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Centre for Entrepreneurship Research, RANEPA
Innovation Economics Department, Gaidar Institute

NEW TECHNOLOGIES, POTENTIAL UNEMPLOYMENT AND NESCIENCE ECONOMY IN THE RUSSIAN REGIONS

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- Change of techno-economic paradigm
- **Digitalization** - the emergence of robot-robot systems (smart homes, Internet of things, autopilot transport, etc.)
- One industrial robot (per 1000 employed) in the US led to 0.18-0.4% decline in share of employed and 0.25-0.5% decrease in wages [Acemoglu, Restrepo, 2017]
- In Russia: Tolyatti and "AvtoVAZ" (reduction from 110 to 35 thousand employees), the example of Sberbank (≈3000 lawyers)
- Geographical differences in automation [Berger, Frey 2015; Berger, Frey 2016]

The goal is to assess the potential number of people *exposed to automation*

The experiment: what will happen if automation happens at the same time? This is not a projection or unemployment!

| Mechanism	Description	Restrictions in Russia
Reduced prices [Pigou, 1933; Stoneman, 1995; Vivarelli, 1995]	Lower prices drive demand and then production and employment (Amazon example)	Price reductions occur in the conditions of perfect competition, in Russia in many markets monopolies and oligopolies are formed
Increased income [Vivarelli, 2014]	Increase in income - increase in demand and employment in other sectors	The increase in income in Russia may go to consumption of foreign durable goods, as well as real estate
Creation of new products and services [Nelson, Phelps, 1966; Freeman et al., 1982; Aghion, Howitt 1994]	The emergence of new products and services - increasing demand for labor	Low entrepreneurial and innovative activity in Russia limits the possibilities of developing new industries and new products

Previously, technology changes created more jobs than they destroyed

Frey, Osborne, 2013: automation probabilities for professions depend on

> ➢ Perception and manipulation
> ➢ Creative intelligence
> ➢ Social intelligence

Zemtsov, 2017: RLMS HSE data.
≈26.5% of employed in Russia (high probability of automation)
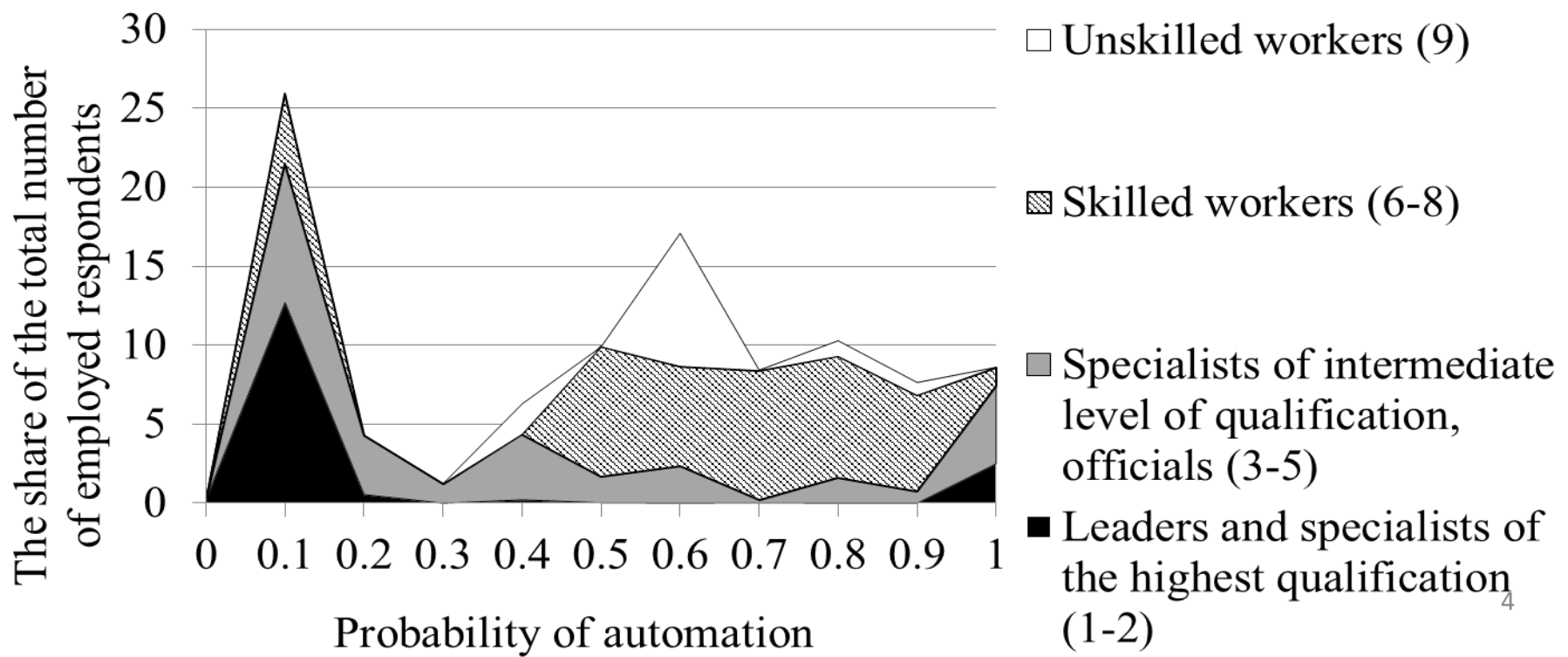
The most popular professions in Russia	Number of employees, million people	Probability of automation, % [Frey, Osborne, 2013]
Drivers	7	≈98
Sellers	6,8	≈98
Accountants, economists	3,6	≈43-94
Teachers	2,8	≈20-94
Loaders	2,3	≈72
Cleaners	2,1	≈66-83
Junior medical staff	1,9	≈0,9-51
Guards	1,8	≈84

[Manyika et al., 2017]: share of routine work in industries

Industries in Russia	Potential automation, %
N. Hotels and restaurants	73
D. Manufacturing Processes	60
A. Agriculture and forestry	58
Retail	53
C. Extraction of minerals	51
F. Construction	47
I. Transport and communications	45.8
E. Electricity, gas and water	44
O. Provision of other services	44
J. Financial activities	43
L. State management; security	39
N. Health care and social services	36
M. Education	27

Industrial centers around Moscow

Oil and gas producers

Saint Petersburg

Moscow

Agrarian informal sector
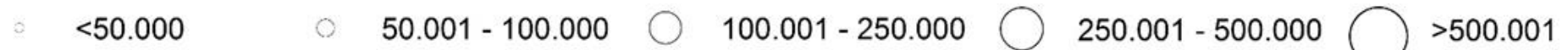
Share of potentially automated jobs in formal sector in 2015

| <42.000 | 42.001 - 44.000 | 44.001 - 45.000 | 45.001 - 46.000 | >46.001 |

The number of employees, exposed to automation, in 2015

| <50.000 | 50.001 - 100.000 | 100.001 - 250.000 | 250.001 - 500.000 | >500.001 |

Country	Frey, Osborne, 2013	Arntz et al., 2016	McKinsey (Manyika et al., 2017)
United Kingdom	35	10	43
Germany	59	12	48
Italy	56,2	10	50
Canada	45	9	47
Poland	56,3	7	49
USA	47	9	46
France	49,5	9	43
Sweden	46,7	7	46
South Korea	-	6	52
Japan	49	7	56
India	68,9	-	52
China	77,1	-	51
Russia	**26,5**	**2**	**44,8**

Russian value is lower than expected: higher share of services?

- The employment in the informal sector is not taken into account
- **The gap** between the exponential growth of automation and the lagging processes of retraining and creating new jobs is possible (Figure below)
- "**The nescience economy** " - part of the population, not ready to participate in the processes of creating and introducing new technologies and products, not ready to compete with robots, to constant training

automation

retraining and creating new jobs
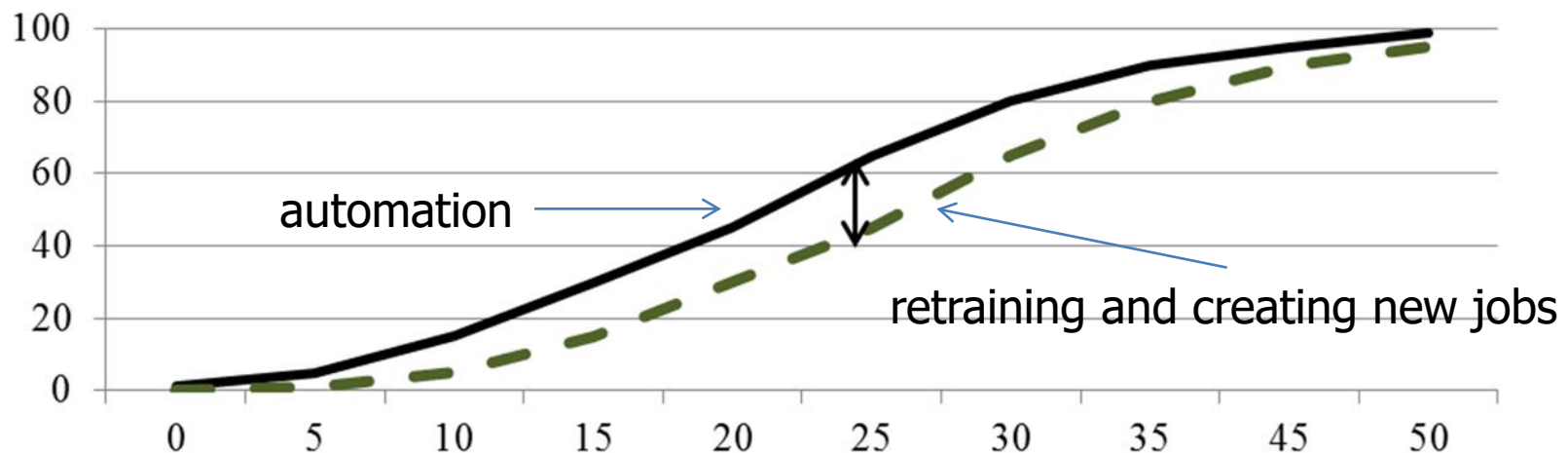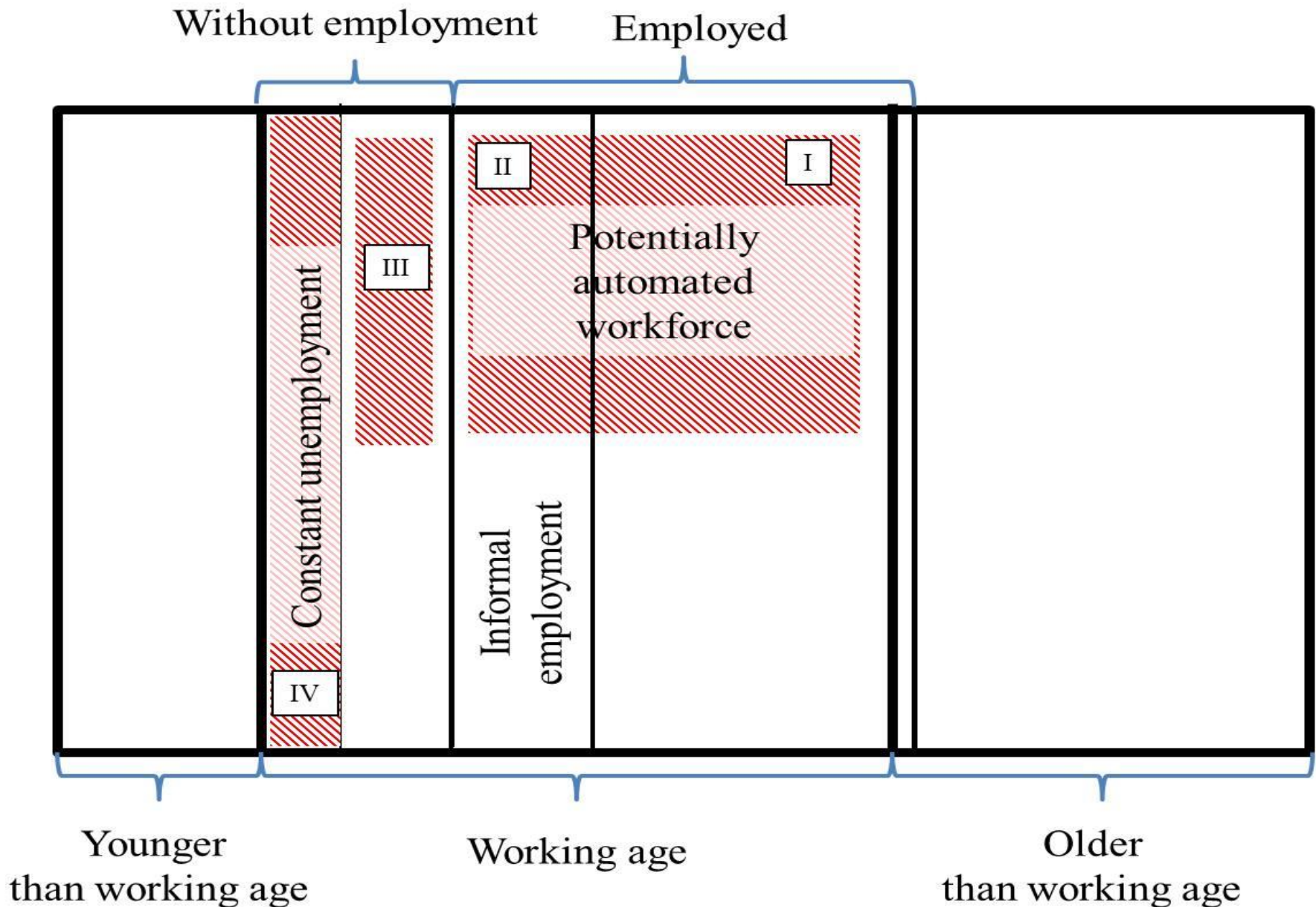
$$NSE_{i,t} = AE_{i,t} + AIE_{i,t} + ANE_{i,t} + CUE_{i,t}$$
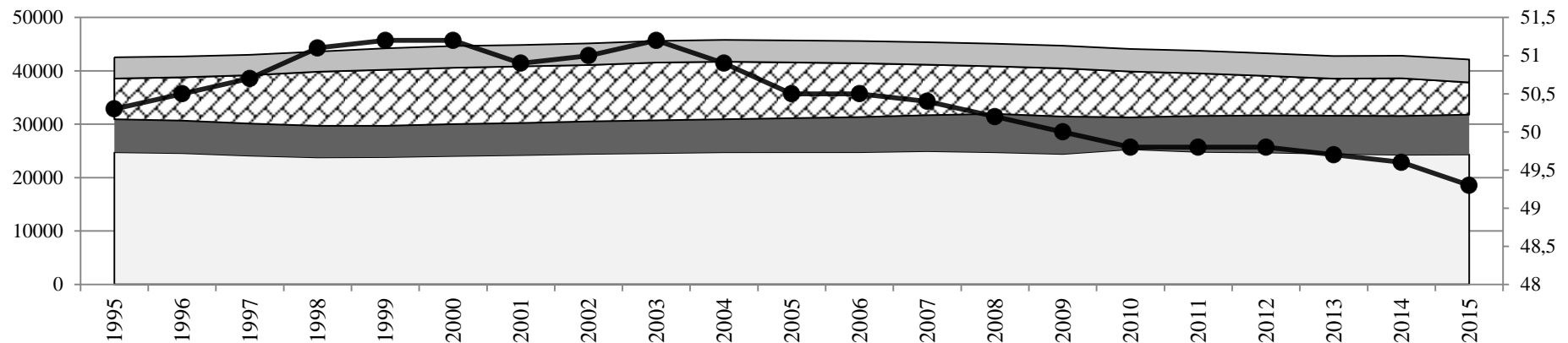
i is a region, *t* is the year

NSE - working age citizens exposed to automation processes (42.13 mln)

AE - formally employed, subject to automation (I; 24.3 mln)

AIE - employed in informal sector, subject to automation (II; 7.4 mln)

ANE - not-working citizens (do not consider themself unemployed), subject to automation (III; 6.06 mln)

CUE - the number of "permanent" unemployed (IV; 4.29 mln)

The number of permanent unemployed, thousand people

The number of unemployed, not included in the number of unemployed, subject to automation, thousand people
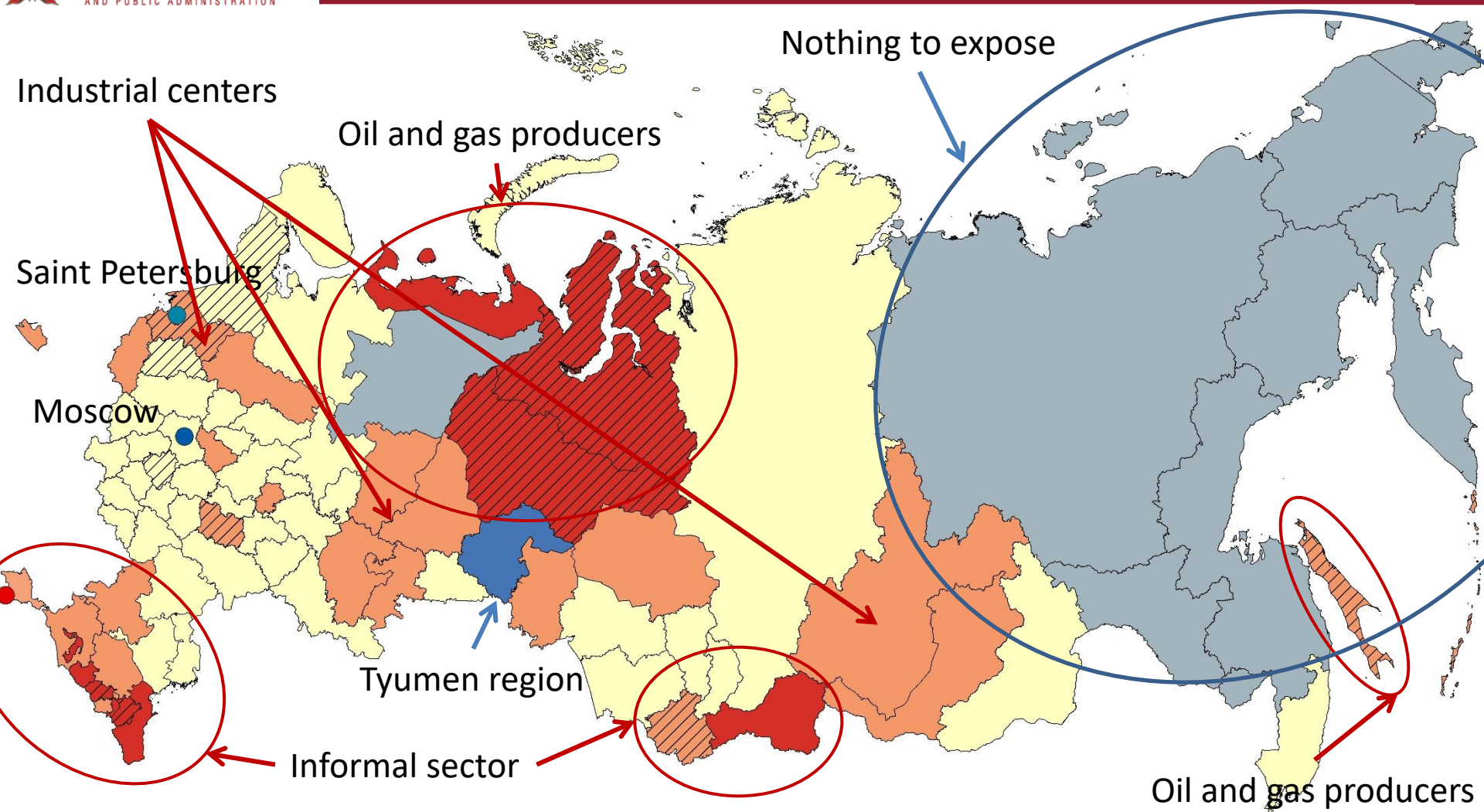
The number of informally employed, subject to automation, thousand people

Number of formally employed, subject to automation, thousand people

dNSE -the share of worcforce exposed to automation, % (right axis)

WORKFORCE EXPOSED TO AUTOMATION

Nothing to expose

Industrial centers

Oil and gas producers

Saint Petersburg

Moscow

Tyumen region

Informal sector

Oil and gas producers

Share of workforce exposed to automation (dNSE)

< 45   45 - 48   48 - 50   50 - 52   > 52

Dependent variable: share of workforce exposed to automation. FE. 2009-2015 гг.							
Constant	3,9*** (0,1)	5,34*** (0,4)	5,04*** (0,42)	5,06*** (0,41)	5,07*** (0,39)	4,8*** (0,32)	4,8*** (0,34)
Employees with higher education,%	-0,01* (0,004)	-0,002*** (0,0008)	-0,002*** (0,0005)	-0,002*** (0,0006)	-0,001** (0,0006)	-0,002** (0,0008)	-0,001* (0,0006)
Urbanization, %		-0,28*** (0,1)	-0,28*** (0,1)	-0,27*** (0,1)	-0,27*** (0,1)	-0,19** (0,07)	-0,17** (0,08)
Entrepreneurial activity	-0,01*** (0,004)						
Income		-0,02*** (0,009)					
Institutions (Crime rate)			-0,02*** (0,009)				
Firms with websites,%				-0,006** (0,003)			
Manufacturing in GRP, %					0,0005** (0,0002)		
Patent activity						-0,001** (0,0004)	
Students, %						-0,009*** (0,002)	-0,001*** (0,003)
Trade per capita						-0,013** (0,002)	-0,013*** (0,002)
Gini income index							0,048* (0,03)

- **49.3% of the working-age population** of Russia, or 42.13 million people are exposed to automation risks
- **Automation in the Russian regions is late** (cheap labor, restrictions on dismissals, etc.) - the risk of forming old-age and "old-service" regions with a set of social problems (unemployment, poverty, social exclusion), a high share of the "nescience economy", social inequlities

How to improve **regional resilience to automation**:
- ✓ creative industries (research, art, etc.) and entrepreneurship
- ✓ STEM (science, technology, engineering and mathematics)
- ✓ social interaction (social workers, teachers, psychologists, etc.)
- ✓ changing conditions (emergency workers)
- ✓ responsibility and management
- ✓ mentoring (mentors, clergymen, coaches, etc.)

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THANK YOU FOR YOUR ATTENTION

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