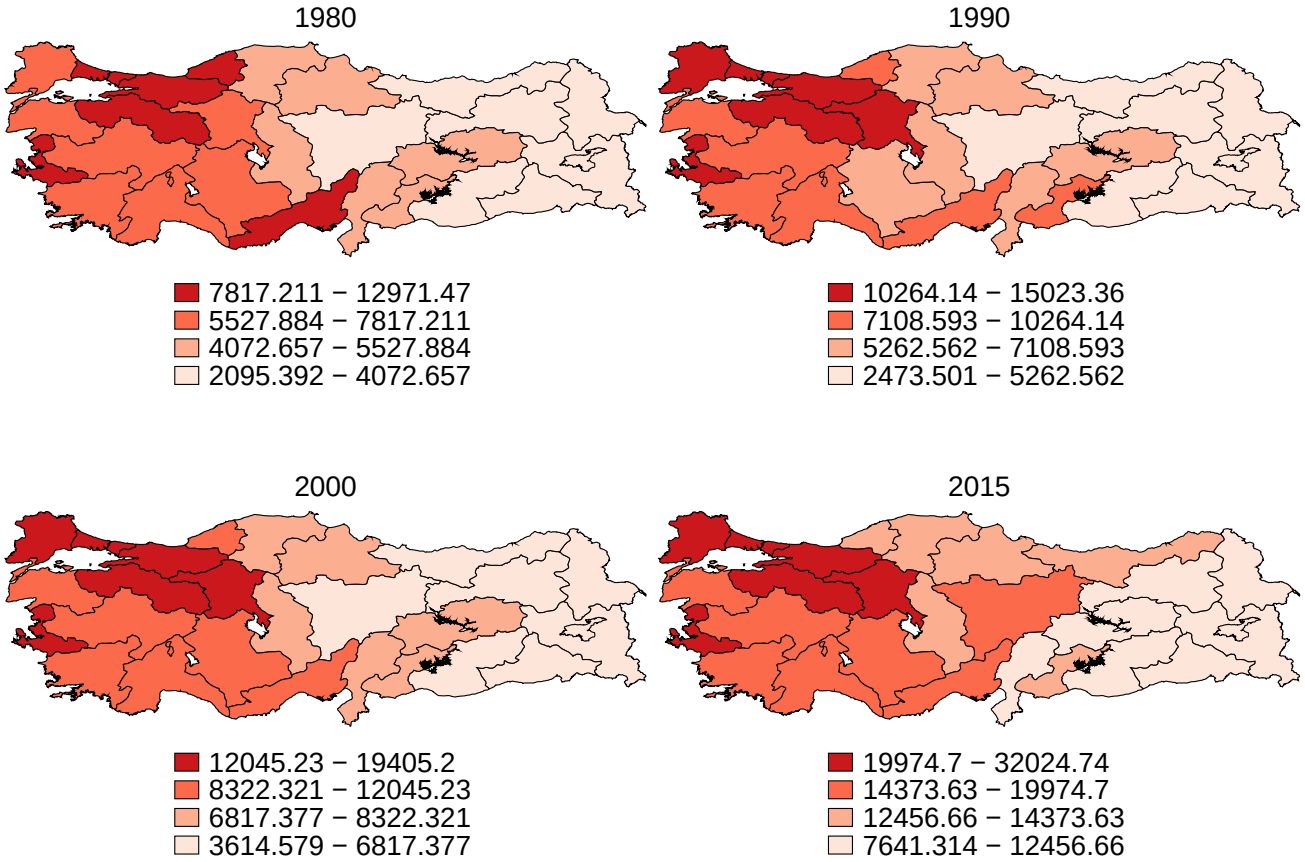


Data on regional development

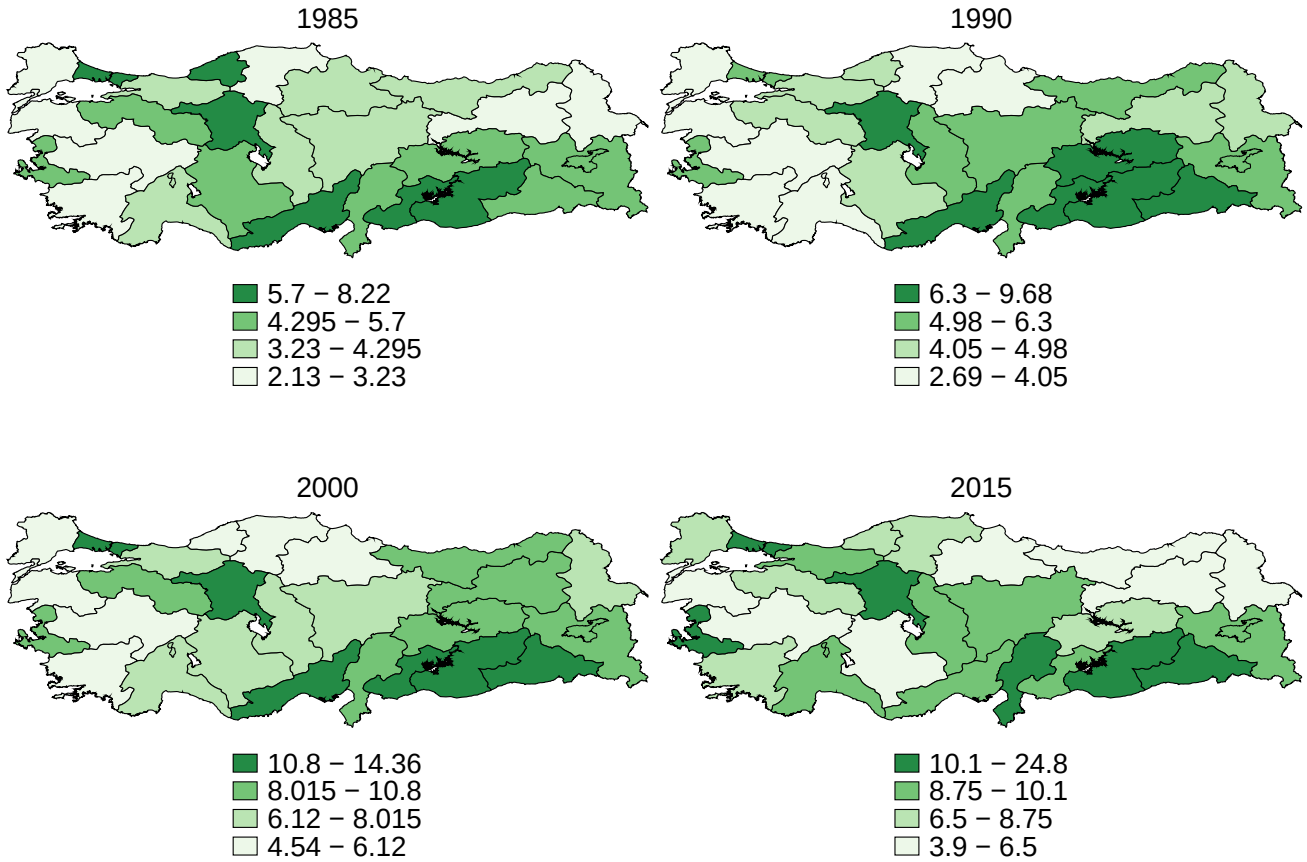
Per capita GDP

- A harmonization has been carried out in order to combine three separate sources
  - Ozotun (1980, 1986): 1975-1987 (NUTS III)
  - TurkStat (2001): 1987-2001 (NUTS III)
  - TurkStat (2018): 2004-2017 (NUTS III)
- Data set : 1980-2015 at NUTS II level

Spatial distribution of per capita GDP



Spatial distribution of unemployment



Methodology I: Exploratory Analyses

Theil Index: Locality of Inequalities

$$T = \sum_{i=1}^{n} y_i log\left(\frac{y_i}{x_i}\right) + \sum_{g=1}^{n} Y_g T_g \tag{1}$$

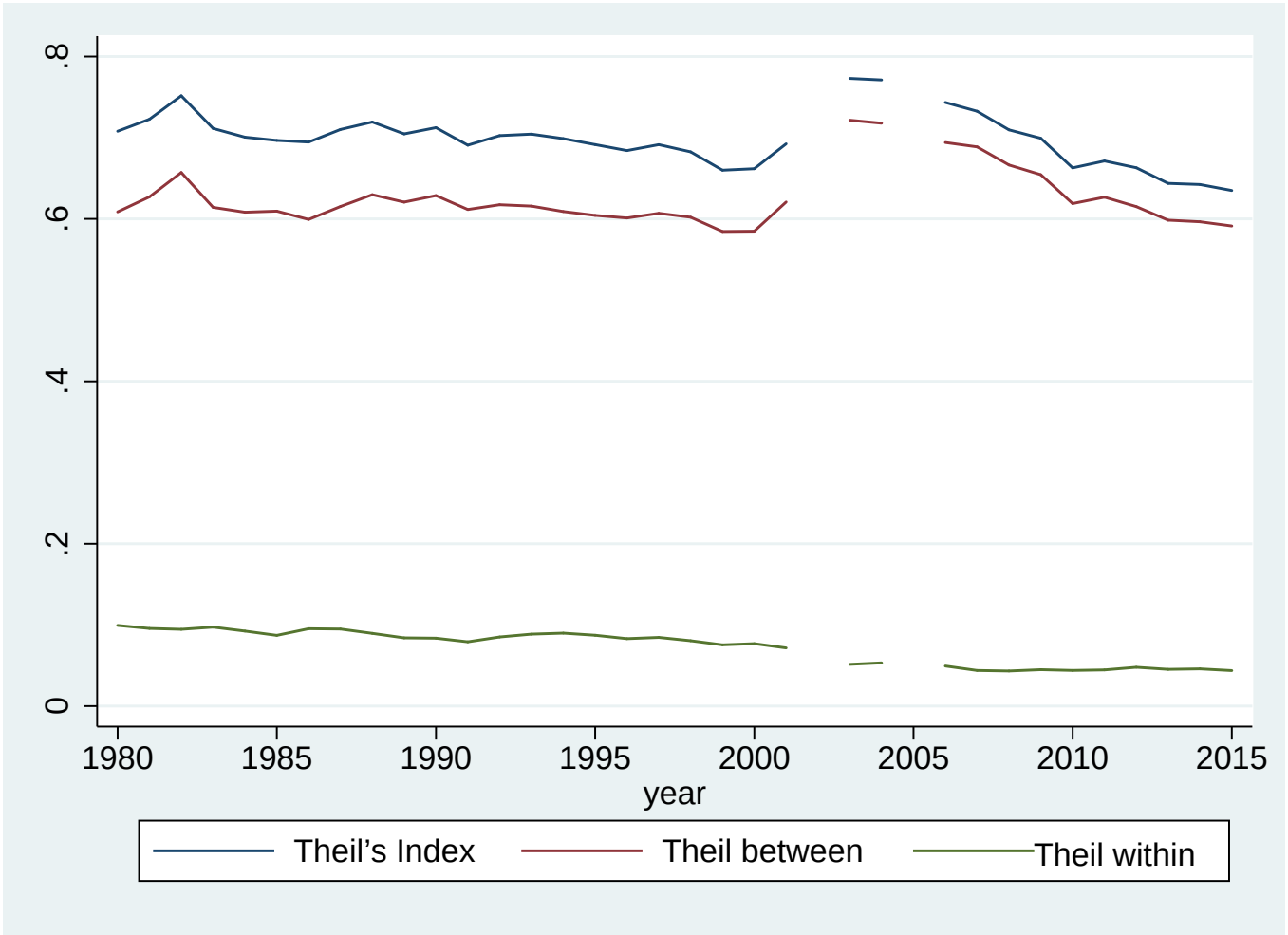
Moran's I: Spatial Dependence

$$I = \frac{n}{s} \frac{\sum_i w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{\sum(y_i - \bar{y})^2} \tag{2}$$

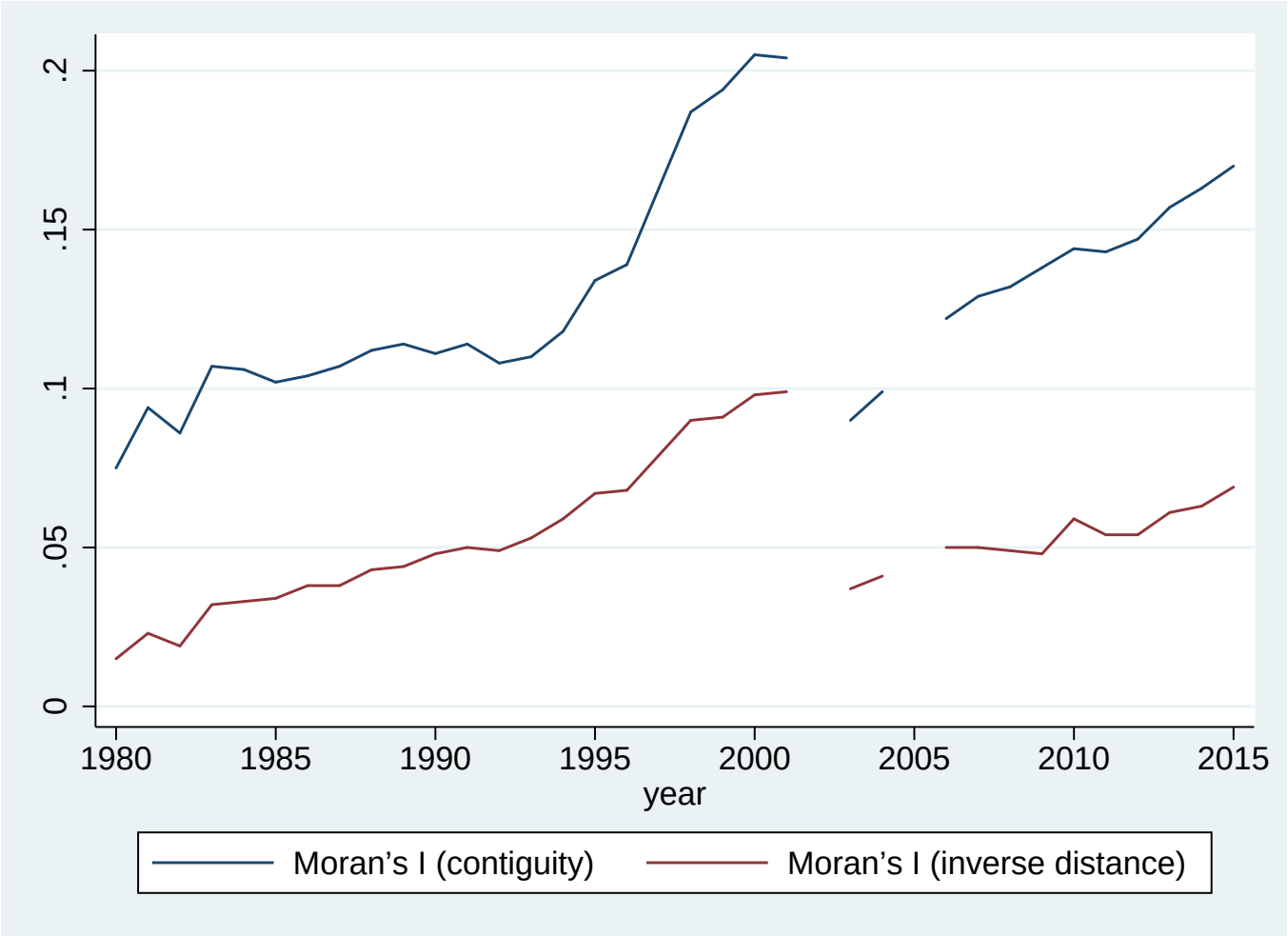
LISA: Spatial Heterogeneity

$$I_i = (x_i - \bar{x}) \sum_j w_{ij}(x_j - \bar{x}) \tag{3}$$

Between-within Inequalities



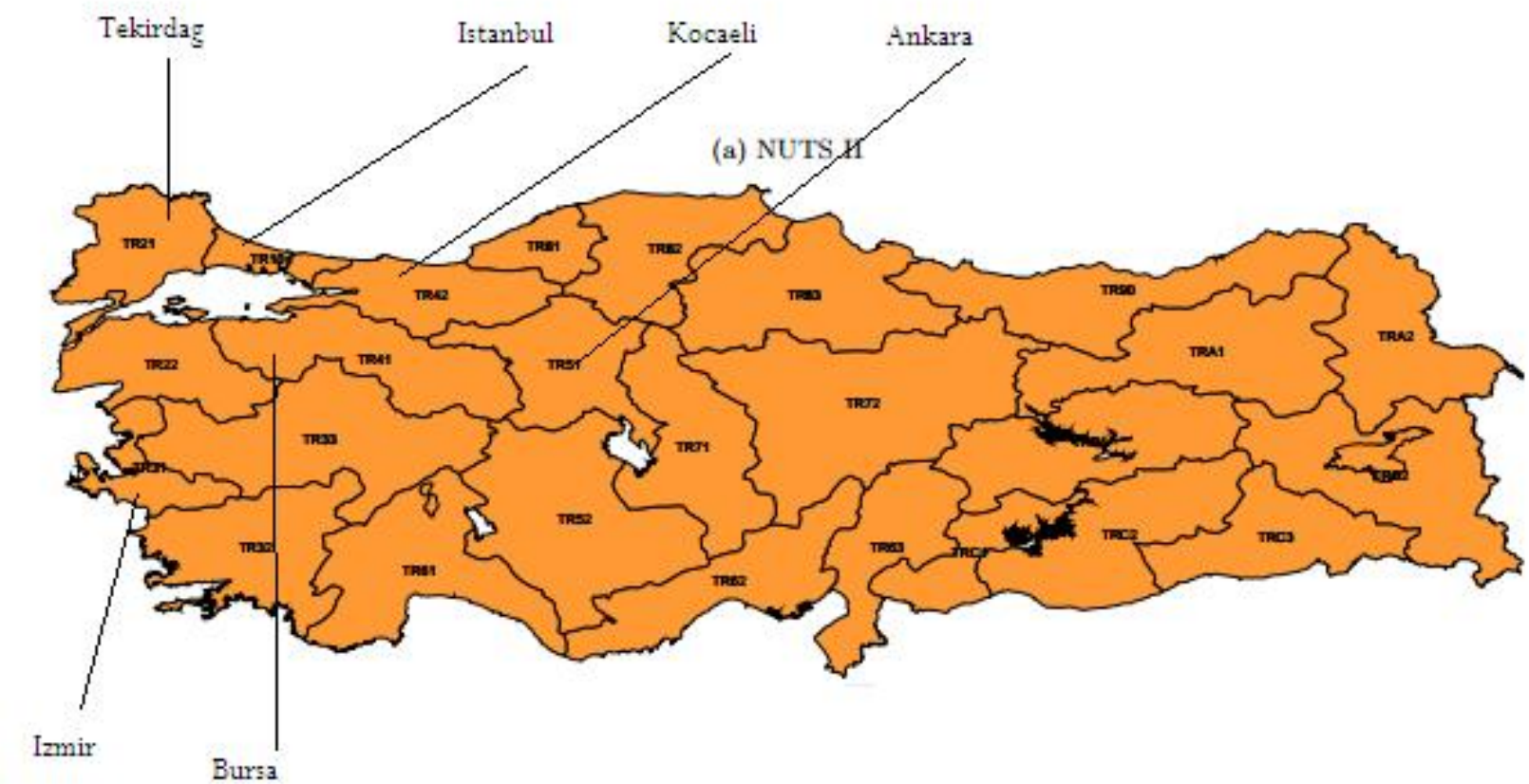
Spatial Auto-correlation



Manufacturing Employment and Spatial Regimes I

	1980	1990	2000	2010	2015	Resulting S.R.
Dominant Spatial Regime: High-High						
TR10 - Istanbul	0.313	0.311	0.269	0.307	0.288	High-High
TR21 - Tekirdag, Kirklareli, Edirne	0.020	0.035	0.063	0.042	0.045	High-High
TR31 - Izmir	0.094	0.094	0.084	0.070	0.069	High-High
TR41 - Bursa, Eskisehir, Bilecik	0.067	0.100	0.119	0.101	0.104	High-High
TR42 - Kocaeli, Sakarya, Düzce, Bolu, Yalova	0.076	0.075	0.087	0.076	0.081	High-High
TR51 - Ankara	0.054	0.043	0.053	0.055	0.059	High-High
Dominant Spatial Regime: High-Low						
TR62 - Adana, Mersin	0.067	0.057	0.041	0.028	0.029	Low-Low

Spatiality of manufacturing clusters: High-High



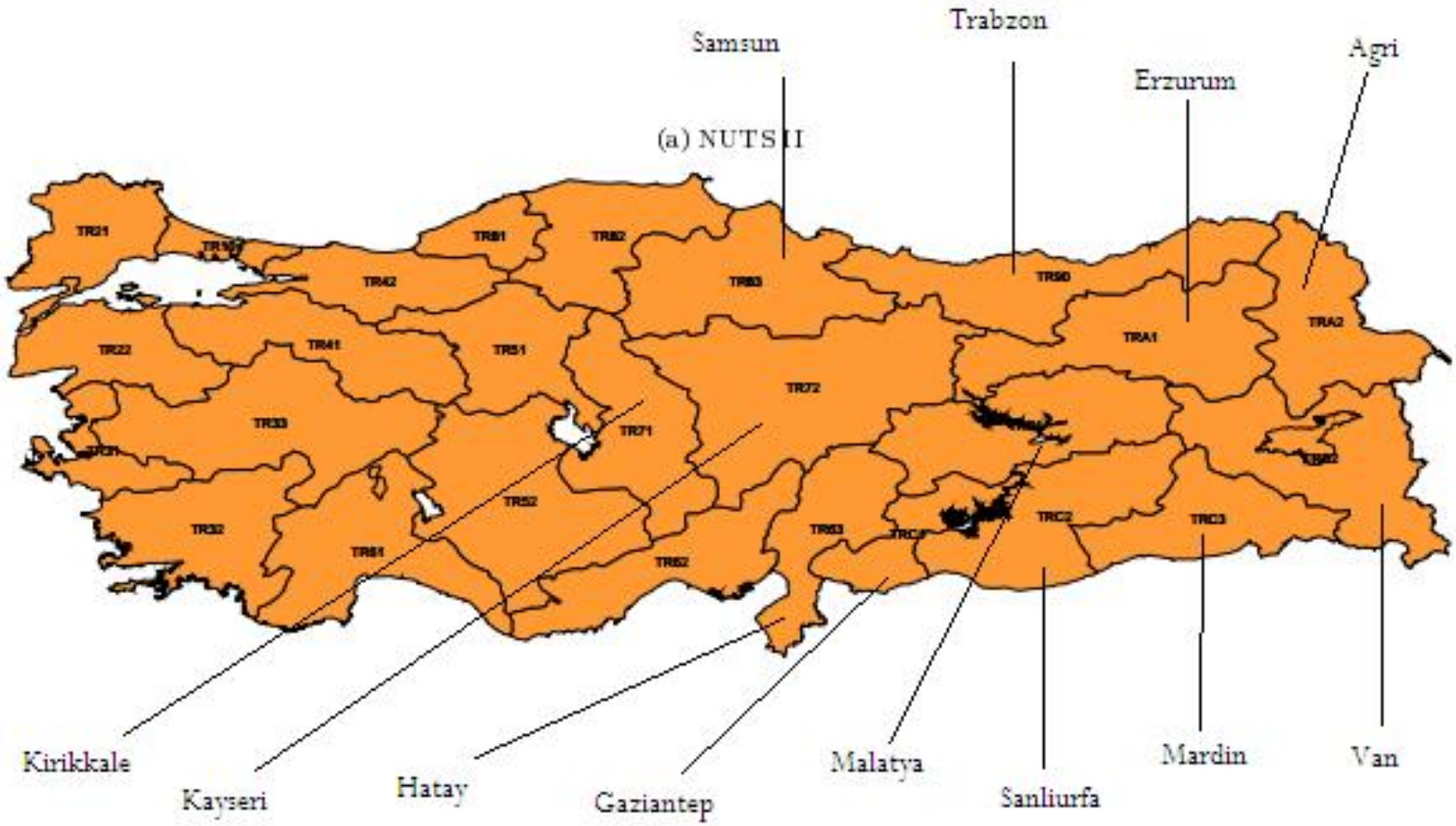
Spatiality of manufacturing clusters: High-Low

Manufacturing Employment and Spatial Regimes II

	1980	1990	2000	2010	2015	Resulting S.R.
Dominant Spatial Regime: Low-High						
TR22 - Balikesir, Canakkale	0.016	0.018	0.016	0.017	0.013	Low-High
TR32 - Aydin, Denizli, Mugla	0.013	0.014	0.038	0.038	0.039	High-High
TR33 -Manisa, Afyon, Kutahya, Usak	0.031	0.038	0.038	0.041	0.044	High-High
TR52 - Konya, Karaman	0.024	0.022	0.021	0.024	0.029	Low-High
TR61 - Antalya, Isparta, Burdur	0.015	0.012	0.010	0.020	0.020	Low-High
TR81 - Zonguldak, Karabuk, Bart?n	0.033	0.024	0.016	0.013	0.011	Low-High
TR82 - Kastamounu, Cankiri, Sinop	0.005	0.007	0.005	0.007	0.007	Low-High
Dominant Spatial Regime: Low-Low						
TR63 - Hatay, Kahramanmaras, Osmaniye	0.027	0.023	0.018	0.028	0.028	Low-Low
TR71 - Kirikkale, Aksaray, Nigde, Nevsehir, Kirsehir	0.004	0.016	0.011	0.011	0.012	Low-Low
TR72 - Kayseri, Sivas, Yozgat	0.026	0.025	0.028	0.030	0.028	Low-Low
TR83 - Samsun, Tokat, Corum, Amasya	0.032	0.024	0.018	0.019	0.018	Low-Low
TR90 - Trabzon, Ordu, Giresun, Rize, Artvin, Gumushane	0.046	0.025	0.021	0.017	0.016	Low-Low
TRA1 - Erzurum, Erzincan, Bayburt	0.006	0.005	0.003	0.003	0.002	Low-Low
TRA2 - Agri, Karsa, Ardahan, Igdir	0.002	0.001	0.002	0.001	0.001	Low-Low
TRB1 - Malatya, Elazig, Bingol, Tunceli	0.015	0.013	0.011	0.010	0.009	Low-Low
TRB2 - Van, Mus, Bitlis, Hakkari	0.003	0.003	0.001	0.002	0.003	Low-Low
TRC1 - Gaziantep, Adiyaman, Kilis	0.010	0.015	0.024	0.029	0.032	Low-Low
TRC2 - Sanliurfa, Diyarbakir	0.003	0.001	0.003	0.008	0.008	Low-Low
TRC3 - Mardin, Batman, Sirnak, Siirt	0.000	0.000	0.001	0.003	0.005	Low-Low

Spatiality of manufacturing clusters: Low-High

Spatiality of manufacturing clusters: Low-Low



Methodology II: Mobility across income classes

Markov Chain Analysis, Quah (1993, 1996)

$$F_{t+1} = M.F_t \tag{4}$$

$$F_{t+s} = (M.M.M.....M) * F_t = M^s F_t \tag{5}$$

Methodology III: Conditional Mobility across income classes

Conditional Markov Chain Analysis

$$F_{t+s} = \begin{cases} (M_1.M_1.M_1.....M_1) * F_t = M_1^s F_t & if \quad Y_1 > Y^* \\ (M_2.M_2.M_2.....M_2) * F_t = M_2^s F_t & if \quad Y_2 < Y^* \end{cases} \tag{6}$$

$$F_{t+s} = \begin{cases} (M_1.M_1.M_1.....M_1) * F_t = M_1^s F_t & if \quad S.regime = High \\ (M_2.M_2.M_2.....M_2) * F_t = M_2^s F_t & if \quad S.regime = Low \end{cases} \tag{7}$$

Impact of industrial memory

Panel A: Per capita GDP (1980-2015)

	Unconditional					Conditional: low manufacturing					Conditional: high manufacturing				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	0.92	0.07	0.01	0.00	0.00	0.95	0.05	0.01	0.00	0.00	0.43	0.57	0.00	0.00	0.00
2	0.08	0.75	0.16	0.00	0.00	0.10	0.76	0.14	0.00	0.00	0.06	0.75	0.19	0.00	0.00
3	0.00	0.08	0.89	0.03	0.00	0.00	0.07	0.91	0.02	0.00	0.00	0.10	0.85	0.04	0.00
4	0.00	0.01	0.06	0.88	0.06	0.00	0.01	0.04	0.91	0.04	0.00	0.00	0.08	0.84	0.08
5	0.00	0.00	0.01	0.08	0.92	0.00	0.00	0.03	0.10	0.87	0.00	0.00	0.00	0.07	0.93

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	Unconditional					Conditional: low manufacturing					Conditional: high manufacturing				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
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2	0.08	0.75	0.16	0.00	0.00	0.10	0.76	0.14	0.00	0.00	0.06	0.75	0.19	0.00	0.00
3	0.00	0.08	0.89	0.03	0.00	0.00	0.07	0.91	0.02	0.00	0.00	0.10	0.85	0.04	0.00
4	0.00	0.01	0.06	0.88	0.06	0.00	0.01	0.04	0.91	0.04	0.00	0.00	0.08	0.84	0.08
5	0.00	0.00	0.01	0.08	0.92	0.00	0.00	0.03	0.10	0.87	0.00	0.00	0.00	0.07	0.93

Impact of Industrial Reshuffling

Panel A: Per capita GDP (1980-2015)

	Stagnant manufacturing					Accelerating manufacturing				
	1	2	3	4	5	1	2	3	4	5
1	0.96	0.04	0.00	0.00	0.00	0.29	0.57	0.14	0.00	0.00
2	0.04	0.74	0.22	0.00	0.00	0.09	0.79	0.11	0.00	0.00
3	0.00	0.11	0.88	0.01	0.00	0.00	0.05	0.90	0.06	0.00
4	0.00	0.02	0.03	0.94	0.02	0.00	0.00	0.07	0.85	0.08
5	0.00	0.00	0.01	0.04	0.94	0.00	0.00	0.00	0.10	0.90

Impact of Industrial Reshuffling

Panel A: Per capita GDP

	Conditional: stagnant manufacturing					Conditional: accelerating manufacturing				
	1	2	3	4	5	1	2	3	4	5
1	0.96	0.04	0.00	0.00	0.00	0.29	0.57	0.14	0.00	0.00
2	0.04	0.74	0.22	0.00	0.00	0.09	0.79	0.11	0.00	0.00
3	0.00	0.11	0.88	0.01	0.00	0.00	0.05	0.90	0.06	0.00
4	0.00	0.02	0.03	0.94	0.02	0.00	0.00	0.07	0.85	0.08
5	0.00	0.00	0.01	0.04	0.94	0.00	0.00	0.00	0.10	0.90

Impact of Spatial Regimes

Panel A: Per capita GDP (1980-2015)

	Dominant Spatial Regime: Low					Dominant Spatial Regime: High					
	1	2	3	4	5		1	2	3	4	5
1	0.92	0.07	0.01	0.00	0.00	1	0.00	0.00	0.00	0.00	0.00
2	0.08	0.75	0.16	0.00	0.00	2	0.00	0.00	0.00	0.00	0.00
3	0.00	0.09	0.88	0.03	0.00	3	0.00	0.00	1.00	0.00	0.00
4	0.00	0.01	0.09	0.88	0.02	4	0.00	0.00	0.01	0.87	0.11
5	0.00	0.00	0.17	0.33	0.50	5	0.00	0.00	0.00	0.07	0.93

Impact of Spatial Regimes

Panel A: Per capita GDP

	Dominant Spatial Regime: Low					Dominant Spatial Regime: High					
	1	2	3	4	5		1	2	3	4	5
1	0.92	0.07	0.01	0.00	0.00	1	0.00	0.00	0.00	0.00	0.00
2	0.08	0.75	0.16	0.00	0.00	2	0.00	0.00	0.00	0.00	0.00
3	0.00	0.09	0.88	0.03	0.00	3	0.00	0.00	1.00	0.00	0.00
4	0.00	0.01	0.09	0.88	0.02	4	0.00	0.00	0.01	0.87	0.11
5	0.00	0.00	0.17	0.33	0.50	5	0.00	0.00	0.00	0.07	0.93

What to do next?

- Production structure and technology level should be considered
- Alternative ways in understanding structural transformation (i.e. firm formation)
- Integrating unemployment as an alternative indicator for regional development

Conclusion

- Limited regional shuffling of manufacturing employment is observed
- However, developed western regions follow the national trends and realize decline in manufacturing employment
- Evolution of regional deindustrialization contains hints on the ongoing disparities
- Regions that have lower manufacturing production as well as regions that realize decrease in manufacturing employment are doing worse compared to other counterparts.