Productivity Differences and Convergence Clubs in Latin America

Carlos Mendez
https://carlos-mendez.rbind.io
Associate Professor
Graduate School of International Development
Nagoya University, JAPAN

Prepared for the 2019 International Joint Conference of JAHSS · JASID

[Slides and paper available at: http://bit.ly/jasid2019n]

Motivation:

- Economic convergence is important for regional cohesion and competitiveness
- Inconclusive literature about Latin America: Convergence vs Divergence vs Convergence Clubs (Galvao and Reis-Gomes, 2007; Barrios et. al, 2018; Martin and Vazquez, 2015)
- Development potential of Latin America constrained by low productivity (Daude and Fernndez-Arias, 2010; Pages 2010; Restuccia, 2013)

Research Objective:

- (Re)evaluate the convergence hypothesis across economies in Latin America with particular emphasis on productivity differences and the formation of multiple convergence clubs.

Methods:

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

Data:

- Labor productivity and total factor productivity (Fernandez-Arias, 2017)
- 20 Latin American countries over the 1980-2014 period

Main Results:

1. Lack of overall convergence in both labor productivity and total factor productivity
2. Multiple local convergence clubs: above and below the average
3. Convergence clubs characteristics:
   - Labor productivity: Four clubs of countries
   - Total factor productivity: Three clubs of countries
   - Clubs show non-parallel trends: crossings, limited stability, and separating trends
   - The lowest-productivity club (Honduras and Nicaragua) is diverging from the rest at the highest speed.

Outline of this presentation

1. Some stylized facts
    - Productivity across countries and over time
    - Heterogeneity across countries and over time
2. Convergence framework
    - Convergengence test (intuition)
    - Convergengence clusters (intuition)
3. Main results of the paper
    - Lack of overall convergence
    - Multiple convergence clubs above and bellow the average
    - Convergence clubs characteristics

[Slides and paper available at: http://bit.ly/jasid2019n]

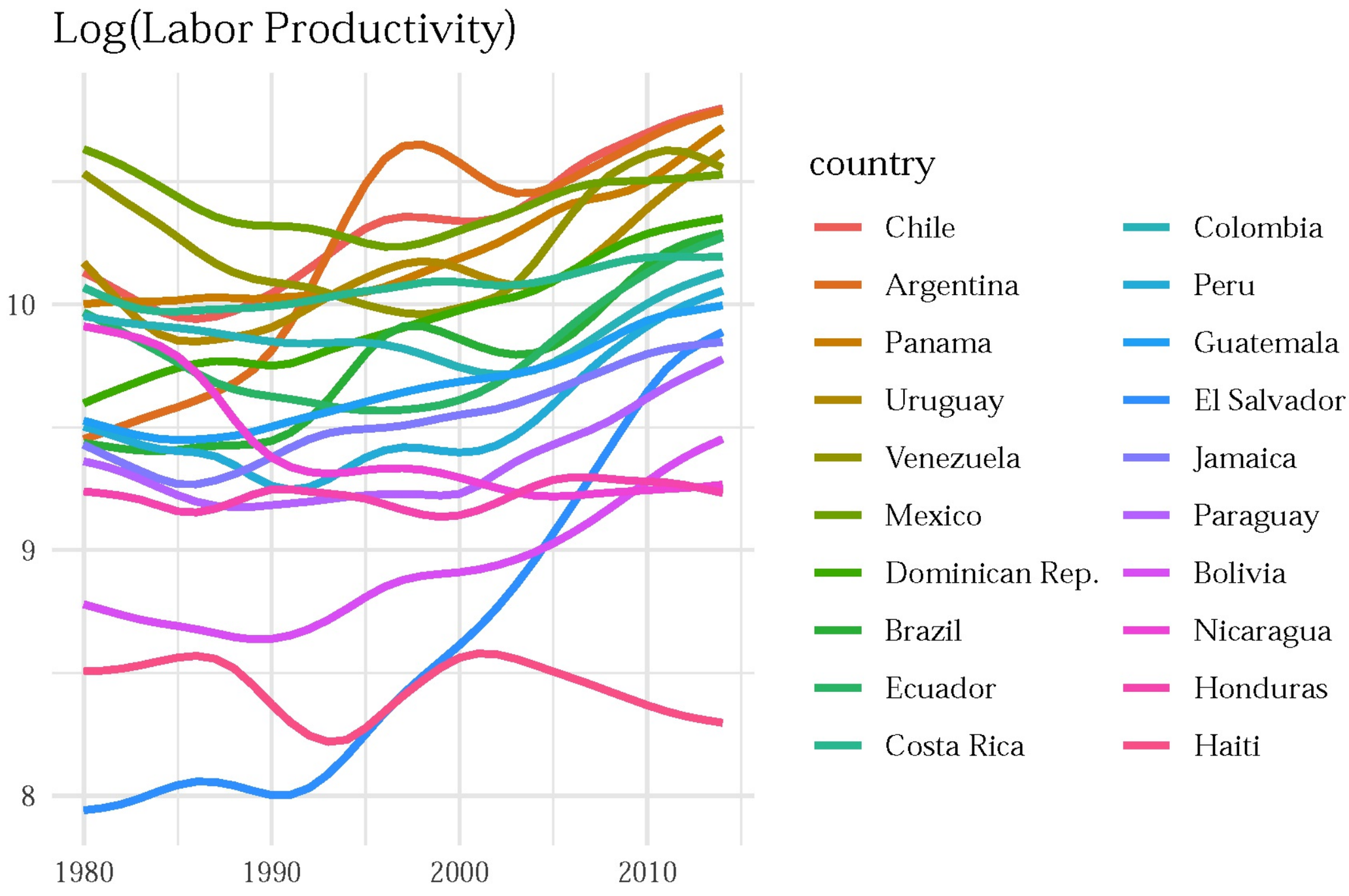
(1) Some stylized facts

Productivity heterogeneity across Latin America

Labor productivity

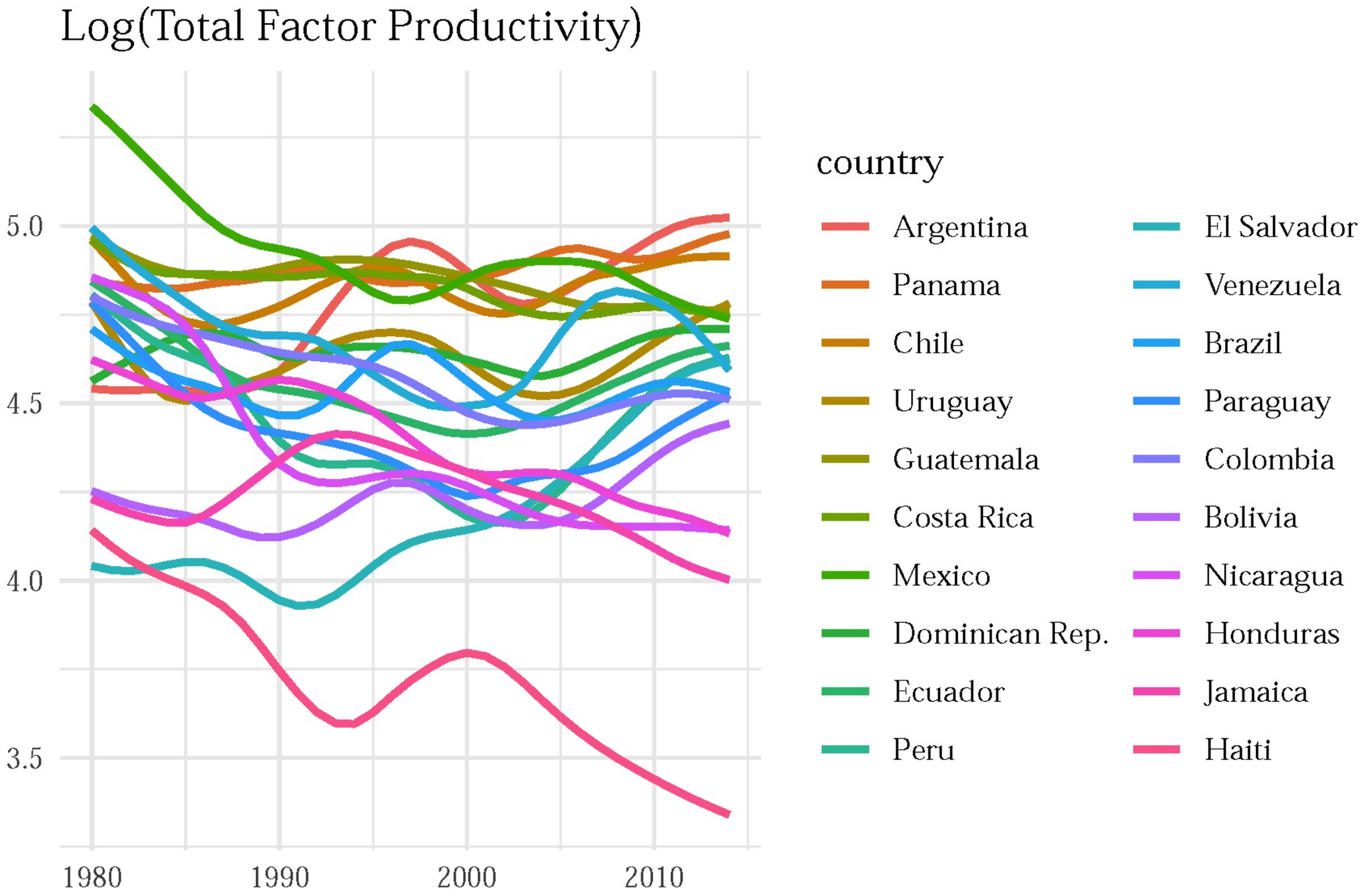
Total factor productivity

Large and heterogeneous productivity differences across Latin America



Note: 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 trends.

Large and heterogeneous productivity differences across Latin America



Note: Total factor productivity is computed by dividing GDP per worker by an aggregate index of physical capital and human capital. The Hodrick-Prescott filter with a smoothing parameter of 6.25 is applied to obtain the long-run trends.

Are there any signs of overall convergence/divergence or convergence clubs?

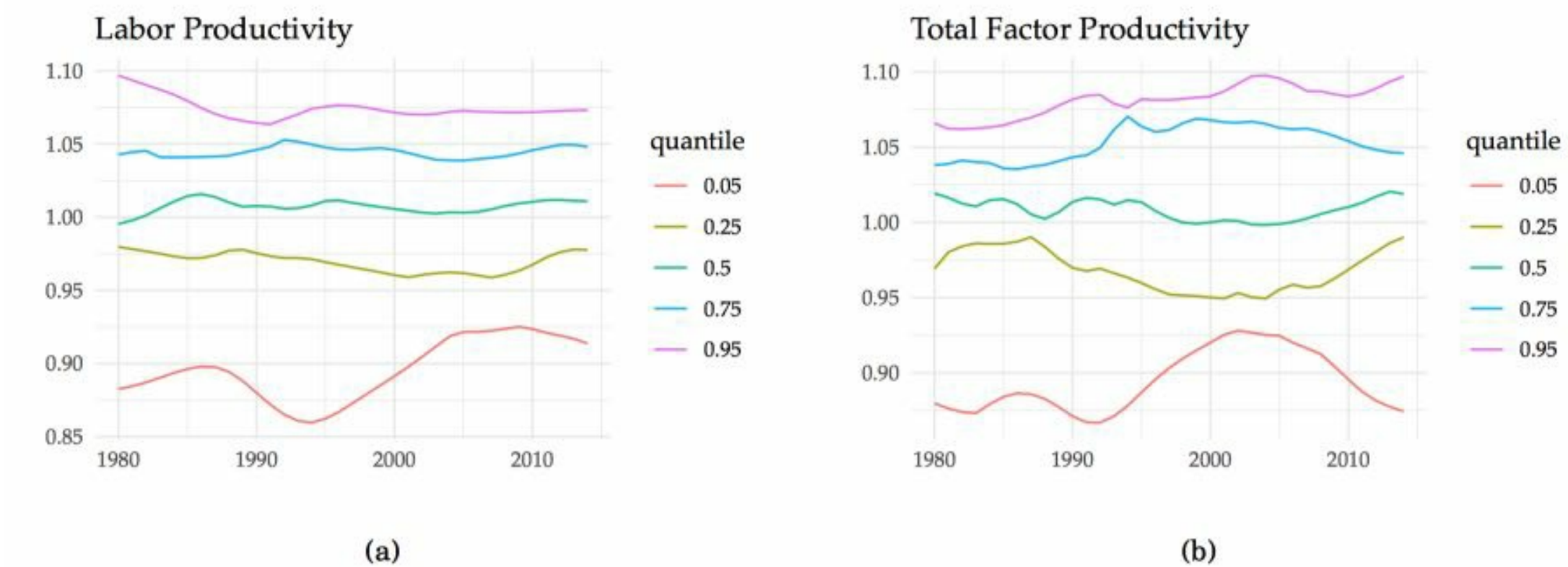


Fig. 1 Productivity differences across Latin American countries 1980-2014

Notes: Both productivity indicators are normalized by the cross-sectional mean of each year. Labor productivity is computed as the long-run trend of (log) GDP per worker. Total factor productivity is computed by dividing GDP per worker by an aggregate index of physical capital and human capital. The Hodrick-Prescott filter with a smoothing parameter of 6.25 is applied to obtain the long-run trends of each indicator.
Source: Author's calculations using data from Fernandez-Arias (2017).

(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

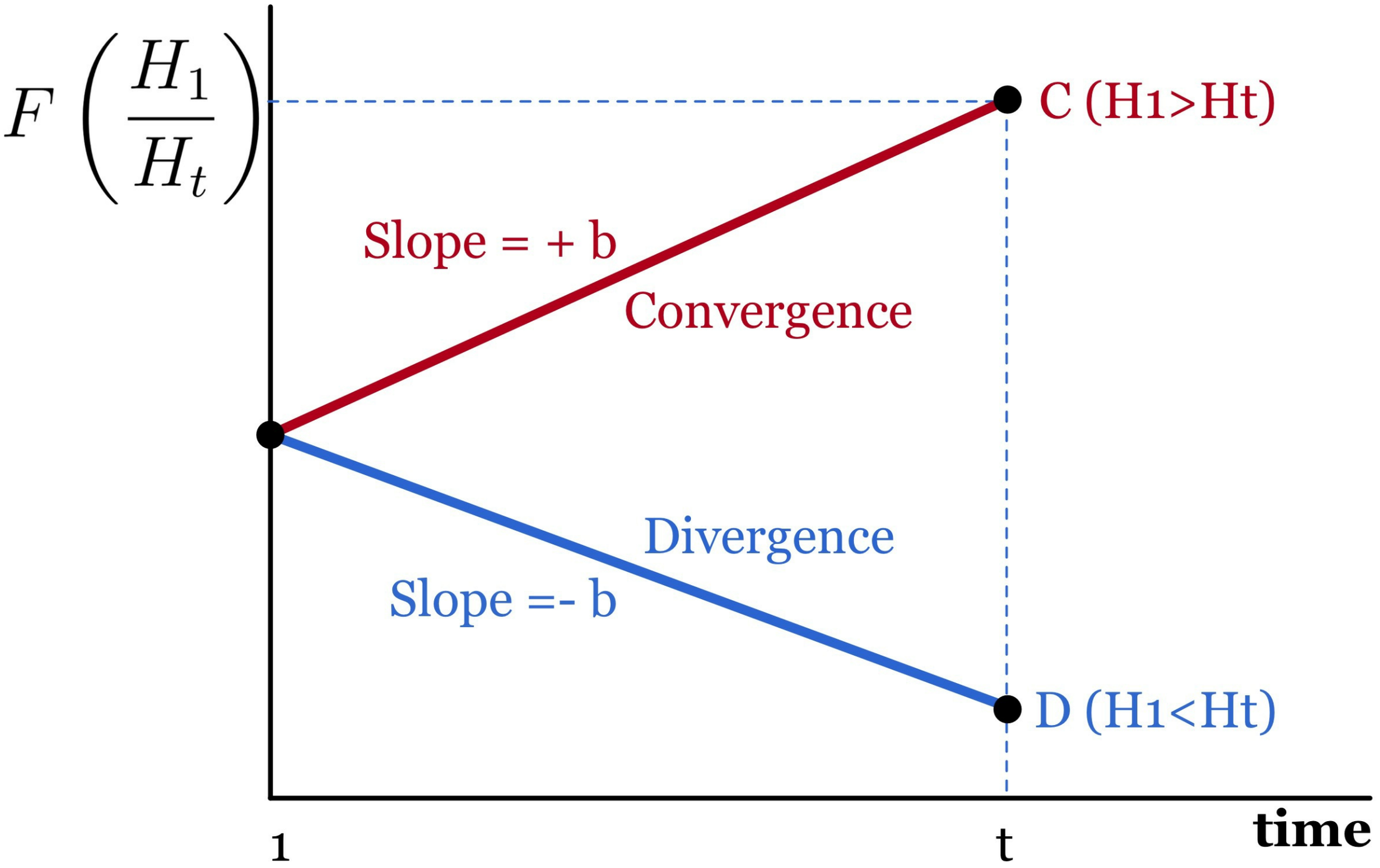
$$H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it}-1)^2 \to 0$$

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

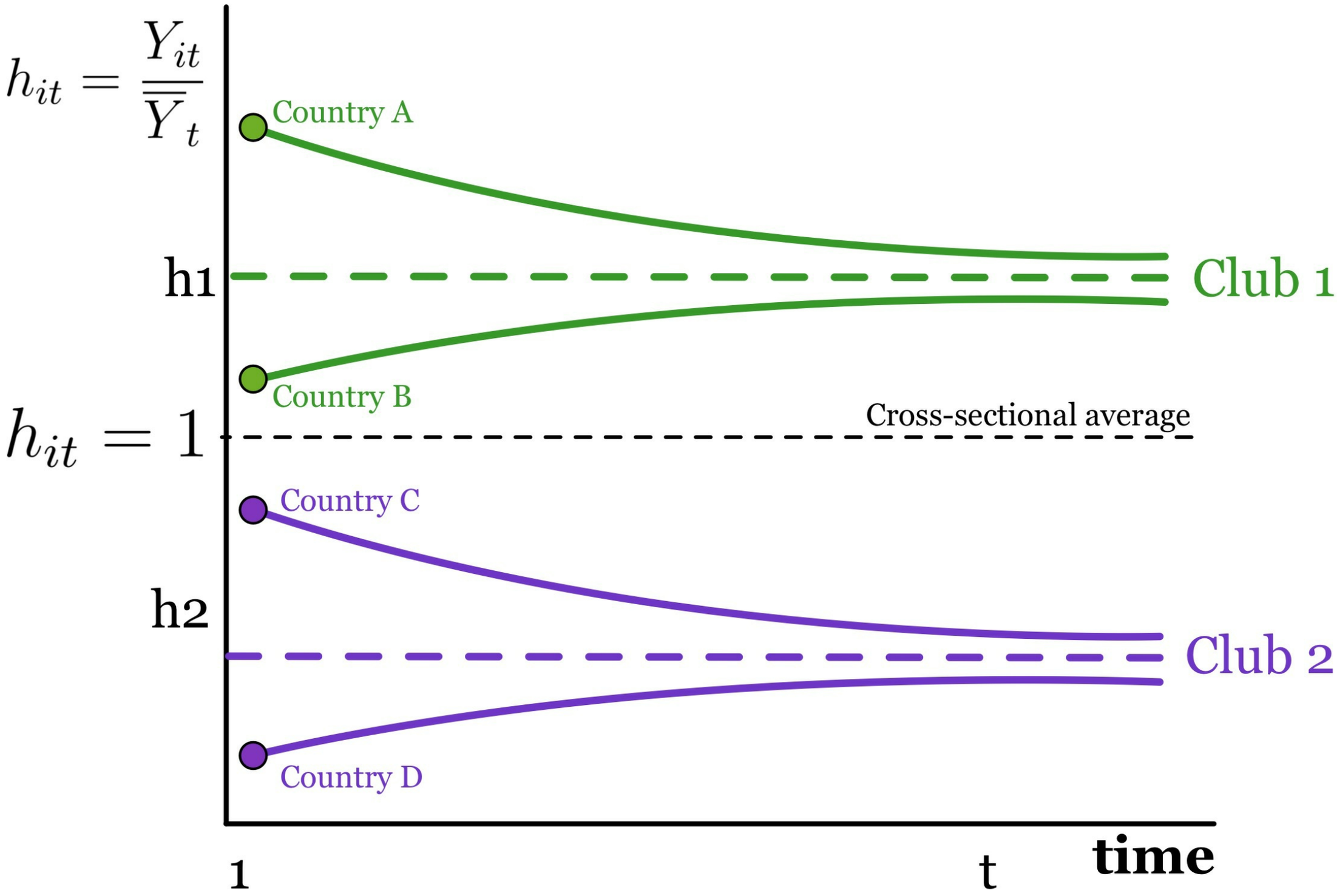
- Thrid, Phillips and Sul (2007) test this hypothesis by using the following log t regression model

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

Convergence test (intuition)



Convergence clubs (intuition)



(3) Main results

Lack of overall convergence

Multiple convergence clubs above and below the average

Convergence clubs characteristics

Lack of overall convergence

Table 1 Log t convergence test 1980-2014

Variable	Coefficient	Standard Error	T-statistic
Labor Productivity	-0.44	0.03	-14.65
Total Factor Productivity	-0.95	0.04	-21.14

Note: The null hypothesis of convergence is rejected when *t*-statistic is less than 1.65.
Source: Author's calculations using data from Fernandez-Arias (2017).

Table 2 Convergence clubs classifications for labor productivity 1980-2014

Club	No. of countries	Coefficient	Standard Error	T-statistic
1	8	1.24	0.15	8.53
2	4	0.14	0.21	0.68
3	5	0.47	0.02	18.91
4	2	3.28	1.42	2.31

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

Table 3 Convergence clubs classifications for total factor productivity 1980-2014

Club	No. of countries	Coefficient	Standard Error	T-statistic
1	5	0.90	0.15	5.86
2	11	0.11	0.09	1.27
3	2	3.78	0.58	6.57

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

Multiple convergence clubs: Above and below the average

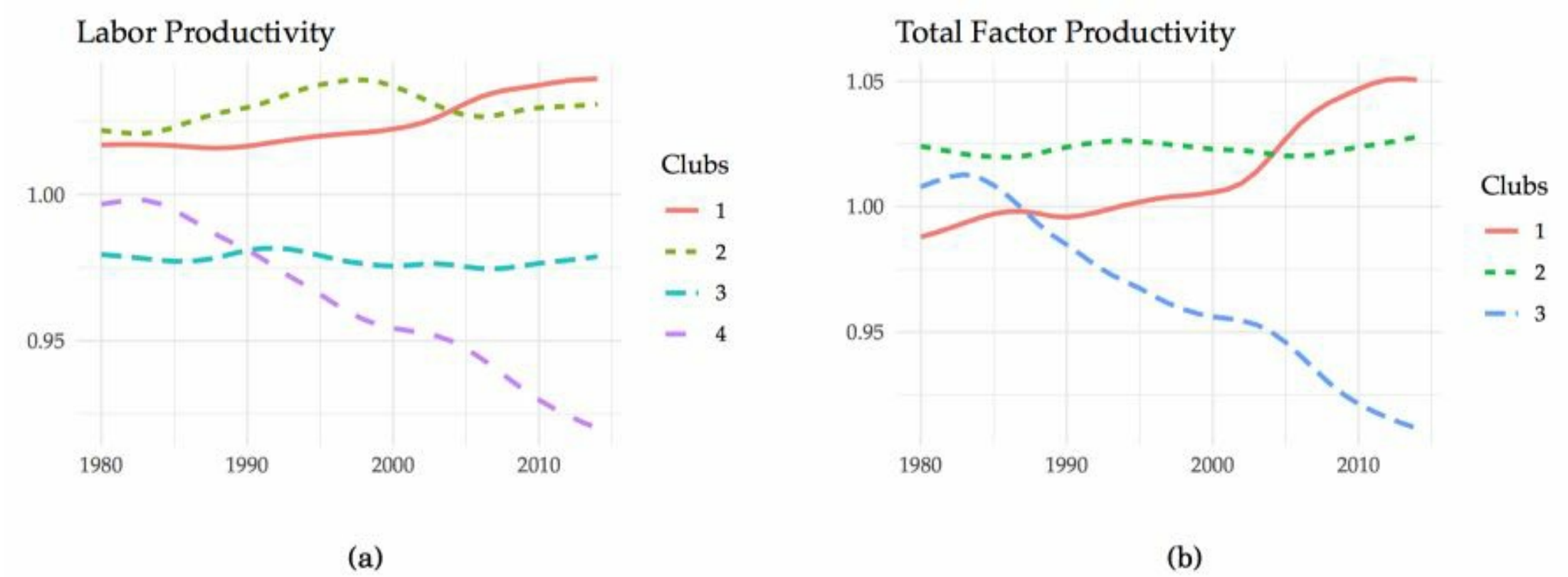
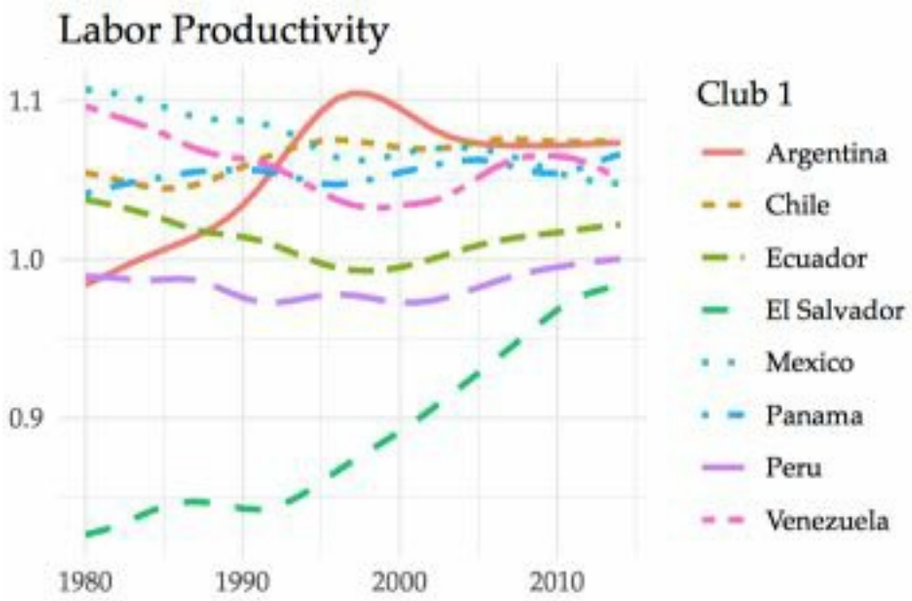


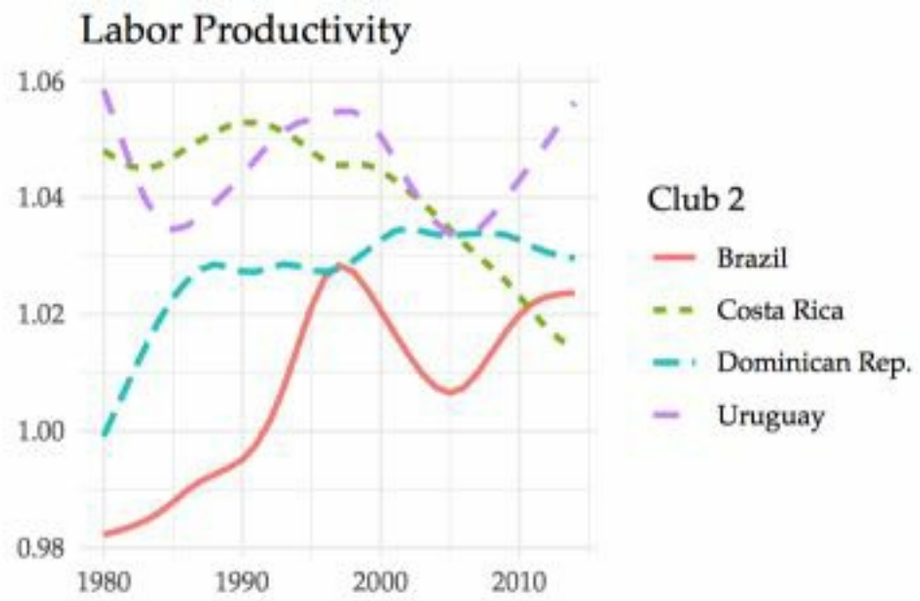
Fig. 2 Productivity convergence clubs in Latin America 1980-2014

Notes: Both productivity indicators are normalized by the cross-sectional mean of each year.
Source: Author's calculations using data from Fernandez-Arias (2017).

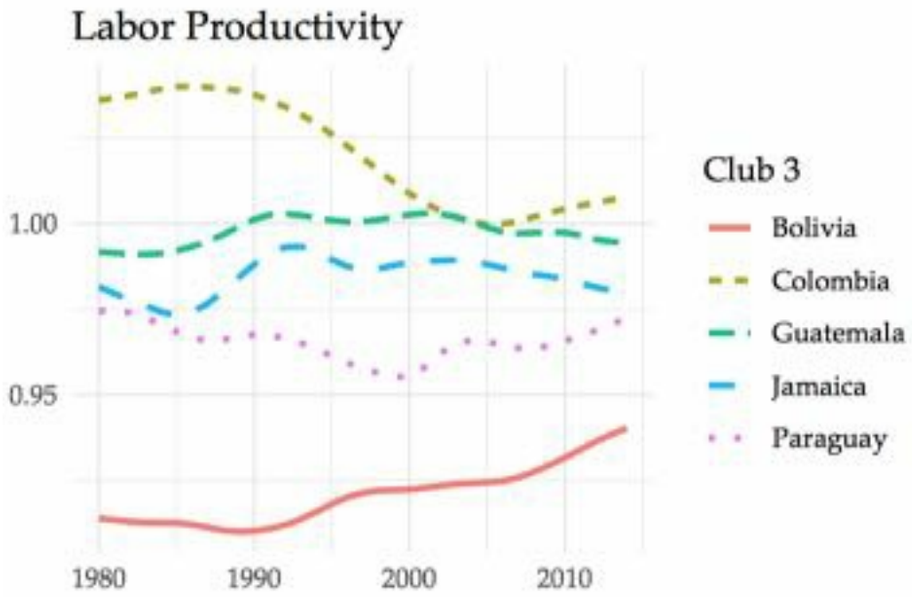
Convergence clubs characteristics: Labor productivity

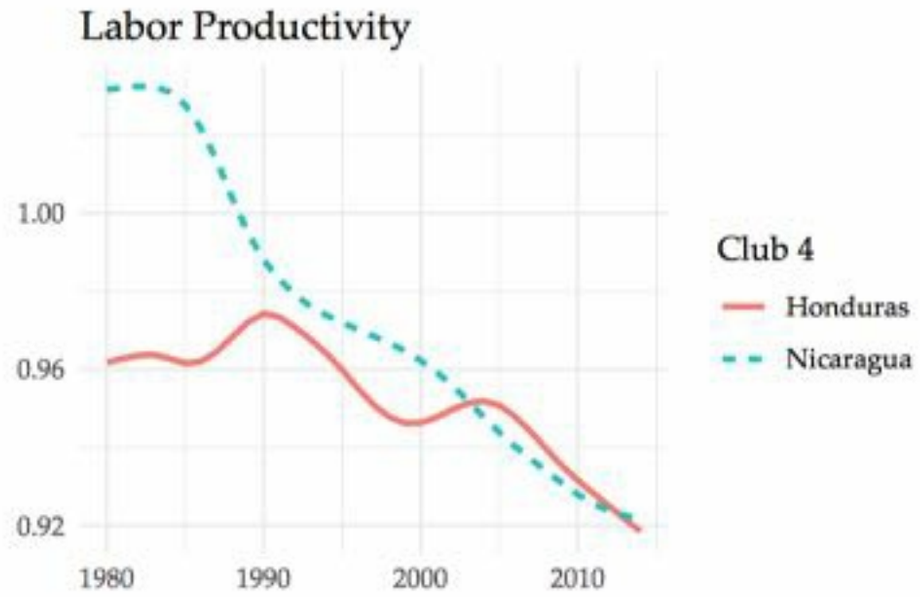


(a)

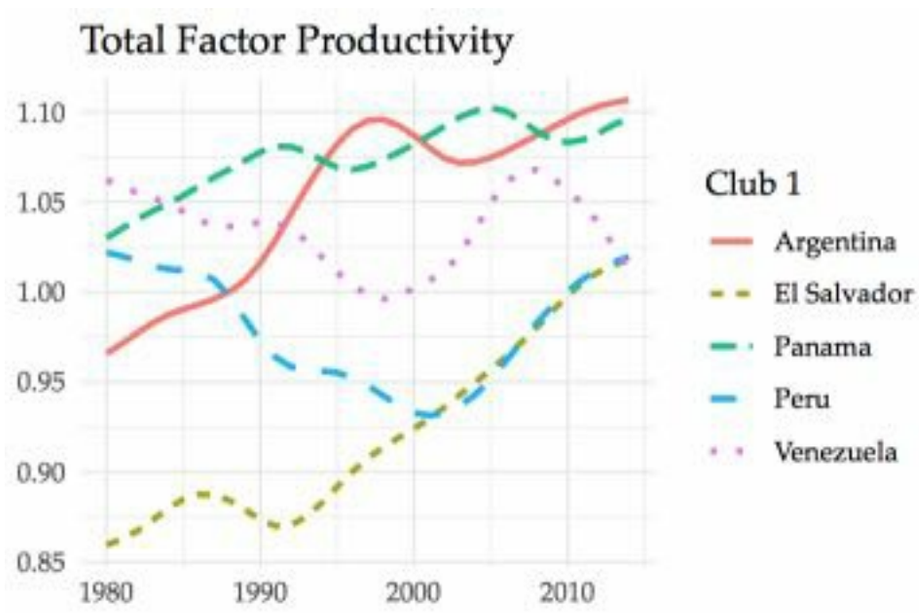


(b)

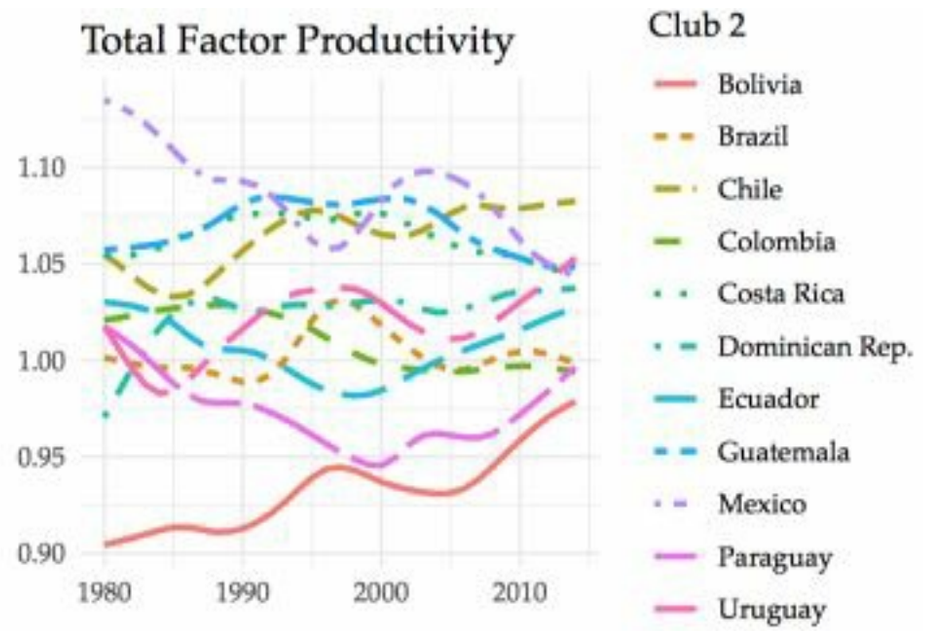




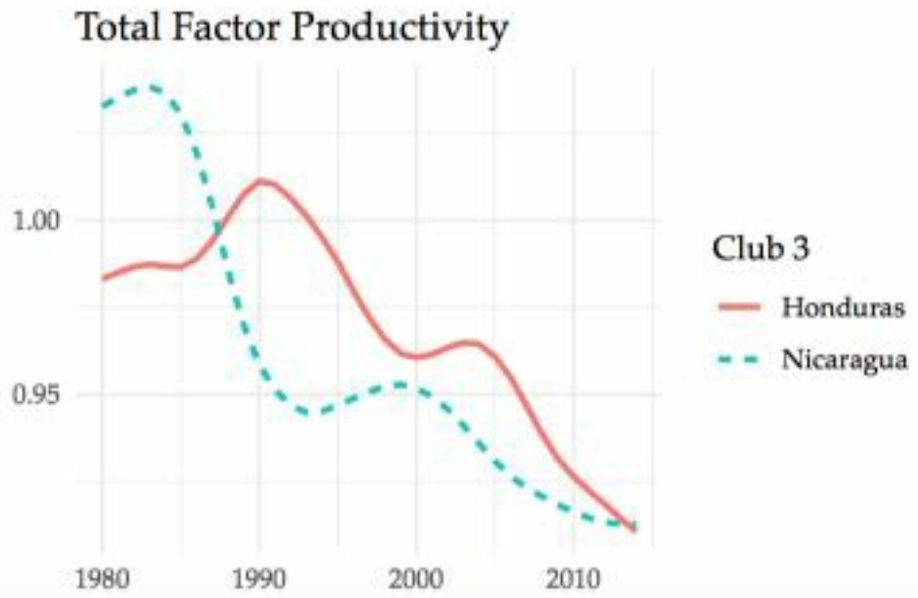
Convergence clubs characteristics: Total factor productivity



(a)



(b)



Concluding Remarks

- Reject the (overall) convergence hypothesis both in terms of labor productivity and total factor productivity
- Multiple convergence clubs below and above the mean
- The clubs show different convergence speeds and separating tendencies. -The poor economic performance of Honduras and Nicaragua is driving the separation of clubs over time.

Implications and further research

- Convergence clubs may help us identify economies facing similar challenges
- Call for better coordination and cooperation policies both within and between clubs
    - International technology transfer initiatives to improve economic cohesion and competitiveness in Latin America.
- Masked behind the low productivity of Latin America, there is still a high degree of heterogeneity that is worth exploring
    - Next extension: (Re)evaluate the composition of convergence clubs using subnational data, which is to be constructed using satellite nightlight data.

Thank you very much for your attention

https://carlos-mendez.rbind.io

Slides and working paper available at: http://bit.ly/jasid2019n

Quantitative Regional and Computational Science lab

https://quarcs-lab.rbind.io

This research project was supported by JSPS KAKENHI Grant Number 19K13669