# Shifting faith of coastal economies: regional evolutionary agglomeration dynamics in face of climate-induced hazards

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**Abstract**

By 2050 about 70% of the world's population is expected to live in cities. Cities offer spatial economic advantages that boost agglomeration forces and innovation, and foster further concentration of economic activities. For historic reasons urban clustering occurs along coasts and rivers, which are prone to climate-induced flooding. To explore tradeoffs between agglomeration economies and the changing face of hazards, we present an evolutionary economics model with heterogeneous boundedly-rational agents who learn from experience. The model combines migration decision of both households and firms between safe Inland and hazard-prone Coastal regions with the core evolutionary economic dynamics of endogenous technological learning and economic growth. Flood damages affect Coastal agents as stochastic shocks hitting workers' labour productivity, capital stock and inventories of firms. We find that the model is able to replicate a rich set of micro- and macro-empirical regularities concerning economic and spatial dynamics. Without climate-induced shocks, the model demonstrates how advantageous transport costs that the waterfront offers lead to the self-reinforcing and path-dependent agglomeration process in Coastal areas. We illustrate how the spatial divergence of economic activities and economic disparity between the two regions evolve over time depending on transport costs. Furthermore, we explore five scenarios of different flood probability and severity, including an acceleration of flood risks with climate change and find that their complex interplay generates non-linear dynamics in the agglomeration patterns and in the performance of the overall economy. Notably, we find that frequent shocks could curb or even revert the agglomeration forces stimulating coastal urbanization in favour of the Inland region, driven purely by economic self-interests of firms and households. Importantly, this gradual shift of economic clusters landwards reduces adverse impacts of climate shocks on the whole economy and emphasize a retreat as a beneficial and efficient climate change adaptation strategy. Conversely, we find that the economy bears major losses when climate conditions allow for an initial concentration of economic activities in the Coastal region, which then suffers severe hazards later. Specifically, when climate conditions

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worsen abruptly, we observe a coastal gentrification of economic activities with harsh downturn for the whole economy.