

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

# Regional convergence clubs in Europe: Identification and conditioning factors

Monika Bartkowska   Aleksandra Riedl

Vienna University of Economics and Business

3<sup>rd</sup> FIW Research Conference

December 11<sup>th</sup>, 2009

## Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

- Club convergence theory: economies with identical structural characteristics converge to same steady state equilibrium only if they have the same initial conditions
  - Empirical evidence:
    - a priori grouping criteria and then test for convergence (Durlauf and Johnson 1995)
      - cluster outcomes are to some extent predetermined
    - endogenous methods (Hobijn and Franses 2000, Corrado *et al.* 2005) – no a priori grouping criteria
      - cannot assess which factors have led to the multiple steady states (initial conditions, structural characteristics)
- ⇒ Problem: conditional vs club convergence (Islam 2003)

- Testing the club convergence hypothesis (Azariadis and Drazen 1990)
  - ① Endogenous identification of convergence clubs in per capita income among 206 NUTS 2 European regions
    - regression based convergence test (Phillips and Sul 2007)
  - ② Determination of factors conditioning the club membership (initial conditions and structural characteristics)
    - ordered probit model

# Regression based convergence test

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

$$h_{it} = \frac{\log y_{it}}{N^{-1} \sum_{i=1}^N \log y_{it}} = \frac{\delta_{it} \mu_t}{N^{-1} \sum_{i=1}^N \delta_{it} \mu_t} = \frac{\delta_{it}}{N^{-1} \sum_{i=1}^N \delta_{it}}$$
$$\delta_{it} = \delta_i + \frac{\sigma_i \xi_{it}}{L(t) t^\alpha}$$

$$H_0 : \delta_i = \delta \text{ and } \alpha \geq 0$$

$$H_A : \delta_i \neq \delta \text{ for all } i \text{ or } \alpha < 0$$

# Regression based convergence test

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

$$V_t^2 = N^{-1} \sum (h_{it} - 1)^2$$

$$V_t^2 \sim \frac{A}{L(t)^2 t^{2\alpha}} \text{ as } t \rightarrow \infty \text{ for some } A > 0$$

$$\log \left( \frac{V_1^2}{V_t^2} \right) - 2 \log L(t) = a + b \log t + u_t$$

where  $b = 2\alpha$

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

Step 1 Cross-section ordering by final observation

Step 2 Formation of core group and convergence club

Step 3 Test for convergence among all the remaining units

Step 4 Recursive and stopping rule

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

- Sample: log GVA per worker of 206 NUTS 2 regions, 1990-2005
- Moran's  $I = 0.6$
- Getis' filter

$$G_i(d) = \frac{\sum_j w_{ij}(d)y_j}{\sum_j y_j}, \quad i \neq j$$

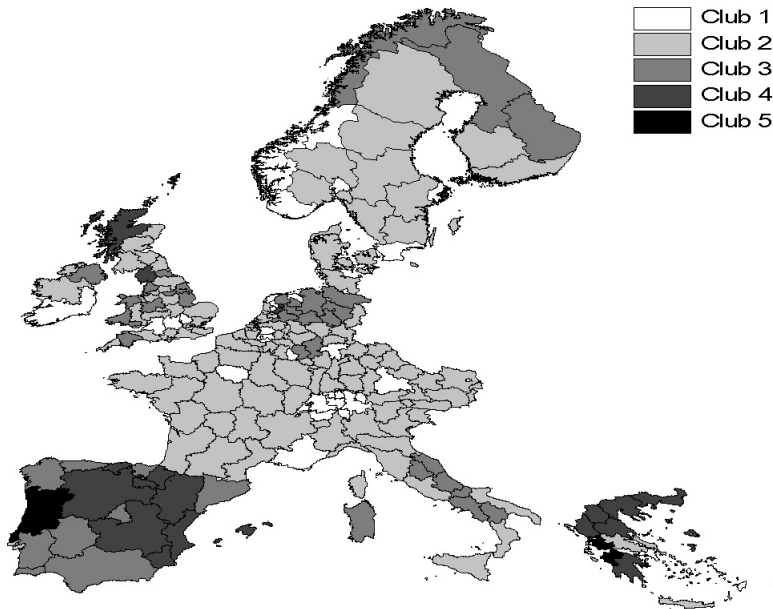
$$\tilde{y}_i = \frac{y_i [W_i / (N - 1)]}{G_i(d)}$$

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions





- Ordered probit model  $y^* = X_i\beta + \epsilon_i$
- Initial conditions
  - heterogeneity in factor endowments (Solow 1956, Galor 1996)
  - threshold externalities in human capital accumulation (Azariadis and Drazen 1990)
- Structural characteristics
  - similar production technology (e.g., Galor 1996)
  - relative location (Quah 1996)
  - country membership (Barro and Sala-i-Martin 1991)
  - agglomeration effects (Corrado *et al.* 2005, Martin and Ottaviano 2001)
  - population growth (Mora 2008)

Introduction

Identification  
of convergence  
clubsFactors  
conditioning  
club  
membership

Conclusions

Variable	Club 1	Club 2	Club 3	Club 4 & 5
<i>Initial conditions</i>				
Labor force	0.502** (0.213)	1.138** (0.449)	-1.524*** (0.526)	-0.111* (0.068)
Capital stock per capita	0.030 (0.032)	0.069 (0.074)	-0.093 (0.098)	-0.007 (0.008)
Capital share	0.305** (0.137)	0.690** (0.271)	-0.928*** (0.325)	-0.067 (0.042)
Human capital	0.005** (0.003)	0.012** (0.006)	-0.016** (0.007)	-0.001 (0.001)
Income per capita	0.277*** (0.105)	0.628*** (0.214)	-0.844*** (0.239)	-0.061* (0.036)
<i>Structural characteristics</i>				
Services	0.409*** (0.158)	0.926*** (0.336)	-1.244*** (0.380)	-0.090* (0.053)
High-tech	0.447** (0.217)	1.012** (0.450)	-1.361** (0.552)	-0.098 (0.064)
Population growth	0.763 (4.198)	1.727 (9.498)	-2.322 (12.758)	-0.168 (0.931)
Agglomeration	0.009 (0.016)	0.020 (0.036)	-0.027 (0.049)	-0.002 (0.004)
W income per capita	-0.144* (0.074)	-0.325** (0.163)	0.437** (0.120)	0.032 (0.022)

Significance levels : \* : 10% \*\* : 5% \*\*\* : 1%

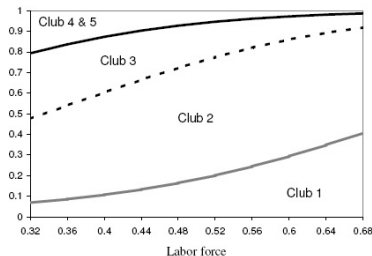
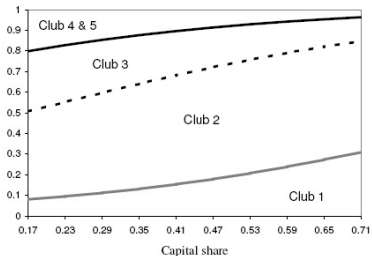
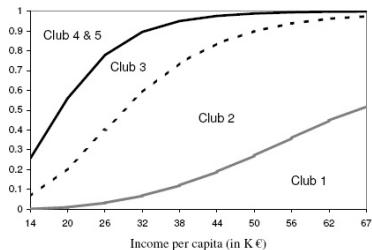
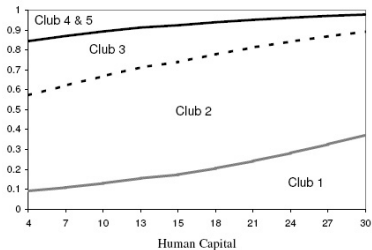
# Cumulative probabilities for initial conditions

Introduction

Identification of convergence clubs

Factors conditioning club membership

Conclusions



Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

- Evidence indicating the existence of convergence clubs in per capita income among western European regions
  - Initial conditions are important, i.e. initial per capita income, human capital, capital share and labor force have impact on the club membership
- ⇒ Club convergence hypothesis explains the observed patterns

Introduction

Identification  
of convergence  
clubs

Factors  
conditioning  
club  
membership

Conclusions

Thank you for your attention!  
Questions? Comments?