

# **Productivity Differences and Convergence Clubs in Latin America**

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

**A summary of the paper in 2 slides...**

## **Motivation:**

- 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 Fernandez-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(global) 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

- Global convergence test (intuition)
- Local convergence clubs (intuition)

## 3. Main results of the paper

- Lack of overall convergence
- Multiple convergence clubs above and below the average
- Convergence clubs characteristics

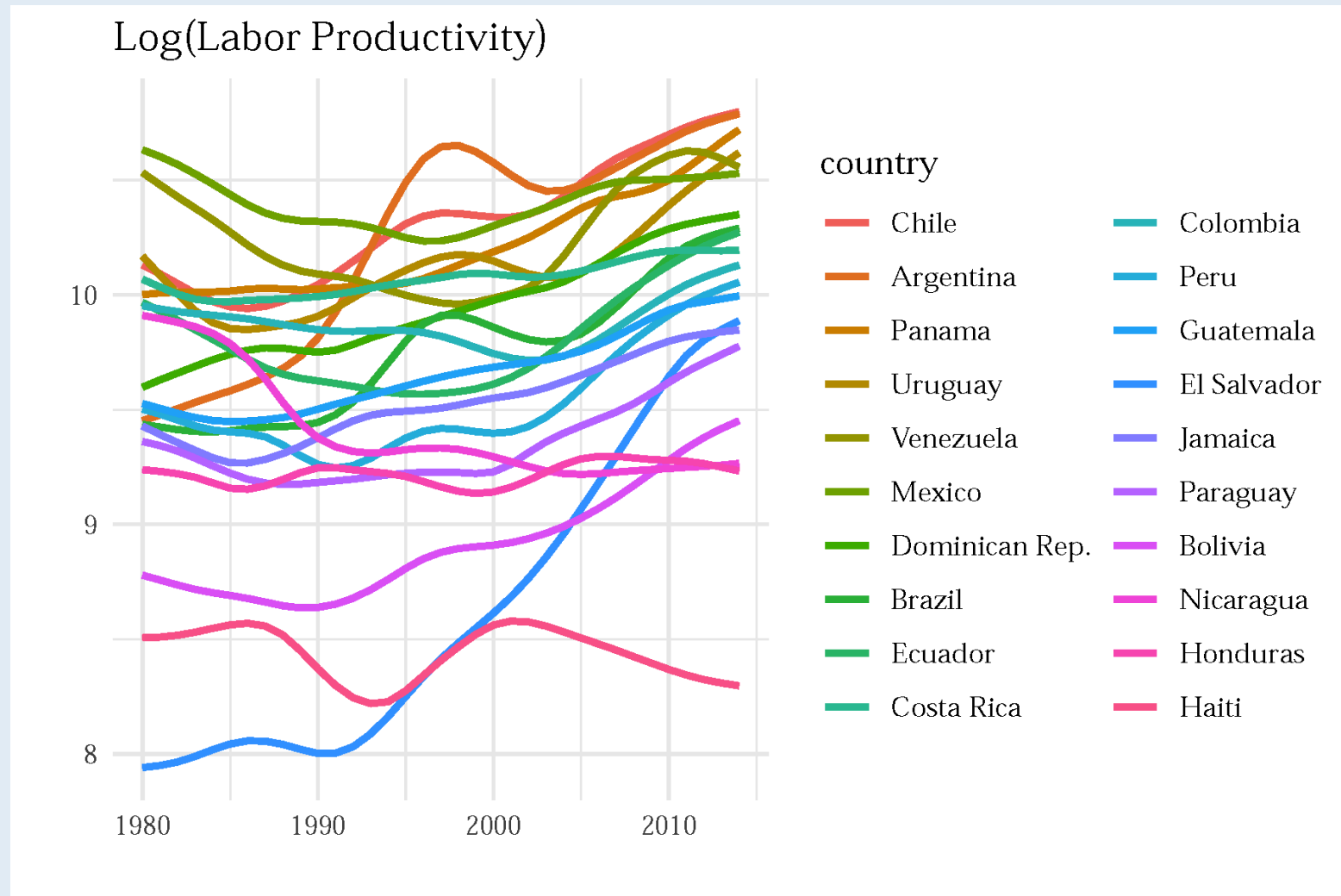
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# **(1) Some stylized facts**

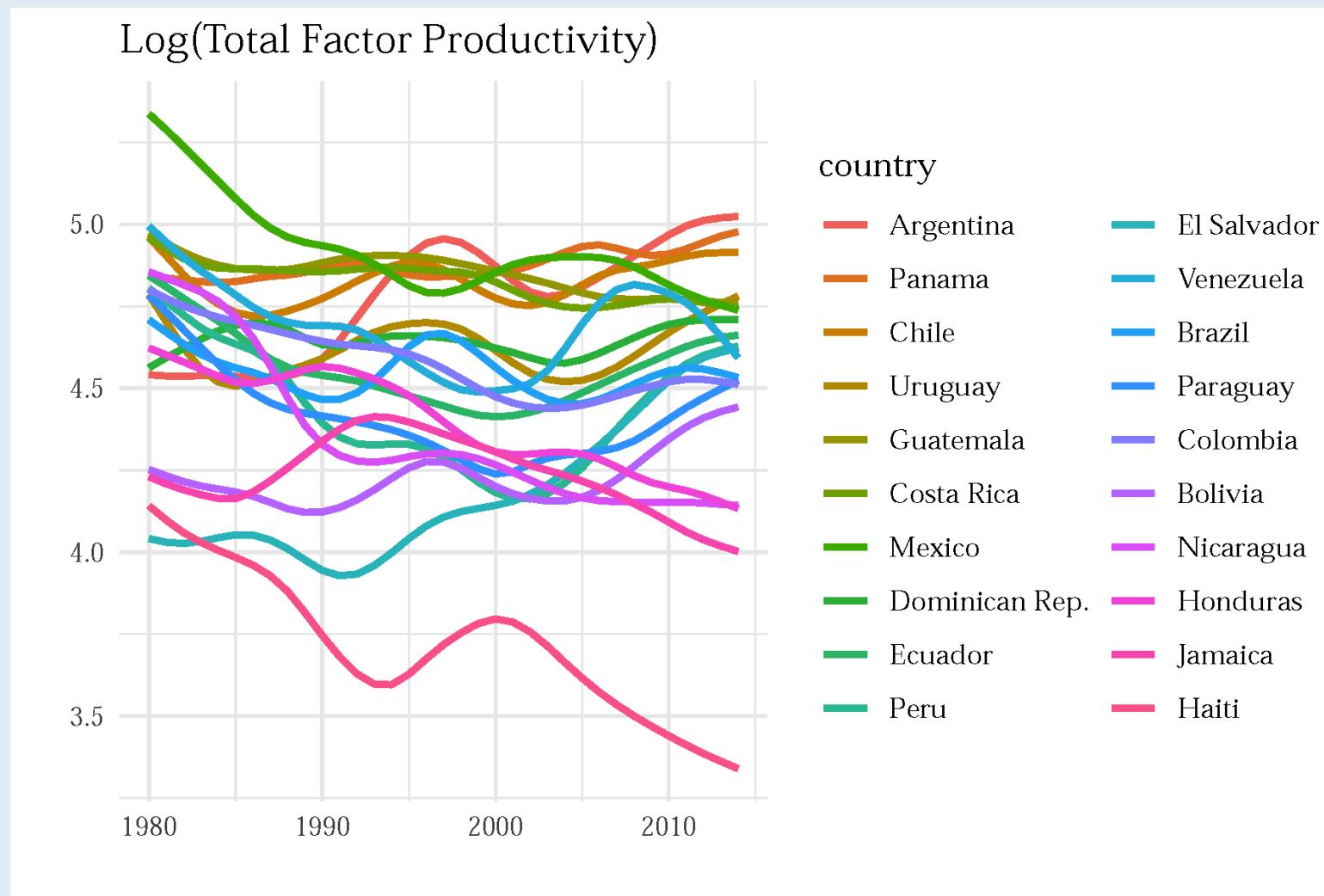
Productivity across countries and over time

Heterogeneity across countries and over time

## Large and heterogeneous productivity differences across Latin America

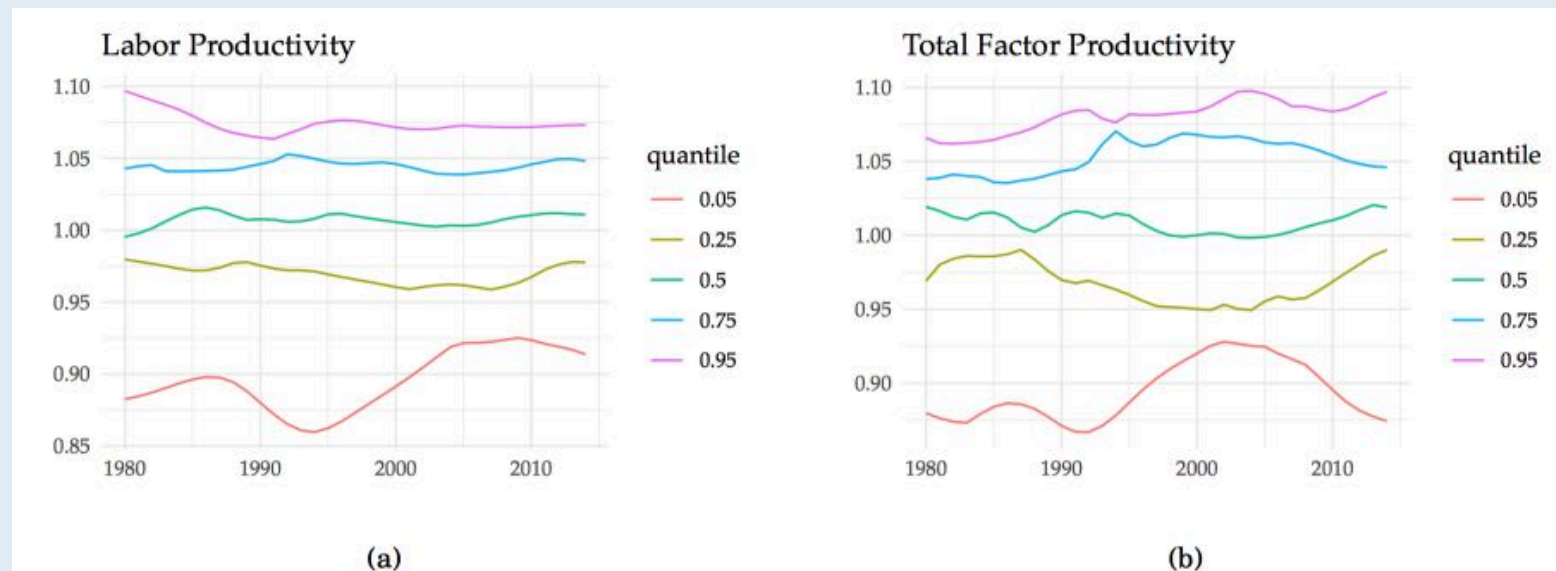


## Large and heterogeneous productivity differences across Latin America





## 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**

Global convergence test (intuition)

Local 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

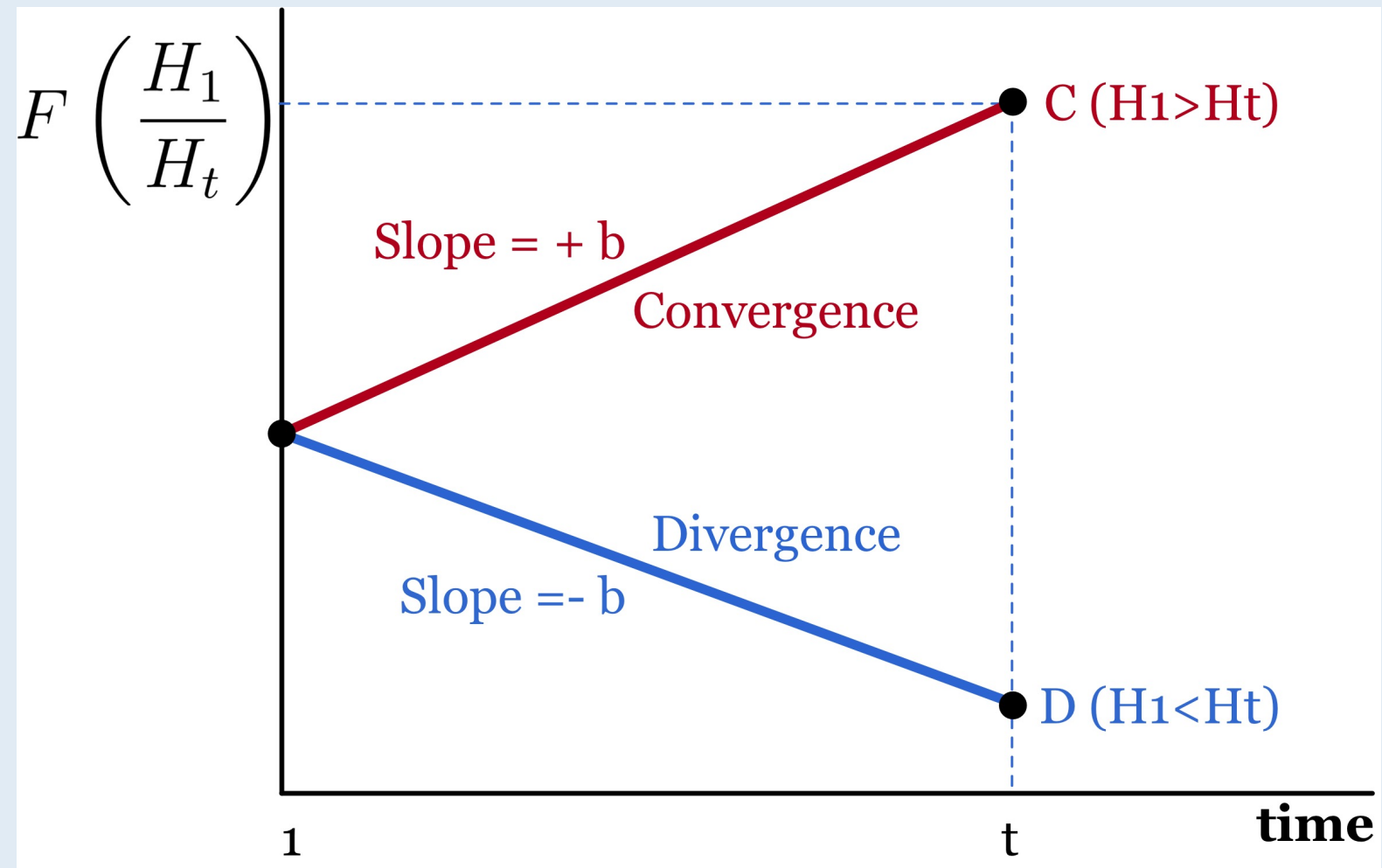
$$H_t = \frac{1}{N} \sum_{i=1}^N (h_{it} - 1)^2 \rightarrow 0$$

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

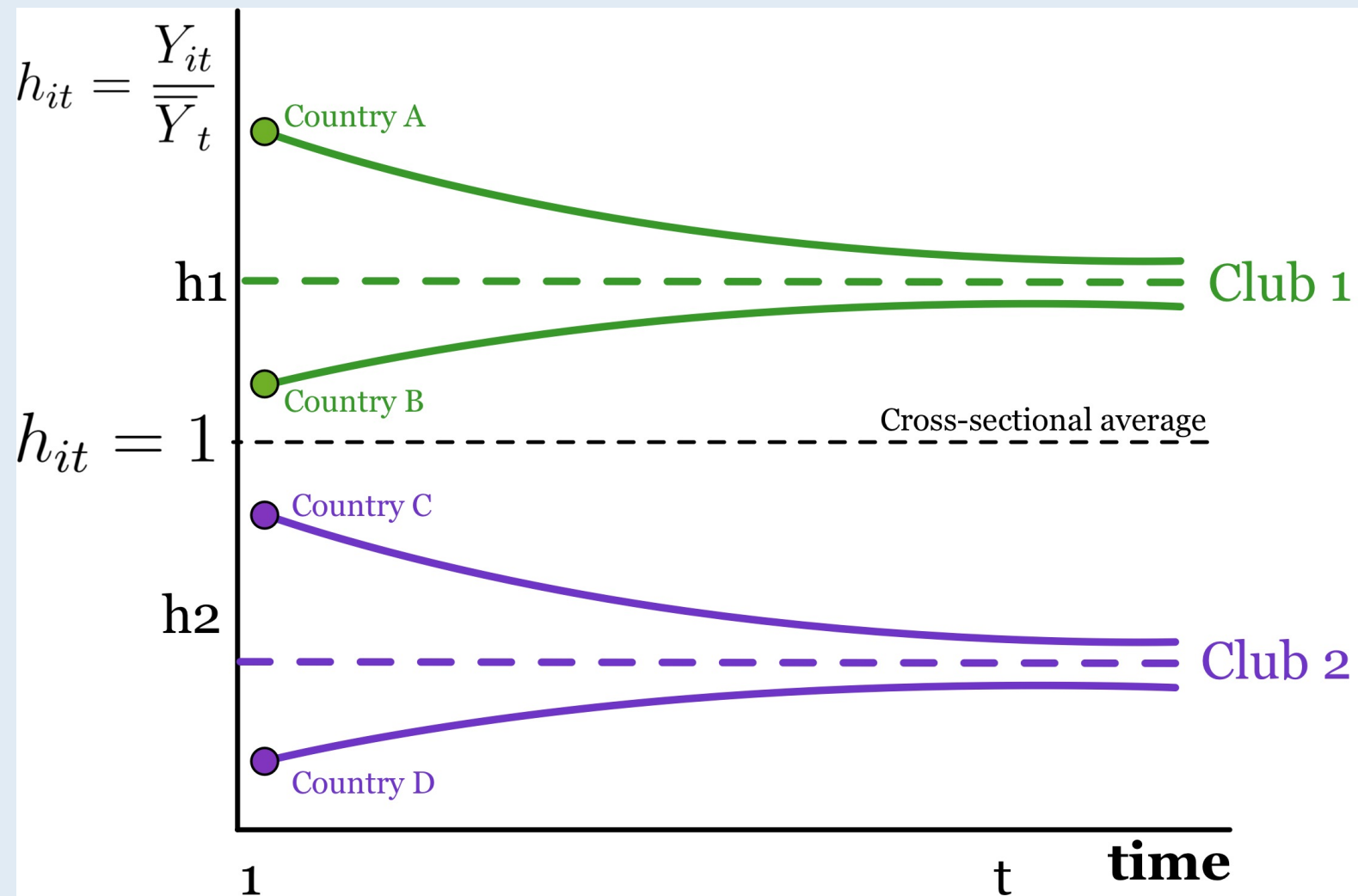
- Thrid, Phillips and Sul (2007) test this hypothesis by using the following log t regression model

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

## 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).

## Multiple convergence clubs

**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.

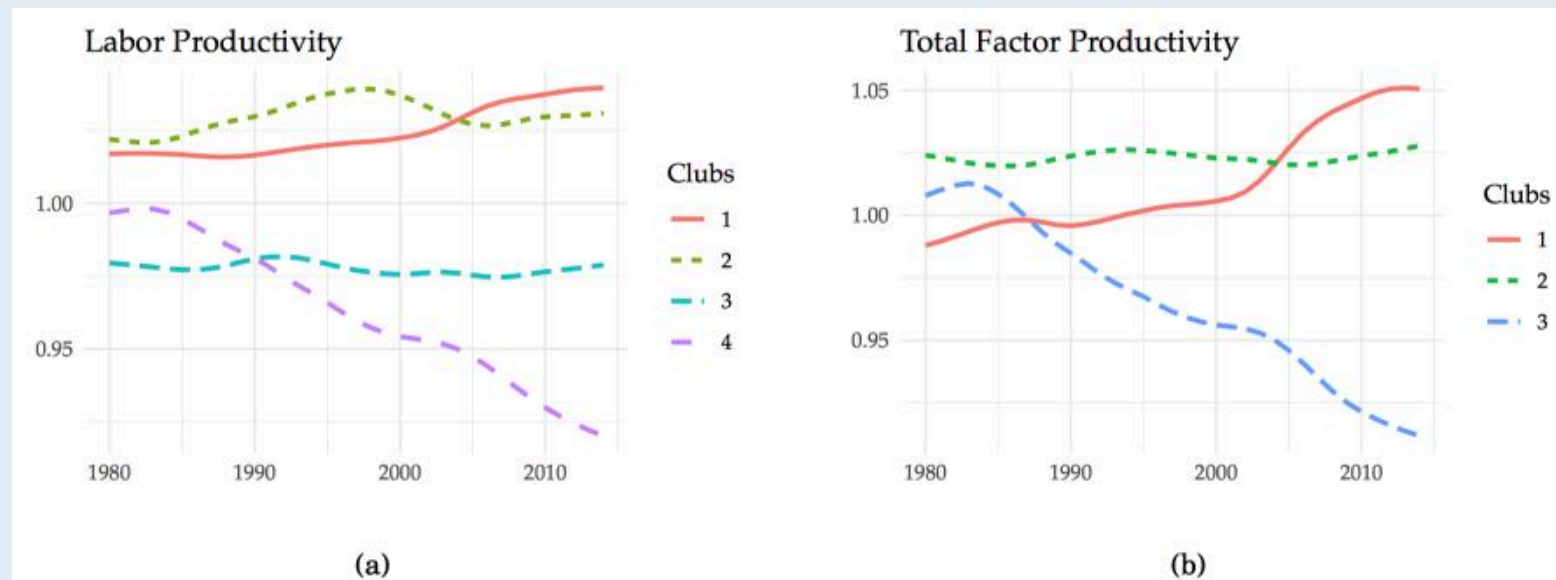
**Table 3** Convergence clubs classifications for total factor productivity 1980-2014

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

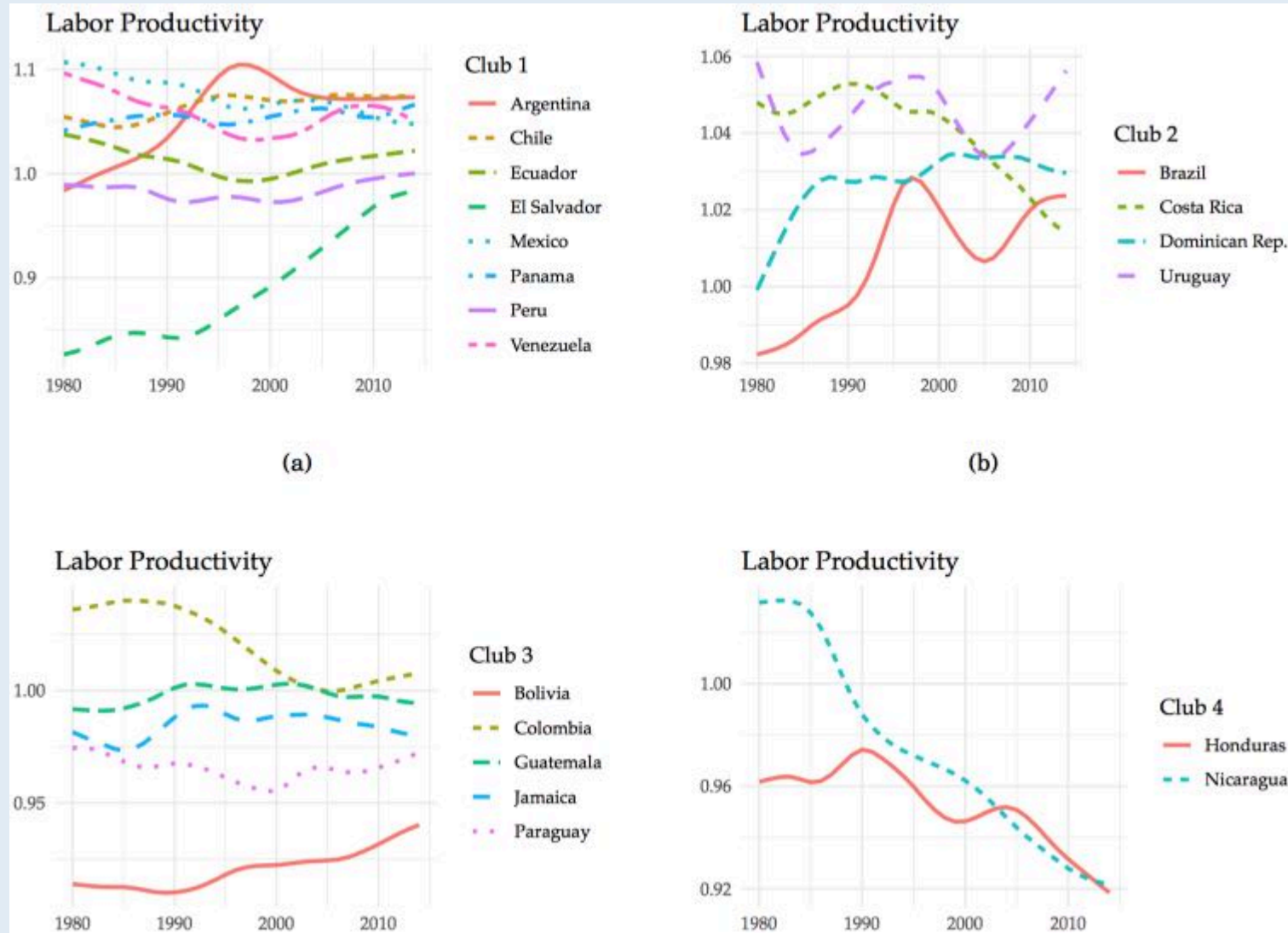


**Fig. 2** Productivity convergence clubs in Latin America 1980-2014

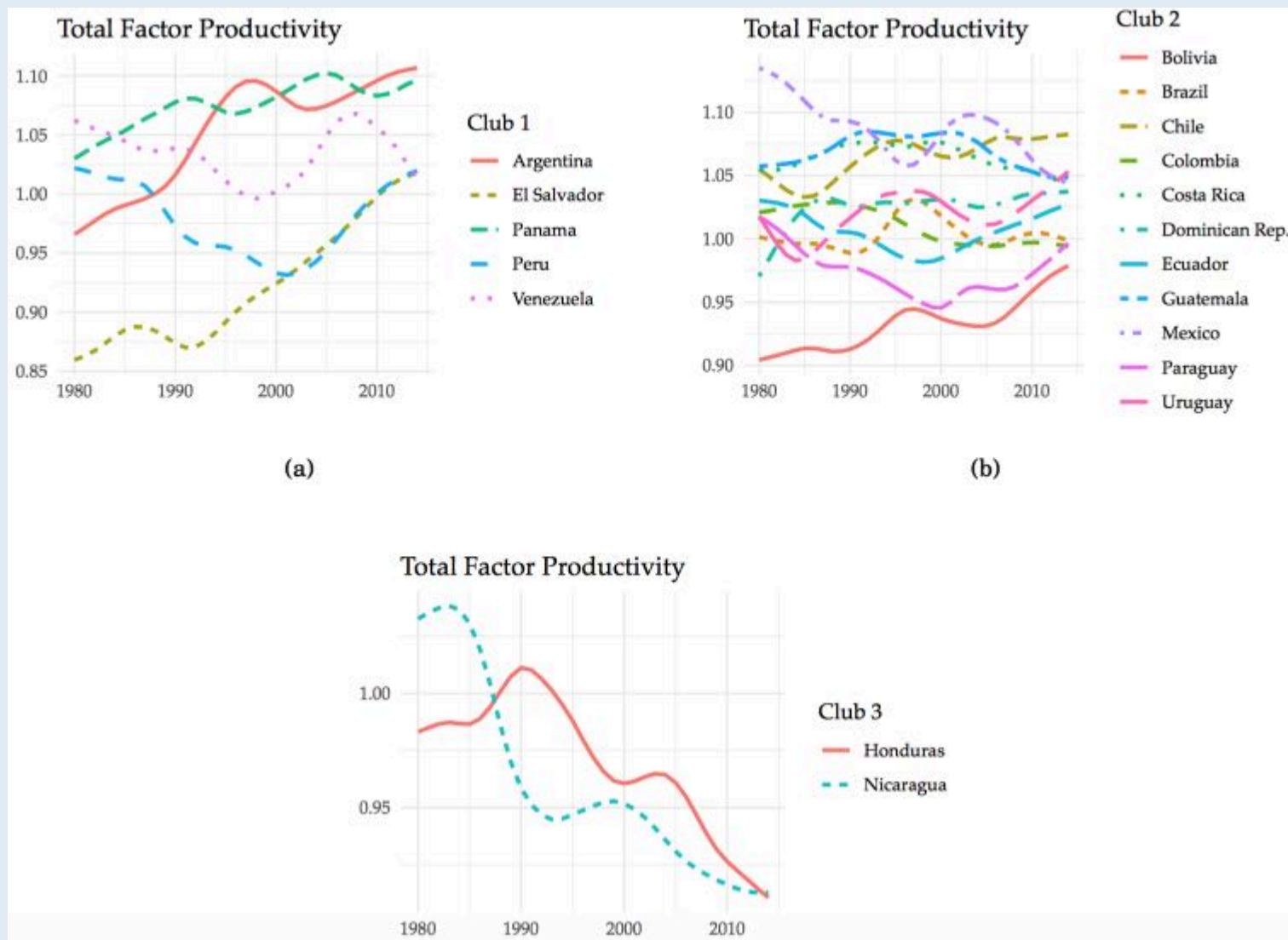
*Notes:* Both productivity indicators are normalized by the cross-sectional mean of each year.

*Source:* Author's calculations using data from Fernandez-Arias (2017).

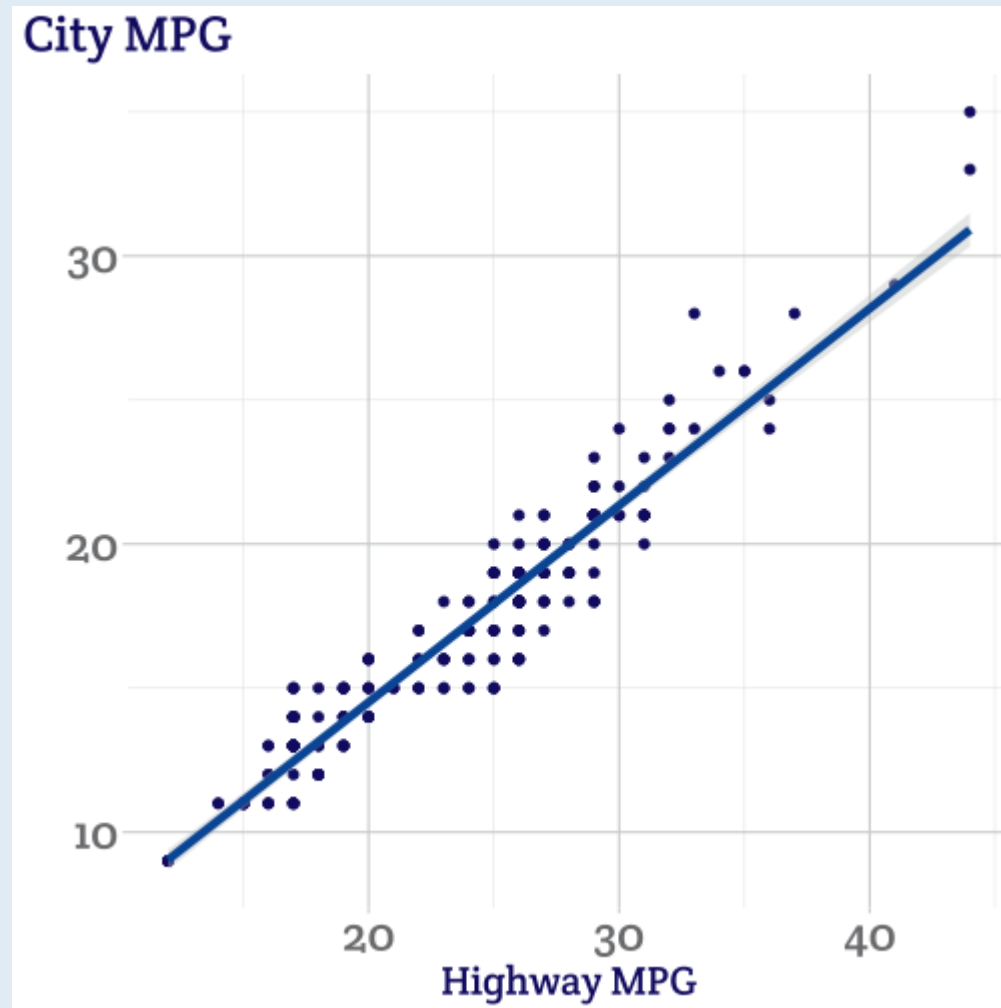
## Convergence clubs characteristics: Labor productivity



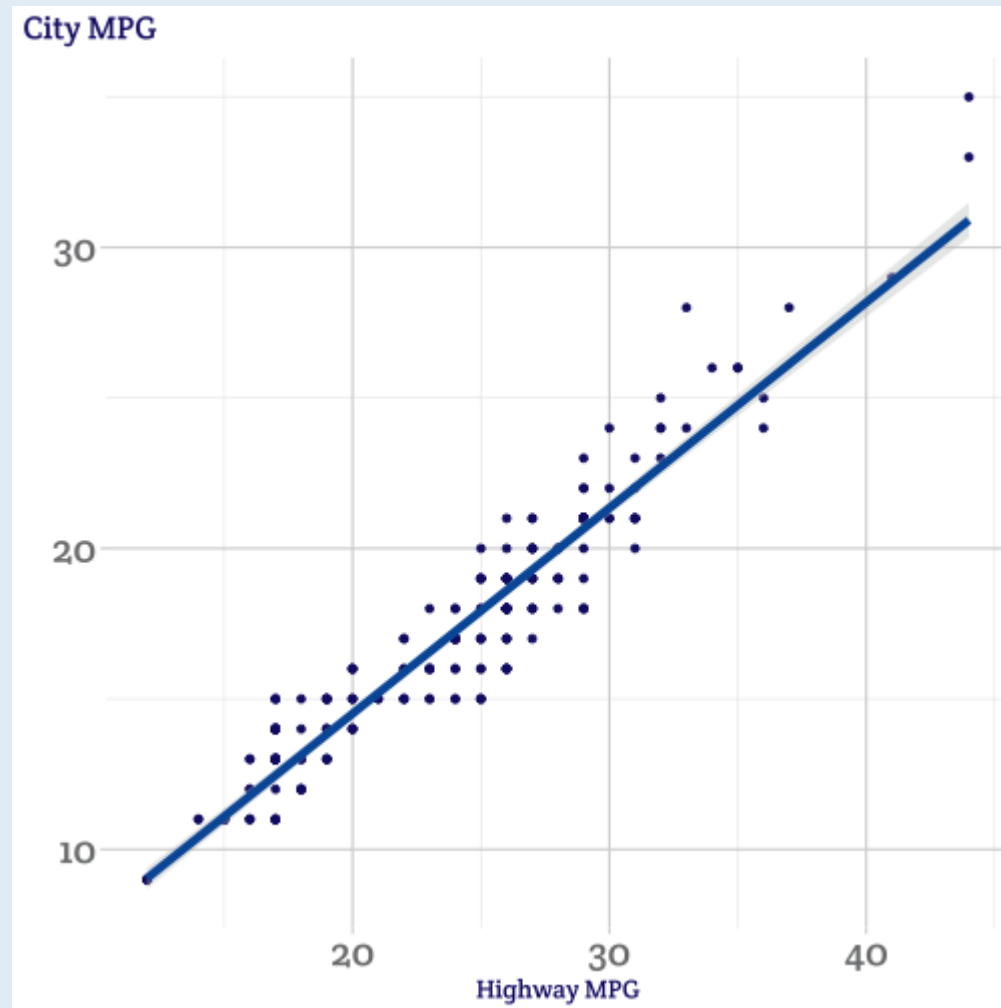
## Convergence clubs characteristics: Total factor productivity



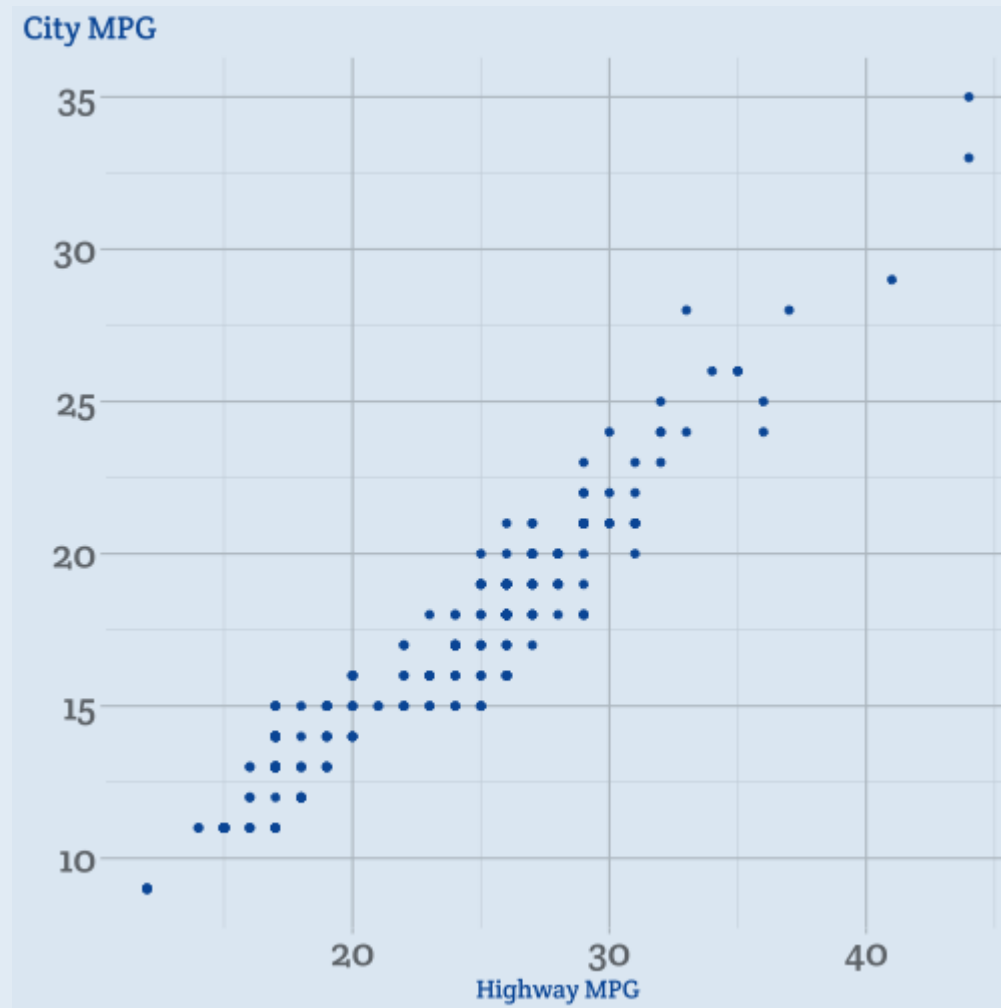
## Scatterplot with `theme_xaringan()` and larger font and geom size

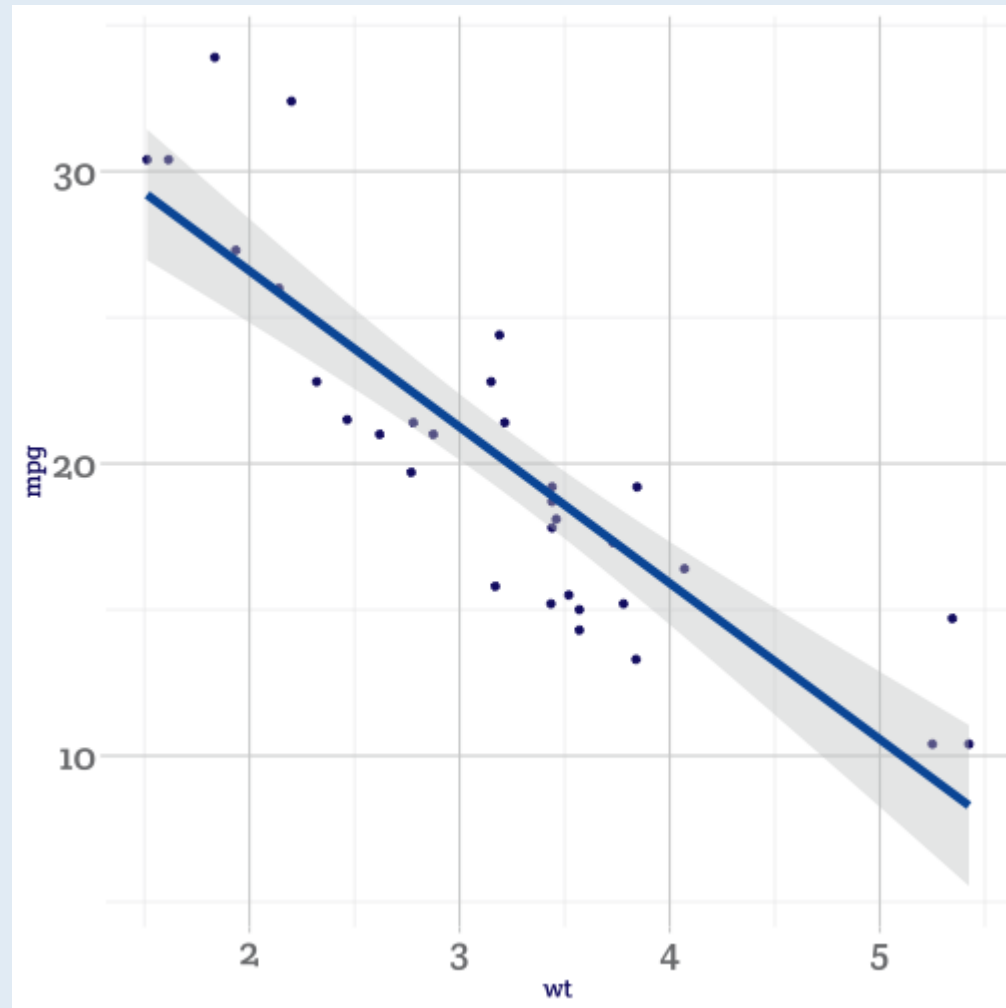


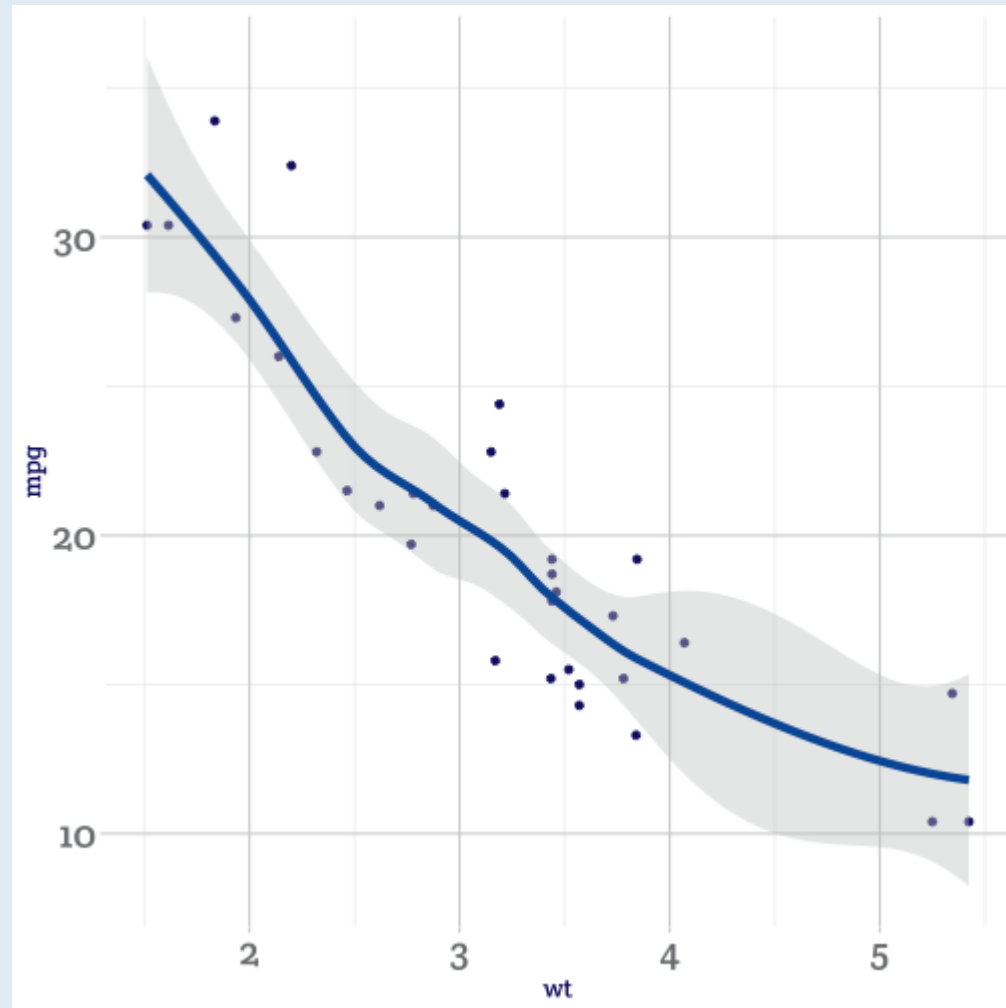
## Scatterplot with theme\_xaringan()



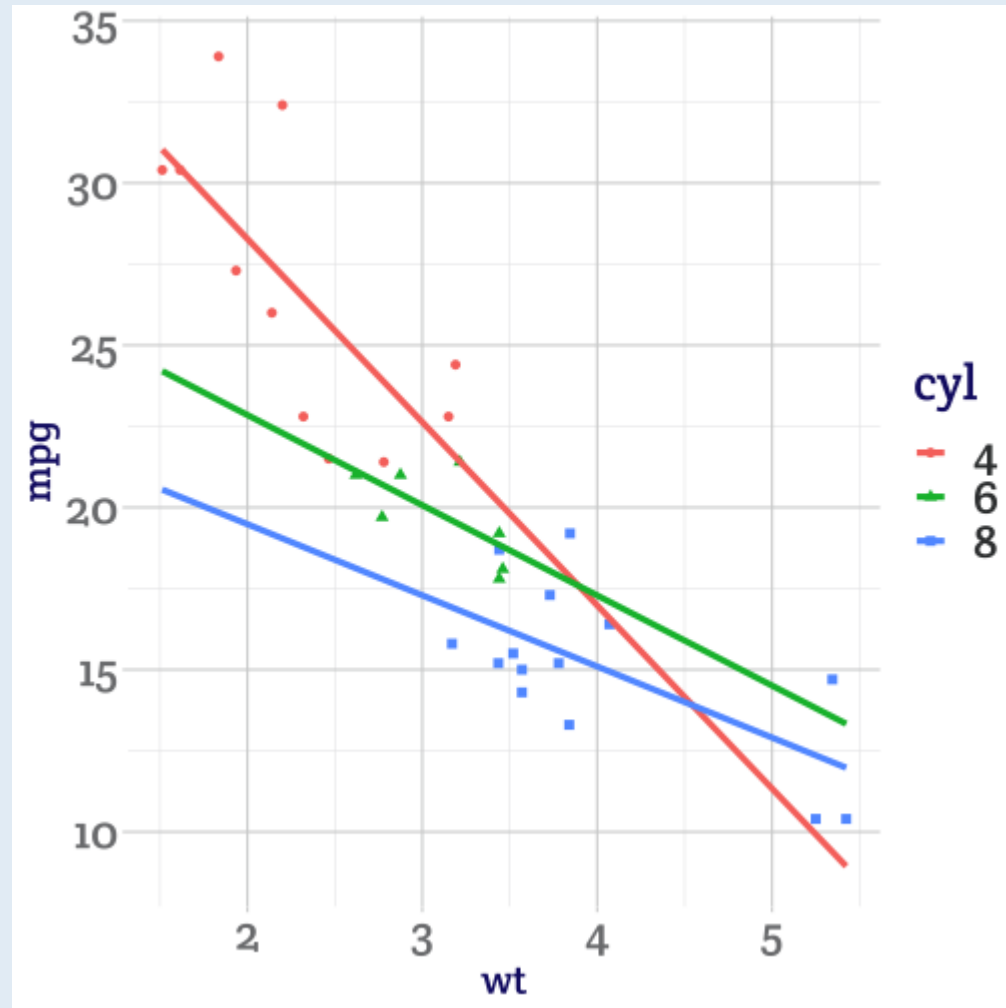
## Scatterplot with theme\_xaringan\_inverse()



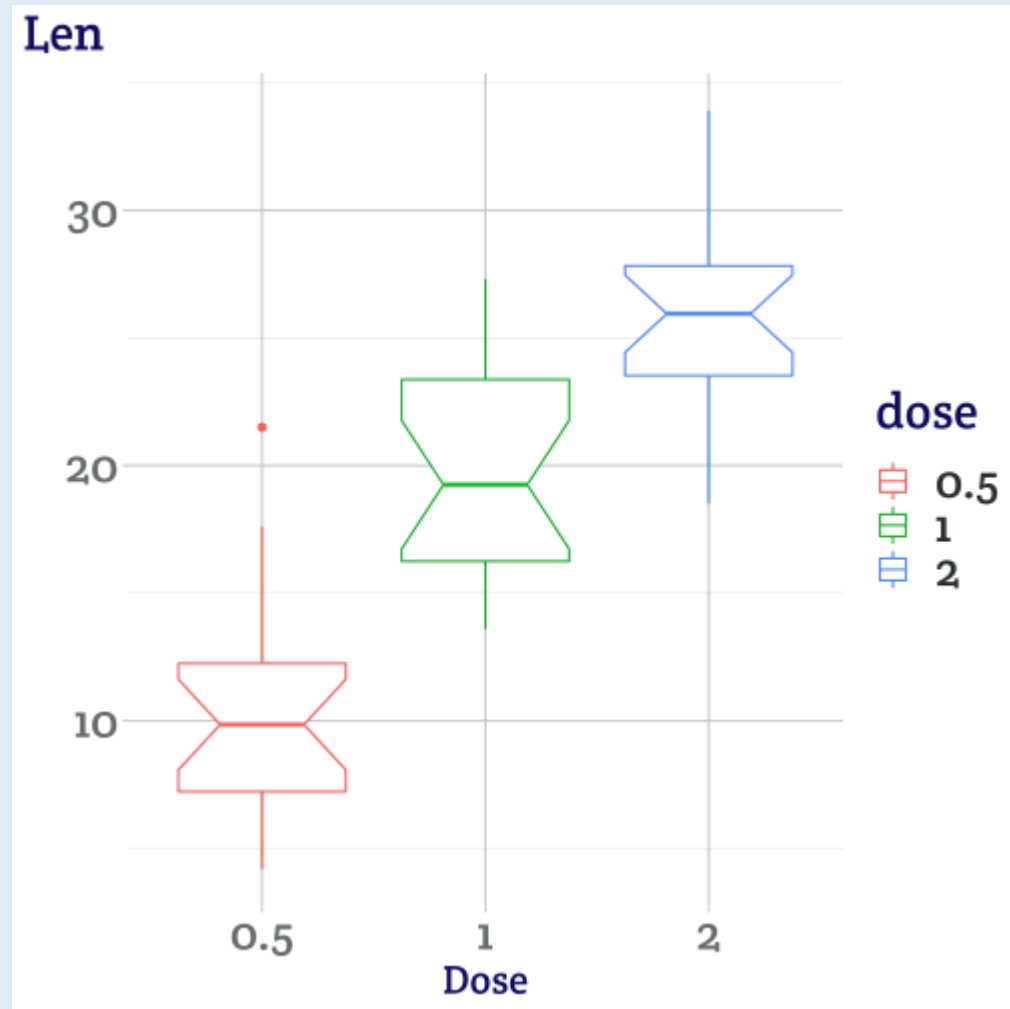


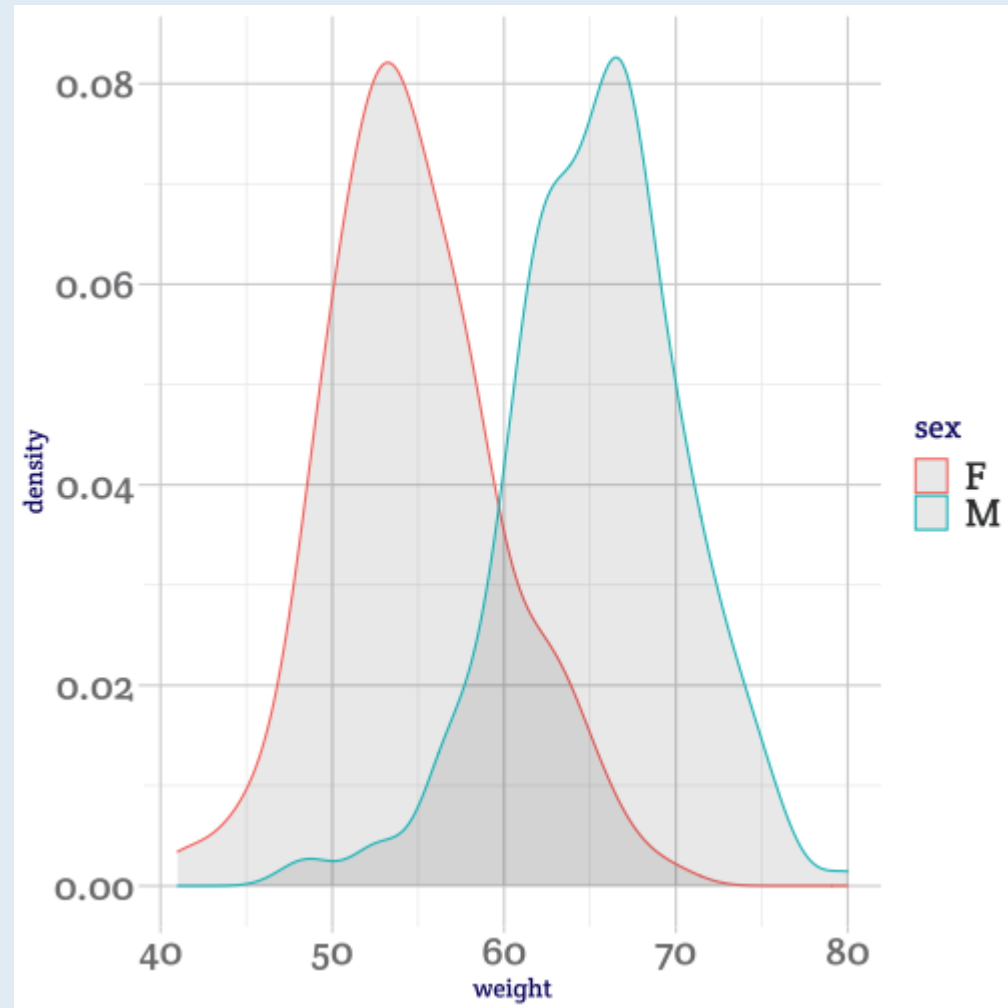






## Box plot

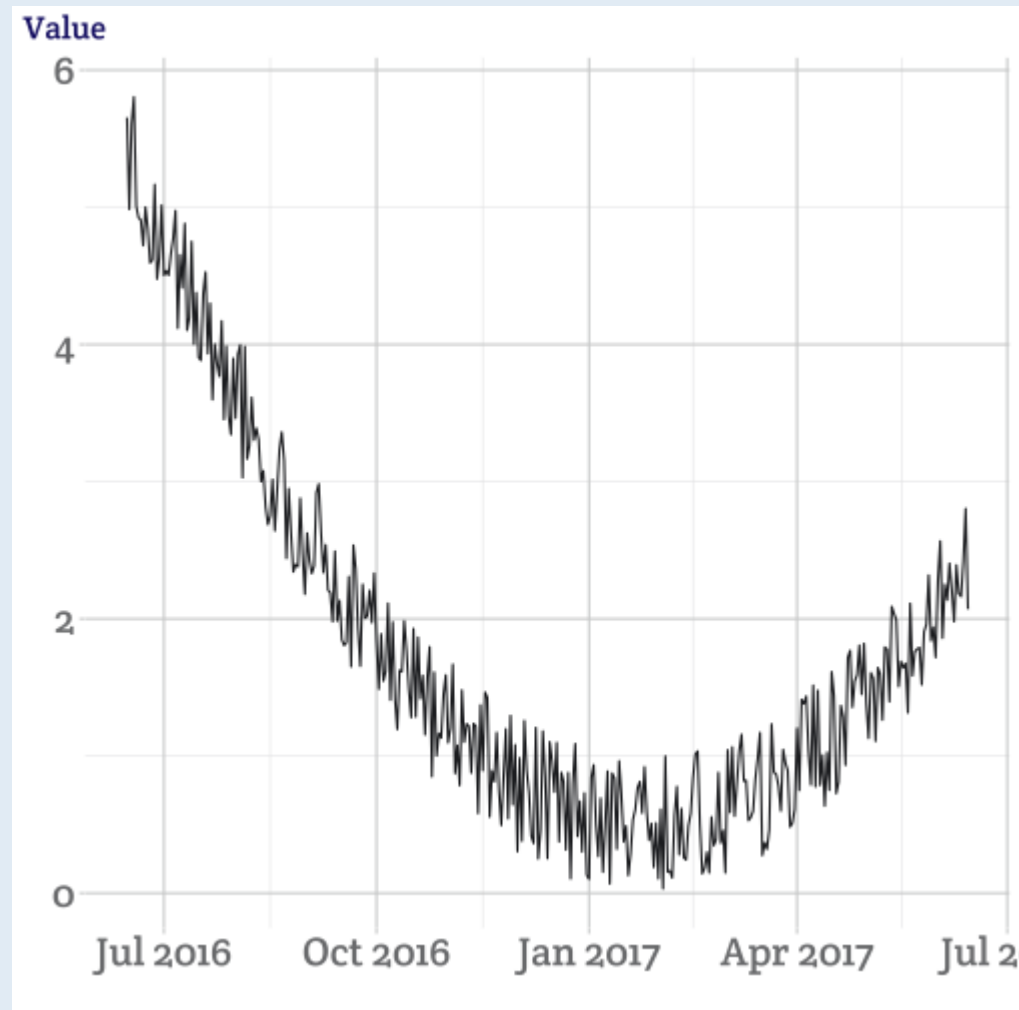




## Bar graph



## Timeseries with theme\_xaringan()



# 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.
- 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

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**Quantitative Regional and Computational Science lab**

<https://quarcs-lab.rbind.io>

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