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Disentangling the pattern of geographic concentration in Tunisian manufactories

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Motivation

- “agglomerations may be more the rule than the exception”

  Krugman *“Increasing retunrs and Economic Geography” J.Pol. Eco.(**1991**)*

- “Markets favour some places over others. Places-cities, coastal areas, and connected countries are favoured by producers”

  World Bank *“Reshaping economic Geography”. (**2009**).*

Theory suggests

- ***Productivity spillover***: an increase in a firm's productivity can have a positive and significant impact on neighbouring firms' productivity

- Other types of ***agglomeration effects***: costs of production may fall as regional sectors have
  - Greater Specialization (Marshall, Arrow and Romer) (MAR)
  - Greater Diversification(Jacobs)
  - Multiple Competing suppliers (Porter)

Leading to
➔ efficiency gains

How can the Tunisian industry concentration be measured?

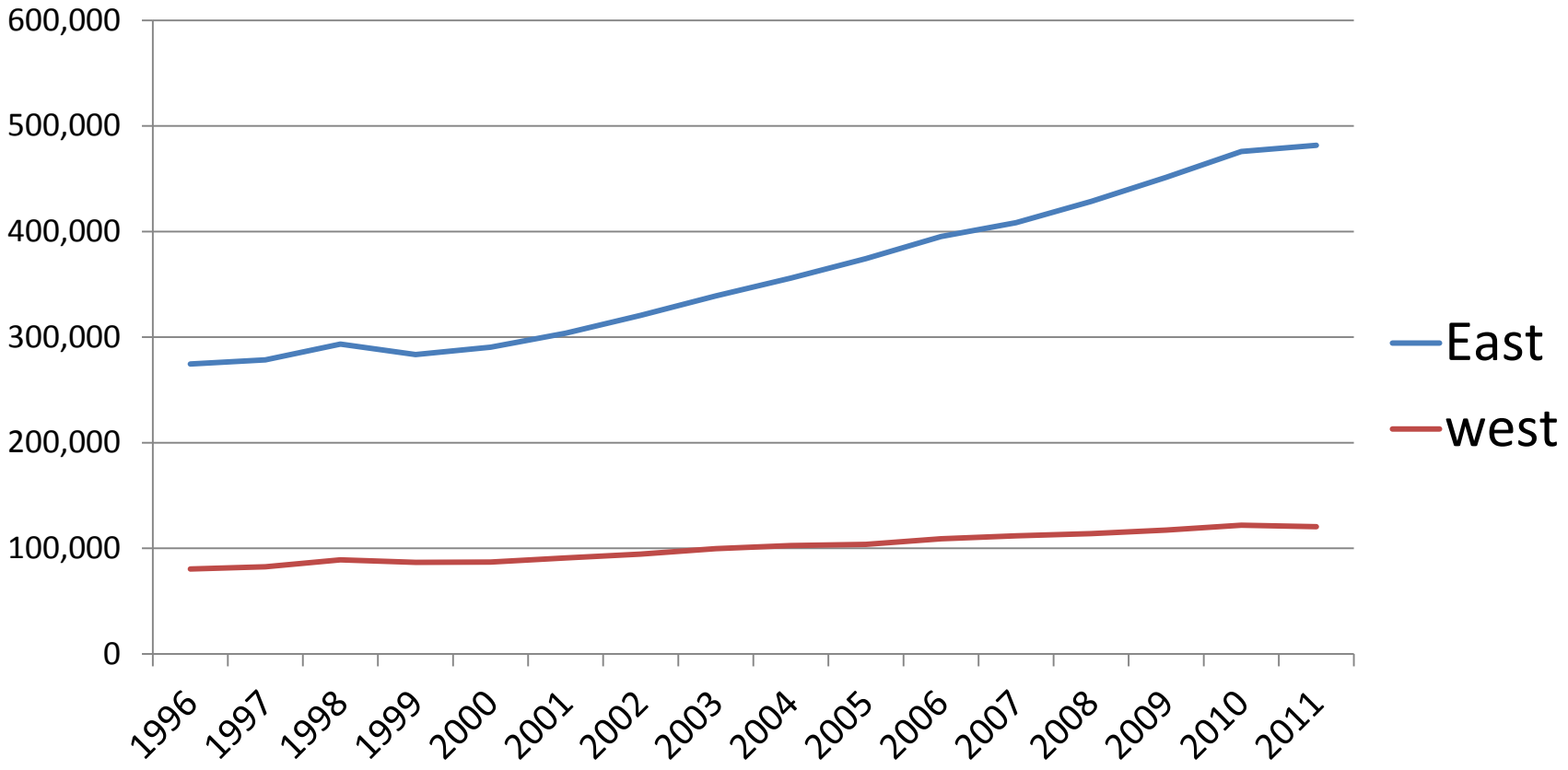
1. *Whether firms cluster?*
   - *Aggregation indices & summary statistics and graphs.*
2. *Why firms cluster?*
   - *Factors driving firms' location choice*
   - *Factors driving firms' employment growth*
3. *What are the benefits of clustering?*
   - *Effects of location on productivity growth*

Paper's outline

1. **Introduction**
2. **Geographic concentration:** *Whether firms cluster?*
   - ***Regional and sectors disparities***
   - ***Specialization index***
   - **Ellison and Glaeser agglomeration index**
3. **Determinants of localization:** *Why firms cluster?*
   - ***Firm's localization model***
   - ***Industry employment growth across localities***
4. **Effect of localization on productivity:** *What are the benefits of clustering?*
5. **Economic externalities:** *localization versus urbanization.*
6. ***Conclusions & policy decisions***

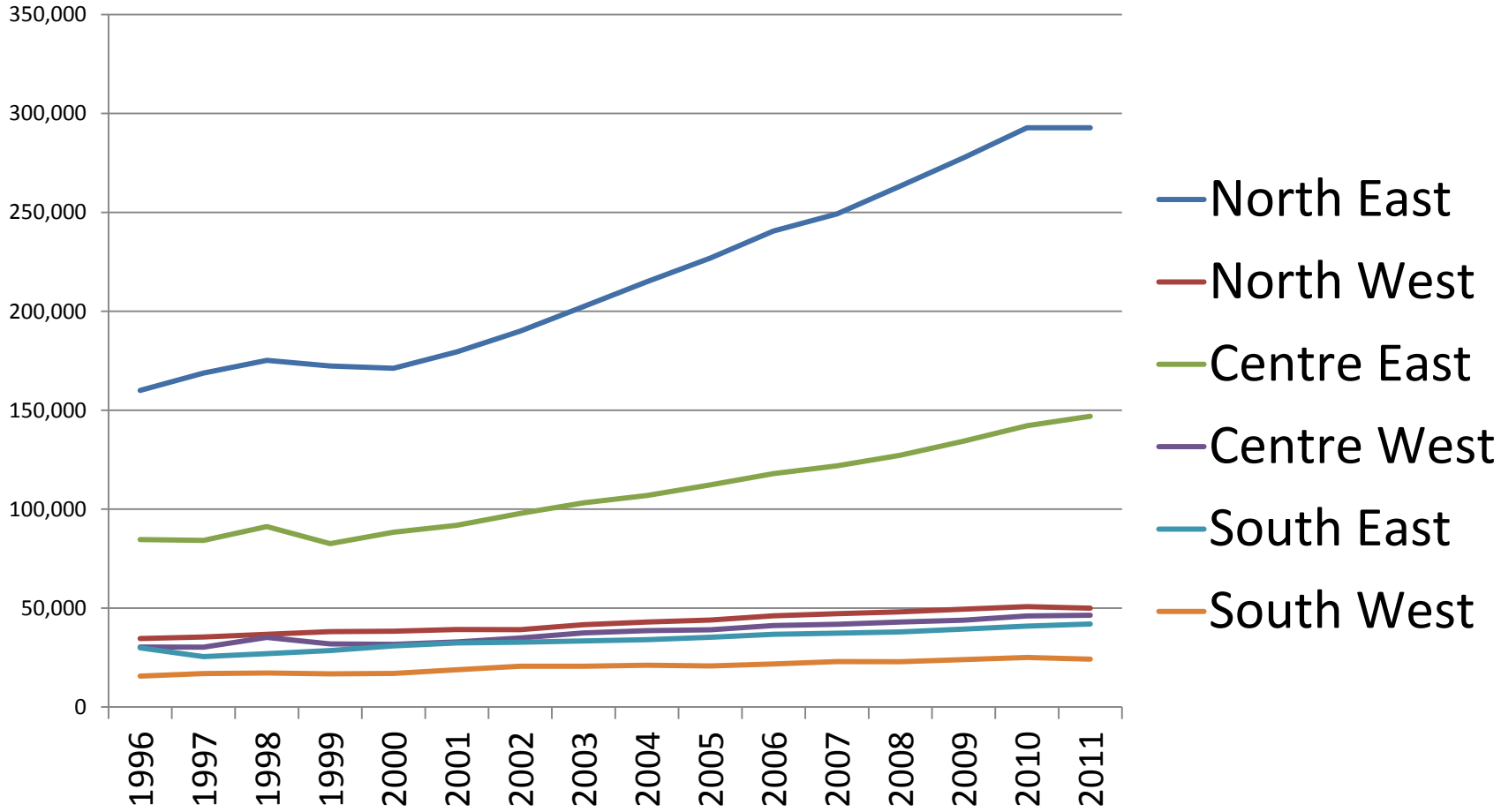
Whether firms cluster?

Regional disparities
Eastern versus Western regions
(Trends of firms numbers)



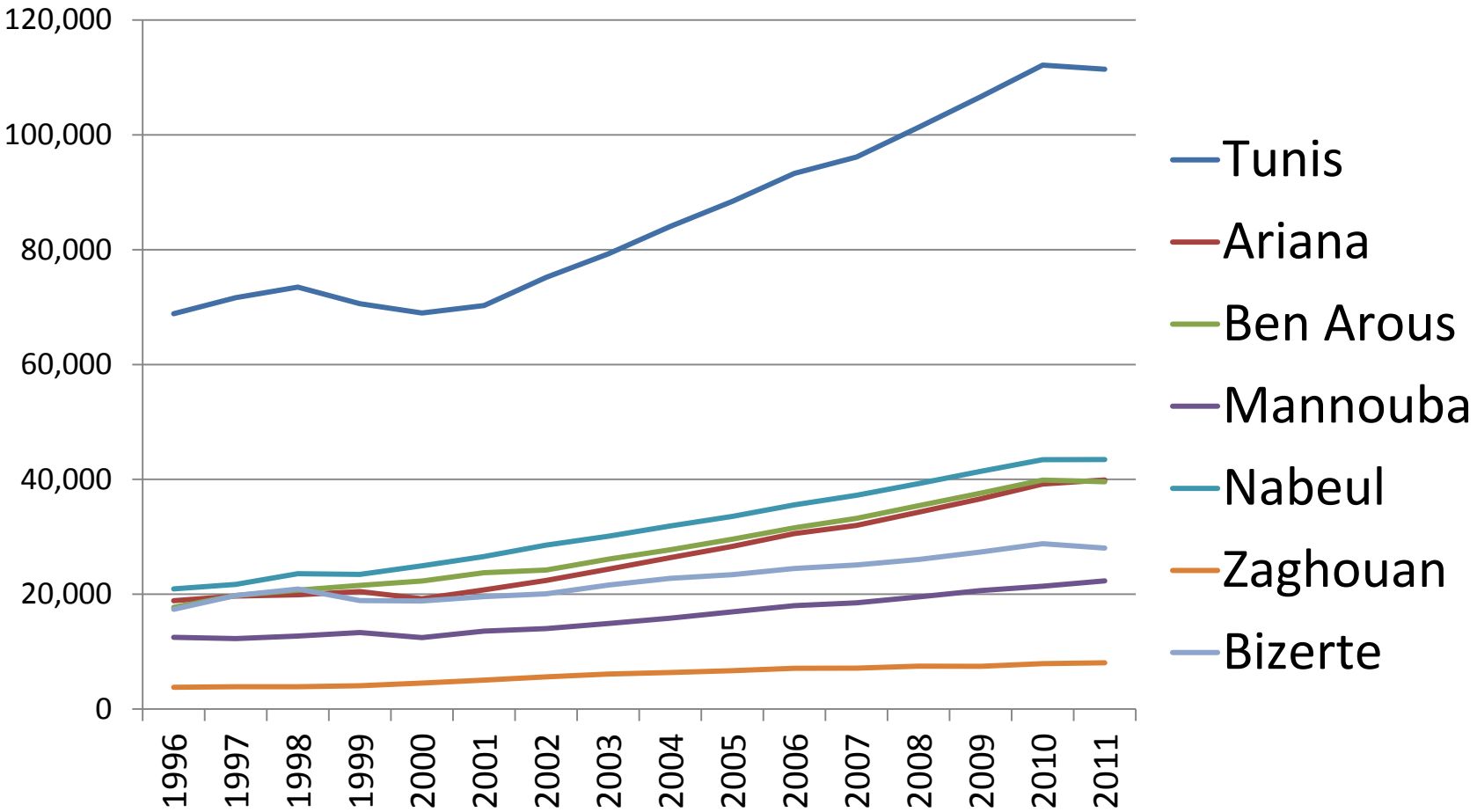
Regional diversity (between regions)

(Trends of firms numbers)



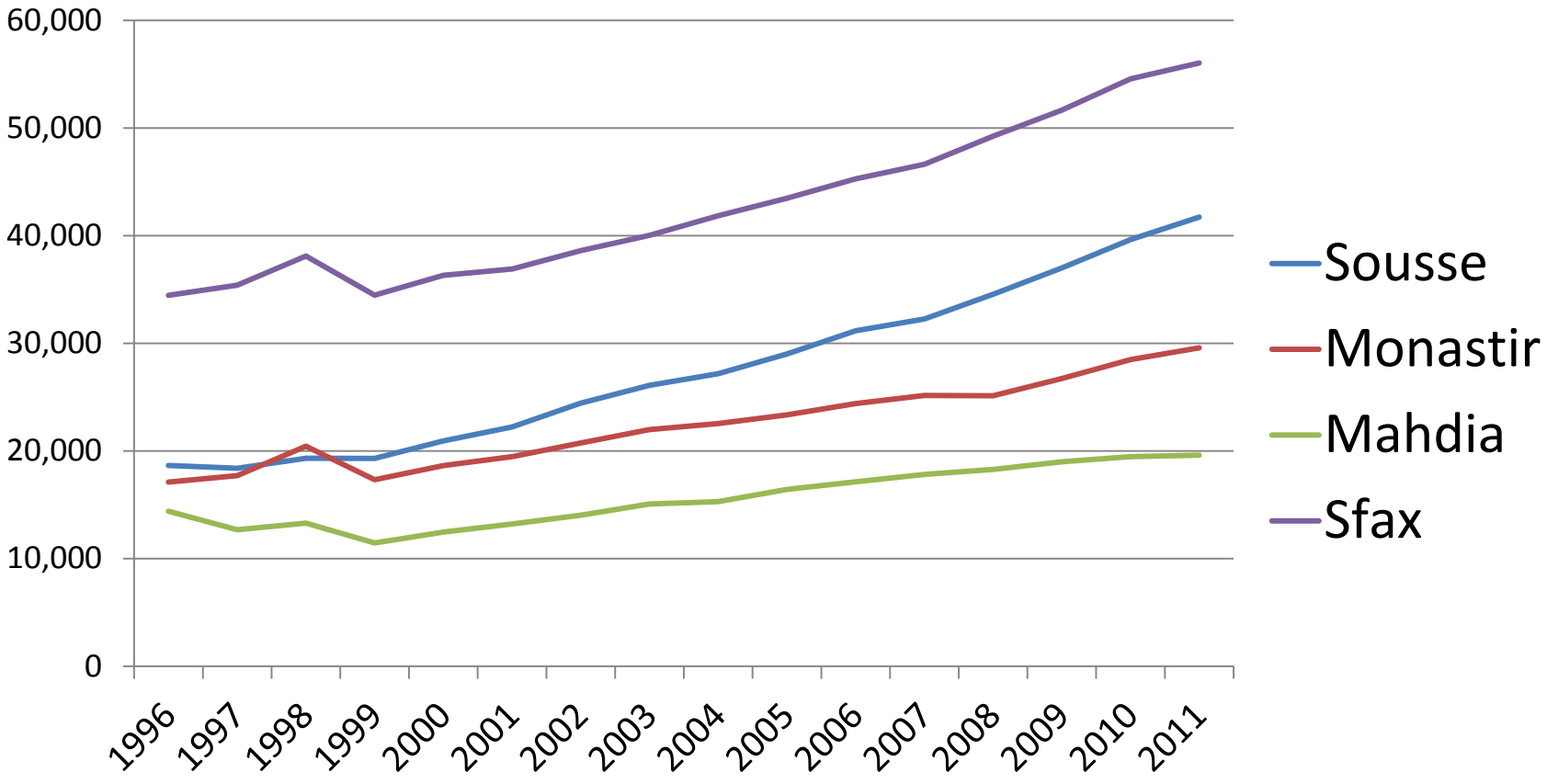
Governorates of the North East (within regions)

(Trends of firms numbers)

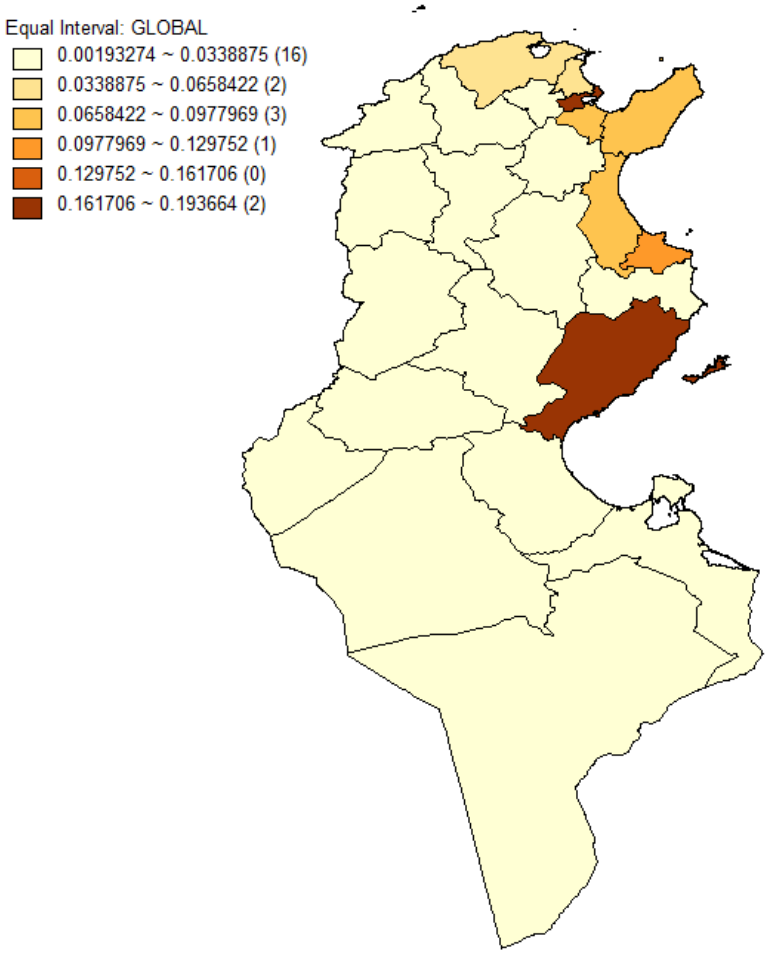


Central East governorates (within regions)

(Trends of firms numbers)



The clustering effect

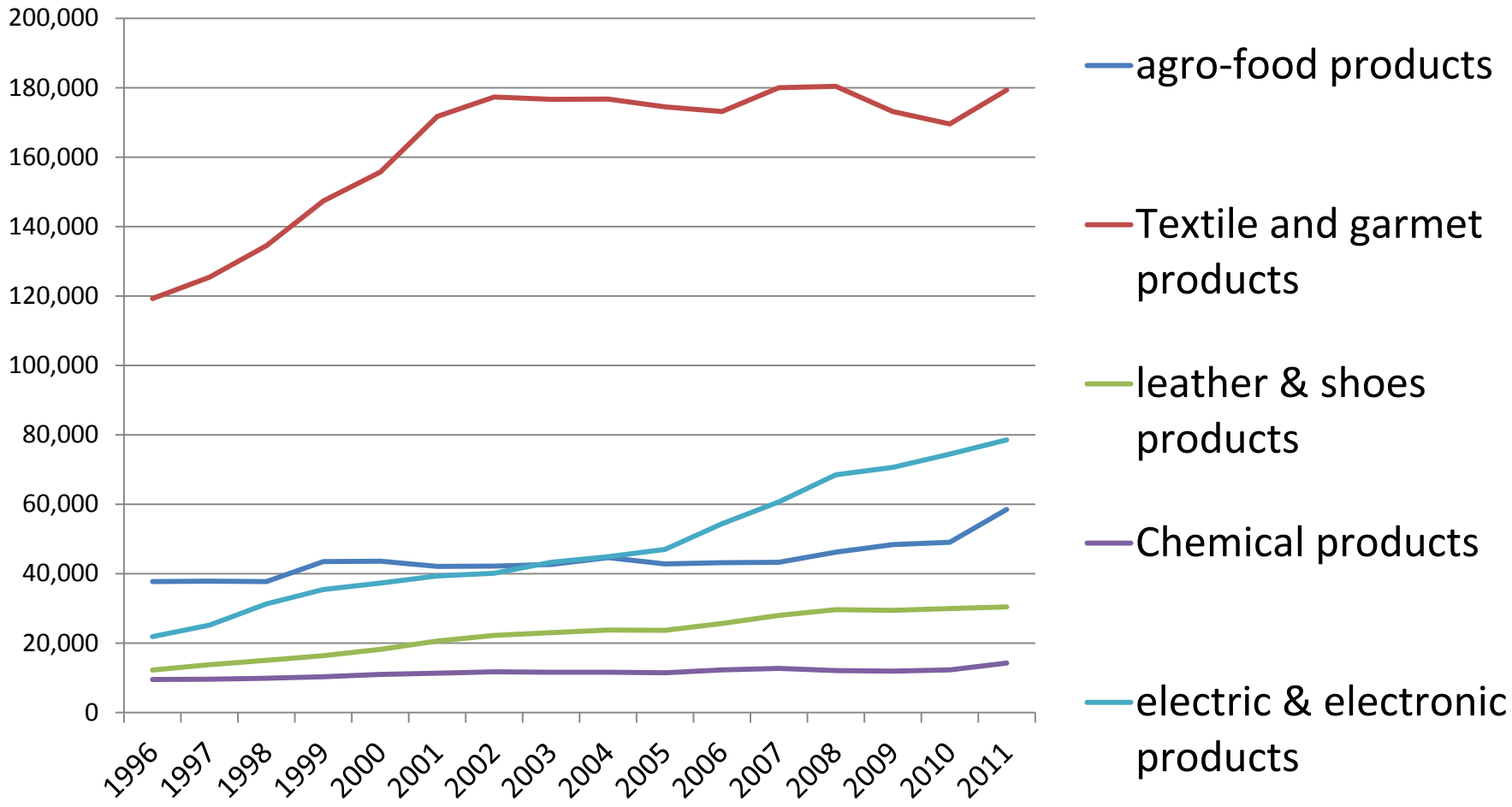


- 83% of firms are concentrated in the Eastern region.

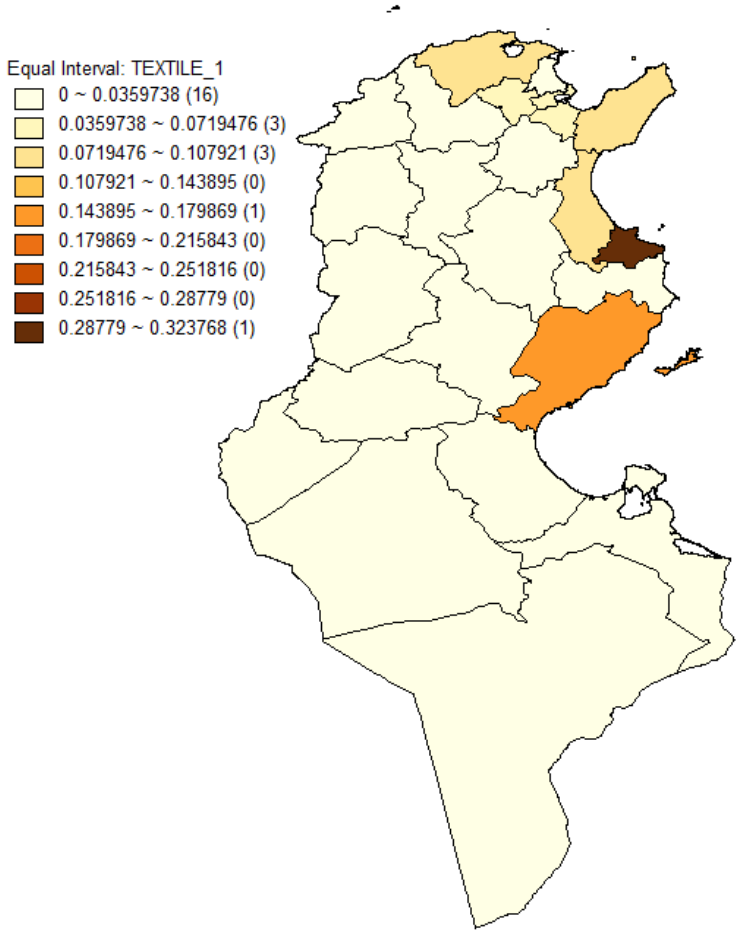
However,

- 40% of firms are concentrated in the two principal CBDs (Tunis and Sfax).

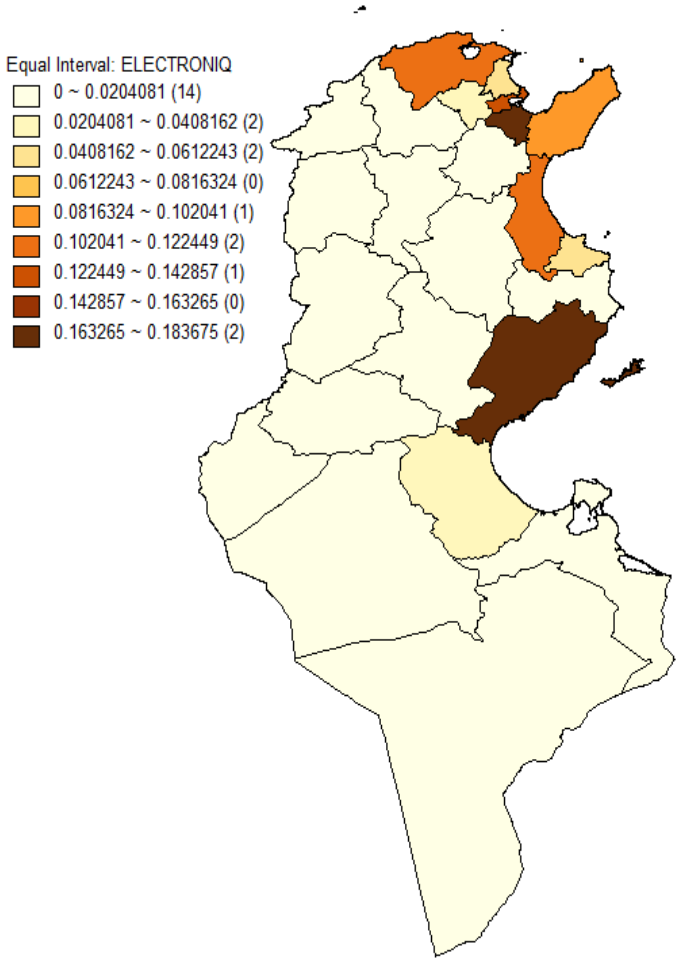
Sectorial disparities



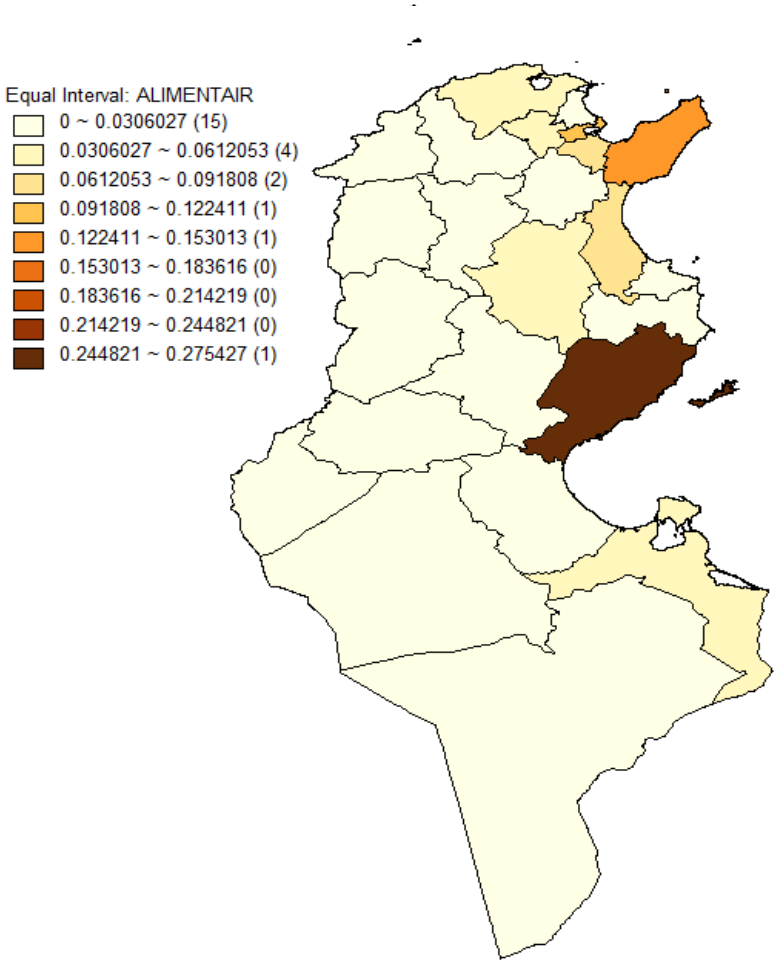
Textile industries located in Monastir (*32.4%*)



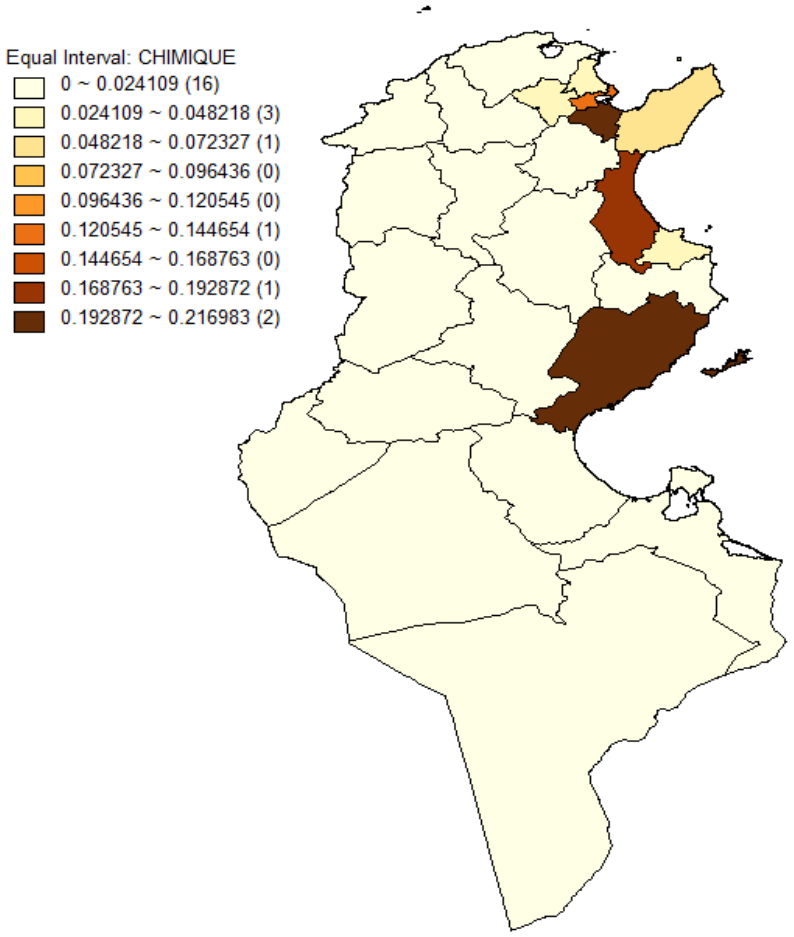
Electric & Electronies : in Greater Tunis (32%)*(Ben Arous (18%), Tunis (14%))* & Sfax (18%)



Agro-food : in Sfax (28%), Nabeul (12%) & Tunis (11%).



Chemical: in Greater Tunis (34%)(Tunis 12% , Ben Arous 22%) & Sfax (21%)



Where firms cluster?

(1) Exporting sector *(electronic, textile and chemical)* are concentrated in littoral regions.

(2) Only products associated with local demand *(agro-food)* are more diversified.

(3) Interior governorate have limited number of industrial units.

Specialization Index

- The specialization index:
  share of sector j employment ***(Emp_{jr})*** in the total employment of region r ***(Emp_r)*** against the share of the total employment in sector j **(Emp_j)** in the total employment at the national level ***(Emp_n)*.**

$$Specialization\ index_{jr} = \frac{Emp_{jr} / Emp_r}{Emp_{jn} / Emp_n}$$

- The more important a sector is at the regional level, the higher the Specialization Index is.

Specialization Index *(results)*

Electric & Electronic		Textile		food		chemical	
Bizerte	3.79	*Siliana*	3.32	*Béja*	4.56	*Kasserin*	5.09
Kairouan	3.74	*Monastir*	3.3	*Sidi Bou*	4.4	*Ben Arous*	3.53
Ariana	2.81	*Mahdia*	2.91	*Mahdia*	3.1	*Sidi Bou*	3.34
Sousse	2.75	*Manouba*	2.4	*Manouba*	2.98	*Le Kef*	2.83
Ben Arous	2.43	*Nabeul*	1.64	*Kasserin*	2.82	*Gabès*	2.40
Nabeul	1.19	*Bizerte*	1.58	*Medenine*	2.56	*Sfax*	1.82
Béja	0.87	*Sfax*	1.28	*Sfax*	2.38	*Manouba*	1.42
Manouba	0.65	*Le Kef*	1.1	*Kairouan*	2.14	*Jendouba*	1.31
Monastir	0.62	*Sousse*	0.92	*Ben Arou*	1.75	*Sousse*	1.30
Sfax	0.4	*Gabès*	0.52	*Sousse*	1.27	*Bizerte*	1.24
Tunis	0.15	*Ariana*	0.37	*Gabès*	1.26	*Nabeul*	1.13

Specialization Index *(Results)*

Interior governorates (*Kairouan, Siliana, Kasserine, Sidi Bouzid)* have greater Specialization indices.

→ The problem of monopoly.

These governorates tend to have only one or a relatively small number of firms (in a specific sector ?)

- Specialization index increases.
- industry concentration seem higher than reality

E&G agglomeration index

Ellison and Glaeser (1997) index

(1) Is a statistical model in which a random distribution of economic activities across spatial units is taken as a benchmark.

(2) Correct for the fact that in firms consisting of few relatively large plants.
➔ Applies to firms with few relatively large plants

(3) Is more appropriate for countries like Tunisia where the industrial structure is characterized by a small number of large plants and a large number of firms of small and medium size.

E&G agglomeration index *(Results)*

Not localized (Gamma<1%)	
Construction	-0.021
Intermidiate (1% < gamma<10%)	
Agro Food	0.060
Very localized (Gamma >10%)	
Transportation material	0.109
Chemical	0.110
Electric & electronics	0.187
Textile and leather	0.240

Whether industries cluster?

E&G agglomeration index: agglomeration forces varied greatly between industries.

- Located industries: (1) Textile and leather, (2) Electric and electronic and (3) Chemical

(E&G indices are respectively 0.24, 0.19 and 0.11).

- Least localized industries : agro-food and construction industries

(E&G indices are respectively 0.06 and -0.02).

Why firms cluster?

Factors driving firms' location choice

- **Firm's localization model**
- **Industry growth across localities**

Firm's localization model

$$FirmGrowth_{gs.t} = \alpha + \beta_1 . log\,(Y_{gs.t-1}) + \beta_2 X_{gs.t-1} + \beta_3 W_{gs.t-1} + \in_{gs.t}$$

- ***FirmGrowth*** $_{gs.t} = log\,(Y_{gs.t}) - log\,(Y_{gs.t-1})$. $\boldsymbol{Y_{gs.t}}$ the number of firms of sector s in province g and at period t

- $\boldsymbol{X_{gs.t-1}}$ **:** vector of firms characteristics of sector s in governorate g along period t-1. (including **capital size. firm's revenue. exporting share. employment size. share of skilled workers**)

- $\boldsymbol{W_{gs.t-1}}$ is a vector of regional characteristics of sector s in governorate g along period t-1.

  (including **sfax_dummy. tunis_dummy. littoral_dummy and specialization index and competition index**)

Table 3: Estimates of localization determinants
(Growth of firms' number)

	Model (1)	*Model (2)*	*Model (3)*	*Model (4)*
Number of firms (t-1)	-0.0439***	-0.0441***	-0.0421***	-0.0423***
Capital	-3.75e-09	-3.42e-09	-5.96e-09	-5.57e-09
Revenue	4.04e-09	4.00e-09	5.39e-09	5.45e-09
Employment size	-7.98e-06	-0.000113	0.000359	0.000205
Exporting	0.0410	0.0205	0.0613	0.0264
Sfax _dummy	1.938***	1.895***	1.983***	1.911***
Littoral_dummy	0.932***	0.933***	0.965***	0.970***
Tunis_dummy	0.634	0.666	0.608	0.663
Wtech	-0.463	-0.490	-0.220	-0.248
Specialization Index		0.0266		0.0475
Competition Index			0.0491*	0.0535*

Firm's localization model *(Results)*

- ***specialization indicator*** has no significant effect.
- ***competition*** has a significant and positive effect.

  ➔ number of firms tends to increase in ~~a~~ more competitive area**s rather** than in specialized ones.
- ***Littoral and Sfax dummies*** have positive and significant effects on provincial attraction.

  ➔Small size firms are mainly concentrated around littoral zones involving all Tunisian CBDs.

  ➔localization choice may rather be considered as urbanization externality choice.

- However,
  Growth on firms' creation decreases if initial number of firms is important.
  ➔ Governorate-industries with an initially high level of employment will have lower firms' growth.

- Firms' capital, income, employment and exporting status does not a significant effect on government-industry

➔ The firm's location model does not consider governorate-sector as an economical performances.

Industry growth across localities

$$EmpGrowth_{gs.t} = \alpha + \beta_1 . \log (E_{gs.t-1}) + \beta_2 X_{gs.t-1} + \beta_3 W_{gs.t-1} + \in_{gs.t}$$

Where

- ***EmpGrowth*** $_{gs.t} = \log (E_{gs.t}) - \log (E_{gs.t-1})$. $E_{gs.t}$ the employment magnitude of sector ***s*** in province ***g*** and at period ***t***.
- $X_{gs.t-1}$ a vector of ***economic factors*** of sector s in governorate g.
- $W_{gs.t-1}$ is a vector of ***aggregate factors*** of sector s in governorate g.

Table 4: Governorate-industry employment growth

(Growth of governorate industry employment)

	Model (1)	*Model (2)*	*Model (3)*	*Model (4)*
Employment (t-1)	-0.00238***	-0.00201***	-0.00158***	-0.00141**
productivity	-0.194***	-0.175**	-0.149**	-0.141**
export	0.108	0.157	0.147	0.173
Tunis_dummy	0.773**	0.653*	0.895***	0.822**
Share of skilled workers	-1.237**	-1.100**	-0.618	-0.573
Specialization index		-0.116**		-0.0652
Competition index			0.126***	0.120***

Industry growth across localities
(Results)

- An initially high level of employment leads to a slower growth in an industry's employment rate
- Employment growth decreases as productivity and proportion of skilled workers are improved.
- Employment growth increases in governorate-industries near Tunis.

- Specialization index have a negative effect.

  ➔ specialization reduces employment growth.

  ➔ The result is ***different from the MAR*** *model prediction.*

- The competition index has a positive effect

  ➔ competition leads to higher a governorate-industry employment growth .

  ➔ ***Agrees with Porter externality*** hypothesis.

What are the benefits of clustering?

Effects of location on productivity growth

Productivity Growth Model

$$ProcGrowth_{gs.t} = \alpha + \beta_1 . log (P_{gs.t-1}) + \beta_2 X_{gs.t-1} + \beta_3 W_{gs.t-1} + \in_{gs.t}$$

Where

- $\boldsymbol{ProdGrowth_{gs.t}} = log (P_{gs.t}) - log (P_{gs.t-1})$. $\boldsymbol{P_{gs.t}}$ the productivity per employee magnitude of sector ***s*** in province ***g*** and at period ***t***.
- $\boldsymbol{X_{gs.t-1}}$ a vector of ***economic factors*** of sector s in governorate g.
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Effect of localization on productivity

- Higher initial productivity in governorate-industry reduces productivity growth.
- Productivity decreases if governorate-industries are exporters.

- Littoral dummy has a positive effect.

  ➔knowledge spillover on firms' productivities.

- Specialization has a positive effect on productivity growth

  ➔ Agrees with the MAR perspective

- Governorate-industry competition reduces productivity growth.

  ➔ Disagrees with the Porter's prediction

However, if we consider both the specialization and competition indices, competition effect become statistically insignificant).

➔ Dynamic externalities may not be appropriate as we restrict to the classical MAR and Porter models.

➔ Allows the distinction between ***localization and urbanization phenomena !***

Localization versus urbanization

Arguments on localization :

- First: natural *resources or transport advantages* often favour a particular location.
- Second: industrial firms could choose to locate near the place of common suppliers to both reduce the cost of getting supplies and to have a closer flow of information to suppliers.
- Third: more stable industry demand would locate together.

Arguments on Urbanization :

- Firms locate in a governorate:
  - because of the high local demand.
  - They can sell some of their output without incurring additional transportation costs.
- In our model we found that location in Greater Tunis has a positive and significant effect on firms' growth.
- Localization in littoral governorate (where principal Tunisian CBS are located) contributed to productivity growth of governorate-industries.

➔ Henderson (1986) refers to these effects as "urbanization" externalities

Conclusion & Policy decisions

- Tunisian structural adjustment program (1988) has increased firms' performances, but it has created a growing inequality between coastal and interior regions. More than 83% of firms are concentrated in the littoral region, (nearby 40% Tunis and Sfax).

- E&G index depicts that (1) textiles and leather sector, (2) electric and electronics and (3) the chemical are the most -agglomerated sectors

Conclusion & Policy decisions

- specialization has a non significant effect on the number of firms tend, reduce employment growth but increase productivity.
- Competition has a positive effect on the number of firms tend, increase employment growth but reduce productivity.
- locating in Greater Tunis results in firms growth improvements, and locating in littoral governorates enhanced productivity growth of governorate-industries

Conclusion & Policy decisions

- Historically :
  - CBDs offered better economical incentives essentially for small firms
  - No strong political actions have been taken to develop new CBDs.
- Exporting industries (*Textile / electric &electronic*) locate near older CBDs
- Non exporting industries are less located but prefer East regions.

Thank you for your attention

Questions or Comments?!

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*Table 6 (Pourquoi 6, were is Table 5): Estimates of productivity growth (*Growth of productivity*)*

	Model (1)	*Model (2)*	*Model (3)*	*Model (4)*
Productivity (t-1)	-0.504***	-0.495***	-0.496***	-0.490***
Export	-0.343	-0.465*	-0.426*	-0.504**
Littoral dummy	0.376**	0.367**	0.327*	0.331*
Specialization Index		0.107**		0.0855
Competition Index			-0.0478*	-0.0369
Constant	5.301***	5.094***	5.389***	5.203***