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**New approach for aggregated labor
productivity comparisons: accounting
for structural differences.
The Russian regions case**

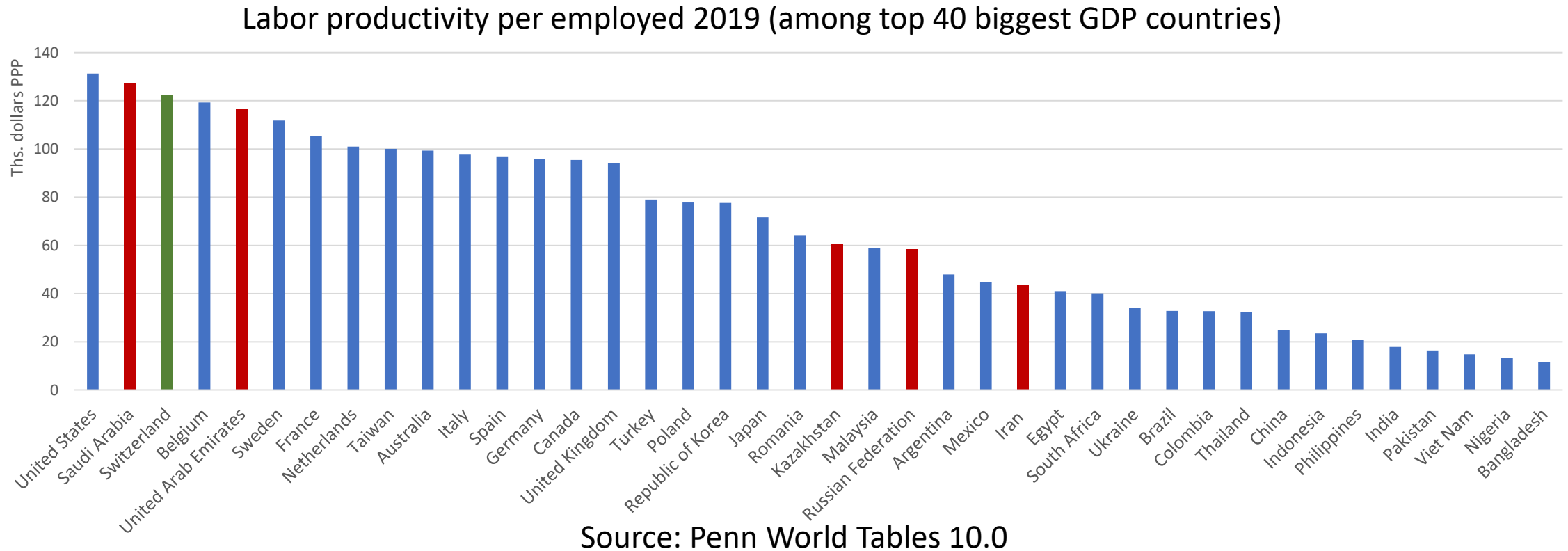
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Introduction

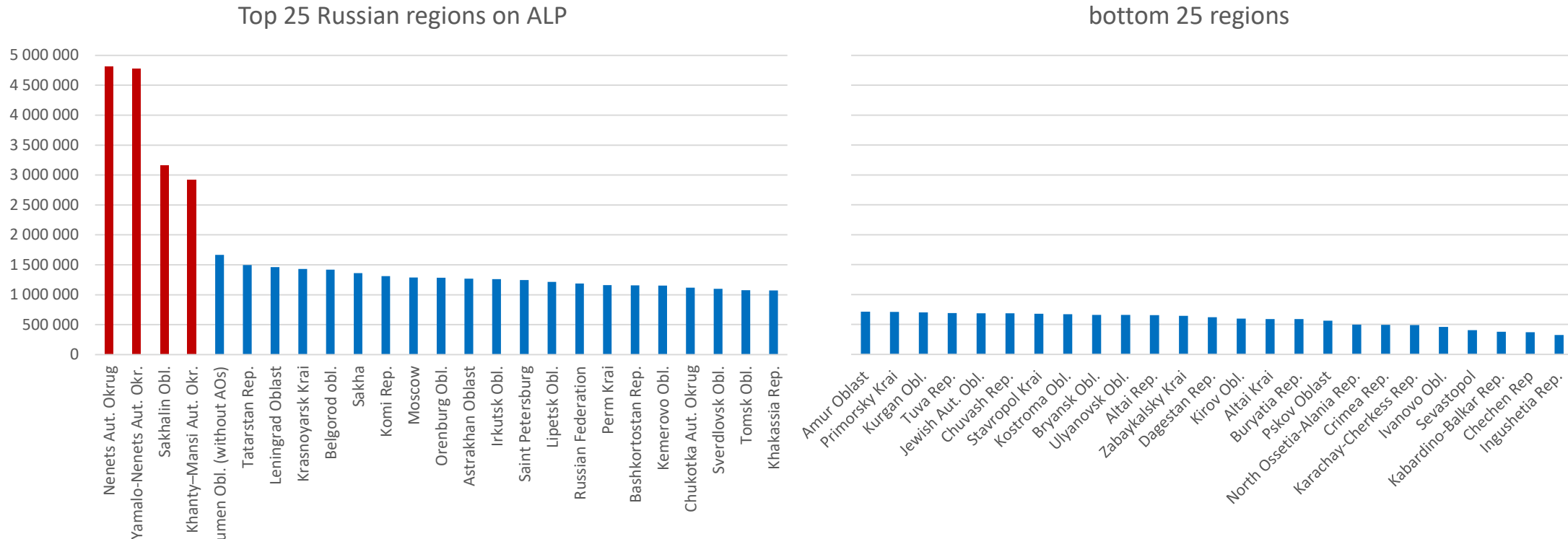
International and interregional comparisons on whole economy level – does it make any sense? (1)



- Do really Saudi Arabia or Arab Emirates have the same economic efficiency as US, Sweden or France?

Introduction

International and interregional comparisons on whole economy level – does it make any sense? (2)

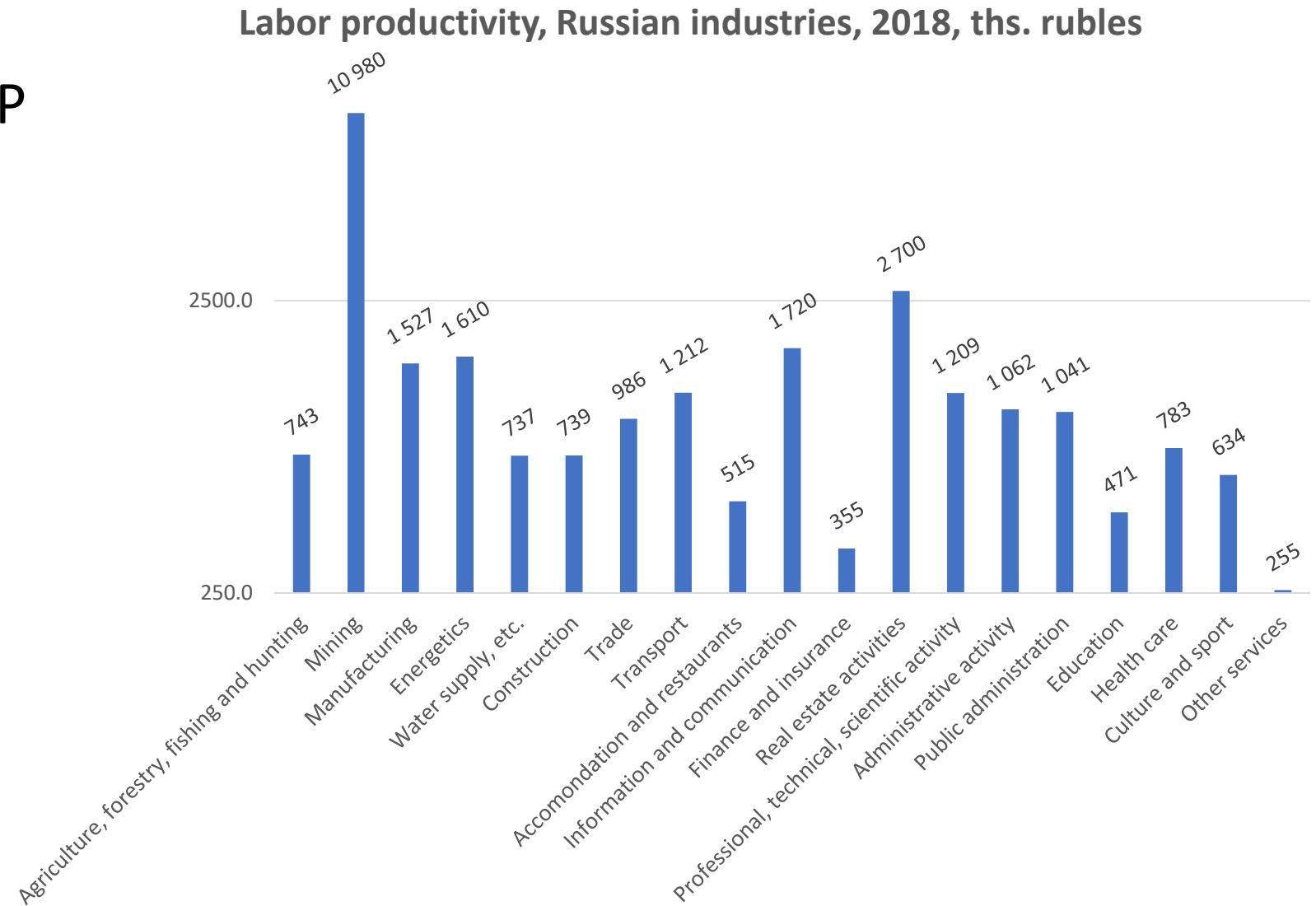


Source: calculations based on Rosstat data

- Regions with resource specialization have higher LP, while regions with agricultural specialization have smaller LP
- Economic structure plays significant defines LP levels.
- Comparisons based on traditional approach to LP estimation are biased due to different specialization of economies. It shows not the whole economy economic efficiency, but efficiency of dominating industries. So using traditional approach we can not obtain correct and precise picture of economic efficiency between countries and regions within single country.

Reasons of biased rankings

- Industrial differences in LP
- Different structural differences



Research questions

- How to deal with the bias in ALP comparisons caused by structural differences?
- How to correct our methodology of ALP estimation to take into account the structural differences between economies?

Literature

Different adhoc solutions to correct for structural differences:

- (Hall & Jones, 1999) proposed to completely exclude the gross added value of the resource sector from the GDP
(Caselli, 2005) criticizes this approach. Following this logic, we should to exclude the agriculture, forestry, and fishing industries. However, such estimates of ALP will no longer be “aggregated”
- exclude resource rent from GDP ((Mamonov & Pestova, 2015), (Zaytsev, 2016)). Better way, but does not solve issue with different structure of non resource part of the economy
- Pen world tables and TED databases – no any correction

Russian regions evidence:

- Russian regions ALP analysis (Mikheeva, 2014, 2015), (Nagaeva, Popod`ko, 2019) – authors stress the importance of structural differences, but no correction done

No any systemic approach exists in the literature to account for structural differences between economies in ALP comparisons

Methodology (1)

Aggregated labor productivity (ALP) in the country or region $j =$

$$\frac{Y^j}{L^j} = \frac{\sum_{i=1}^N y_i^j}{L^j} = \frac{\sum_{i=1}^N \left(\frac{y_i^j * l_i^j}{l_i^j} \right)}{L^j} = \frac{\sum_{i=1}^N Lp_i^j * l_i^j}{L} = \sum_{i=1}^N Lp_i^j * w_i^j$$

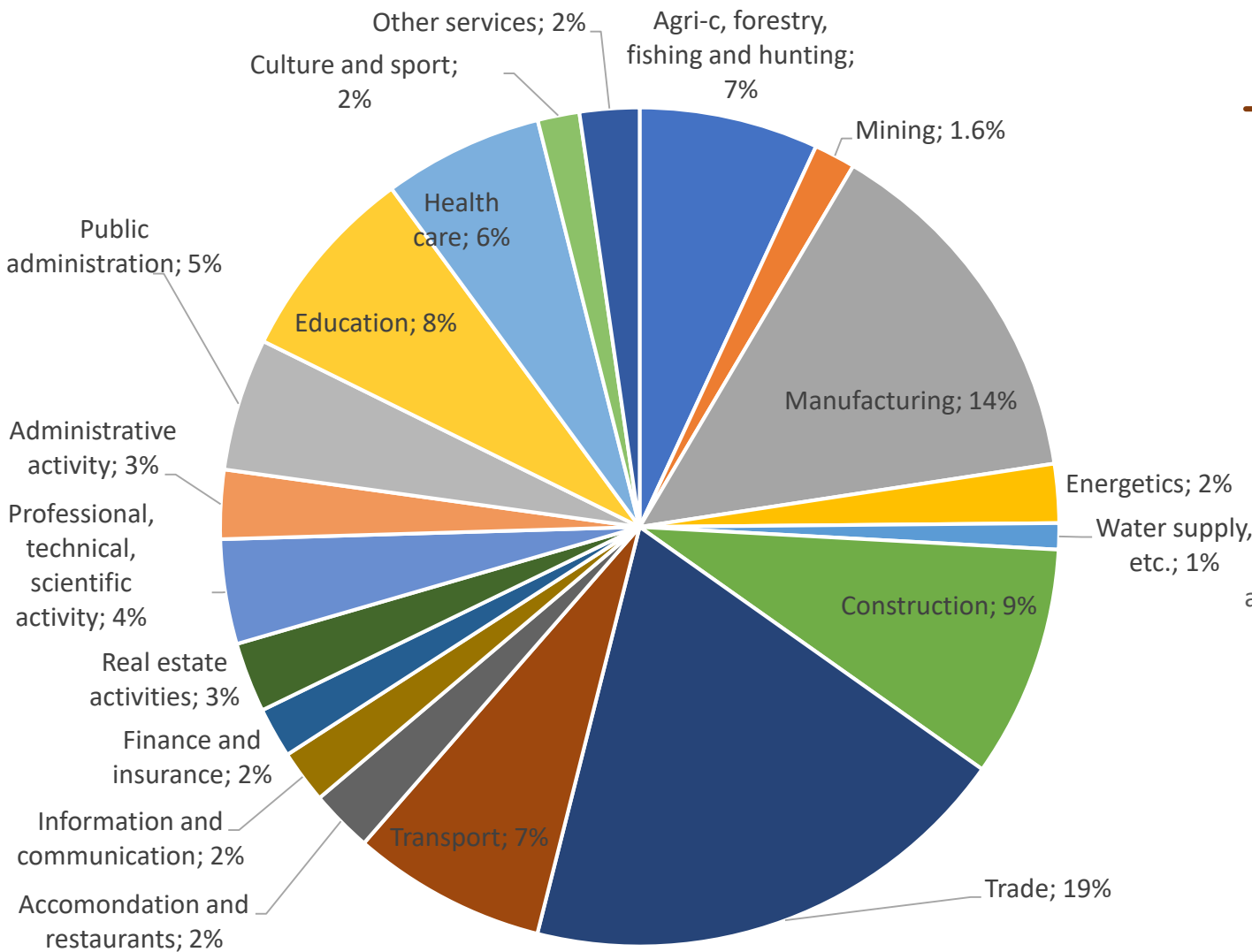
Industrial labor productivity $Lp_i = \frac{y_i^j}{l_i^j}$

- $\sum_{i=1}^N w_i^j = 1$
- i - industry index, j - country (region) index.
- Y - GDP (GRP) of the country (region)
- L is the number of people employed in the economy as a whole
- y_i - gross value added of industry i
- l_i - number of people employed in the industry i
- Lp_i - labor productivity in industry i
- w_i is the share of industry i in the total number of people employed in the economy (an indicator of the structure of the economy).
- N is the total number of industries (sectors) into which the economy is divided.

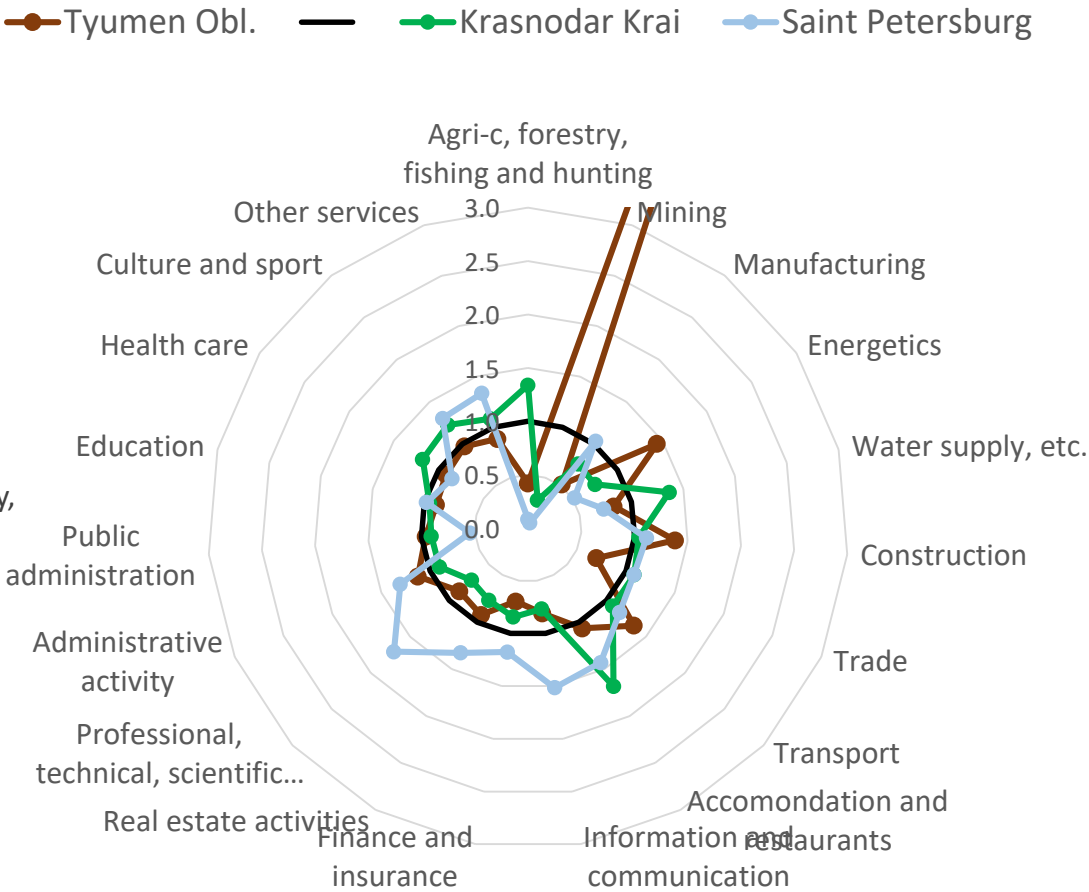
ALP depends on industrial LPs, but also on economic structure!

But labor structure is very different across Russian regions

Russian labor structure by industry, 2018



Coefficient of localization in different regions



Methodology (2)

Our idea - fix and use the same (“benchmark”) labor structure

$$\text{Aggregated labor productivity}_j = \sum_{i=1}^N Lp_i^j * \overline{w}_i$$

\overline{w}_i - fixed labor structure for each region j. We use average Russian labor structure as benchmark

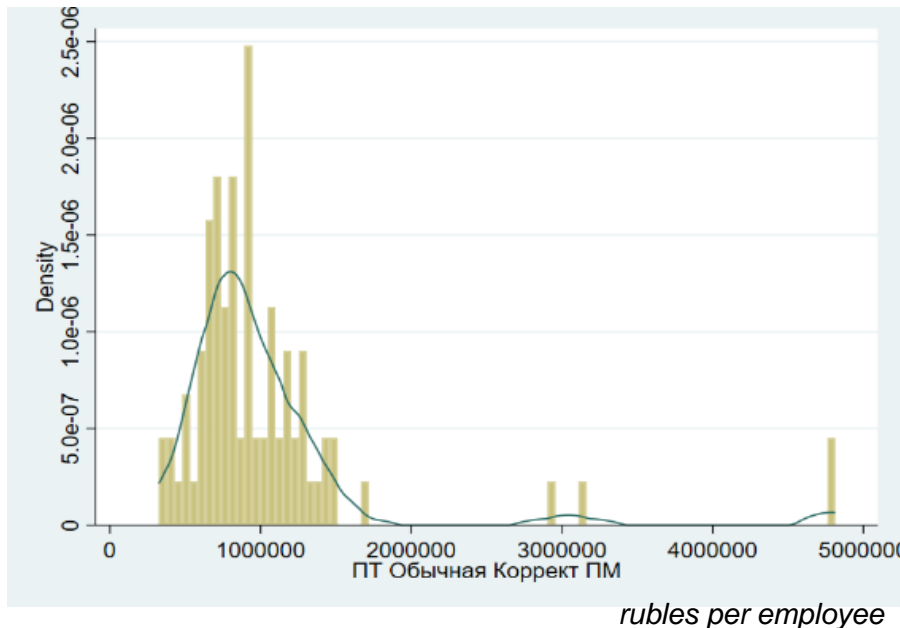
Our idea is close to approaches used in the index theory and the international comparisons program (World bank, 2014) in calculating purchasing power parities

Data

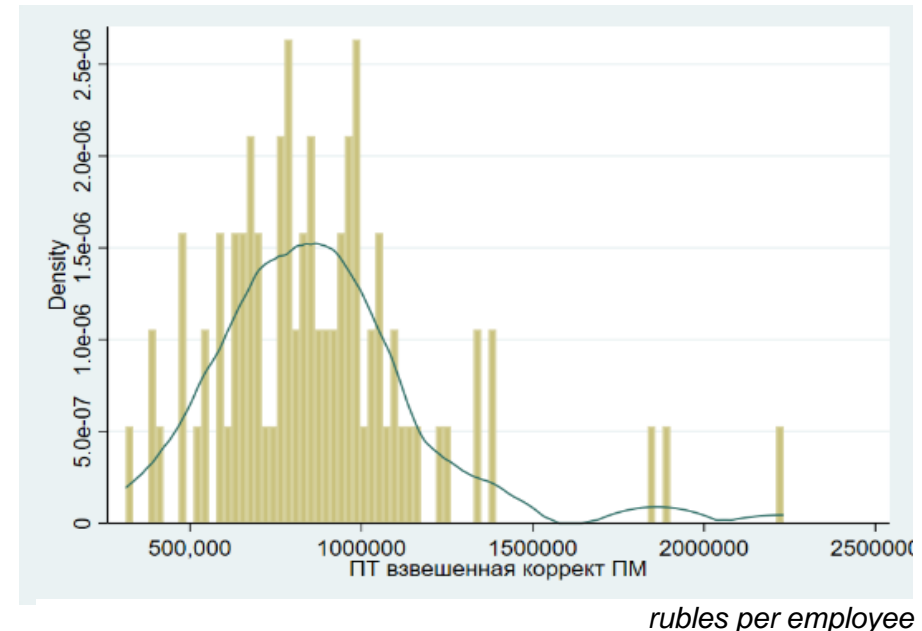
- Data on industrial GVA and employment on 85 Russian regions
- 2018 year
- 19 industries
- Source of data: official Rosstat data

Weighed approach shows that the real gap in productivity (ALP) between the Russian regions is 2 times smaller

Traditional approach

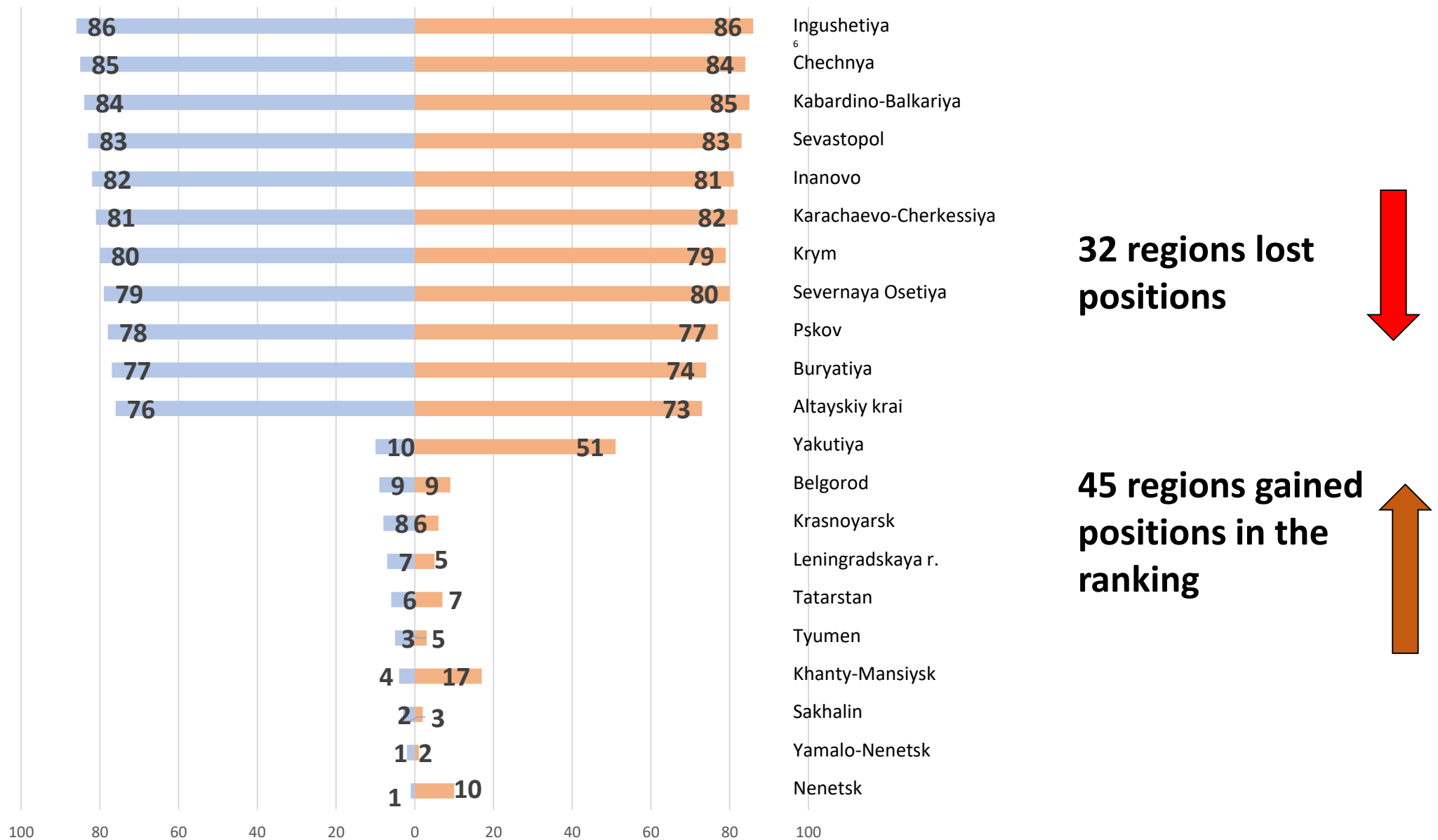


Weighted approach

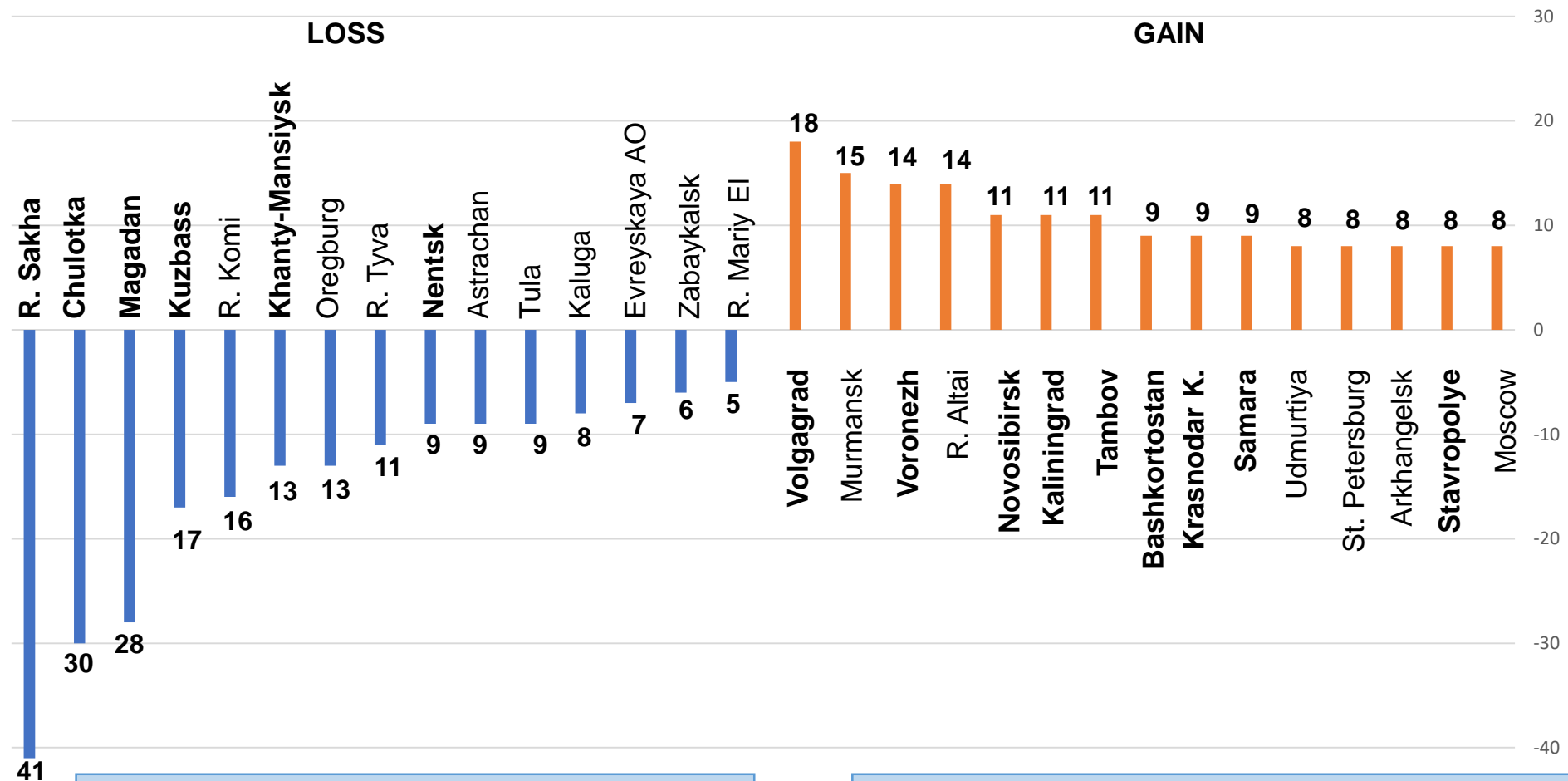


The traditional ALP of the most productive region in Russia is 15 times higher than the level of the least productive region (4813 vs. 325 thnd RUR per employee). A weighted approach reduces this gap down to 7 times (2232 vs. 312 thnd RUR per employee).

Due to changes in ALP, 77 out of 85 regions changed their positions in the Russian ranking of productivity



Regions with the strongest change in the ranking are regions with specialization in mining (loss) or agriculture (gain)



Strongest ALP decline and position loss in regions with **specialization** of the regional economy in **mining**, esp. in **oil and gas extraction**

Strongest ALP increase and position gain in 2 types of regions:

- **agricultural regions**
- regions with the **structure of employment very close** to the **structure** of those employed in the **Russian economy** as a whole

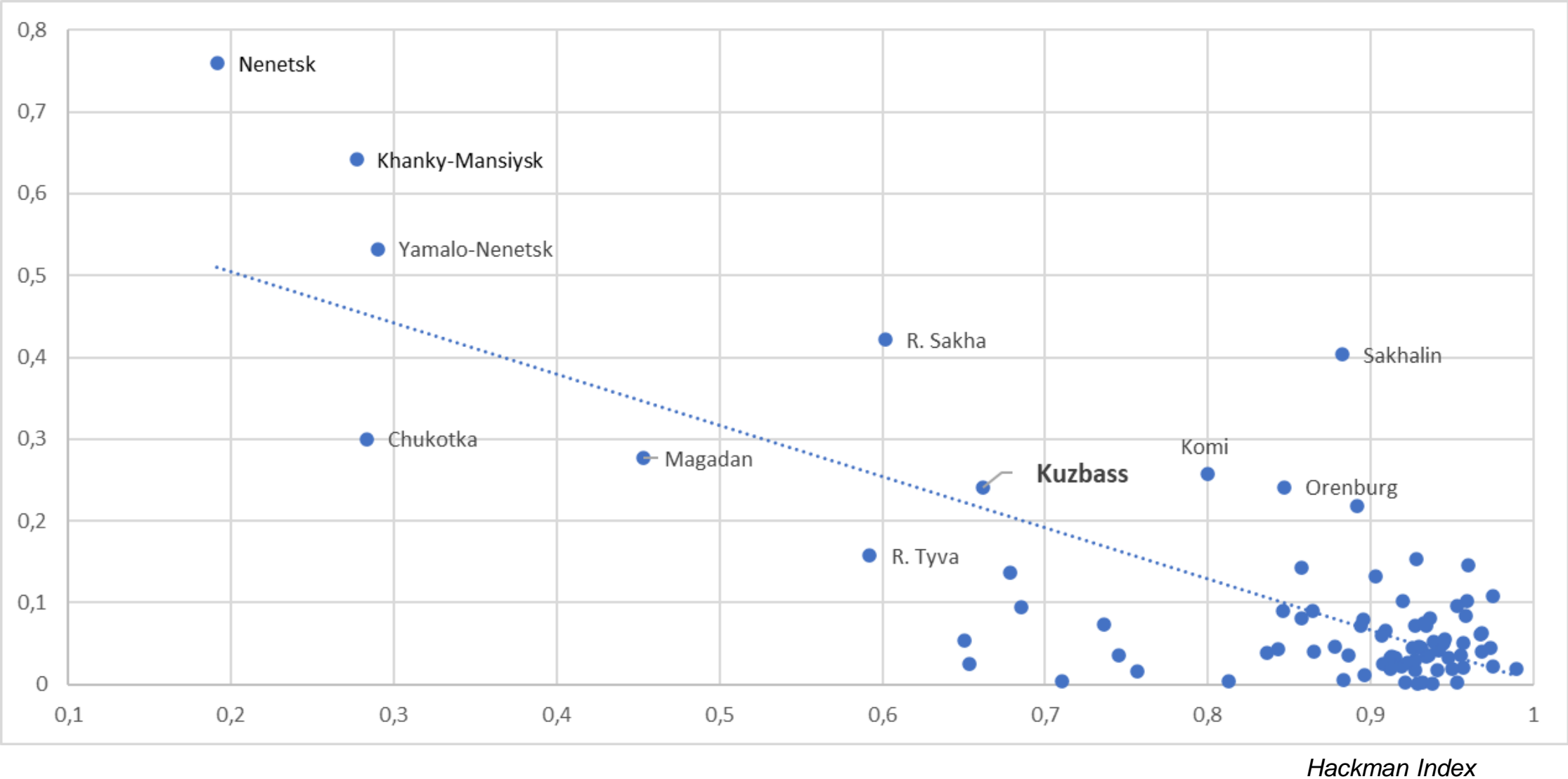
There are no significant changes in the group of Russian most productive regions

Top-10 regions (weighted approach)	Traditional ALP, RUR/empl	Weighted ALP, RUR/empl	ALP Difference %	Position in traditional ranking	Position in weighted ranking	Difference in positions
Yamalo-Nenetsk r.	4 774 173	2 232 117	-53%	2	1	1
Sakhalin r.	3 161 454	1 885 458	-40%	3	2	1
Tumen r.	1 667 803	1 837 856	10%	5	3	2
Moscow	1 288 797	1 383 264	7%	12	4	8
Leningrad r.	1 463 280	1 381 567	-6%	7	5	2
Krasnoyarsk	1 432 336	1 341 271	-6%	8	6	2
Tatarstan R.	1 496 644	1 333 947	-11%	6	7	-1
St. Petersburg	1 245 818	1 252 275	1%	16	8	8
Belgorod r.	1 419 653	1 232 314	-13%	9	9	0
Nenetskiy AR	4 812 895	1 155 786	-76%	1	10	-9

- **8 regions** out of **traditional TOP-10** stayed in our approach in the **leading group**
- **2 new regions** entered the leading group – **Moscow** and **St-Petersburg**.
 - *Moscow thanks to its high productivity in a manufacturing sector.*
 - *Petersburg primarily thanks to an extraction industry and public administration, where the city has less employees and high productivity than the Russian average.*

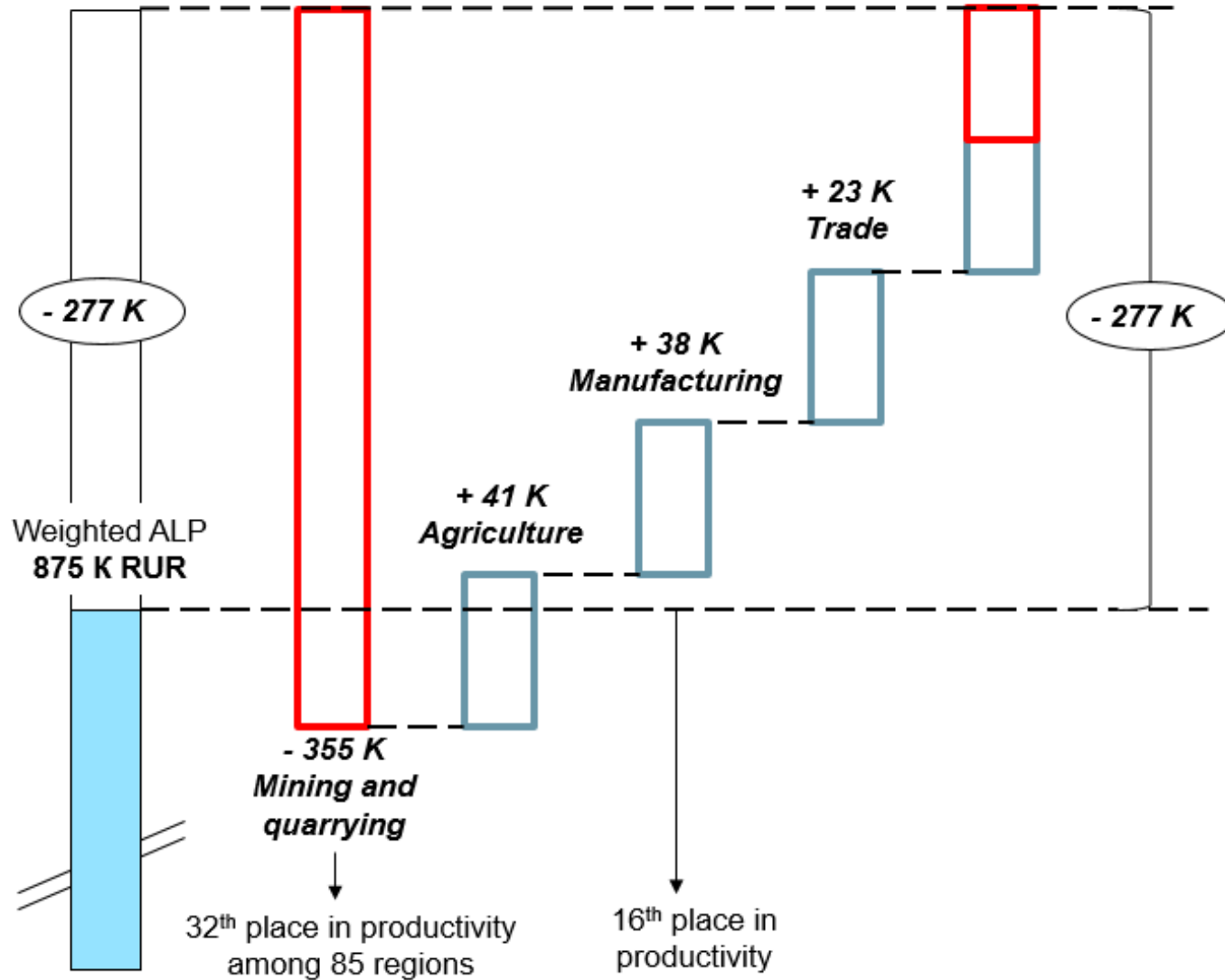
The change in the ALP depends on the distance between the region's industrial structure of employed and the Russian structure

ALP change, [%]



The case of Kuzbass

Traditional ALP
1 152 K RUR



The **sectoral contribution** to the the adjustment of the region's productivity can be either **positive** or **negative**

The **size of the sectors' contribution** depends on **two factors**:

- **Difference** between the **share of employed** in the industry in the region and **share of employed** in the same industry in Russia
- **Level of the region's productivity** in a given industry: the higher it is, the stronger the industry's contribution to the adjustment of the traditional PT

Summary of results

- The **real gap** in productivity between the Russian regions is **2 times smaller**
- 77 out of 85 **regions changed their positions** in the Russian productivity ranking – the role of some regions in generating country's ALP has changed
- Regions with the **strongest change** in the ALP and Ranking are **regions that specialize** in a particular industry
- The **change** in the productivity **depends on the distance** between the **region's industrial structure of employed** and the Russian structure
- ALP adjustment depends on the **industrial inputs**, that can be positive or negative. The **contribution size** of a particular industry depends on the region's **share of employed** and **level of the region's productivity** in it

Thank you!!!

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TFP levels, 2017

