Disparities in Regional Productivity, Capital Accumulation, and Efficiency across Indonesia:

A Convergence Clubs Approach

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[Slides and paper available at: http://bit.ly/arsc2019]

Motivation:

- Economic convergence is important for regional cohesion and competitiveness
- Regional income disparities are a pervasive feature of Indonesia (Esmara 1975; Mishra 2009; Bendesa et al 2016)
- Improvements in labor productivity (and its determinants) may help reduce regional income disparities

Research Objective:

- Study the evolution of regional disparities in labor productivity, capital accumulation, and efficiency across Indonesian provinces with a particular emphasis on the formation of local convergence clubs
    - Labor productivity = F(Physical capital, Human capital, Efficiency)

Methods:

- Nonlinear dynamic factor model (Phillips and Sul, 2007, 2009)
- Clustering algorithm for panel data (Phillips and Sul, 2007, 2009)

Data:

- Labor productivity, phyical capital, human capital, efficiency (Katoka, 2013,2018)
- 26 Indonesian provinces over the 1990-2010 period

Main Results:

1. Cross-provincial dynamics of labor productivity are characterized by TWO convergence clubs
2. The dynamics of the proximate determinants of labor productivity show some mixed results:
   - Physical and human capital are characterized by multiple convergence clubs (FOUR and TWO convergence clubs, respectively)
   - Two alternative measures of efficiency are characterized by ONE convergence club

Outline of this presentation

1. Some stylized facts
2. Convergence framework (intuition)
3. Main results of the paper
    - Two convergence clubs in labor productivity
    - Four convergence clubs in physical capital
    - Two convergence clubs in human capital
    - One convergence club in efficiency (non-parametric and parametric)

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(1) Some stylized facts

Regional heterogeneity across Indonesia

Are there any signs of convergence in labor productivity?

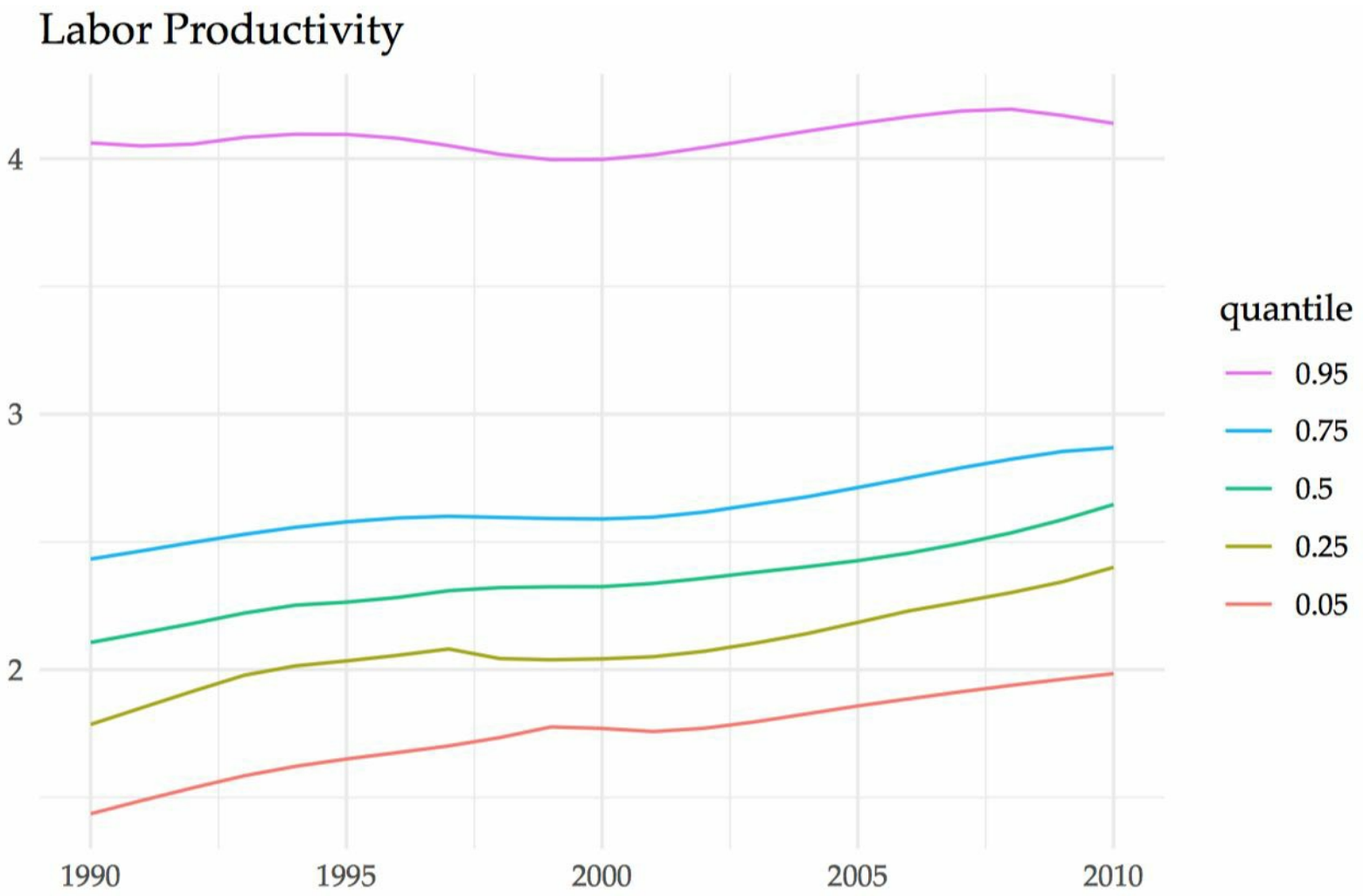
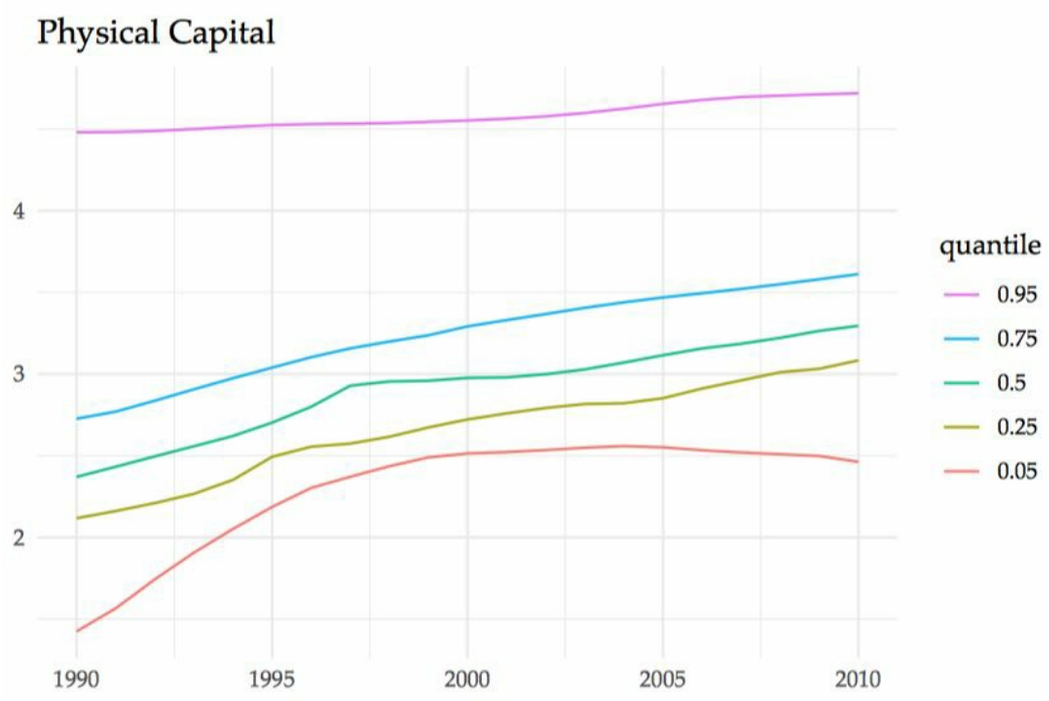


Fig. 1 Cross-provincial dynamics of labor productivity

Notes: Labor productivity is computed as the long-run trend of (log) GDP per worker. The Hodrick-Prescott filter with a smoothing parameter of 6.25 is applied to obtain the long-run trend of the series.

Are there any signs of convergence in the determinants of labor productivity?



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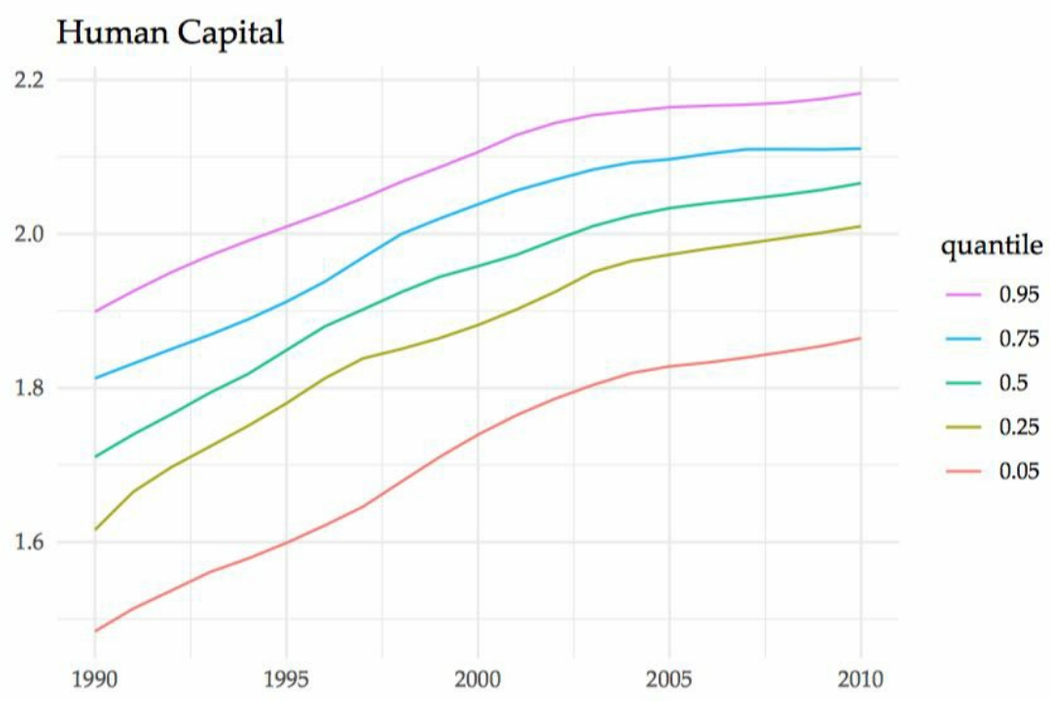

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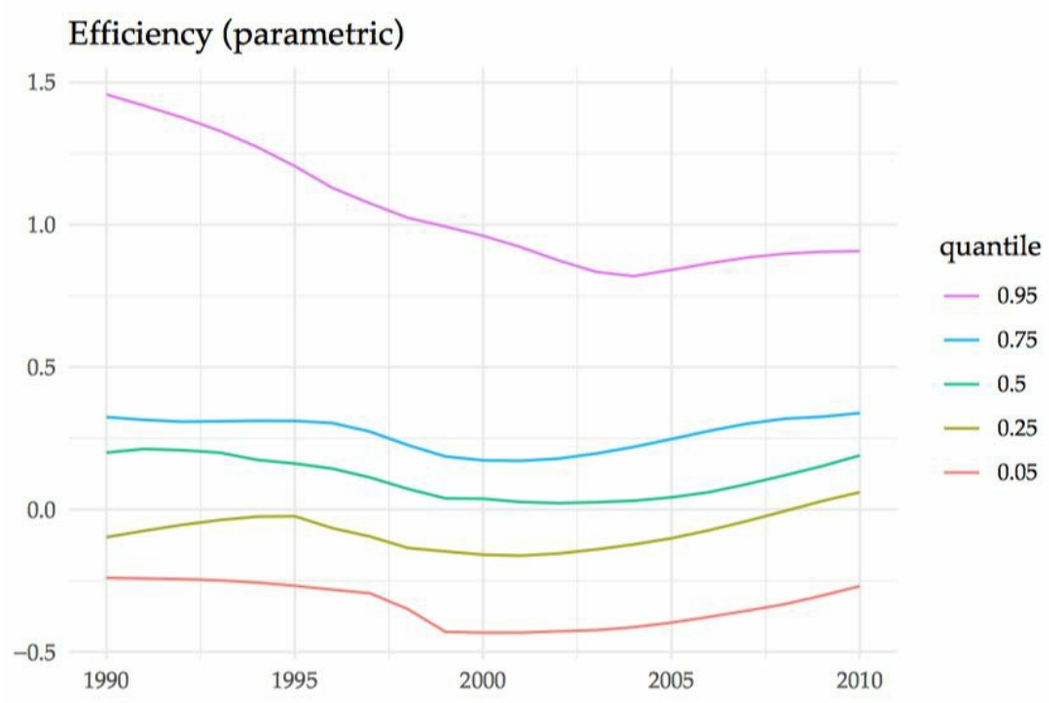

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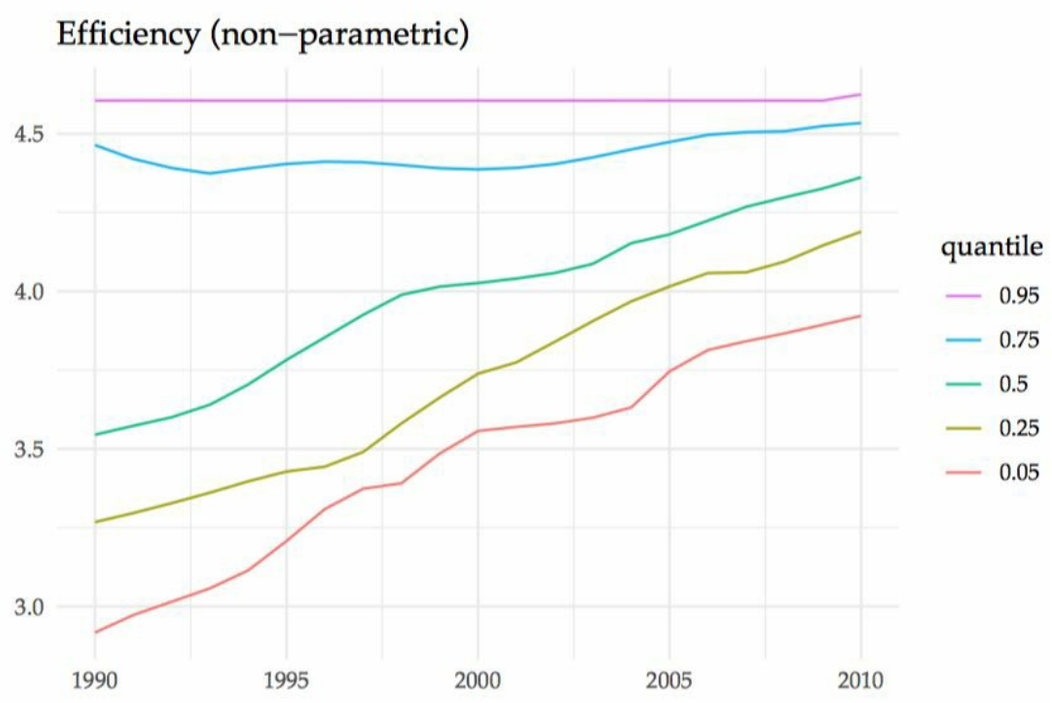

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(2) Convergence framework

Convergence test (intuition)

Convergence clubs (intuition)

Convergence framework (brief overview)

- First, define a relative transition parameter, h_{it}, as

$$h_{it} = \frac{y_{it}}{\frac{1}{N}\sum_{i=1}^{N} y_{it}}$$

- Second, the convergence hypothesis is defined as

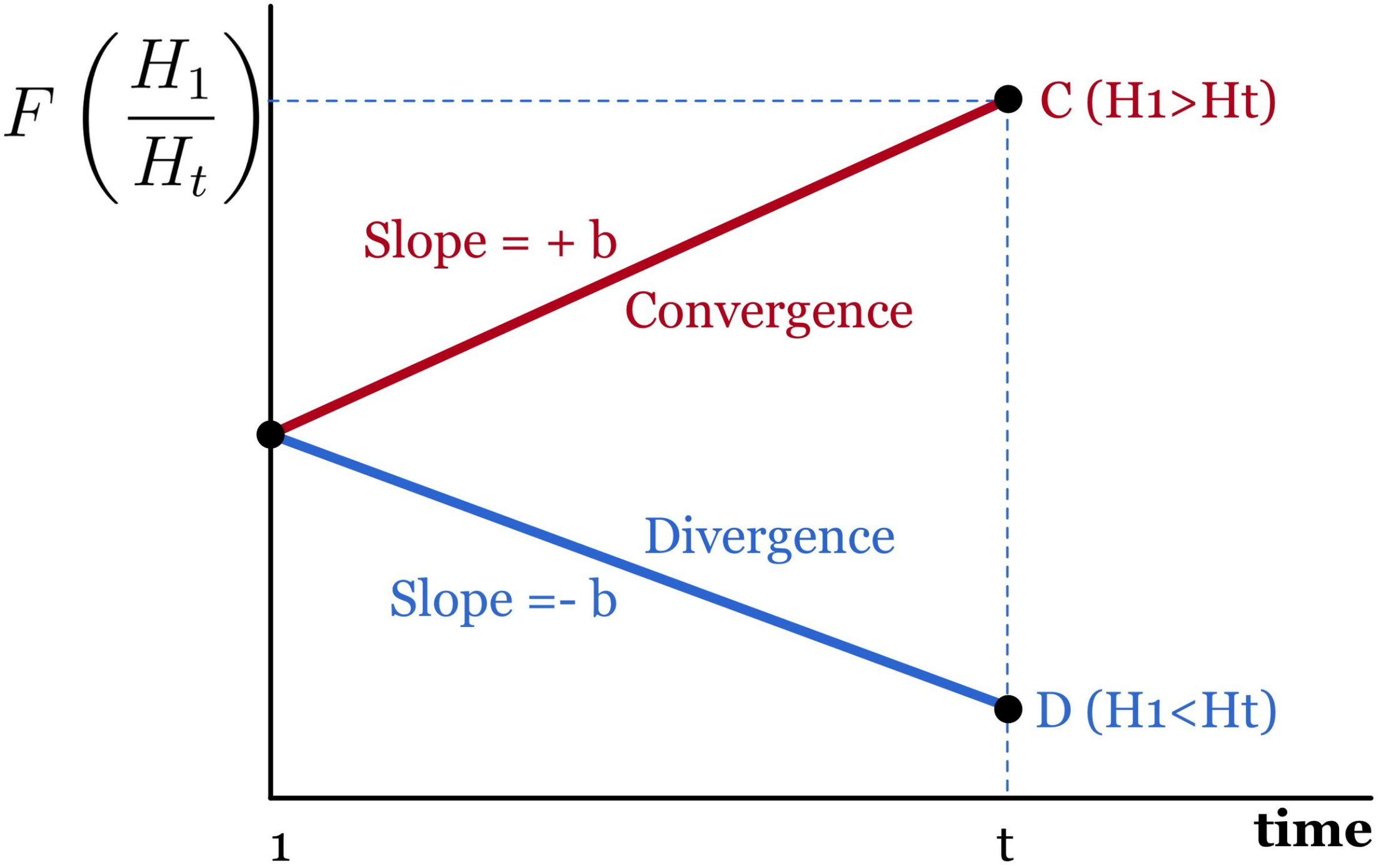
$$H_t = \frac{1}{N}\sum_{i=1}\left(h_{it} - 1\right)^2 \to 0$$

In other words, when the relative transition parameter converges to unity, $h_{it} \to 1$, the cross-sectional variance converges to zero, $H_t \to 0$.

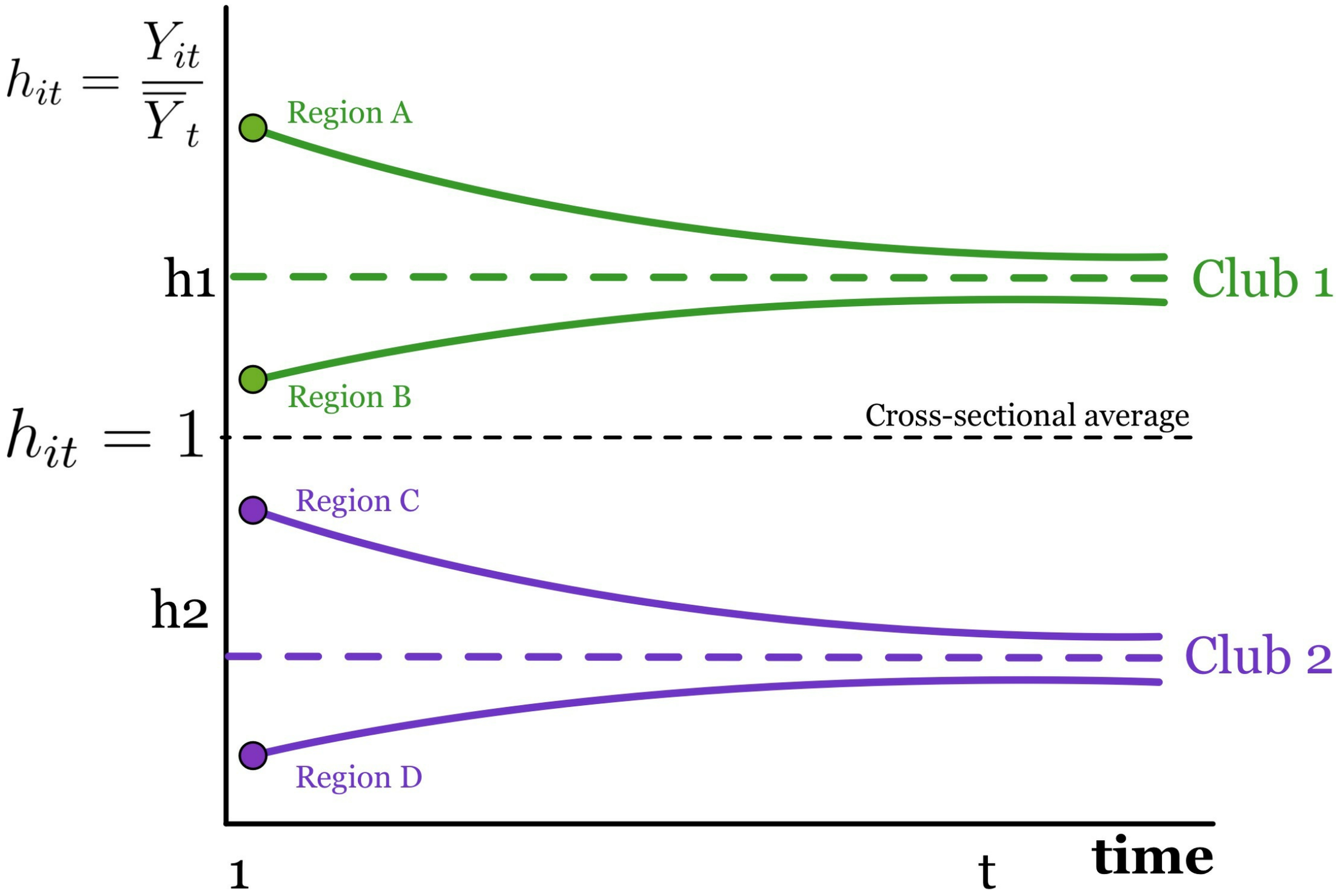
- Thrid, Phillips and Sul (2007) test this hypothesis by using the following log t regression model

$$log\left(\frac{H_1}{H_t}\right) - 2log\{log(t)\} = a + b\, log(t) + \epsilon_t$$

Convergence test (intuition)



Convergence clubs (intuition)



(3) Main results

Overall results

Characteristics of the two convergence clubs in labor productivity

Characteristics of the multiple convergence clubs in capital accumulation

Characterstics of the unique convergence club in efficiency

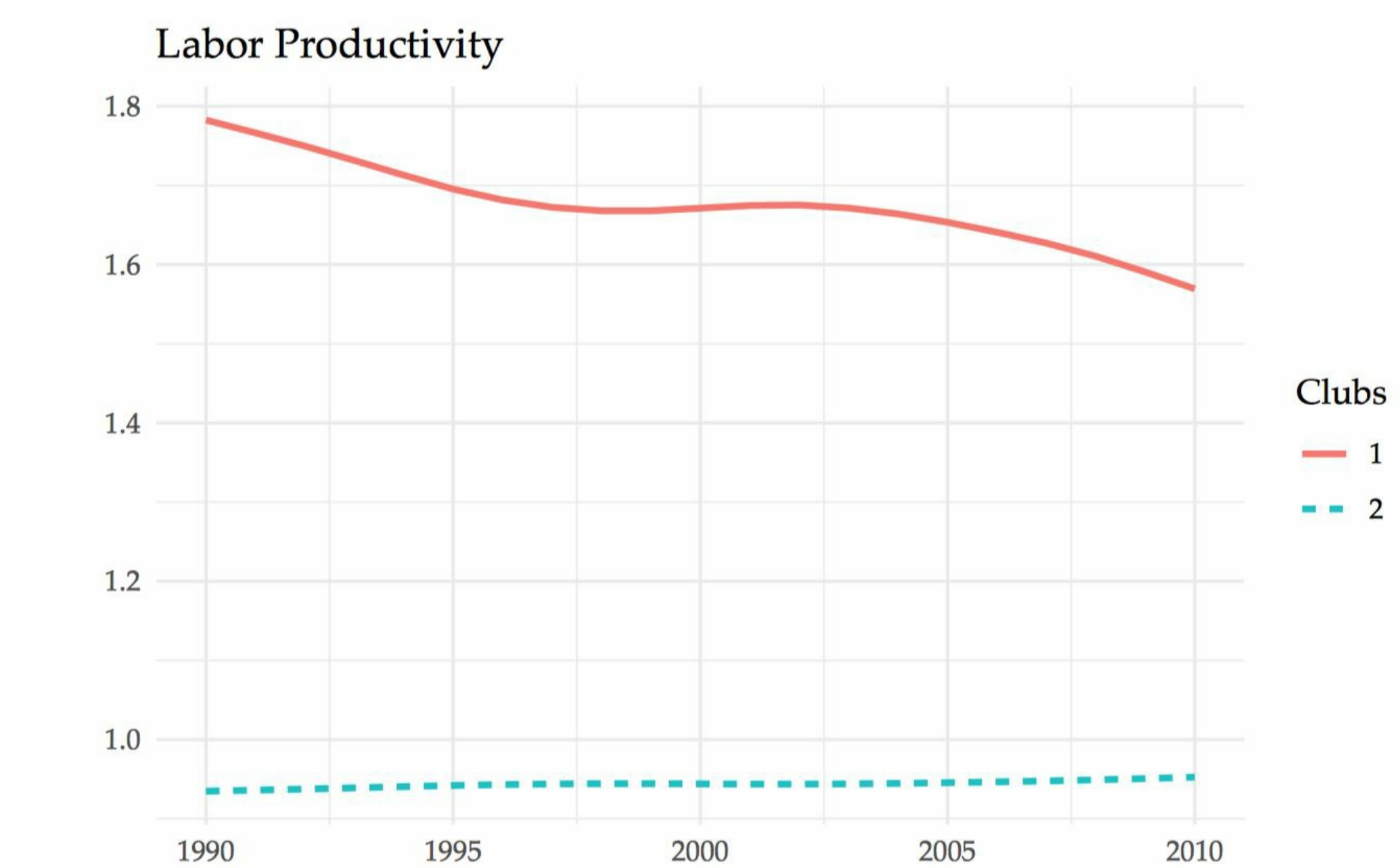
Overall results: Convergence and Divergence

Table 1 Log t convergence test 1990-2010

Variable	Coefficient	Std. Error	t-statistic
Labor productivity per worker	-0.27	0.06	-4.24
Physical capital per worker	-0.54	0.02	-35.77
Human capital per worker	-0.25	0.06	-4.12
Efficiency (Parametric)	0.38	0.53	0.73
Efficiency (Non-Parametric)	0.76	0.07	11.02

Note: The null hypothesis of convergence is rejected when *t*-statistic is less than 1.65.

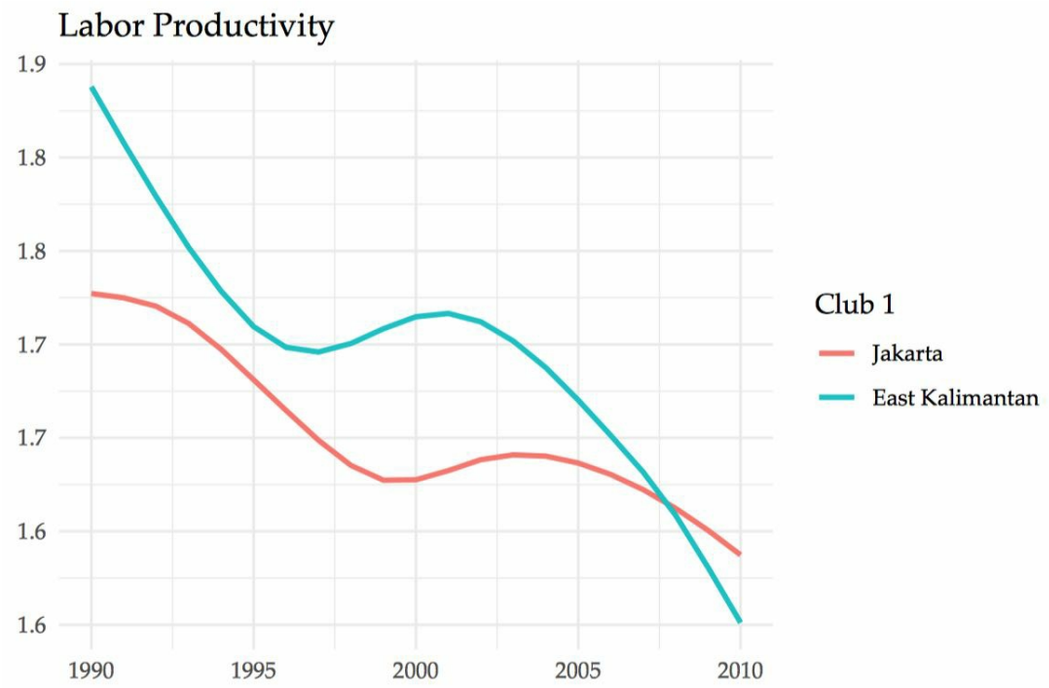
LABOR PRODUCTIVITY: Two convergence clubs



Club	No. of countries	Coefficient	Standard Error	t-statistic
1	2	3.089	1.7334	1.7821
2	24	0.0192	0.0831	0.2314

Note: The null hypothesis of convergence is rejected when the *t*-statistic is less than 1.65.

LABOR PRODUCTIVITY: Members of the clubs



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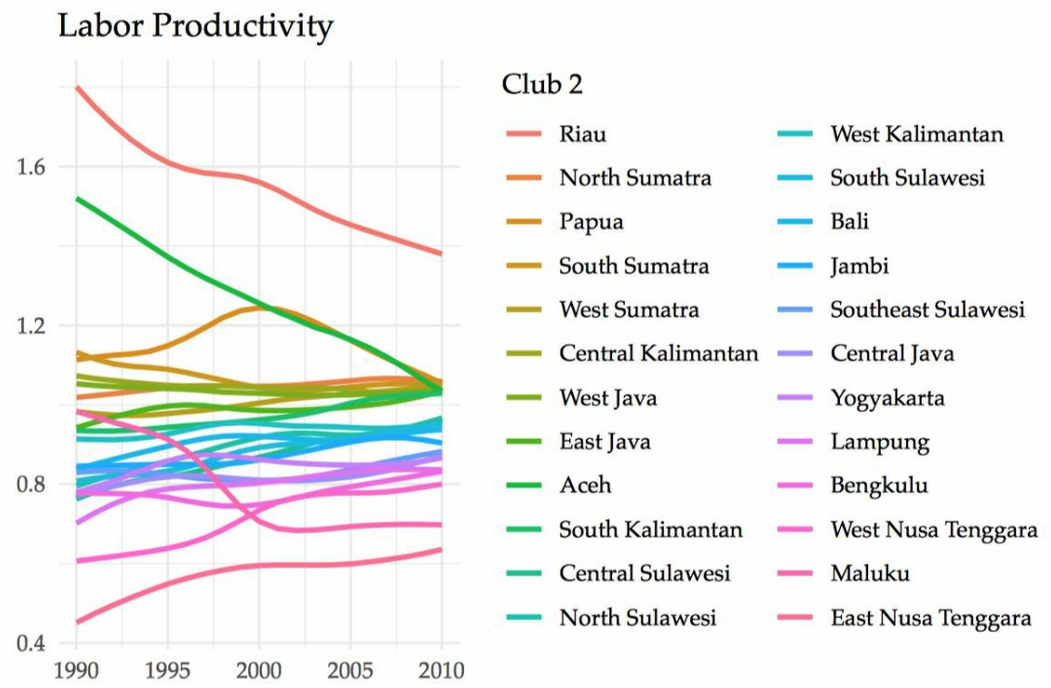

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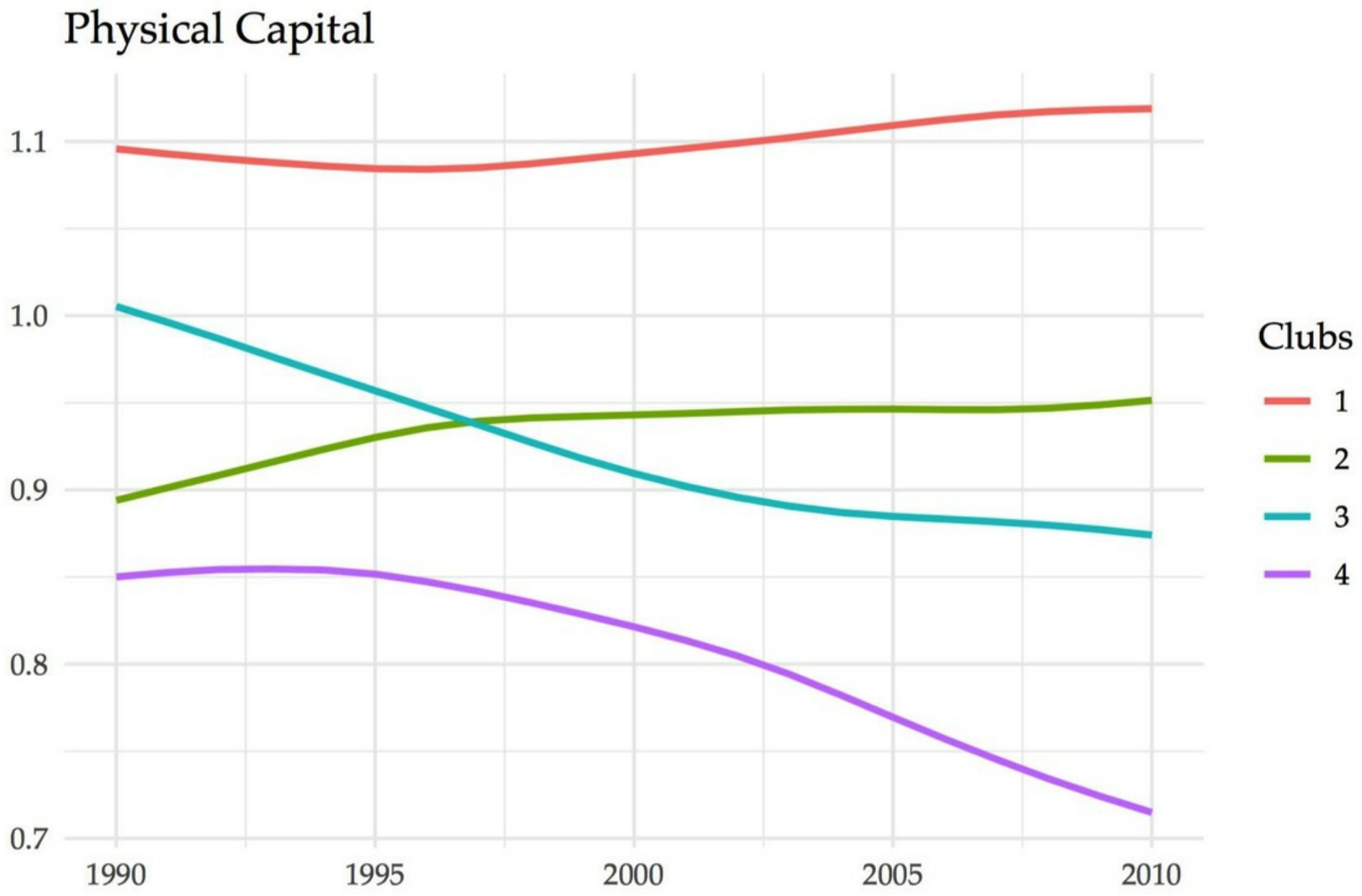
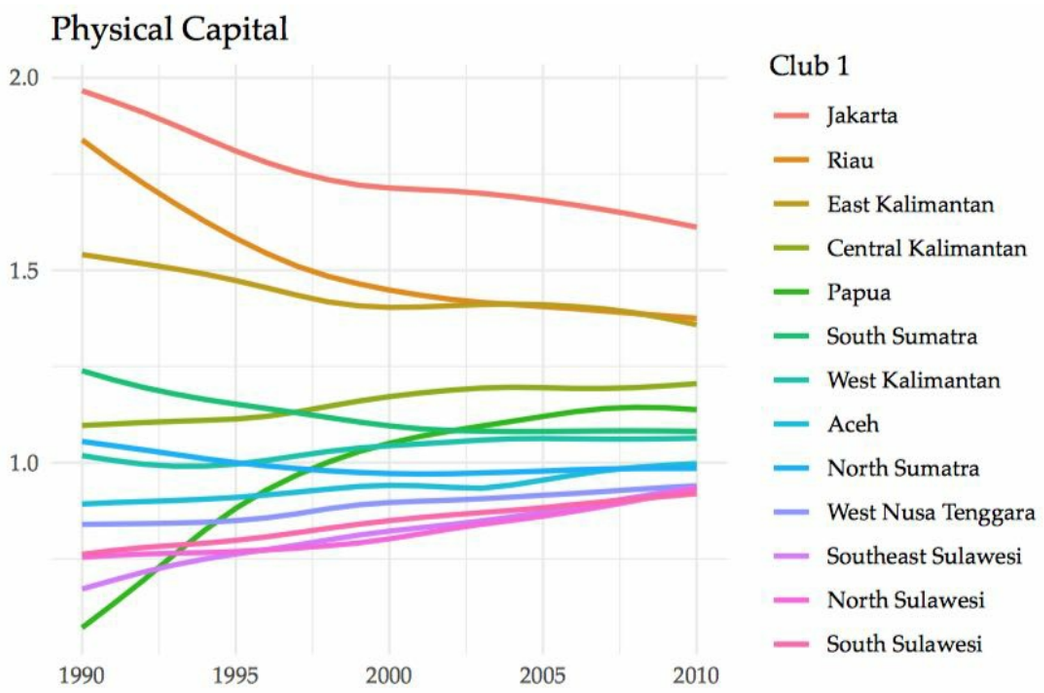
PHYSICAL CAPITAL: Four convergence clubs



Club	No. of countries	Coefficient	Standard Error	t-statistic
1	13	-0.055	0.04	-1.3752
2	7	0.4093	0.0161	25.4488
3	2	1.3432	1.4211	0.9452
4	3	3.3393	0.5707	5.8511

Note: Non-converging countries: Bali. The null hypothesis of convergence is rejected when the *t*-statistic is less than 1.65.

PHYSICAL CAPITAL: Members of the clubs



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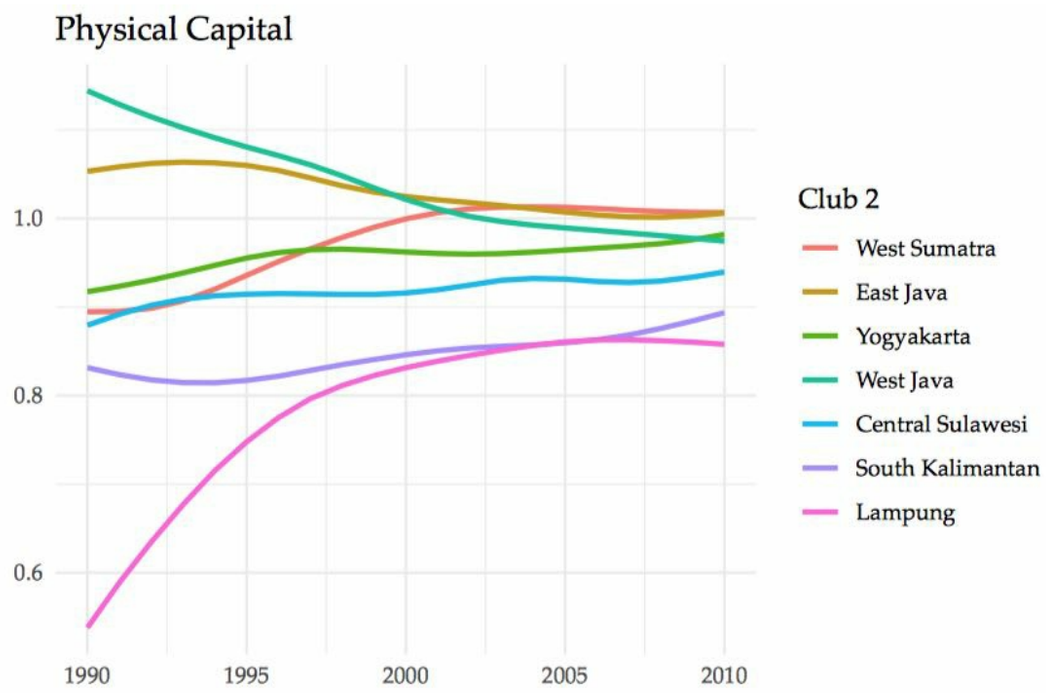

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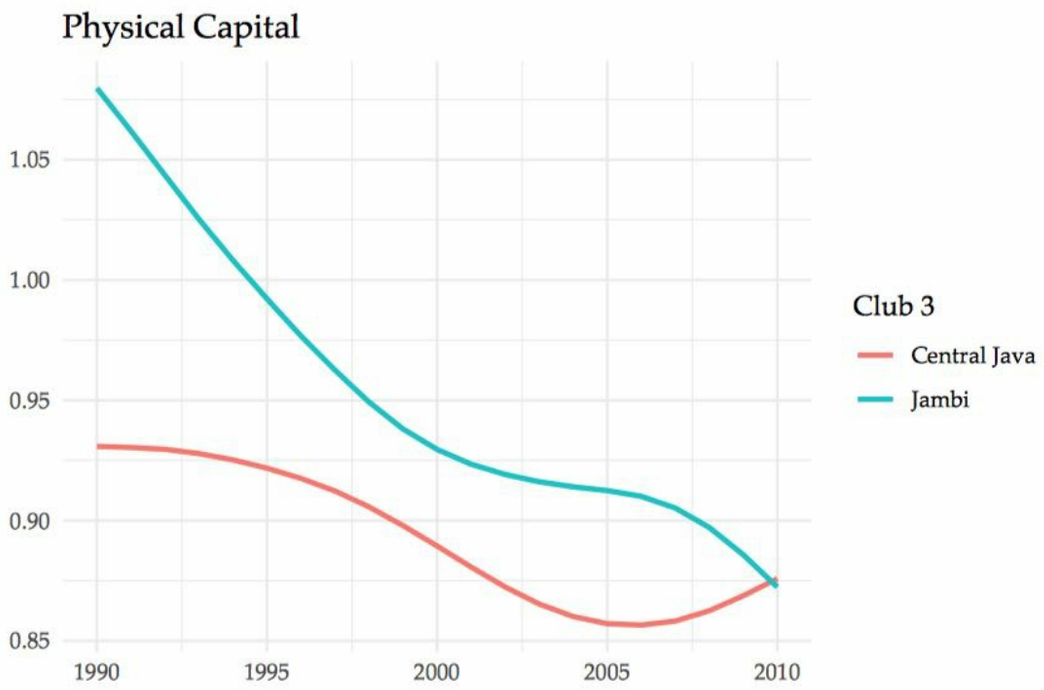

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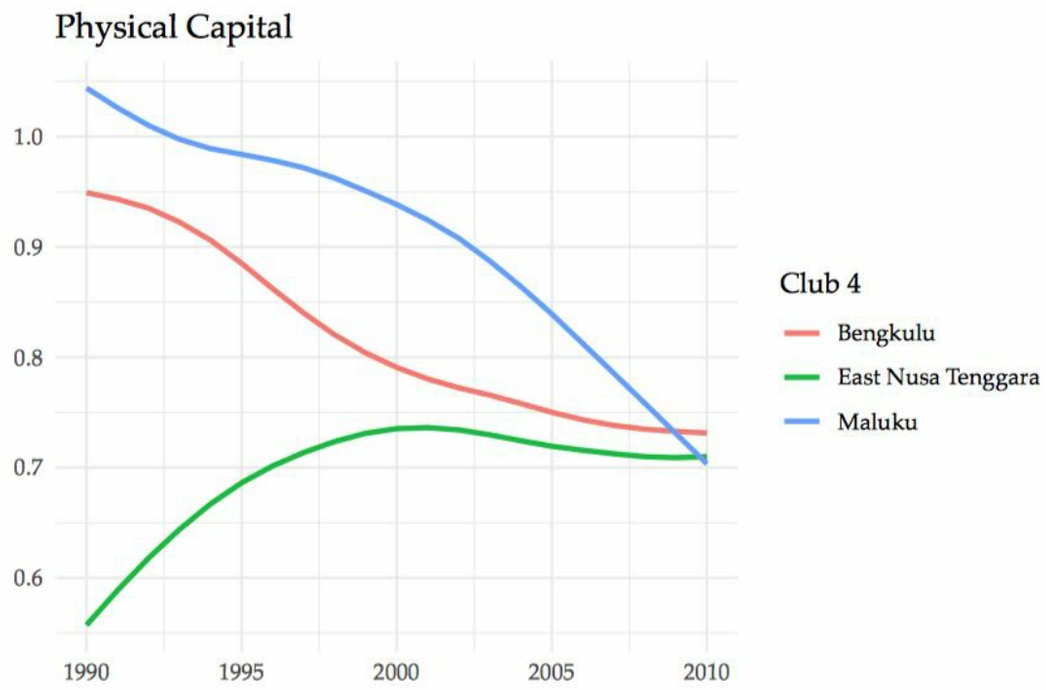

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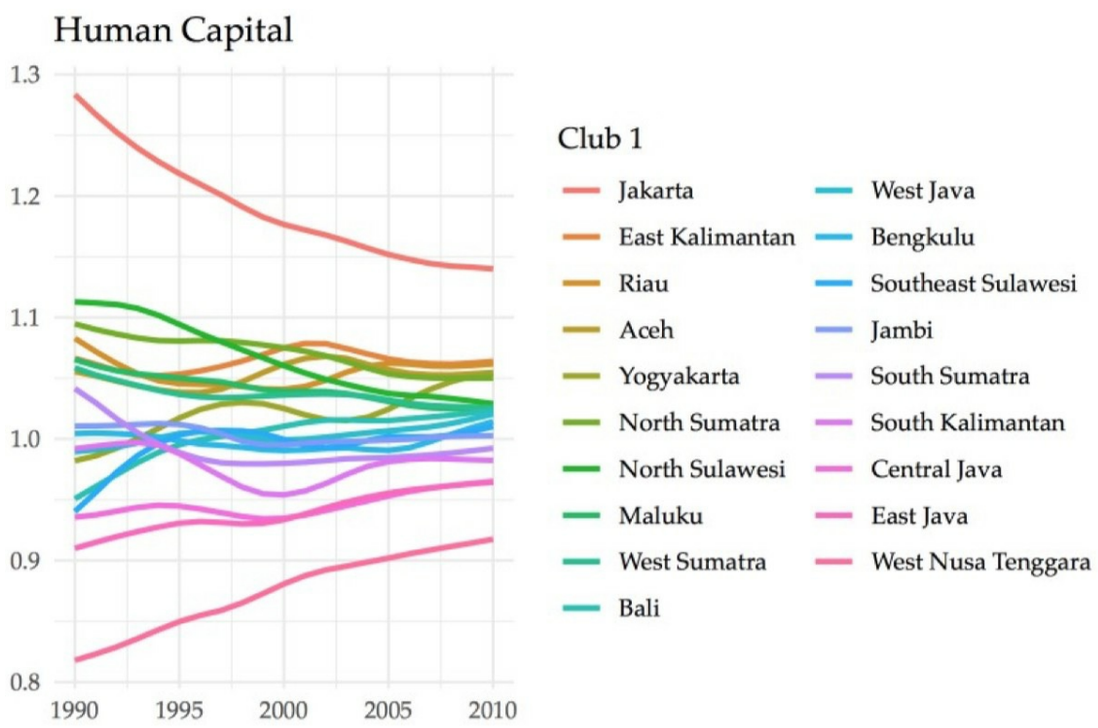
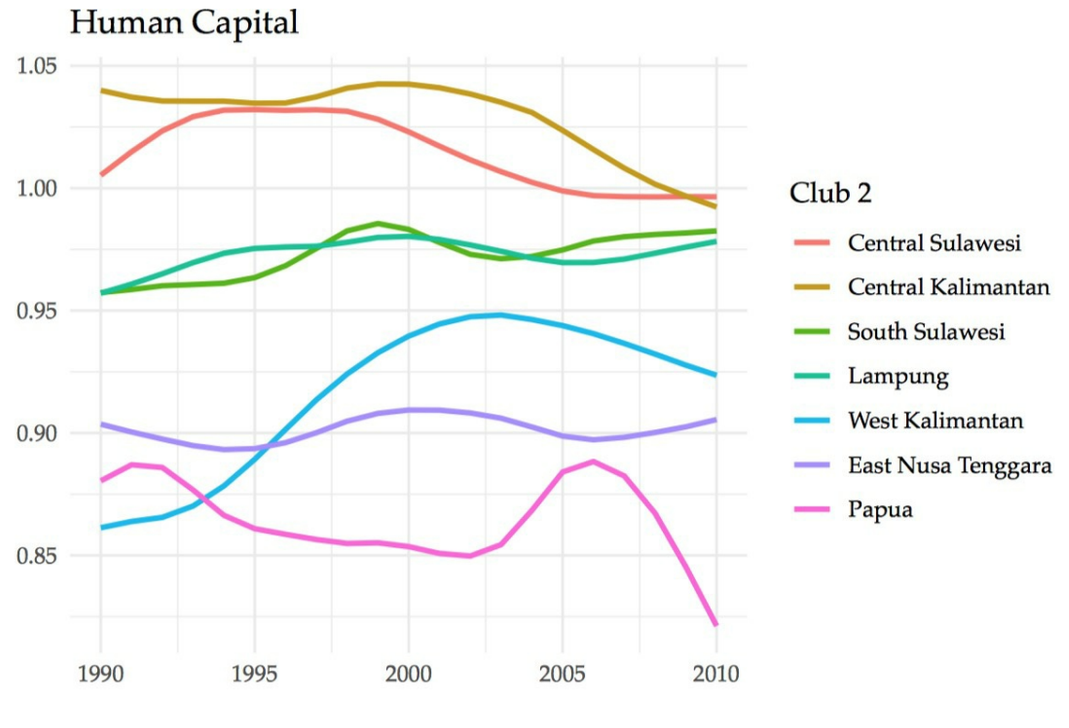
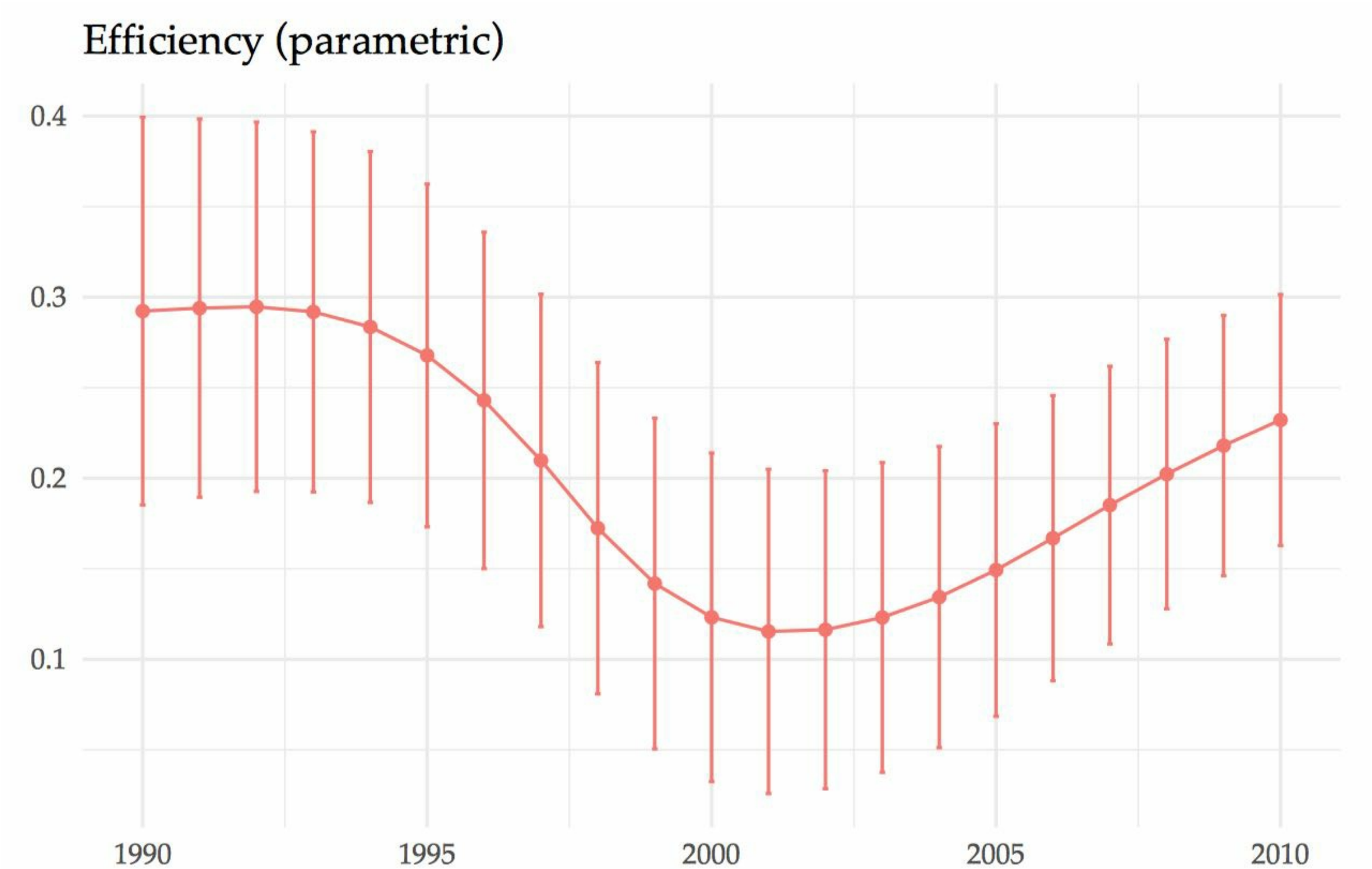
HUMAN CAPITAL: Two convergence clubs

HUMAN CAPITAL: Members of the clubs





EFFICIENCY: One convergence club



Note: Efficiency is measured in absolute levels using a Cobb-Douglas production function with elasticity parameter of 0.33. The mean and the 95 confidence interval is computed for each year

Concluding Remarks

- Reject the (overall) convergence hypothesis in labor productivity and two of its determinants: physical capital and human capital
    - Physical capital: Four clubs with separating trends at the extremes
    - Human capital: Two clubs with serating trends
- A unique convergence club in efficiency
    - Low effeciency club: Is this a low efficiency trap?

Implications, discussion, and further research

- Regional heterogeneity is a pervasive feature in Indonesia (and many developing countries)
    - The need for an analaytical framework that focuses on heterogeneity and goes beyond the average
- Convergence clubs may help us identify economies facing similar challenges
    - Call for better coordination and cooperation policies both within and between clubs
- Masked within provinces in Indonesia, there is still a high degree of heterogeneity that is worth exploring. Using district level data is the next step.

Thank you very much for your attention

https://carlos-mendez.rbind.io

Slides and working paper available at: http://bit.ly/arsc2019

Quantitative Regional and Computational Science lab

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