

# Capabilities, Competitiveness, Nations

Jan Fagerberg\* and Martin Srholec\*\*

\*) IKE, Aalborg University, TIK, University of Oslo and CIRCLE, Lund University

\*\* ) CERGE-EI, Charles University and Economics Institute of the Academy of Sciences of the Czech Republic, CIRCLE, Lund University

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# Why growth (and welfare) differs

- A (**the?**) central question in economics
- How to approach it: From **capital accumulation** to **knowledge**-based dynamics
- Knowledge and growth: **Creation** and **exploitation** of knowledge not as **easy** as some believe ....
- **Capabilities** for doing so essential, both at the level of the **firm** (Teece 2010) and at more aggregate levels (the **national** level, Abramovitz 1986, Lall 1993, Kim 1997)
- Firm and country level capabilities normally **interact** in the process of economic growth

# Capabilities and Competitiveness

Country competitiveness defined (OECD, 1992)

“the degree to which, under open market competition, a country can **produce goods and services that meet the test of foreign competition** while simultaneously maintaining and **expanding domestic real income**”

“Competitiveness” – a useful concept only for firms?

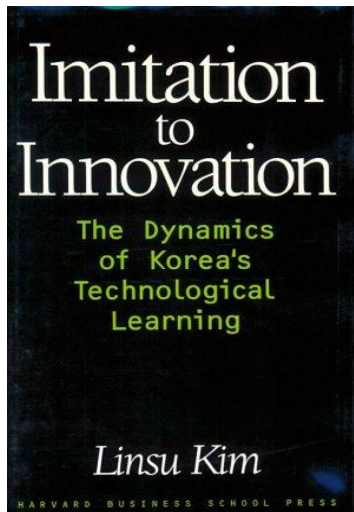
- Countries and firms: **altogether different?**
- Countries cannot «**go bankrupt**» - **really?**
- Countries: **economic units**, with systems for governance (and institutions), whose members produce **economic value** drawing on the **capabilities and resources** of the country (often in **competition** with foreigners)

# Both technological and social capabilities required ...

## Technological capabilities

Linsu Kim (1997):

*“the ability to make **effective use of technological knowledge** in efforts to **assimilate, use, adapt and change existing technologies**”*

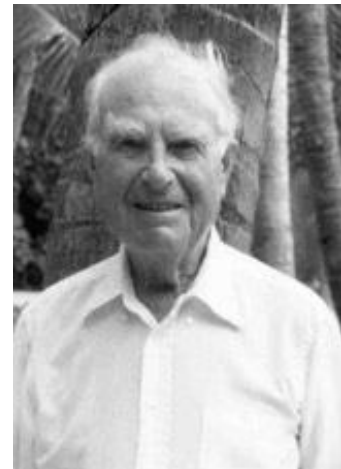


- Innovation capability
- Finance capability
- Production capability

## Social capabilities

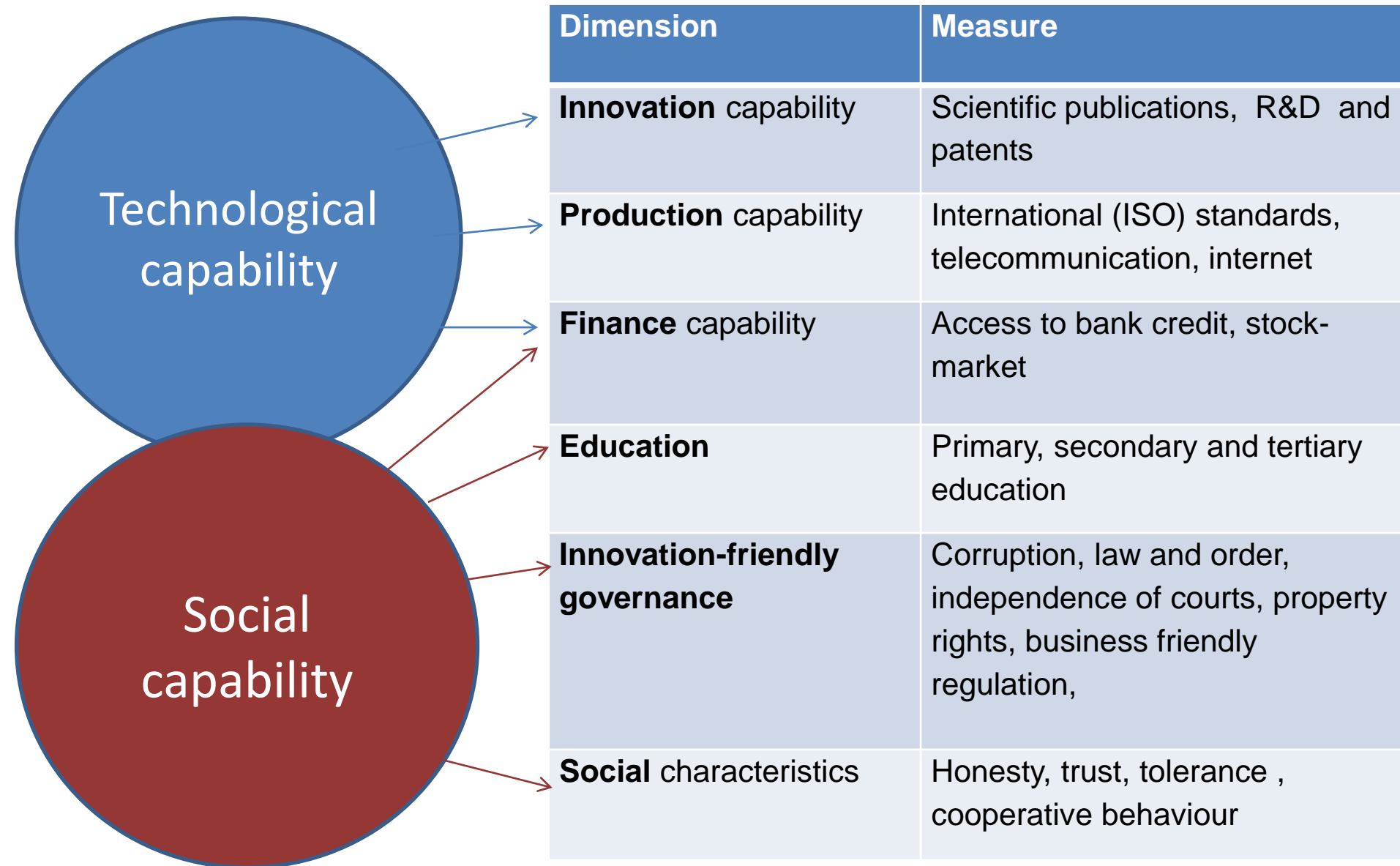
Moses Abramovitz (1994):

*“Countries’ levels of general **education** and technical competence, the commercial, industrial and financial **institutions** (...) and the **political and social characteristics** that influence the risks, the incentives and the personal rewards of economic activity”*



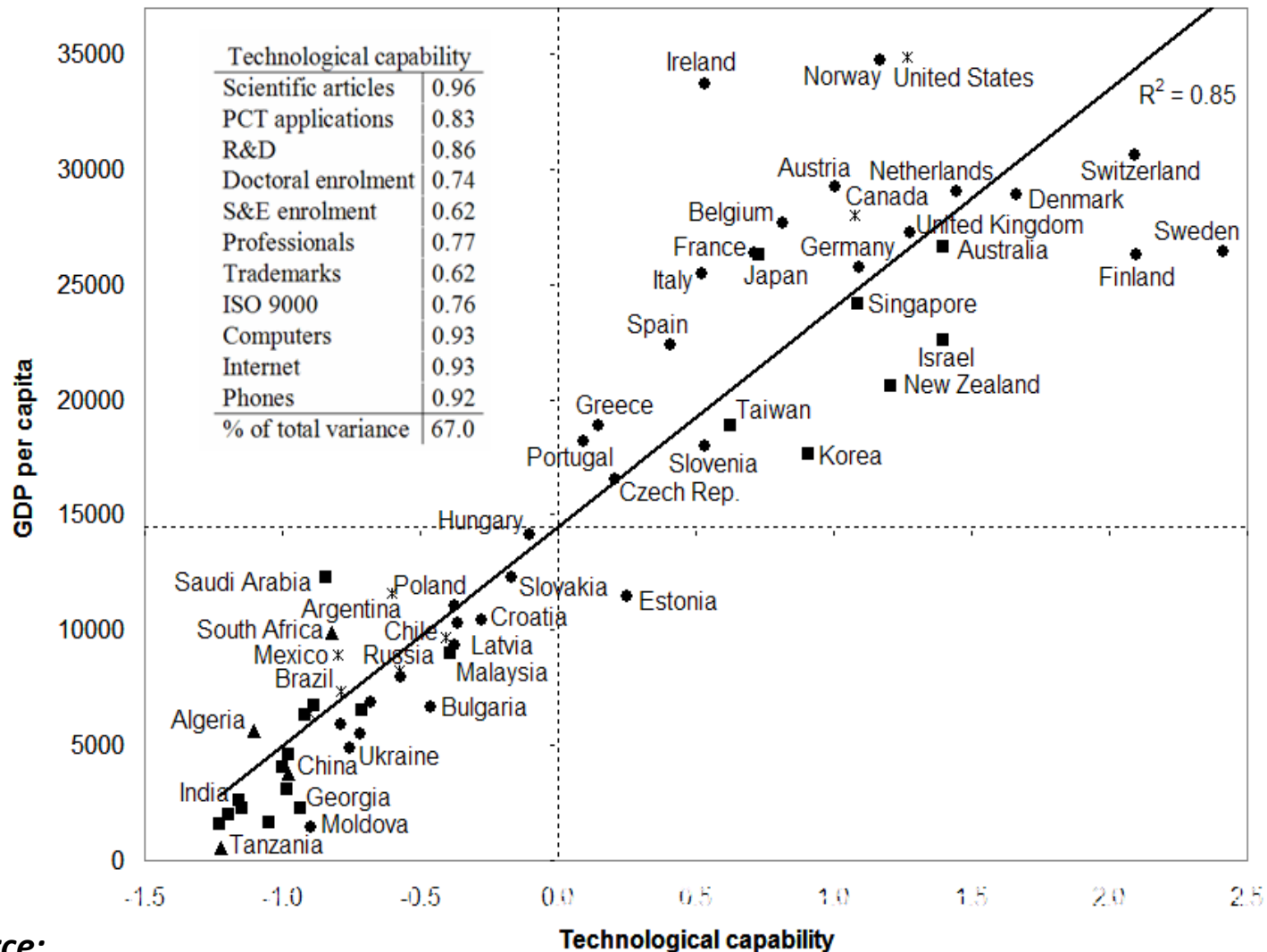
Moses Abramovitz

# How can Technological and Social Capability be measured?



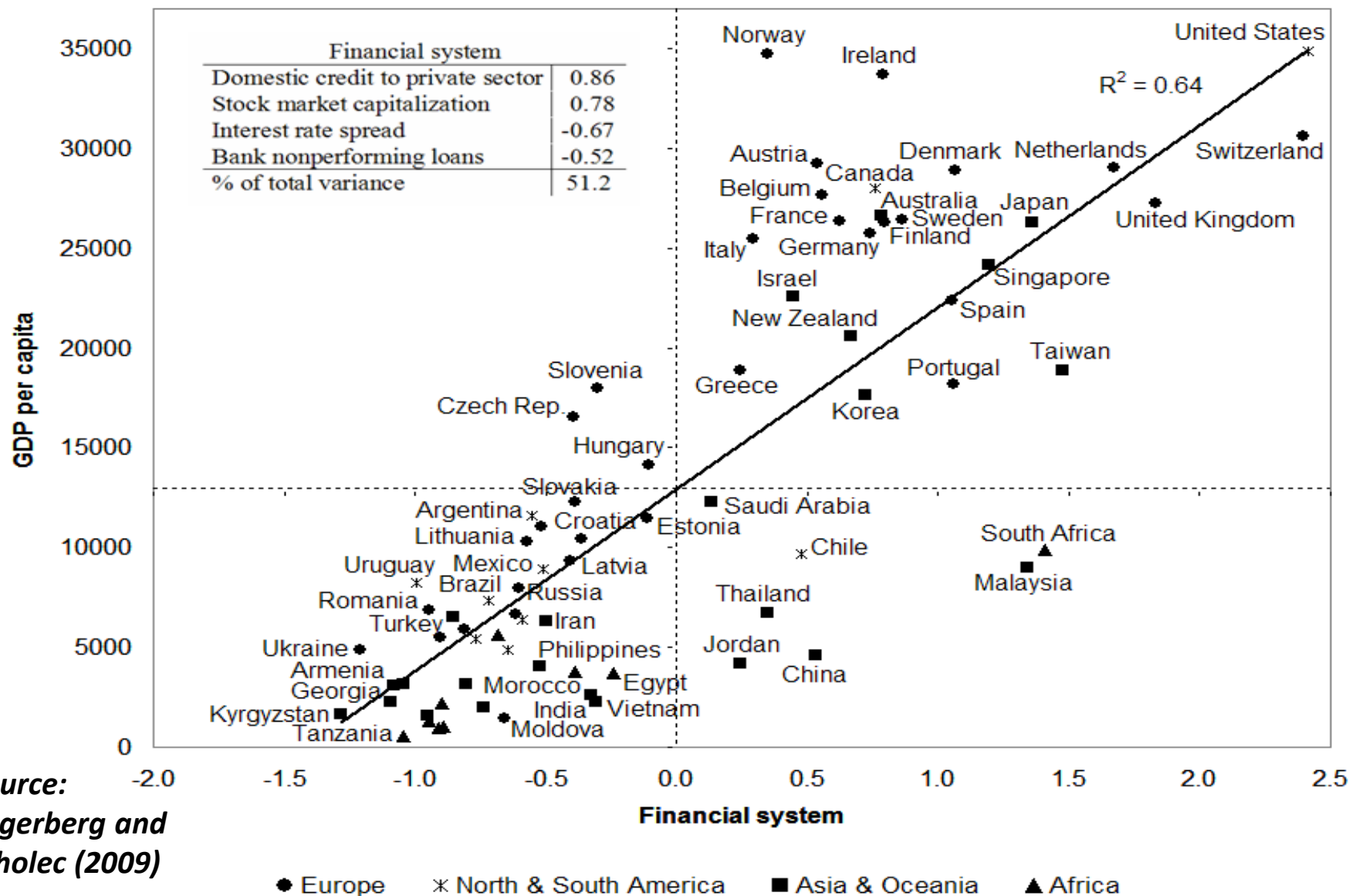
**Next: Some examples from recent research .....**

# Technological capability & GDP per capita (2000-2004)

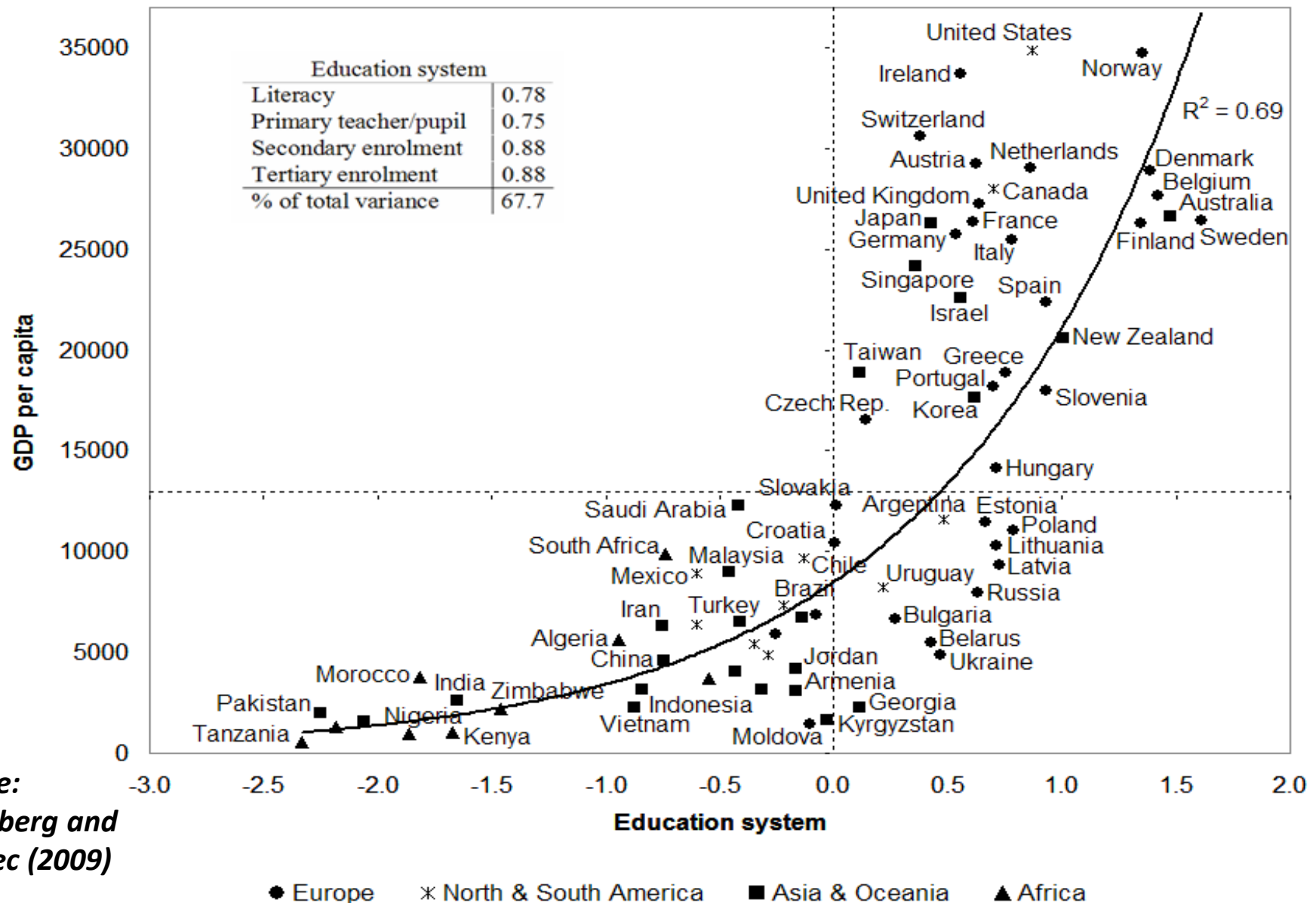


**Source:**  
**Fagerberg and Srholec**  
**(2009)**

# Financial system and GDP per capita (2000-2004)



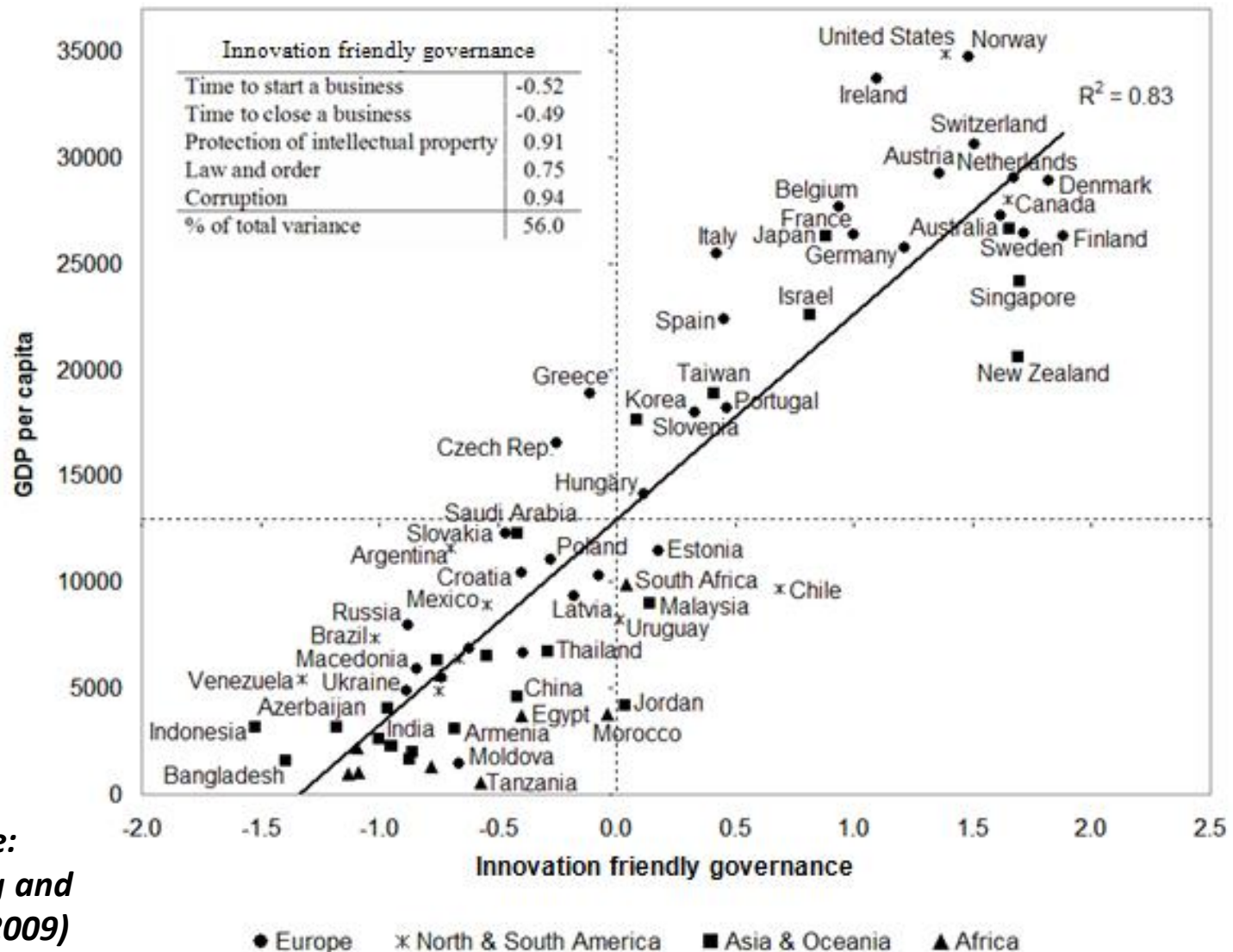
# Education and GDP per capita (2000-2004)





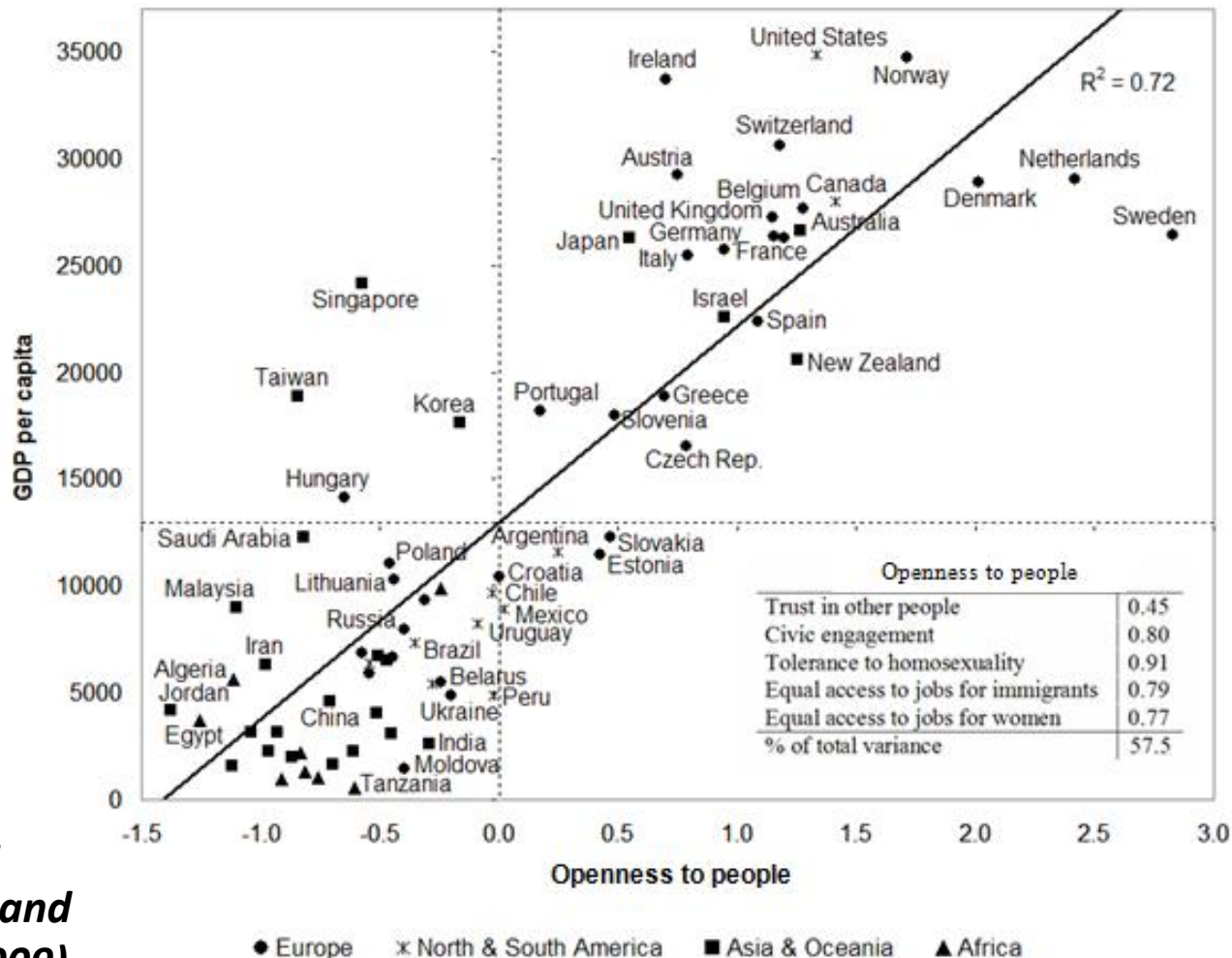
# Innovation friendly governance & GDP per capita

(2002-2004)



Source:  
Fagerberg and  
Srholec (2009)

# Social characteristics(«openness to people») and GDP per capita (2000-2004)



Source:  
Fagerberg and  
Srholec (2009)

# Capabilities and economic growth: A simple (Schumpeterian) model

Assume that the GDP of a country (Y) is a function of its **technological capability** (T) and its **social capability** - or capacity for exploiting the benefits of knowledge - (C):

$$Y = f(T, C)$$

Technological capability is a function of knowledge (or innovation) created in the country (N) and knowledge diffused to the region from outside (D):

$$T = h(N, D)$$

The diffusion of external knowledge follows a logistic curve (d), where  $T_*^{cap}$  and  $T_i^{cap}$ , represent the frontier country and the country under consideration, respectively:

$$d = \gamma - \gamma T^{gap} \quad \left( T^{gap} = \frac{T_i^{cap}}{T_*^{cap}} \right)$$



# Why do growth differs?

By differentiation and substitution we arrive at the following solution for growth of GDP, using small case letters for growth rates (e.g.,  $y = dY/Y$ , etc.):

$$y = \gamma \varepsilon_{YT} \varepsilon_{TD} - \gamma \varepsilon_{YT} \varepsilon_{TD} T^{gap} + \varepsilon_{YT} \varepsilon_{TN} n + \varepsilon_{YC} c$$

Diffusion
Innovation
Social  
capability

where  $\varepsilon_{YT} = \frac{\partial Y}{\partial T} \frac{T}{Y}$  refers to the partial elasticity of GDP with respect to technology (similar for other variables) .

Model applied to cross country samples by Fagerberg (1987) and Fagerberg and Verspagen (2002) : All three factors matter, imitation becomes harder through time, the importance of innovation increases

# Including international trade . .

Assume that exports of a country (i) depend on four factors: its **technological capability** (T), its **social capability** (C), its **price competitiveness** (P) and **world demand** (W):

$$X = f(T, C, P, W)$$

Exports

$$T = \frac{T_i}{T_{world}}$$

where

$$C = \frac{C_i}{C_{world}}$$

$$P = \frac{P_i}{P_{world}}$$

Since imports in this model are the “world’s” exports – inverse of the equation above with domestic demand (Y) replacing world demand, we get:

$$M = g\left(\frac{1}{T}, \frac{1}{C}, \frac{1}{P}, Y\right)$$

Imports

# Linking trade & growth

If we assume that trade is in balance, we get:

$$XP = M$$

Finally consider as earlier that technology depends on both national sources ( $N$ ) and diffusion ( $D$ ) from abroad, and that the latter follows a logistic curve. By totally differentiating, substituting and rearranging, the following solution for growth of GDP follows:

$$y = \gamma \varepsilon_{TD} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} - \gamma \varepsilon_{TD} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} T^{gap} + \varepsilon_{TN} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} n + \frac{\varepsilon_{XC} + \varepsilon_{MC}}{\varepsilon_{MY}} c + \frac{\varepsilon_{XP} + \varepsilon_{MP} + 1}{\varepsilon_{MY}} p + \frac{\varepsilon_{XW}}{\varepsilon_{MY}} w$$

Diagram illustrating the components of the growth equation and their conceptual mappings:

- Diffusion** (circled) points to the first term:  $\gamma \varepsilon_{TD} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}}$
- Innovation** (circled) points to the second term:  $-\gamma \varepsilon_{TD} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} T^{gap}$
- Social Capability** (circled) points to the third term:  $\varepsilon_{TN} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} n$
- Price** (circled) points to the fourth term:  $\frac{\varepsilon_{XC} + \varepsilon_{MC}}{\varepsilon_{MY}} c$
- Demand** (circled) points to the fifth term:  $\frac{\varepsilon_{XP} + \varepsilon_{MP} + 1}{\varepsilon_{MY}} p$

Model applied to cross country samples by Fagerberg (1988 and Fagerberg and Srholec (2008))

# Conclusion from the model: Growth = Catch-up potential + Competitiveness

**WHAT** to measure:

**HOW** to measure:

- **Technological capability:** R&D, patents, publications and ICTs
- **Social Capability:** Education, governance, financial system
- **Price:** Growth in unit labour cost
- **Demand:** Growth of world demand weighted by export composition

**Sample: 90 countries on different levels of development, 1980-2002**

*From: Fagerberg, Srholec and Knell (2007): The Competitiveness of Nations, World Development*

# Explaining GDP growth: Regression results

(1980-2002)

	OLS	Iteratively re-weighted least squares	OLS Excluding Outliers
Constant	..	-0.02	0.002
	..	(0.28)	(0.03)
<b>Log of the initial GDP per capita (diffusion)</b>	-0.79***	-0.76***	-0.82***
	(6.24)	(6.86)	(8.45)
<b>Technology</b>	0.31***	0.31**	0.41**
	(2.65)	(2.39)	(2.61)
<b>Social Capability</b>	0.33***	0.33***	0.36***
	(3.14)	(3.55)	(3.90)
<b>Price</b>	-0.19***	-0.18**	-0.18***
	(2.62)	(2.19)	(3.99)
<b>Demand</b>	0.41***	0.35***	0.31***
	(3.02)	(2.82)	(3.22)
F-test	14.50	12.93	19.66
R <sup>2</sup>	0.46	..	0.53
Observations	90	90	80

*Note: Absolute value of robust t-statistics in brackets. \*, \*\*, \*\*\* denote significance at the 10, 5 and 1 per cent levels. Beta values reported.*



# Explaining GDP growth: A decomposition

(1980-2002)

	N	Initial GDP per capita	Actual difference in growth	Estimated difference in growth	Contribution of the explanatory factors					
					Diffusion	Tech- nology	Social cap.	Price	Demand	Other.
Developed countries	27	16,625	-0.4	-0.2	-1.6	0.4	0.2	0.0	0.6	0.2
Asian Tigers	4	8,477	3.7	3.2	-0.7	1.1	0.8	0.0	1.0	1.1
East Asia	5	2,670	2.9	2.0	1.1	-0.2	0.2	-0.1	0.1	0.9
South Asia	5	1,209	1.7	2.0	2.0	-0.3	-0.2	-0.1	-0.1	0.7
West Asia	7	8,605	0.1	0.0	-0.4	-0.2	0.1	0.3	-0.2	0.4
Latin America	19	5,481	-1.0	-1.0	0.0	-0.2	-0.1	0.0	-0.2	-0.5
North Africa	4	3,720	0.3	0.5	0.5	-0.3	-0.1	0.0	-0.5	0.8
Sub-Saharan Africa	18	1,741	-0.5	-0.5	1.8	-0.3	-0.4	0.0	-0.6	-0.9

# Conclusions

- Capabilities matter for competitiveness, and they can be measured (with available data)
- High explanatory power, robust results
- Differences in the potential for diffusion are important for growth, but conditional on:
  - **Technological capability**
  - **Social capability**
  - Price competitiveness (to a lesser extent)
  - **Demand (specialization)**
- Some (mostly poor) countries disadvantaged by other factors related to geography, history and nature
- What is the effect of the current economic crisis on capabilities and, hence, future growth in different parts of the world?