City Sophistication

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The University of São Paulo Urban and Regional Economics Lab

Previous results for Brazil

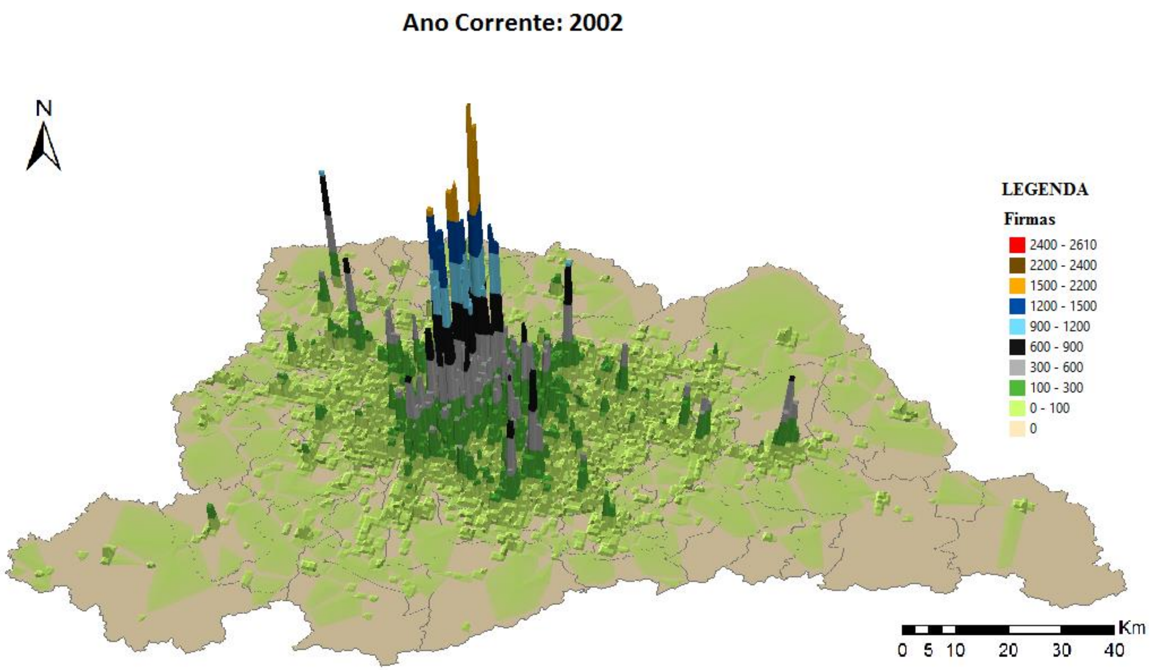
Urban wage premium

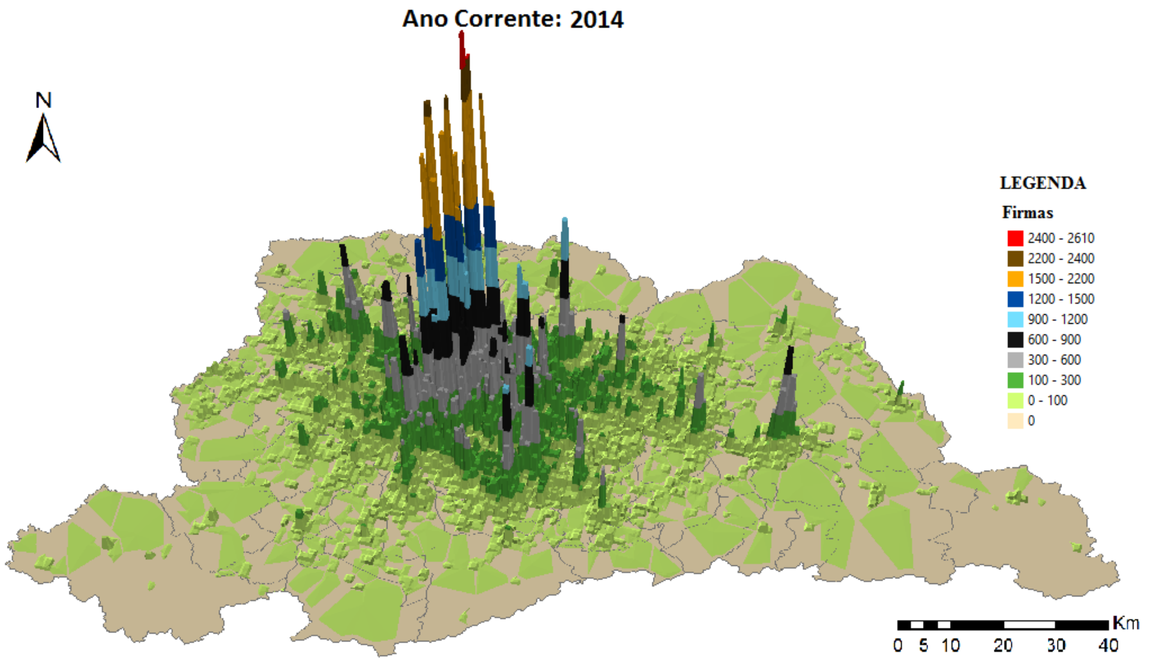
- Gonzaga and Azzoni (2019)
- Gross premium: 24% (29.5% large LMAs, 17% medium, 7.4% for small)
- With fixed effects for workers: 2.2%.
- With fixed effects for firms: 1.3%.
  - Replicate Barufi et al. (2016) and Chauvin et al. (2017).
  - Adjusted R^2 with just the observable effects is 60.6%;
  - Observable plus firm fixed effects, 78%;
  - Observable plus worker fixed effects, 91.7%.
    - Heterogeneity of workers is more important than the heterogeneity of firms
- Both fixed effects simultaneously – premium vanishes
- Our estimation (both fixed effects, illuminated area, endogeneity):
  - Urban density – 4.99%
  - Urban area – 4.3%
  - Total agglomeration premium close to 10%, much higher than the previous literature

Intra-urban premium

- Campos and Azzoni (2019)

of Firms


Ano Corrente: 2002
N
LEGENDA
Firmas
2400 - 2610
2200 - 2400
1500 - 2200
1200 - 1500
900 - 1200
600 - 900
300 - 600
100 - 300
0 - 100
0
Km
0 5 10 20 30 40


Ano Corrente: 2014
N
LEGENDA
Firmas
2400 - 2610
2200 - 2400
1500 - 2200
1200 - 1500
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300 - 600
100 - 300
0 - 100
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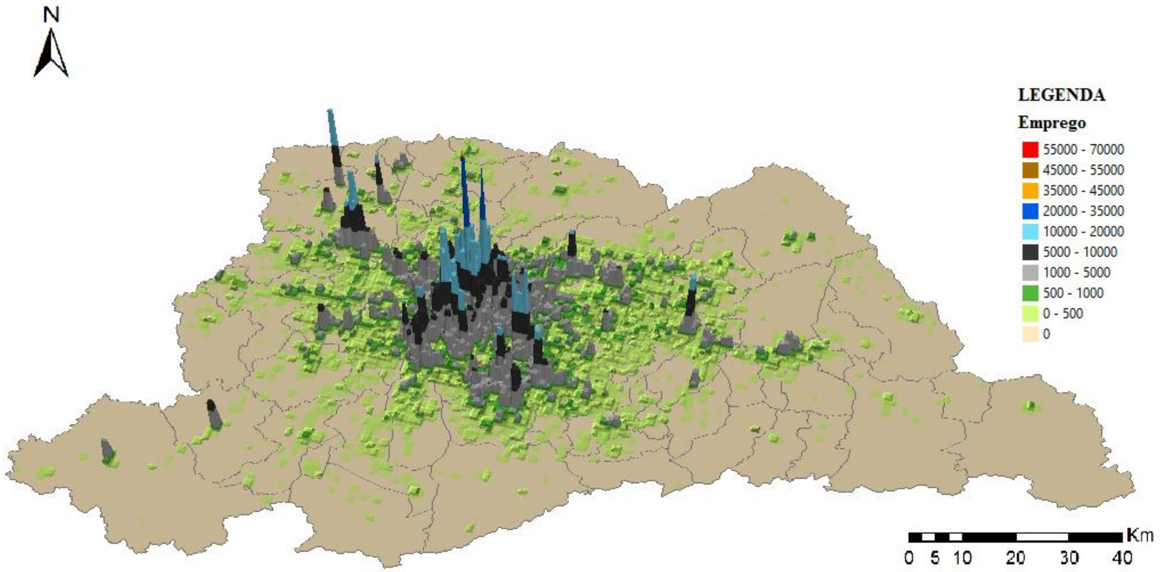
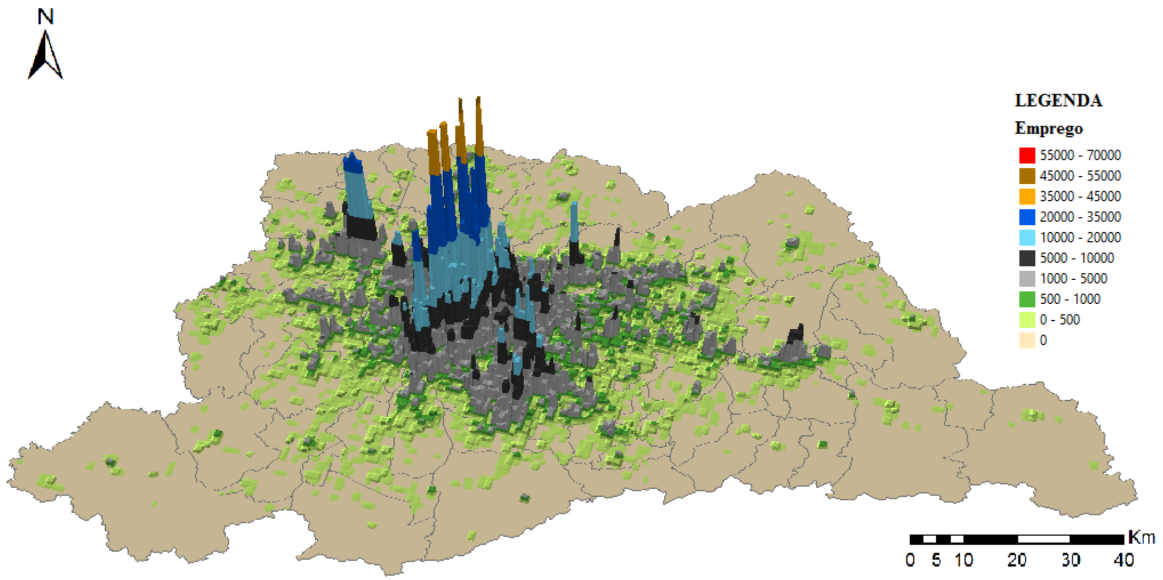
Km
0 5 10 20 30 40

of Workers

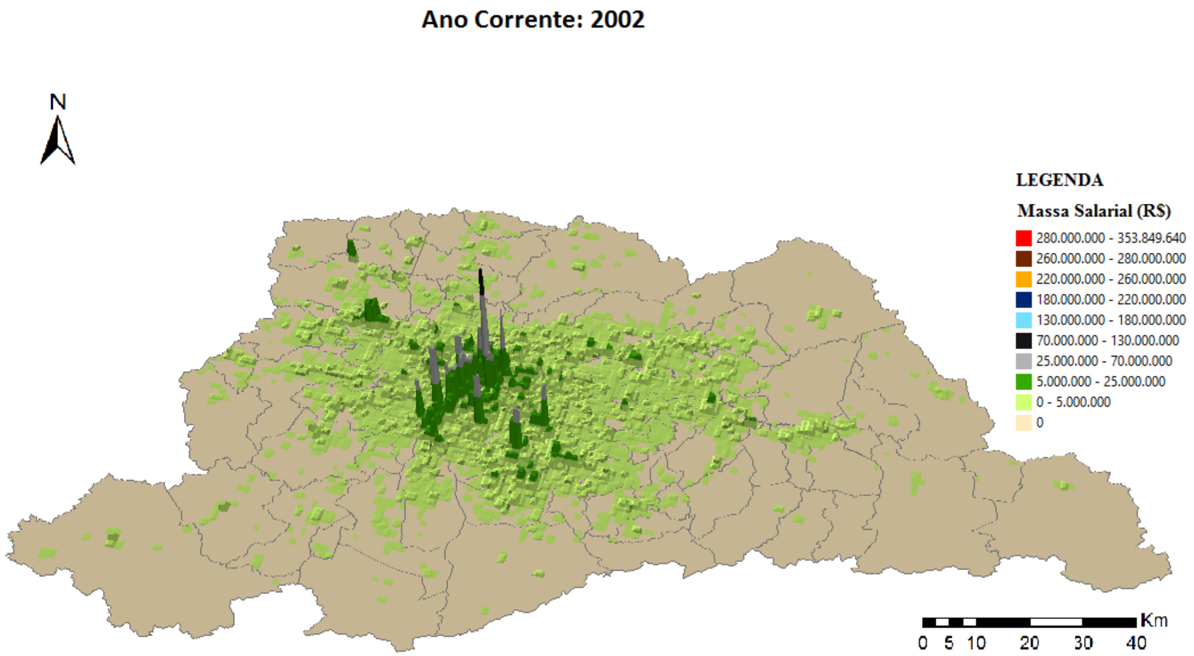
Ano Corrente: 2002

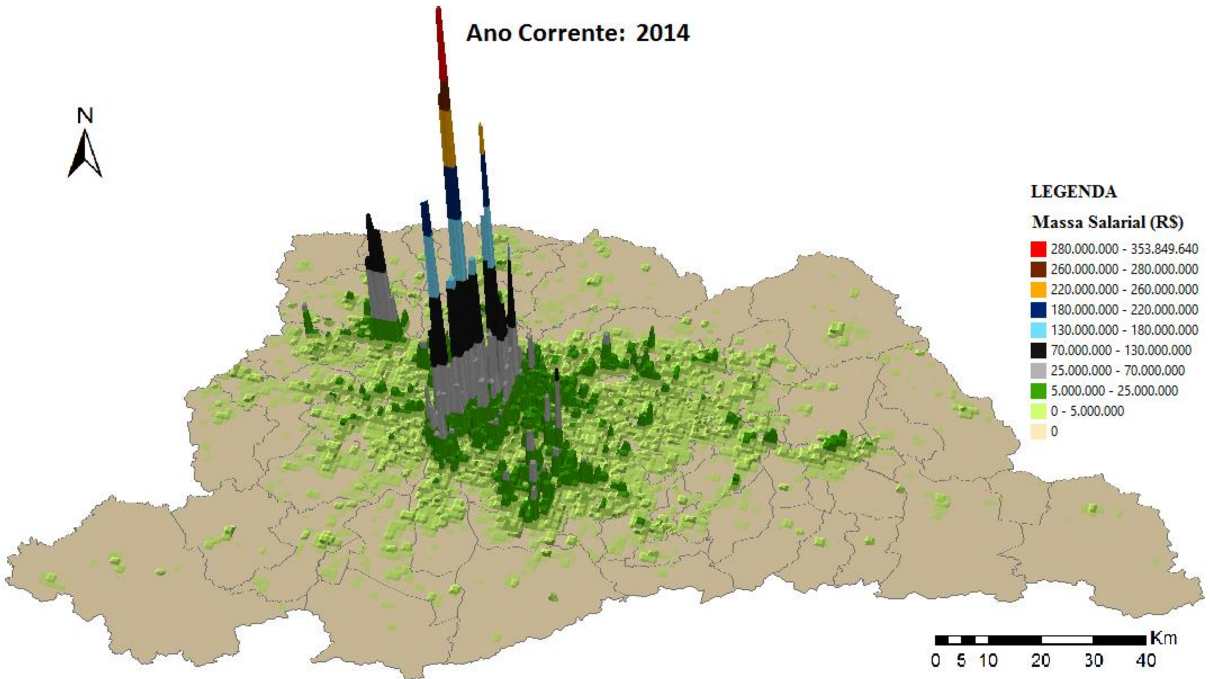


Ano Corrente: 2014



Total Wage Bill





Objective and motivation

- We assess the quality of the labor demanded by private firms in cities with different positions in the Brazilian urban network.
- The idea is that cities with more sophisticated labor demand might be more competitive, and that the observed growth in the intensity of skills in the city indicates future competitiveness.
- By looking at the skills of present workers, we deal with labor demand, which is different from considering education levels, which indicate labor supply conditions.

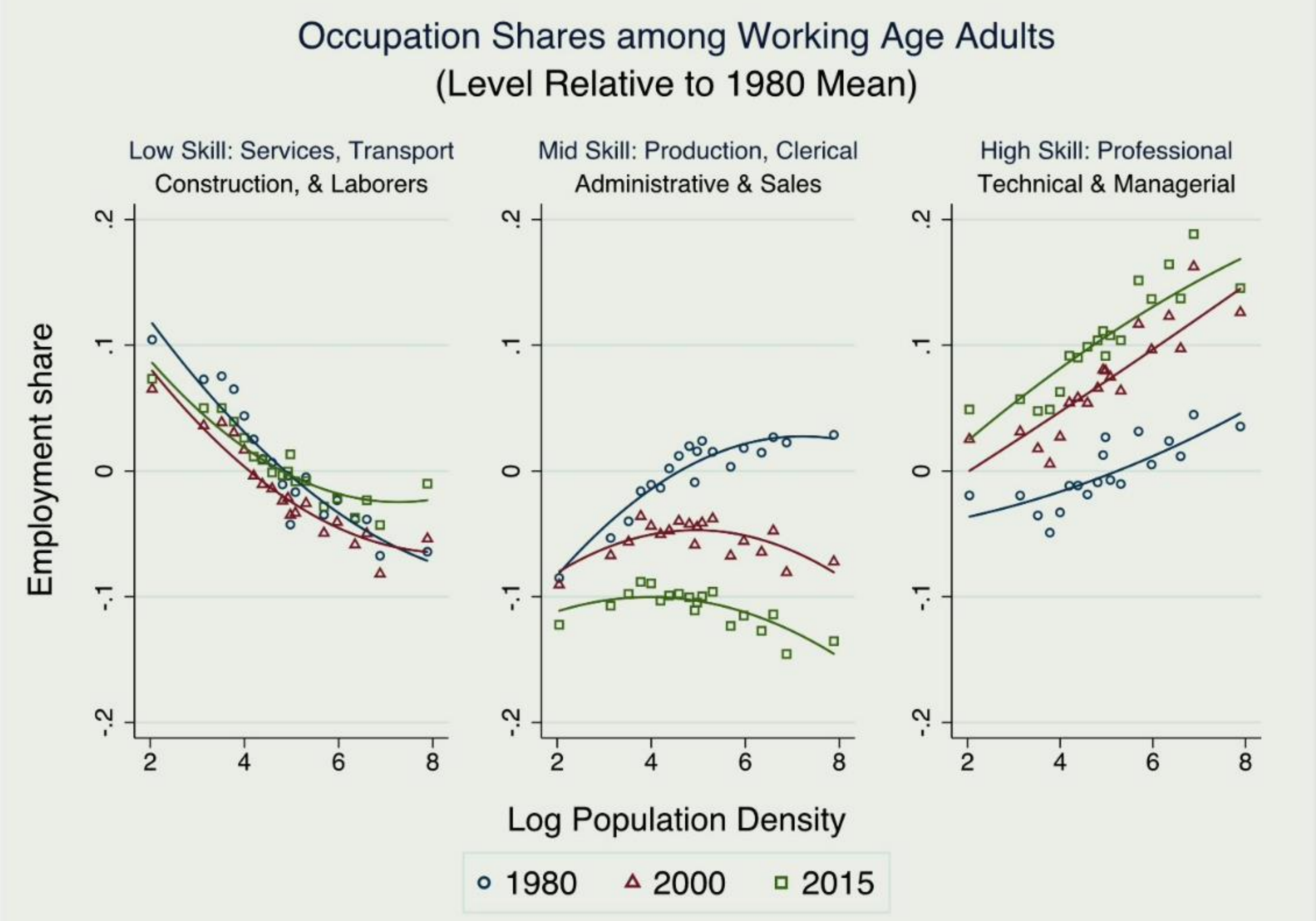
Some evidence from the USA

Work of the past, work of the future

By David Autor

Keynote Speech, American Economic Association Annual Meeting, 2019

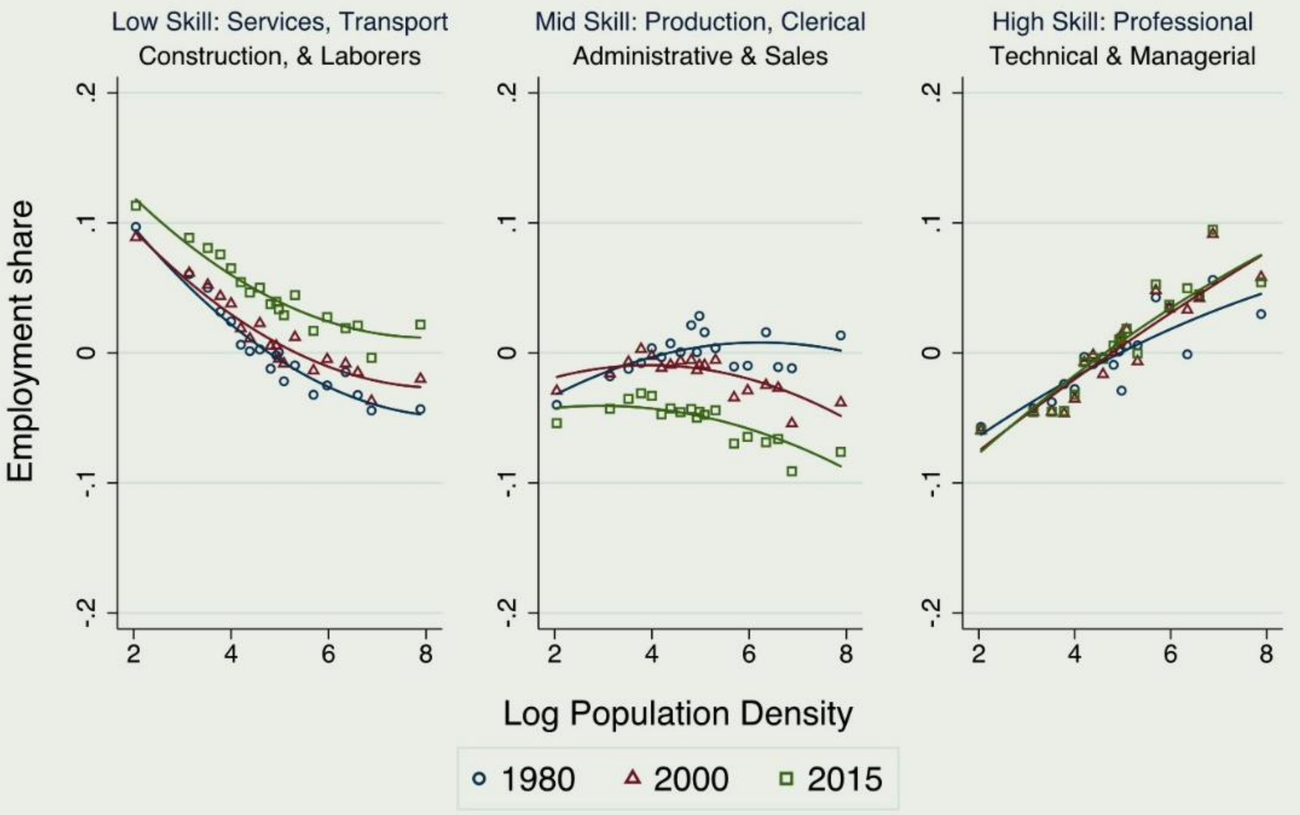
https://www.aeaweb.org/webcasts/2019/aea-ely-lecture-work-of-the-past-work-of-the-future



All Workers
2015

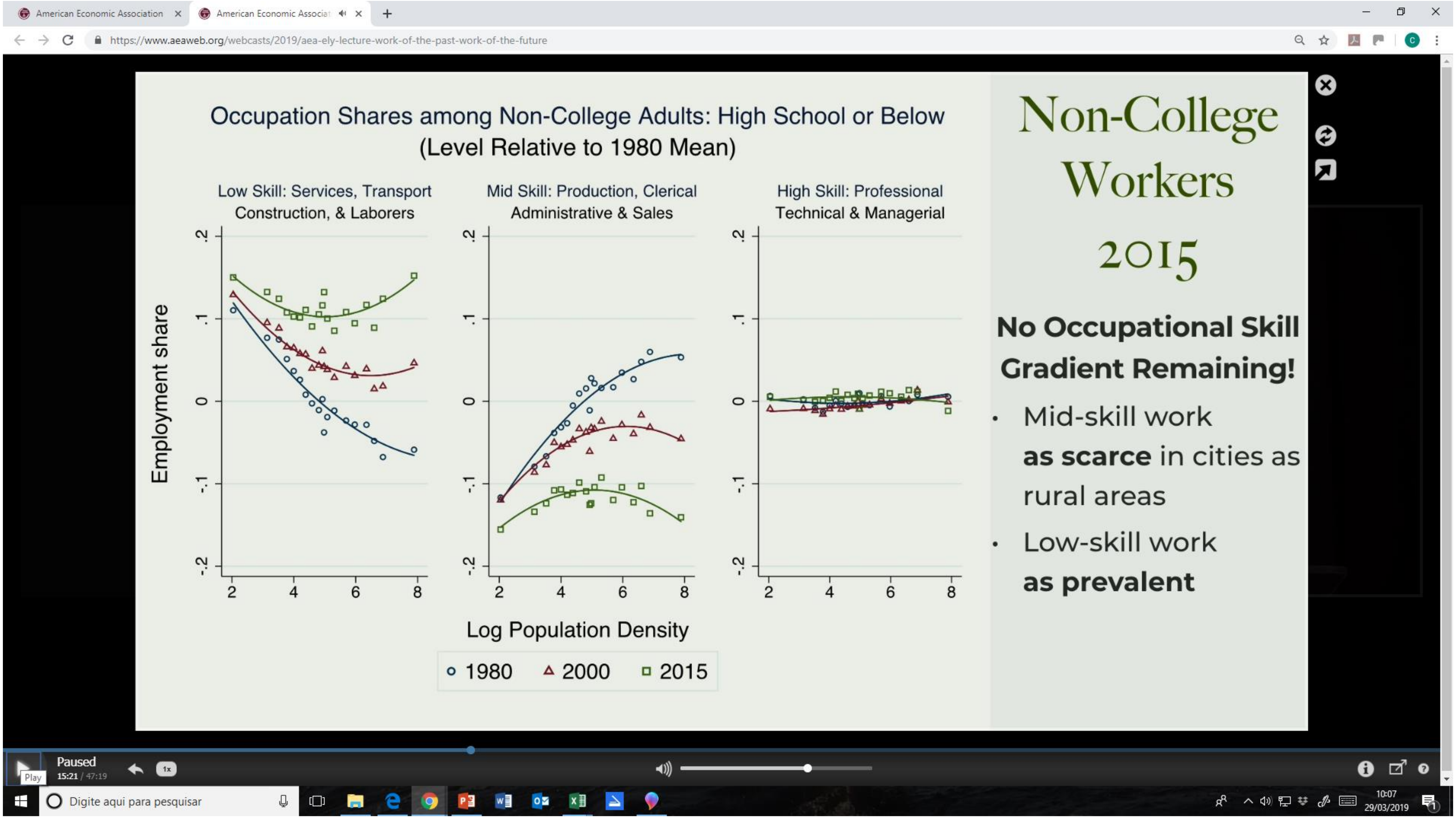
There is Now Less Middle-Skill Work in Cities than in Metro and Rural Areas

Occupation Shares among College Adults: Some-College or Above
(Level Relative to 1980 Mean)



College Workers 2015

Almost No Change in Occupational Distribution of College-Educated Adults


American Economic Association
American Economic Associat
https://www.aeaweb.org/webcasts/2019/aea-ely-lecture-work-of-the-past-work-of-the-future
Occupation Shares among Non-College Adults: High School or Below
(Level Relative to 1980 Mean)
Low Skill: Services, Transport
Construction, & Laborers
Mid Skill: Production, Clerical
Administrative & Sales
High Skill: Professional
Technical & Managerial
Employment share
.2
.1
0
-.1
-.2
2
4
6
8
Log Population Density
1980
2000
2015
Non-College
Workers
2015
No Occupational Skill
Gradient Remaining!
Mid-skill work as scarce in cities as rural areas
Low-skill work as prevalent
Paused
15:21 / 47:19
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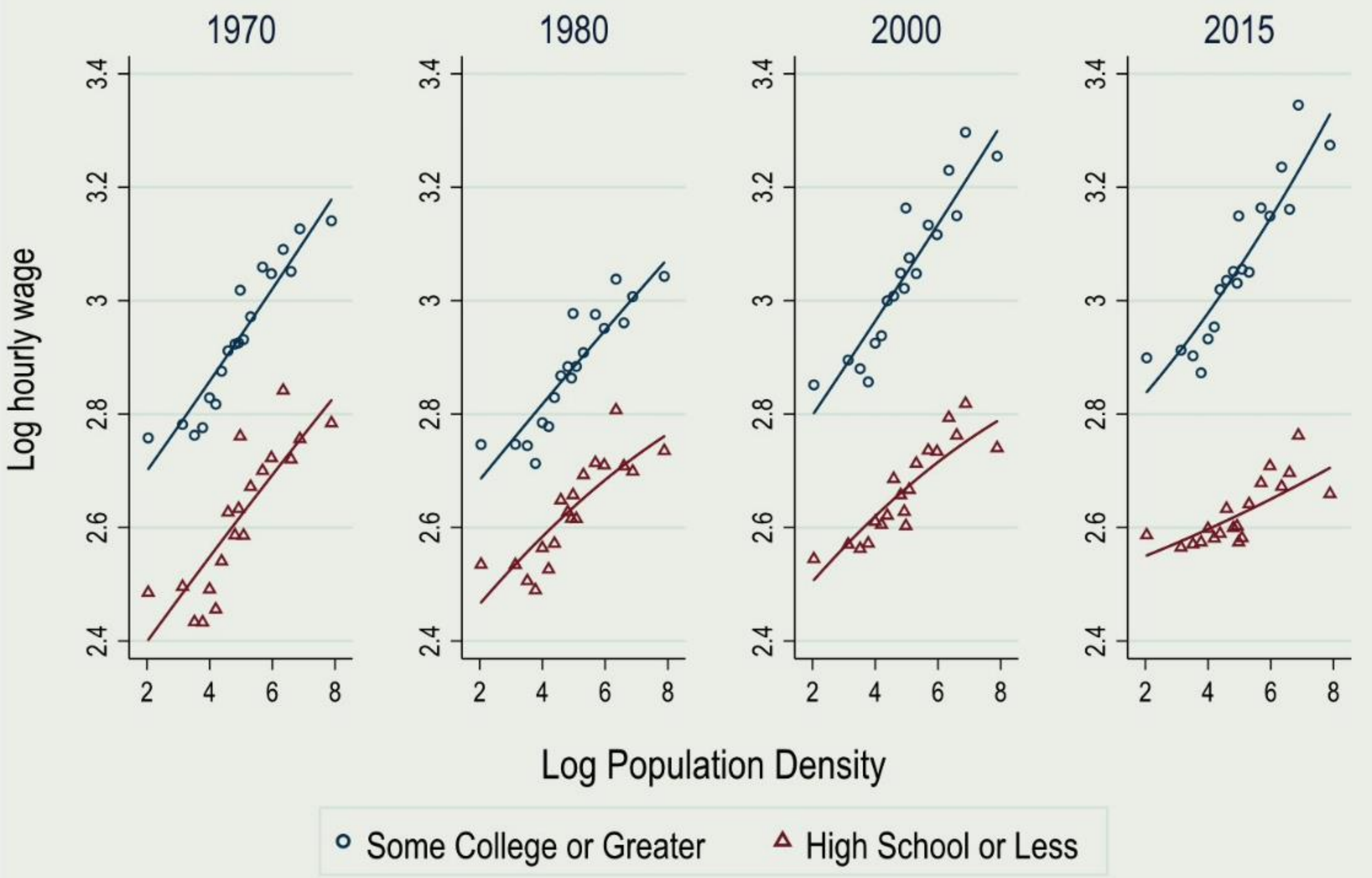
29/03/2019

Declining Urban Wage Premium among Non-College Workers
Log Real Earnings of Working-Age Adults ($2015)

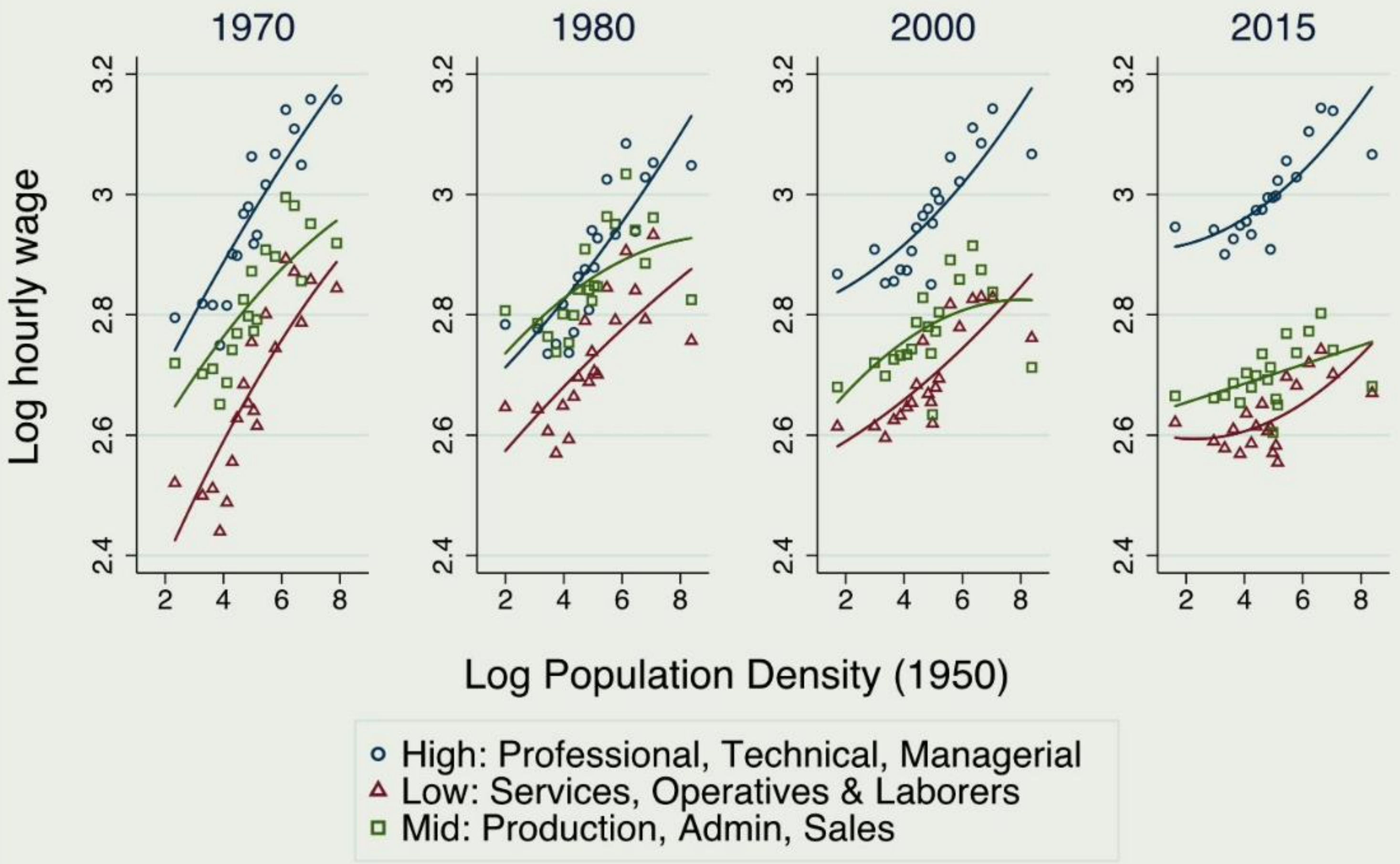


College vs. Non-College Wages among Working-Age Adults

- Paralleling the Decline of Middle-Skill Urban Jobs
- Fall in the Urban Wage Premium for Non-College Workers
- Especially pronounced after 2000

Falling Urban Wage Premium in Mid-Skill Occupations

Non-College Men (High School or Less), 1970 - 2015 ($2015)



Wages of Non-College Men *in* High skill Low skill & Mid-skill occupations

Collapse of urban wage premium in mid-skill occupations

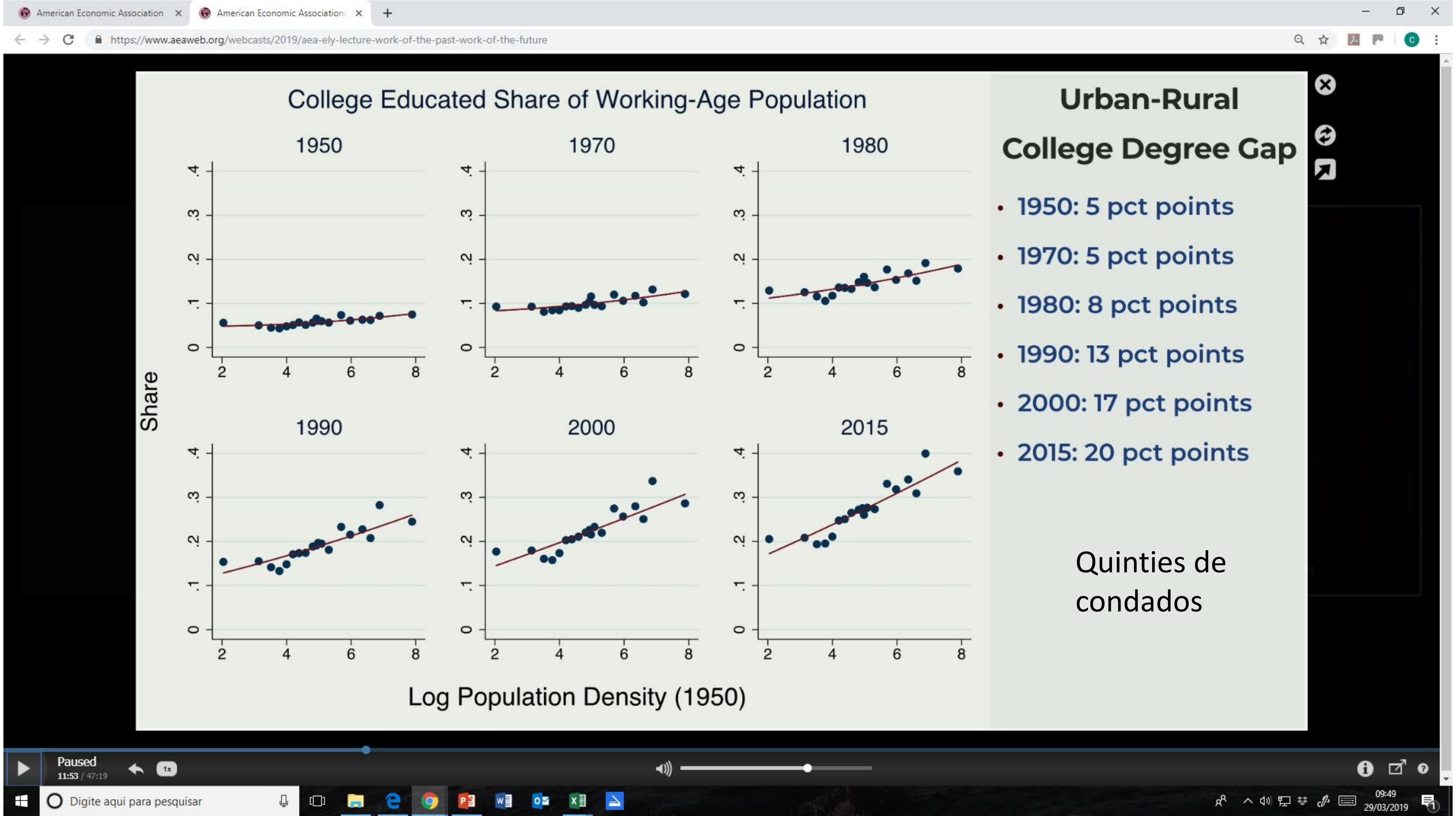
Employment Shares in New Census Job Titles (Cumulative)

Working Age Adults

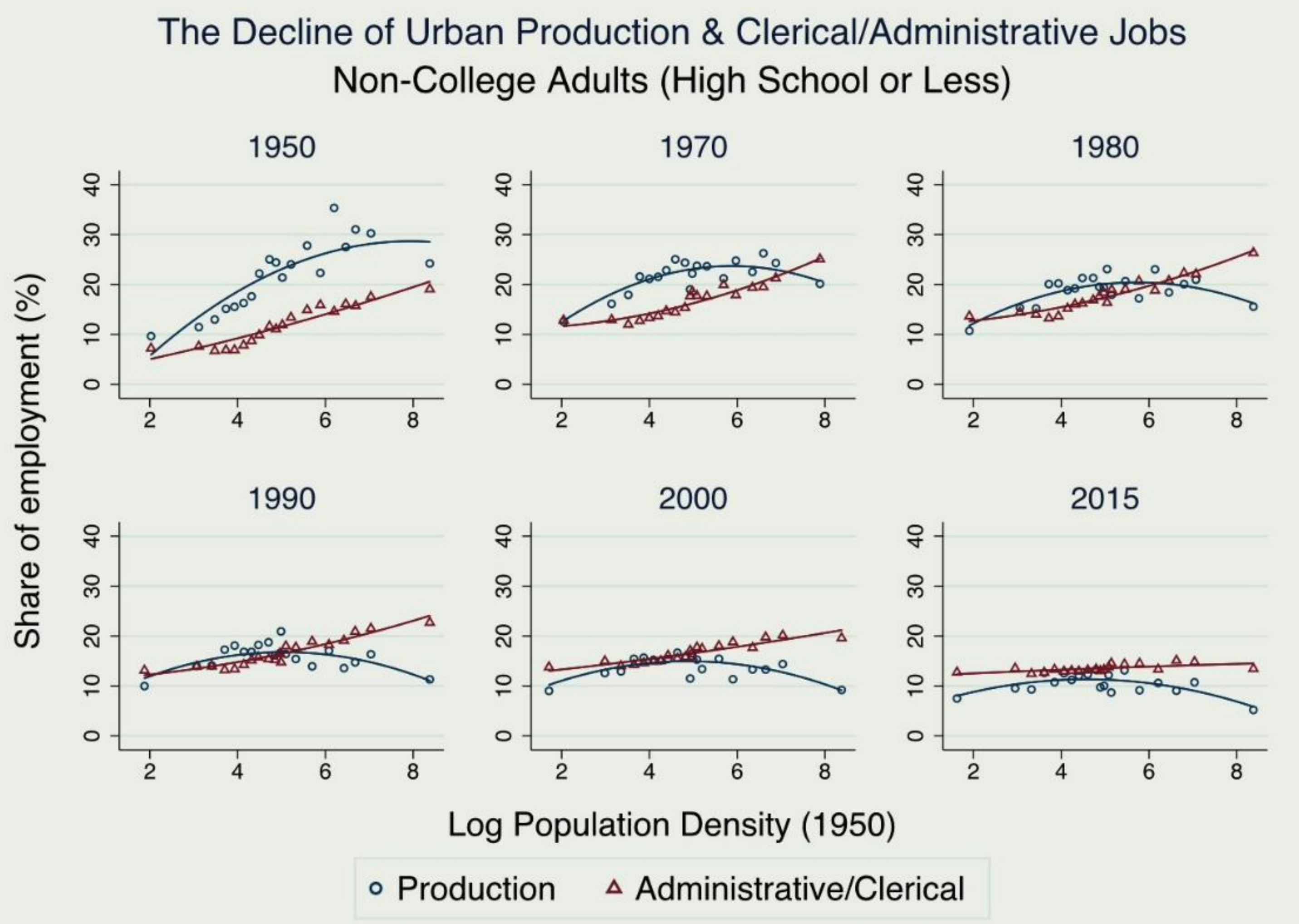
Work of the Future

1. Frontier Workers
   - Programmer-Analyst
2. Wealth Workers
   - Barista
3. Last Mile Workers
   - Inspector-Hand Packager

Diferença Rural-Urbano nos USA para pessoas com nível universitário



Quinties de condados



Where Did the Middle Skill, <u>Non-College</u> Urban Jobs Go?

Production + Administrative Fall from ~40% of Jobs to ~20% of Jobs between 1980 and 2015

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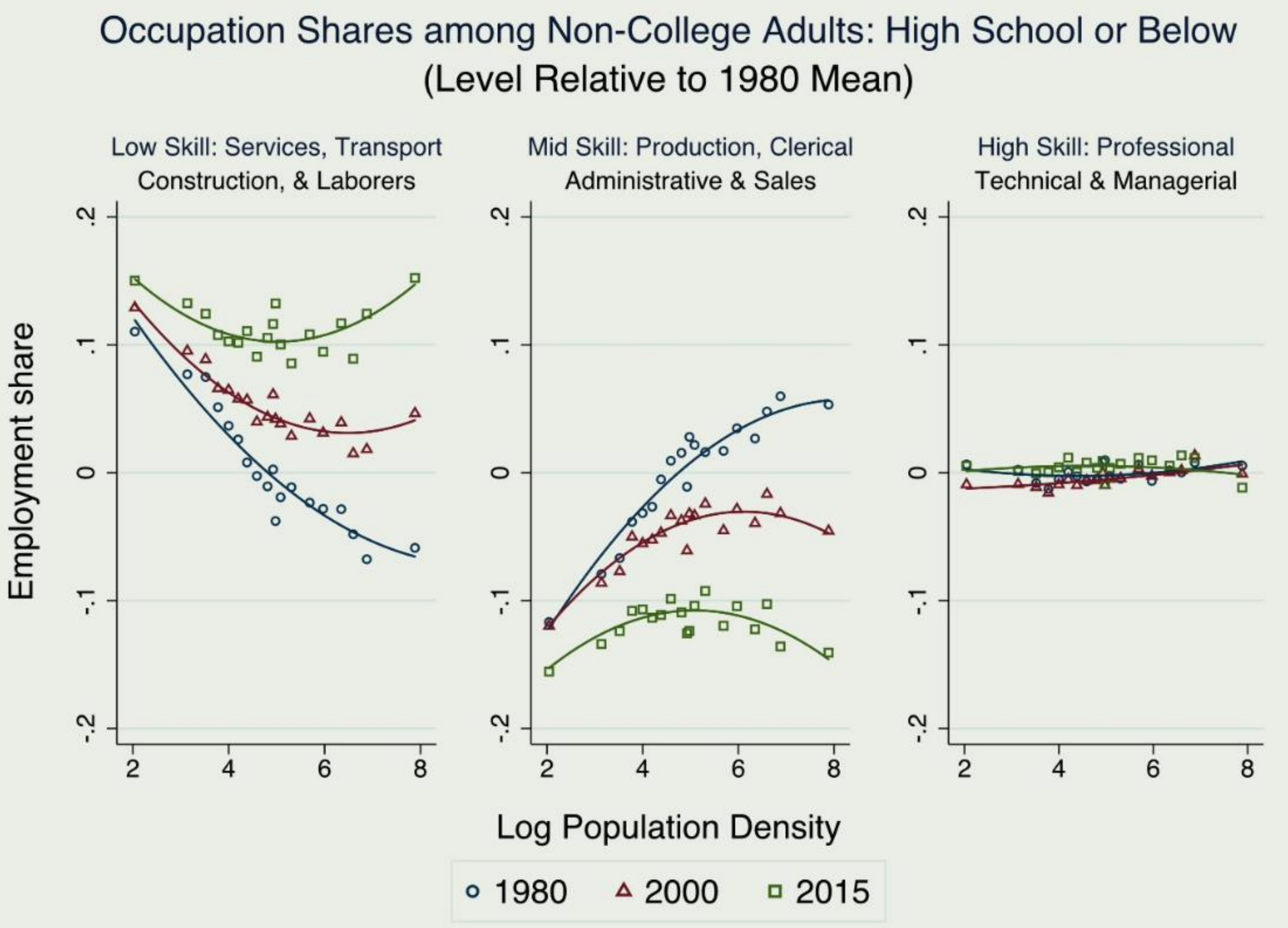
https://www.aeaweb.org/webcasts/2019/aea-ely-lecture-work-of-the-past-work-of-the-future



Decline of

Middle Skill,

Non-College

Urban Work

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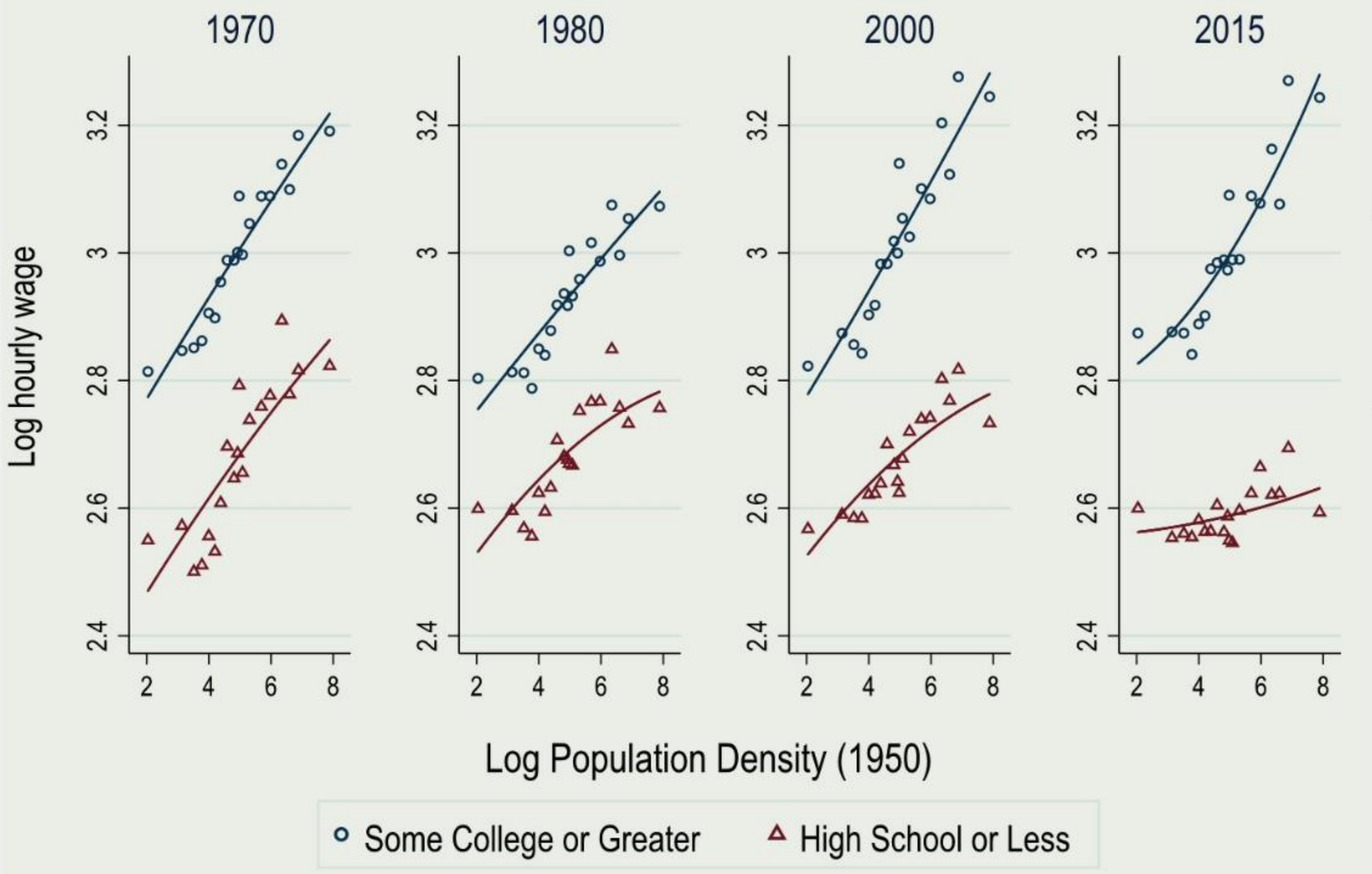
29/03/2019

Declining Urban Wage Premium among Non-College Workers

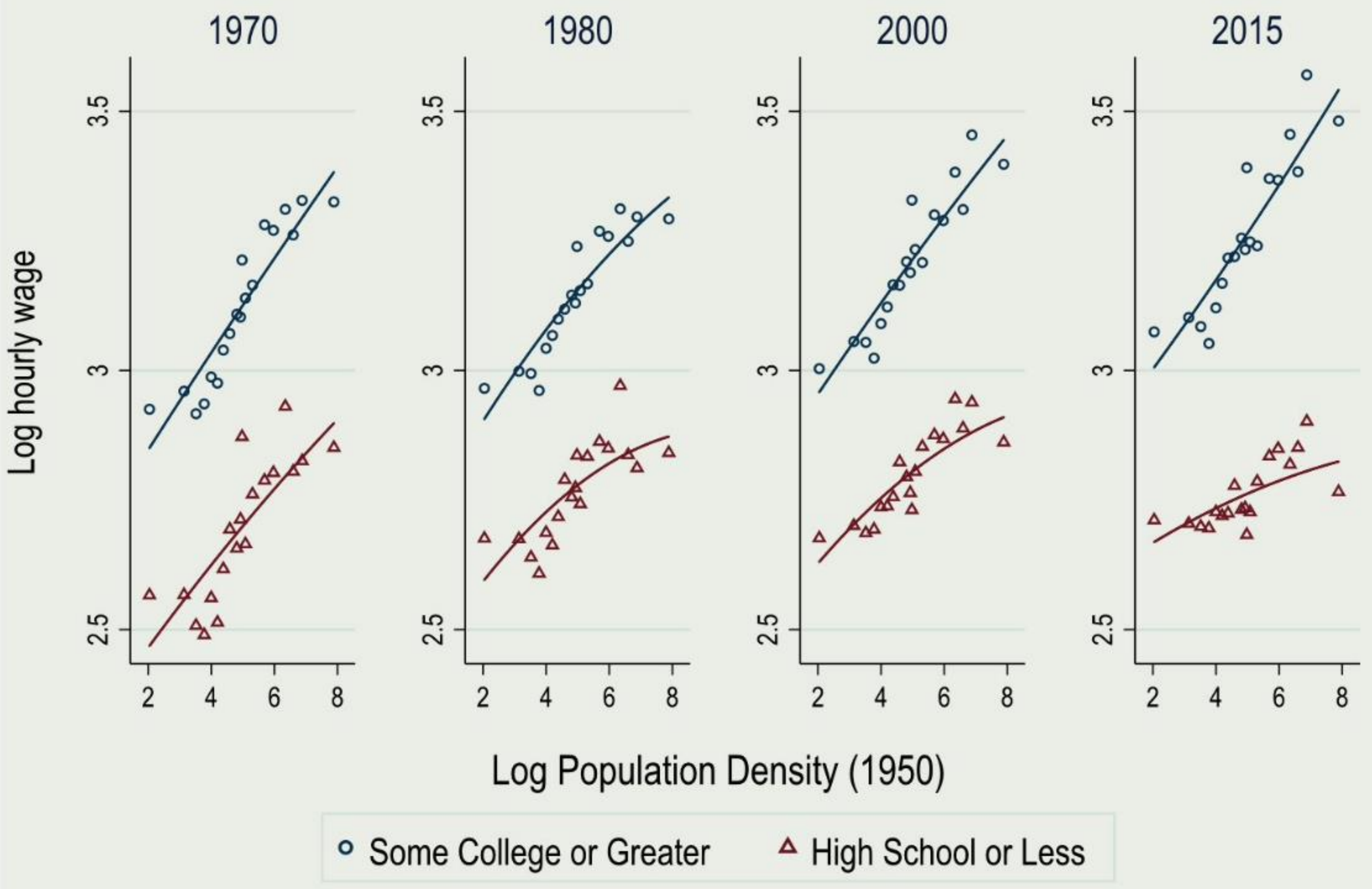
Log Real Earnings of Men and Women, Ages 25 - 39 ($2015)



College vs. Non-College Wages among Adults Ages 25–39

- Fall in the Urban Wage premium for non-college workers
- Most pronounced for young adults, ages 25 — 39

Declining Urban Wage Premium among Non-College Workers
Log Real Earnings of Men and Women, Ages 40 - 54 ($2015)



College vs. Non-College Wages among Adults Ages 40-54

- Fall in the Urban Wage premium for non-college workers
- Also highly visible for prime age adults, age 40 — 54

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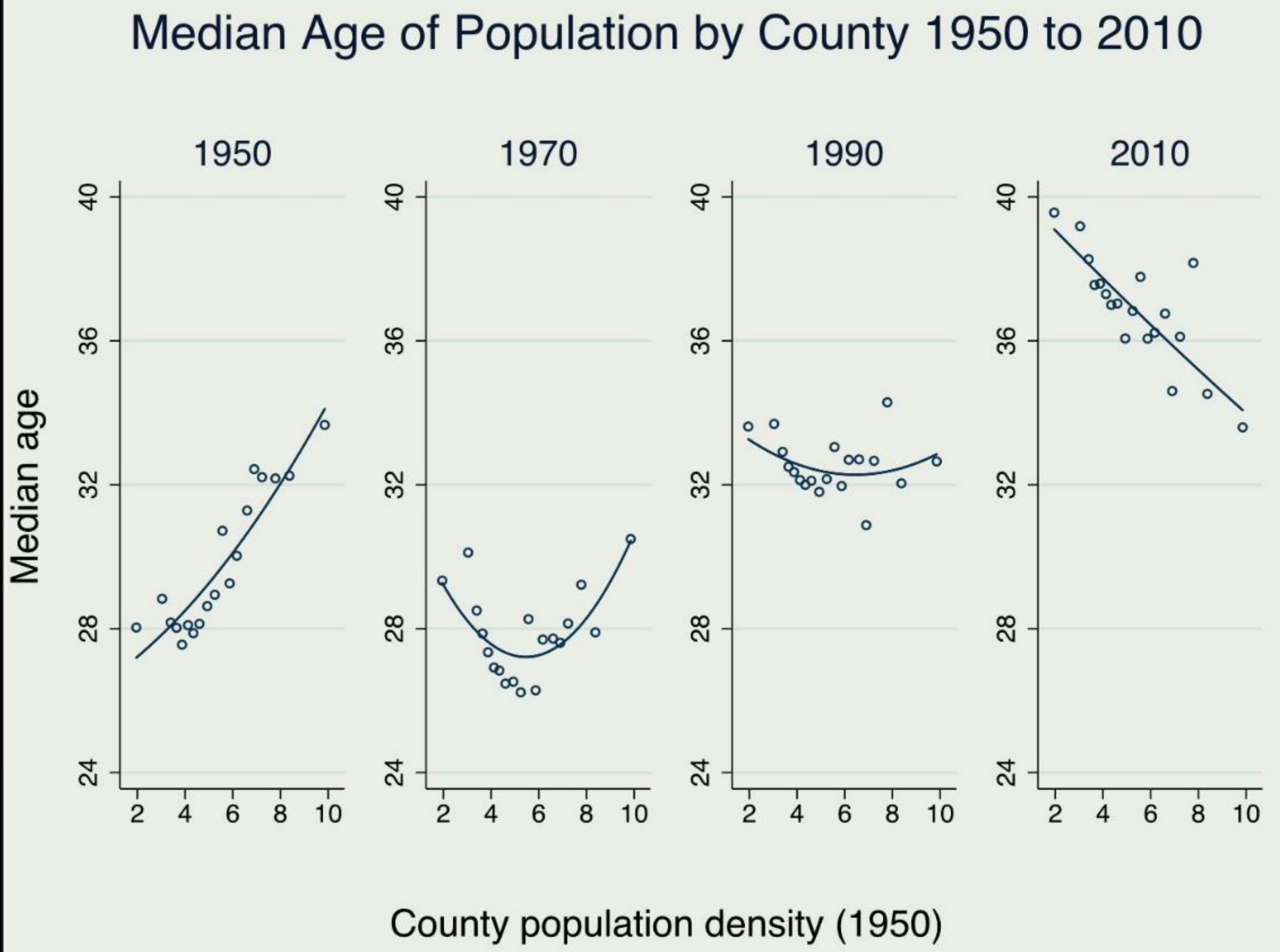
American Economic Association
https://www.aeaweb.org/webcasts/2019/aea-ely-lecture-work-of-the-past-work-of-the-future



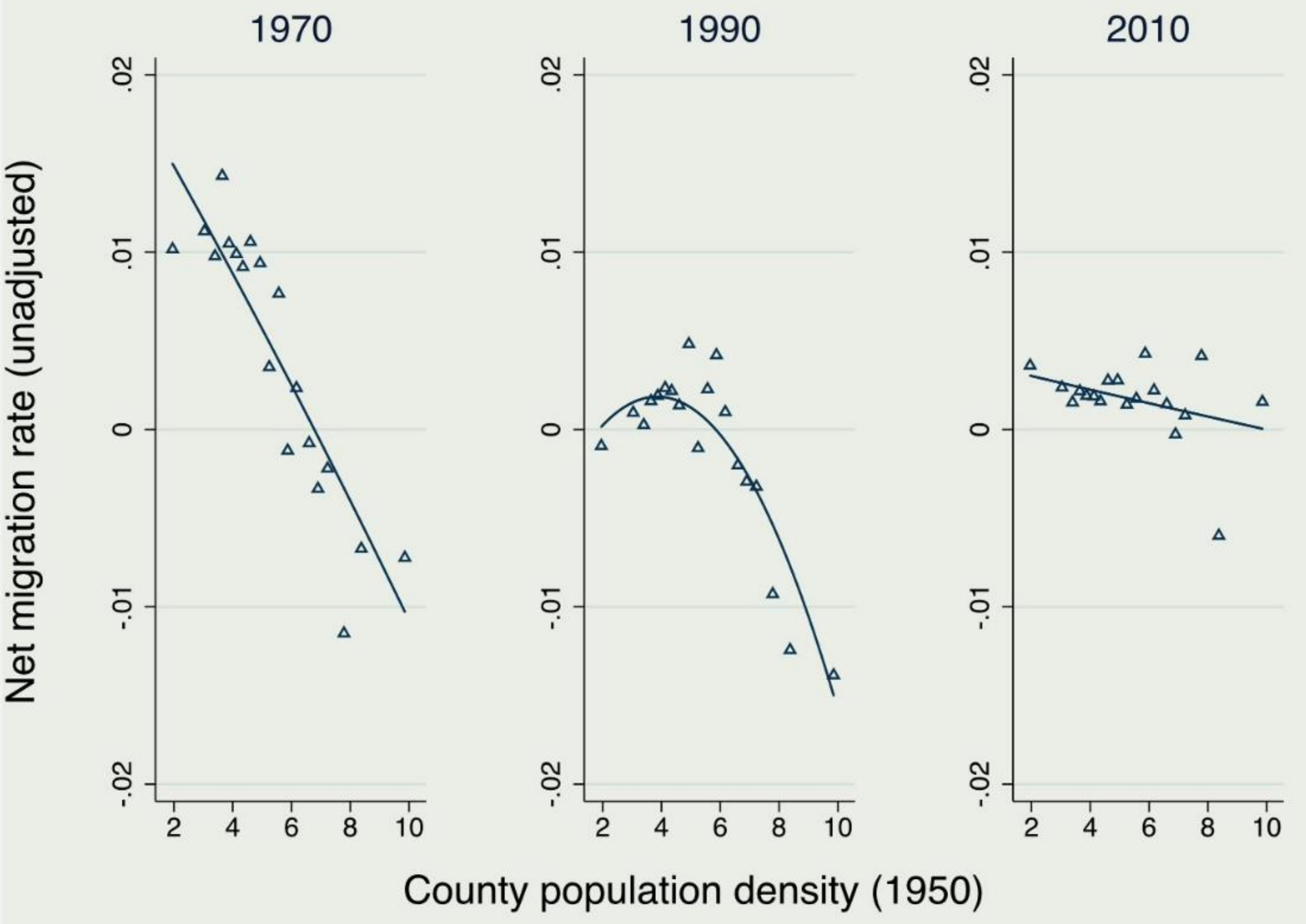
The Inversion of the Age-Density Gradient, 1950-2010

- In 1950s, cities were **five years older** than rural areas
- By 1990, **no age gradient** remained
- By 2010, cities were **six years younger** than rural areas

Summary, 1950 - 2010

- Rural areas aged **12 years**
- Cities aged **2 yrs**

Net Migration Rate (Unadjusted) by County 1970 to 2010

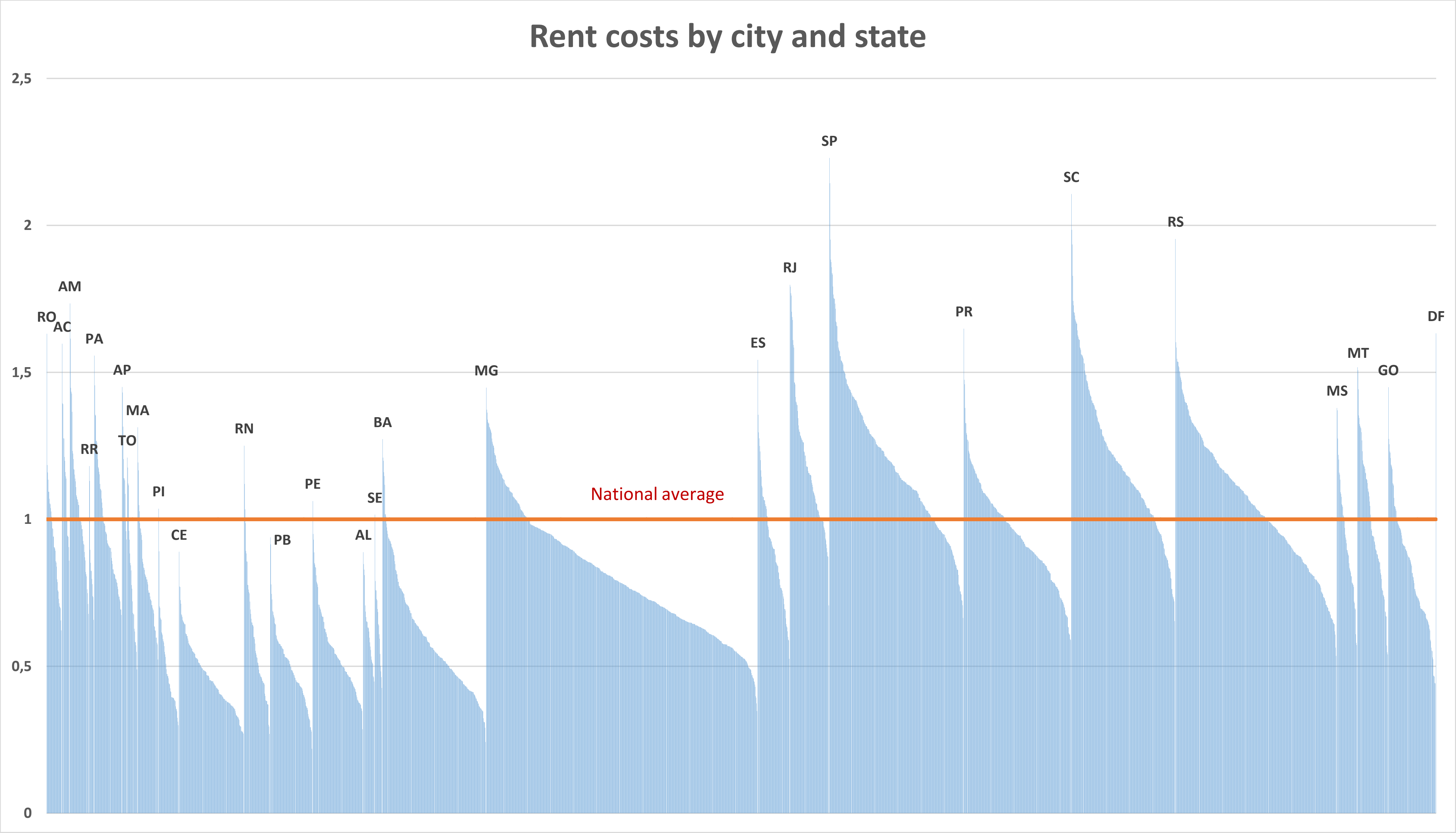


Net Migration Rates Across Counties

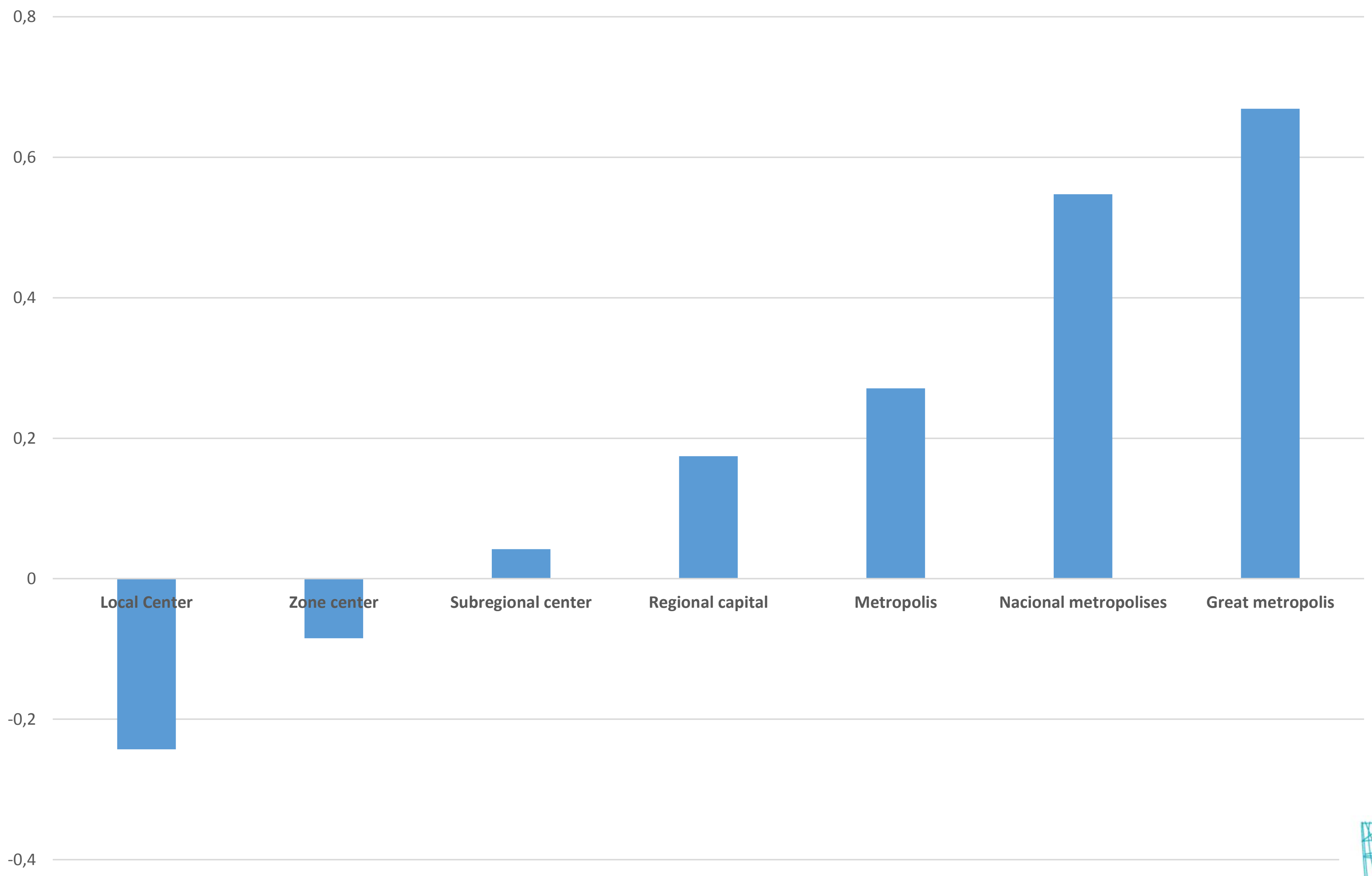
Putting it All Together

- **A huge decline in net migration**
- **Steep fall in outflows from urban to suburban + rural areas**

Living costs …


Rent costs by city and state
2,5
2
1,5
1
0,5
0
National average
RO
AC
AM
PA
RR
AP
TO
MA
PI
CE
RN
PB
PE
AL
SE
BA
MG
ES
RJ
SP
PR
SC
RS
MS
MT
GO
DF

Rent costs



0,8
0,6
0,4
0,2
0
-0,2
-0,4
Local Center
Zone center
Subregional center
Regional capital
Metropolis
Nacional metropolises
Great metropolis

Basic concepts

Sophistication – skill intensity of occupations – Cognitive, Social, Motor

→ Labor demand

City – Functional classification – 7 categories

Size – 351 Labor Market Areas Deciles, + 5% Top, 1% Top, Largest

Labor sophistication - Skills

- Labor demand
- Formal jobs
- Public *vs.* Private organizations
- Employed in December; >20 hours/week; age 18-65
- 2003-2016, matched panel of firms and workers
- Over 400 million observations
  - 5% Sample each year, proportional at the urban areas
  - Overall – 21,348,669 observations
  - Private organizations – 17,524,540 observations

How are skill levels measured? (For each of the 2,702 occupations)

https://www.onetonline.org/

One of the 263 Skills associated with each occupation

12. Mathematical Reasoning — **The ability to choose the right mathematical methods or formulas to solve a problem.**

A. How important is MATHEMATICAL REASONING to the performance of *your current job*?

Not Important*	Somewhat Important	Important	Very Important	Extremely Important
1	2	3	4	5

* If you marked Not Important, skip LEVEL below and go on to the next activity.

B. What level of MATHEMATICAL REASONING is needed to perform *your current job*?

1	2	3	4	5	6	7
Determine how much 10 oranges will cost when they are priced at 2 for 20 cents			Decide how to calculate profits to determine the amounts of yearly bonuses		Determine the mathematics required to simulate a space craft landing on the moon	Highest Level

Skill level associated to the occupation

3 * 5 = 15

Range: 1 to 35
Standardized

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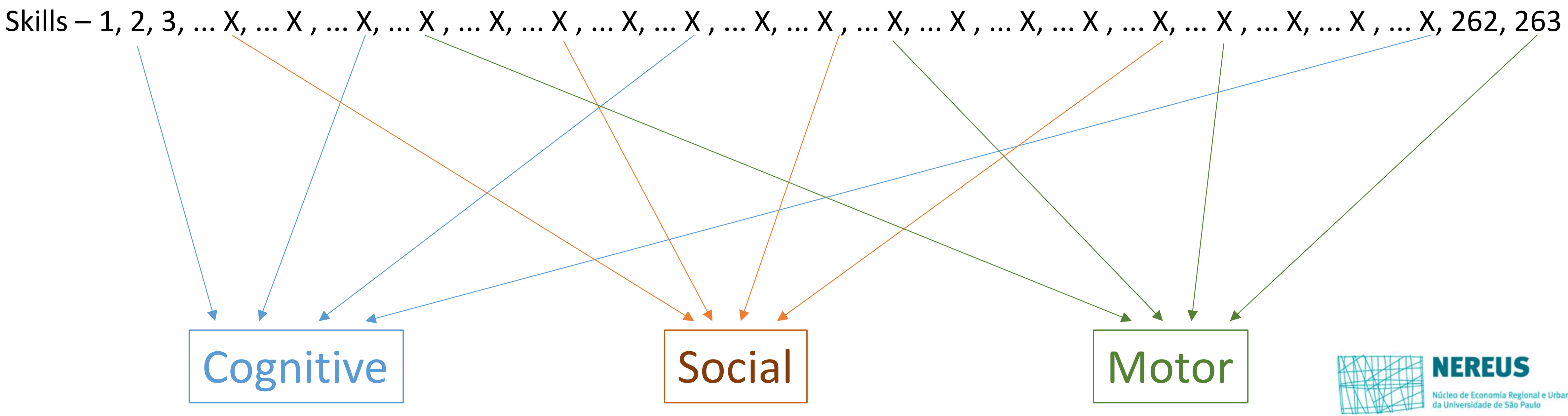
➔ 263 skills attributed to each of the =~ 6 million workers



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Cognitive	Social	Motor
[-0.24 to 0.30]	[-0.20 to 0.37]	[-0.18 to 0.29]
Deductive Reasoning	Social Perceptiveness	Manual dexterity
Inductive Reasoning	Coordination	Control precision
Category Flexibility	Persuasion	Static strength
Reading Comprehension	Negotiation	Dynamic strength
Writing	Establishing and Maintaining interpersonal Relationships	Performing general physical activities
Critical Thinking	Selling or Influencing Others	Handling and moving objects
Complex Problem Solving	Resolving Conflicts and negotiating with Others	
Analytical Thinking		
Mathematical Reasoning		
Factor Analysis → 1 variable	Factor Analysis → 1 variable	Factor Analysis → 1 variable

Examples of occupations with the associated skill levels

The resulting skill indicators are continuous non-orthogonal standardized variables, with a standard deviation of 0.1, preserving a desirable relation of complementarity (Bacolod and Blum, 2010).
The value ranges are:
Cognitive [-0.24 to 0.30]
Social [-0.20 to 0.37]
Motor [-0.18 to 0.29]

Cognitive	
Low	High
Car washer	Physicist
Fashion model	Astronomer
Textile fiber classifier	Spatial geophysicist
Restaurant attendee	Neurophysiologist
Animal killer	Surgeon

Motor	
Low	High
Operational research professor	Metal frame operator
Statistician	Mining operator
Environment economist	Airport fireman
Political scientist	Mason
Ombudsman	Car washer

Social	
Low	High
Car washer	Ombudsman
	Media products evaluator
Cloth presser	Lawyer
Textile and leather worker	Purchases supervisor
Weaver	Commercial director
Parts washer	

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Skill intensity - examples

<table>
<tr><td colspan="4">Social</td></tr>
<tr><td rowspan="3">Cognitive</td><td></td><td>High</td><td>Low</td></tr>
<tr><td>High</td><td>Construction engineer (airports)
Cardiologist
Communications manager
Human resources director
Surgeon
Foreign trade director</td><td></td></tr>
<tr><td>Low</td><td>Paper stand worker
Door to door vendor
Street Market vendor
Street vendor
Sales assistant
Popcorn street vendor</td><td>Gardner
Tire fixer
Industrial sewer
Paper cutter operator
Tapestry washer</td></tr>
</table>

Skill intensity - examples

		Motor	
		High	Low
Cognitive	High	Heart surgeon Neuro surgeon Dentist surgeon Head and neck surgeon	Construction engineer (hydraulics) Company lawyer Chemical engineer Professor of sociology (college) Linguist Physicist (atomic and molecular)
	Low	Metal meltier Mason Drill operator (mining) Concrete mounting Coal minge operator	Telephone operator Fashion model Telemarketing operator Mail operator

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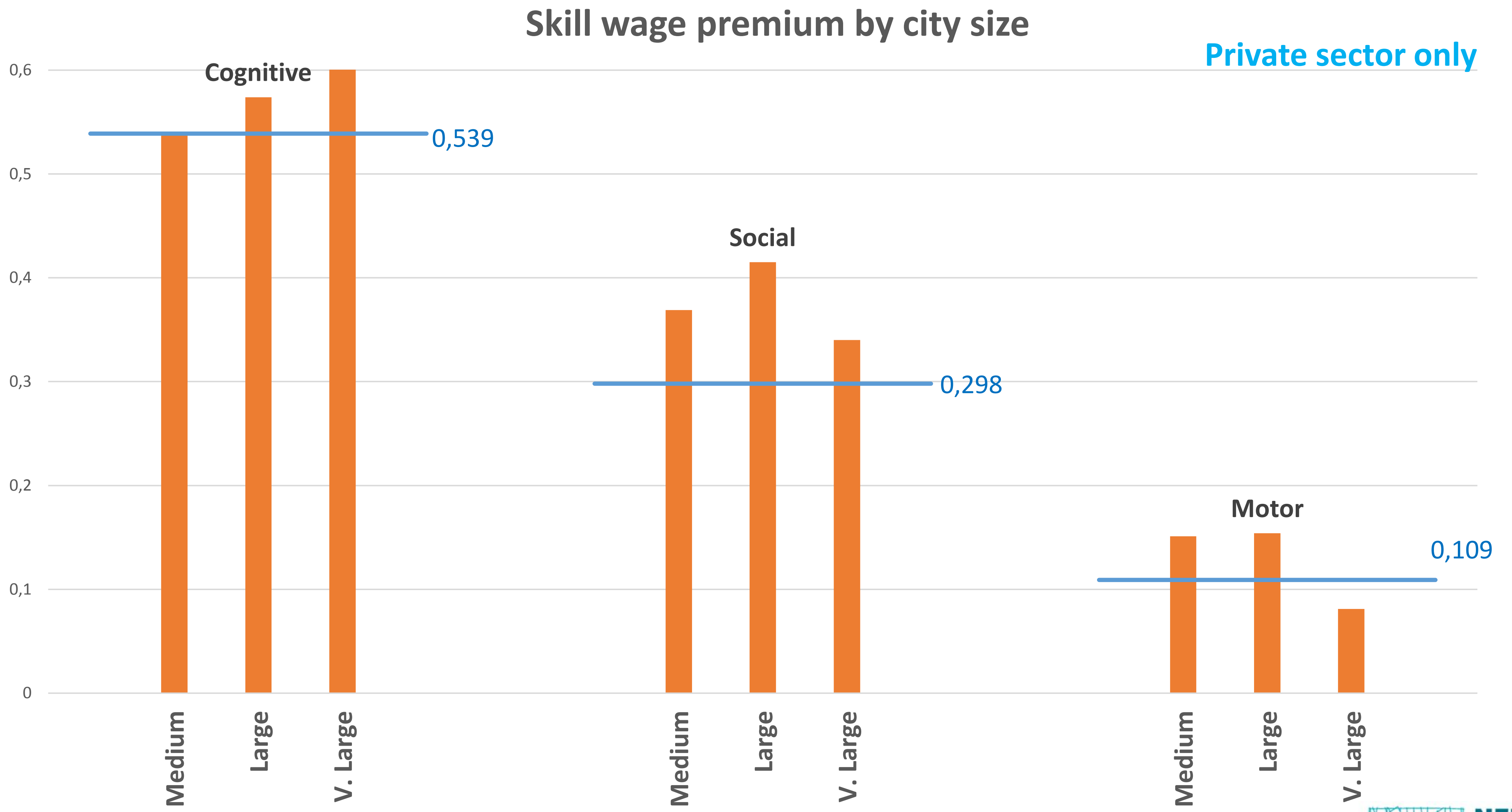
Skill intensity - examples

		Motor	
		High	Low
Social	High	Physiotherapist Forest area supervisor	Market risk director Tourism specialist Press agent Public relations Stock market broker Social Psychologist
	Low	Furniture assembler Train operator assistant Furnace assistant Machine assembler Plastic molder Wood panel operator	Copydesk assistant Advertisement model Fashion model Artistic model



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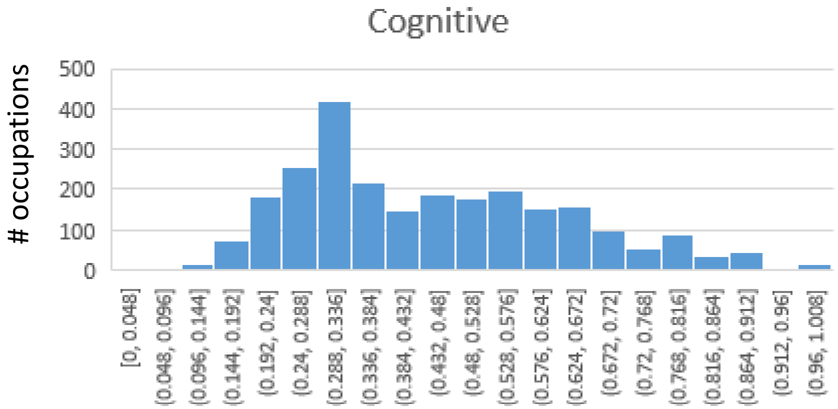
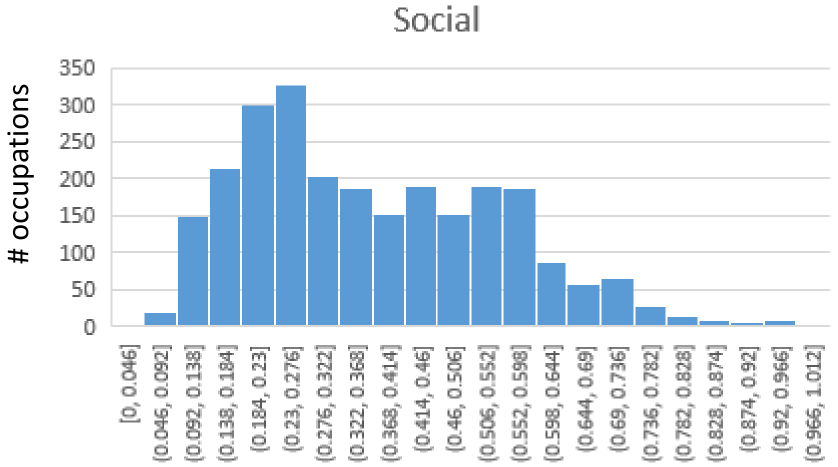
Distributions of skill values

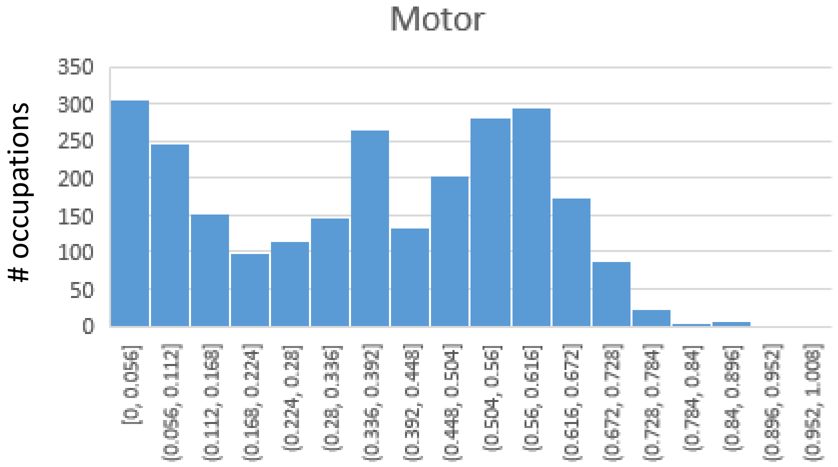
Range 0 - 1 (top)



Average values	
Top 5%	0.872
Top 10%	0.819
90% lowest	0.441
Bottom 30%	0.253
Top 10%/Bottom 30%	3.2



Average values	
Top 5%	0.770
Top 10%	0.706
90% lowest	0.331
Bottom 30%	0.177
Top 10%/Bottom 30%	4.0



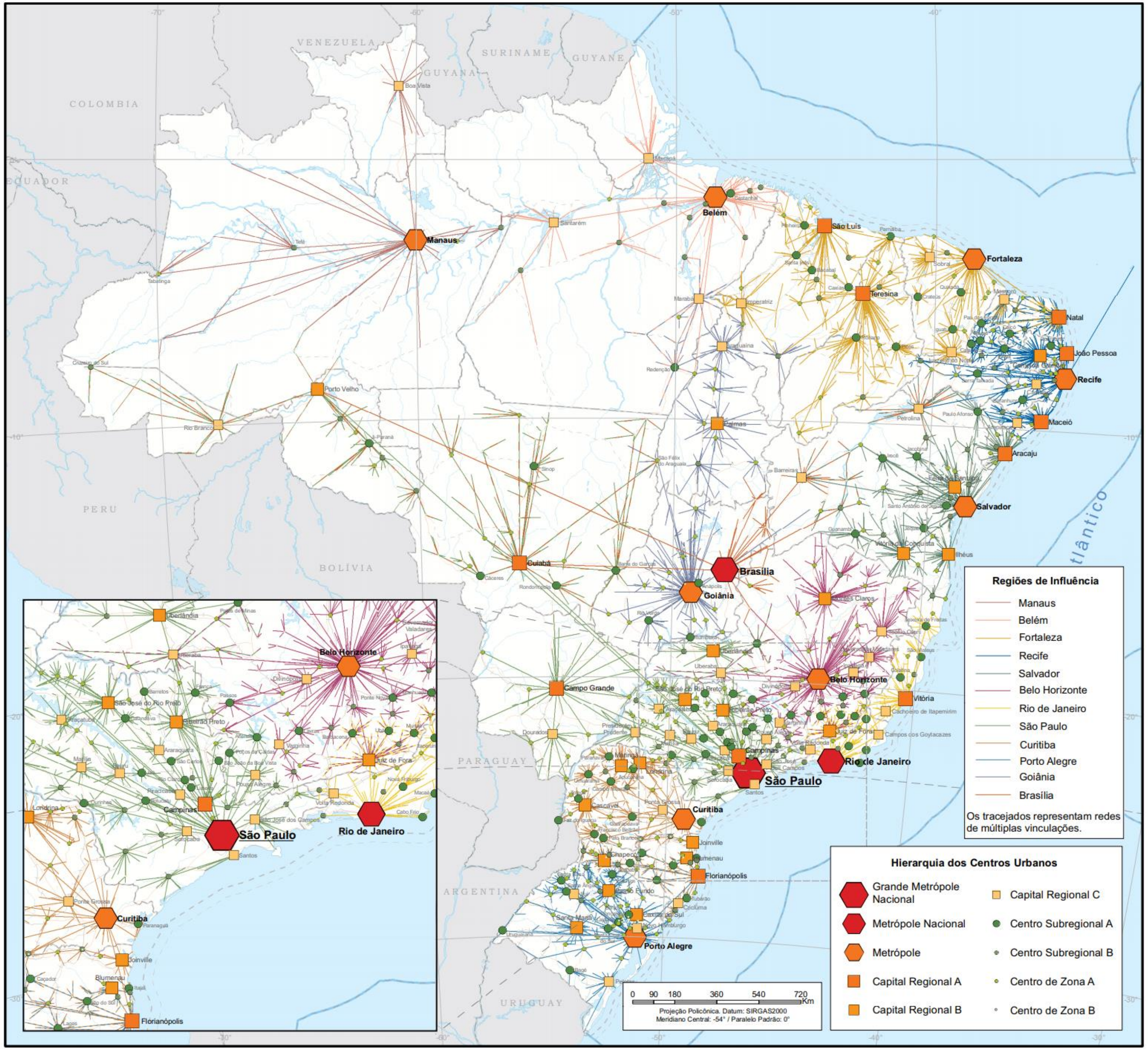
Average values	
Top 5%	0.727
Top 10%	0.685
90% lowest	0.326
Bottom 30%	0.082
Top 10%/Bottom 30%	8.4

Results - Skill Levels by City Type

Average 2003-2016

Urban Network

Great National Metropolis
2 National Metropolises
10 Metropolises
70 Regional Capitals
139 Sub-Regional Centers
556 Zone Centers
4,473 Local Centers



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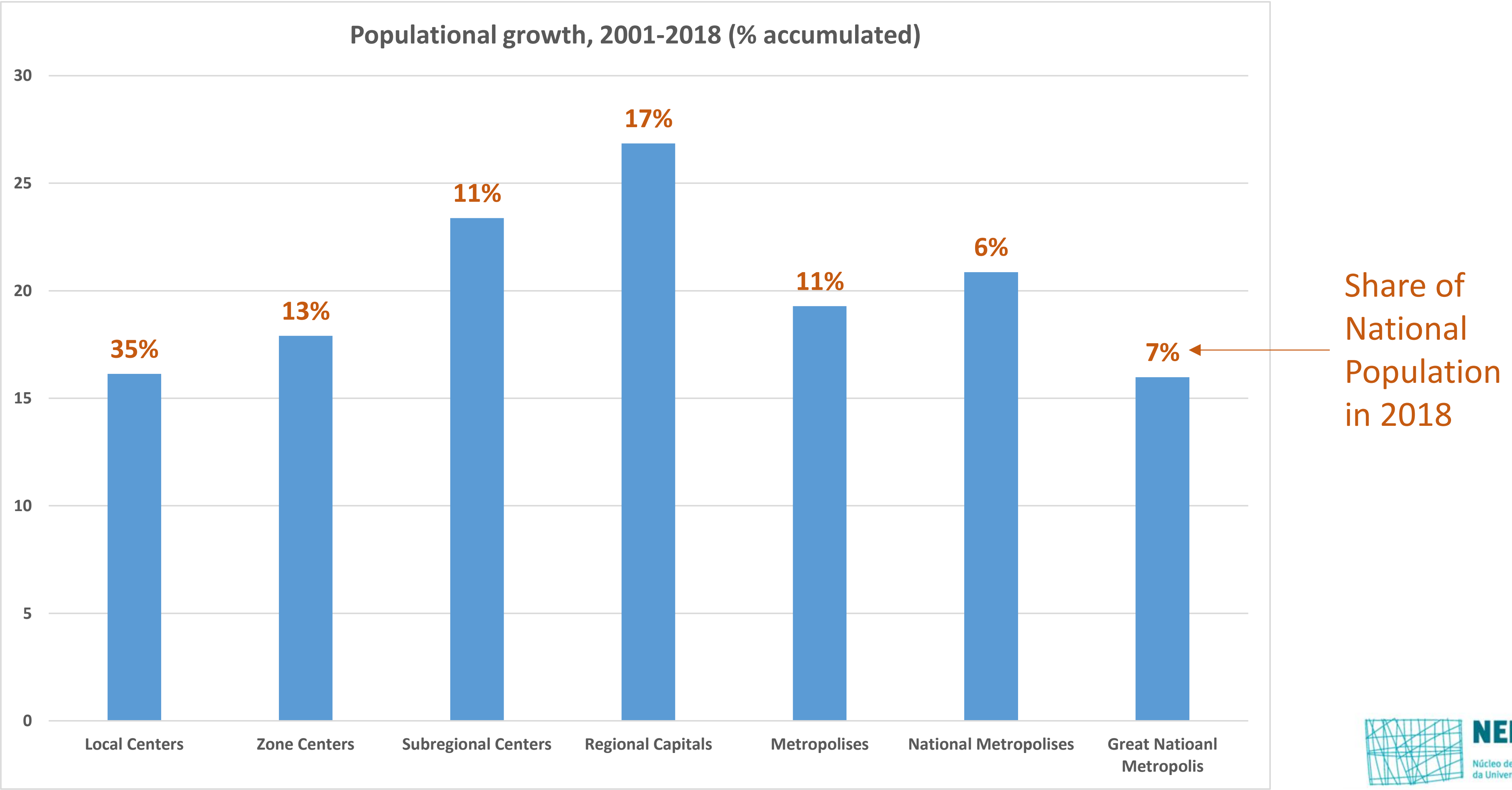
Recent populational growth



Types of cities considered

- Functional classification (Official statistics office, IBGE)
    - Pop in 2018; yearly growth 2001-18
  - Great national metropolis (Sao Paulo, 12.2 K, 0.8%)
  - 2 national metropolises (Rio de Janeiro – 6.7 K, 0.7%, and Brasília 2.9 K, 1.9%)
  - 10 metropolises
    - Manaus – 2.1K, 2.2%; Belém- 1.5K, 0.7%; Fortaleza – 2.6K, 1%; Recife – 1.6K, 0.7%; Salvador – 2.8K; 0.8%, Belo Horizonte – 2.5K, 0.6%, Curitiba – 1.9K, 0.9%; Goiânia - 1.5K, 1.7%; Porto Alegre – 1.5K, 0.4%
  - 70 Regional capitals (A - 11, 0.9K; B – 20, 0.43K; C – 39, 0.25K)
  - 139 sub-regional centers (A – 85, 0.09K; B – 79, 0.07K)
  - 556 zone centers (A – 192, 0.04K; B – 364, 0.02K)
  - 4,473 local centers (<10K)
- 17 municipalities Pop > 1 K; Σ = 45.5 K; 21.9% of total population
- 68.2% of municipalities < 20 K; Σ = 32.2K; 15.5% of total population

Skill intensity

$$\boldsymbol{Skill}^{s} = \beta_0 + \beta_1.Sector + \beta_2.Firm\ Size + \beta_3.Gender + \beta_4.Age + \beta_5.Age^2 + \beta_6.Edu + \beta_8.Time +$$

$$+ \beta_9.(\boldsymbol{City\ Type}) + \beta_{10}.(\boldsymbol{City\ Type * Time}) + \mu$$

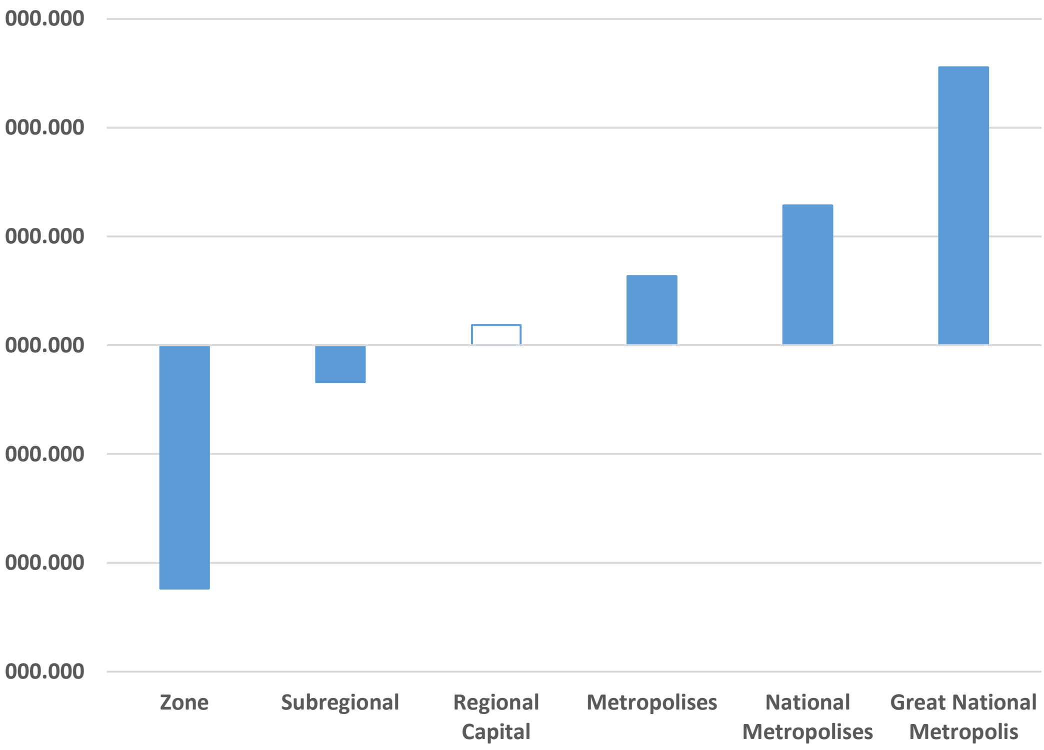
Microdata - workers
14 Sector dummies (agriculture and ranching as reference)
8 Firm size dummies (<4 workers as reference)
10 Education level dummies (illiterate as reference)
6 City Type dummies (Local Centers as reference)
s **– Cognitive, Social, Motor**

Estimation with POLS

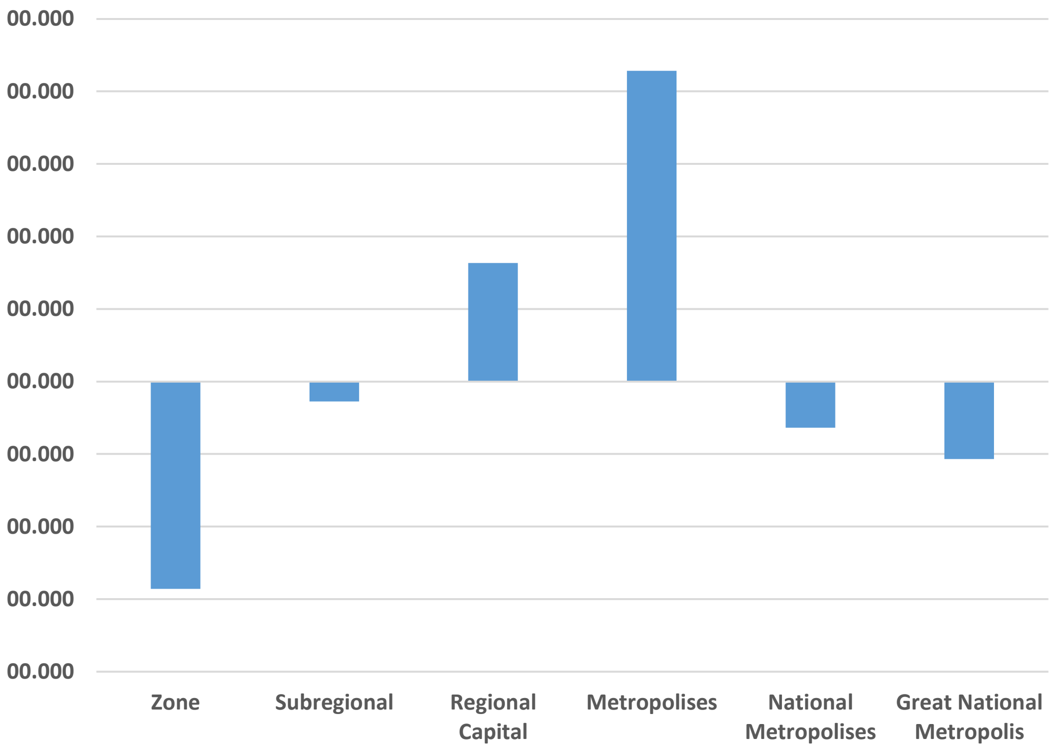
Overall – 21,348,669 observations
Private organizations – 17,524.540 observations
Separate regressions for each skill type

Cognitive skills

Private Organizations



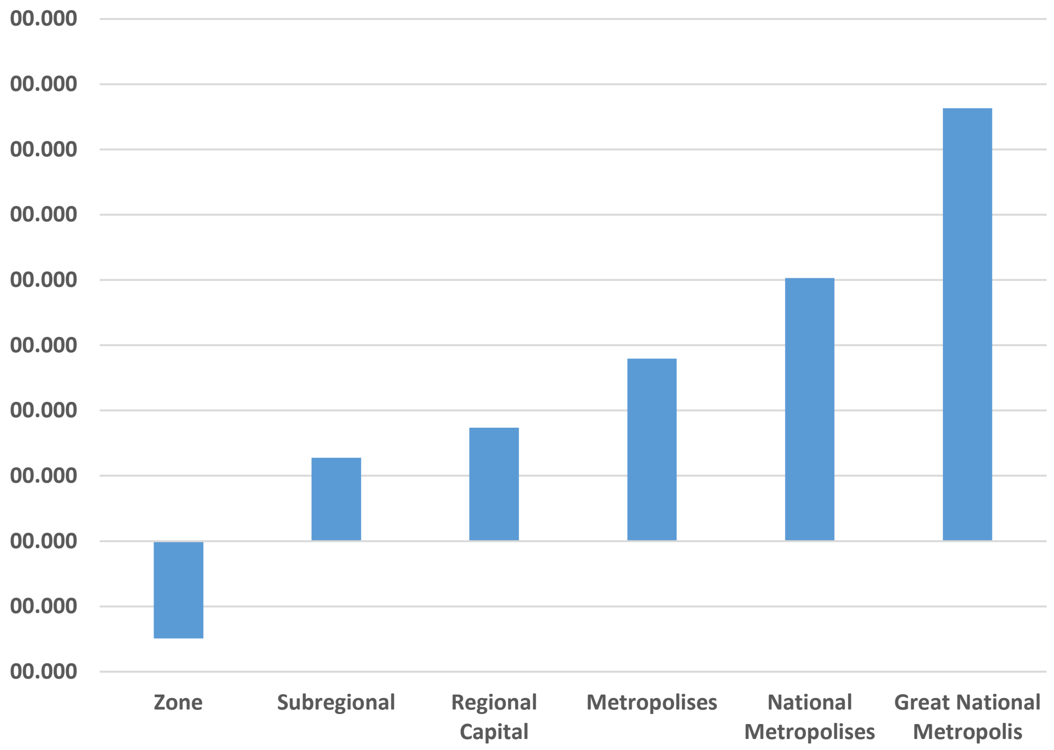
Public + Private



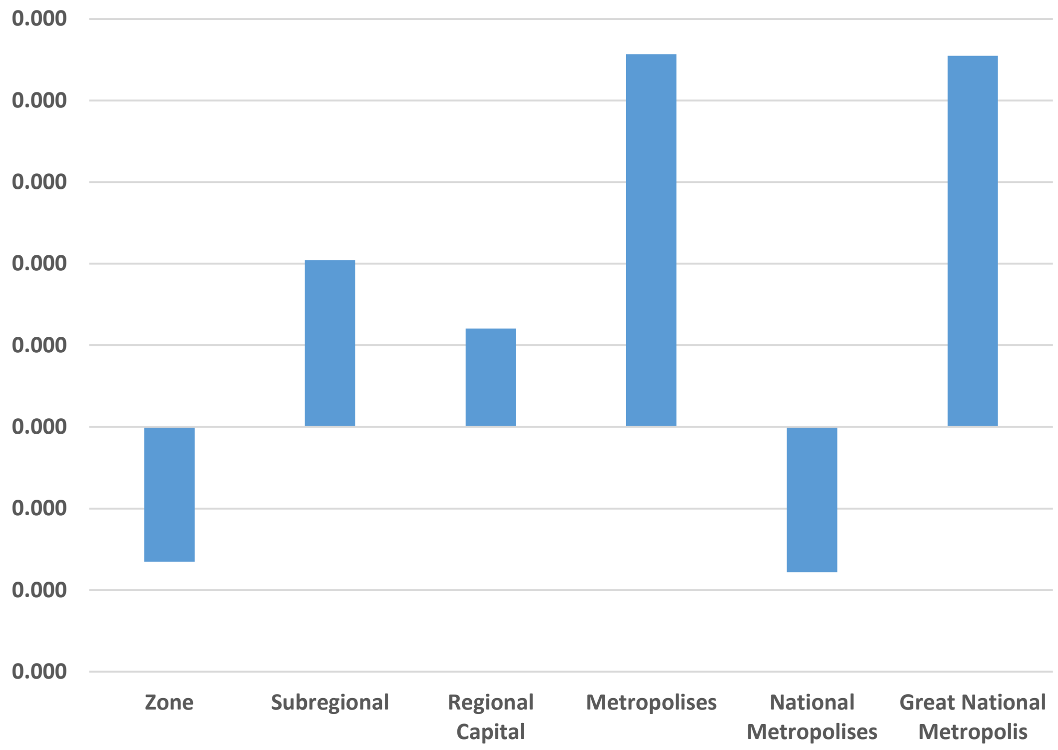
Reference: Local Centers

Social skills

Private Organizations



Public + Private



Reference: Local Centers

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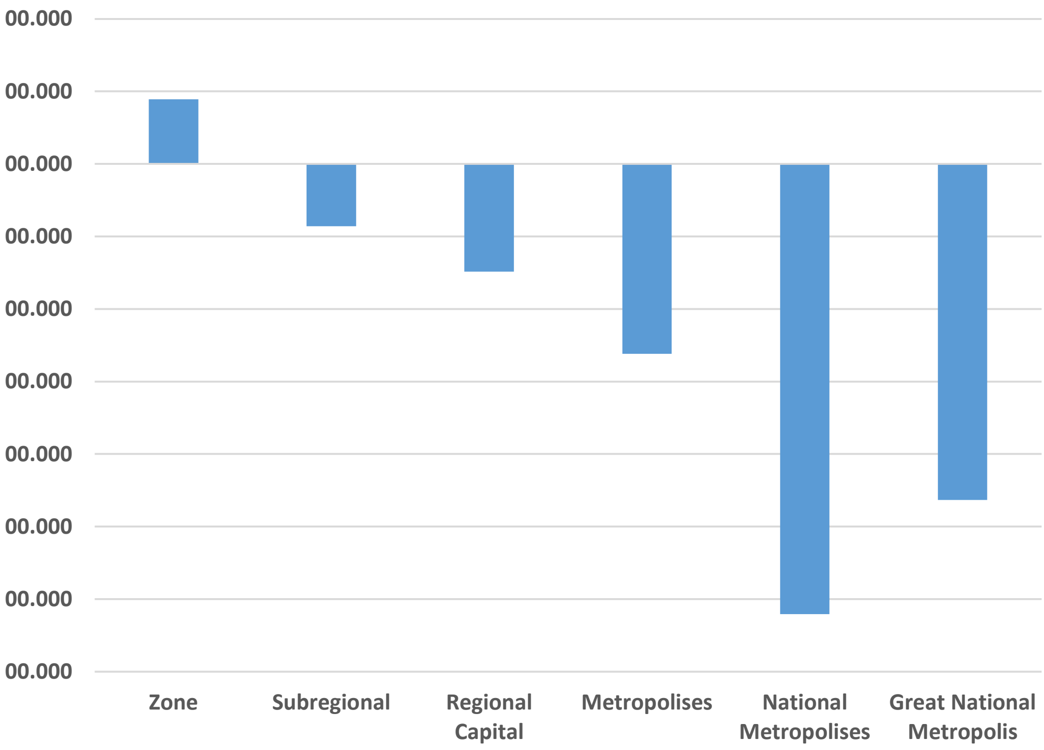
Motor skills

Private Organizations



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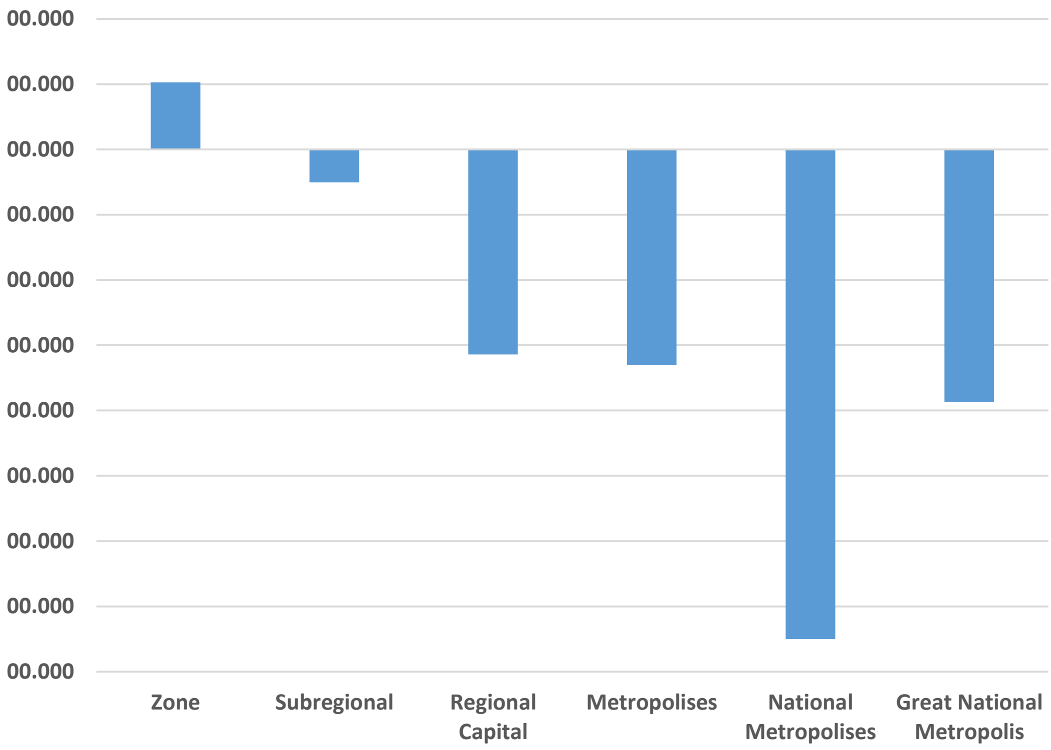

Reference: Local Centers

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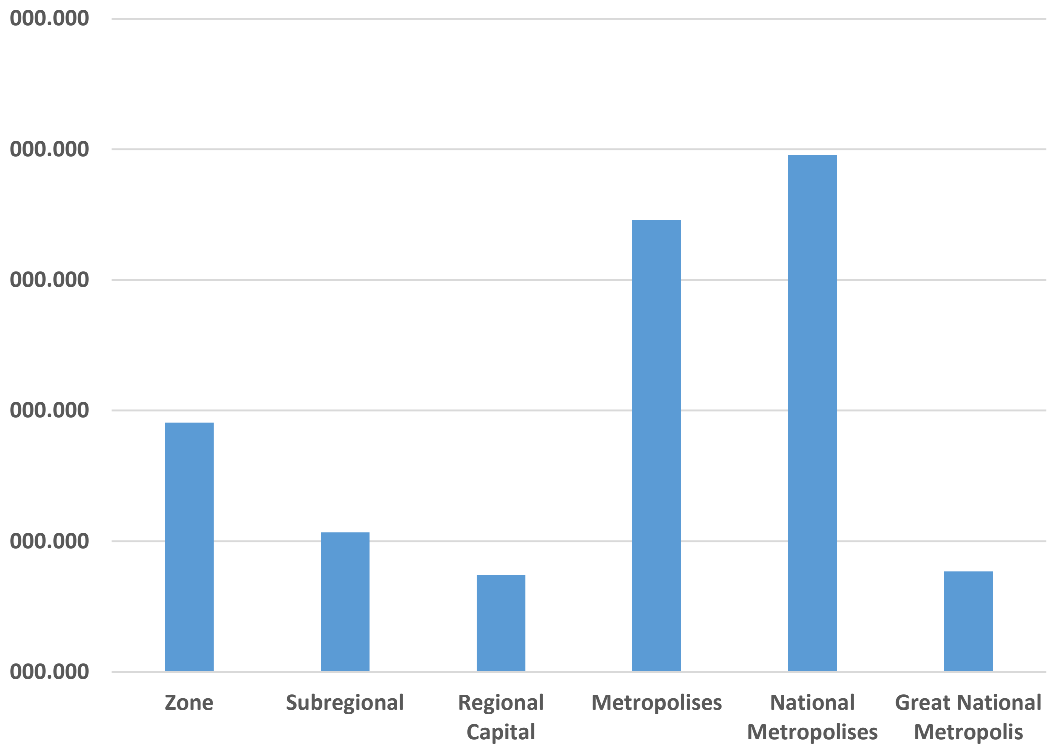
Skill Level Growth, 2003-2016

Cognitive skills – Growth 2003-16

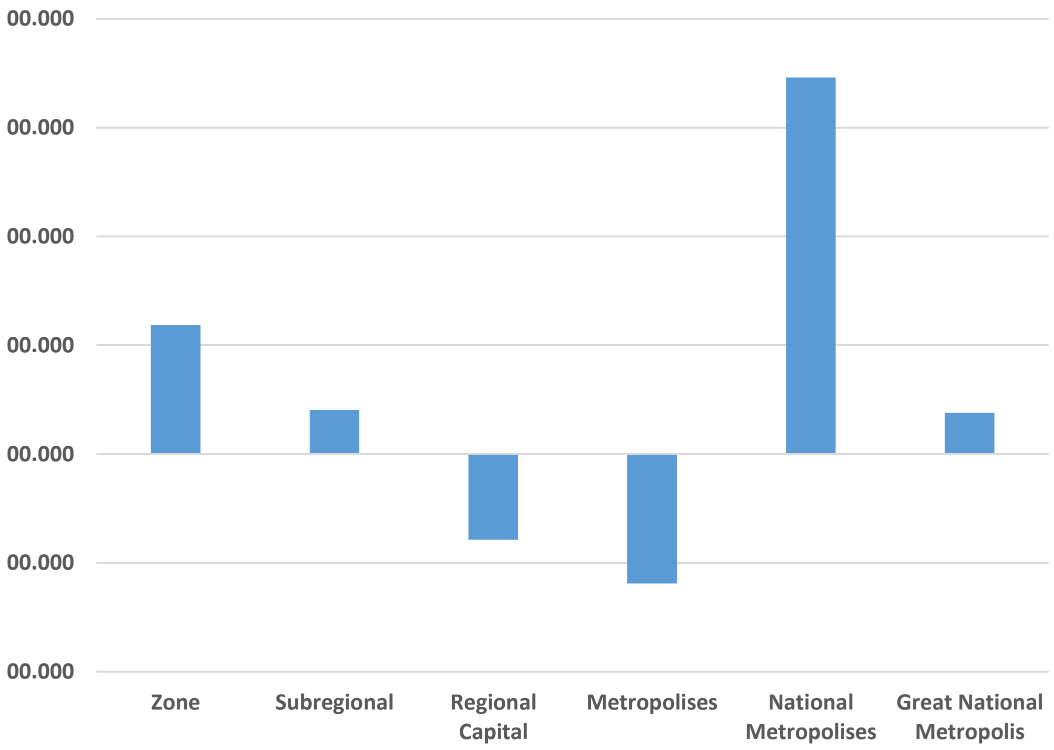
Local Centers = -0,00761

Private Organizations



Local Centers = -0,0076

Public + Private



Reference: Local Centers

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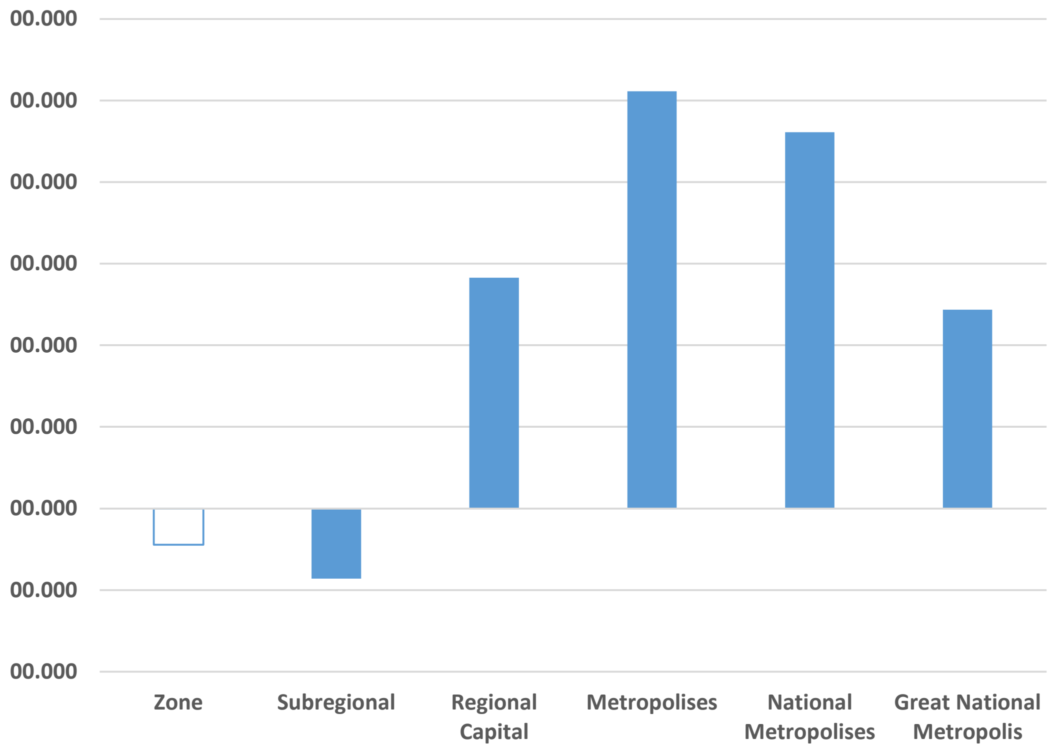
Social skills – Growth 2003-16

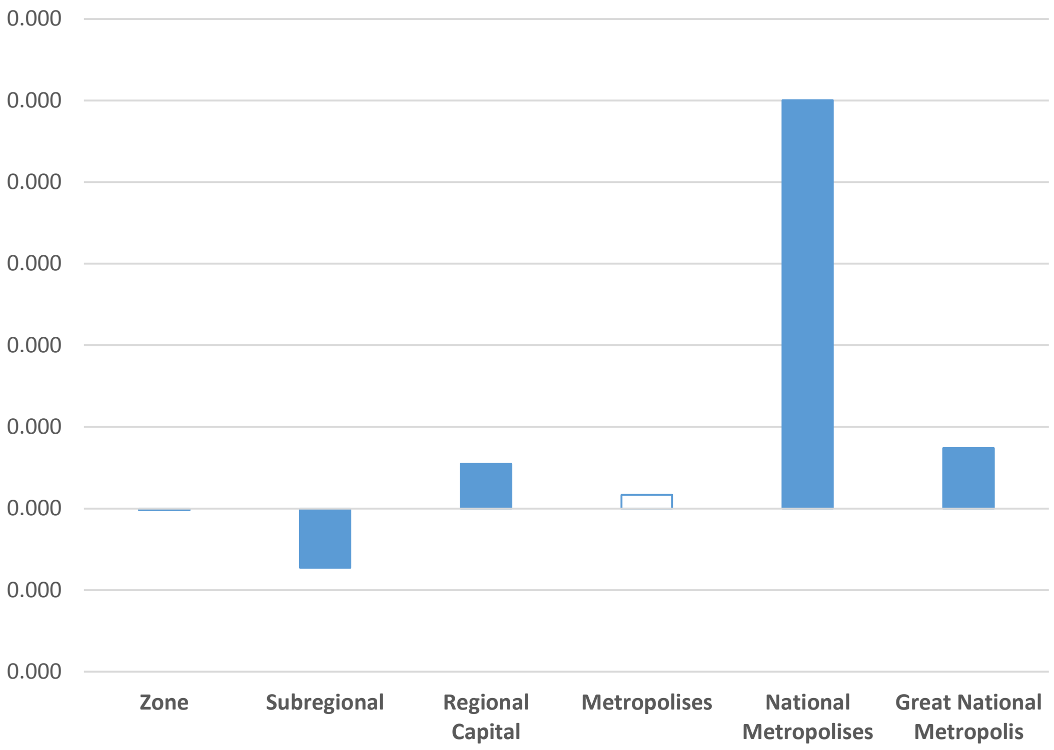
Local Centers = -0,0093

Private Organizations



Local Centers = -0,0078

Public + Private



Reference: Local Centers

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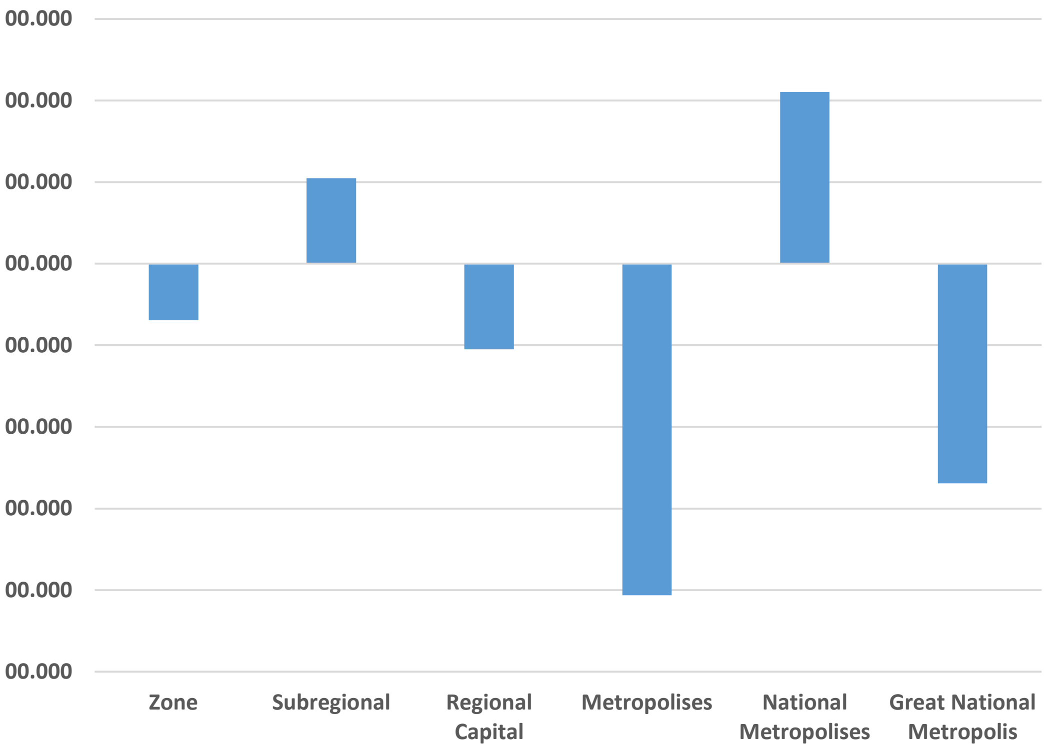
Motor skills – Growth 2003-16

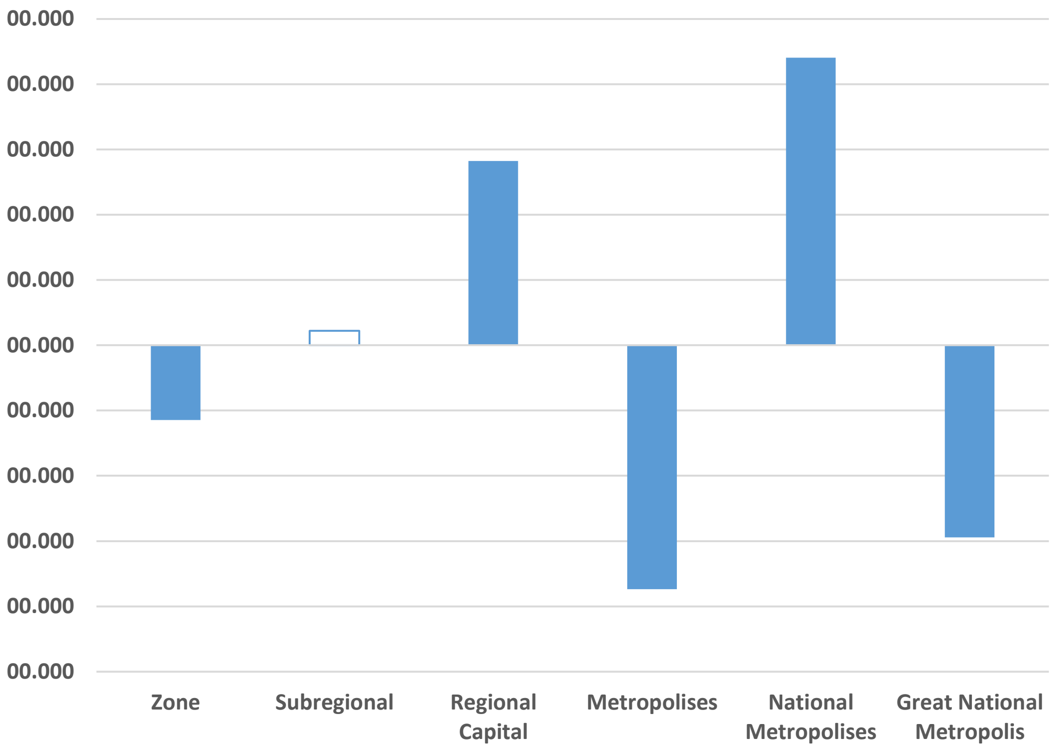
Local Centers = 0,0115

Private Organizations



Local Centers = 0,0117

Public + Private



Reference: Local Centers

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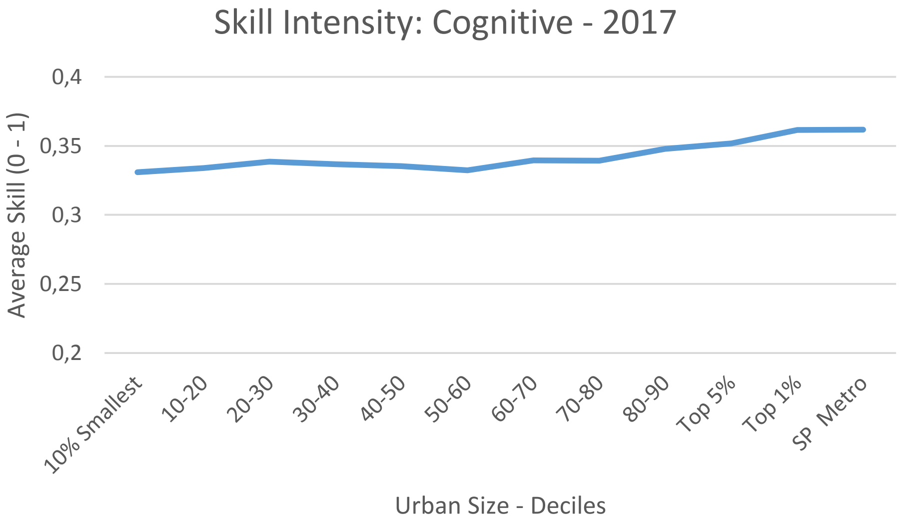
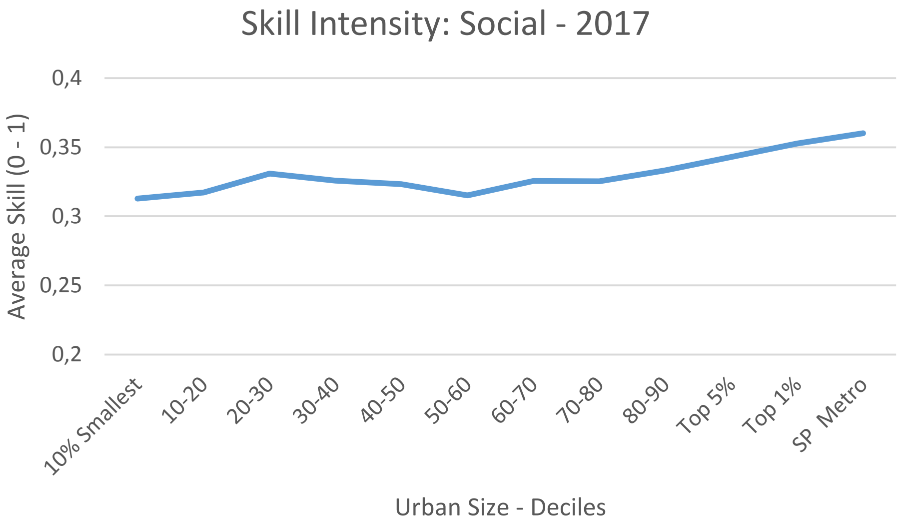
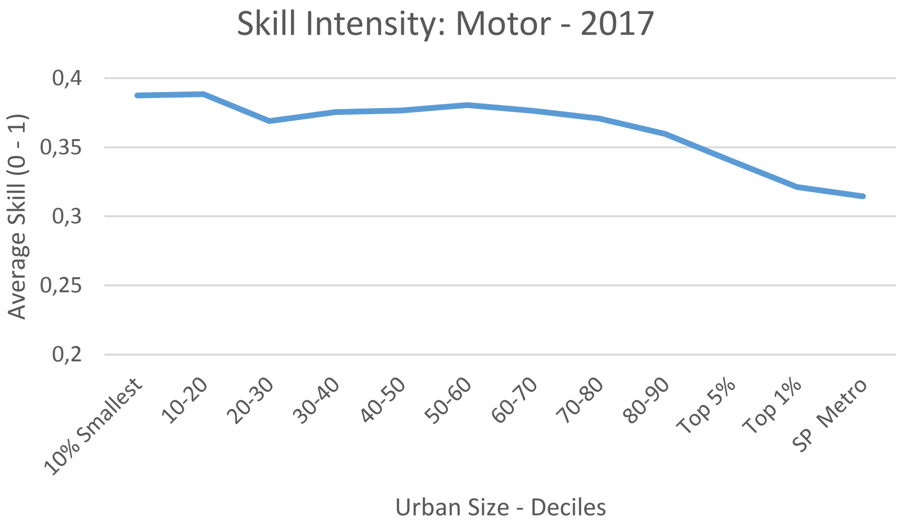
Results - Skill Levels by City Size

Average 2003-2017



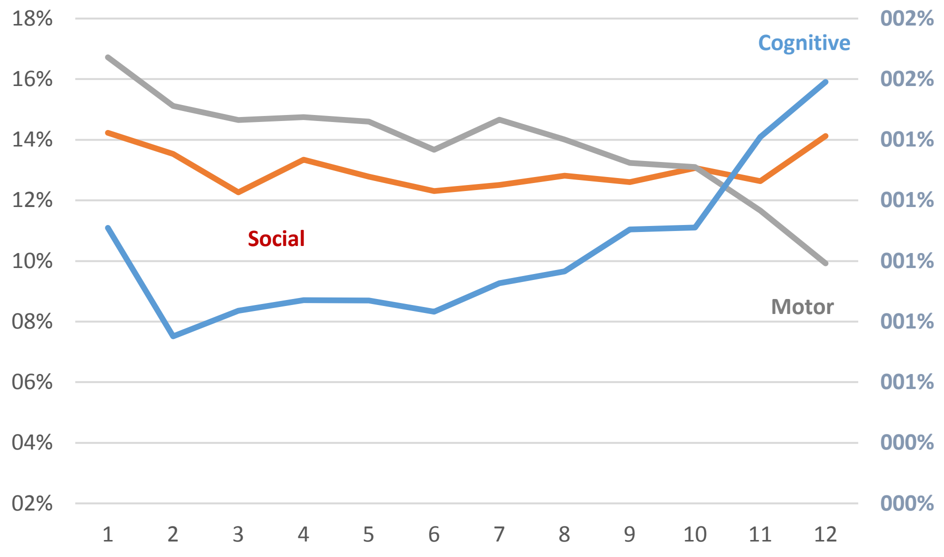
Skill Intensity by Urban Size 2017





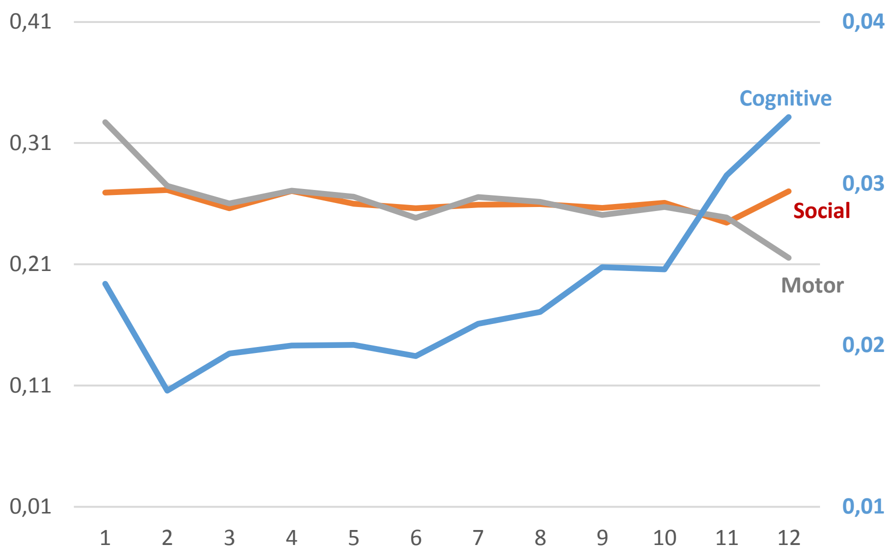
Share of sophisticated work by urban size

Share of workers in the 250 most sophisticated occupations



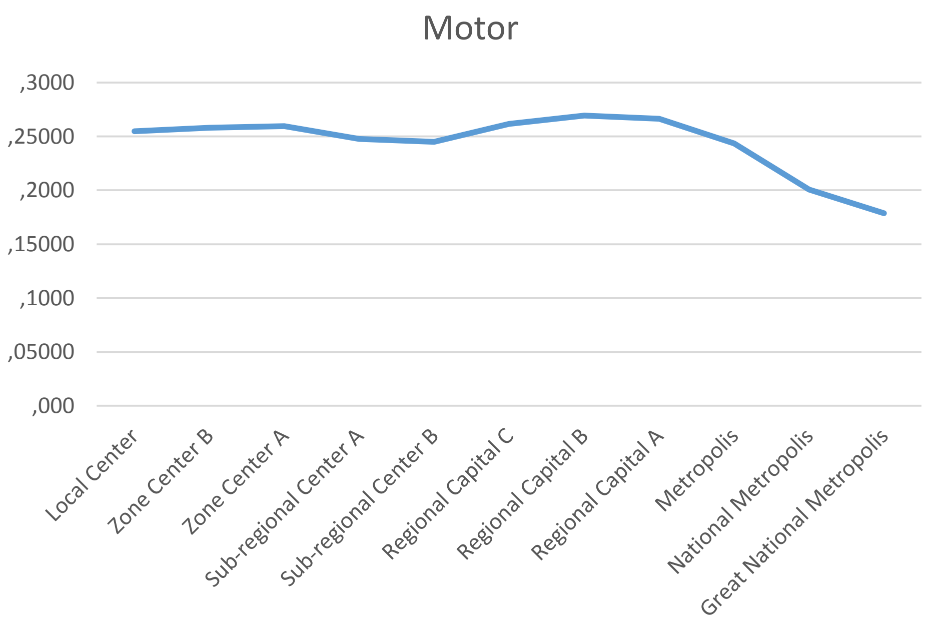
Small Large

Share of workers in the 25 most sophisticated sectors

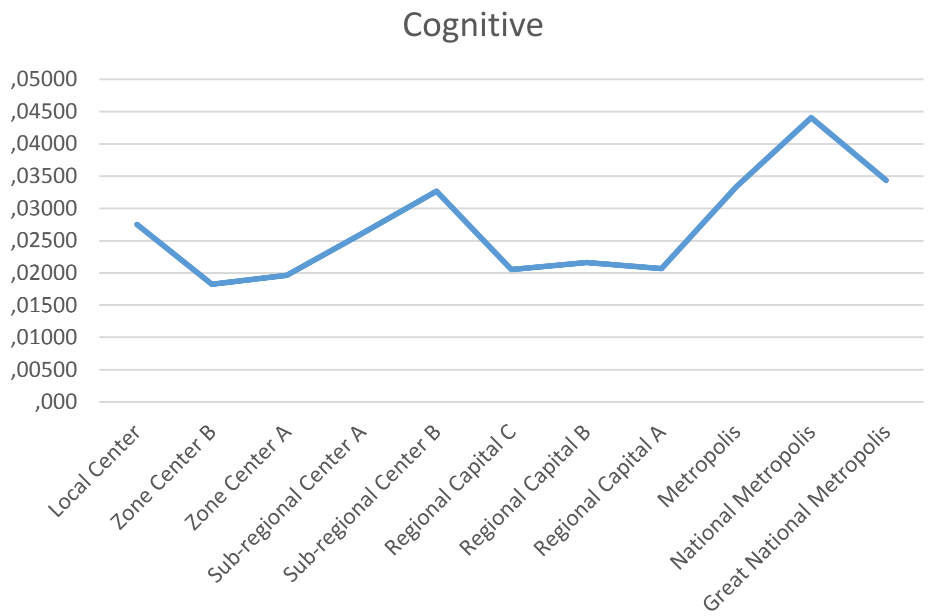


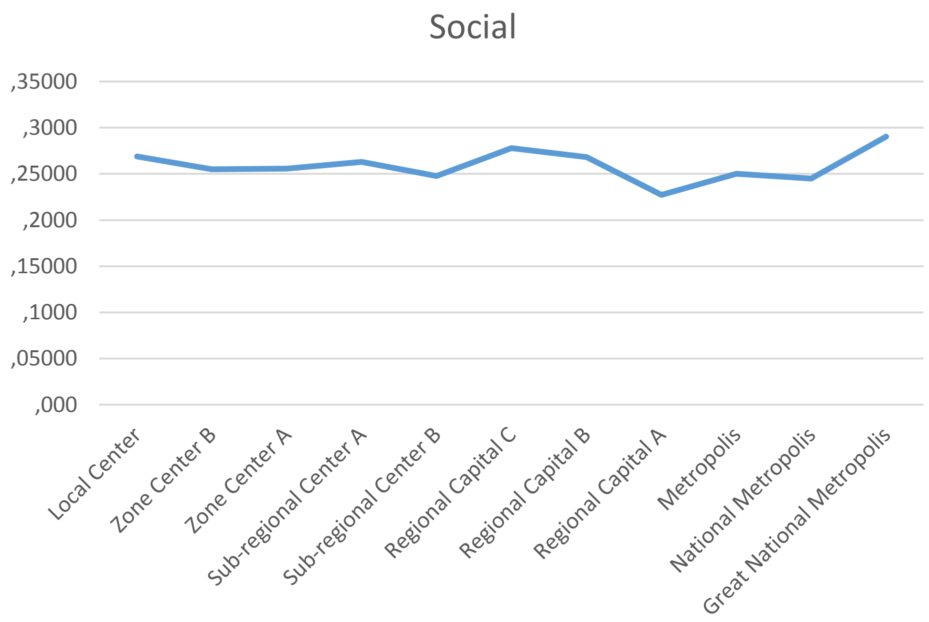
Small Large

Share of sum of skills in top 250 occupations

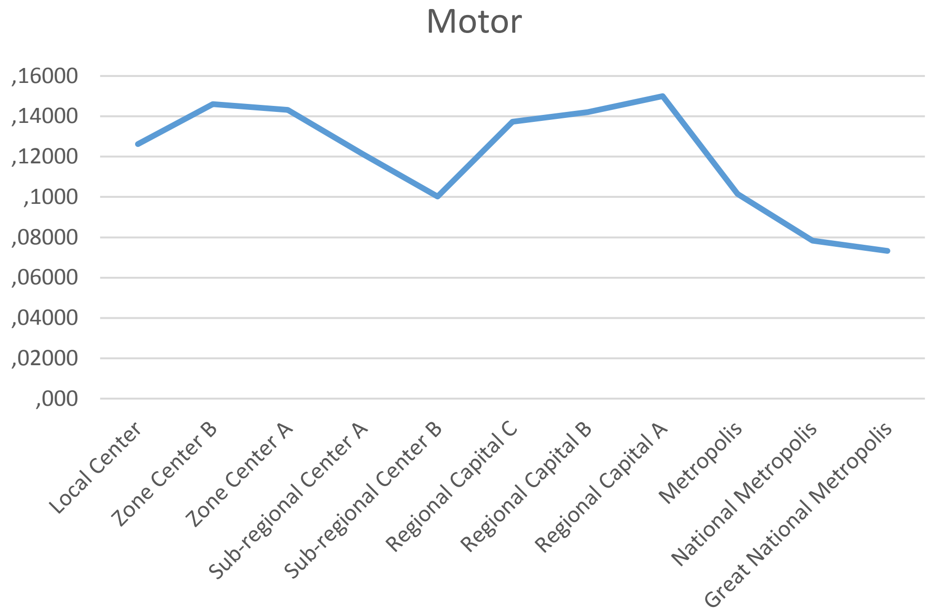


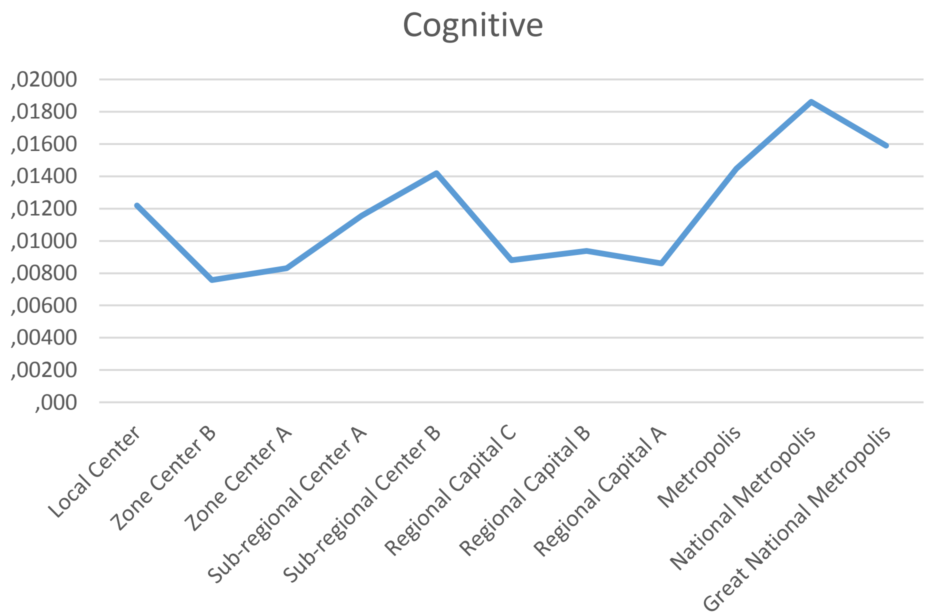
2017

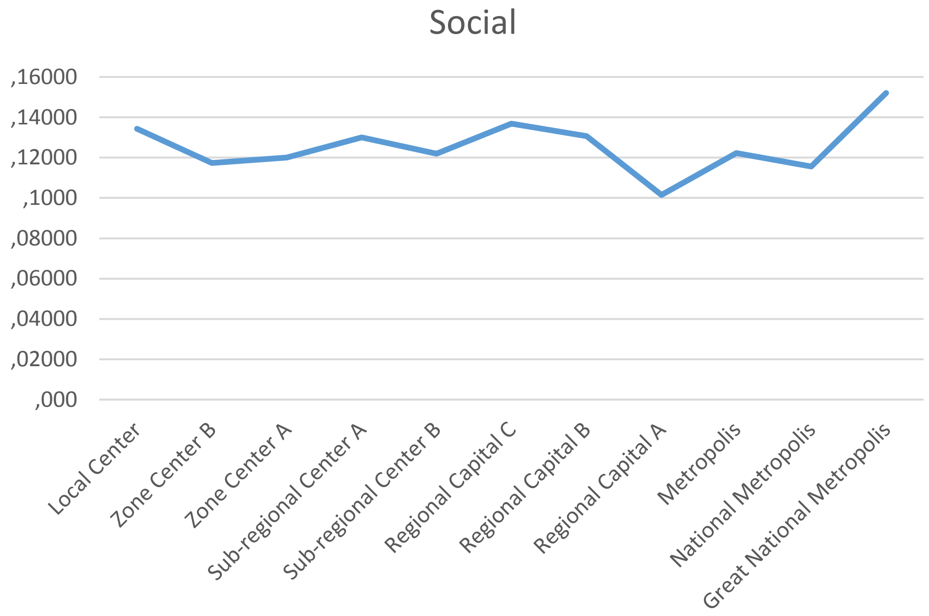




Share of workers in top-skill 250 occupations







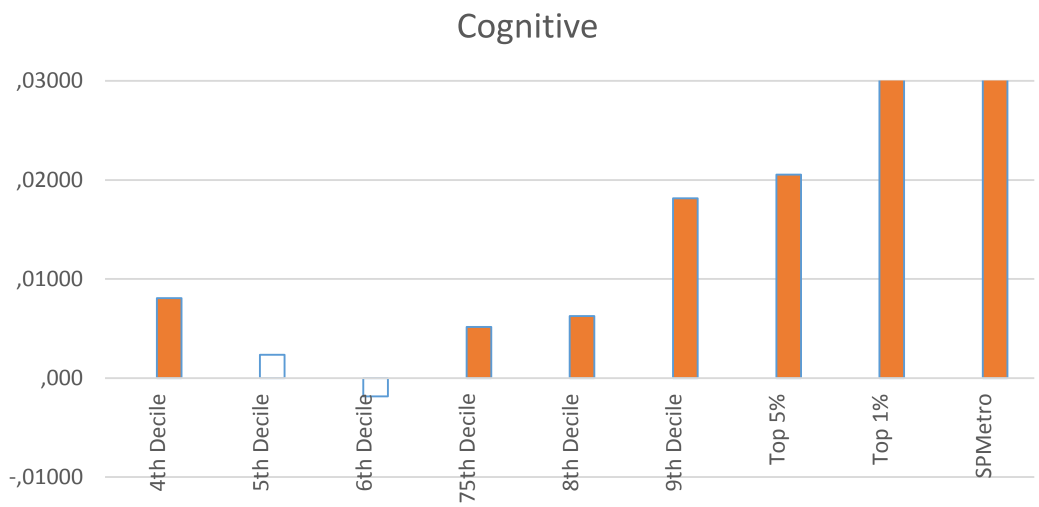
2017

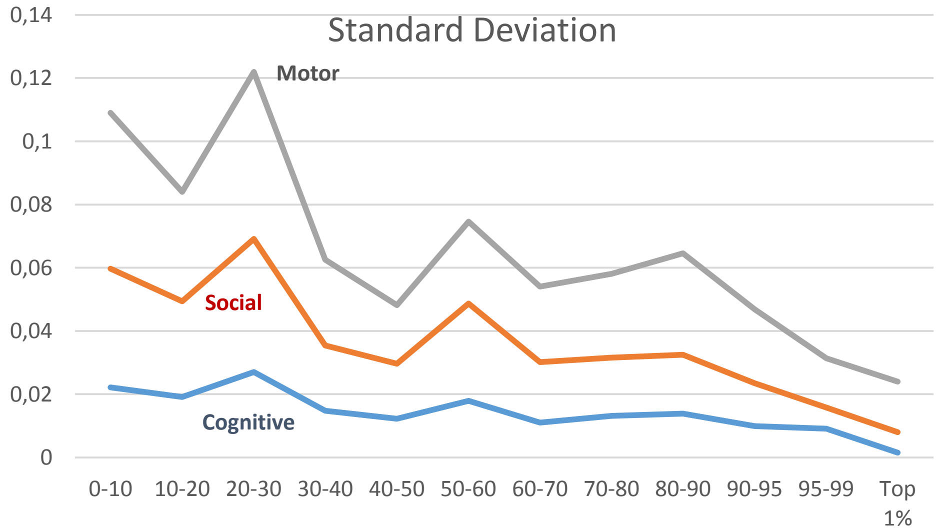
Skill levels by city size

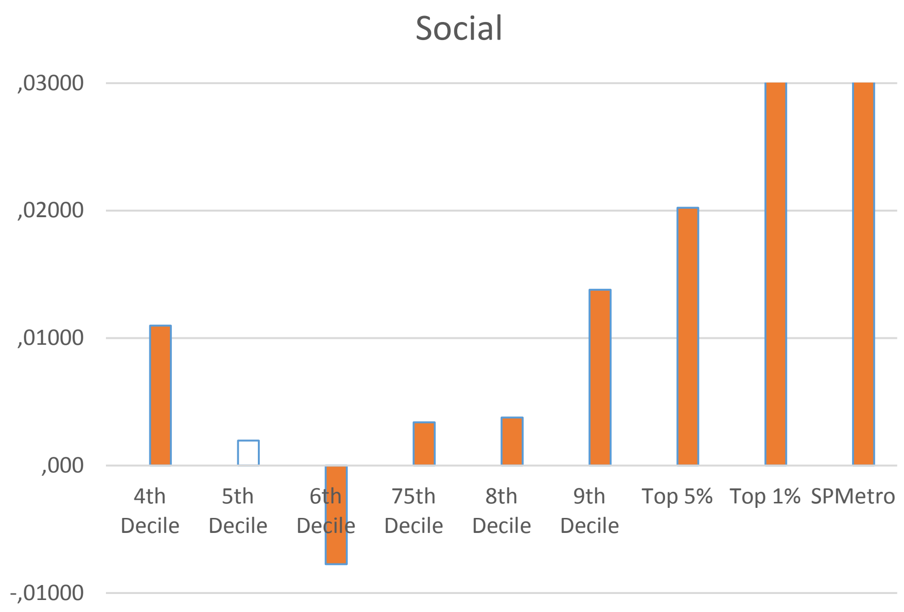
(Average 2003-2017, Intercept dummies)

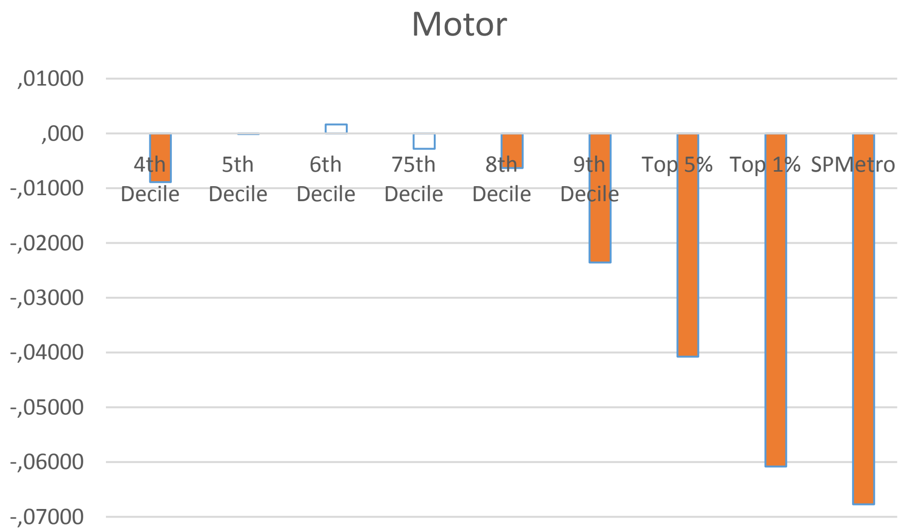
$S_t = a + b*\text{Time} + c_i*(\text{Size Dummy}_i)$

Reference: 30% smallest LMAs



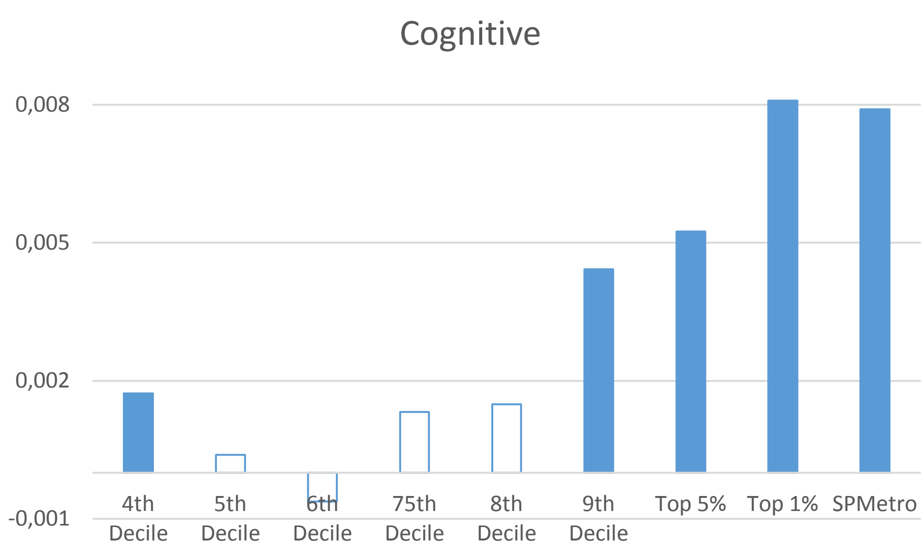


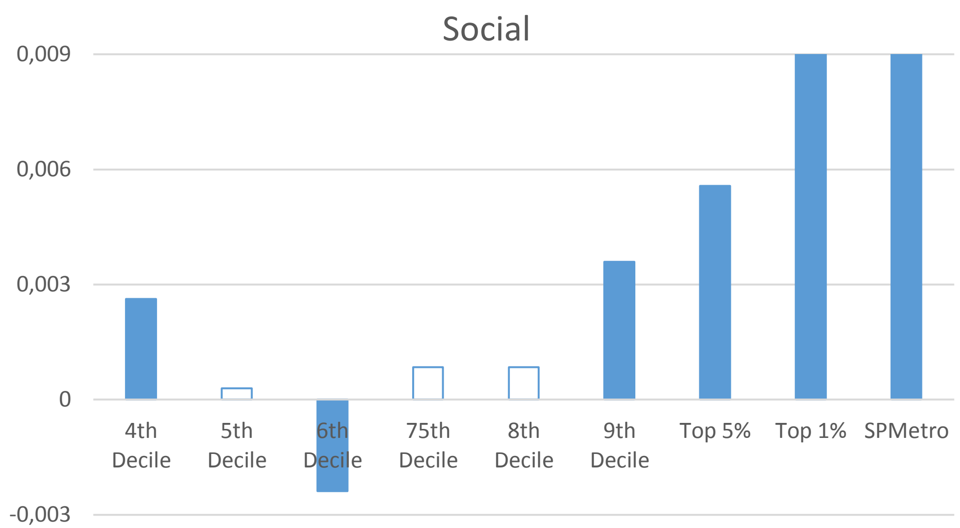


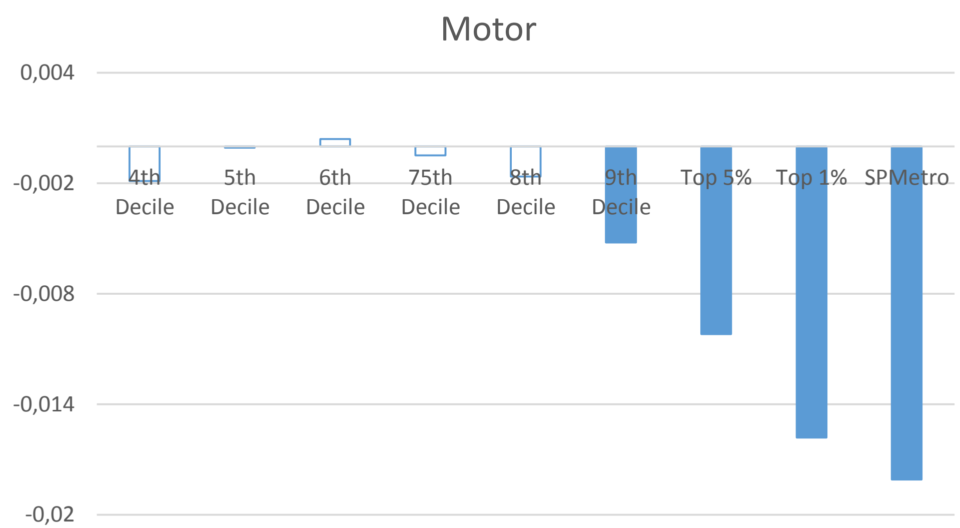


Skill growth by city size

(Average 2003-2017, Intercept dummies*Trend)







$\text{Ln } S_t = a + b*\text{Time} + c_i*(\text{Time*Size Dummy}_i)$

Reference: 30% smallest LMAs

Concluding remarks

- Cognitive and social skills more intense in centers of higher hierarchical position
- Private and public quite different
- Growth of cognitive and social skills in metropolises and national metropolises
- No consideration for the informal sector (self-employed, for example)
- Approach with good potential for regional studies

Thanks!

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Prof. Stan Czamanski in Brazil

ESTUDO DOS EFEITOS MULTIPLICADORES DOS INVESTIMENTOS INDUSTRIAIS E DOS PROGRAMAS GOVERNAMENTAIS

Stan Czamanski
Luiz Augusto de Queiroz Ablas
Martin Lu
Juarez Alexandre Baldini Rizzieri

SÃO PAULO
1976

A study of the multiplier effects of industrial investments and governmental programs

Research Report

ESTUDO DOS EFEITOS MULTIPLICADORES DOS INVESTIMENTOS INDUSTRIAIS E DOS PROGRAMAS GOVERNAMENTAIS

42061

Stan Czamanski
Luiz Augusto de Queiroz Ablas
Martin Lu
Juarez Alexandre Baldini Rizzieri

Sample of Results from the report

TABELA 4-5

EFEITO MULTIPLICADOR INTERINDUSTRIAL POR SETOR

CÓDIGO: FIBGE	GÊNEROS DE INDÚSTRIAS:	$i^T.(I-A)^{-1}_{BR}$	$i^T.(I-A)^{-1}_{SP}$
00	Extração de minerais	1,1711	1,0498
10	Produtos de minerais não metálicos	1,4530	1,3801
11	Metalúrgica	1,4189	1,3462
12	Mecânica	1,5748	1,5071
13	Material elétrico e de comunicações	1,6702	1,6154
14	Material de transporte	2,0335	1,9232
15	Madeira	1,7311	1,2779
16	Mobiliário	1,6481	1,4863
17	Papel e papelão	1,4113	1,3983
18	Borracha	1,5458	1,4223
19	Couros e peles e produtos similares	1,5779	1,5710
20	Química	1,5268	1,4152
21	Produtos farmacêuticos e veterinários	1,4524	1,4258
22	Perfumaria, sabões e velas	1,6863	1,4440
23	Produtos de matérias plásticas	1,6091	1,3825
24	Têxtil	1,7841	1,5470
25	Vestuário, calçados e artefatos de tecidos	1,9457	1,6644
26	Produtos alimentares	2,1801	1,9046
27	Bebidas	1,5279	1,4304
28	Fumo	1,5805	1,5117
29	Editorial e gráfica	1,5468	1,4771
30	Diversas	1,4225	1,3647
99	Agricultura, extração vegetal e criação	2,1764	1,7430

Discussion paper
Academic seminar

UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ECONOMIA E ADMINISTRAÇÃO
INSTITUTO DE PESQUISAS ECONÔMICAS - IPE

IDENTIFICATION OF INDUSTRIAL CLUSTERS AND COMPLEXES: A COMPARISON OF METHODS AND FINDINGS

by

Stan Czamanski
Cornell University

and

Luiz Augusto de Q. Ablas
University of São Paulo

TRABALHO PARA DISCUSSÃO INTERNA Nº 08/76

Nota: Circulação restrita aos professores e alunos do Instituto de Pesquisas Econômicas e do Departamento de Economia da Faculdade de Economia e Administração da Universidade de São Paulo.

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F3843

TRABALHO PARA DISCUSSÃO INTERNA Nº 08/76

A methodology for the computation of technical coefficients from production tax data
Discussion paper, Academic seminar

UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ECONOMIA E ADMINISTRAÇÃO
INSTITUTO DE PESQUISAS ECONÔMICAS - IPE

TRABALHO PARA DISCUSSÃO INTERNA Nº 09/76

METODOLOGIA DE CÁLCULO DE COEFICIENTES TÉCNICOS A PARTIR DE DADOS DO IPI

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