

URBAN-BIASED STRUCTURAL CHANGE

Natalie Chen
Warwick

Dennis Novy
Warwick

Carlo Perroni
Warwick

Horng Wong
Stockholm

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MOTIVATION

Many countries have seen a rapid shift of economic activity from manufacturing to services

- ▶ Largely attributed to **sectoral productivity growth** and **international trade**
- ▶ Much focus has been on explaining trends for countries as a whole

Recent evidence suggests structural change differs across regions within countries

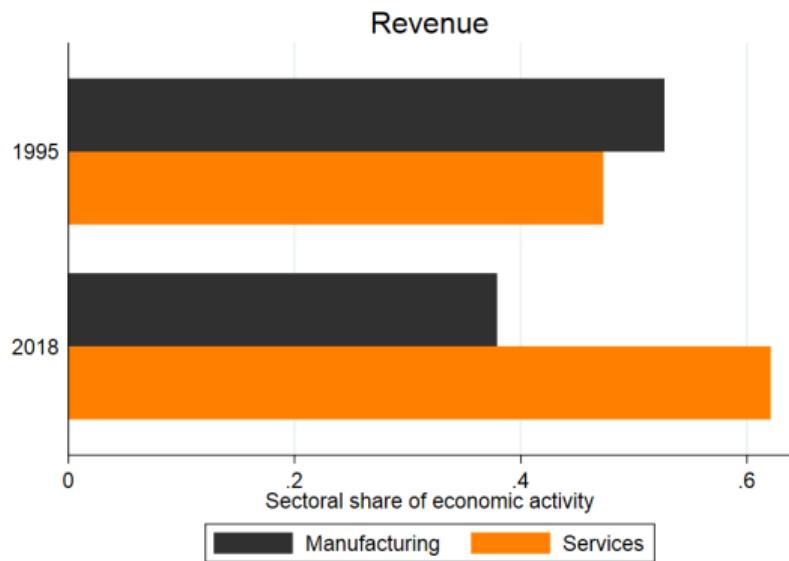
- ▶ **Increasing agglomeration** of services firms in large cities (Desmet & Henderson, 2015)

WE ASK:

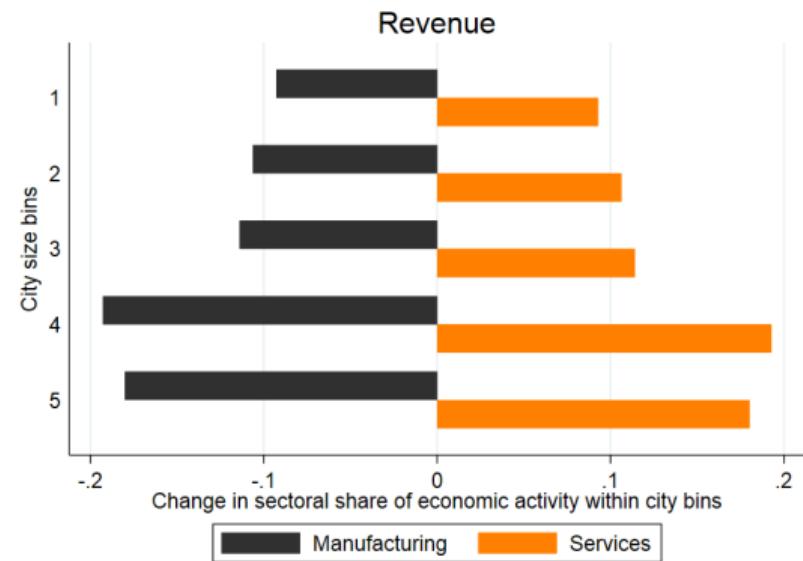
- (1) Within a country, how different is structural change in different locations?
- (2) What role do sectoral productivity growth, international trade, and agglomeration forces play in explaining those location-specific patterns?

FRANCE 1995-2018

Aggregate structural change

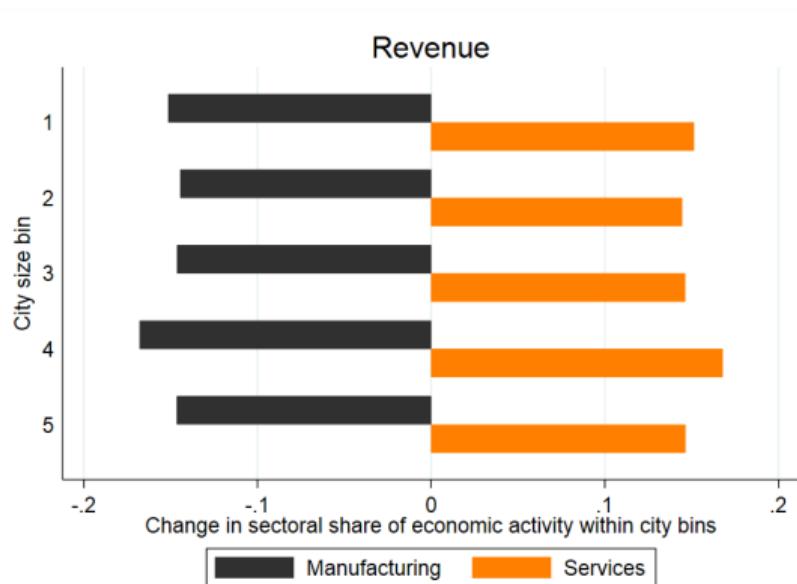


Urban-biased structural change

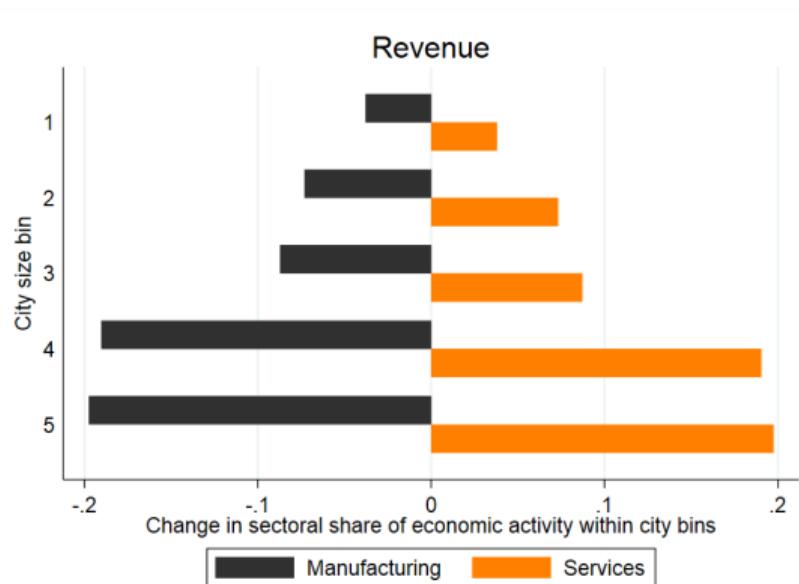


LARGE FIRMS ACCOUNT FOR URBAN-BIASED STRUCTURAL CHANGE

Bottom 95% of sales dist.



Top 5% of sales dist.



WHAT WE DO

(1) Stylized facts: **urban-biased structural change** in France (1995-2018)

- ▶ Services share of economic activity has increased more in large cities
- ▶ Location of large firms account for urban-biased structural change

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 - ▶ Services share of economic activity has increased more in large cities
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- (2) Model of cities, heterogeneous firms, & structural change:
 - ▶ Sector-level forces for structural change:
 - (a) **Sectoral TFP growth** (Herrendorf, Rogerson, & Valentinyi, 2014)
 - (b) **Falling international trade costs** (Melitz, 2003; Alessandria, Johnson, & Yi, 2021)
 - (c) **Changes in agglomeration externalities** (Desmet & Henderson, 2015)

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 - (c) **Changes in agglomeration externalities** (Desmet & Henderson, 2015)
- (3) Structural estimation & quantitative assessment of forces & channels:
 - ▶ **Agglomeration ext.** have grown for services but declined for manufacturing
 - ▶ Shifts services into large cities and boosts large services firms' productivity
 - ▶ Crowds out manufacturing from large cities
 - ▶ Explains urban bias, also important for aggregate structural change

DATA FROM FRANCE

Economic activity: Firm balance sheet data (FICUS-FARE)

- ▶ All firms (1995-2018)
- ▶ Sales, value-added, employment, exports (including services firms!), location

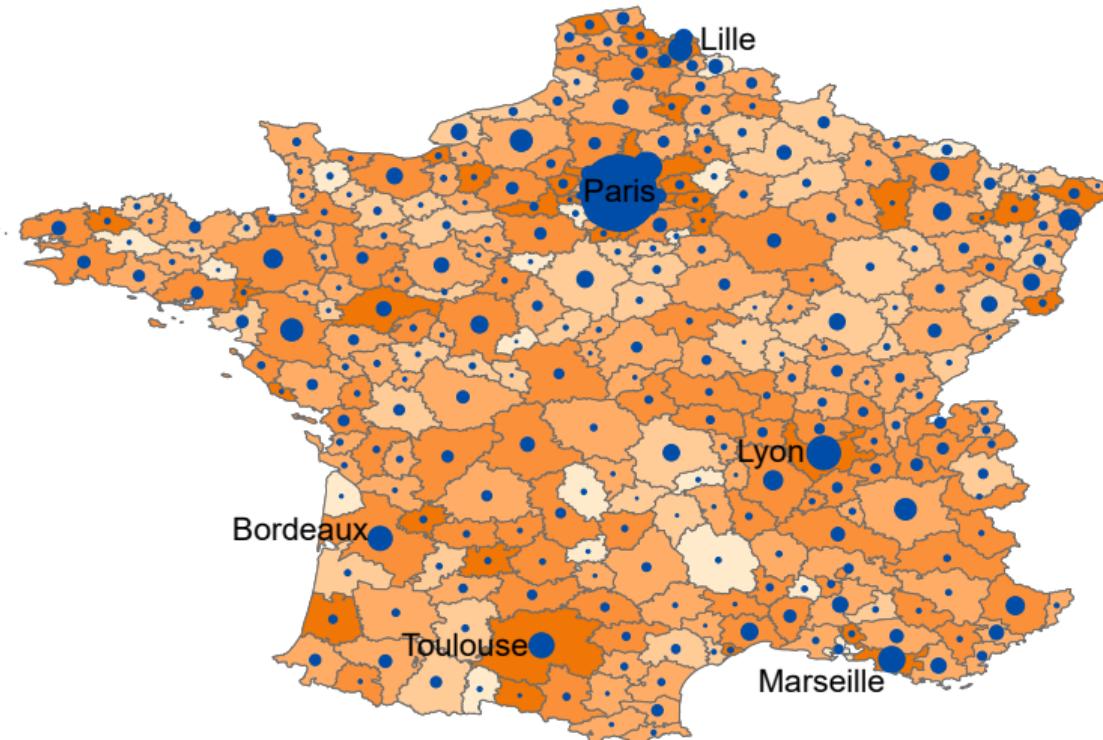
Population size in cities: Matched employer-employee data (DADS)

- ▶ All workers (1995-2018)
- ▶ Location of work and residence
- ▶ City \equiv commuting zone ([Combes, Duranton, Gobillon, Puga, & Roux, 2012](#))

Our sample:

- ▶ Firms with 1 establishment, or with all establishments in the same commuting zone
- ▶ 297 cities
- ▶ Services: accommodation/catering, admin/support services, arts/entertainment, construction, finance/insurance, ICT, real estate, and specialized/technical services

POPULATION AND THE INCREASE IN THE SERVICES SHARE



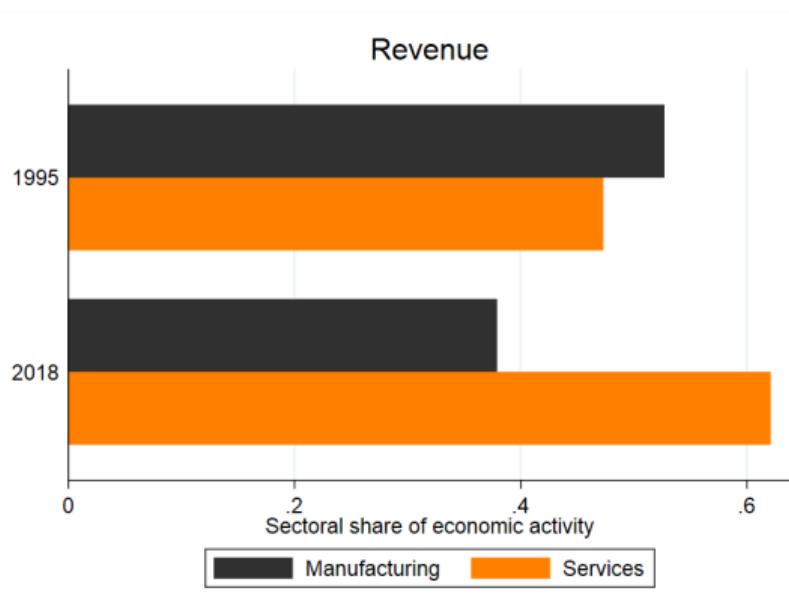
DISTRIBUTION OF ECONOMIC ACTIVITY ACROSS CITY SIZES

Statistic	City size bin	Manufacturing		Services	
		1995	2018	1995	2018
Share of revenue	1	0.67	0.58	0.33	0.42
	2	0.64	0.53	0.36	0.47
	3	0.54	0.42	0.46	0.58
	4	0.56	0.37	0.44	0.63
	5	0.32	0.15	0.68	0.85
	overall	0.52	0.38	0.48	0.62

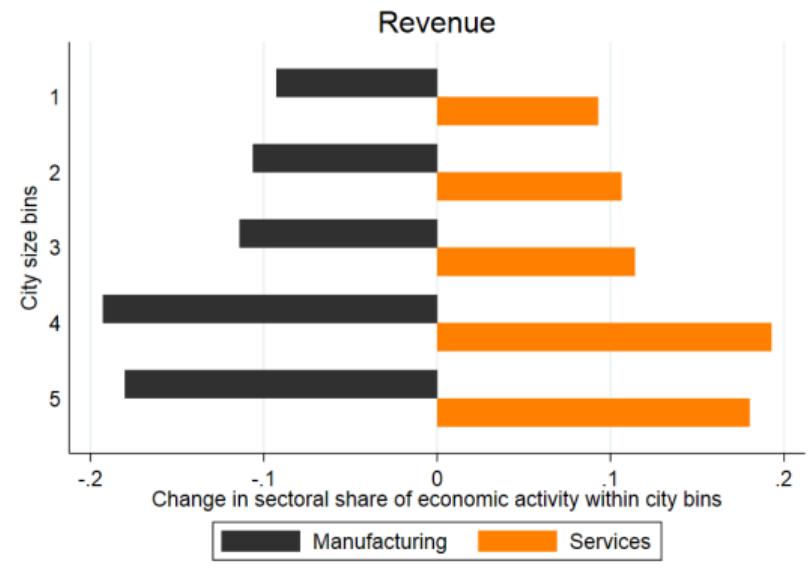
Large cities already predominantly services in 1995. Nevertheless, large cities experienced a stronger shift into services.

URBAN-BIASED STRUCTURAL CHANGE IN FRANCE 1995-2018

Aggregate structural change



Urban-biased structural change



More

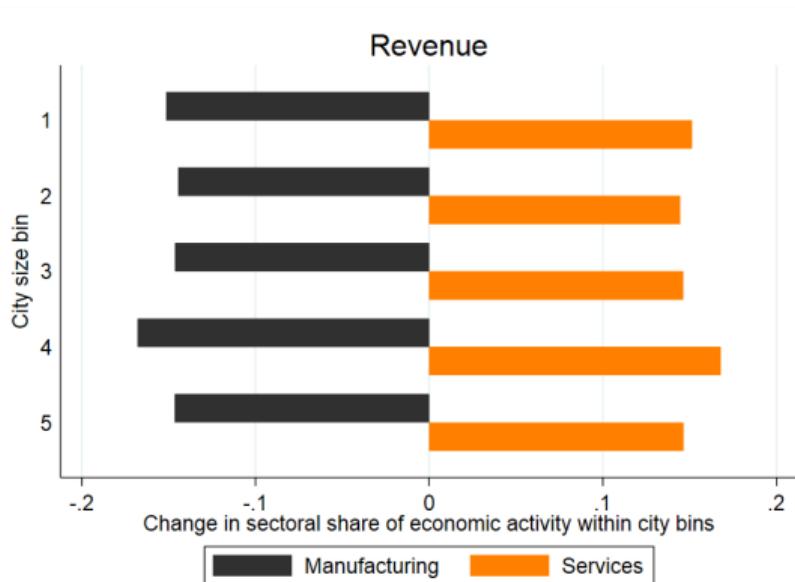
Multi-establishment

Non-tradables

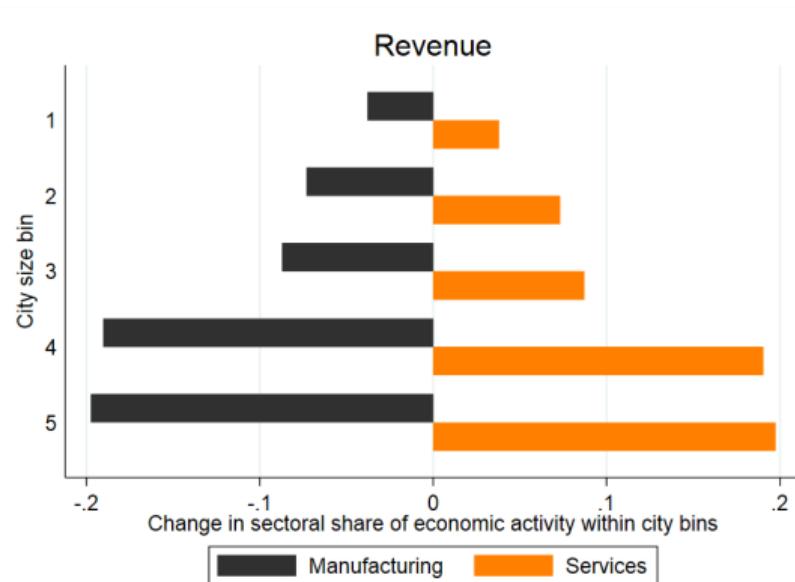
Comparative advantage

LARGE FIRMS ACCOUNT FOR URBAN-BIASED STRUCTURAL CHANGE

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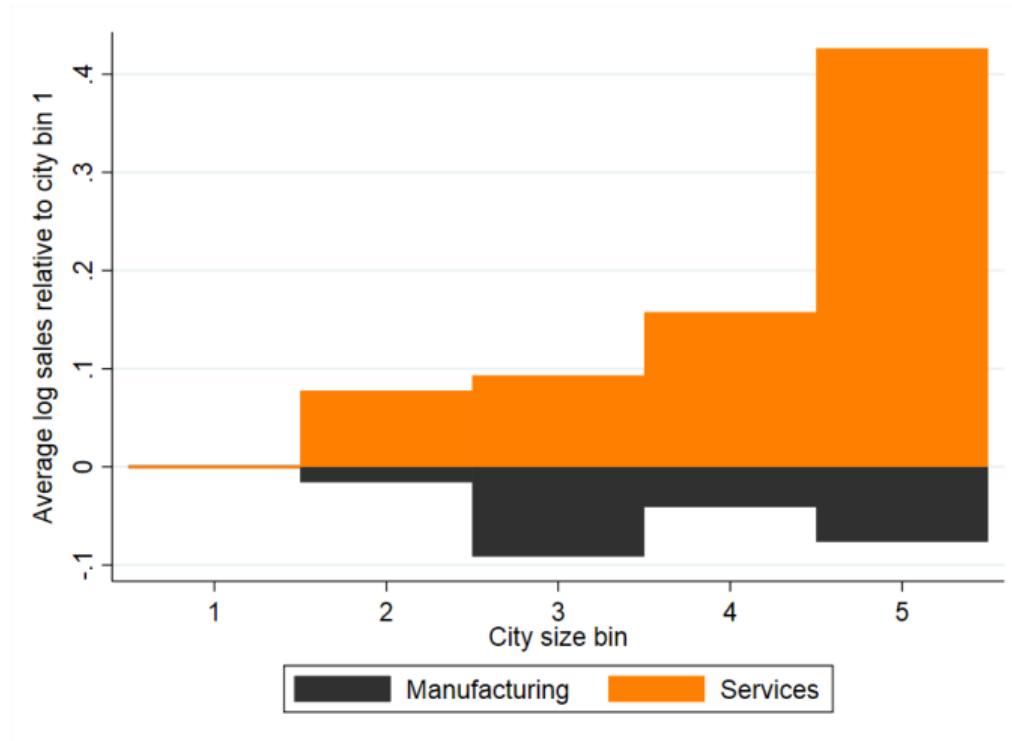


Top 5% of sales dist.



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SORTING PATTERNS DIFFER BETWEEN MANUFACTURING & SERVICES FIRMS



MODEL OF FIRM-CITY SORTING AND STRUCTURAL CHANGE

Goal: Quantitatively assess sectoral TFP growth, international trade costs, and agglomeration externalities as drivers of urban-biased structural change

Data	Model ingredient
- Aggregate structural change	Sectoral TFP growth (Ngai & Pissarides, 2007) Income effects (Comin, Lashkari, & Mestieri, 2021)
- Large firms/exporters important for urban-biased structural change	Selection into exporting and variable trade costs that differ across sectors
- Cities differ in population size - Sector-city & firm-city sorting	Agglomeration effects and sorting of sectors and firms to cities

MODEL STRUCTURE: COUNTRIES AND CITIES

We build on Gaubert's (2018) model of cities

Countries:

- ▶ Two symmetric countries: Home and Foreign

Cities: details

- ▶ Measure I of ex-ante identical cities
- ▶ Cities host workers and two sectors: manufacturing (m) and services (s) firms
- ▶ City size (population) determined by agglomeration & congestion forces
- ▶ Free mobility of (homogeneous) workers and goods/services within countries
- ▶ Wages are higher in larger cities to compensate workers for higher land prices

MODEL STRUCTURE: PREFERENCES AND FIRMS

Preferences:

[details](#)

- ▶ Non-homothetic CES aggregator across sectors $j \in \{m, s\}$ (Comin, Lashkari, & Mestieri, 2021)
 - ▶ Relative price effects
 - ▶ Non-homothetic income effects
- ▶ Homothetic CES aggregator within each sector

Firms:

- ▶ Monopolistic manufacturing and services sectors
- ▶ Production function: $q_j(z, i) = A_j \Psi_j(z, L(i)) l^{\alpha_j} h^{1-\alpha_j}$ where $\alpha_j \in (0, 1]$
 - ▶ A_j : sector-specific TFP
 - ▶ $\Psi_j(z, L(i))$: sorting and agglomeration
 - ▶ Export status $x \in \{0, 1\}$
- ▶ Variable trade costs τ_j and fixed export cost f_j^x
- ▶ Firms jointly choose city i , whether to export ξ , labor l , and land h

MODEL STRUCTURE: AGGLOMERATION AND SORTING

$$\log \Psi_j(z, i) = \log z + \frac{a_j}{2} \left[\log \frac{L(i)}{L(1)} + \frac{(1 + \xi_j) \log z + (1 - \xi_j)}{1 + \log z} \frac{1}{s_j} \left(\left(1 + \log \frac{L(i)}{L(1)} \right)^{s_j} - 1 \right) \right]$$

where $a_j \in [0, 1]$, $s_j \in [0, 1]$, $\xi_j \in [-1, 1]$

- ▶ Generalize Gaubert's (2018) specification to allow negative sorting
- ▶ a_j : strength of agglomeration externalities
- ▶ s_j : rate of diminishing returns to agglomeration externalities
- ▶ ξ_j : governs direction and strength of sorting by firm size and city size
 - ▶ $\xi_j > 0$: positive sorting
 - ▶ $\xi_j < 0$: negative sorting
 - ▶ $\xi_j = 0$: no sorting

STRUCTURAL ESTIMATION: KEY PARAMETERS

We estimate time-varying agglomeration parameters:

- ▶ One set for 1995, another for 2018 (unlisted parameters common across 1995 & 2018)
- ▶ Method of simulated moments: pooled 1995+2018 specification

We calibrate time-varying sectoral TFP and trade costs

Key parameters	Method	Time-varying
Sorting effect (ξ_j)	Estimate	No
Agglomeration effect (a_j)	Estimate	Yes
Variable trade costs (τ_j)	Average export intensity	Yes
Fixed export cost (f_j^x)	Proportion of exporters	Yes
Sectoral TFP (A_j)	Δ aggregate sectoral rev share, $\% \Delta$ real GDP per capita	Yes

other parameters

STRUCTURAL ESTIMATION: METHOD OF SIMULATED MOMENTS

Find parameters Θ that minimize distance between data M and model \widehat{M} moments:

$$\widehat{\Theta} = \arg \min_{\Theta} (M - \widehat{M}(\Theta))' \mathcal{W}^{-1} (M - \widehat{M}(\Theta))$$

- ▶ \mathcal{W} is inverse of var-cov matrix of data moments
- ▶ Targeted moments for each sector and snapshot:
 - I. Normalized log revenue distributions
 - II. Mean normalized log revenue by city size quintiles
 - III. Distribution of sector-level revenues across city size quintiles
- ▶ Same moments as Gaubert (2018)
- ▶ Given observed city sizes, estimation procedure finds agglomeration and sorting parameters that rationalize these moments

detour

model fit

KEY ESTIMATION AND CALIBRATION RESULTS

Key estimated parameters	Sector	Value in 1995	Value in 2018
Sorting effect (ξ_j)	MN	-0.104	
	SS	0.420	
Agglomeration diminishing marginal returns (s_j)	MN	0.668	
	SS	0.912	
Agglomeration effect (a_j)	MN	0.718	0.694
	SS	0.703	0.712
Variable trade costs (τ_j)	MN	0.148	0.073
	SS	3.009	1.196
Sectoral TFP (A_j)	MN	1	2.039
	SS	1	0.838

Three sector-specific forces used for counterfactuals: A_j , a_j , τ_j

WHAT DRIVES URBAN-BIASED STRUCTURAL CHANGE?

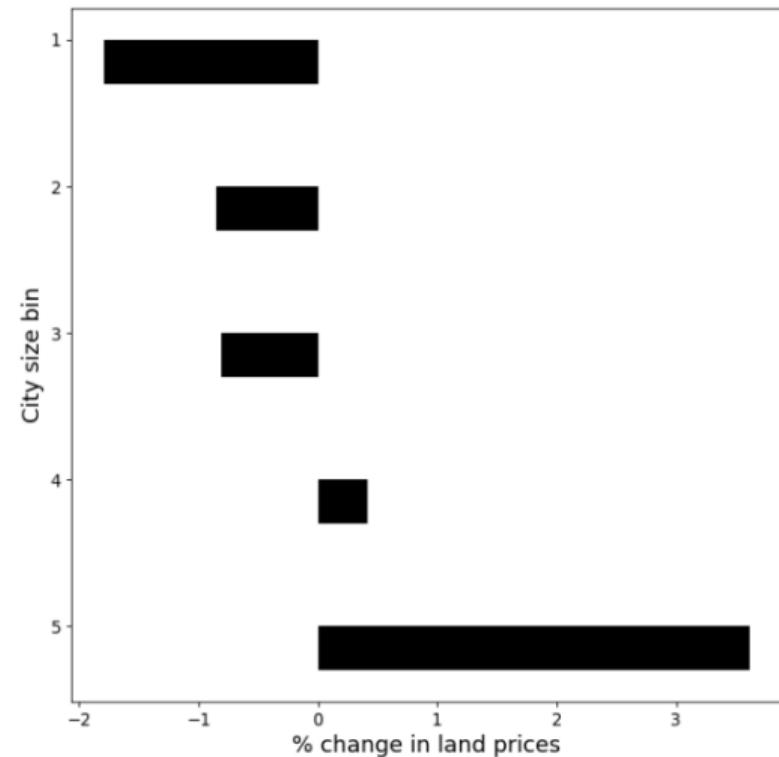
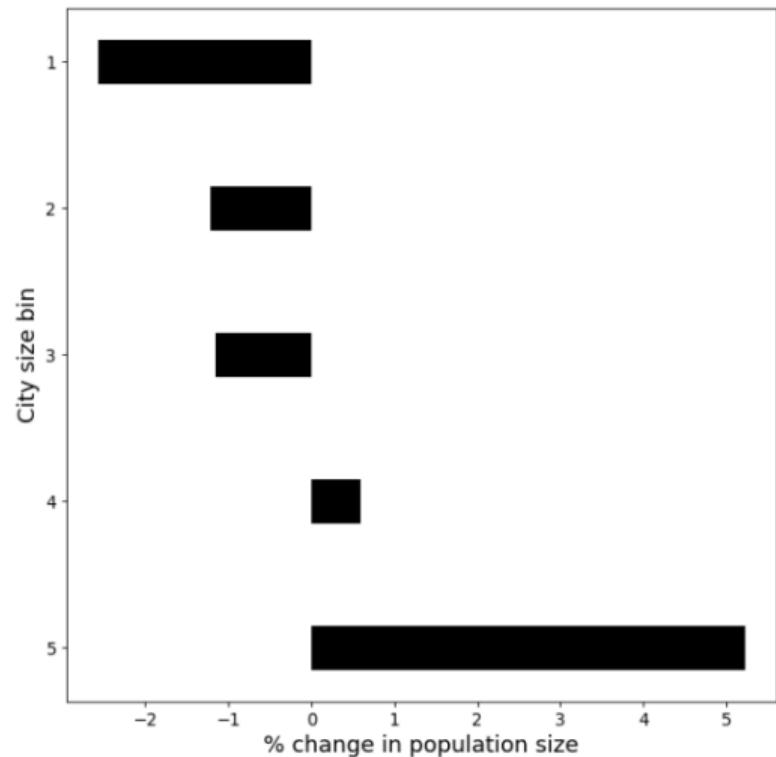
Counterfactual change in **services** share of revenue in each city size bin:

- ▶ Start from estimated 1995 equilibrium
- ▶ Change only A_j , τ_j , or a_j to 2018 levels

City size bin	Data	Model	Δ TFP	Δ trade costs	Δ agglomeration
1 (smallest)	0.093	0.062	0.150	-0.005	-0.071
2	0.106	0.073	0.144	-0.006	-0.056
3	0.114	0.137	0.151	-0.005	-0.011
4	0.193	0.154	0.146	-0.005	0.013
5 (largest)	0.180	0.222	0.142	-0.003	0.105
Agg. structural change	0.145	0.143	0.158	-0.004	-0.012

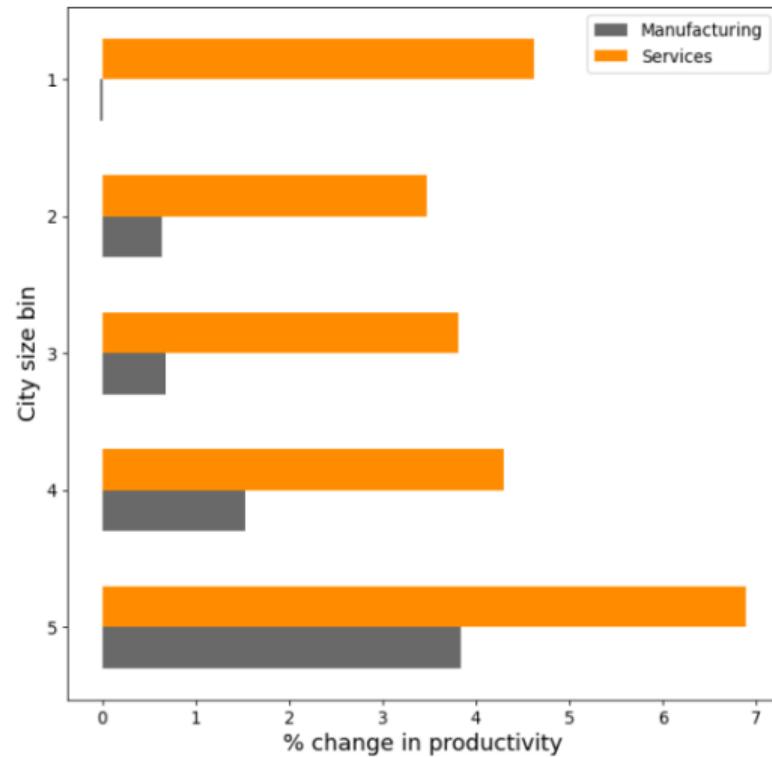
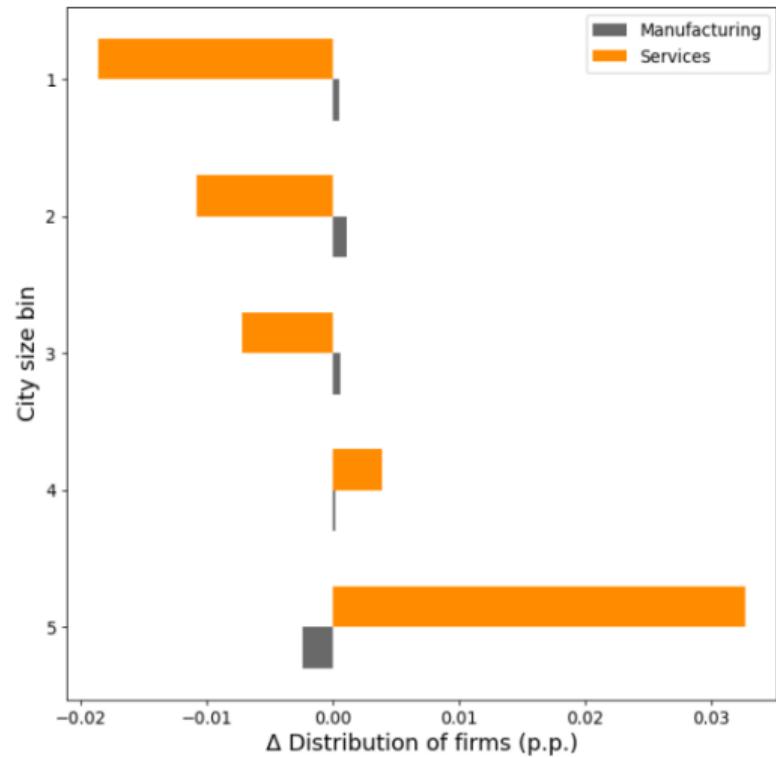
$a_{SS} \uparrow \rightarrow$ services productivity $\uparrow \rightarrow$ large city population size & land price $\uparrow \rightarrow$ large services firm productivity \uparrow , crowd out manufacturing in large cities \rightarrow UBSC

INCREASED SERVICES AGGLOM. CAN EXPLAIN THE URBAN BIAS



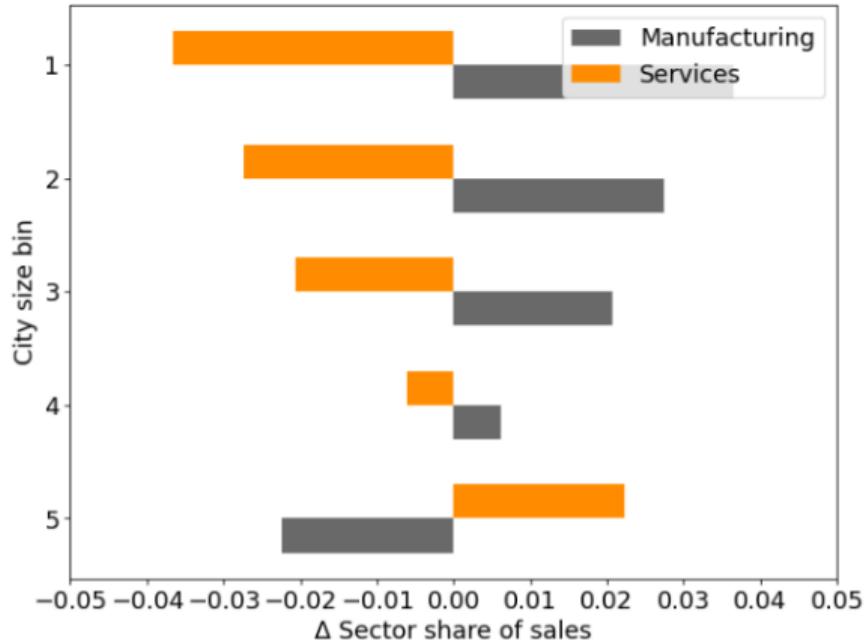
Increase in population size and land prices in large cities

INCREASED SERVICES AGGLOM. CAN EXPLAIN THE URBAN BIAS



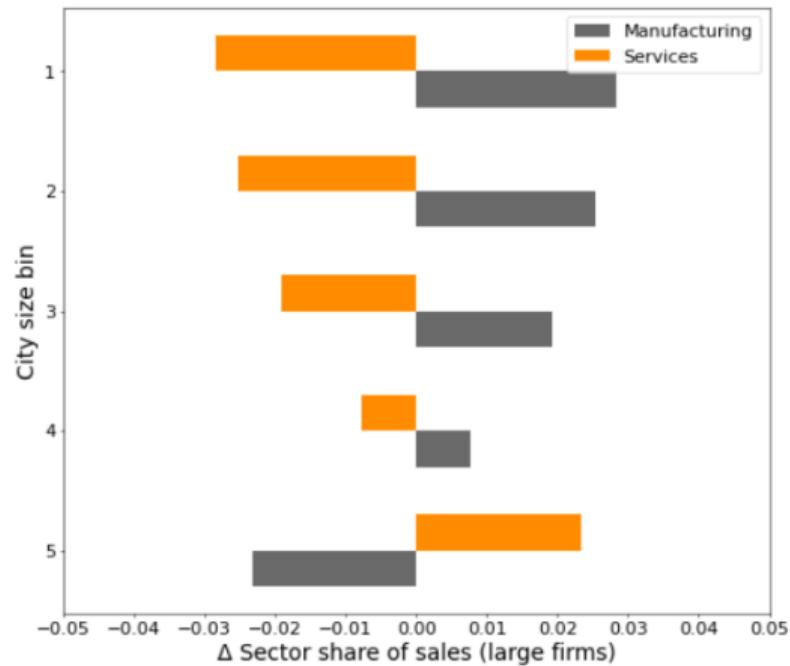
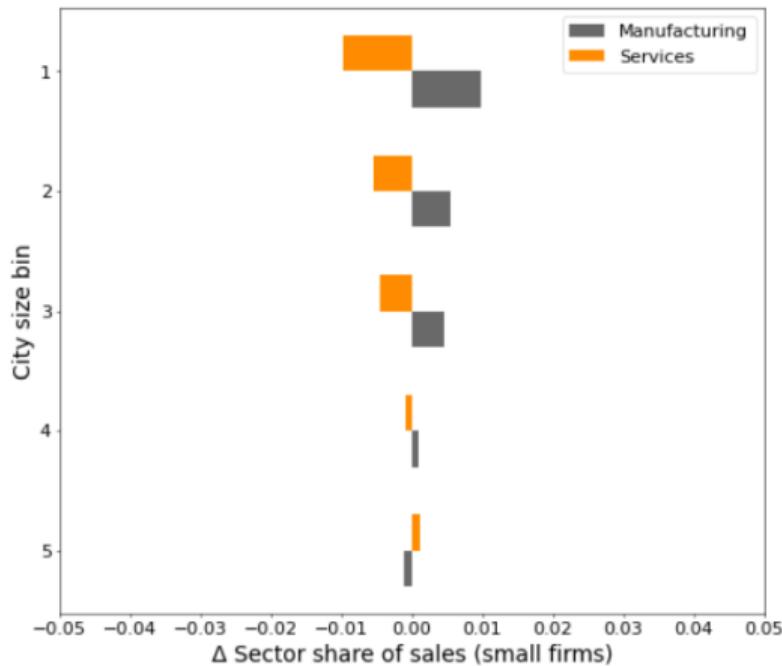
Services firms concentrate more in large cities and productivity rises more in large cities

INCREASED SERVICES AGGLOM. CAN EXPLAIN THE URBAN BIAS



Urban-biased structural change

INCREASED SERVICES AGGLOM. CAN EXPLAIN THE URBAN BIAS



Urban-biased structural change driven by large firms

CONCLUSION

- ▶ We document new facts about structural change in France from 1995 to 2018:
 - ▶ Structural change is **urban-biased**
 - ▶ **Large firms** account for the urban bias
- ▶ We build a model of heterogeneous firms and cities to quantify contribution of three sector-specific forces to urban-biased structural change:
 - ▶ Sectoral TFP growth
 - ▶ Falling international trade costs
 - ▶ Changes in agglomeration externalities
- ▶ Structural estimation reveals that:
 - ▶ Diverging agglomeration externalities between services and manufacturing is an important driving force
 - ▶ Manufacturing TFP growth reinforces services growth in large cities

PARC ANDRÉ CITROËN, 15TH ARRONDISSEMENT OF PARIS



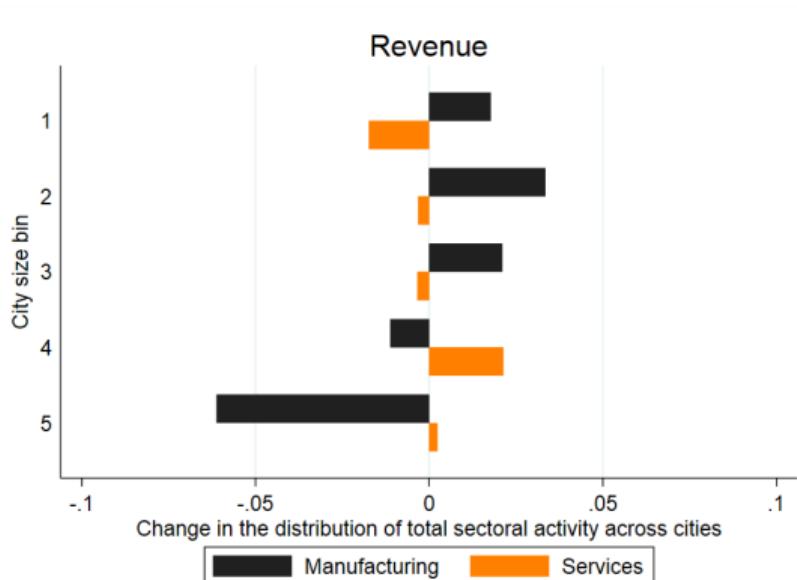
APPENDIX

CONTRIBUTIONS

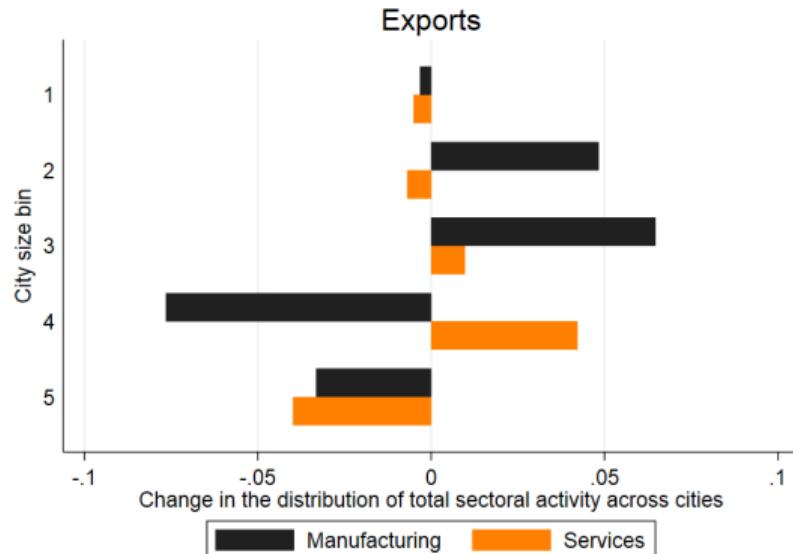
- ▶ Spatial structural change (Desmet & Rossi-Hansberg, 2014; Eckert & Peters, 2018; Eckert, Ganapati, & Walsh, 2022; Fajgelbaum & Redding, 2022; Coeurdacier, Oswald, & Teignier, 2022; Fan, Peters, & Zilibotti, 2022)
Our project: we show there is urban bias in structural change, highlighting role of large firms
- ▶ Macro-development: Focuses on the country level (Herrendorf, Rogerson, & Valentinyi, 2014; Alessandria, Johnson, & Yi, 2021; Comin, Lashkari, & Mestieri, 2021)
Our project: (i) New micro-level facts about structural change, (ii) sectoral TFP growth has important spatial implications, but cannot account for urban-biased structural change
- ▶ International trade: Largely focuses on role of manufacturing trade on spatial economic activity (Fajgelbaum & Redding, 2022; Bakker, Garcia-Marin, Potlogea, Voigtländer, & Yang, 2022)
Our project: growth of services exporters in large cities matters for population sizes
- ▶ Urban/spatial: Agglomeration economies and positive sorting (Combes, Duranton, Gobillon, Puga, & Roux, 2012; Desmet & Henderson, 2015; Gaubert, 2018; Duranton & Puga, 2020)
Our project: changes in agglomeration forces key for understanding rise of service exporters

URBAN-BIASED STRUCTURAL CHANGE IN FRANCE 1995-2018

Sales:



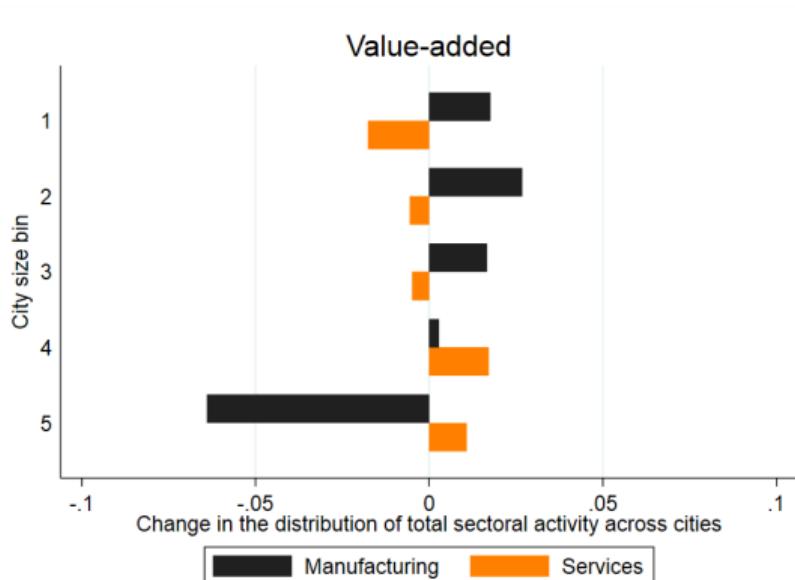
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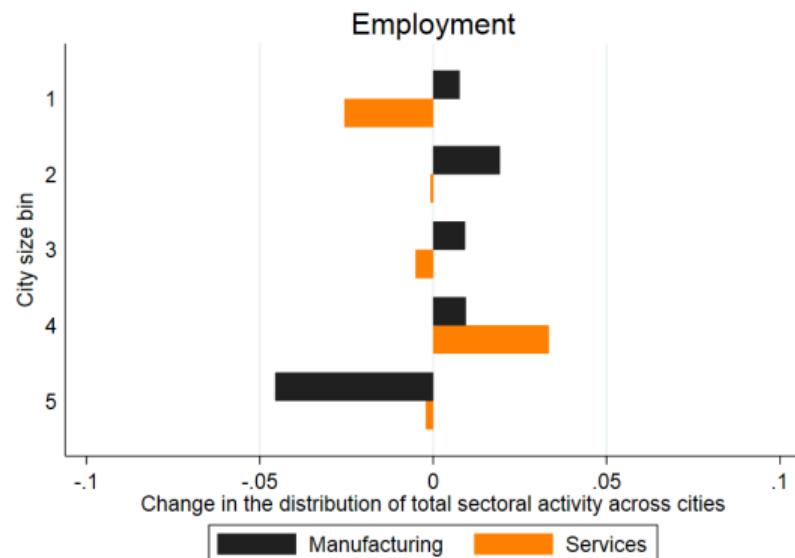
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URBAN-BIASED STRUCTURAL CHANGE IN FRANCE 1995-2018

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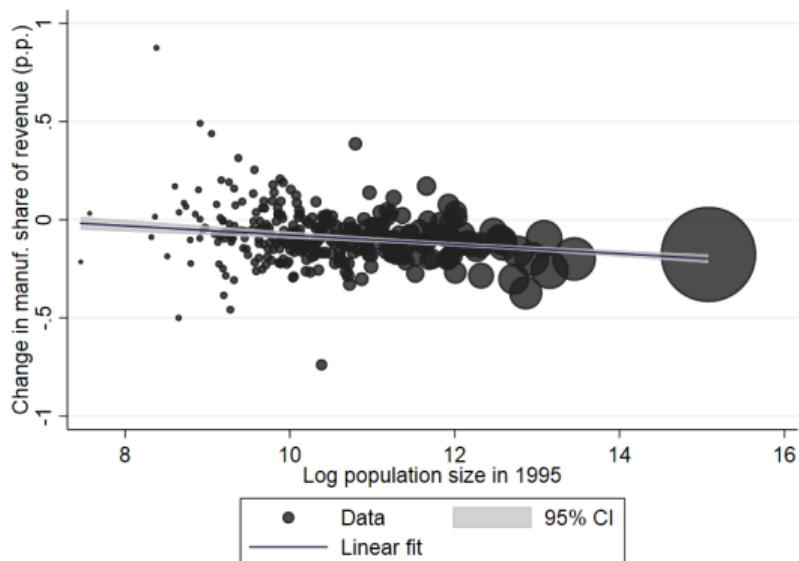
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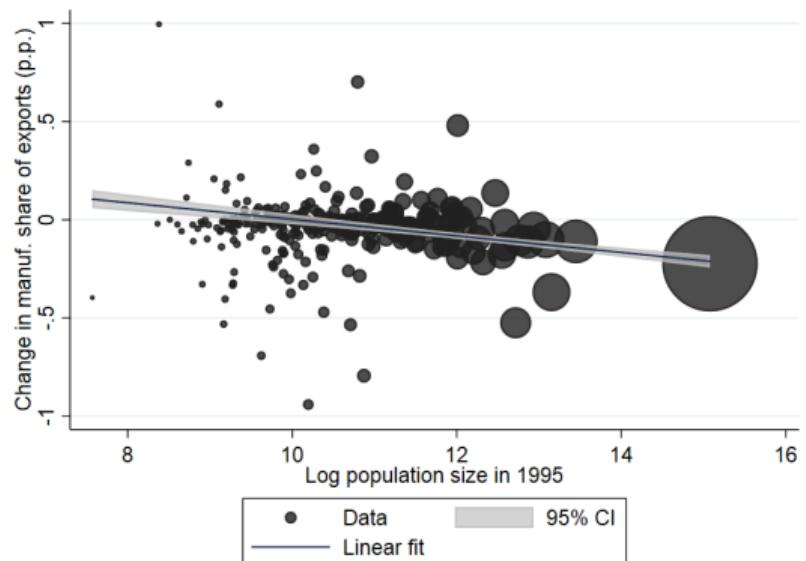
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URBAN-BIASED STRUCTURAL CHANGE: PARIS VS THE REST?

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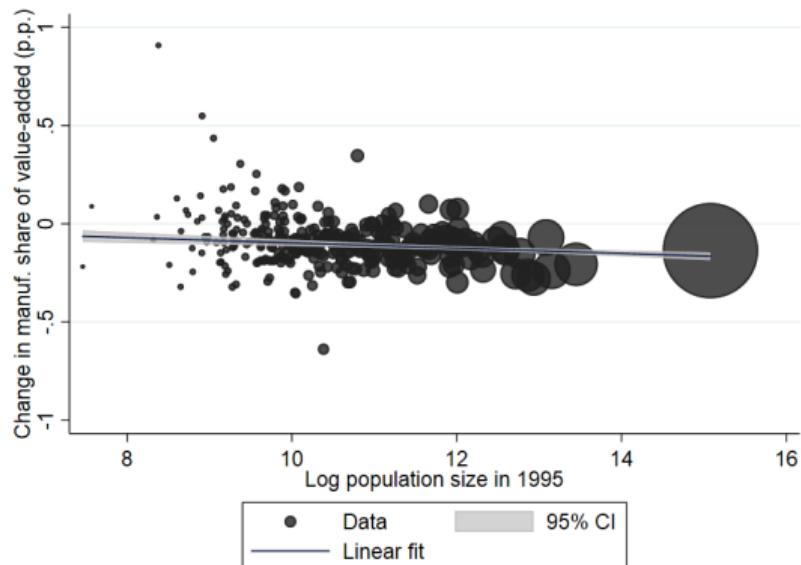
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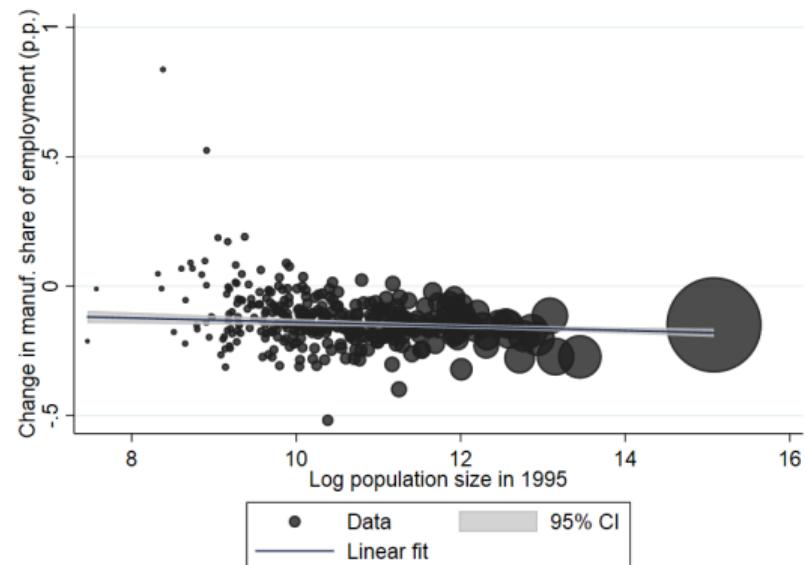
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URBAN-BIASED STRUCTURAL CHANGE: PARIS VS THE REST?

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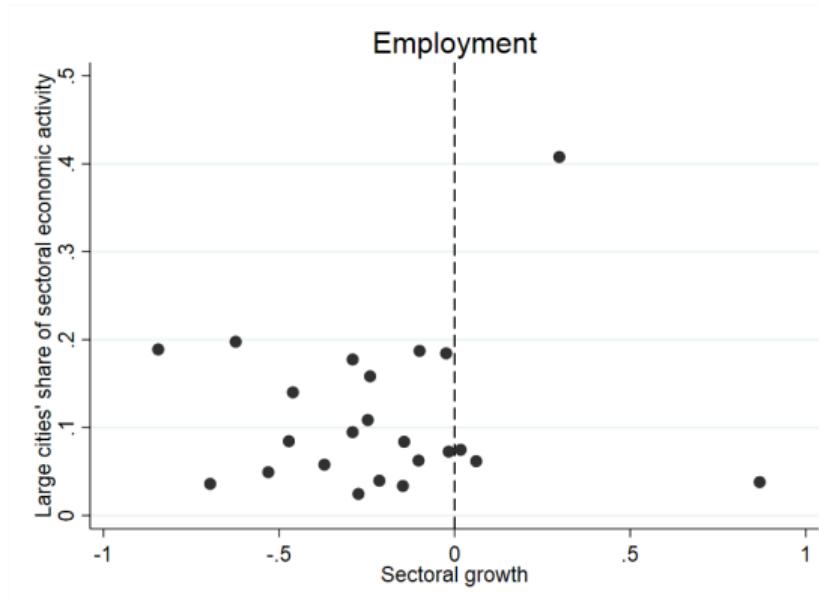
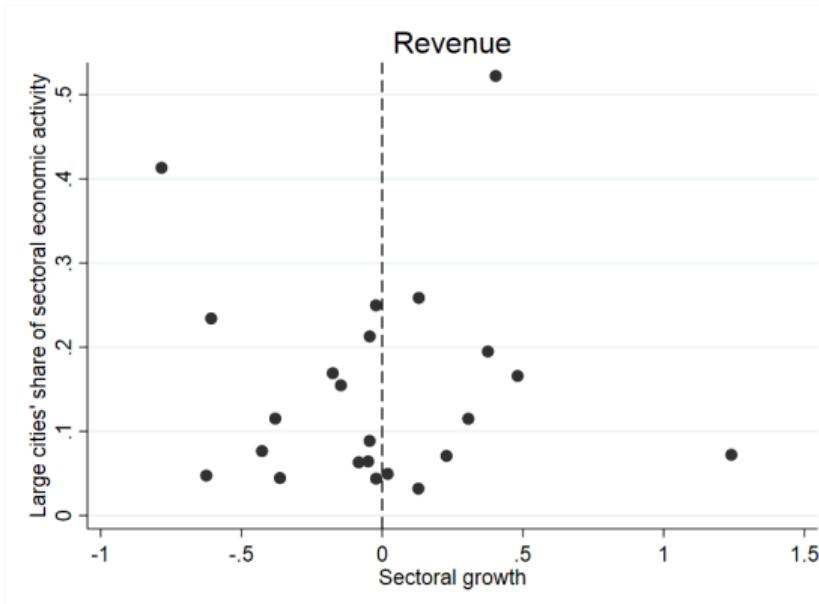


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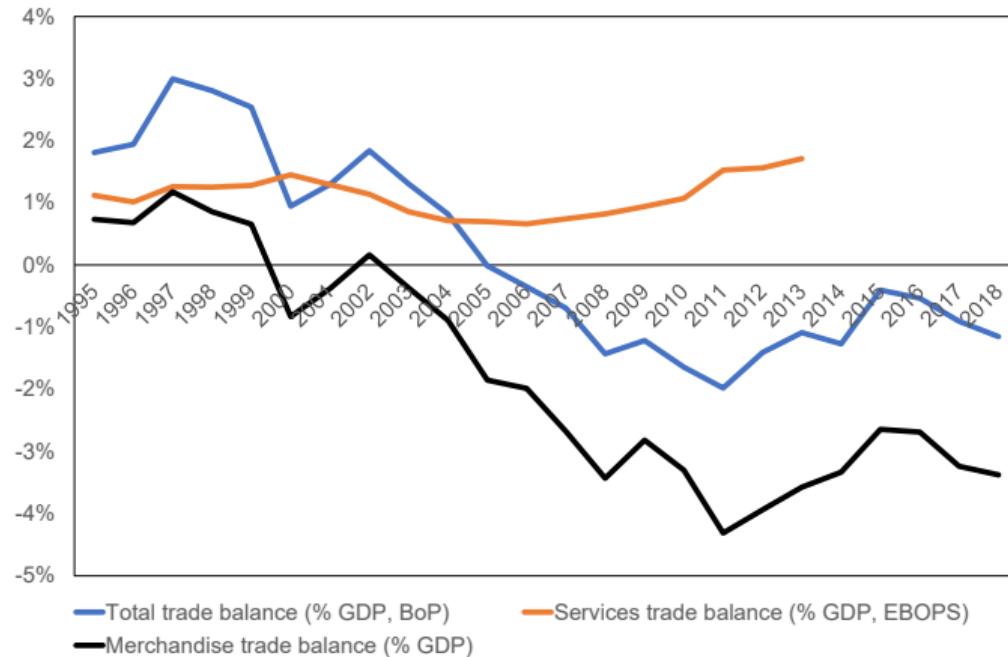
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URBAN-BIASED STRUCTURAL CHANGE: COMPARATIVE ADV.?

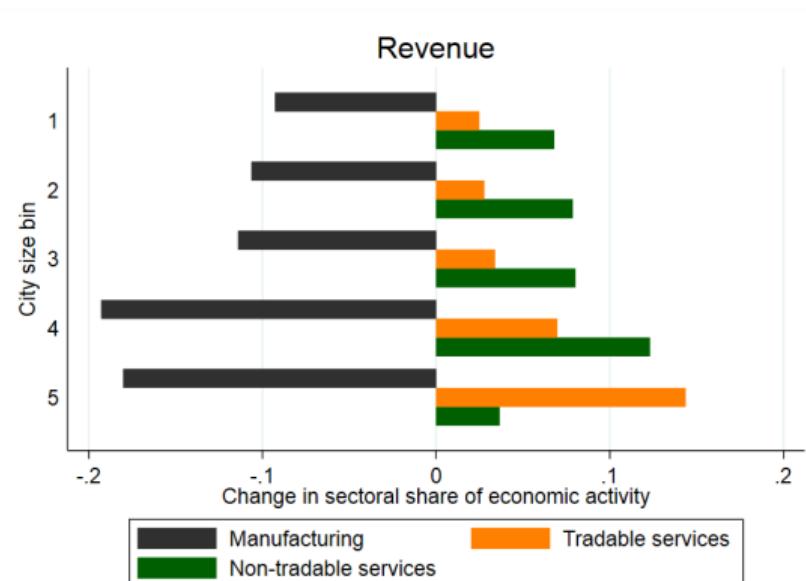


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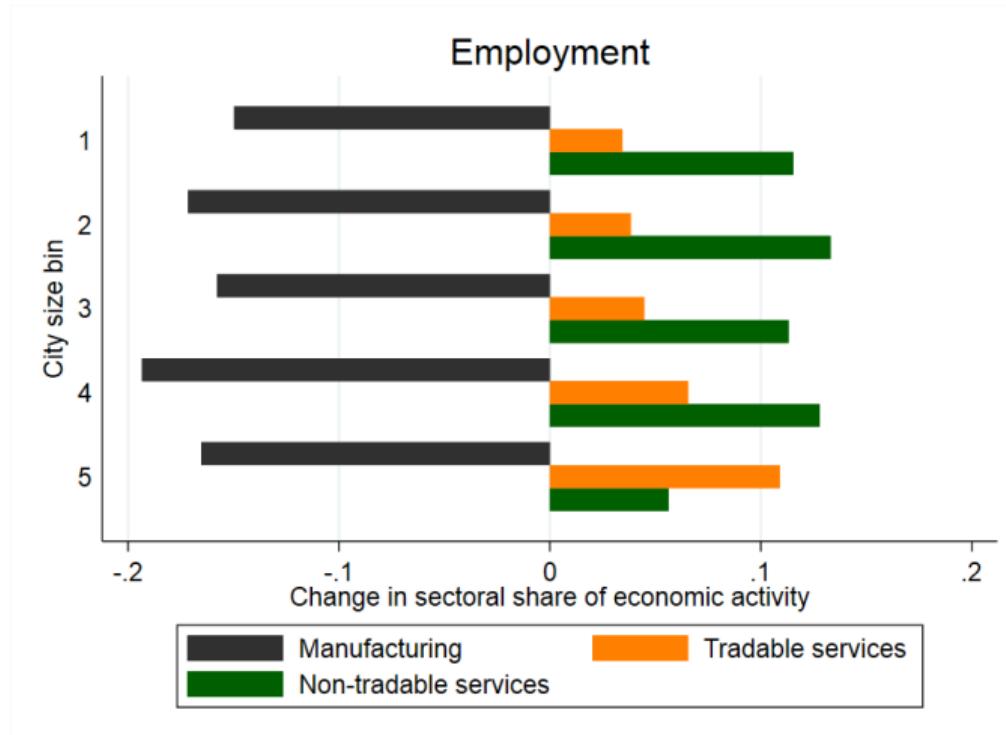


URBAN-BIASED STRUCTURAL CHANGE: NON-TRADABLES?



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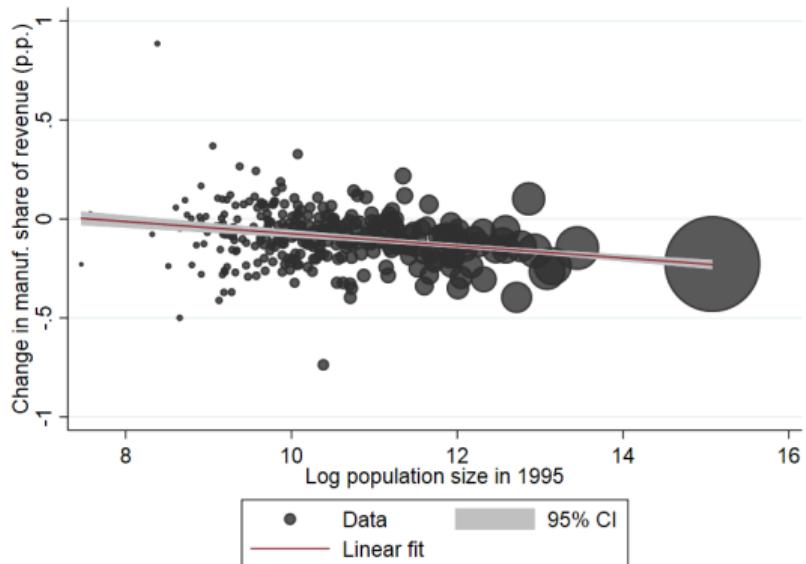
URBAN-BIASED STRUCTURAL CHANGE: NON-TRADABLES?



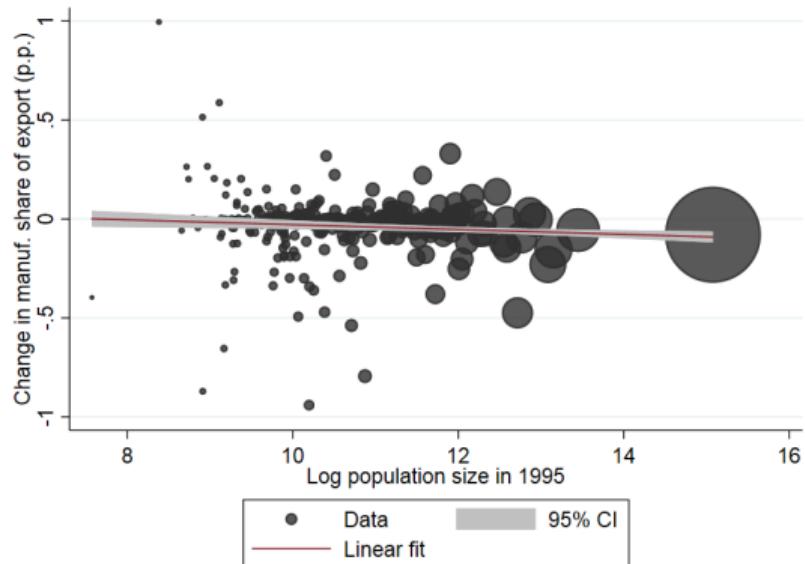
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URBAN-BIASED STRUCTURAL CHANGE: INC. MULTIPLANT FIRMS

Sales:



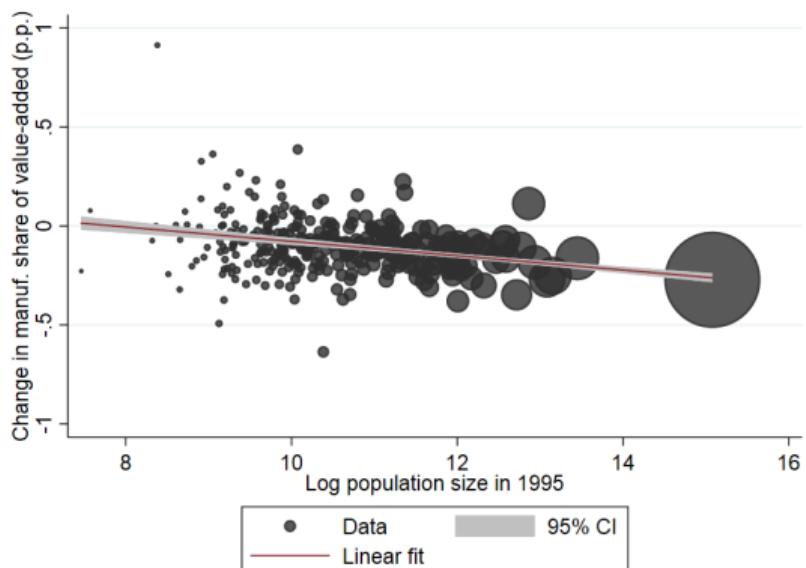
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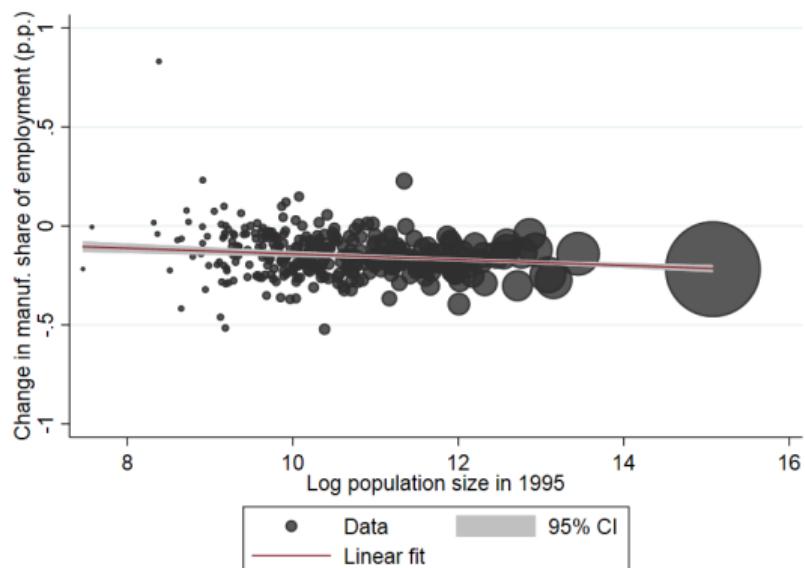
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URBAN-BIASED STRUCTURAL CHANGE: INC. MULTIPLANT FIRMS

Value-added:



Employment:



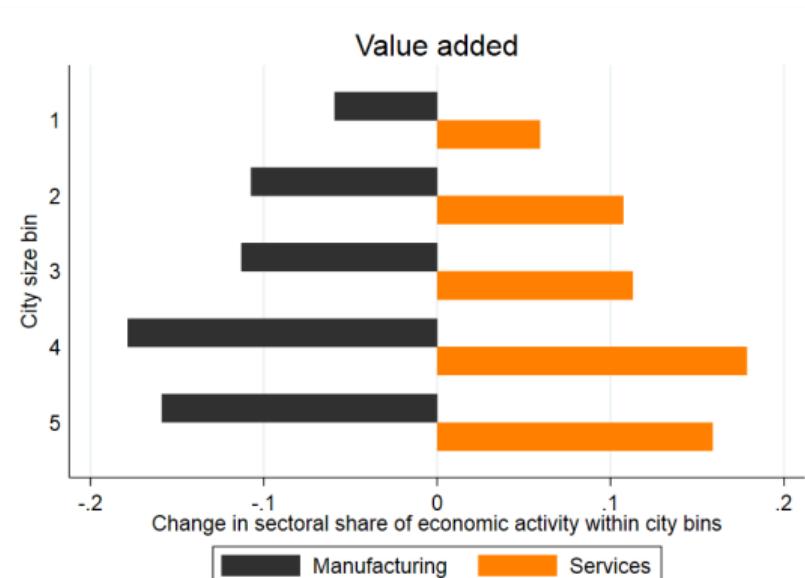
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LARGE FIRMS ACCOUNT FOR URBAN-BIASED STRUCTURAL CHANGE

Bottom 95% of sales



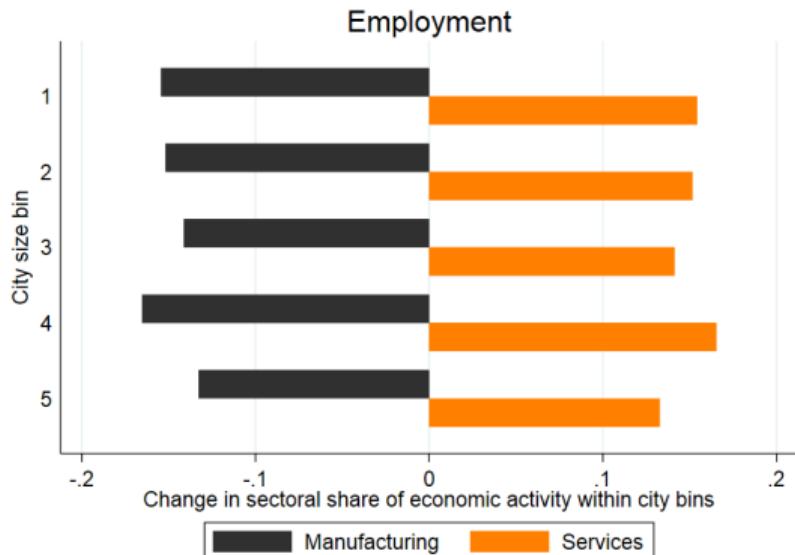
Top 5% of sales



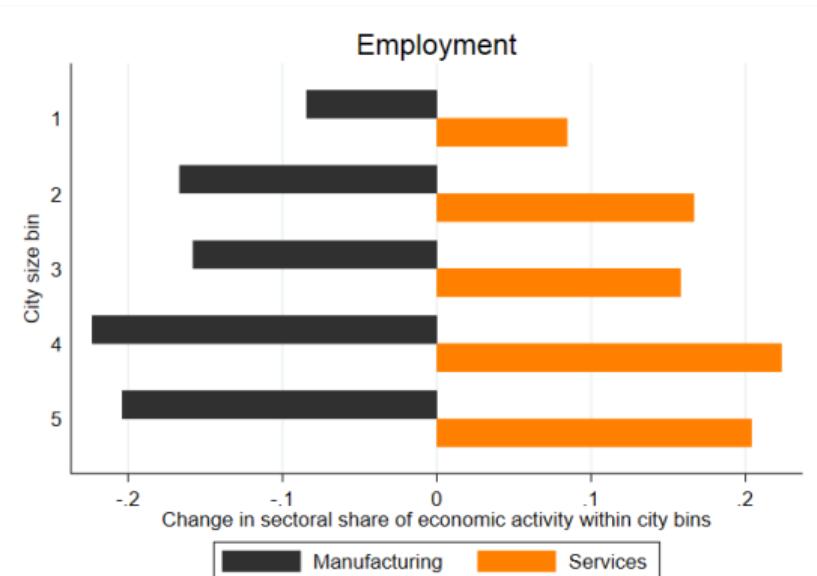
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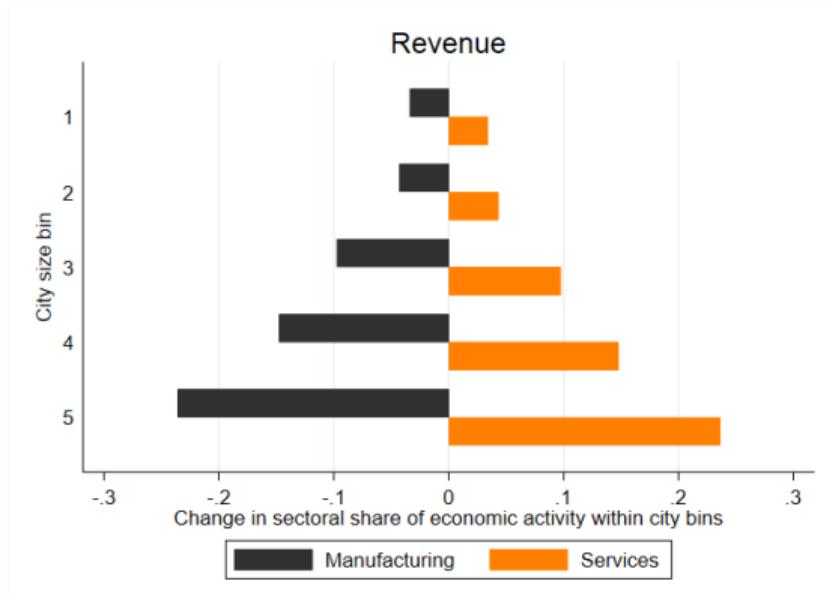
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EXPORTERS ACCOUNT FOR URBAN-BIASED STRUCTURAL CHANGE

Non-exporters only



Exporters only



back

EXPORTERS ACCOUNT FOR URBAN-BIASED STRUCTURAL CHANGE

Non-exporters only



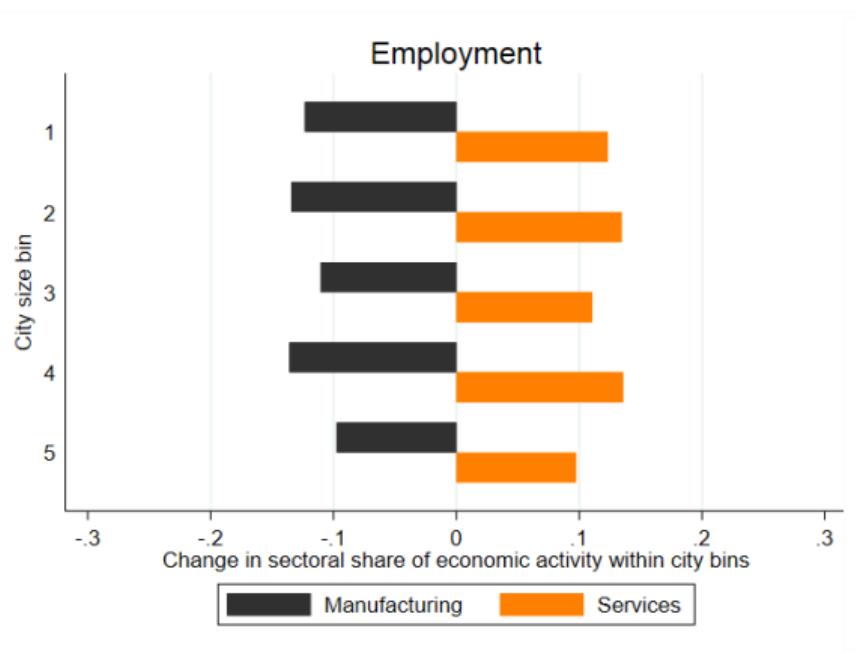
Exporters only



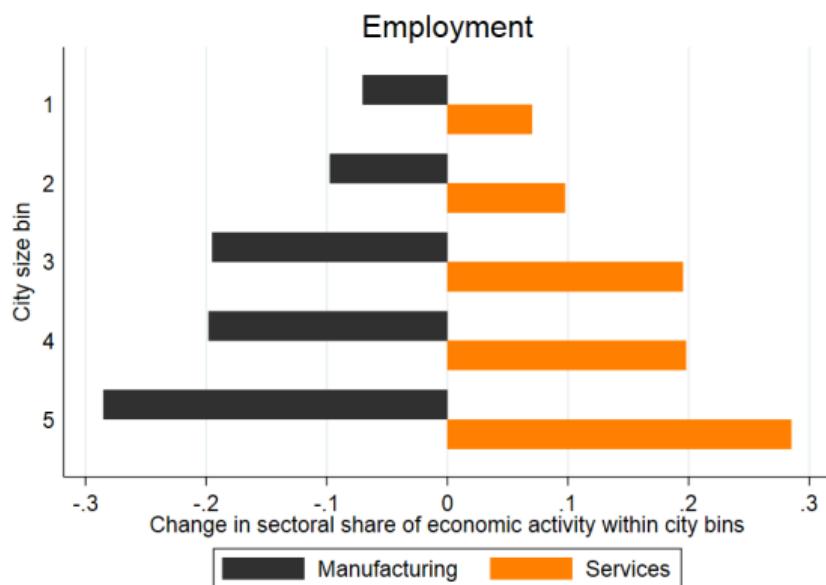
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Non-exporters only

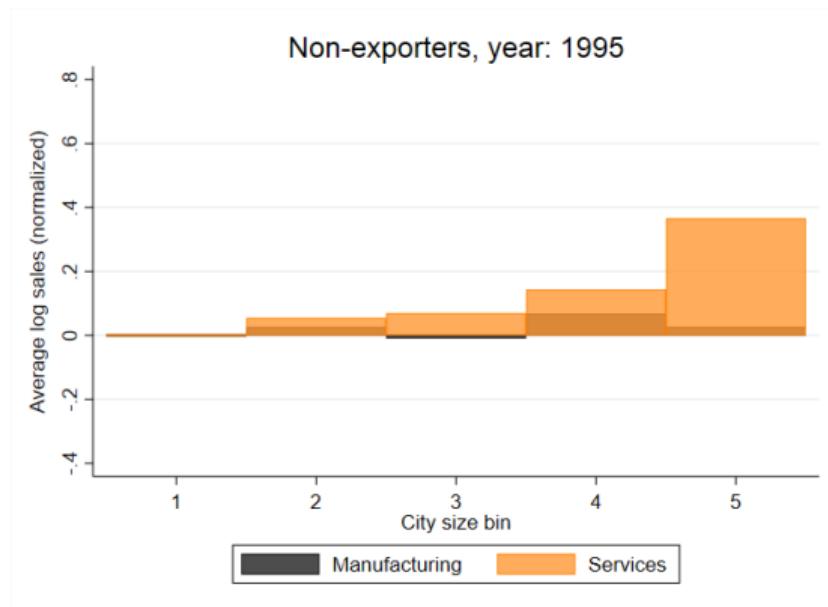


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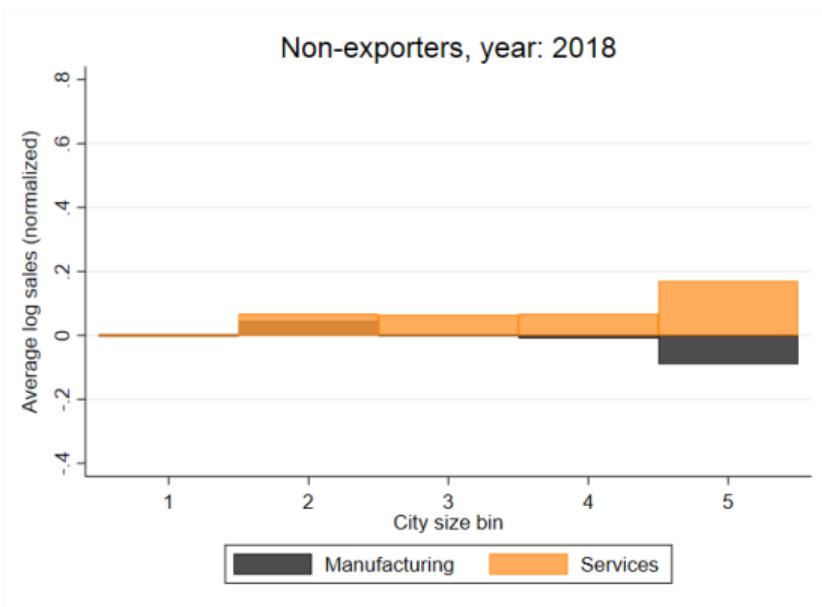


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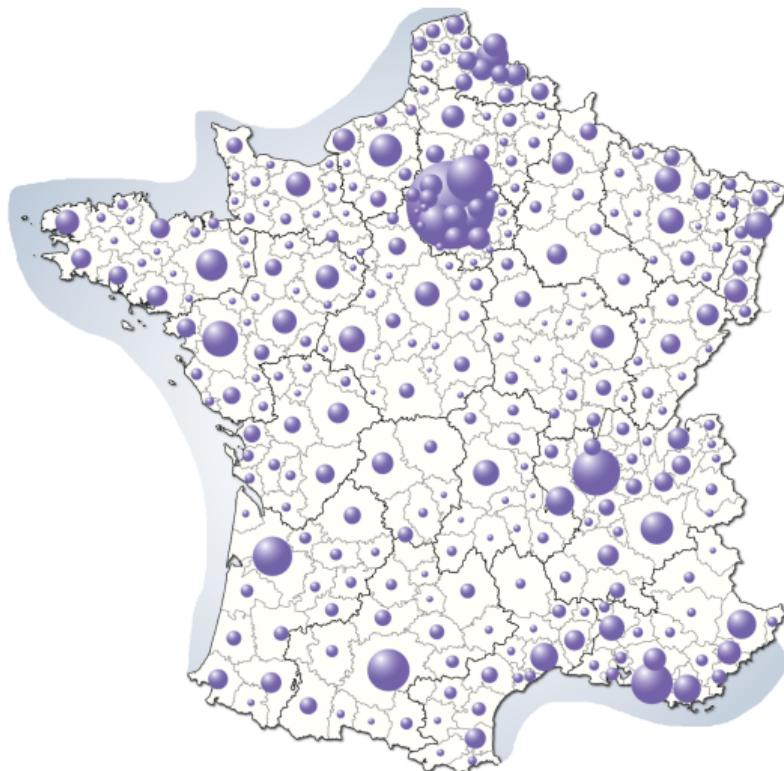
SORTING PATTERNS DIFFER BETWEEN EXPORTERS & NON-EXPORTERS



Exporters



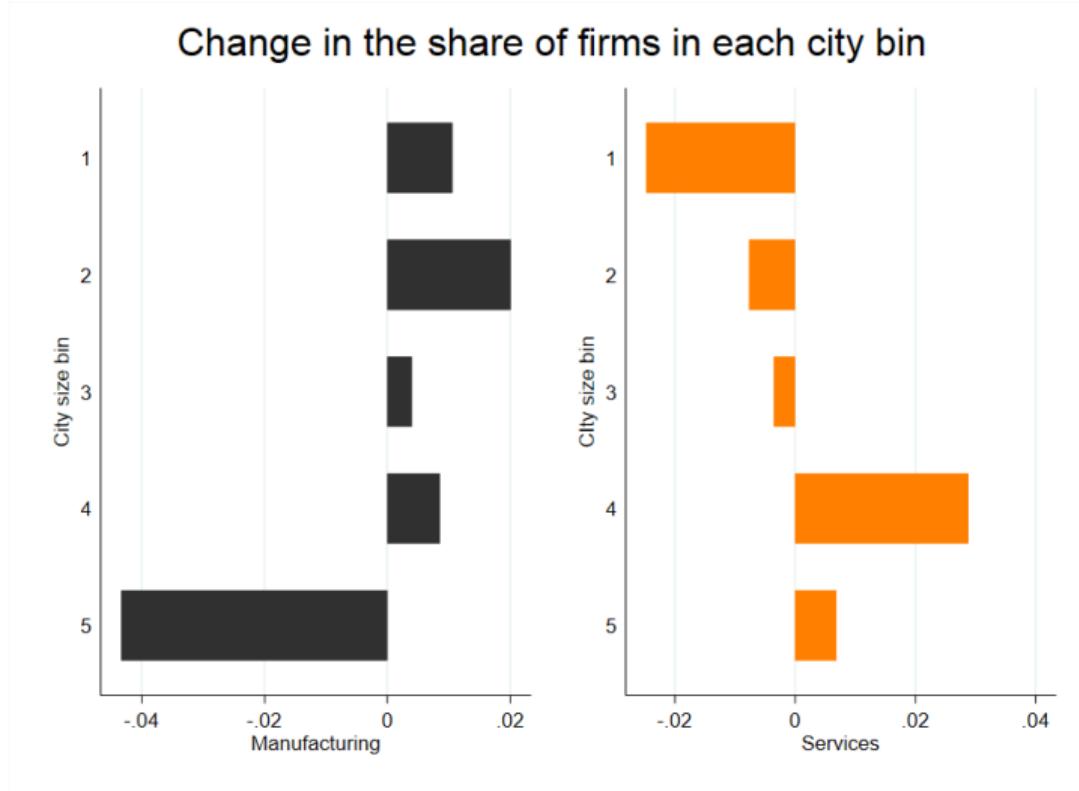
POPULATION OF COMMUTING ZONES



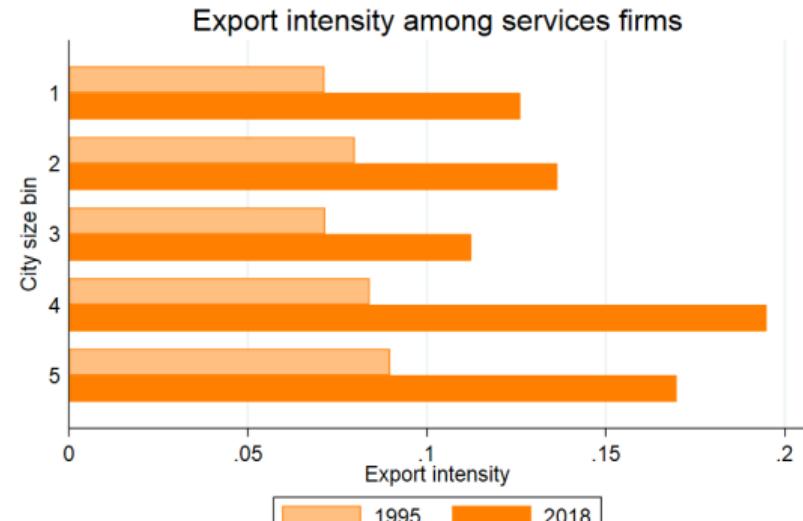
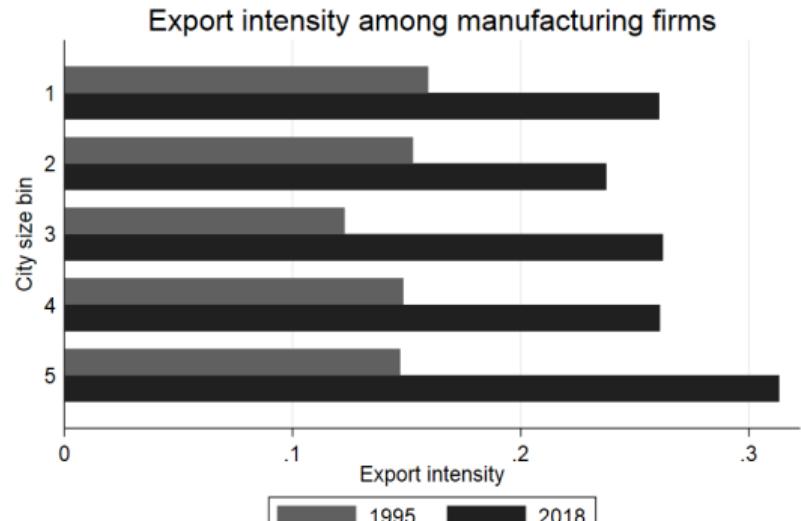
The two largest in each bin:

- ▶ Paris and Lyon
- ▶ Marseilles and Toulouse
- ▶ Brest and Reims
- ▶ Chartres and Gap
- ▶ Ganges and Flandre-Lys

CHANGING LOCATIONS OF MANUFACTURING & SERVICES FIRMS

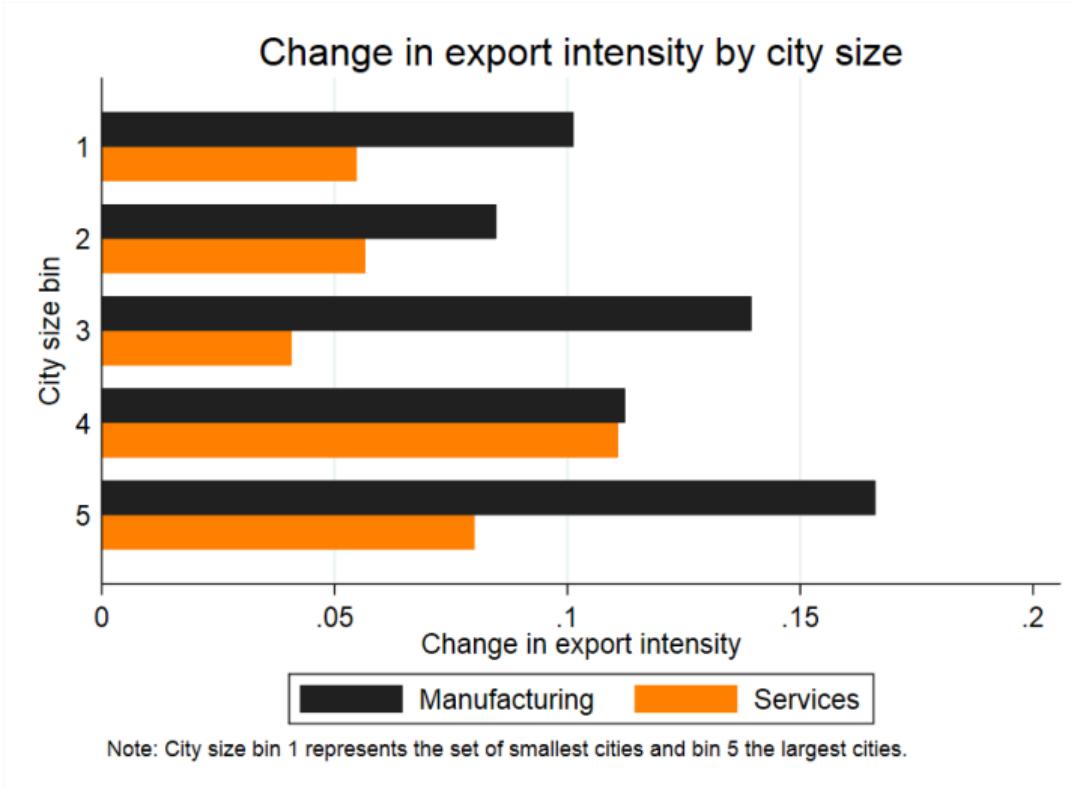


LARGER CITIES ARE MORE EXPORT INTENSIVE

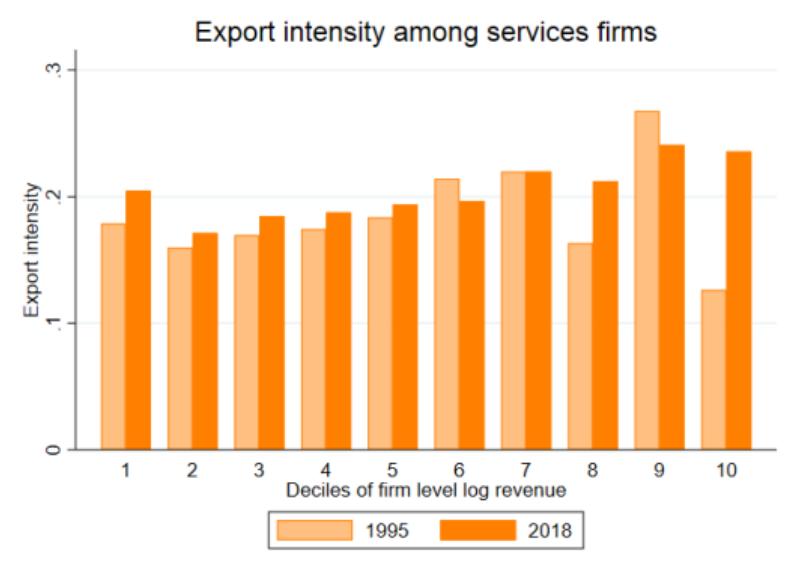
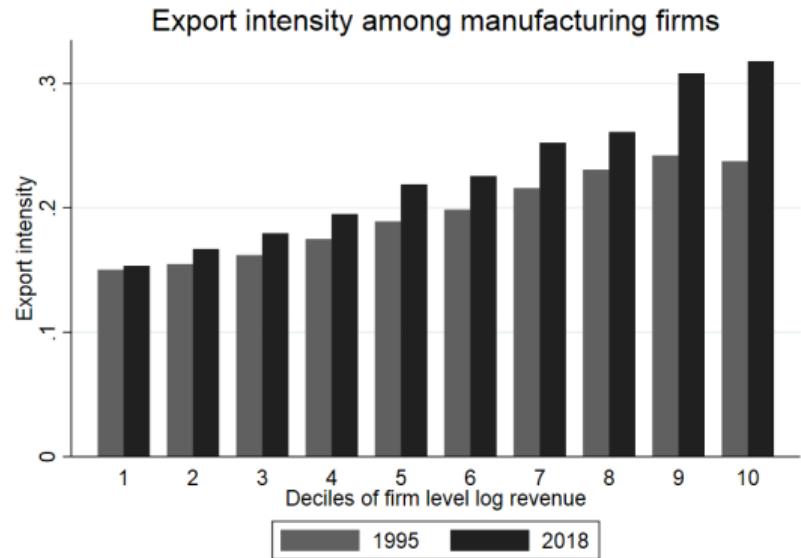


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LARGER CITIES HAVE BECOME MORE EXPORT INTENSIVE

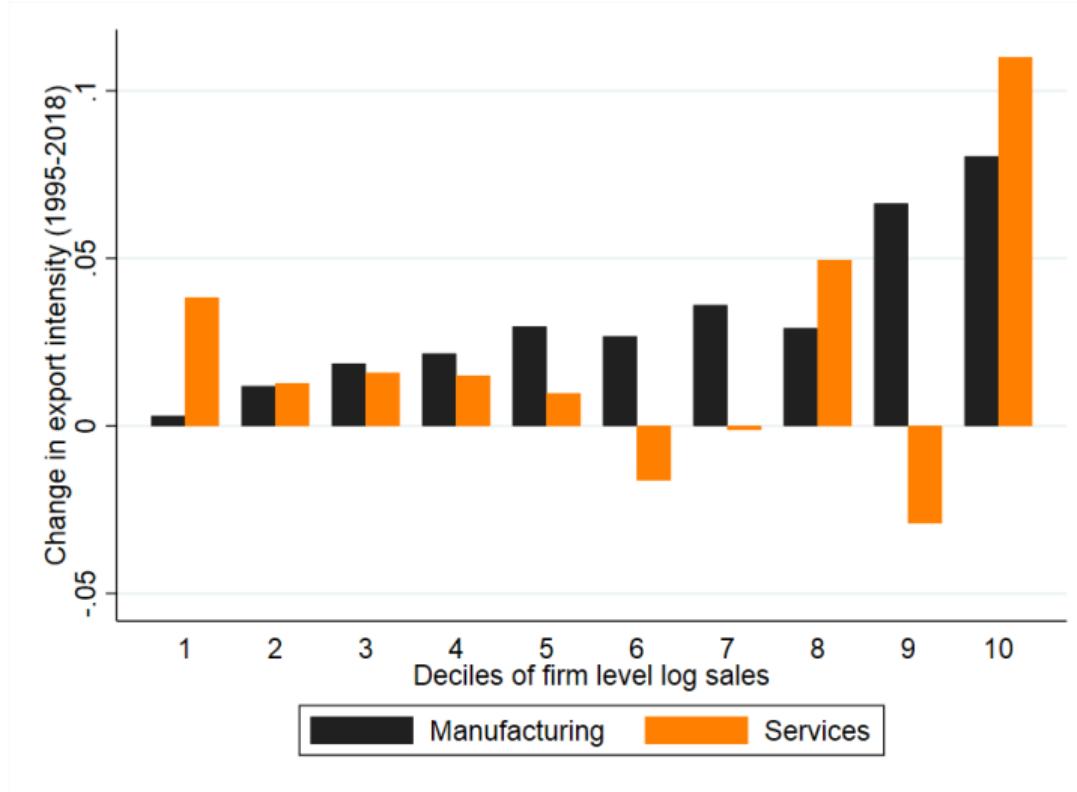


LARGER FIRMS ARE MORE EXPORT INTENSIVE



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LARGER FIRMS HAVE BECOME MORE EXPORT INTENSIVE



MODEL STRUCTURE: CITIES

- ▶ Mass L of identical workers
- ▶ Utility:

$$U(i) = \left(\frac{C(i)}{\eta}\right)^{\eta} \left(\frac{h(i)}{1-\eta}\right)^{1-\eta}$$

- ▶ Budget constraint:

$$PC(i) + p_h(i)h(i) = W(i)$$

- ▶ Free mobility:

$$W(i) = \Lambda p_h(i)^{1-\eta}$$

- ▶ Land price schedule:

$$p_h(i) = L(i)^{\gamma}$$

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MODEL STRUCTURE: PREFERENCES

Non-homothetic CES preferences (Comin, Lashkari, Mestieri, 2021):

$$\sum_j \theta_j^{\frac{1}{\rho}} \left(\frac{Q_j}{Q^{\varsigma_j}} \right)^{\frac{\rho-1}{\rho}} = 1$$

Each sector j 's sales share is then:

$$\vartheta_j = \frac{P_j Q_j}{\sum_k P_k Q_k} = \frac{\theta_j P_j^{1-\rho} Q^{(1-\rho)(\varsigma_j-1)}}{\sum_k \theta_k P_k^{1-\rho} Q^{(1-\rho)(\varsigma_k-1)}}$$

When $\varsigma_j = 1 \forall j$, preferences are homothetic.

Homothetic CES within sectors:

$$Q_j = \left(\int_{\omega \in \Omega_j} q_j(\omega)^{\frac{\sigma_j-1}{\sigma_j}} d\omega \right)^{\frac{\sigma_j}{\sigma_j-1}}$$

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MODEL STRUCTURE: DISCUSSION

We do not distinguish between:

1. Different manufacturing/service sectors:

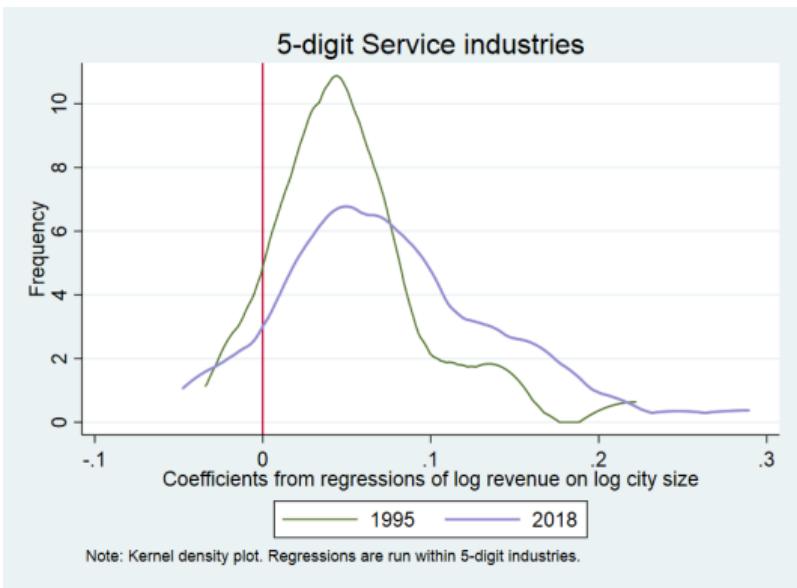
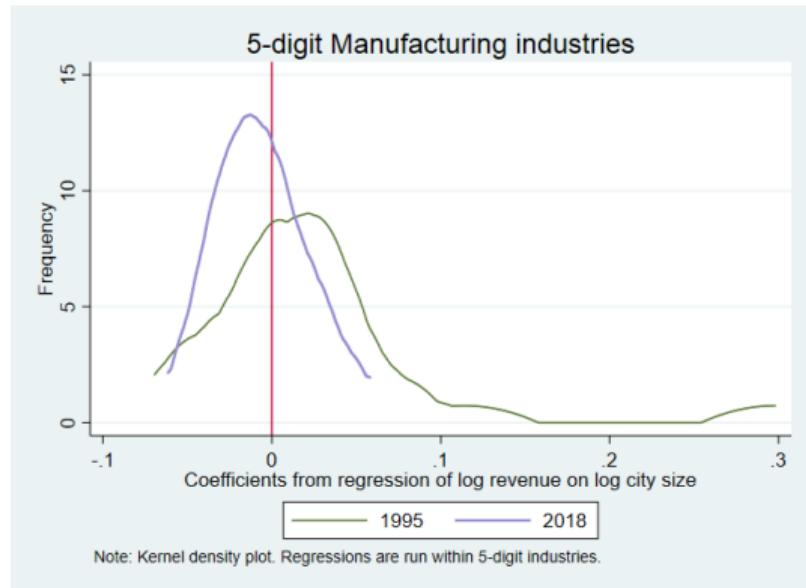
- ▶ ⇒ no role for changes in the composition of manufacturing output
- ▶ Reason: no evidence that different manufacturing (service) sectors have changed sorting patterns [go](#)

2. Tradable services and location-specific services:

- ▶ ⇒ no role for non-homotheticity in preferences in shaping spatial sorting
- ▶ Reason: no evidence in the data that concentration of services firms in large cities is accounted for by growth of local services firms [go](#)

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SHIFTING CITY-LEVEL COMPARATIVE ADVANTAGE?



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ALL PARAMETERS

Parameters	Value	Method/source	Δ Time
Consumption exp. share (η)	0.8	INSEE household exp. survey	No
Land price elasticity (γ)	0.7	Combes et al (2016)	No
Non-homotheticity (ς_j)	1.3	Comin et al (2021)	No
Between-sector CES elasticity (ρ)	0.3	Comin et al (2016)	No
Within-sector CES elasticity (σ_j)	11, 3	Revenue/total cost ratio	No
Labor share (α_j)	0.35, 0.47	wage bill/total cost ratio	No
Sectoral production weight (θ_j)	0.18, 0.82	Aggregate sectoral revenue share	No
Location and scale of $\Gamma_j(z)$ dist.	-	Estimate	No
Var of location-specific shock (ν_j^ϵ)	-	Estimate	No
Agglomeration effect (a_j)	-	Estimate	Yes
Agglomeration curvature (s_j)	-	Estimate	No
Sorting effect ($\xi_{j,x}$)	-	Estimate	No
Variable trade costs (τ_j)	-	Export intensity	Yes
Fixed export cost (f_j^x)	-	Proportion of exporters	Yes
Sectoral TFP (A_j)	-	Δ aggregate sectoral rev share, Δ real GDP per capita	Yes

Total of 30 parameters to estimate over 1995+2018 and manufacturing+services

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OTHER ESTIMATION RESULTS

Key estimated parameters	Sector	Exporter	Value in 1995	Value in 2018
Agglomeration effect (a_j)	MN		0.502	0.493
	SS		0.160	0.177
Sorting effect ($\xi_{j,x}$)	MN	No	0.052	0.052
	MN	Yes	-0.020	-0.020
	SS	No	4.959	4.959
	SS	Yes	4.122	4.122
Variable trade costs (τ_j)	MN		1.148	1.073
	SS		4.009	2.196
Fixed export costs (f_j^x)	MN		0.068	0.099
	SS		0.096	0.189
Sectoral TFP (A_j)	MN		1	2.667
	SS		1	0.908

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STRUCTURAL ESTIMATION: DETOUR

$$\begin{aligned}\log R_j(z, i) - E[\log R_j(0)] = & \log \Psi_j(z, i)^{\sigma_j - 1} (1 + \mathbf{1}[export_j(z, i)]\tau_j^{1-\sigma_j}) \\ & - E\left[\log \Psi_j(z, 0)^{\sigma_j - 1} (1 + \mathbf{1}[export_j(z, 0)]\tau_j^{1-\sigma_j}) \mid z \in \mathcal{Z}_j(0)\right] \\ & - (\sigma_j - 1)((1 - \eta)\alpha_j + (1 - \alpha_j))\left(\frac{1}{1 - \eta}\right) \log \frac{W(i)}{W(0)} \\ & + (\sigma_j - 1)\hat{\epsilon}_i,\end{aligned}$$

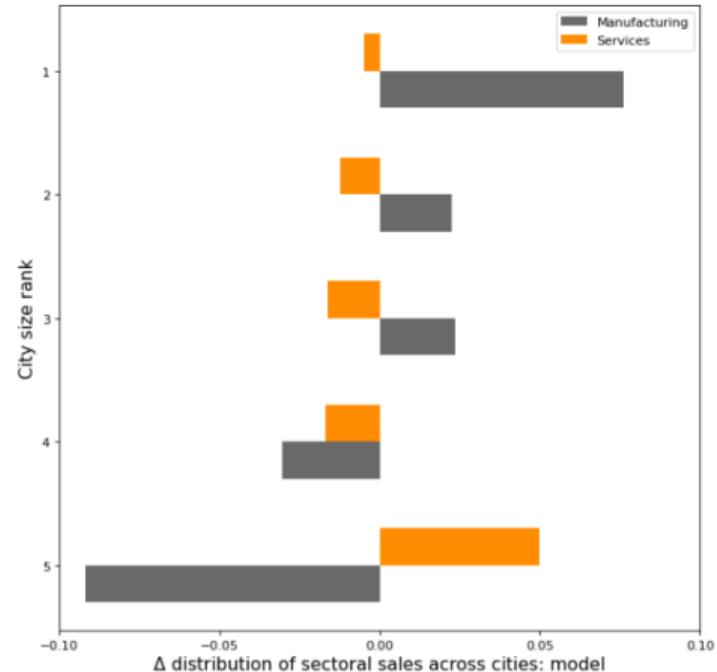
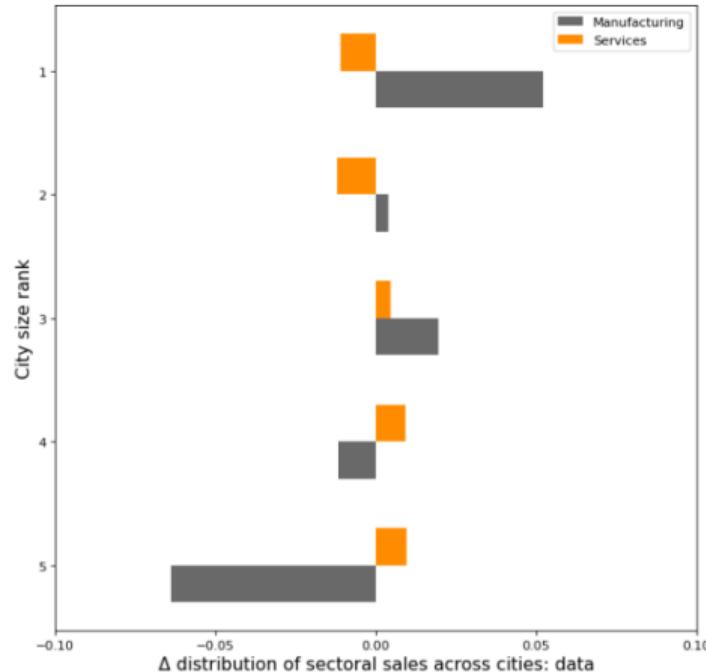
Key object to estimate is the productivity function: $\Psi_j(z, i)$

- ▶ Given observed city size distribution, guess parameters in $\Psi_j(z, i)$, as well as those governing the distribution of z and $\hat{\epsilon}$
- ▶ Solve joint location choice and exporting choice problem
- ▶ Simulate relevant moments and compare with data

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STRUCTURAL ESTIMATION: MODEL FIT

Urban-biased structural change in distribution of sectoral sales across cities: data and model



STRUCTURAL ESTIMATION: MODEL FIT 1995

Moments	Data	Model	Data	Model
	Manufacturing		Services	
<u>Share of revenue</u>				
City 1 (smallest)	0.259	0.241	0.141	0.124
City 2	0.232	0.221	0.149	0.169
City 3	0.171	0.202	0.163	0.161
City 4	0.161	0.136	0.169	0.164
City 5 (largest)	0.178	0.199	0.379	0.381
<u>Firm size-city size</u>				
City 1 (smallest)	0.000	0.000	0.000	0.000
City 2	0.016	-0.013	0.066	0.142
City 3	-0.037	0.058	0.087	0.128
City 4	0.070	0.081	0.177	0.211
City 5 (largest)	0.070	0.106	0.475	0.345

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STRUCTURAL ESTIMATION: MODEL FIT 1995

Moments	Data	Model	Data	Model
	Manufacturing		Services	
<u>Share of revenue (exporters only)</u>				
City 1 (smallest)	0.253	0.253	0.050	0.047
City 2	0.245	0.221	0.062	0.098
City 3	0.171	0.202	0.085	0.087
City 4	0.158	0.129	0.149	0.089
City 5 (largest)	0.184	0.196	0.655	0.679
<u>Firm size-city size (exporters only)</u>				
City 1 (smallest)	0.000	0.000	0.000	0.000
City 2	-0.021	-0.144	0.021	0.087
City 3	-0.121	-0.187	0.060	-0.001
City 4	-0.081	-0.159	0.147	0.003
City 5 (largest)	-0.380	-0.248	0.432	0.251

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