Geography, integration and dynamics

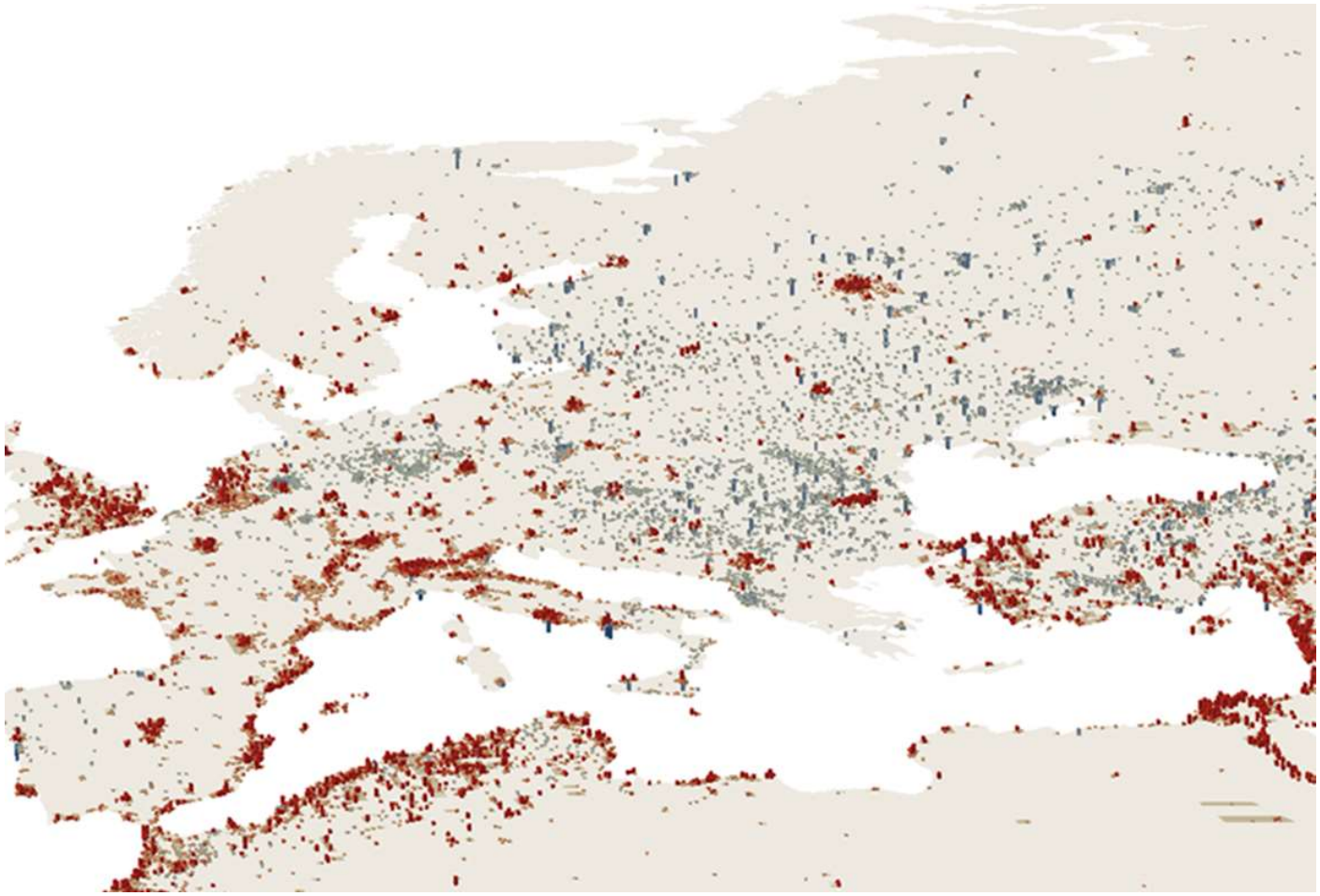
Vienna EU-EAEU Workshop

Nathaniel Young

European Bank
for Reconstruction and Development

The share of people living in sparsely populated areas, and their absolute number, decreased

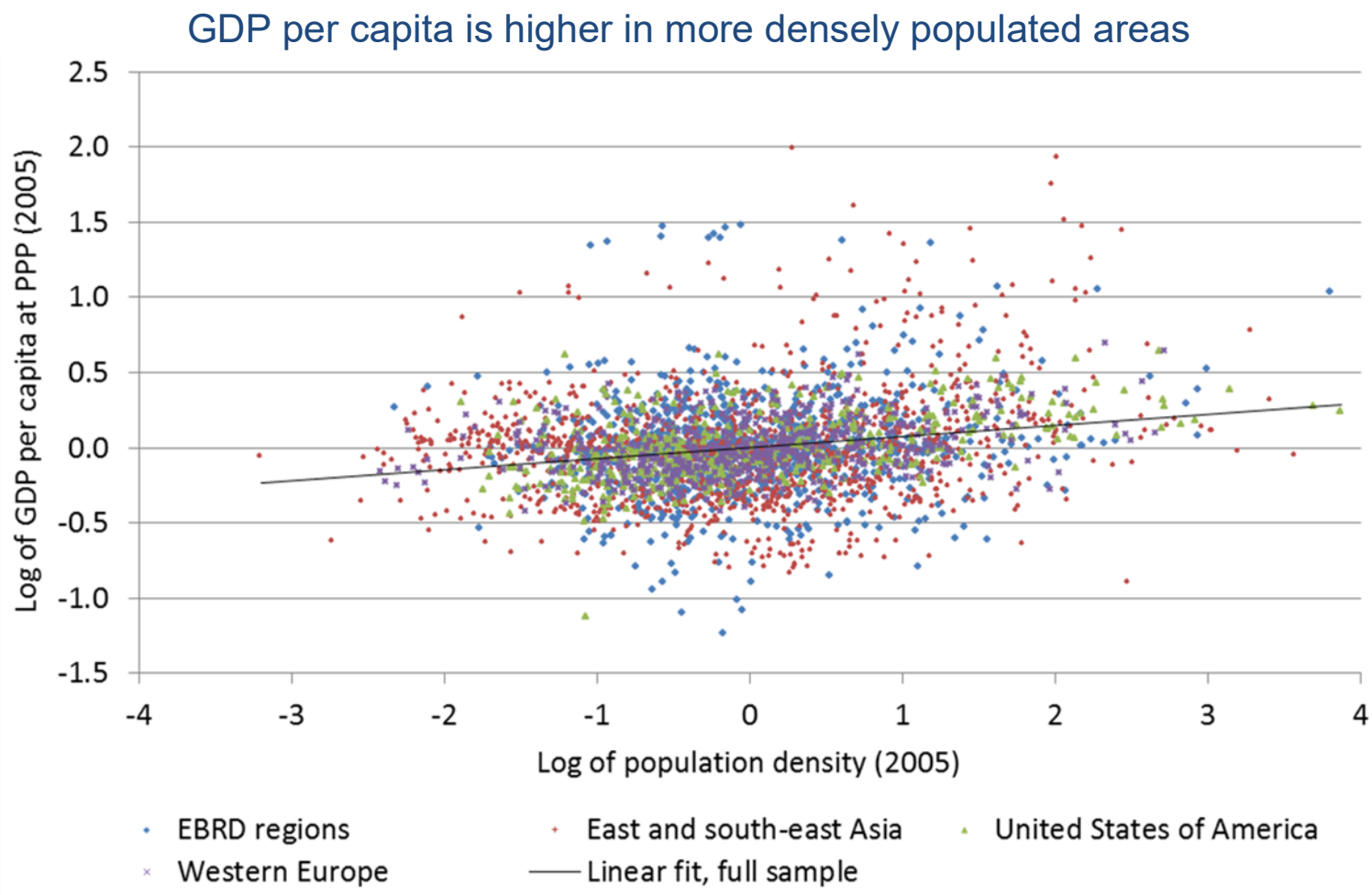
As population growth has been concentrated in major metropolitan areas



Source: OECD and authors' calculations. Based on a 100 sq. km grid.

Productivity is around 5% higher if a city is twice the population of a similarly sized city in the EBRD regions

In fact, places where population density increases also appear to be getting more productive



Source: G-Econ data and authors' calculations. Each dot represents a 1 degree by 1 degree cell with a minimum population of 10 people and minimum GDP per capita of US$ 7.38 at PPP.

A model of geography and development
(Desmet, Nagy and Rossi-Hansberg, JPE 2018)

- Each location is unique in terms of its

  Amenities
  Productivity
  Geography (relative location to all other locations)

- Each location has firms that

  Produce and trade subject to transportation costs
  Innovate

- Static component of the model

  Allen and Arkolakis (2013) and Eaton and Kortum (2002)
  Allow for migration restrictions

- Dynamic components

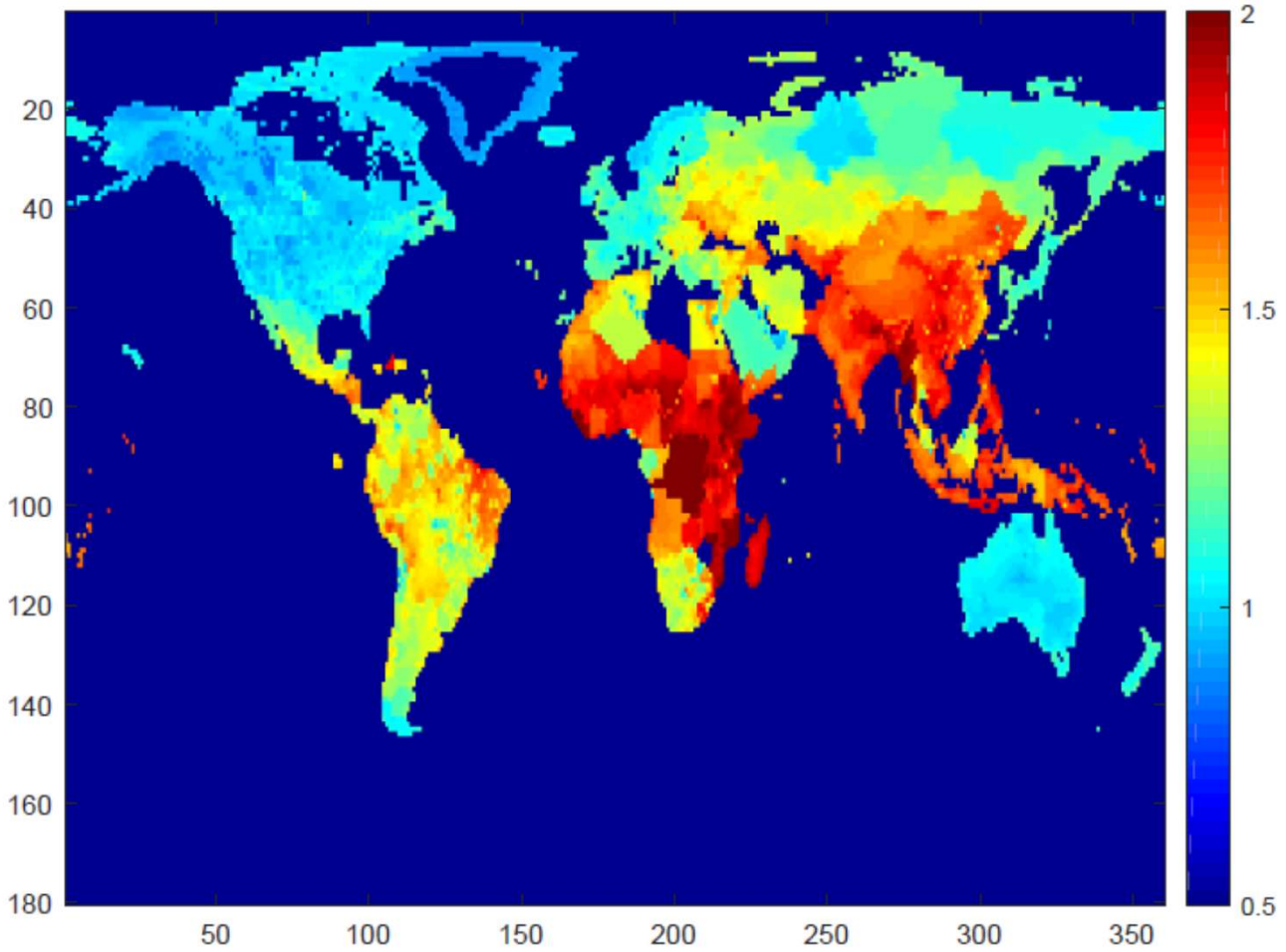
  Desmet and Rossi-Hansberg (2014)
  Land competition and technological diffusion

Dispersion, Agglomeration and Dynamics
(Desmet, Nagy and Rossi-Hansberg, JPE 2018)

- Congestion reduces local amenities
  - Greater population density lowers enjoyment of a location
- Production benefits from density (at home and elsewhere)
  - Higher pop density spurs innovation investments
  - Productivity shocks increase in pop density and past innovations
  - Productivity shocks also increase in innovations in other places
- Migration Costs Exist at each location
  - Some places are expensive to enter
  - Those same areas give a high payoff for leaving
- Agents choose where to live each period
  - based on the utility available from staying, and the highest utility elsewhere after paying the migration cost

Most densely populated areas are projected to achieve the highest gains in real per capita income by 2040

Estimated growth in GDP per capita, 2000-40 (log-point difference)

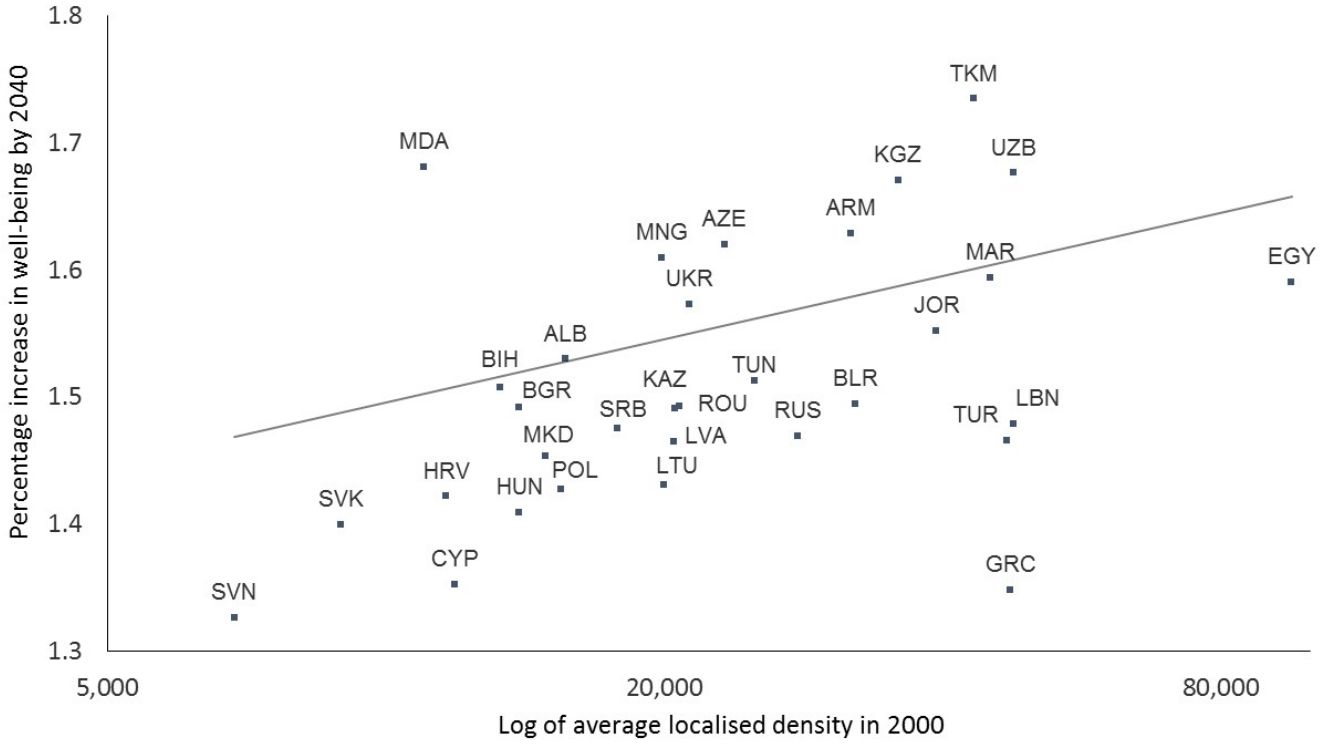


Source: Authors' calculations. Model estimates for the period 2000-2040. Estimates are obtained for the one by one km grid.

Most densely populated areas are projected to achieve the highest gains in well-being by 2040

- But only if congestion can be kept in check, based on the spatial model (Desmet et al., 2018) that includes trade-offs between productivity and congestion
- Investments in municipal infrastructure such as public transit, water and waste water and recycling can help

Change in well-being is expected to be higher in countries with greater average localised population density



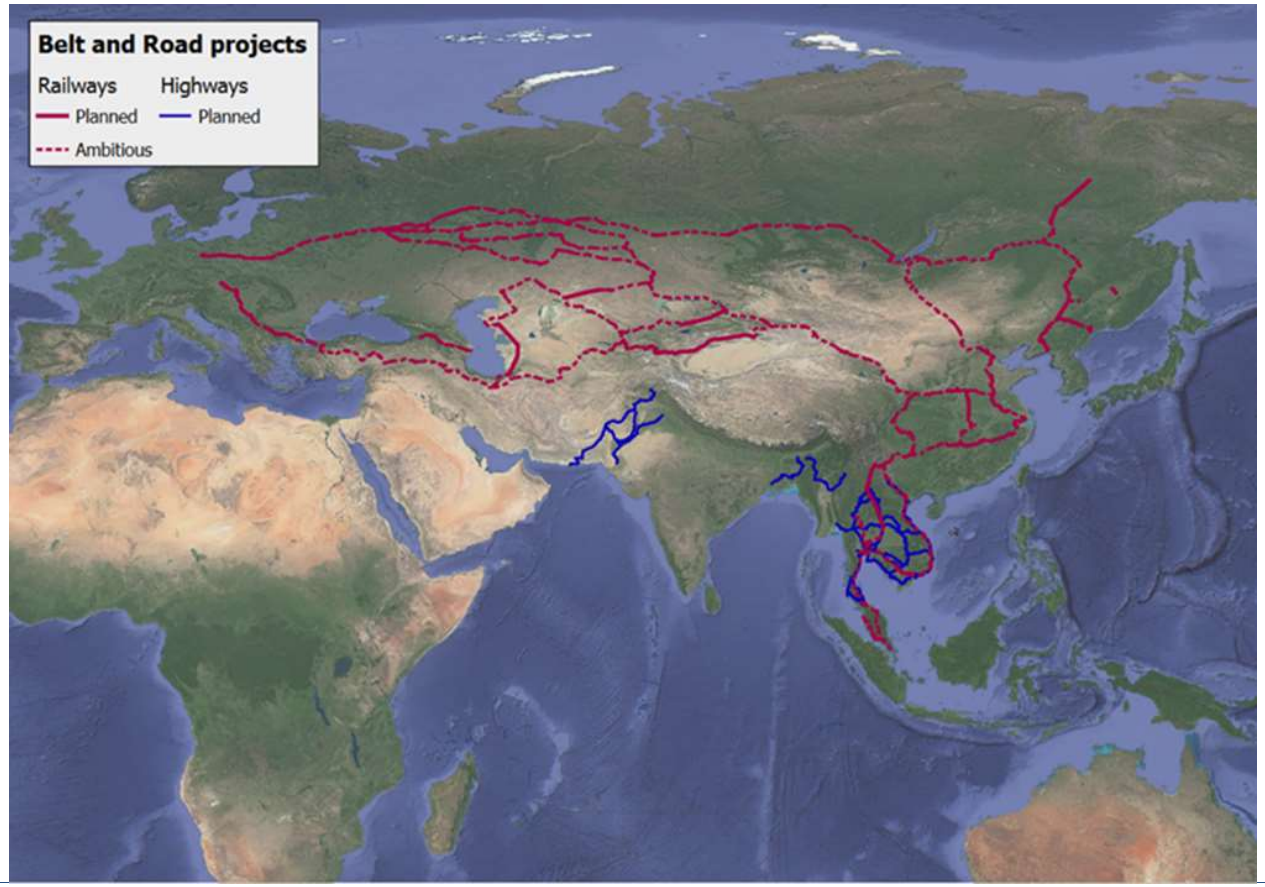
Source: Authors' calculations. Population-weighted average model estimates for the period 2000-2040. Estimates are obtained for the one by one km grid.

Extensive upgrades under China's planned and potential investments as part of the Belt and Road Initiative

The "planned BRI" envisages a relatively limited set of infrastructure investments in roads and railways, but have a high likelihood of completion

The hypothetical, "ambitious BRI" encompasses additional investments across Eurasia

Belt and Road Initiative projects, planned and hypothetical

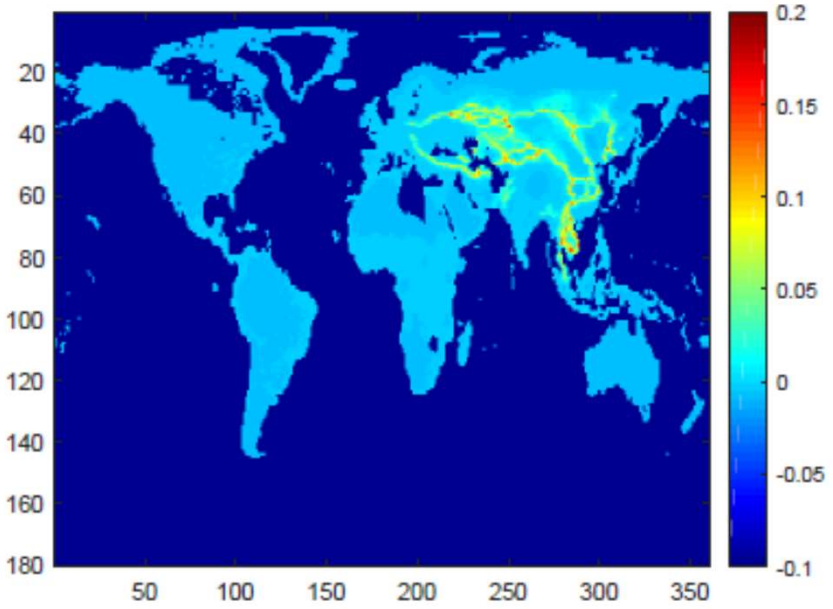


Source: Mercator Institute and authors. "Planned" investments are those completed, under construction or pending construction. "Ambitious" upgrades trace an expansive set of hypothetical routes.

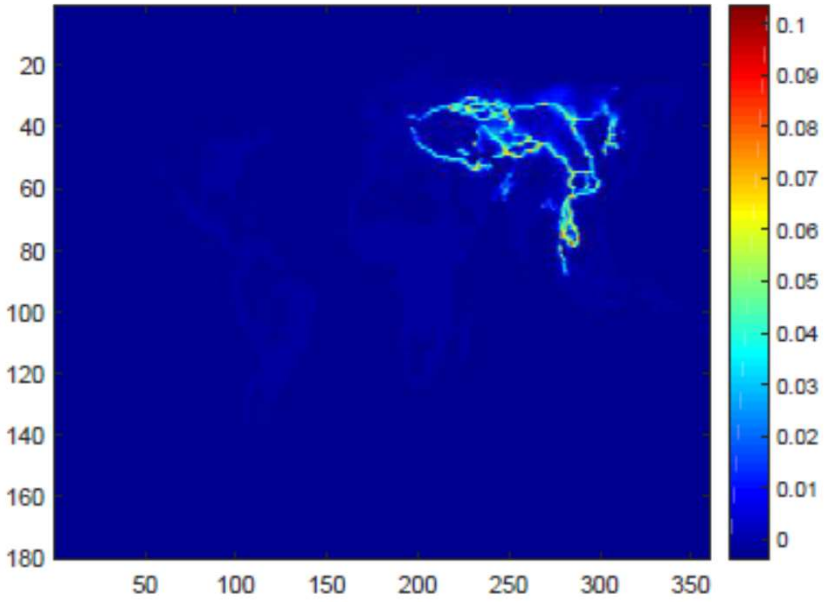
Extensive upgrades under China's planned and potential investments as part of the Belt and Road Initiative

Long term results: Belt and Road Initiative projects, planned and hypothetical

Log point change in real per capita income



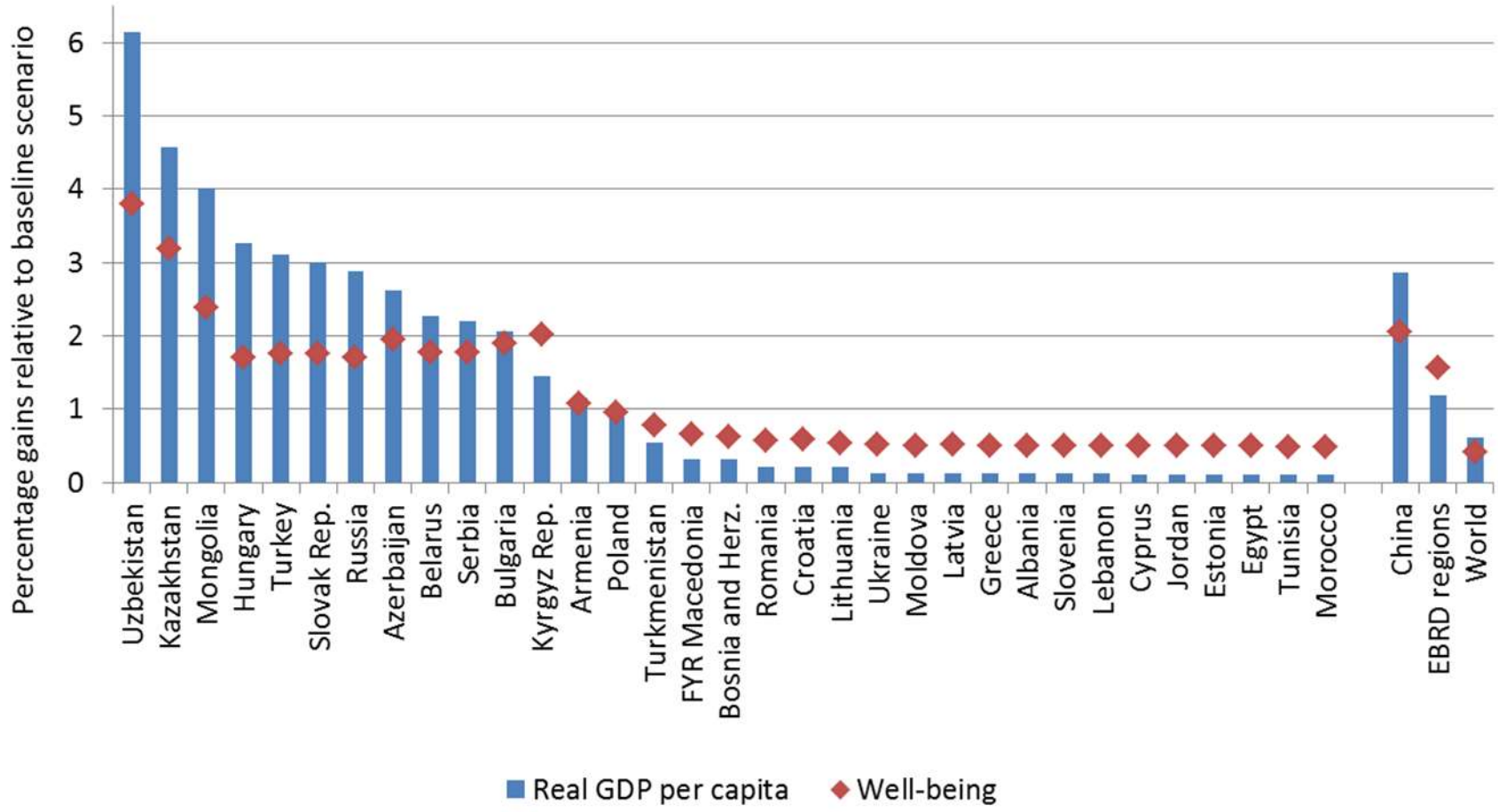
Log point change in average well-being



Source: Mercator Institute, authors and authors' calculations.

Gains from infrastructure accrue widely but become weaker as distance from the upgrades increases

Gains in the ambitious Belt and Road Initiative scenario, relative to the baseline

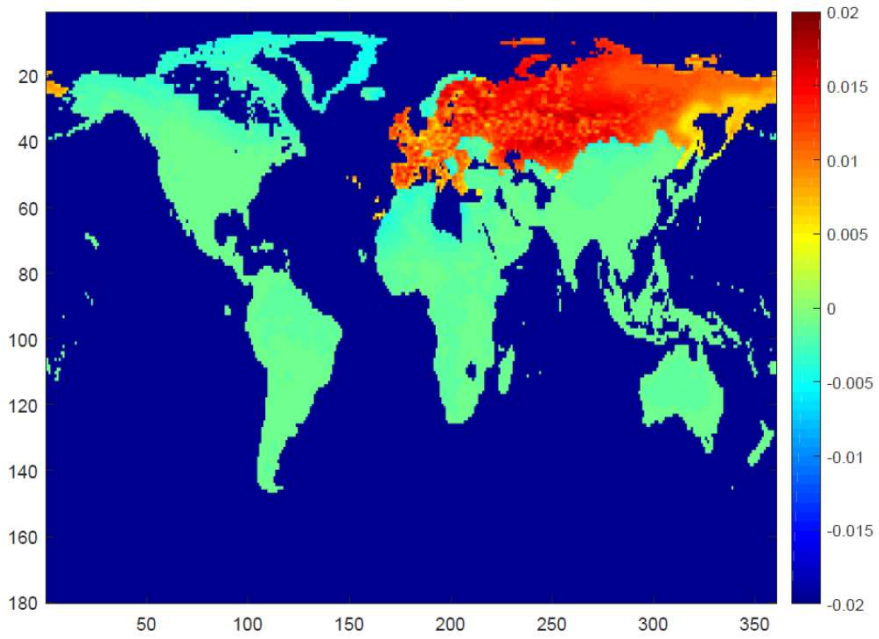


Source: Authors' calculations.

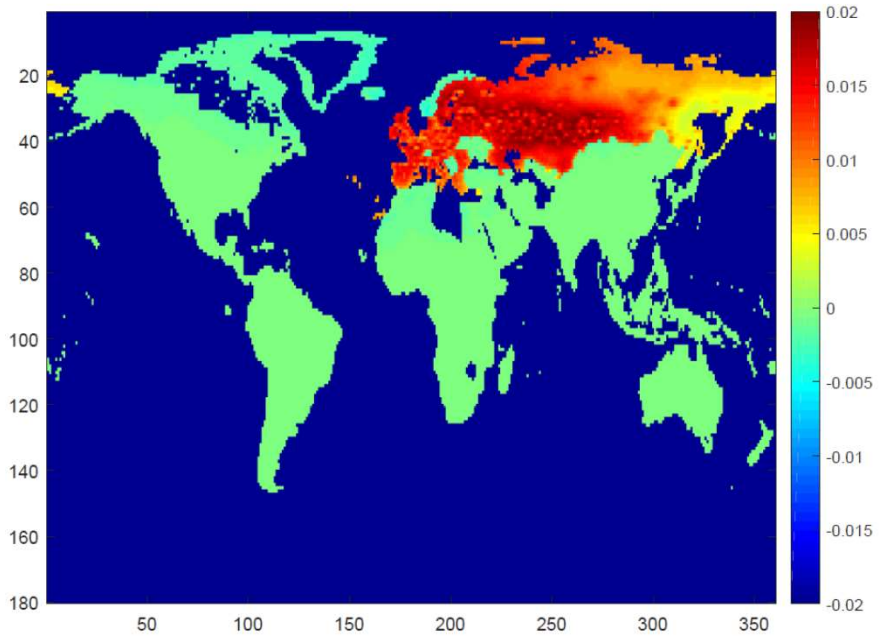
EU-EAEU Integration delivers lasting economic boosts: Pop Density concentrates in central and eastern Europe

1.0% Reduced trade costs between all EU-EAEU locations

Immediate impact
(log point change)



Long run impact
(log point change)

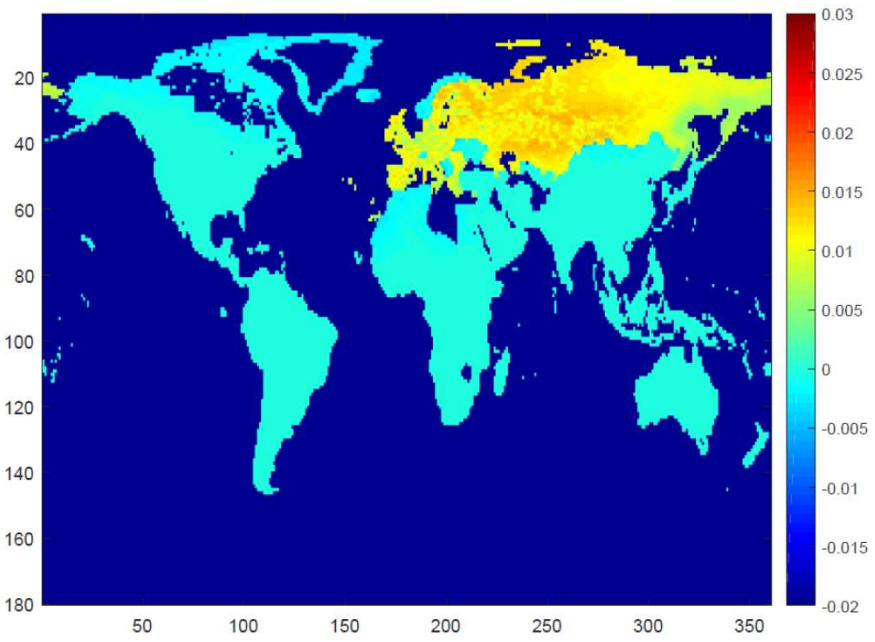


Source: Authors' calculations.

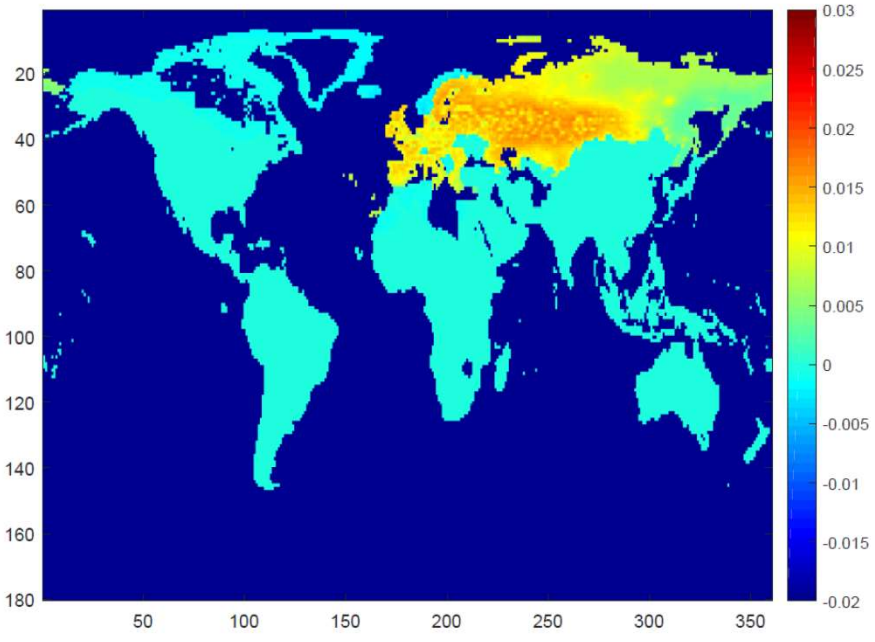
EU-EAEU Integration delivers lasting economic boosts: Real Output per capita rises with density and productivity

1.0% Reduced trade costs between all EU-EAEU locations

Immediate impact
(log point change)



Long run impact
(log point change)

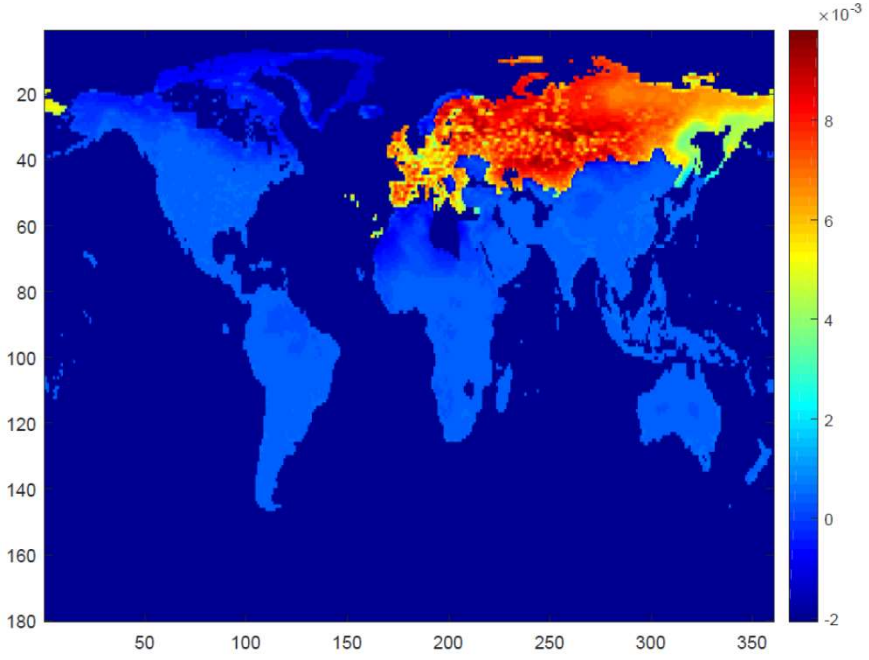


Source: Authors' calculations.

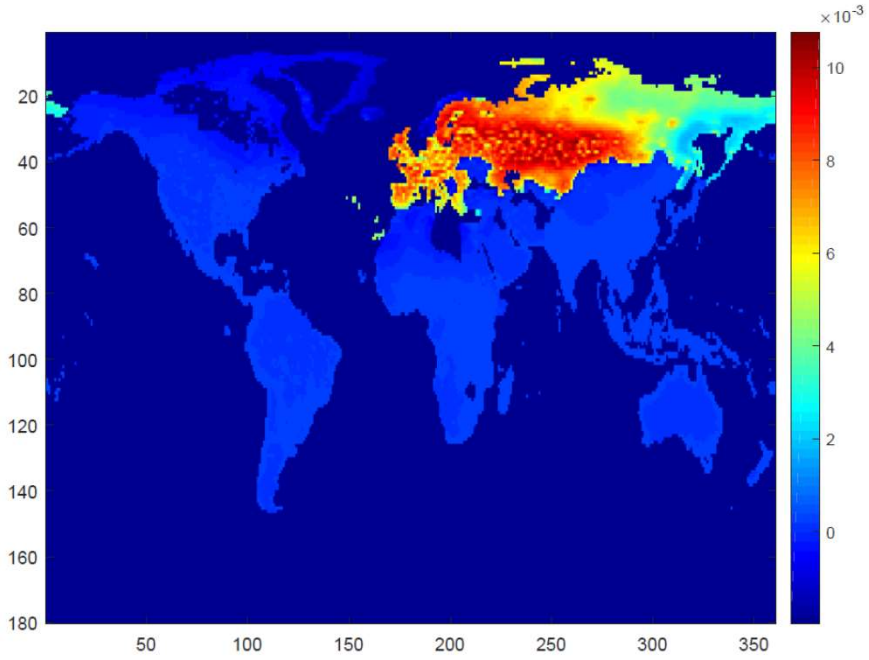
EU-EAEU Integration delivers lasting economic boosts: Average well-being rises, slightly offset by congestion

1.0% Reduced trade costs between all EU-EAEU locations

Immediate impact
(log point change)



Long run impact
(log point change)



Source: Authors' calculations.

Small uniform reduction in trade costs between EBRD regions & their neighbours increases local & global output per capita

- In fact gains from Eastern and Western oriented reduction in trade costs are close to equivalent in the medium-run
- The effects match the gains from extensive route-specific upgrades

Estimated impact of reducing trade costs relative to the baseline scenario (in percentage terms)

	Belt and Road Initiative		2 per cent reduction in trade costs	
	Planned upgrades	*Ambitious* upgrades	EBRD *regions* + *east* Asia + *south-east* Asia	EBRD regions + advanced European economies
	(2)	(3)	(4)	(5)
		Real GDP per capita		
World	-	0.6	0.7	0.9
EBRD regions	-	1.7	1.8	1.8
China	-	2.9	2.1	0.0
Russia	-	2.9	1.8	1.7
Turkey	-	3.1	1.9	1.9
		Average well-being		
World	0.2	0.4	0.2	0.5
EBRD regions	0.1	1.7	1.8	1.5
China	0.1	2.0	1.9	0.1
Russia	0.1	1.7	1.8	1.4
Turkey	0.1	1.8	1.8	1.5

Source: Authors' calculations. Estimates from the 2 per cent reduction are linearly extrapolated from results modelling a 1.0 per cent uniform reduction in the respective areas.

Discussion: Geography, integration and dynamics

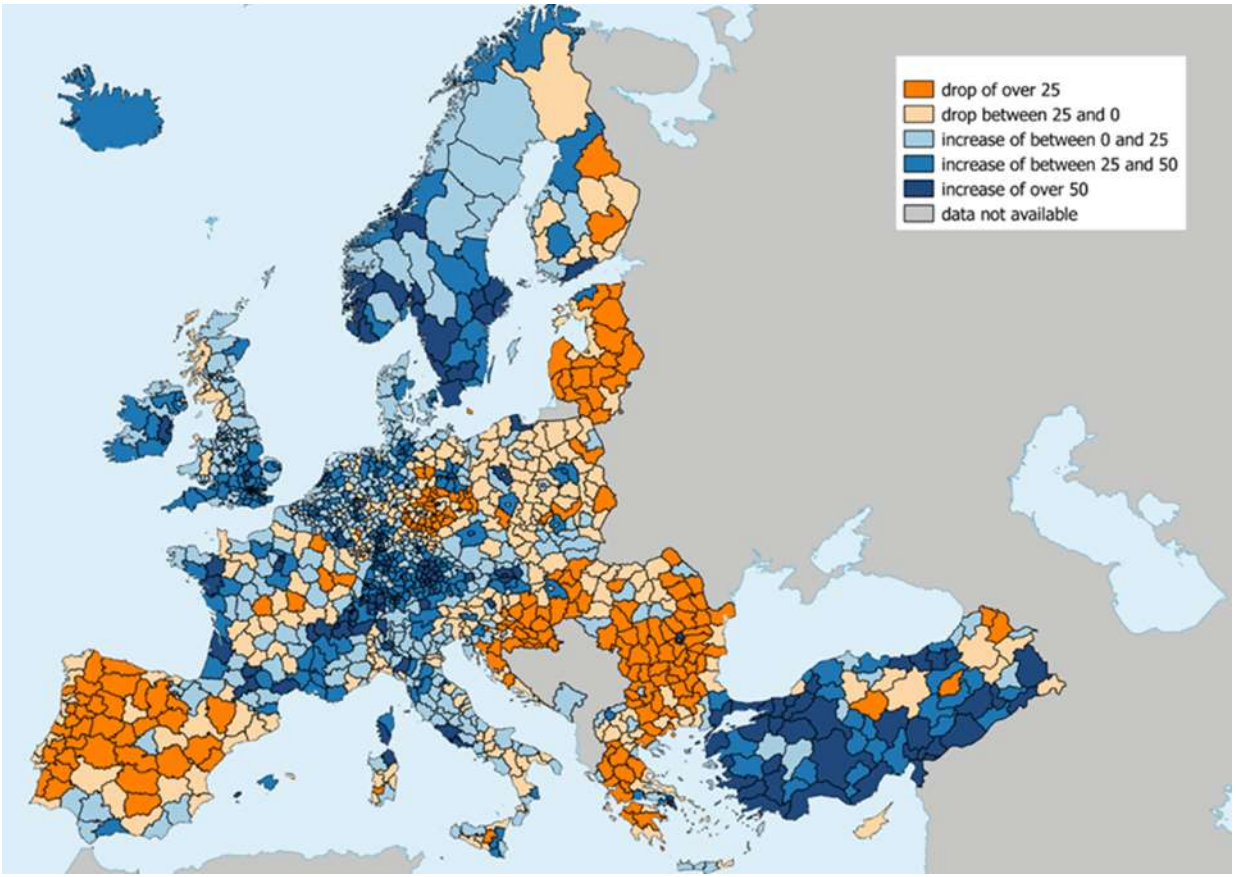
- Since the start of transition, people have been moving into larger cities but many in the EBRD regions (often majority) live in areas facing depopulation
- Agglomeration enhances economic opportunities, and EBRD regions' most densely populated areas are projected to achieve the highest gains in well-being through 2040
- But congestion and pollution can lower the quality of life. These factors need to be managed well
- EU-EAEU economic integration (reduced trade costs) provides an opportunity to stimulate productivity in the region, with estimated gains to real income and well-being.
- Small uniform reductions in trade costs are estimated to deliver comparable gains to major upgrade investments running across regions.

Appendix

People choose to live in places with better economic opportunities

More densely populated areas benefit from larger potential markets, greater pool of skilled workers and economies of scale in provision of public goods

Net population changes by region (NUTS-3)

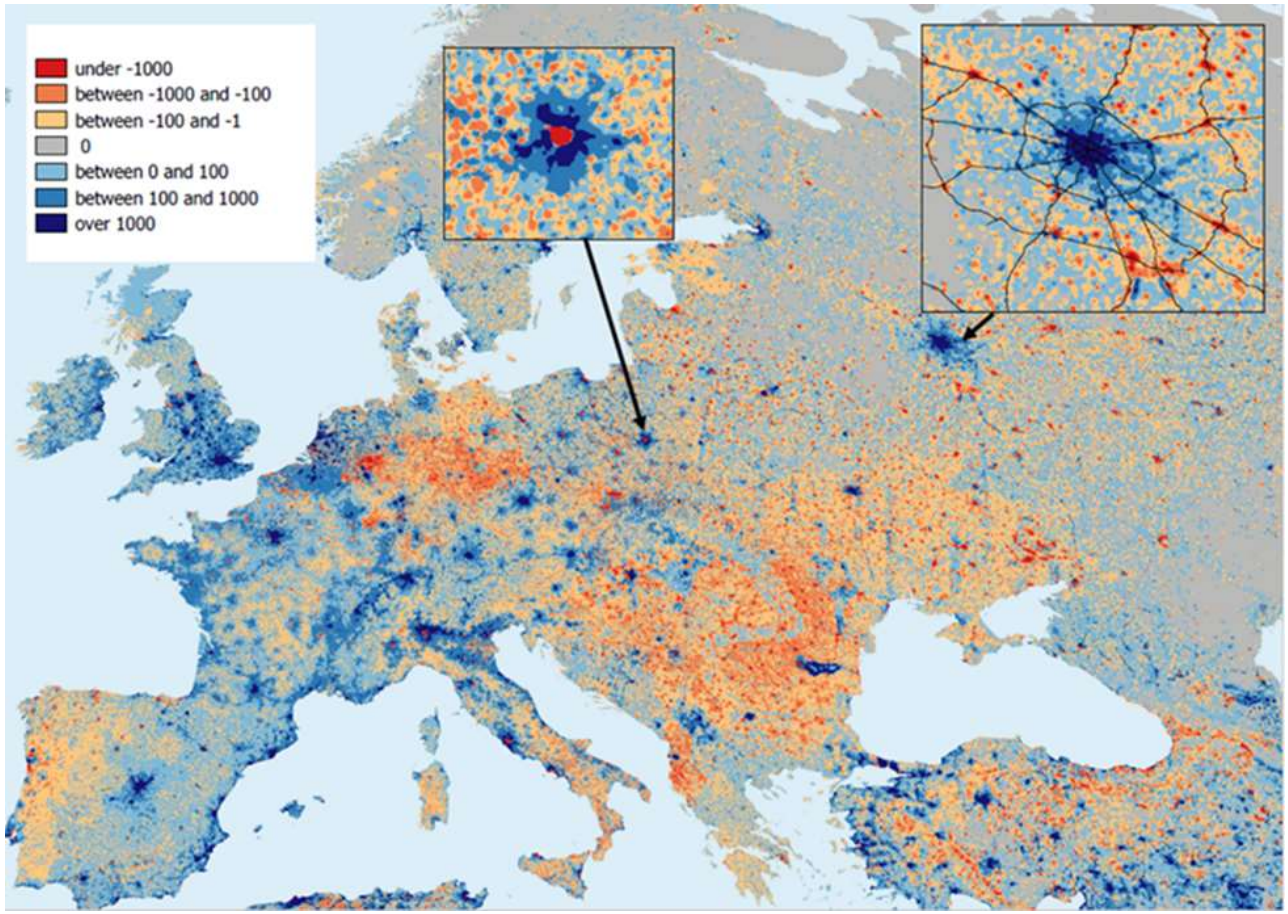


Source: Eurostat and authors' calculations.

People concentrate seeking opportunity and move out when facing congestion or better commutes

Warsaw: An example of a city that experienced dispersion of populations

Changes in localised population density, 2000-14



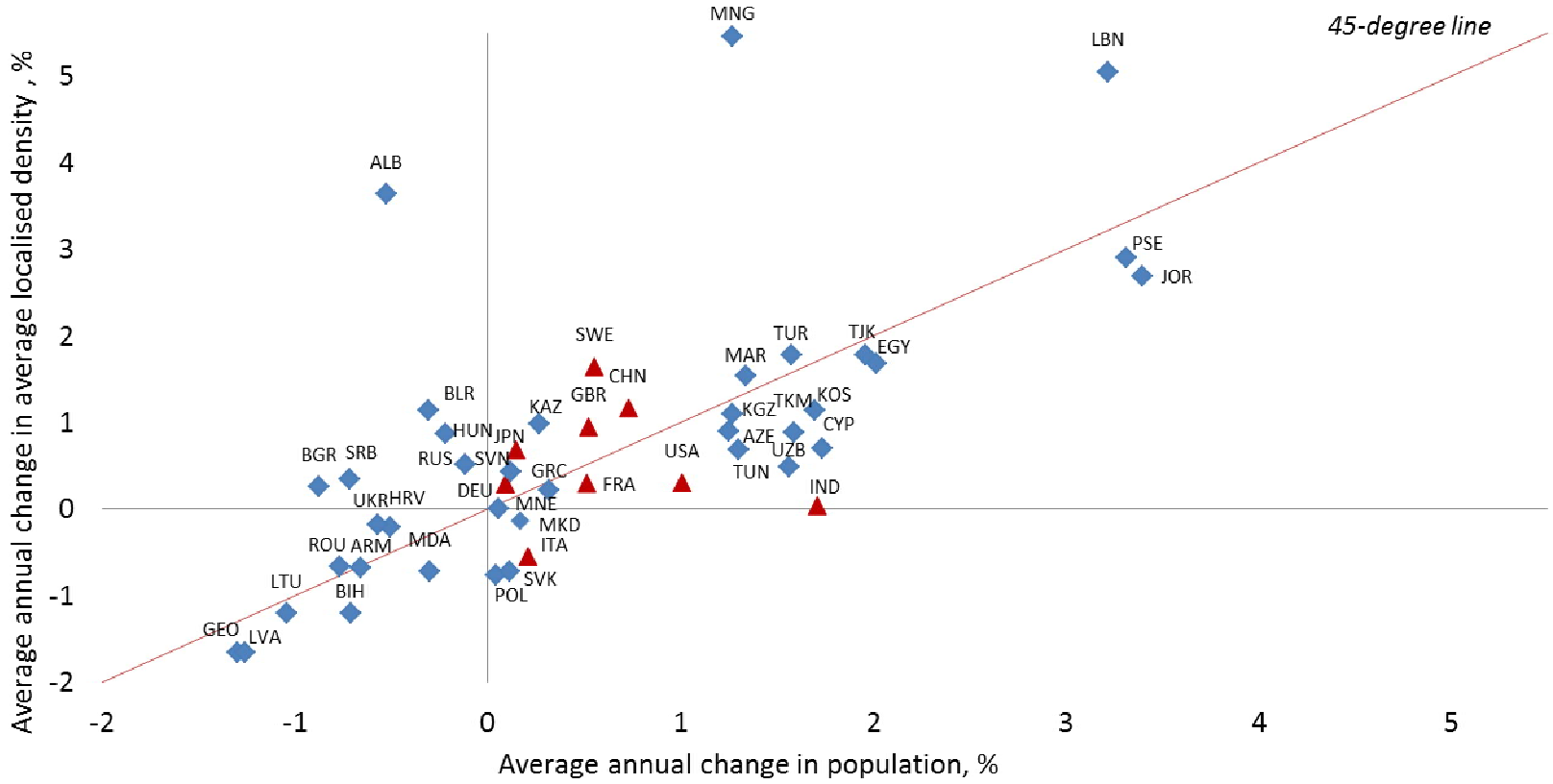
Source: European Commission and authors' calculations. Average localized population density is the distance-weighted number of people in a 5 km radius of a person taken at random .

Generally, changes in average population density is correlated with changes in total population – with notable exceptions

Mongolia showed far greater concentrating of population relative to population growth reflecting a concentration of people at the capital city, Ulaanbaatar

Dispersion of population was observed in Poland and the Slovak Republic where the population grew marginally but localised population density decreased

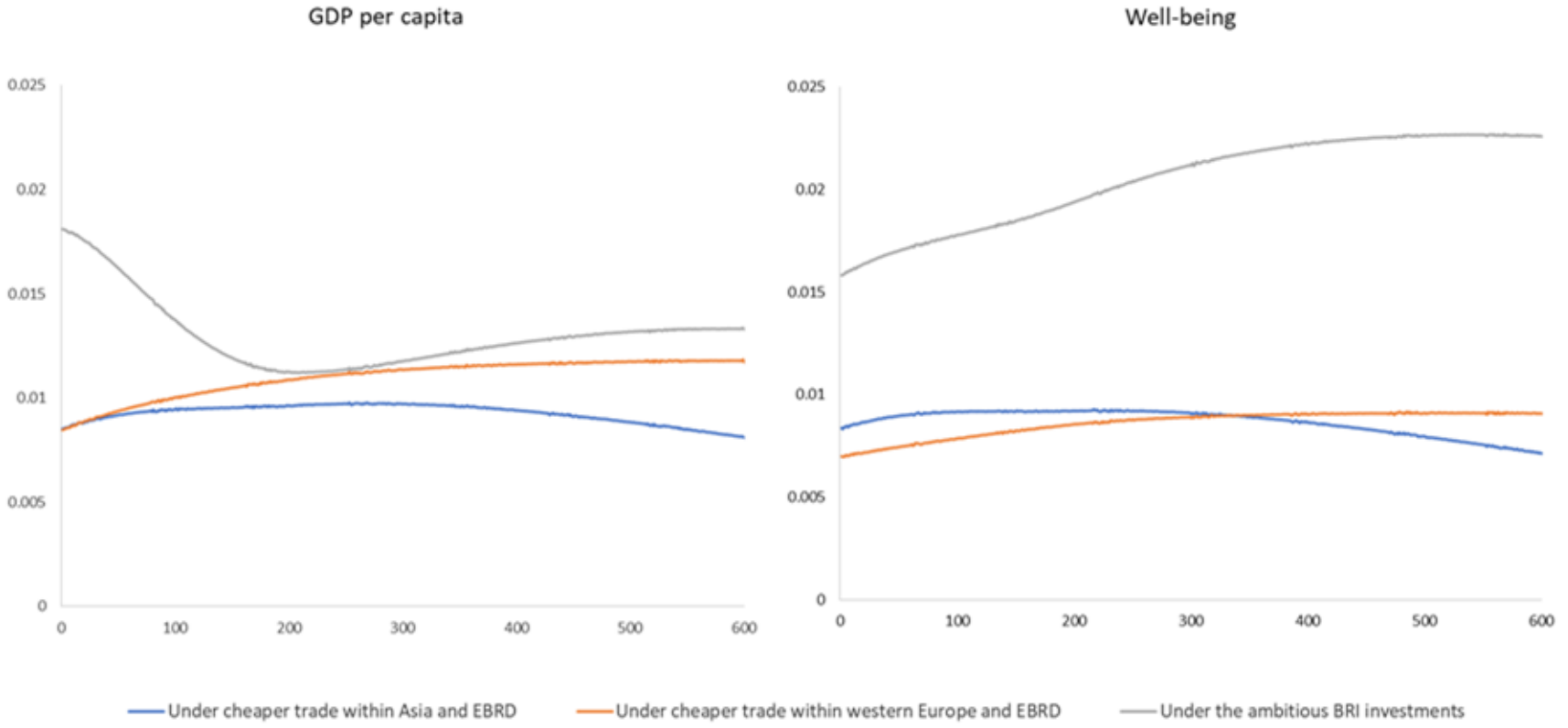
Changes in average localised population density and total population, 1990–2014



Source: European Commission and authors' calculations. Average localised densities have been obtained using 1 km^2 grid cells.

Long run outcomes show the dynamic effects of density: scenarios ⇧ population density lead to higher gains

Log-point difference to the outcome in the baseline by year. Measures report population weighted averages for countries in the EBRD regions



Source: Authors' calculations.

A model of geography and development
(Desmet, Nagy and Rossi-Hansberg, forthcoming JPE)

- Production per unit of land of a firm producing good omega

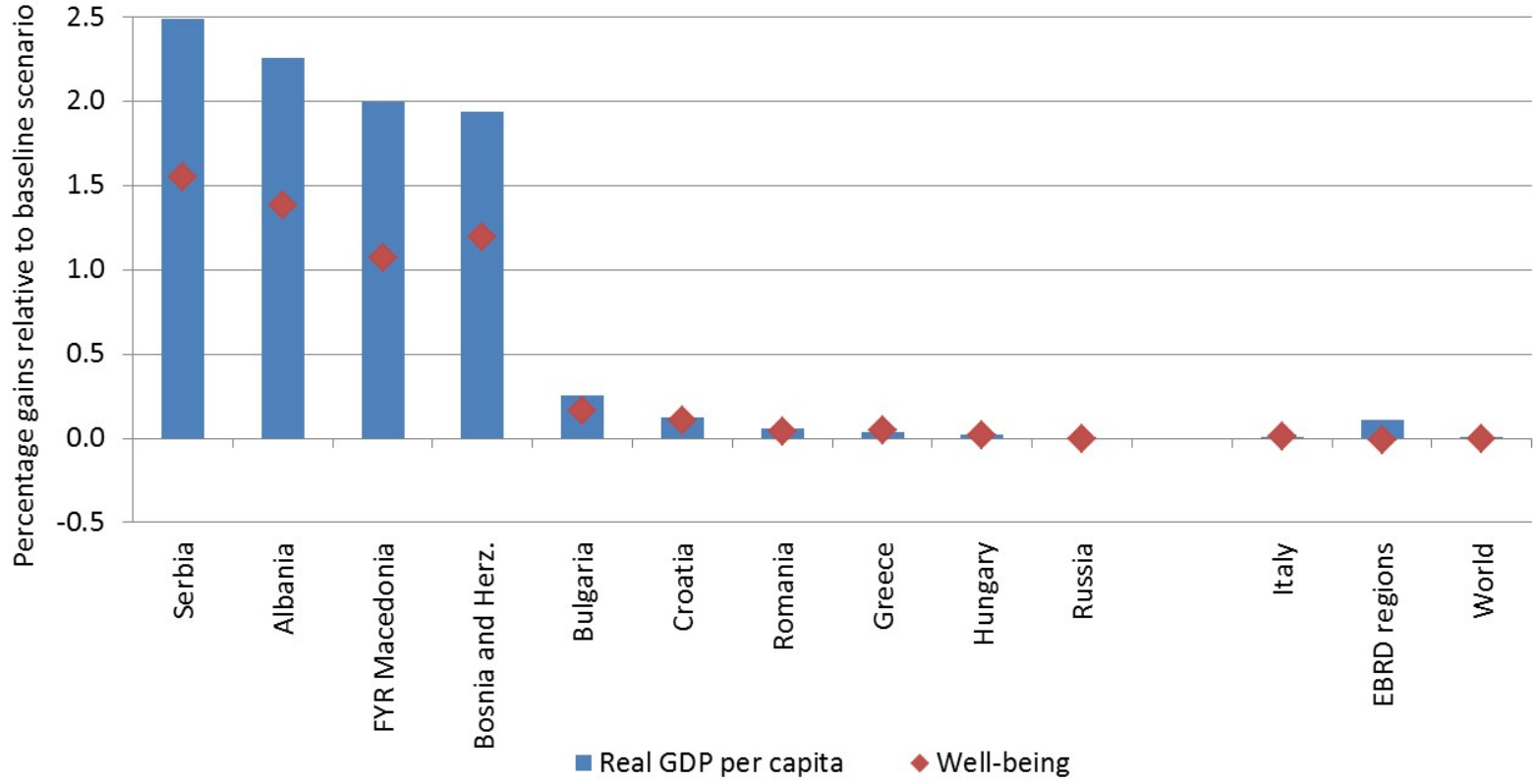
$$q_t^{\omega}(r) = \phi_t^{\omega}(r)^{\gamma_1} z_t^{\omega}(r) L_t^{\omega}(r)^{\mu}$$

- Productivity depends on decisions to innovate
  - Invest $\nu \phi_t^{\omega}(r)^{\xi}$ units of labor to get innovation $\phi_t^{\omega}(r)$
  - Acts as agglomeration force
- Productivity shocks are increasing in
  - Population density
  - Past innovation
  - Productivity of other locations

Infrastructure upgrades deliver gains to the communities through which new transport links pass

- Model analyses roads and railways in the Western Balkans
- Since 2001 there have been 17 rail projects and 32 road projects with EBRD involvement in the Western Balkans region, completed or still on-going, with investments of €7.3bn in transportation infrastructure

Gains from Western Balkans transportation investments by 2040



Source: Authors' calculations. The estimates for Kosovo are not available but are reflected in those of its neighbours.