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COVID-19 RESTRICTIONS, POLICY MEASURES AND TRANSPORT SECTOR IN LATVIA: IO ANALYSIS OF MOST EXTREME SHOCKS

27th INFORUM World conference
(11.-13.10.2021.)

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13.10.2021.

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Introduction

- **COVID-19 policy and society safety measures** have caused **both negative and positive challenges** for the transport sector.
- Economic impact of COVID-19 has received **a lot of research attention**.
- A number of recent studies have examined various aspects of COVID-19 era restrictions, limitations, policies, direct and side effects and various impacts, including economic impacts. Considerable research attention has been directed towards COVID-19 impact on supply-chains, transport, logistics, delivery organisation and management.

Introduction

- The recent findings outline new challenges that include both **negative** (restrictions, risks, additional costs, lock-downs etc.) and **positive** (unexpected booming of niche industries, as courier services, online services, take-away food deliveries etc.) activities.
- The **aim of the research** is to model an **impact of the most extreme** shocks that transport sector encounter during the COVID-19 era **on the economy and regional development.**
- Urban-rural income inequality

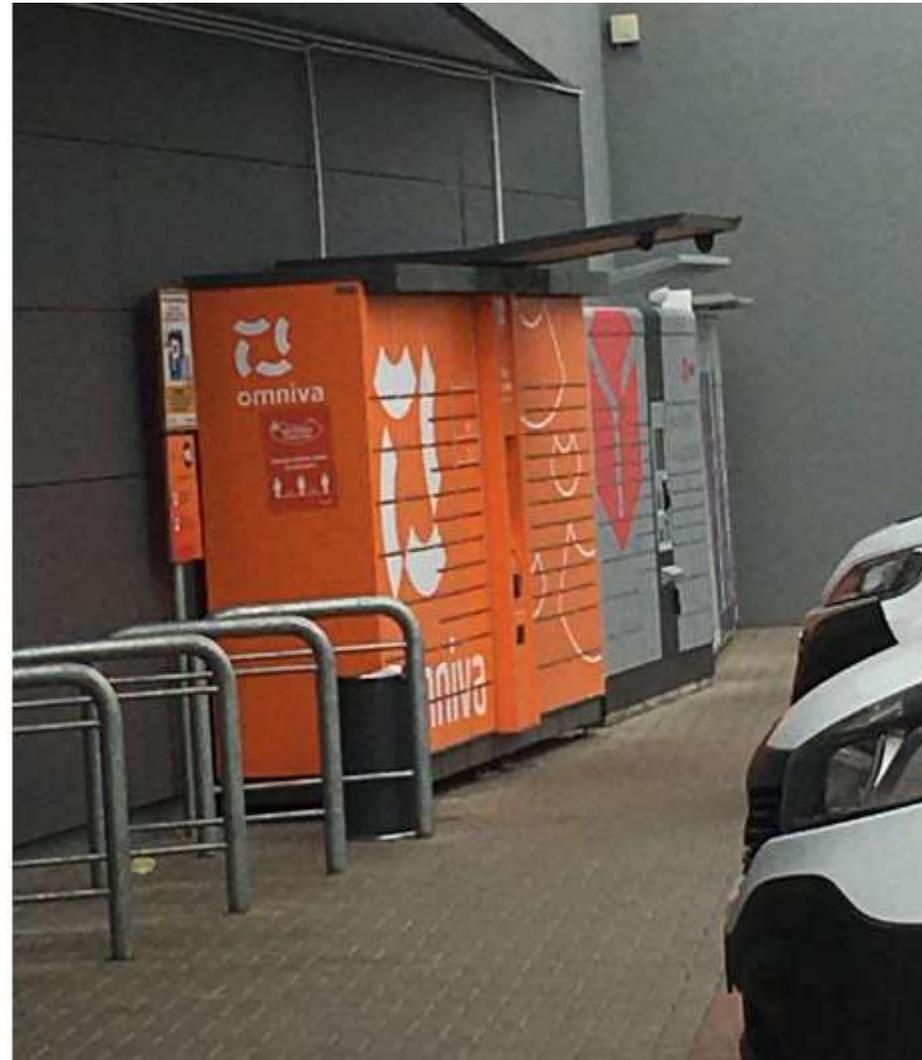
Introduction

A comparative-static approach that involves an **input-output model** with **additional regional modelling block** and **scenarios** are applied.

Two scenarios are estimated for Latvia's economy:

- **firstly**, extremely dramatic decline in demand on air transport services by 90%;
- **secondly**, unexpected increase in demand for postal and courier services that tripled the output.

- Super fast-growing **parcel terminal services**: no face-to-face (as in the post office), around the clock in any weather 24/7; sms etc.



Materials and Methods

- In the research, the high level of sectoral disaggregation of the economy is used that is based on the classification of economic activity (NACE) Rev.2, that **subdivides** the economic activity **into 64 industries**. IO table of 2015 (Eurostat).
- Transport is classified according to H industry that consists of 5 branches: Land transport and transport via pipelines (NACE code H49), water transport (H50), air transport (51), warehousing and support activities for transportation (H52), and postal and courier activities (H52).
- In result, the elaborated **input-output model** computes the results for **64 economic activities**.
- All calculations performed in MS Excel.

Materials and Methods

In order to reveal various aspects and observe the phenomena from different perspectives the **regional development** is analysed and modelled by two approaches.

- **Firstly**, regional development is analysed according to **NUTS3** level. Latvia is subdivided into six regions according to NUTS 3 level: **Riga, Pieriga, Kurzeme, Zemgale, Vidzeme, and Latgale**.
- **Secondly**, the **urban-rural typology** of Eurostat (Eurostat, 2018) is applied that classify regions into: **predominantly urban regions, intermediate regions, predominantly rural regions**.
- The computed values are aggregated into 10 major NACE groups (NACE codes: A, B-E, F, G-I, J, K, L, M-N, O-Q, R-U) for the regional development

Regional perspective – perspective no 1

Economic activity – modelling results - > aggregated from 64 to 10 industries
*vector of (10 *1)

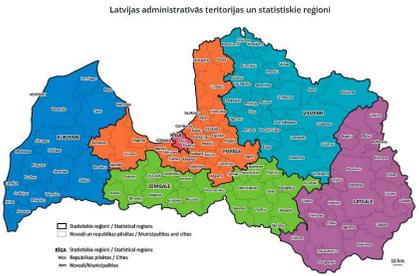


From statistics: Economic activity (10 industries (sectors)) allocation NUTS3 by 6 region (shares)
*10 vectors (1*6)

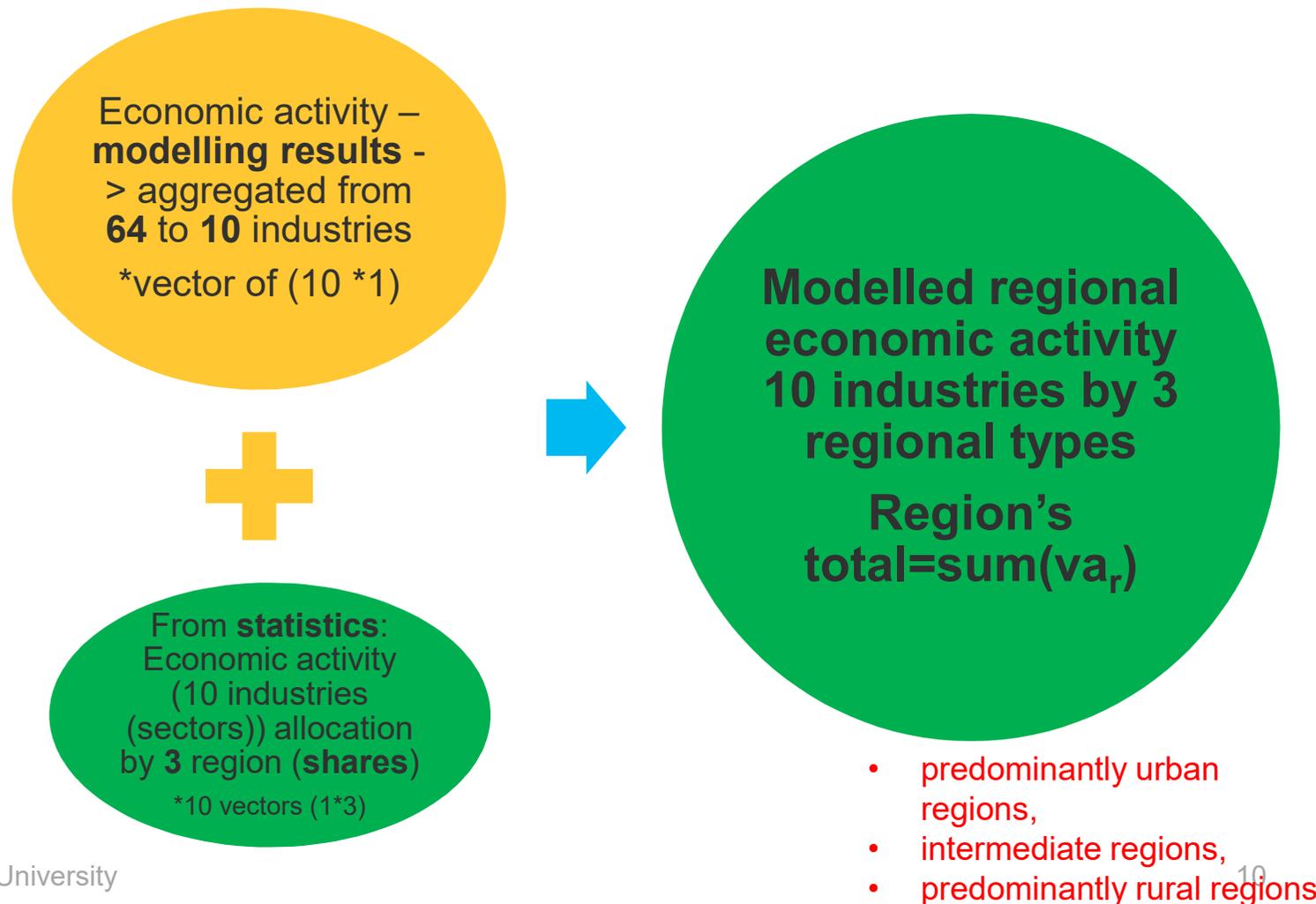


Modelled regional economic activity 10 industries by 6 regions
Region's total=sum(va_s)

- Riga,
- Pierīga,
- Kurzeme,
- Zemgale,
- Vidzeme,
- Latgale



Regional perspective – perspective no 2



Materials and Methods

- The research is based on the EU data and Eurostat classification. The research period is **2015-2020** (or till latest statistics available). The research uses the latest available **symmetric input-output (product-to-product) table of 2015** that is actually a set of tables, including domestic input-output and import input-output tables.
- The impact of sectoral shocks is modelled as **the scenario analysis** applying **input-output model**. In this research, the impact and the so-called **what-if scenarios** are evaluated in **short term** and **medium term** hence **technological coefficients are constant**. The what-if scenarios allow to estimate the quantitative effect of a certain (or given) change in the economy.
- The elaborated input-output model includes the basic identities that ensure the equilibrium in the economy and additional regional development modelling block.

Materials and Methods

The modelling process includes several stages:

- firstly, the direct and indirect impact modelling using main input-output model, obtaining results for 64 economic activities.
- Secondly, the values are aggregated into 10 major NACE groups (NACE codes: A, B-E (except F), E, F, G-J, K, L, M-N, O-Q, R-U) and used for regional development modelling block – both, firstly, compute the sectoral economic activity in six regions, sum the results and obtain the certain region's totals by bottom-up approach; secondly, compute the sectoral economic activity in predominantly urban regions, intermediate regions, and predominantly rural regions, sum the results and obtain the certain area's totals by bottom-up approach.
- The research data analysis covers the whole EU, but modelling is executed on the case of one EU country - Latvia. **The method and the scenarios are applicable to the EU countries facing similar research questions.**

Results and Discussion

- In more detail, tables etc.

Transport dynamics in the EU and Latvia in 2016-2019 (value added, chain linked volumes, index 2015=100)

Industry/Time	European Union - 27 countries				Latvia			
	2016	2017	2018	2019	2016	2017	2018	2019
Total - all NACE activities	101.9	104.8	107.0	108.6	101.8	105.1	108.7	111.3
Transportation and storage	100.8	105.1	108.0	110.2	101.7	108.3	112.6	109.6
Land transport and transport via pipelines	100.3	104.4	106.8	:	102.3	110.9	106.1	:
Water transport	104	107.4	110.2	:	95.0	91.7	85.5	:
Air transport*	103.2	114.7	127.1	:	123.9	153.9	185.3	:
Warehousing and support activities for transportation	101.3	105.9	108.9	:	94.8	95.5	97.9	:
Postal and courier activities	97.8	97.3	95.7	:	95.3	98.9	108.6	:

Data Source: Eurostat (updated 13.10.2021.)

: no data available; * For Latvia, the data on output dynamics are given due to classification updates and observable breaks in series.

To model the impact of sectoral shocks caused by policy and safety measures in COVID-19 era, evaluating the macroeconomic, sectoral and regional perspective, two comparative-static scenarios are estimated taking into account the above-detected trends and assumptions (based on data analysed) in Latvia's economy:

First scenario:

- **air transport** services (NACE code H51) experience a dramatic final **demand decrease by 90%** (due to policy measures and flight restrictions), it is assumed that the general consumption pattern and routine is constant as **it is an unexpected short-term shock with unknown length of impact**.
- The **society** believes that it will **soon be over**. The other indicators (as regional allocation of economic activity by NUTS 3 level and economic activity by urbanisation of area etc.) are unchanged – *ceteris paribus*.
- This scenario involves computing the impact on shocked industry, computing direct and indirect impact on other industries (64 industries), on the basis of computed sectoral development results, the impact on six regions (NUTS 3 level) is computed, how it has affected the economic activity in cities, towns, suburbs, and rural areas.
- The scenario illustrates the **impact** of collapse of one industry on the rest of the economy in different perspectives **without government compensation mechanisms** or support programs;

Modelling results of the first scenario representing sectoral output change (%)

NACE/CPA CODE	Product or service	Impact
N77	Rental and leasing services	-11.6%
N78	Employment services	-9.7%
C30	Other transport equipment	-7.0%
H52	Warehousing and support services for transportation	-6.8%
C22	Rubber and plastic products	-5.4%
N79	Travel agency, tour operator and other reservation services and related services	-5.3%
C20	Chemicals and chemical products	-3.3%
J62 63	Computer programming, consultancy and related services; Information services	-3.0%
C24	Basic metals	-2.5%

The results of the first scenario argue that the service sector is influenced more than manufacturing due to air transport collapse –rental and leasing services (-11.6%), employment services (-9.7%), other transport services (-7.0%), impact on manufacturing is relatively minor and only on certain branches.

To model the impact of sectoral shocks caused by policy and safety measures in COVID-19 era, evaluating the macroeconomic, sectoral and regional perspective, two comparative-static scenarios are estimated taking into account the above-detected trends and assumptions (based on data analysed) in Latvia's economy:

Second scenario:

- Output of **postal and courier services** (NACE code H53) **tripled** due to the government restrictions and safety measures regarding shops, markets etc. and **households and business tend to maintain the consumption pattern** as used, consume the goods (including food and beverages, materials, electronics etc.) but **buy more goods online** (or use other distance shopping options) with delivery. The courier services and pickup point services experience overload.
- However, it is an **unexpected short-term shock with unknown length of impact** for both economic actors – households and courier and postal service companies. At the same time, the general belief is that **it soon will be over**.
- The other indicators (as regional allocation of economic activity by NUTS 3 level and economic activity by urbanisation of area etc.) are unchanged – *ceteris paribus*. This scenario also involves computing the impact on shocked industry, computing direct and indirect impact on other industries (64 industries) and the impact on six regions (NUTS 3 level) and how it has affected the economic activity in cities, towns, suburbs, and rural areas.
- The scenario demonstrates the impact of demand increase observed in one industry on the rest of the economy in different perspectives **without additional government compensation mechanisms** or support programs. The aim is to estimate the **impact of relatively forced decisions** (caused by restrictions allowing to buy online but not in shop) **made by economic agents** on the economy.

Modelling results of the second scenario representing sectoral output change (%)

NACE/CPA CODE	Product or service	Impact
C17	Paper and paper products	3.5%
C22	Rubber and plastic products	3.2%
N77	Rental and leasing services	1.0%
H52	Warehousing and support services for transportation	0.9%
C20	Chemicals and chemical products	0.9%
N80_82	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	0.8%
J58	Publishing services	0.8%
H51	Air transport services	0.8%
M69_70	Legal and accounting services; services of head offices; management consultancy services	0.7%
J62_63	Computer programming, consultancy and related services; <u>Information services</u>	0.6%

The results of the second scenario on tripled output in postal and courier services argue that there is a positive impact, but the scale is relatively low, the most affected industries are manufacturing (of paper products (increase by 3.5%), rubber and plastic goods (3.2%)).

Next stage

Next stage includes **summing** the **64** industry results **into 10 major industries**.

- Next, the regional allocation matrices: 1) matrix of regions and 2) matrix of region types are applied to compute regional and regional typical results.
- In order to model the impact on regions; which regions are more resistant and which are more vulnerable.

Regional – dual perspective

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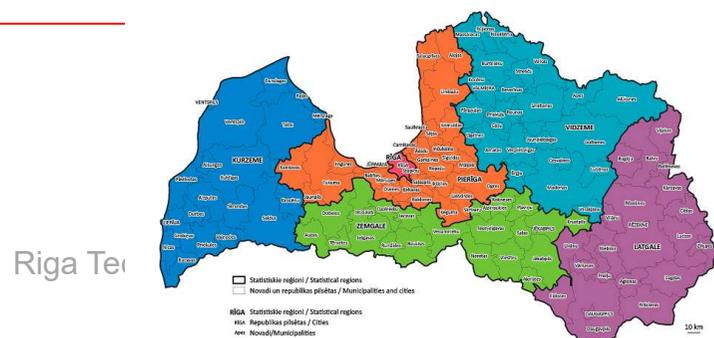
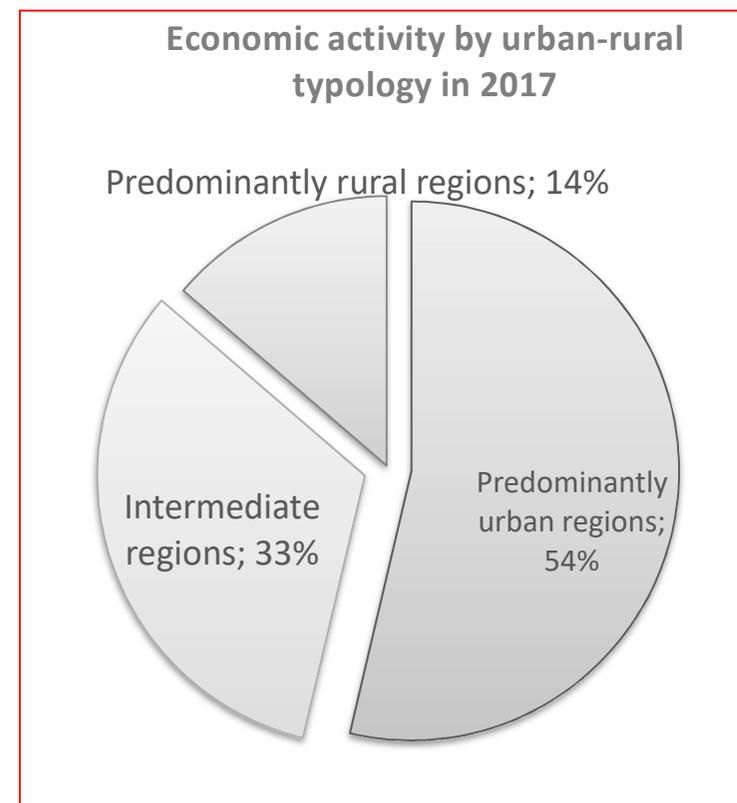
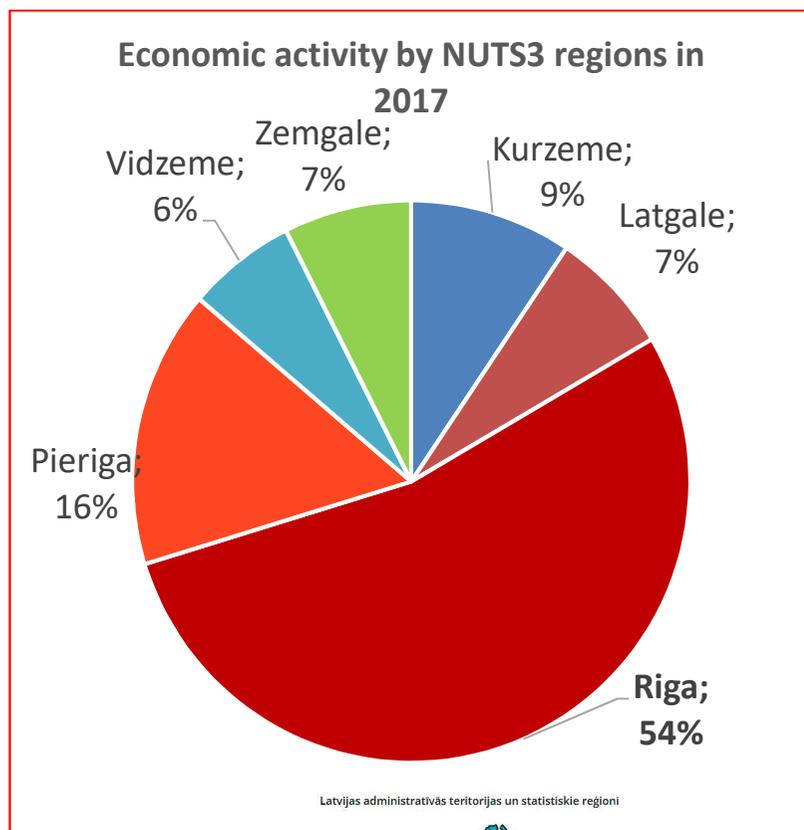
2017 COEF							
	Latvija	Kurzeme	Latgale	Rīga	Pierīga	Vidzeme	Zemgale
Total - all							
A	100%	20%	14%	8%	15%	21%	22%
B-E	100%	12%	9%	36%	22%	9%	12%
F	100%	10%	5%	56%	15%	6%	8%
G-I	100%	9%	6%	57%	18%	4%	5%
J	100%	4%	2%	85%	7%	2%	1%
K	100%	3%	2%	86%	6%	1%	2%
L	100%	10%	7%	50%	20%	6%	7%
M_N	100%	4%	3%	74%	12%	3%	4%
O-Q	100%	10%	11%	51%	12%	7%	9%
R-U	100%	8%	6%	58%	16%	6%	6%



2

TERRTYPO (Labels)		Predominanti y urban regions	Intermediate regions	Predominantly rural regions
NACE_R2 (Labels)	TOTAL			
Total - all NACE activ				
Agriculture, forestry	100%	8%	49%	43%
Industry (except con	100%	36%	43%	21%
Construction	100%	56%	30%	13%
Wholesale and retai	100%	57%	33%	10%
Information and con	100%	85%	13%	3%
Financial and insura	100%	86%	11%	3%
Real estate activitie	100%	50%	37%	13%
Professional, scient	100%	74%	19%	7%
Public administratio	100%	51%	33%	16%
Arts, entertainment	100%	58%	30%	12%

Regional snapshot in 2017



The findings confirm **that the urban areas due to higher economic activity and larger service sector are more affected** to the modelled shocks both negative and positive.

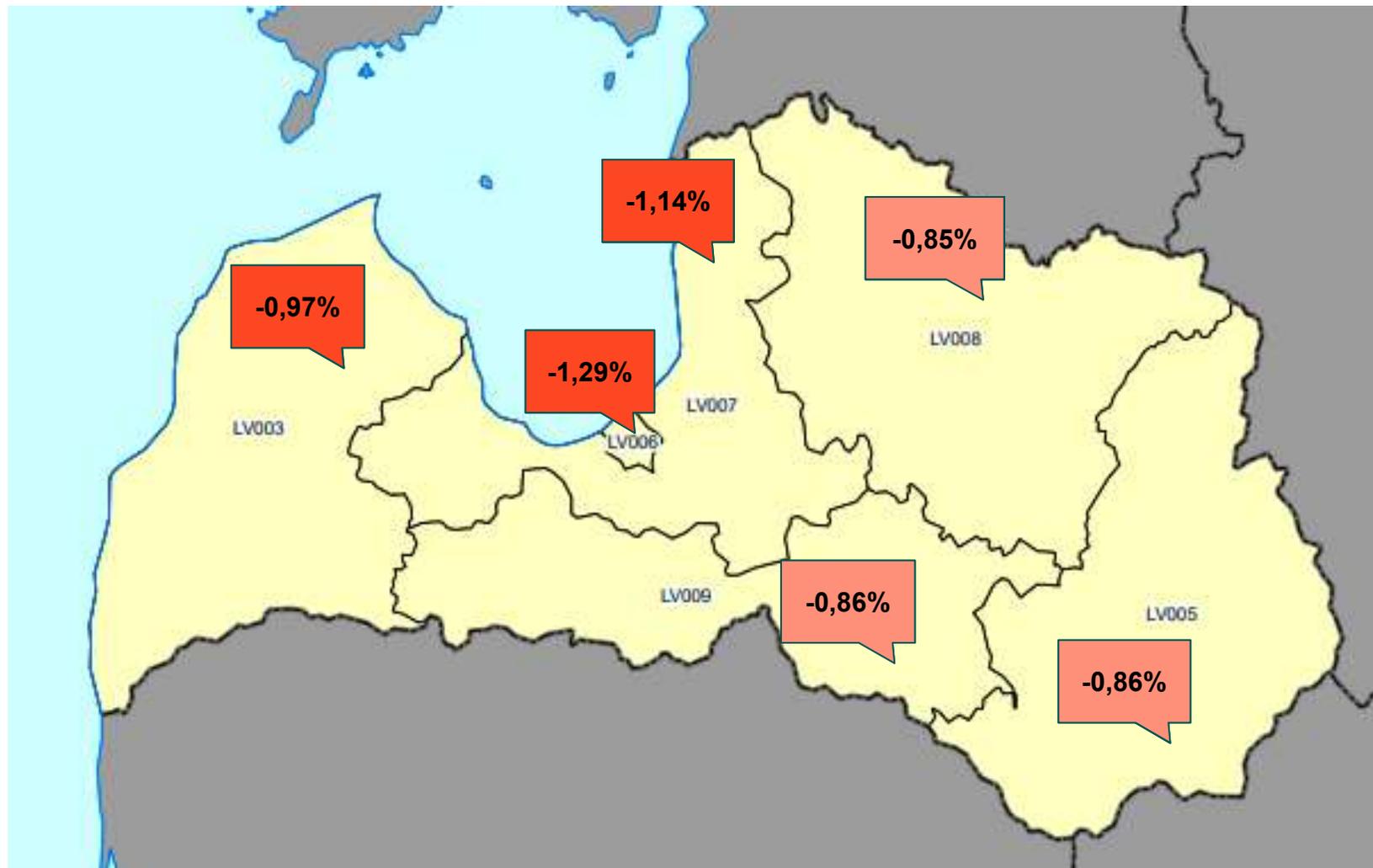
The rural areas are relatively **less negatively affected during the crisis**, but at the same time, during the recovery (for example, in the post-COVID era) it may lead to weaker economic activity and the rural areas will continue to lag behind urban areas.

Modelling results of the two scenarios representing regional output change (%)

Scenarios/NUTS3	TOTAL	Riga	Pieriga	Vidzeme	Kurzeme	Latgale	Zemgale
First scenario	-1.14%	-1.29%	-1.14%	-0.85%	-0.97%	-0.86%	-0.86%
Second scenario	0.96%	1.02%	1.06%	0.70%	0.92%	0.81%	0.73%

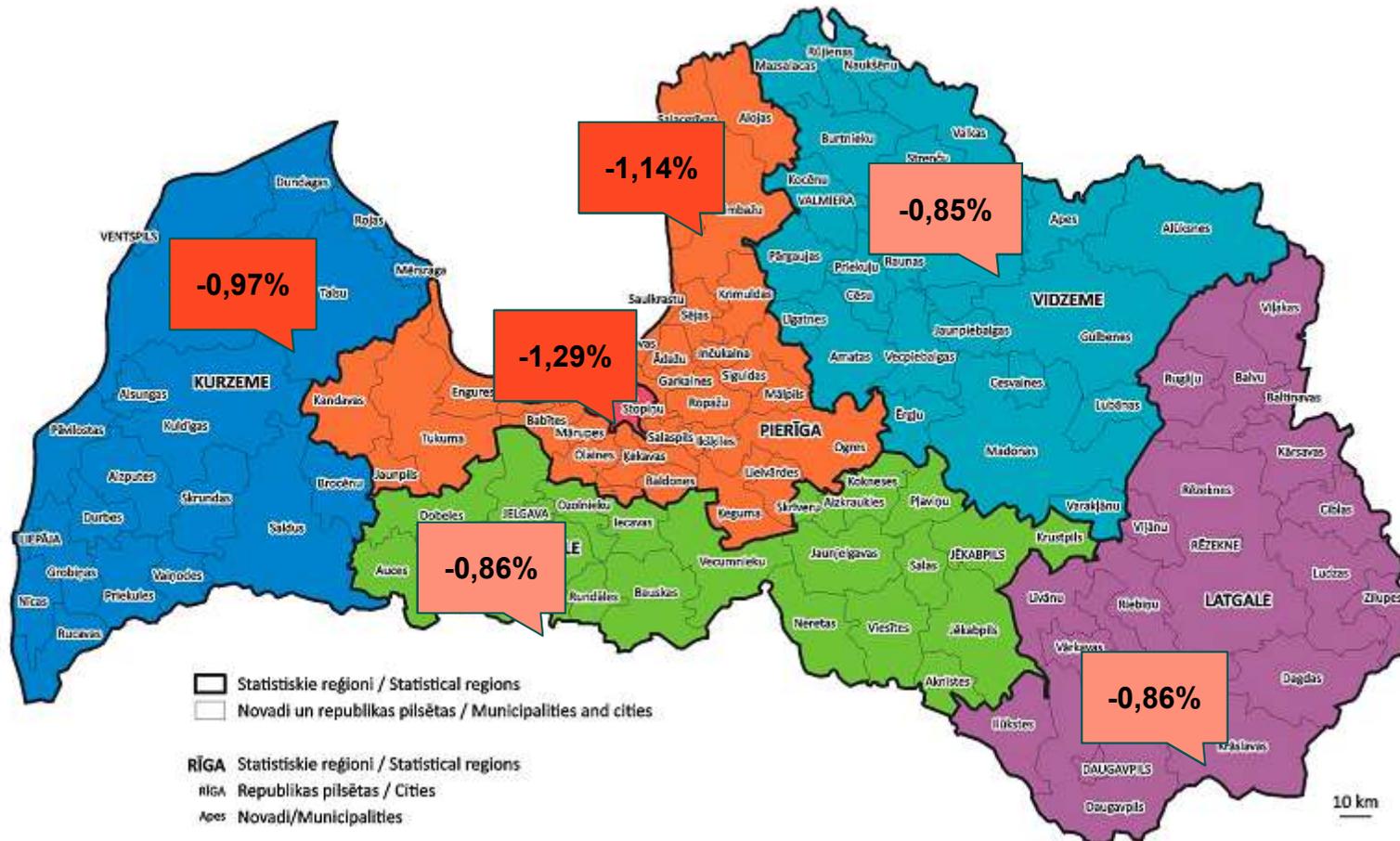


Air transport – scenario: -1.14%

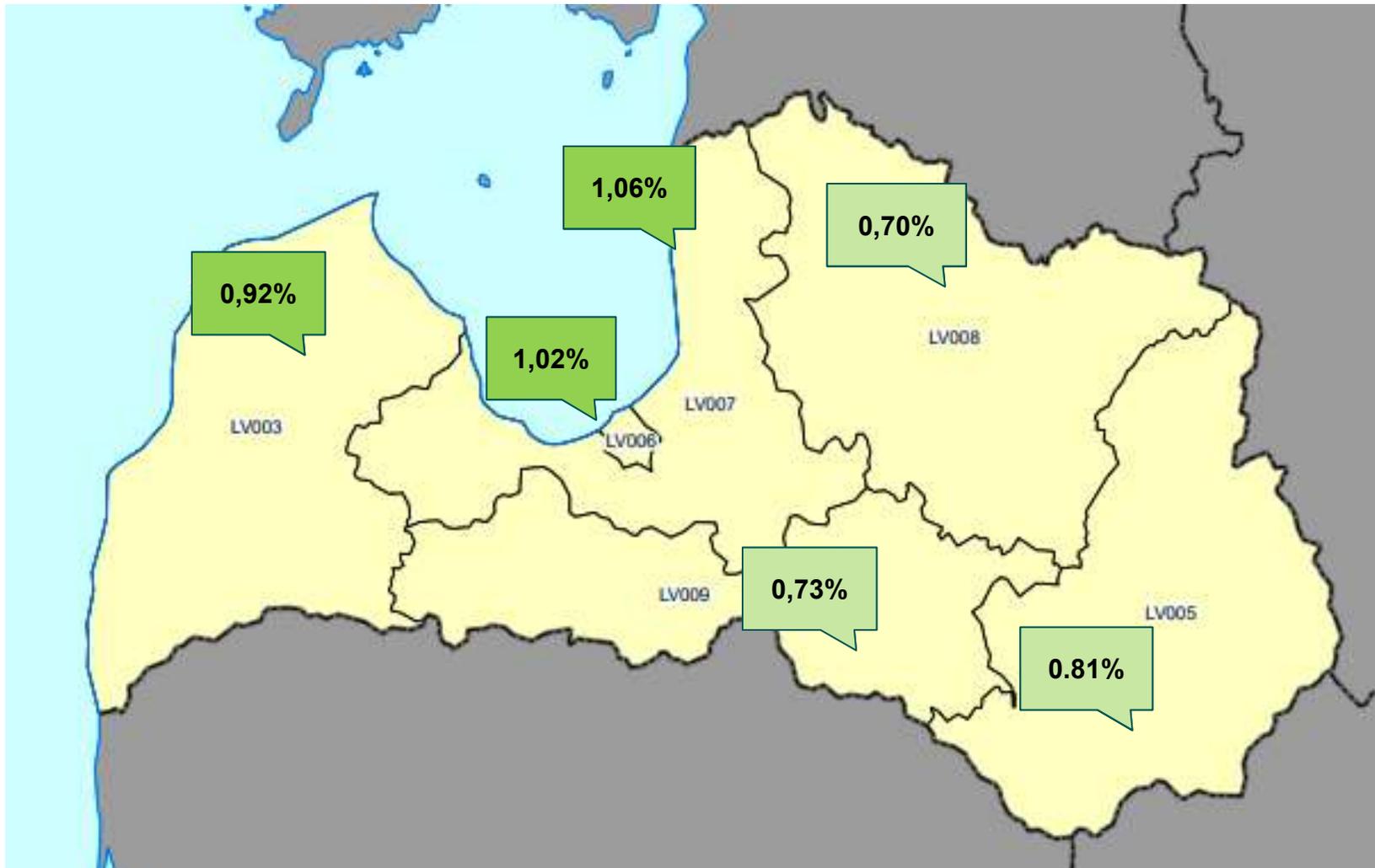


Air transport – scenario: -1.14%

Latvijas administratīvās teritorijas un statistiskie reģioni



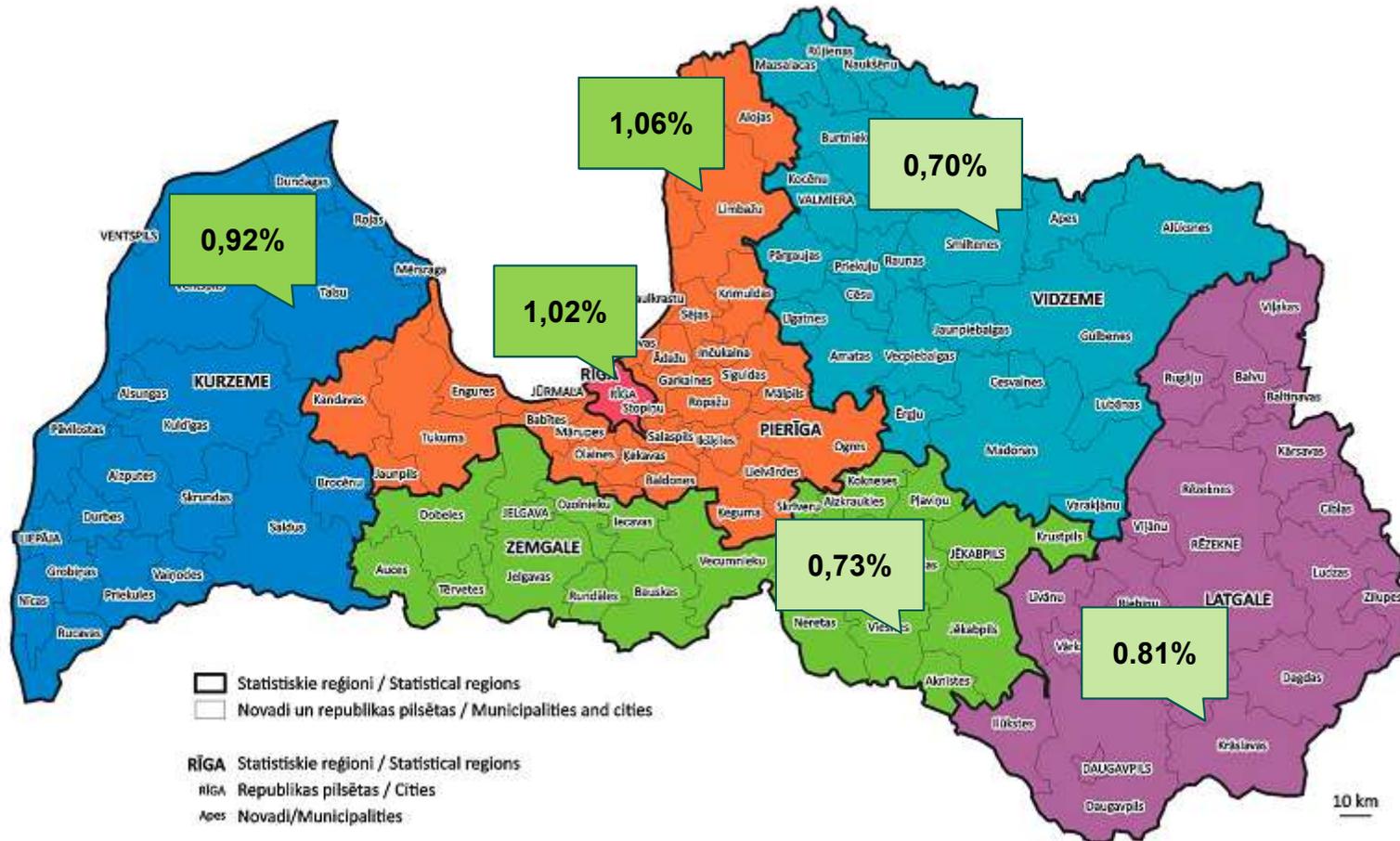
Courier services – scenario +0.96%



Courier services – scenario

+0.96%

Latvijas administratīvās teritorijas un statistiskie reģioni



Modelling results of the two scenarios representing output change in territories regarding level of urbanisation (%)

Scenarios/Territory	TOTAL	Predominantly urban regions	Intermediate regions	Predominantly rural regions
First scenario	-1.14%	-1.29%	-1.03%	-0.85%
Second scenario	0.96%	1.02%	0.97%	0.72%

Eurostat:

- **predominantly urban regions** form part of the urban-rural typology, they are NUTS level 3 regions **where more than 80 % of the population** live in urban clusters.
- **intermediate regions** form part of the urban-rural typology, they are NUTS level 3 regions where more than 50 % and up to 80 % of the population live in urban clusters.
- **predominantly rural regions** form part of the urban-rural typology, they are NUTS level 3 regions **where at least 50 % of the population** live in rural grid cells.

Conclusions

- Government policy and safety measures in transport sector caused by COVID-19 **have notable impact** on economies. Economic modelling is a power tool to estimate the impact of certain shocks and evaluate the impact on other industries, regional development, and development, for example, in rural areas etc.
- The findings demonstrate that **service industries are more affected** by both collapse in air transport (first scenario) and booming postal and courier services (second scenario), but **agriculture, most of manufacturing and energy sector** are significantly **less affected**.

Conclusions (cont)

- The results of regional modelling according to NUTS 3 level argue that the **capital city region (Riga region) and suburbs (Pieriga region) are affected more than other regions** in both modelling scenarios.
- The findings confirm that **the urban areas** due to higher economic activity and larger service sector **are more affected to shocks both negative and positive** that transport sector encounters.
- The **rural** areas are relatively **less negatively affected** during the crisis, but at the same time, during the economic recovery or some short-term economic boom (for example, **in the post-COVID era**) it may lead to weaker economic activity and the **rural areas** will continue **to lag behind** urban areas.
- This is an issue that the regional policy and economic **policy makers** are encouraged to take into account in order to ensure a **more balanced regional economic development**.

Thank You for the attention!

Contacts:

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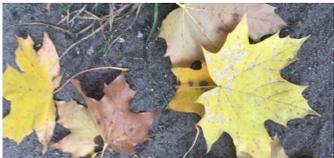


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