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:

- Large regional inequality in Indonesia (Esmara 1975; Mishra 2009; Kataoka 2018)
    - A large literature focuses on the dynamics of regional inequality
        - MOST papers use the classical convergence approach of Barro and Sala-i-Martin (1991)
            - Describe the dynamics of the "average" region (Garcia and Soelistianingsih 1997; Resosudarmo and Vidyattama 2006; Hill, Resosudarmo, and Vidyattama 2007; Vidyattama 2013; 2014).
        - FEW papers study the dynamics of regional convergence "beyond the average" (Sakamoto 2007; Kurniawan et. al, 2019)
    - Kurniawan et. al (2019 Reg. Sci PP) use the novel convergence approach of Phillips and Sul (2007 Econometrica) to study regional income convergence in Indonesia beyond the average
        - Focus on the role of heteregeneity both across regions and over time
        - Provinces in Indonesia are converging to TWO separate clubs

Research Objective:

Study the determinants of regional per-capita income: labor productivity, capital accumulation and efficiency

- 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?

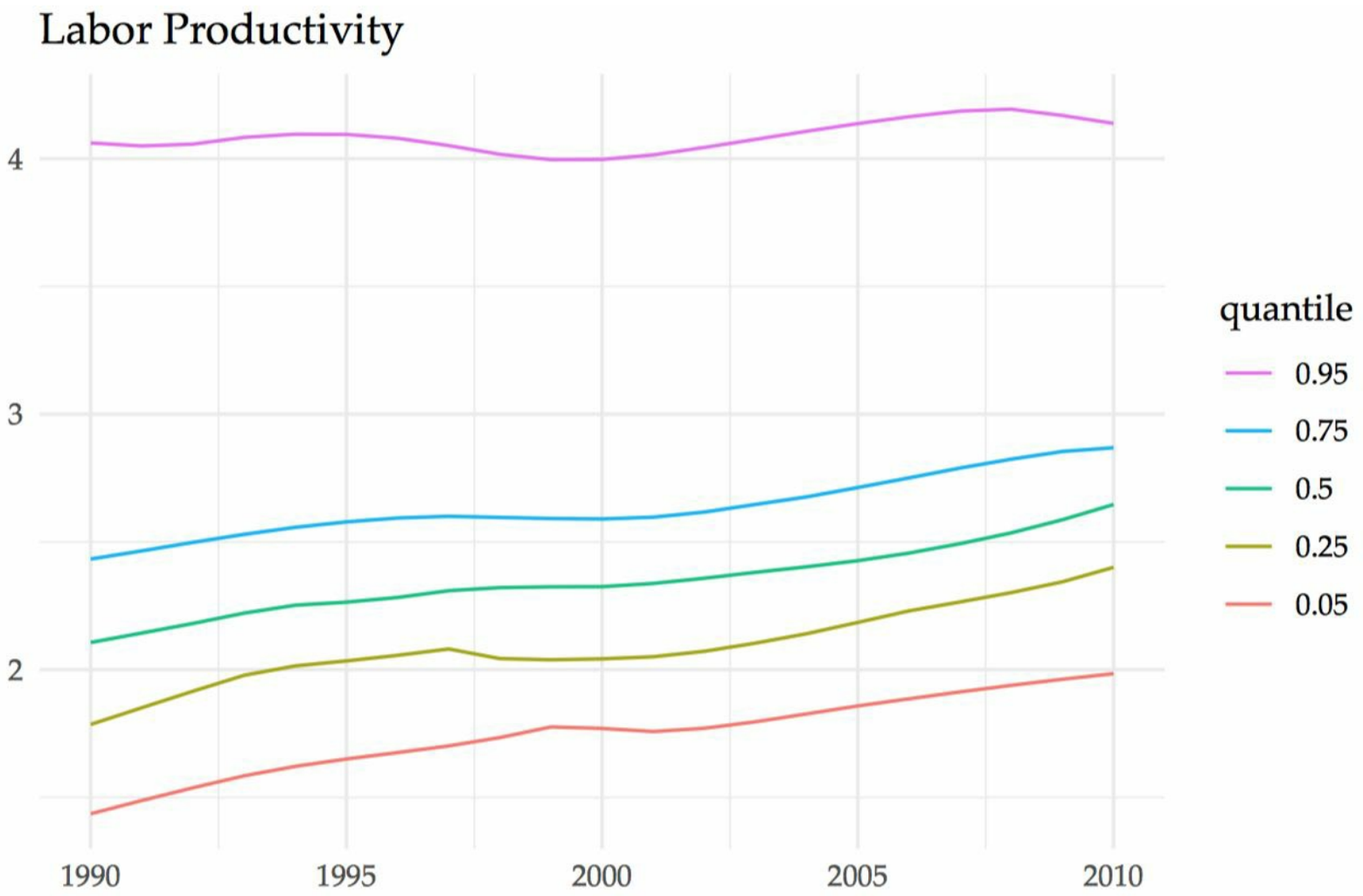
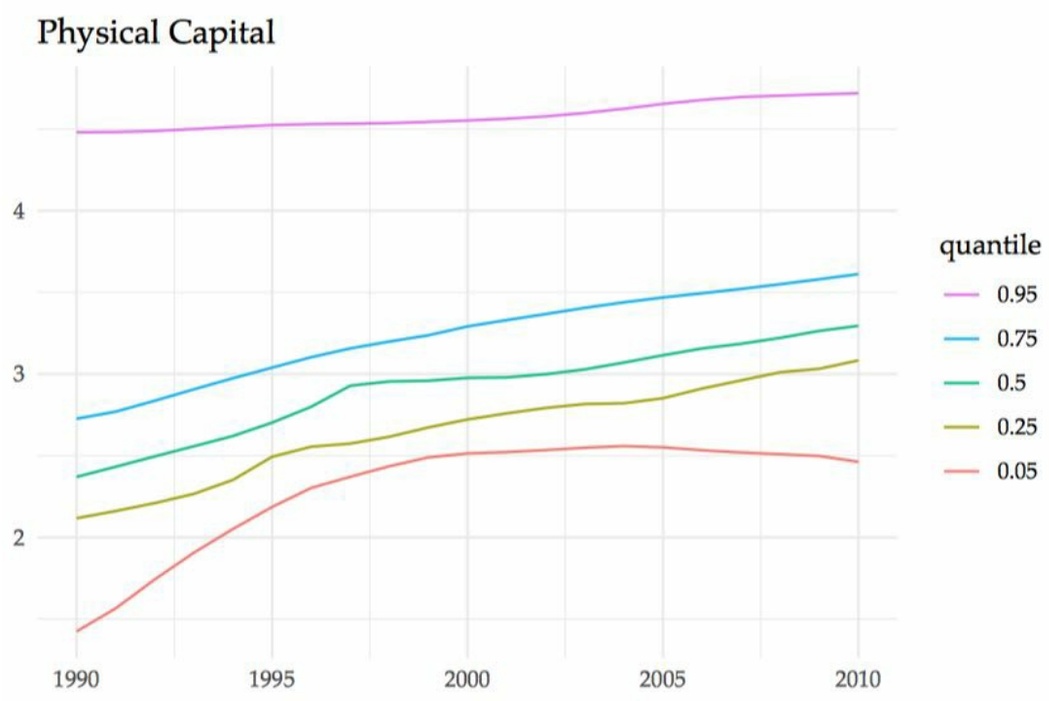


Fig. 1 Cross-provincial dynamics of labor productivity

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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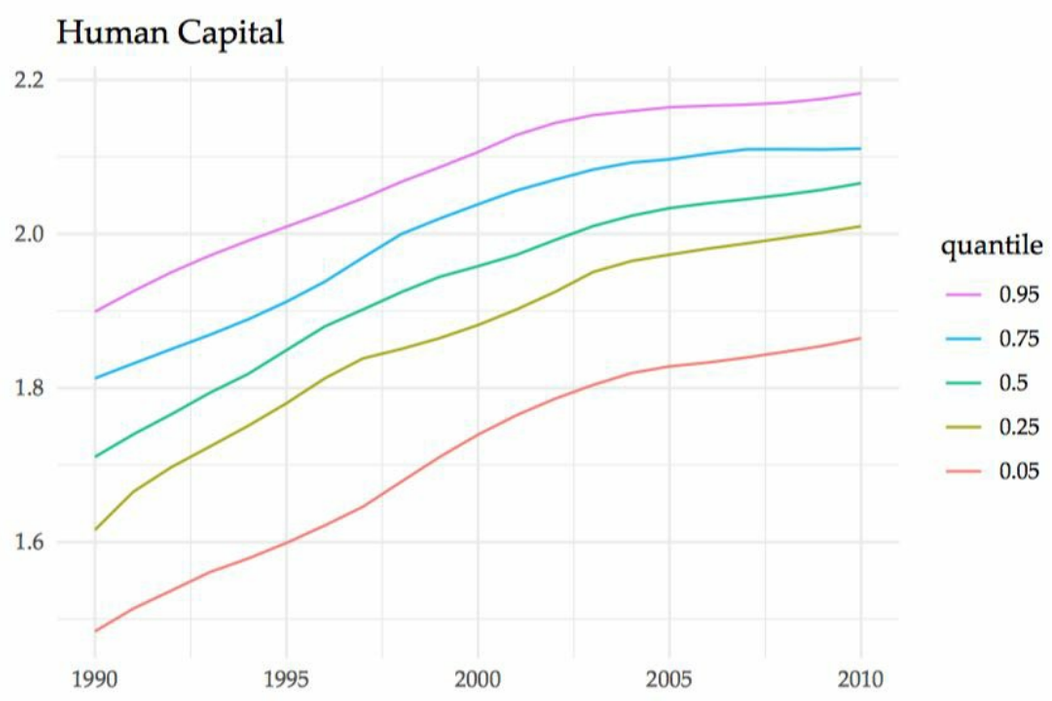

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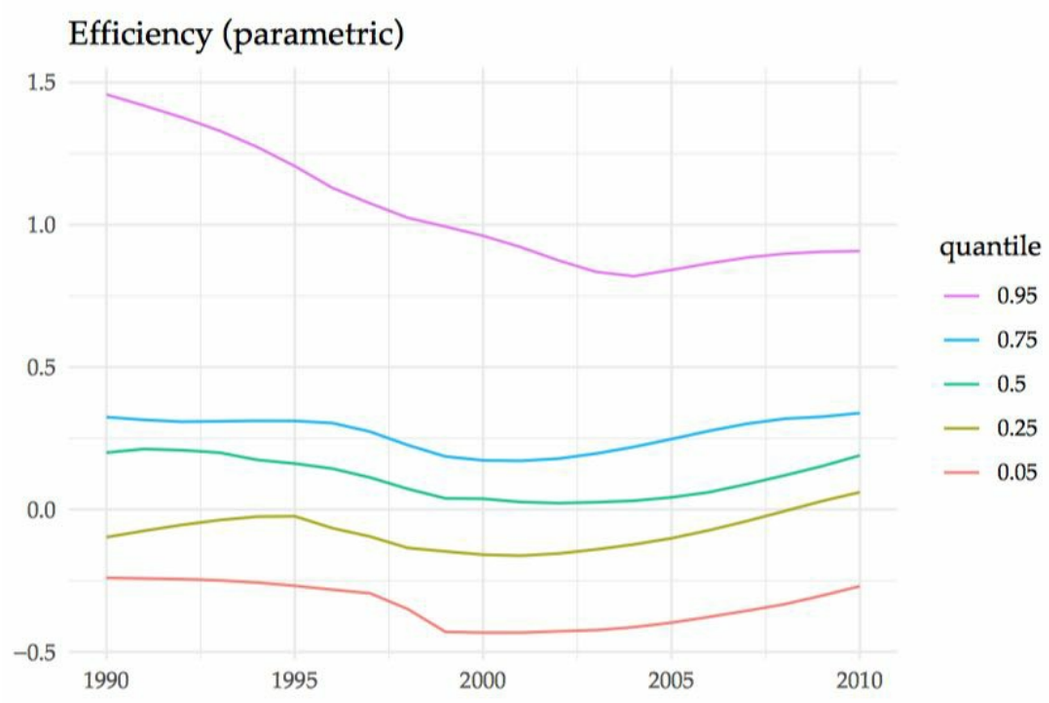

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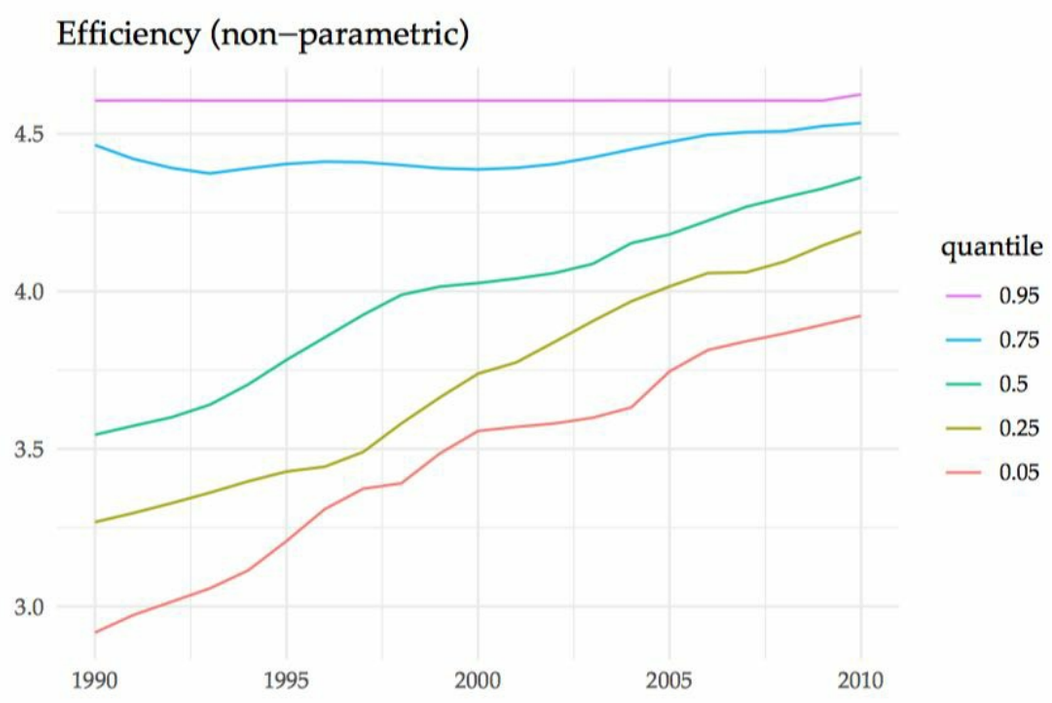

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(2) Convergence framework

Convergence test (intuition)

Convergence clubs (intuition)

Convergence framework (brief overview)

- First, define a relative transition parameter, , as

$$= \frac{}{\frac{1}{} \sum_{=1}}$$

- Second, the convergence hypothesis is defined as

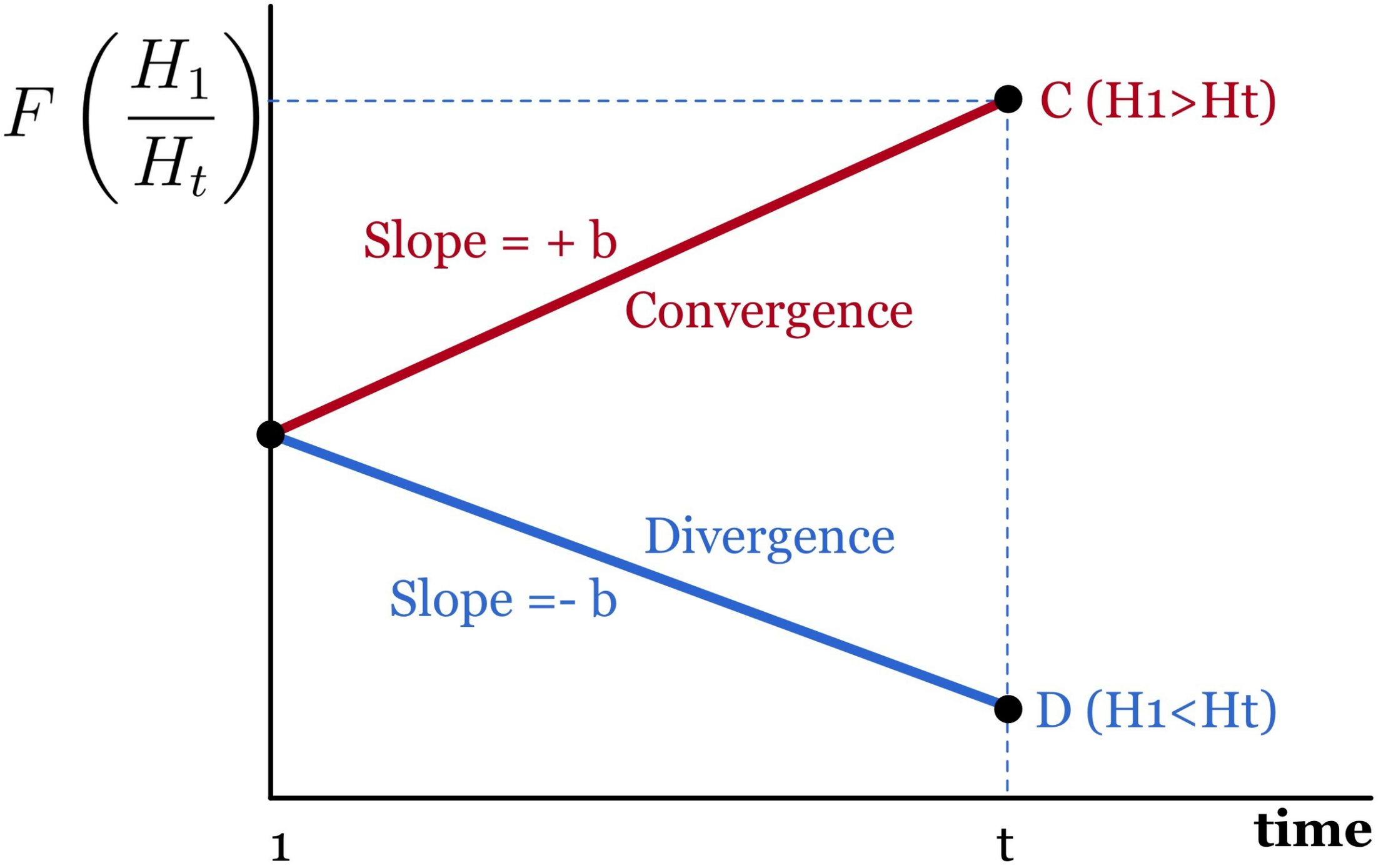
$$= \frac{1}{} \sum_{=1} (\quad - 1)^2 \to 0$$

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

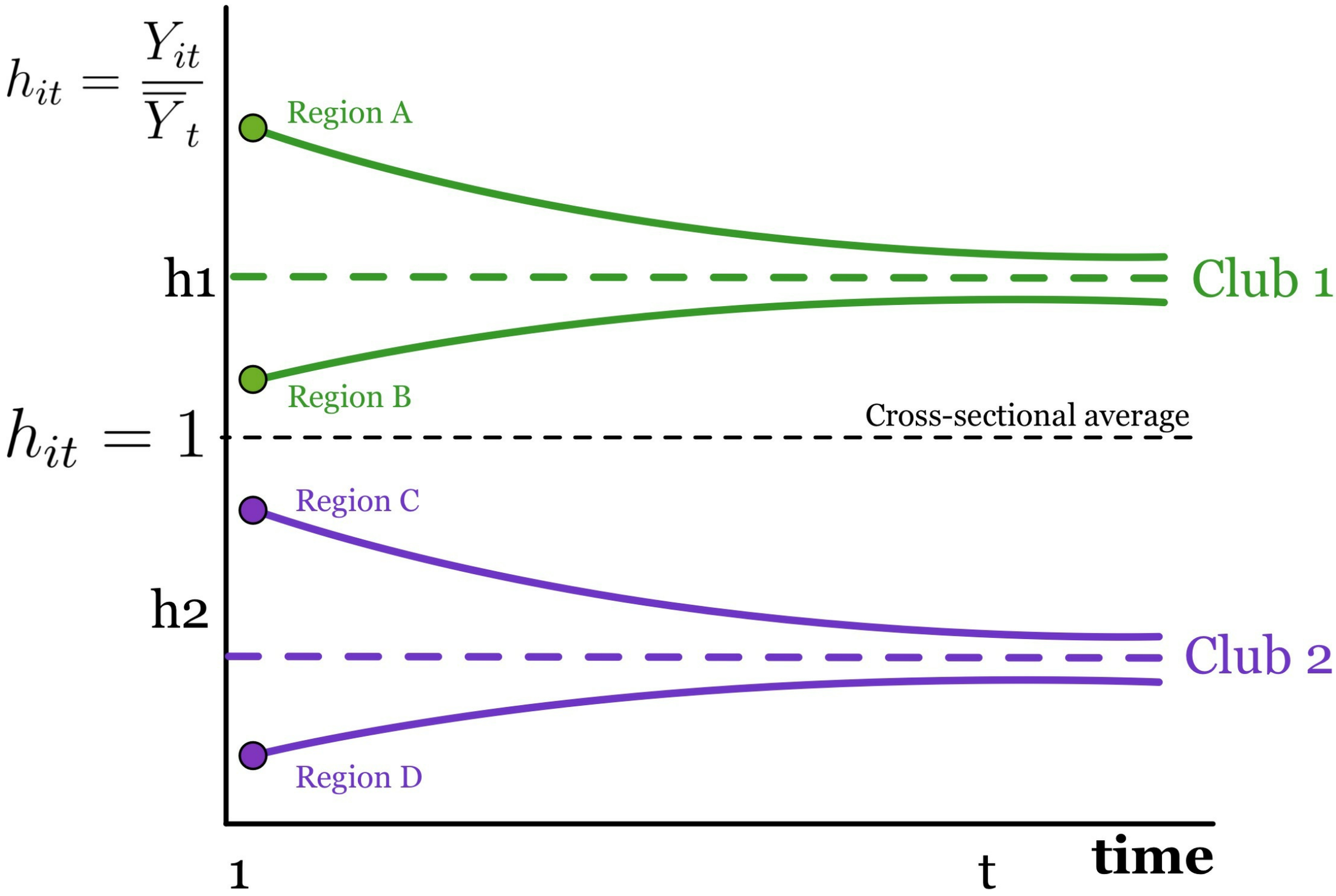
- Thrid, Phillips and Sul (2007) test this hypothesis by using the following log t regression model

$$\left(\frac{1}{} \right) - 2 \quad \{ \quad ( ) \} = \quad + \qquad ( ) +$$

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

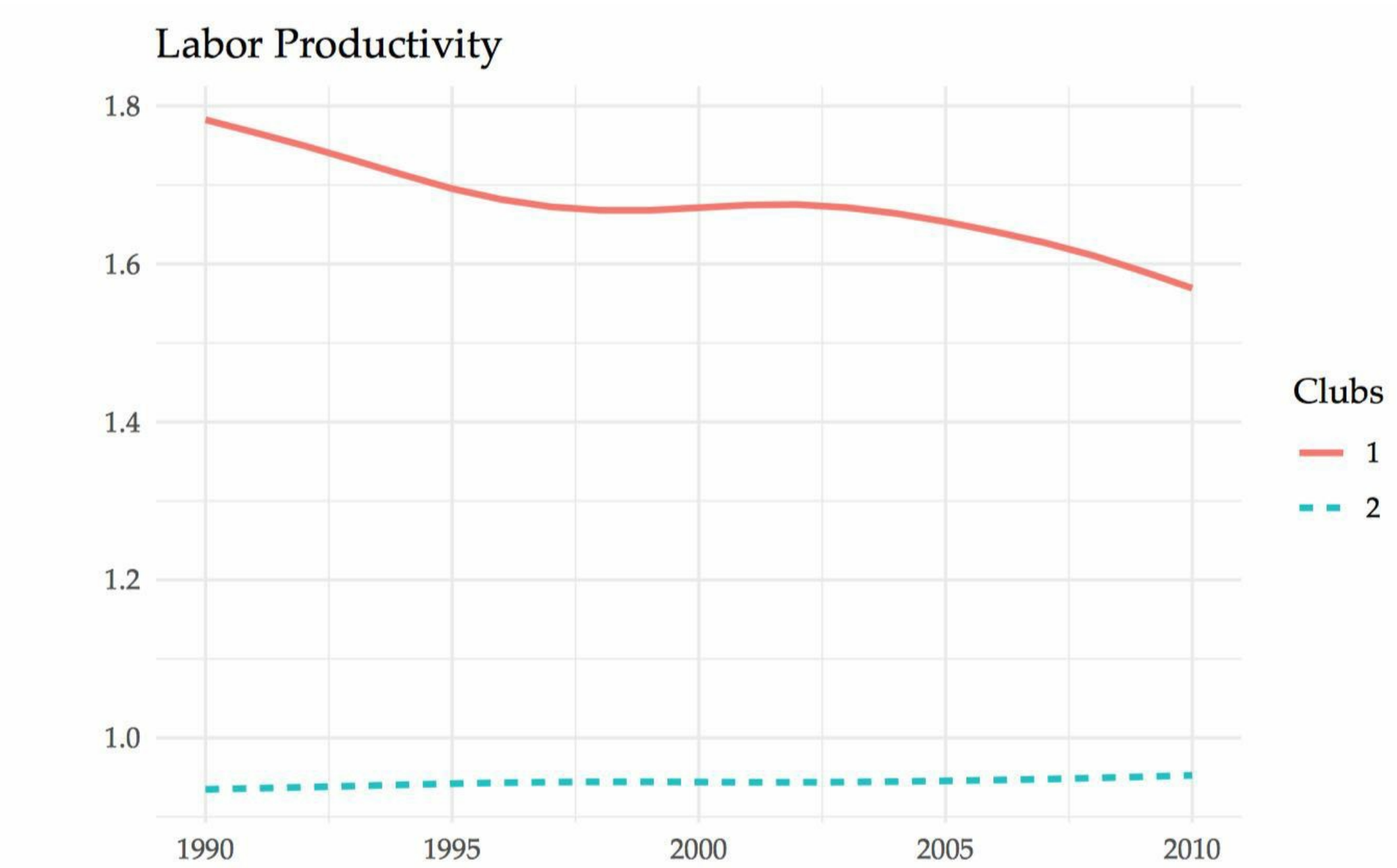
Overall results: Convergence and Divergence

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.

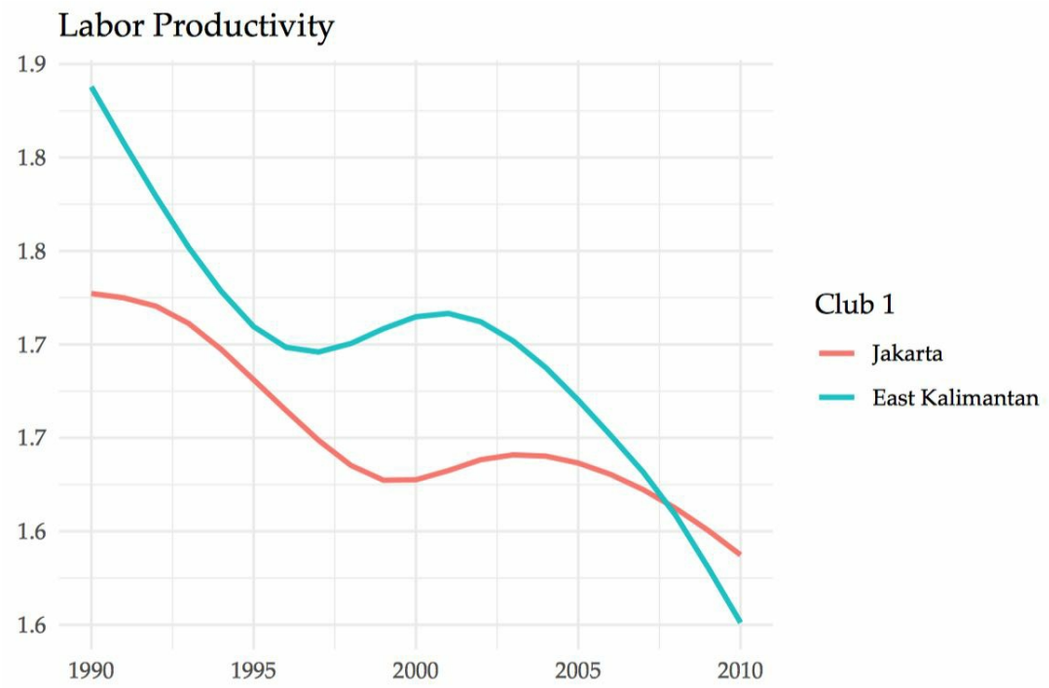
LABOR PRODUCTIVITY: Two convergence clubs



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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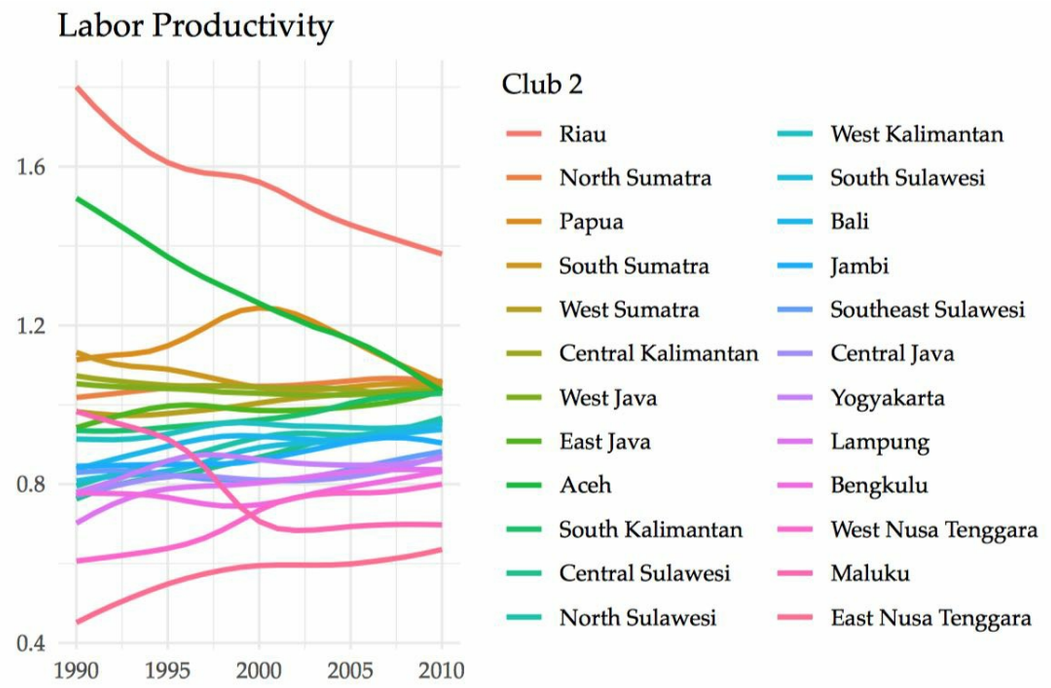

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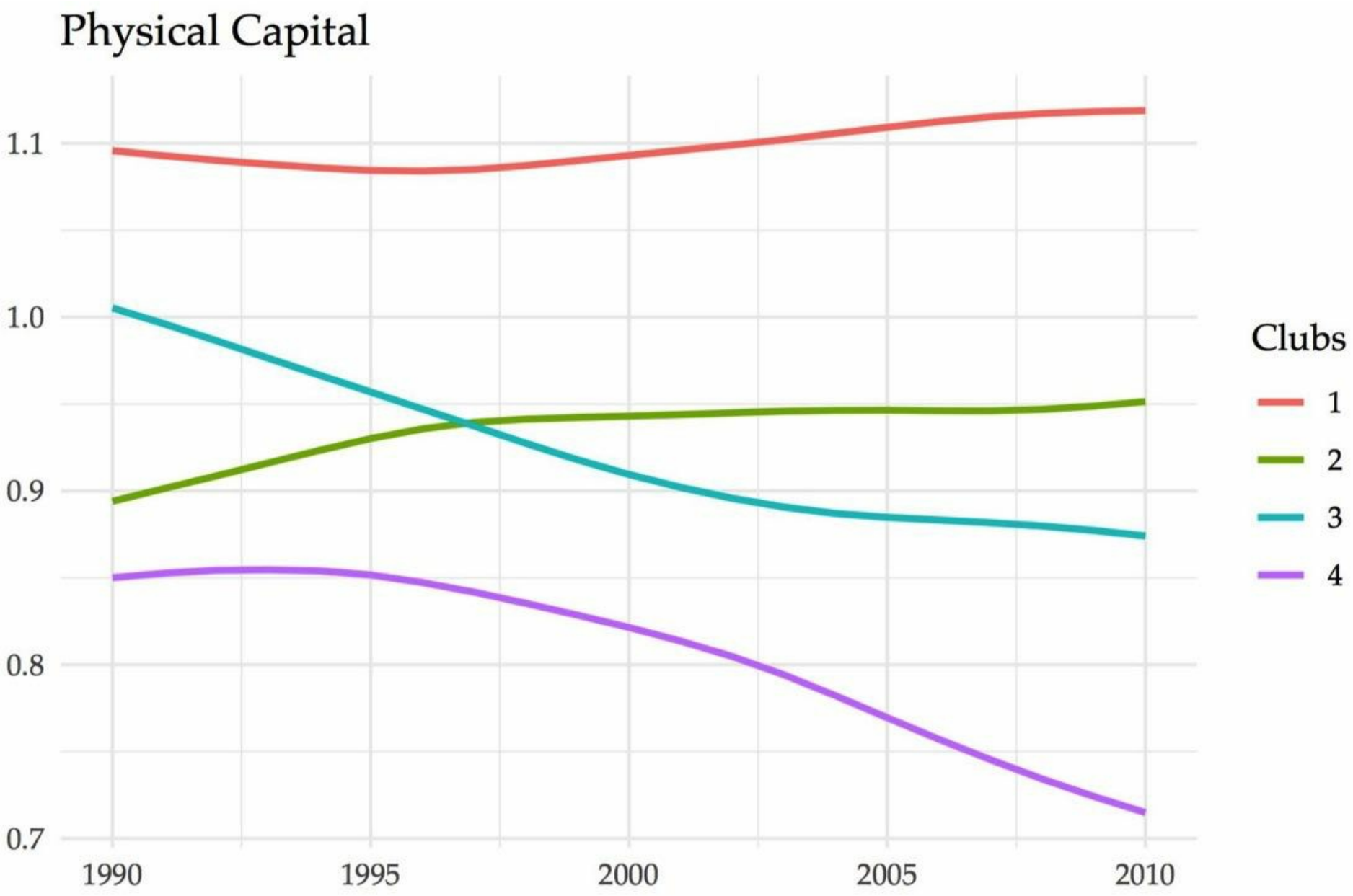
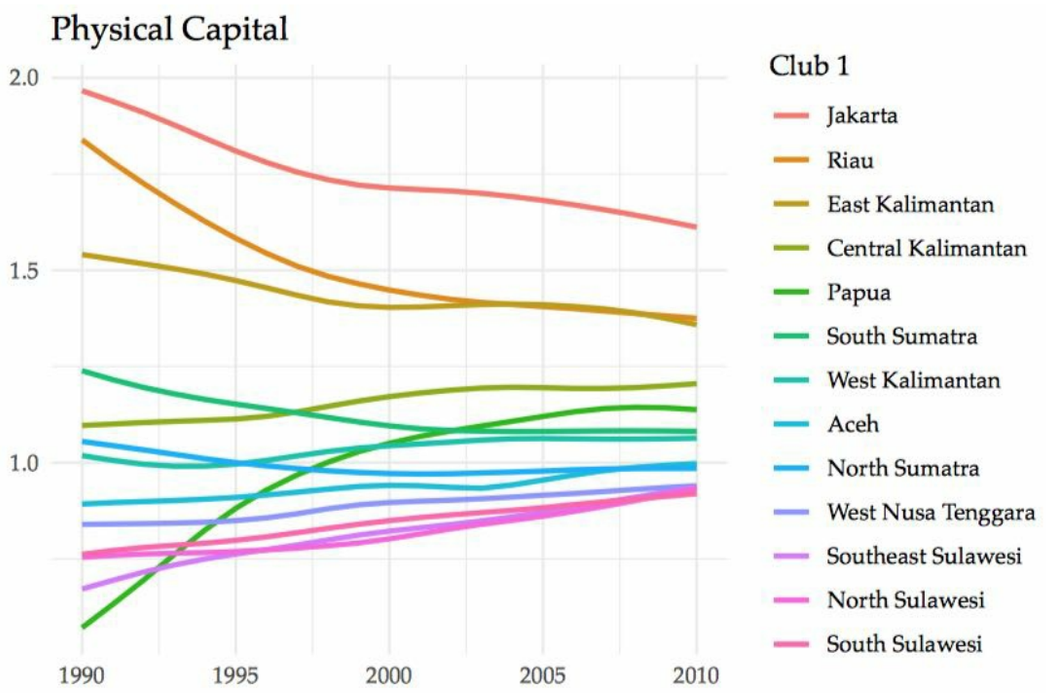
PHYSICAL CAPITAL: Four convergence clubs



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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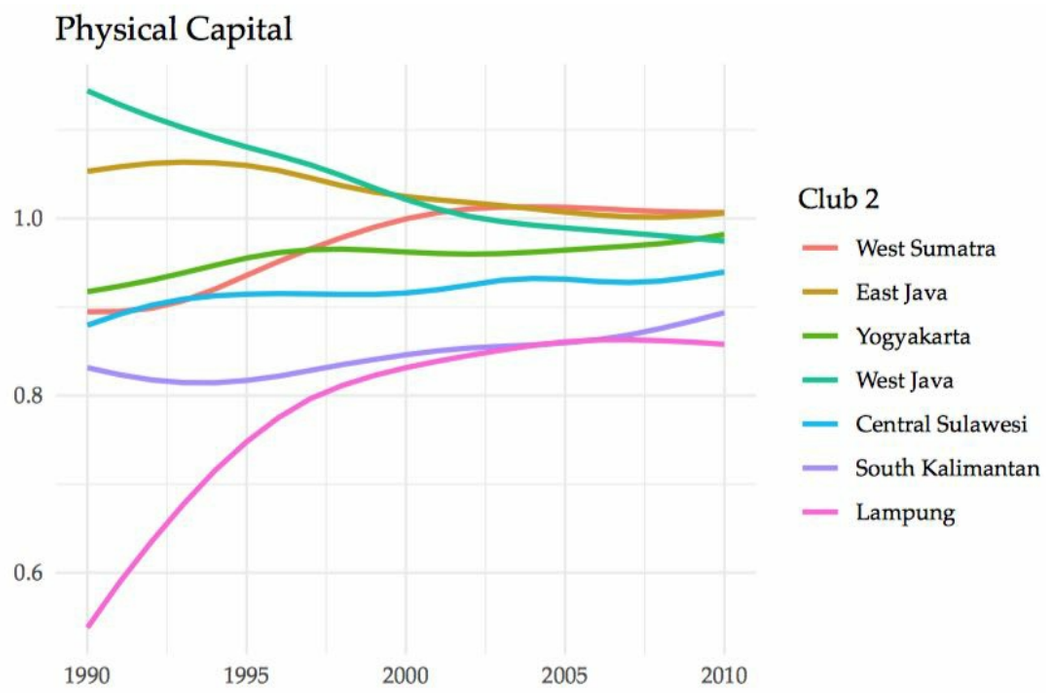

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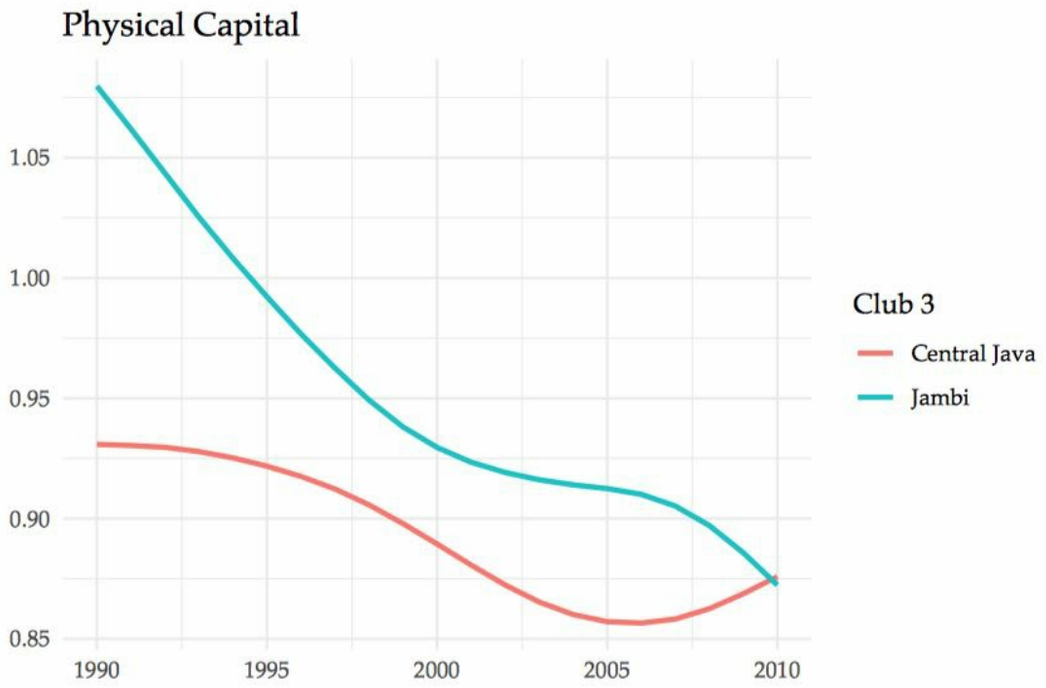

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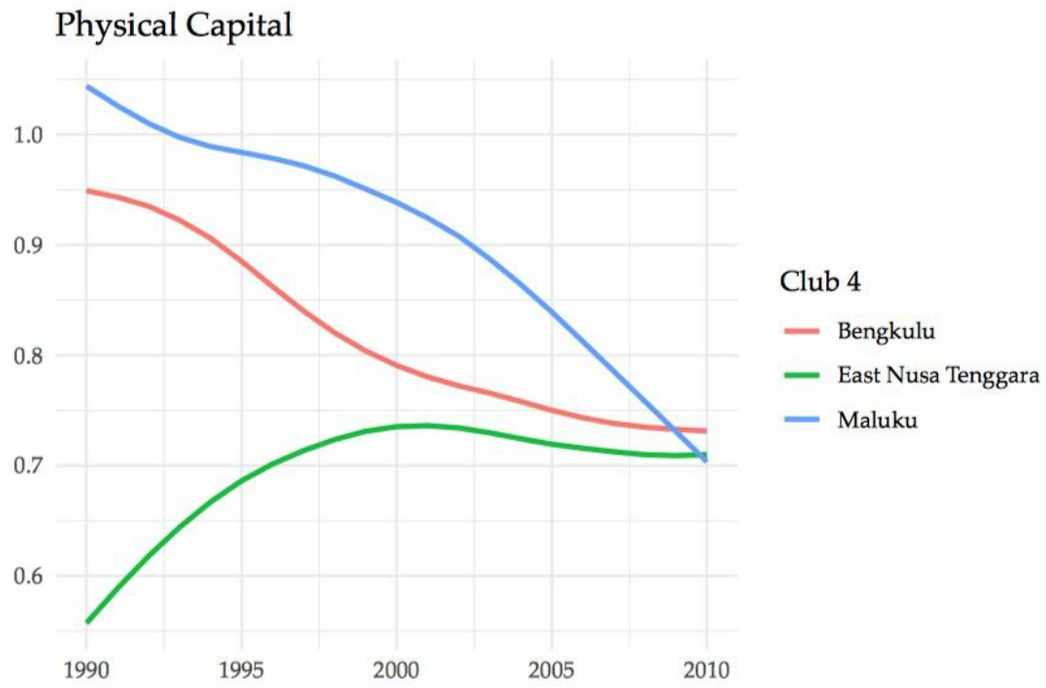
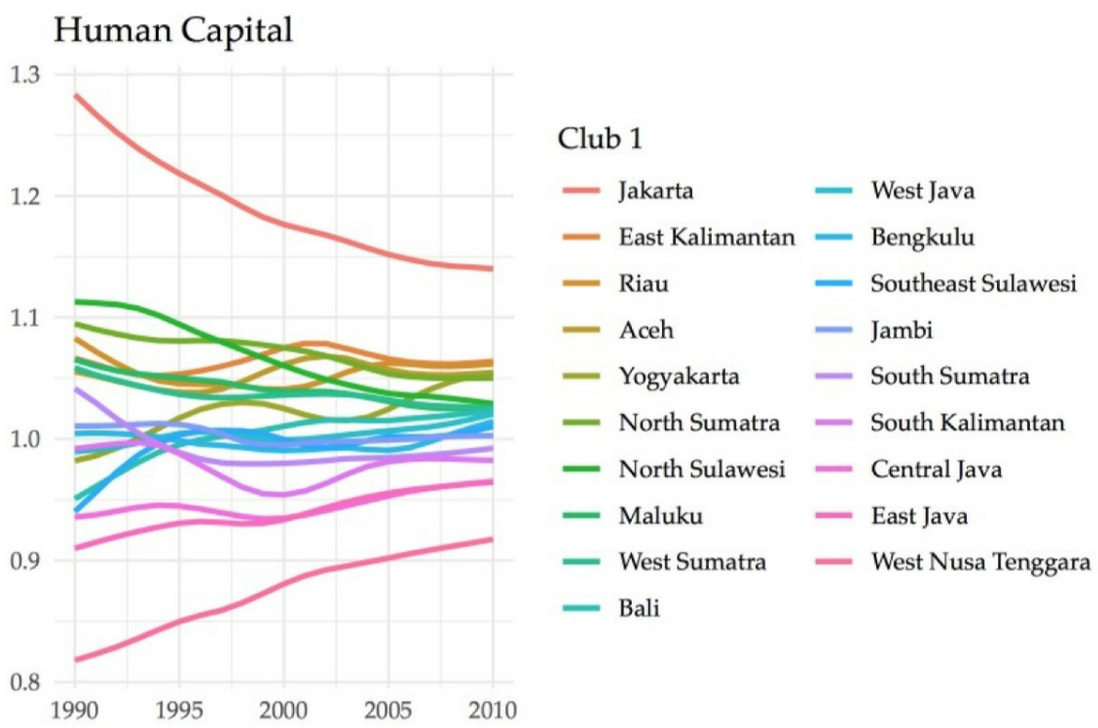
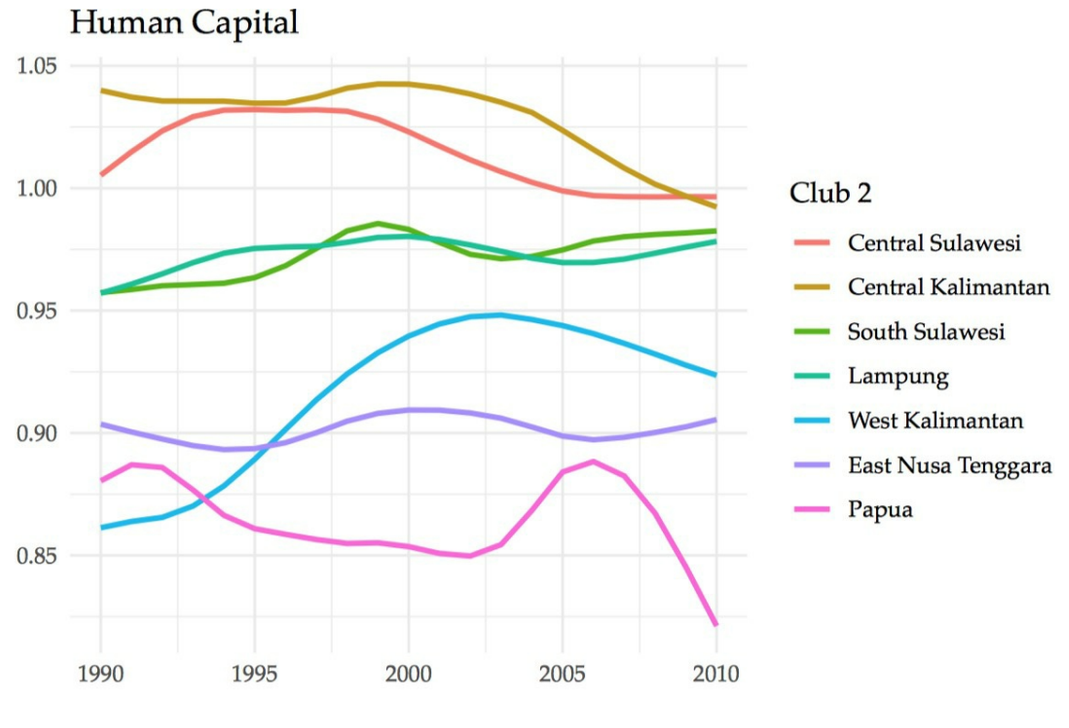


(d)

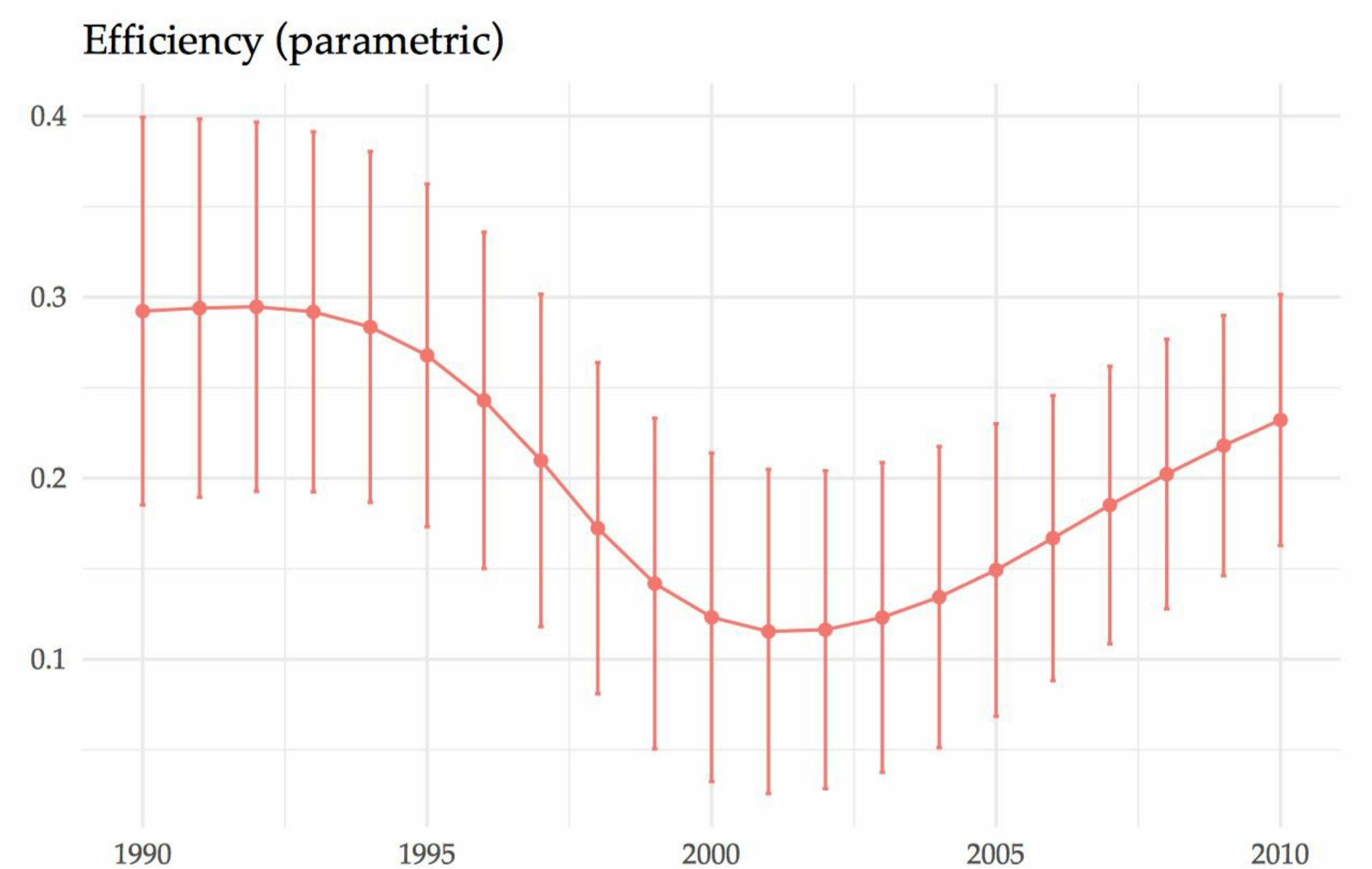
HUMAN CAPITAL: Two convergence clubs

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

- Labor productivity: Two largely separated clubs
- Physical capital: Four clubs with separating trends at the extremes
- Human capital: Two clubs with separating 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 and using firm level data is the following

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

https://quarcs-lab.rbind.io

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