

Why would I like to research with you at TUD?

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Regional inequality, convergence, and its determinants – A view from outer space[☆]



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ABSTRACT

This paper provides a new dataset of regional income inequalities within countries based on satellite nighttime light data. First, we empirically study the relationship between luminosity data and regional incomes for those countries for which regional income data are available. Second, we use our estimation results for an out-of-sample prediction of regional incomes based on the luminosity data. These results enable us to investigate regional income differentials in developing countries that lack official income data. Third, we calculate commonly used measures of regional inequality within countries based on predicted incomes. An investigation of changes in the dispersion of regional incomes over time reveals that approximately 67–70% of all countries experience sigma-convergence. Forth, we study different major determinants of within-country changes in inequality, i.e., the determinants of the convergence process. We find evidence for an N-shaped relationship between development and regional inequality. Resources, mobility, trade openness, aid, federalism and human capital are also very important.

motivation and ideas

Productivity convergence across subnational regions of ASEAN: measuring physical capital from outer space

Motivation:

- Scarce literature of the dynamics of productivity across subnational regions in ASEAN
- Studies of productivity in the region may help to prevent the regions to escape middle-income traps

Research Questions:

- Are subnational regions in ASEAN **maybe a different region LA, Africa, the world?** converging to an upper steady state of high productivity?
- Are there productivity convergence clubs?

Methods:

- Linear OLS regressions, spatial convergence, distributional convergence, etc.

ASEAN + Asia at night...



Physical capital measure by nightlights

Income and education data have become recently available for subnational regions of the world. However, **physical capital data has not yet become widely available.**

Satellite data has been used to predict income per capital data (**Lessman et al. (2017)**). But, **it may also be used for predicting physical capital.**

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ORIGINAL ARTICLE



Regional convergence and spatial dependence across subnational regions of ASEAN: Evidence from satellite nighttime light data

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ABSTRACT

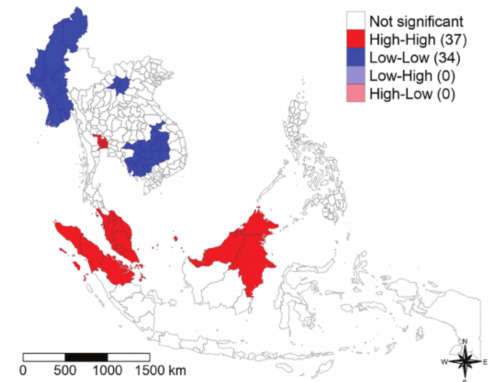
Satellite nighttime light data are increasingly used for evaluating the performance of economies in which official statistics are non-existent, limited, or non-comparable. In this paper, we use a novel luminosity-based measure of GDP *per capita* to study regional convergence and spatial dependence across 274 subnational regions of the Association of South East Asian Nations (ASEAN) over the 1998–2012

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FIGURE 9 Local Moran's I for log(luminosity-based GDP per capita)



(a) Cluster map for 1998

Empirical strategy

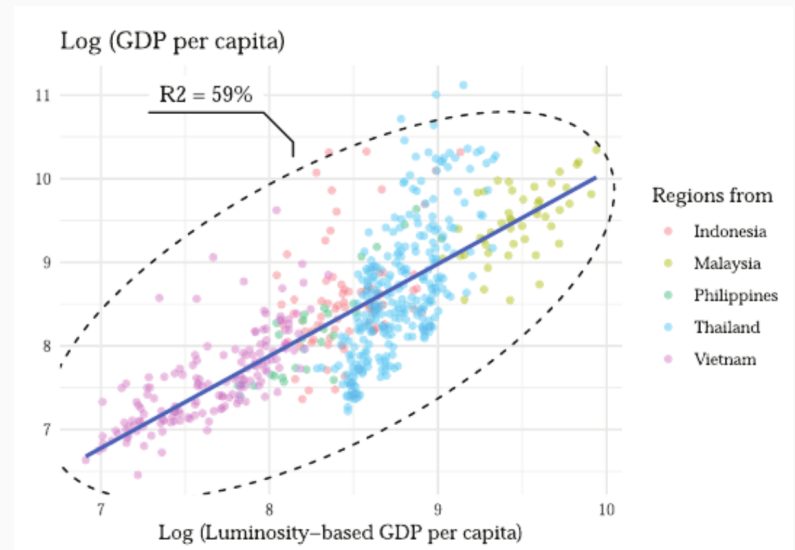
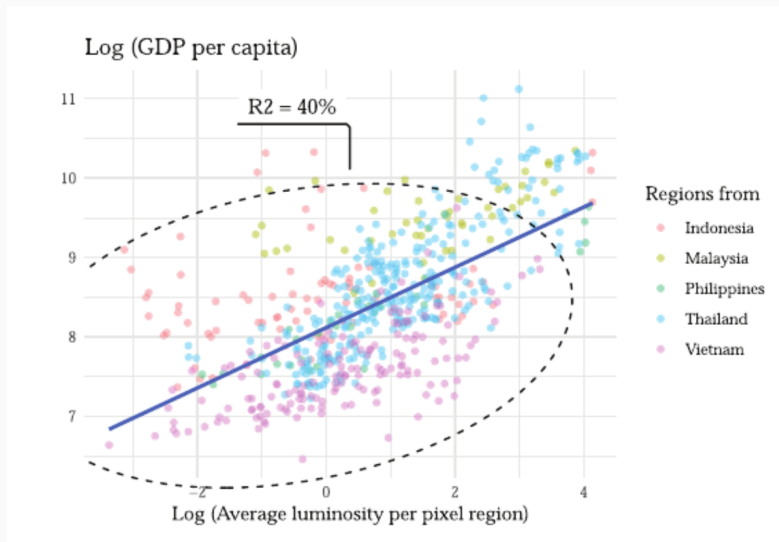
In terms of income per capita Lessman et al (2017) proposed the following model for subnational data:

$$\ln(y_{i,j,t}) = \alpha + \beta \cdot \ln(l_{i,j,t}) + \gamma \cdot \ln(y_{j,t}) + \delta \cdot \ln(tc_{i,j,t}) + \zeta \cdot \ln(lc_{i,j,t}) + \kappa \\ \dots \ln(r_j) + \lambda \cdot \ln(a_j) + \vartheta \cdot \ln(r_j) \cdot \ln(a_j) + \eta_k + \theta_t + \nu_i + \varepsilon_{i,j,t}$$

- $y_{i,j,t}$ is the GDP per capita of region i in country j at time t
- $l_{i,j,t}$ is the average nighttime light within a region
- $y_{j,t}$ is the country-level income per capita
- $tc_{i,j,t}$ is the number of top-coded pixels (DN = 63) within a region
- $lc_{i,j,t}$ is the number of low-coded, dark pixels within a region (DN = 0)
- r_j is the number of regions within a country
- a_j the overall size of a country in square kilometers
- η_k are time-invariant fixed effects for different lending group regions of the world as defined by the World Bank (North America (NA) is used as reference group)
- θ_t are the satellite configuration fixed effects, which change over time (but not always on an annual basis)
- ν_i is a regional random effect and $\varepsilon_{i,j,t}$ is the error term.

Empirical strategy

- Ideally a **similar regression can be run for Physical capital**.
- If for major economies in ASEAN physical capital data is available for subnational regions (For example for Malaysia, Thailand and Indonesia). Then, an **out-of-sample prediction can recover physical capital data for all ASEAN subnational regions**.



Productivity dynamics

Since data for Income, Human capital and predicted physical capital become available; then, productivity A (as a residual) can be recovered from the following equation: (adapted from Mendez (2020))

$$Y_{i,j,t} = K_{i,j,t}^{\alpha} (A_{i,j,t} H_{i,j,t})^{1-\alpha}$$

where $Y_{i,j,t}$ is the total output (production) of region i in country j at time t, $K_{i,j,t}$ is the predicted stock of physical capital, $H_{i,j,t}$ is the stock of human capital, and $A_{i,j,t}$ is a measure of aggregate efficiency, and α is a parameter that represents the elasticity of output with respect to physical capital.

- The variable A represents the efficiency with which inputs are used.
- **A variety of methodologies can be applied to study productivity dynamics. Sigma-beta convergence, spatial regressions, club convergence or distributional convergence**

Major References

- Lessmann, C., & Seidel, A. (2017). Regional inequality, convergence, and its determinants—A view from outer space. *European Economic Review*, 92, 110-132.
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