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Growth and Convergence. Some Empirical Analysis

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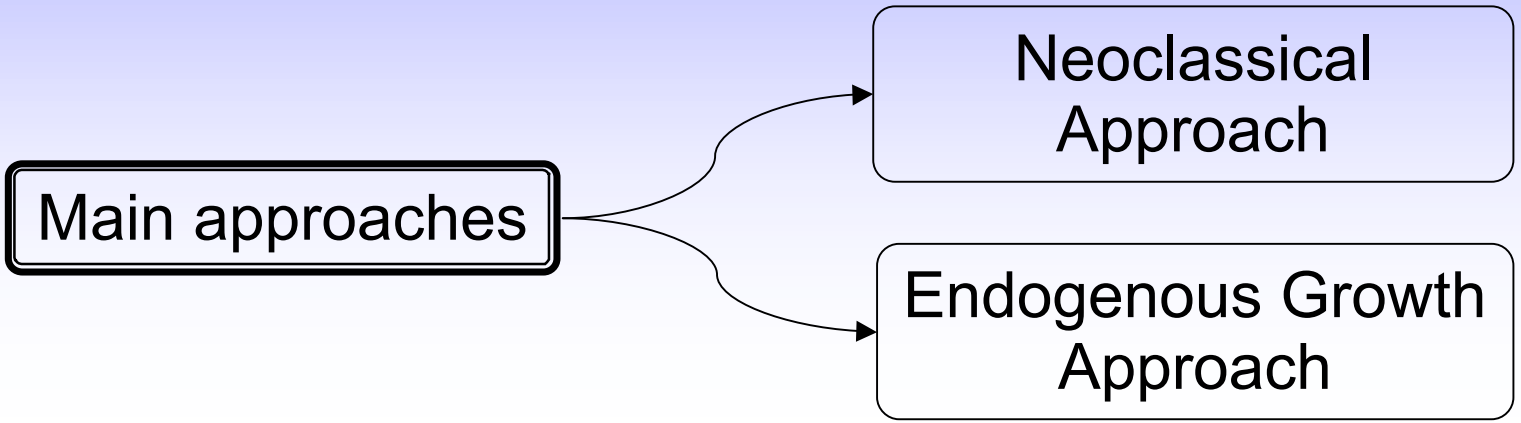
The Theoretical Background

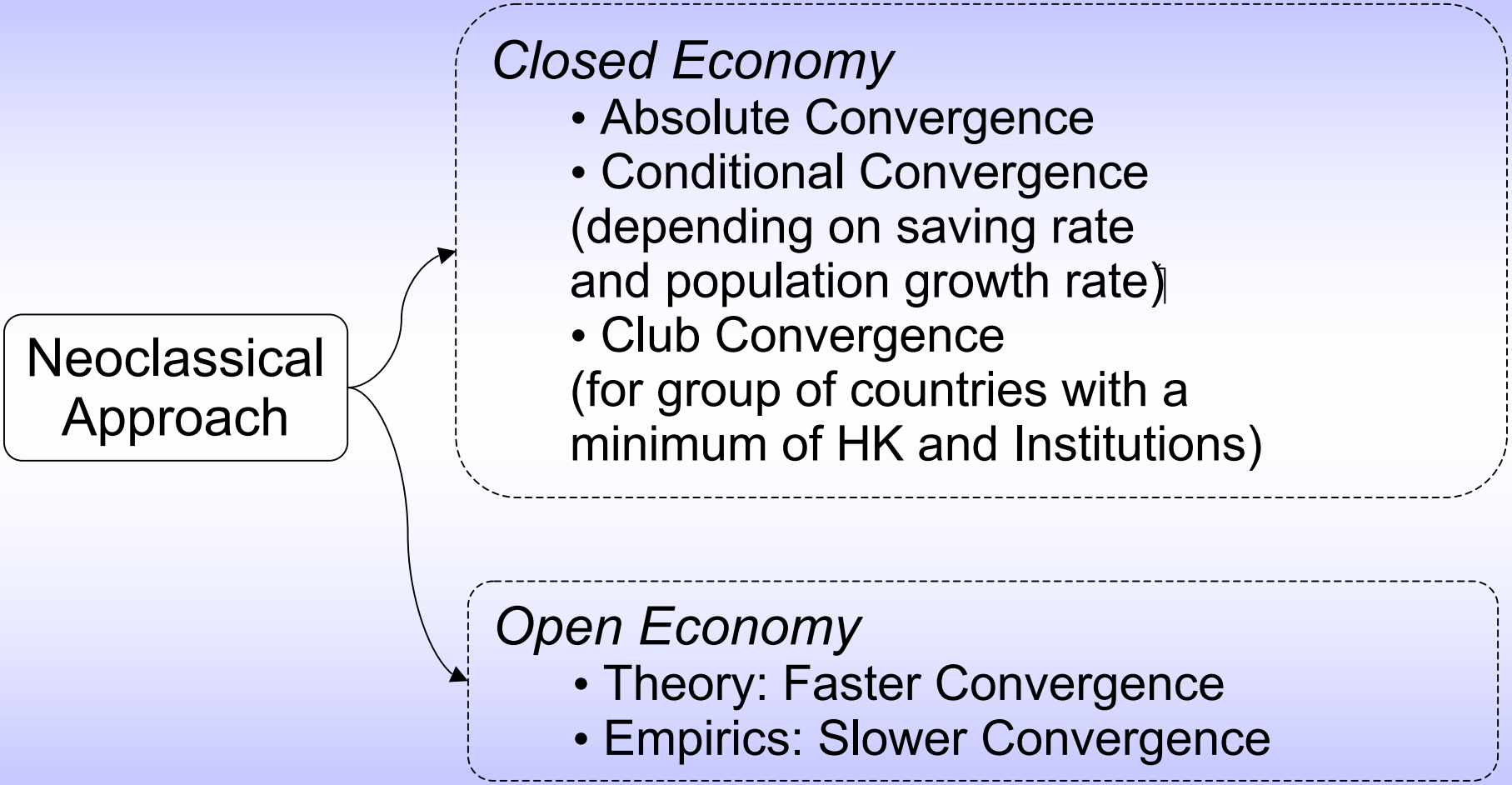
Economic Growth



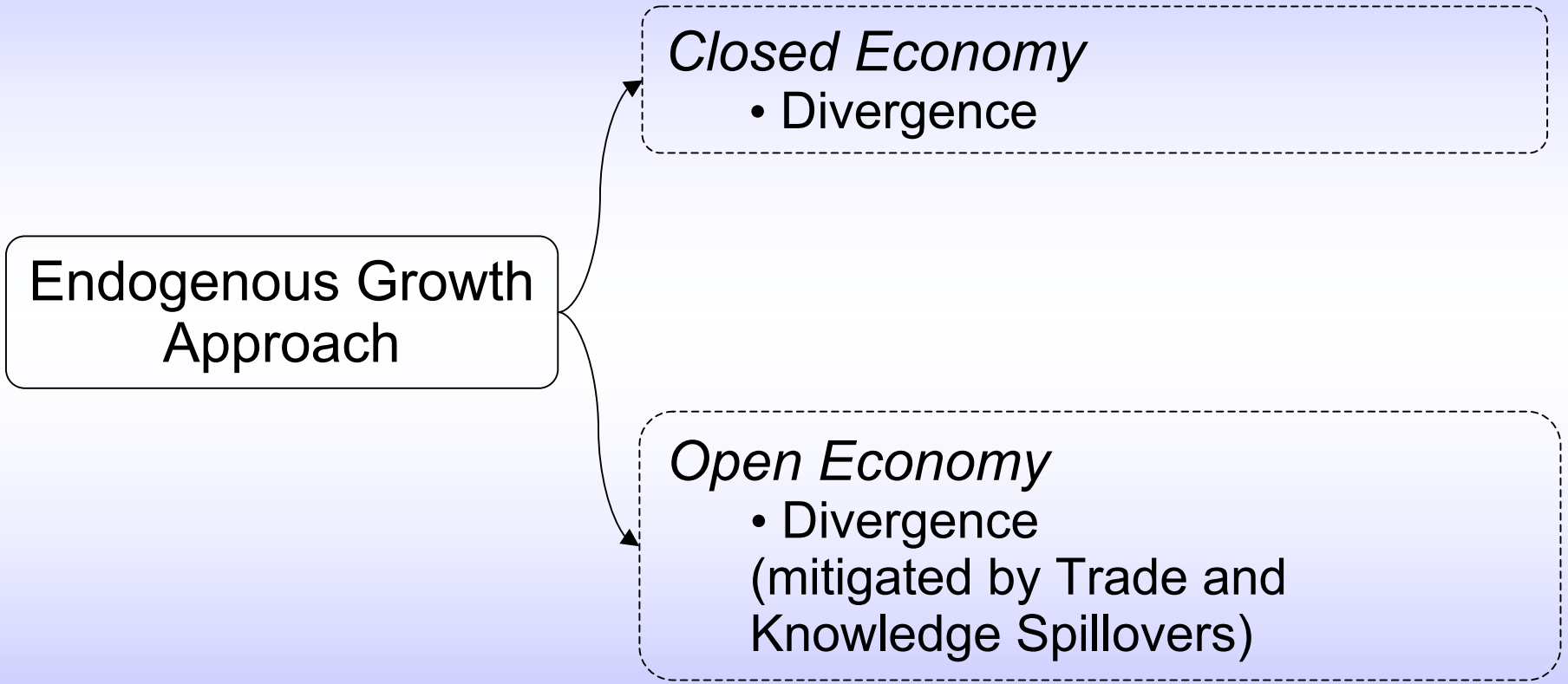
We focus on the following issues:

- Convergence
- Economic Policies

Convergence Issue



Convergence Issue



Economic Behaviours & Policies

Behaviour	*Influence of Policies*
Absolute Convergence	None
Conditional Convergence	Saving Rates and Population Growth
Club Convergence	Minimum Endowment of HK and Institutions
Divergence	Endogenuos Elements (as Innovation)

From Theoretical to Empirical Models

Static Solow Model (Barro & Sala-i-Martin 1992)

$$\frac{1}{T}\log\left(\frac{z_{i,t_0+T}}{z_{i,t_0}}\right) = B - \frac{(1-e^{-\beta})}{T}\log(z_{i,t_0}) + \varepsilon_{it}$$

Where T = period of time

z_{i,t_0} = PILpc at time 0

$z_{i,t_{0+T}}$ = PILpc at time T

$$B = g_A + \frac{(1-e^{-\beta})}{T}[\log(\hat{z}^*) + g_A t_0]$$

and homogeneous hypothesis holds $g_{Ai} = g_A$ $\hat{y}_i^* = \hat{y}^*$

Dynamic Model (Amable 2000)

$$\ln(z_{i,t}) = a_i + b\ln(z_{i,t-\tau}) + \gamma W_{i,t} + \varepsilon_{i,t}$$

Where
- τ = period of time
- z_{i,t_0} = PILpc at time 0
- $z_{i,t_{0+T}}$ = PILpc at time T
- $W_{i,t}$ = row of determinants of economic growth

Smulders Model (Smulders 1992)

$$\begin{bmatrix} \tilde{h}_t^R \\ \tilde{L}_t^R \\ \tilde{L}_t^W \end{bmatrix} = \hat{\mathbf{i}} \begin{bmatrix} \tilde{h}_{t-1}^R \\ \tilde{L}_{t-1}^R \\ \tilde{L}_{t-1}^W \end{bmatrix} + \gamma_1 \begin{bmatrix} W_1 \\ 0 \\ 0 \end{bmatrix} + \gamma_2 \begin{bmatrix} W_2 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{bmatrix}$$

where:

$\tilde{h}^R = \tilde{h}^A - \tilde{h}^B$ is the log of the productivity gap between advanced and backward countries

$\tilde{L}^R = \tilde{L}^A - \tilde{L}^B$ is the log of the ratio of labour employed in production between advanced and backward countries

$\tilde{L}^W = s^A \tilde{L}^A + s^B \tilde{L}^B$ is the sum, weighted by GDP, of labour in production for advanced and backward countries

$\hat{\mathbf{i}}$ is a matrix containig structural technological and spillovers parameters

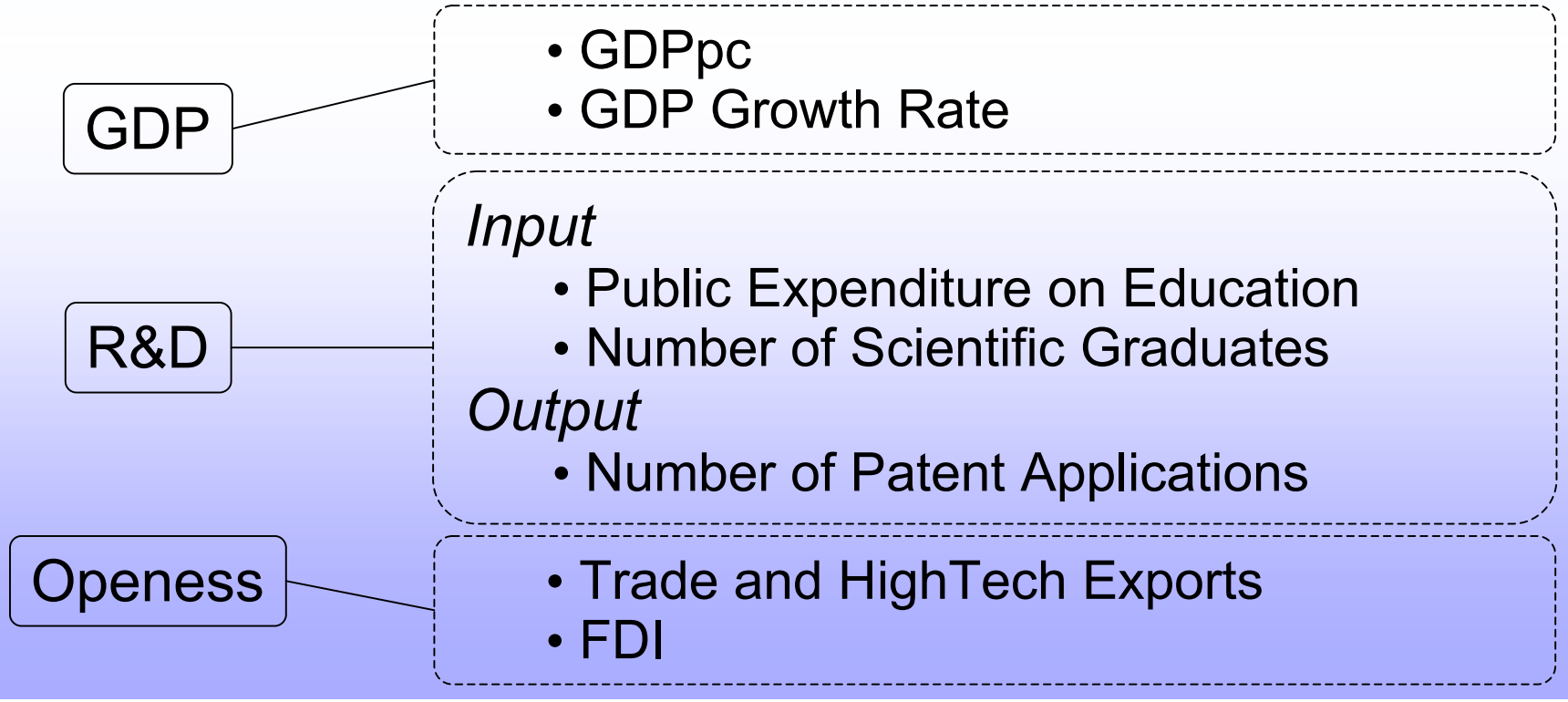
Estimate Methods and Techniques

- Static Solow Model: OLS
- Dynamic Model: GMM
- Smulders Model: VARX

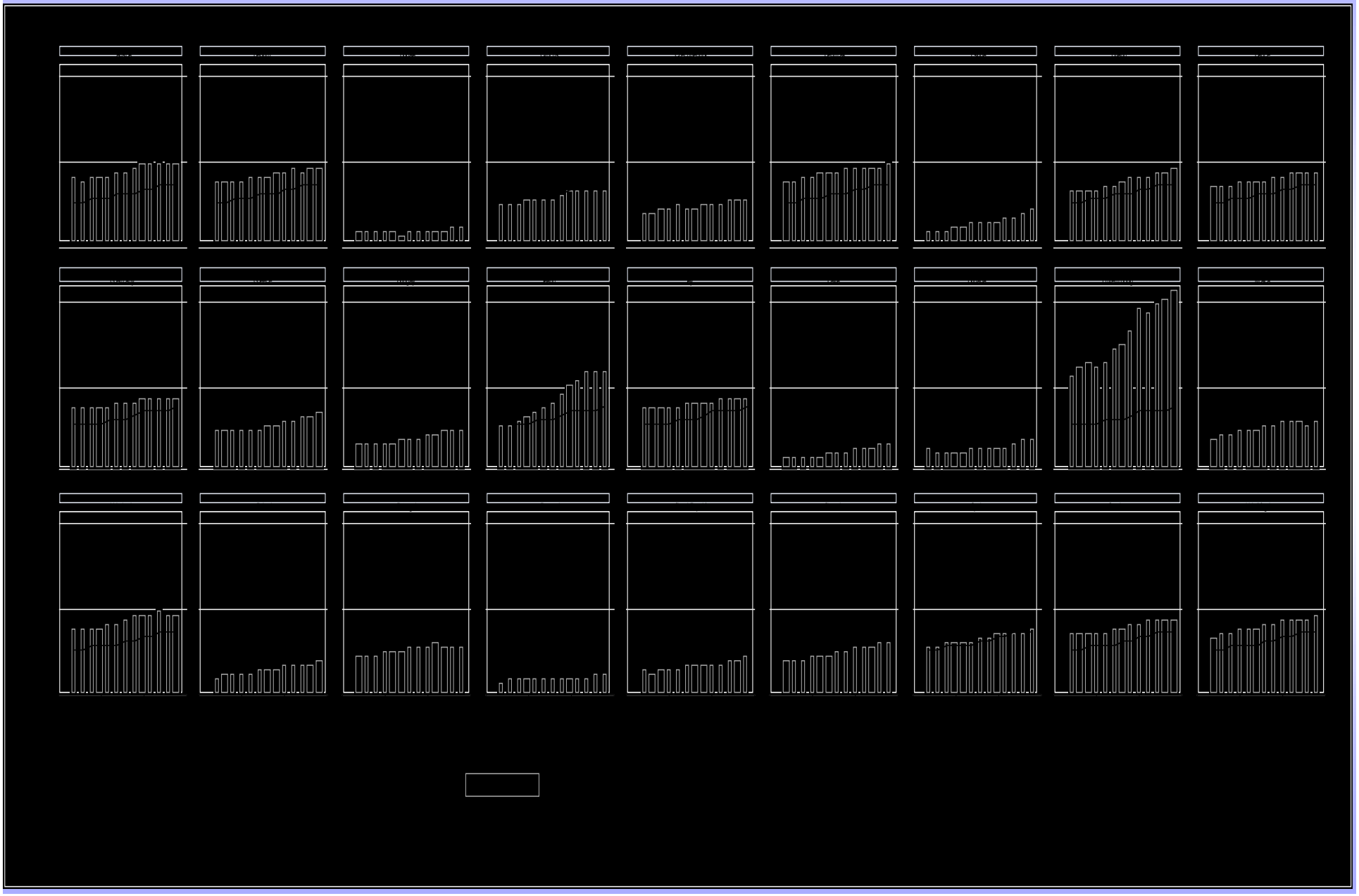
Some Empirical Analysis

Analysis and Variables

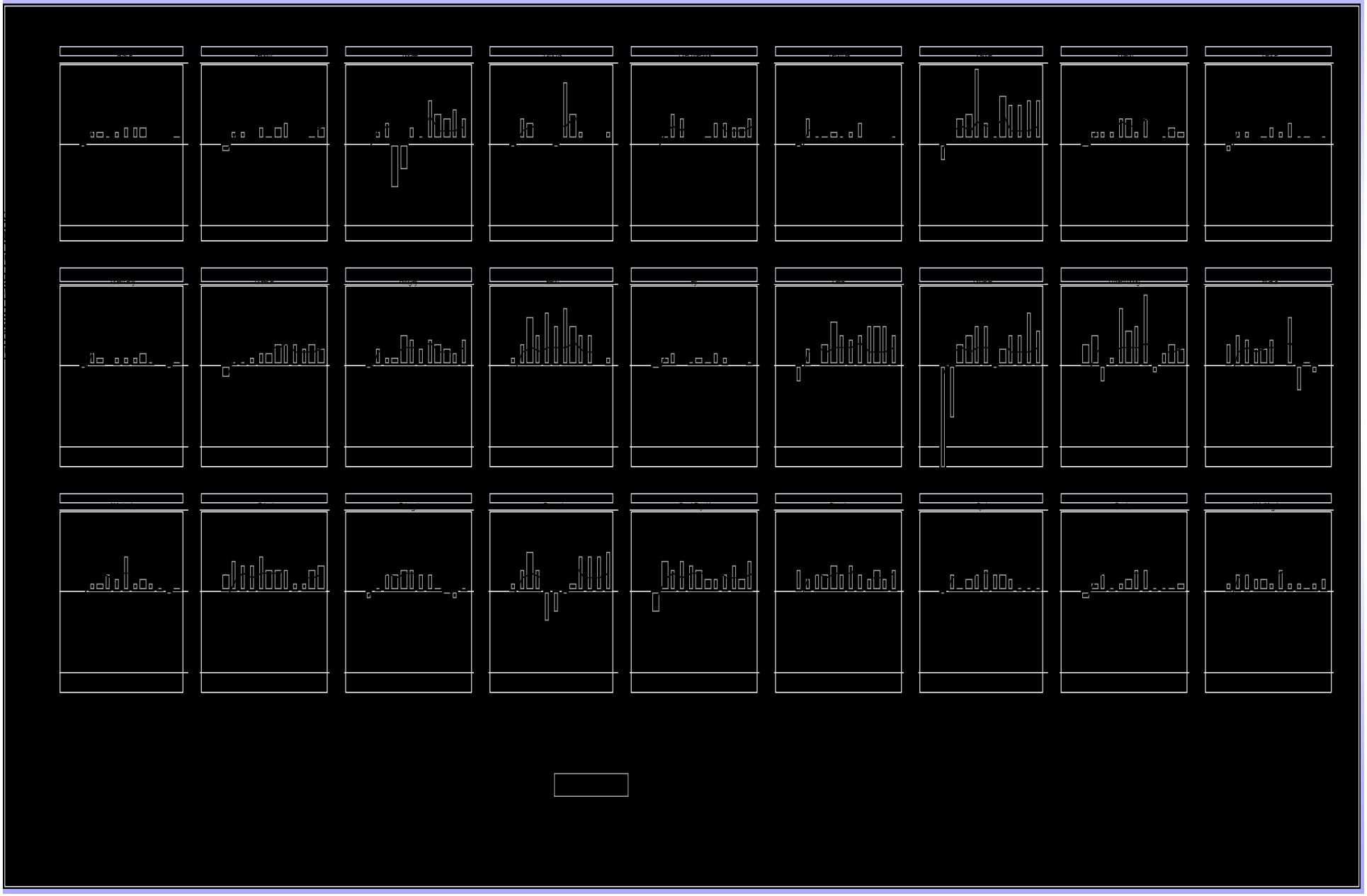
- Descriptive Analysis (GDPpc, R&D, Openess)
- Static Solow Model OLS (GDPpc, UE27)
- Dynamic Model GMM (GDPpc, R&D, Openess, UE21)



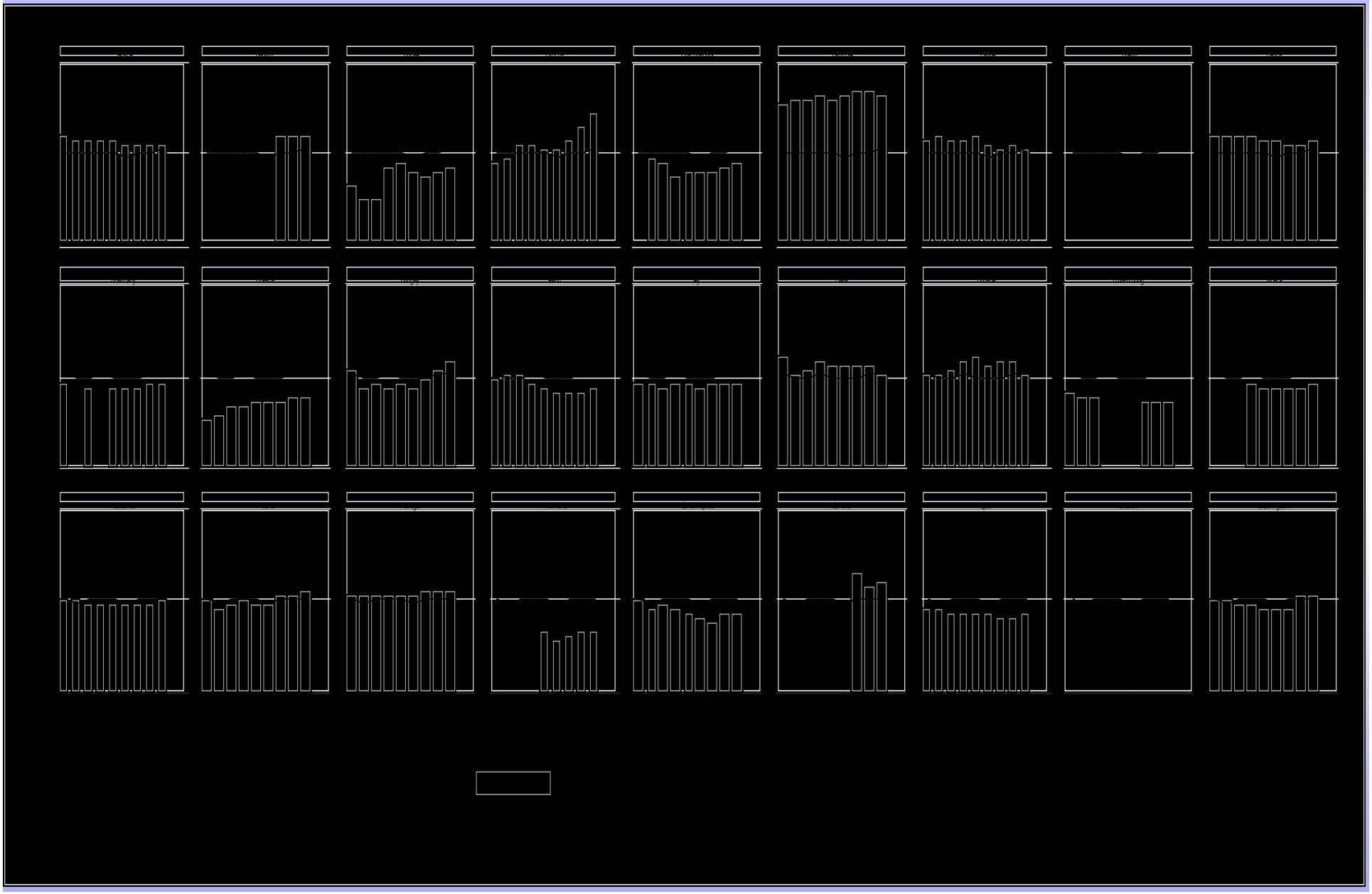
GDPpc Descriptive Analysis



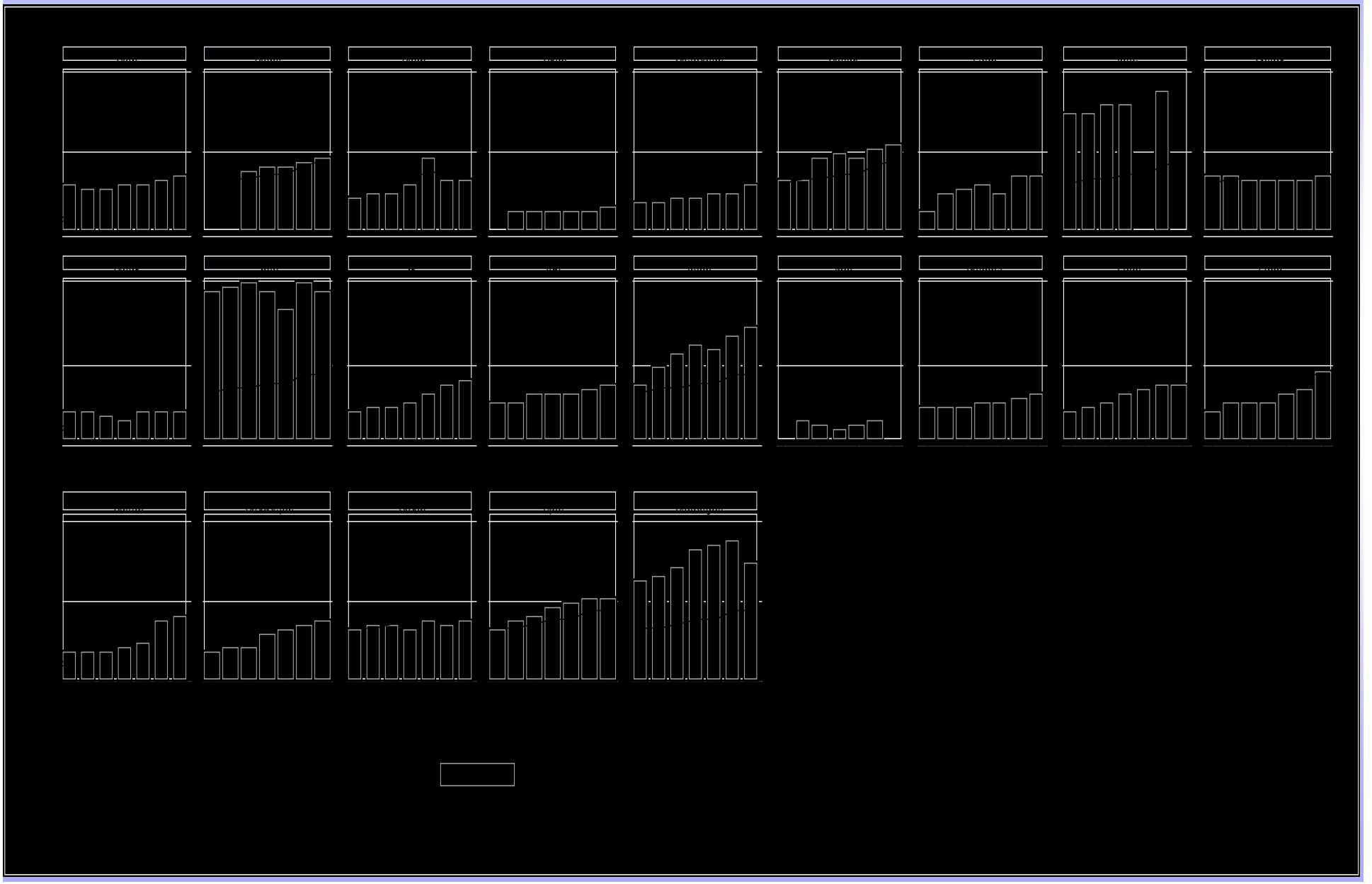
GDPpc Growth Descriptive Analysis



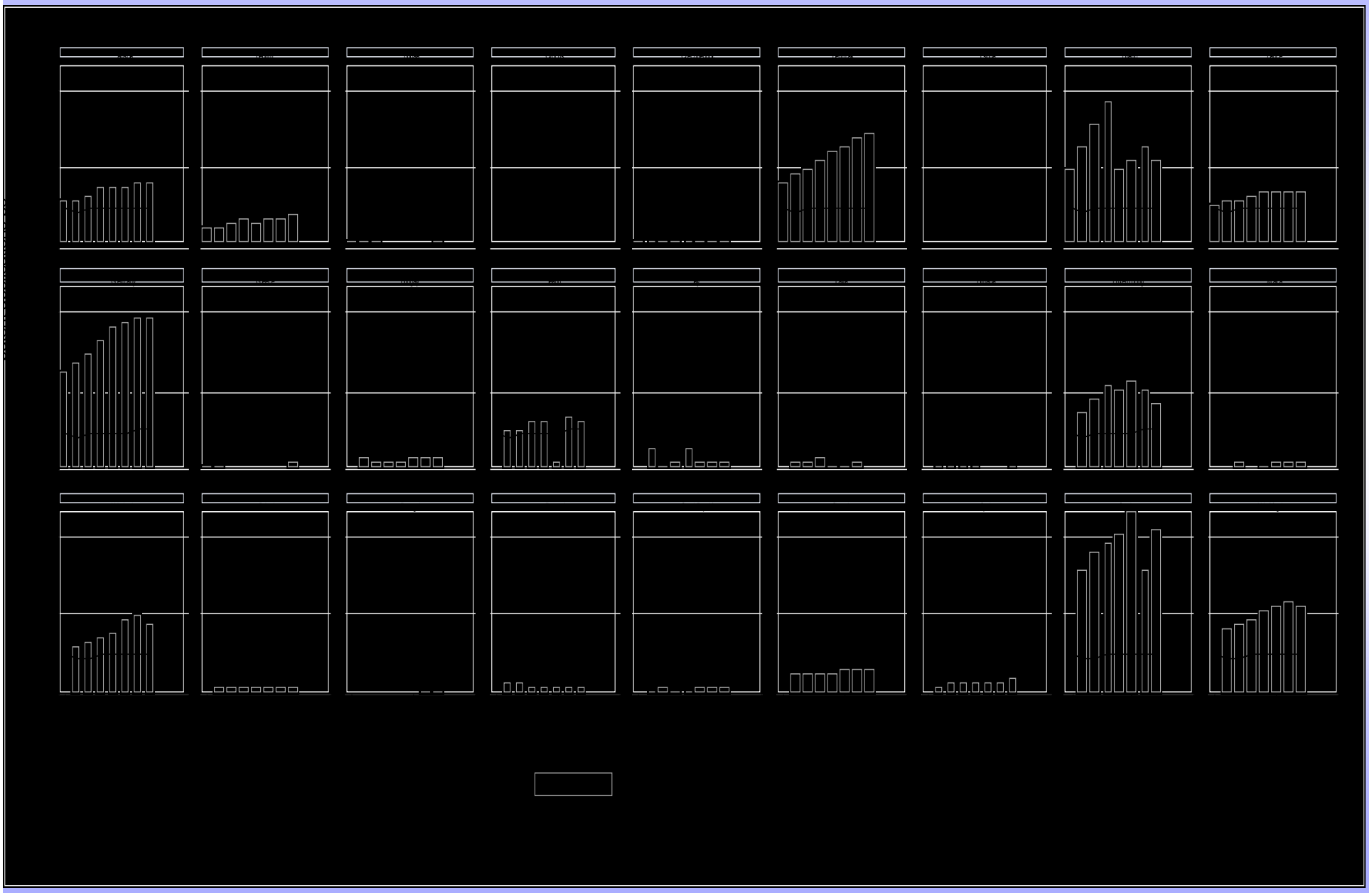
Public Expenditure on Education Descriptive Analysis



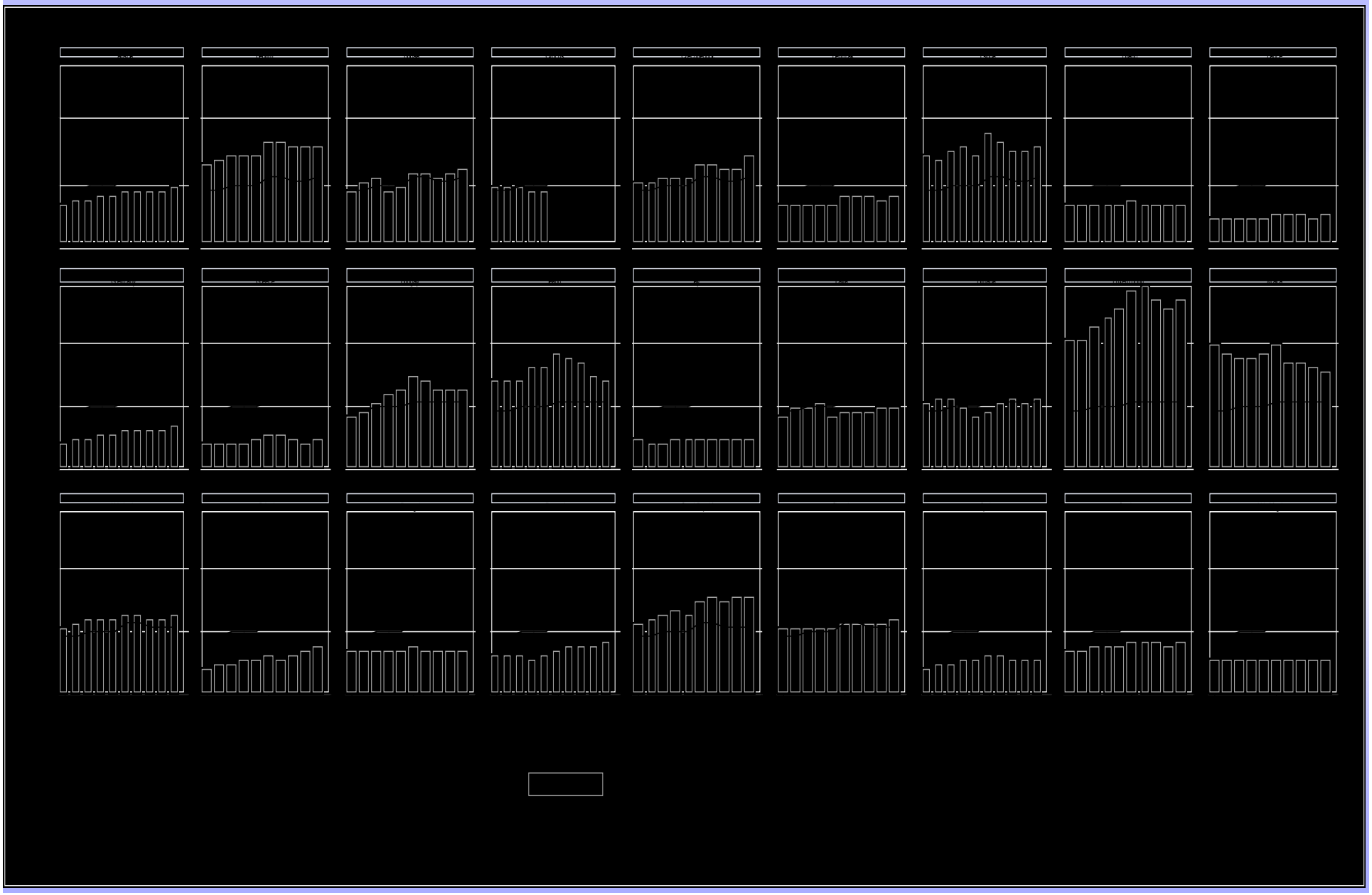
Number of Scientific Graduates Descriptive Analysis



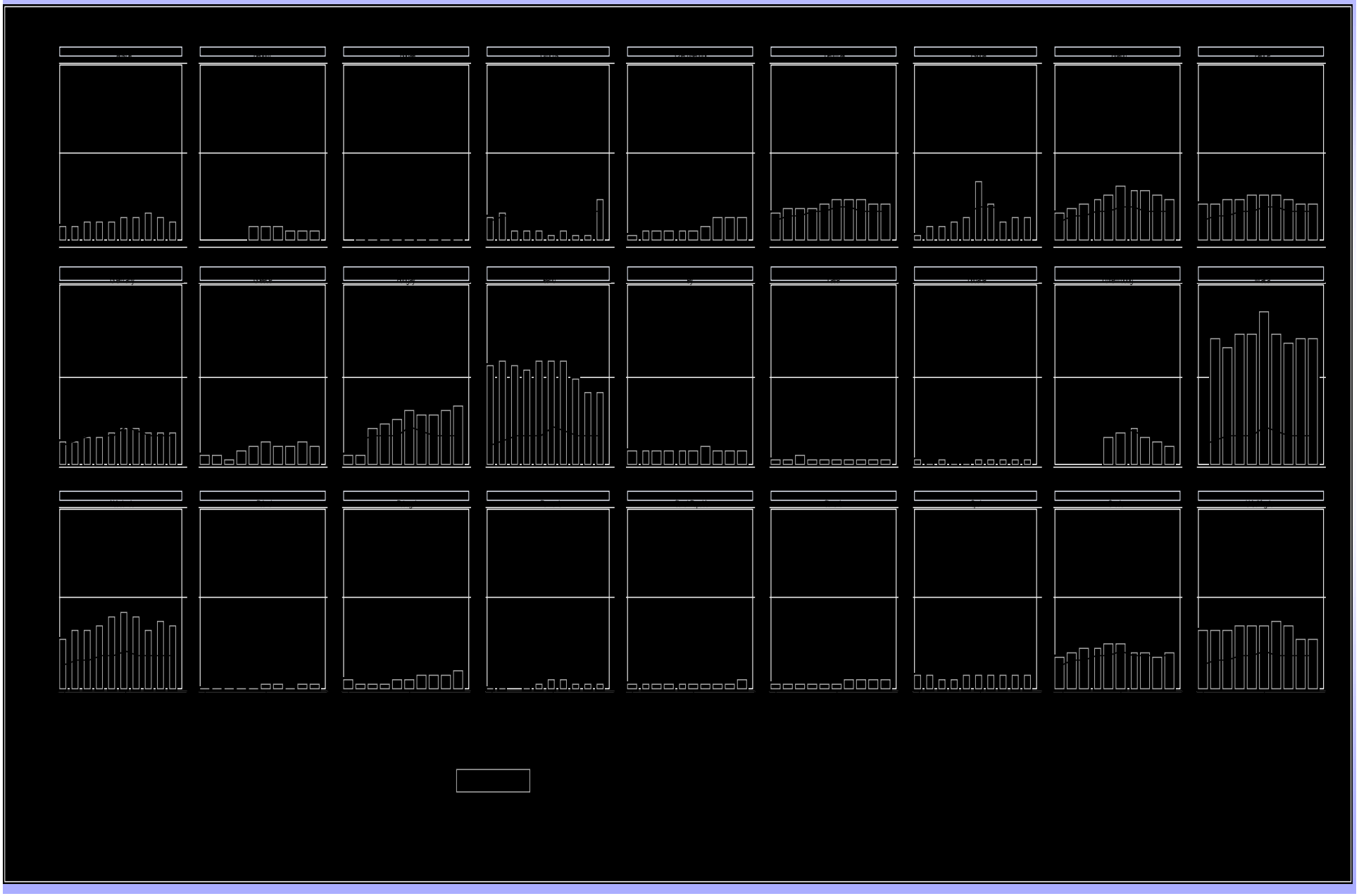
Patent Applications pc Descriptive Analysis



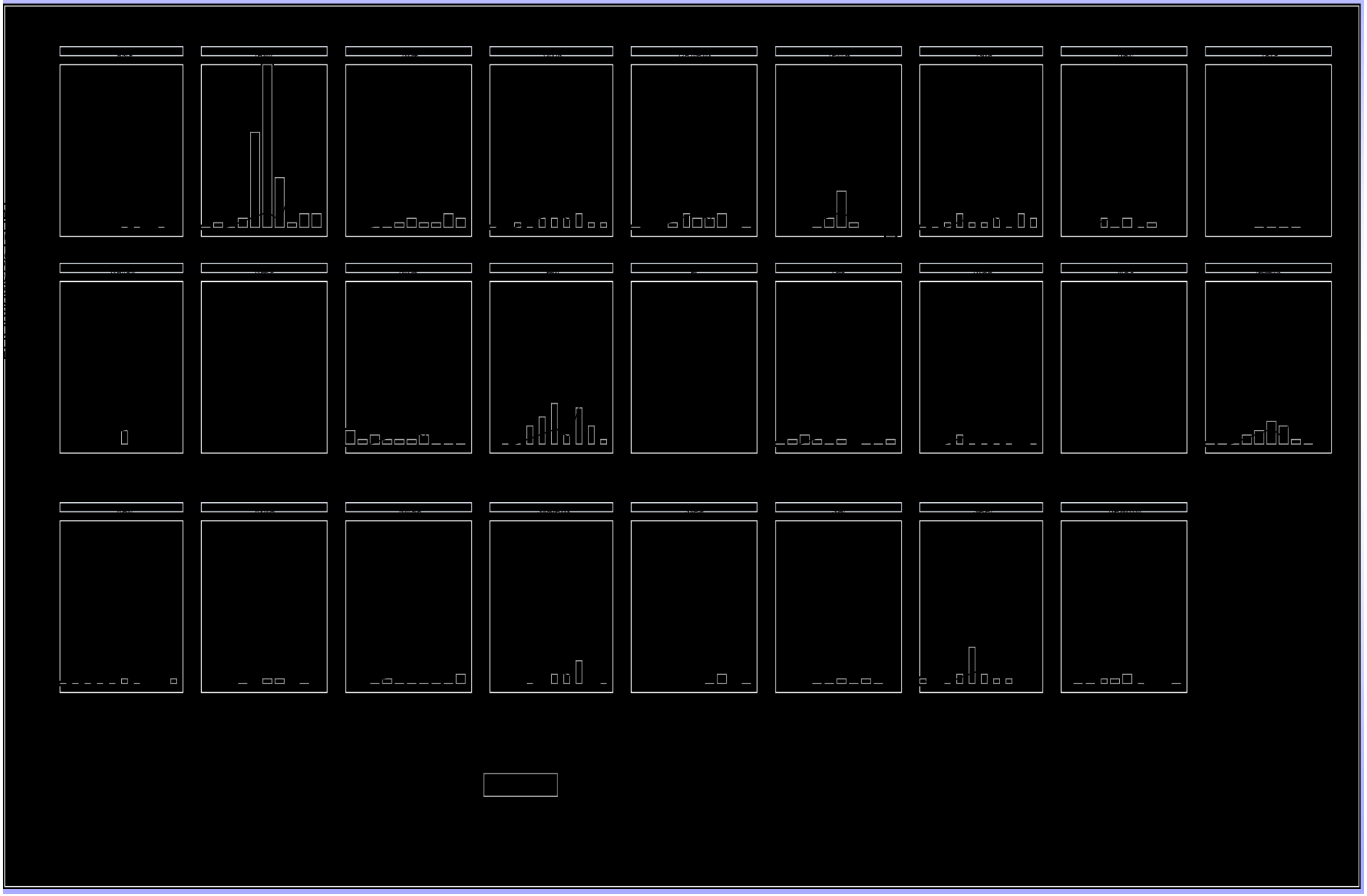
Trade (%GDP) Descriptive Analysis



HighTech Exports Descriptive Analysis



FDI Net InFlows Descriptive Analysis



Static Solow Model - Estimates Results

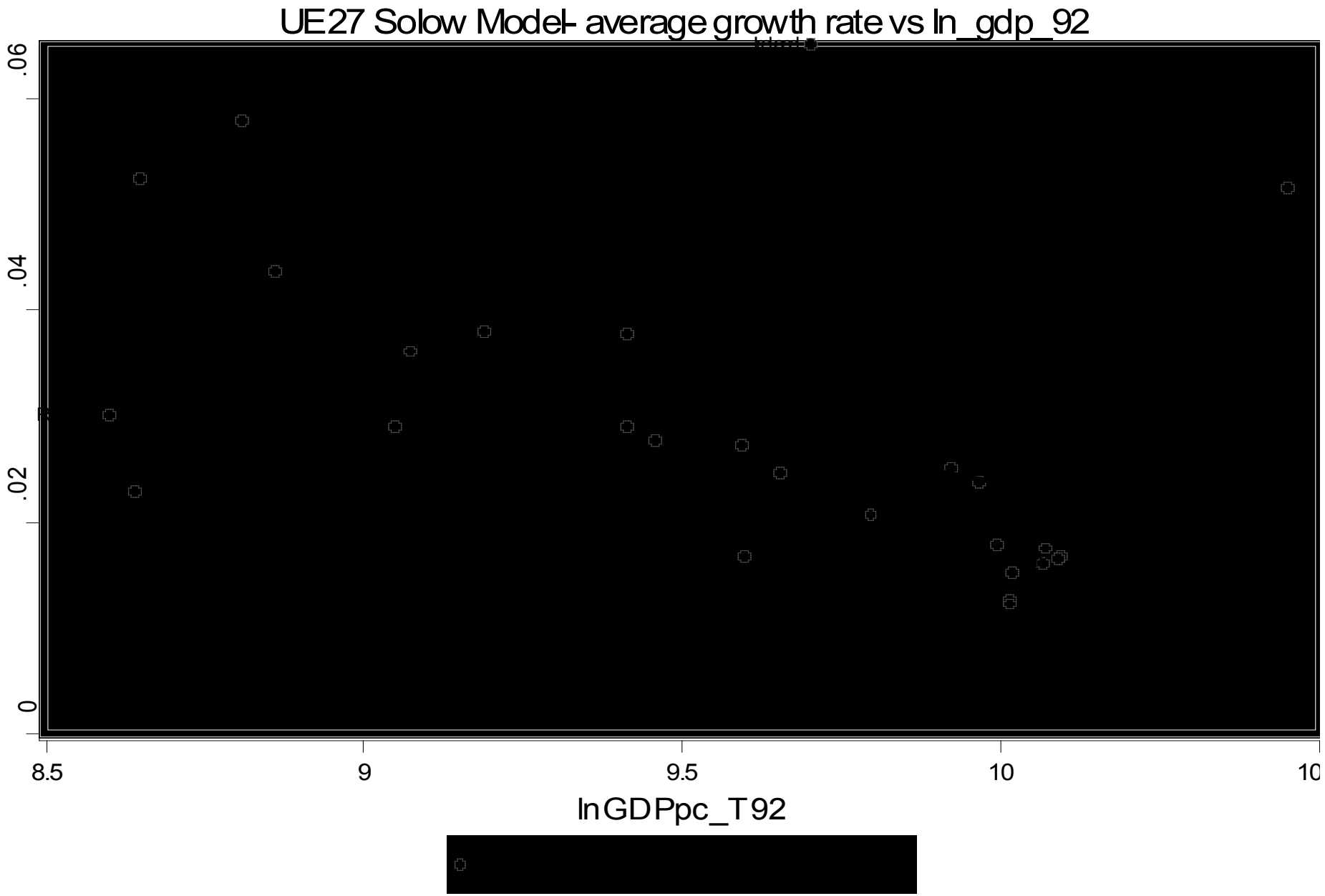
```
      Source |       SS       df       MS              Number of obs =      27
-------------+------------------------------           F(  1,    25) =    6.27
       Model |  .001082918     1  .001082918           Prob > F      =  0.0192
    Residual |  .004317126    25  .000172685           R-squared     =  0.2005
-------------+------------------------------           Adj R-squared =  0.1686
       Total |  .005400044    26  .000207694           Root MSE      =  .01314

------------------------------------------------------------------------------
    GrowthAR |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 lnGDPpc_T92 |  -.012077   .0048227    -2.50   0.019    -.0220095   -.0021445
       _cons |  .1444661   .0461943     3.13   0.004     .0493272     .239605
```

Regression coefficient < 0, then $\beta > 0$

Absolute Convergence

Static Solow Model - Estimates Plot



Dynamic Model - Estimates Results

Dependant variable: ln(gdppc)

	A				B				C				D				E			
Variables	endo	eso	coeff	p-value	endo	eso	coeff	p-value	endo	eso	coeff	p-value	endo	eso	coeff	p-value	endo	eso	coeff	p-value
LNgdppc L1	x		1,14045	0,000	x		1,09057	0,000	x		1,09408	0,000	x		1,38117	0,000	x		1,52859	
Lntrade						x	0,1885765	0,000						x	0,274578	0,008				
LNHTexp										x	0,04894	0,068		x	0,032101	0,29		x	0,063913	0,015
LNSCIgrad		x	0,0676274	0,017										x	0,041202	0,354		x	0,041117	0,297
LNPATapplRES														x	0,007717	0,226		x	0,008437	0,066
LNPUBexpEDU																				
LNFDIin														x	0,001818	0,632		x	-0,0009	0,785
Hansentest			14,00	0,396			14,24	0,432			12,21	0,59			5,76	0,33			4,29	0,429
N.observations			97	97			105	105			103	103			59	59			59	59

Dependant variable: ln(gdppc)

	F			G			H				I				
Variables	endo	coeff	p-value	endo	coeff	p-value	endo	eso	coeff	p-value	endo	eso	pred	coeff	p-value
LNgdppc L1	x	0,9657594	0,000	x	1,045678	0,000	x		1,01017	0,000	x			1,144031	0,002
Lntrade	x	0,2195081	0,009								x			0,39976	0,002
LNHTexp								x	0,0242018	0,073					
LNSCIgrad				x	0,0945109	0,012	x		0,0780581	0,033					
LNPATapplRES												x		0,00976	0,038
LNPUBexpEDU															
LNFDIin															
Hansentest		18,47	0,914		13,79	0,989			11,33	0,998				13,62	0,191
N.observations		105	105		97	97			97	97				84	84

Comments

- Dynamic model seems to confirm divergence but this result doesn't consider the investment variable
- Trade has a crucial role in determining growth
- Other variables are not significant in these specifications
- Specification *I* of the dynamic model highlights the role for growth of both openness and patent applications