

Education, financial markets and economic growth

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Outline

- I. Education and economic growth**
- II. Education, financial development and economic performance**
- III. Policy implications**

Education and economic growth: conceptual framework

**Aggregate Output = f [*Capital (physical and human),
Employment, Technological Progress*]**

Growth of per capita aggregate output:

- **Investment**
- **Human capital accumulation**
- **Labour utilisation growth**
- **Total factor productivity growth**

Determinants of human capital

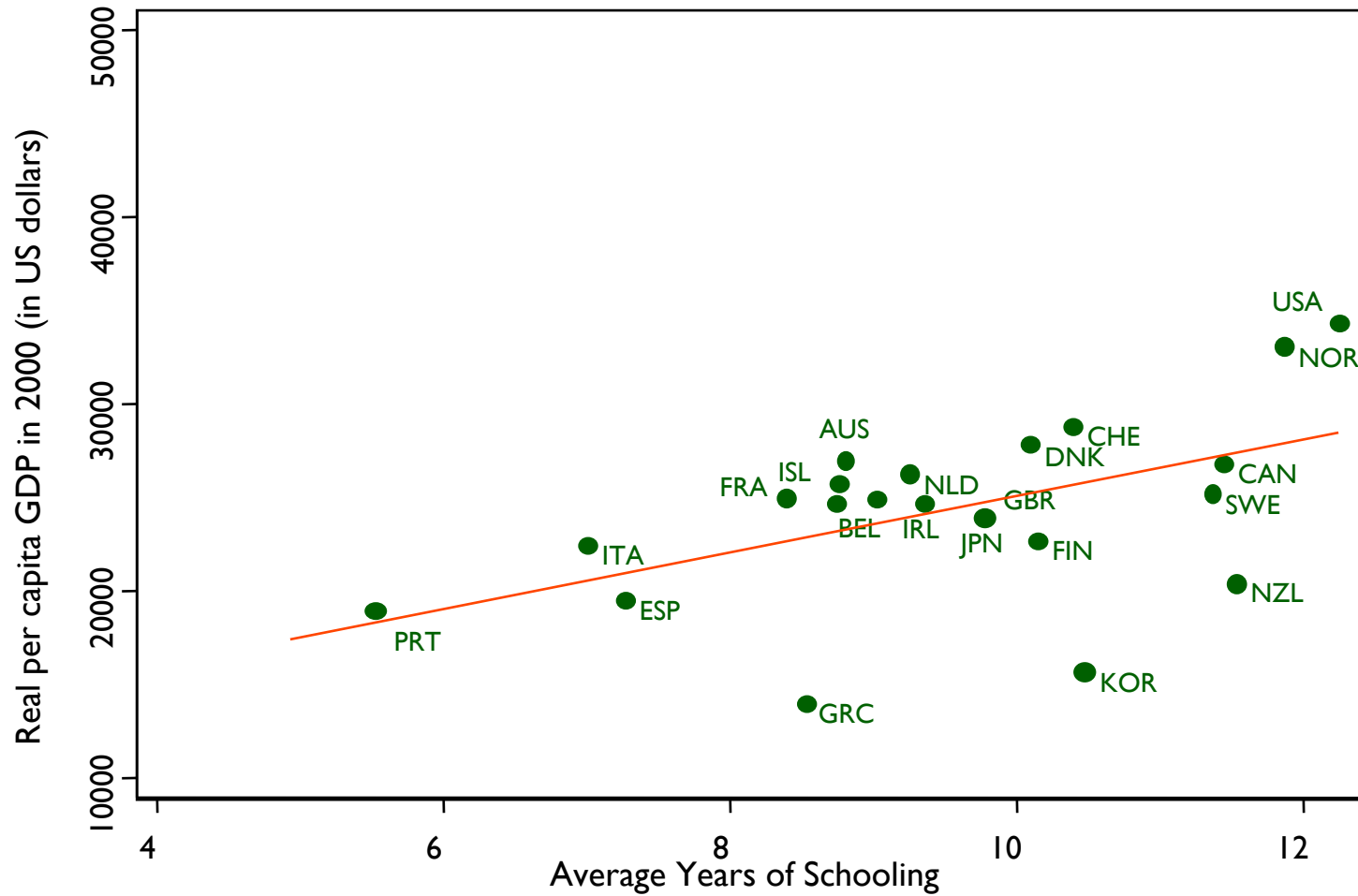
- **Education**
 - quantity of formal education (average years of schooling)
 - quality of education
- **On-the-job training and learning, cognitive skills**
- **Health status (e.g. life expectancy)**

Direct effects of education on economic growth (I)

- **Education as a component of human capital and a factor of production (extended neoclassical growth theory)**
- **Macroeconomic evidence:**
 - **Affluent countries are relatively more richly endowed with human capital;**
 - **Fastest growing economies have also experienced rapid human capital accumulation;**
 - **Recent research based on improved statistics confirms: better schooling and faster growth go together – independently of other relevant factors of economic development (e.g. physical capital accumulation, country-specific factors).**

Income and education level

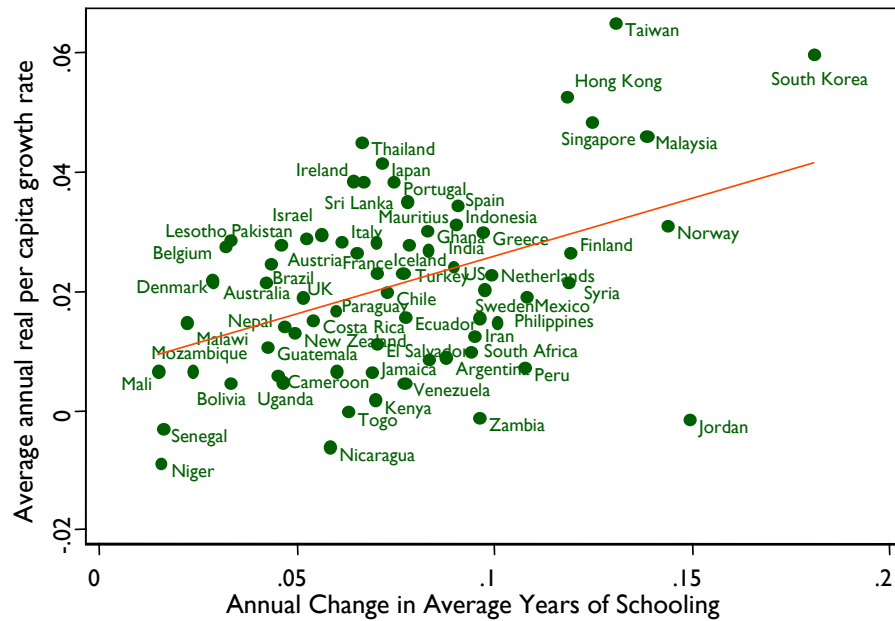
High income OECD countries



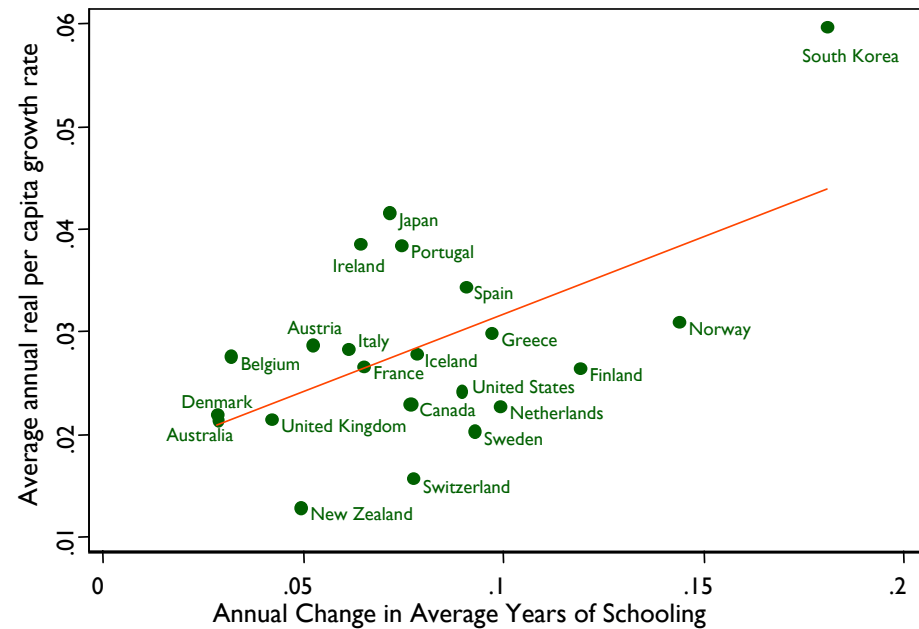
Source: Data from Barro-Lee (2001) and Penn World Tables; ECB calculations

Human capital accumulation and income growth

**All countries
(1960 – 2000)**



**High income OECD countries
(1960 – 2000)**



Source: Data from Barro-Lee (2001) and Penn World Tables; ECB calculations

Direct effects of education on economic growth (II)

- **Education as an input of production**
- **Microeconomic evidence and causality assessment:**
 - **More years of formal schooling lead to higher wages;**
 - **Private returns on education estimated to be between 6.5%-9.0%: An additional year of schooling leads to 7.5% higher income on average over working life;**
 - **Social returns to schooling are most likely larger due to human capital externalities, i.e. knowledge spillovers from more educated workers to less educated ones;**
 - **Causality established by employing innovative approaches and techniques (e.g. studies of twins).**

Labour force quality and GDP growth

Quality of education is also highly relevant, notably:

- quality of teachers (education level; graduate studies; training)
- teacher-pupil ratios
- public spending in education
- Internationally standardised tests (e.g. in math and science)

Macroeconomic evidence:

- Differences in education quality explain more of the growth variations across countries than quantity measures (such as average years of schooling; share of college graduates, etc.);
- Higher quality of the labour force also contributes to labour productivity growth (evidence from the euro area).

Indirect effects of education on growth (I)

Education also influences economic growth indirectly through its impact on other growth determinants, such as:

- labour force participation
- overall labour utilisation
- total factor productivity
- skill-bias of new technologies
- capital-skill complementarities

Indirect effects of education on growth (II)

Education positively influences labour force participation and labour utilisation:

- the higher the education level, the higher the participation in the labour force;
- more educated workers are more likely to be employed (e.g. in 2006, the employment rate in the euro area for university graduates was 83.5% compared to 57.2% for less educated persons);
- education decreases duration of unemployment.

Education and labour utilisation

Euro area labour force participation

(in thousands of persons in the age group 25 to 59)

Education	1996		2006		Diff. 1996-2006	
	total	females	total	females	total	females
below secondary						
total employment	34197	13235	32561	12810		
unemployed	5348	2619	3751	1911		
inactive	20445	16538	15478	11737		
participation ratio (in %)	65.9	48.9	70.1	55.6	4.2	6.7
above secondary						
total employment	43407	18084	52171	23288		
unemployed	4220	2247	4158	2109		
inactive	10339	7583	10485	7497		
participation ratio (in %)	82.2	72.8	84.3	77.2	2.1	4.4
tertiary						
total employment	21581	8893	31681	14933		
unemployed	2619	1532	1911	1592		
inactive	2463	1730	3492	2492		
participation ratio (in %)	90.8	85.8	90.6	86.9	-0.2	1.1

Source: Eurostat, Labour Force Survey; data for 2006 is up to 2006 Q3

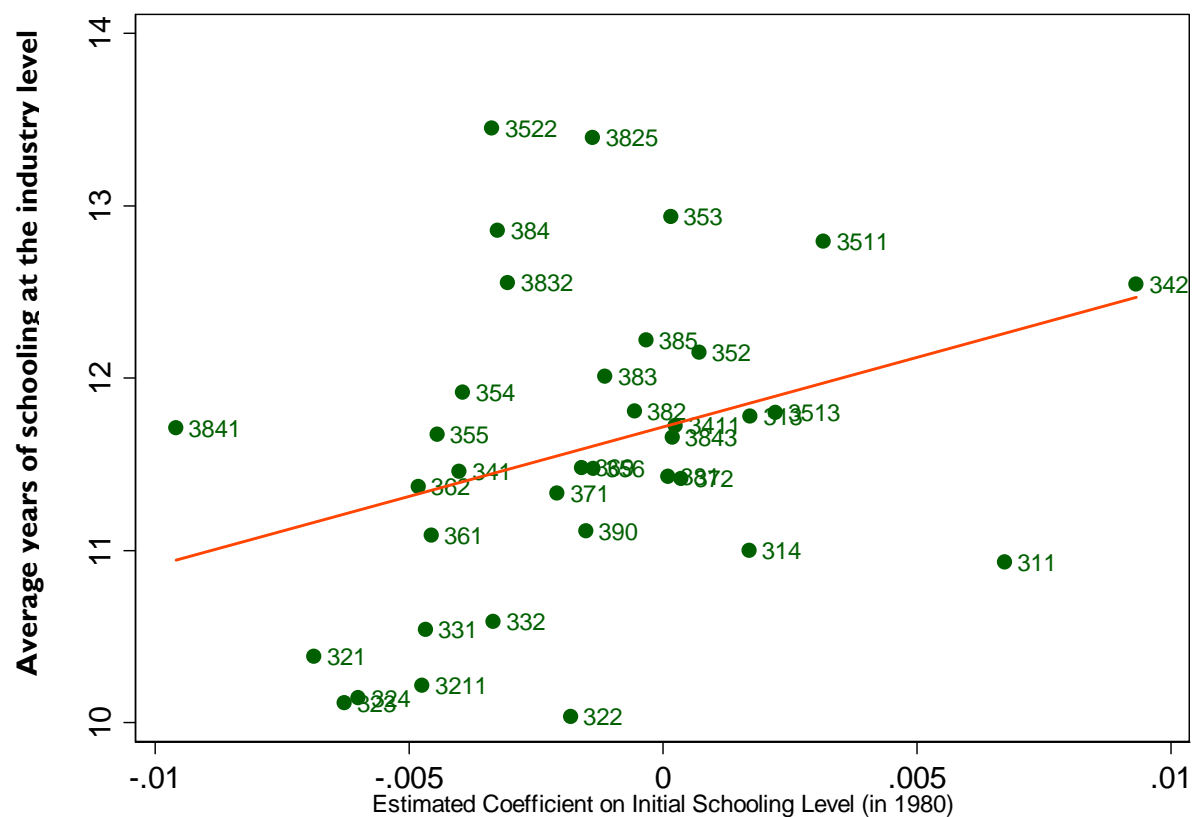
Indirect effects of education on growth (III)

Education supports innovation and the rapid adoption of new technologies, especially in view of the skill-bias of modern technology:

- countries with high human capital endowments use existing technologies better and innovate more;
- education, research & development and entrepreneurial activity are especially important for advanced economies (like the euro area) that are closer to the technological frontier;
- technological advances (e.g. ICT) in the 1970s-1990s have been biased towards highly skilled labour, i.e. favoured educated workers;
- human capital is particularly important for the adoption of technologies that augment existing skills.

Education and the skill-bias of technological change (I)

Education is especially important for the growth of knowledge-intensive sectors, like pharmaceuticals or computers/office equipment.



Industry Skill Intensity

High-Skill

- 3822: Drugs and pharmaceuticals
- 3825: Office and computing
- 353: Petroleum refineries
- 3511: Chemicals
- 342: Printing and publishing

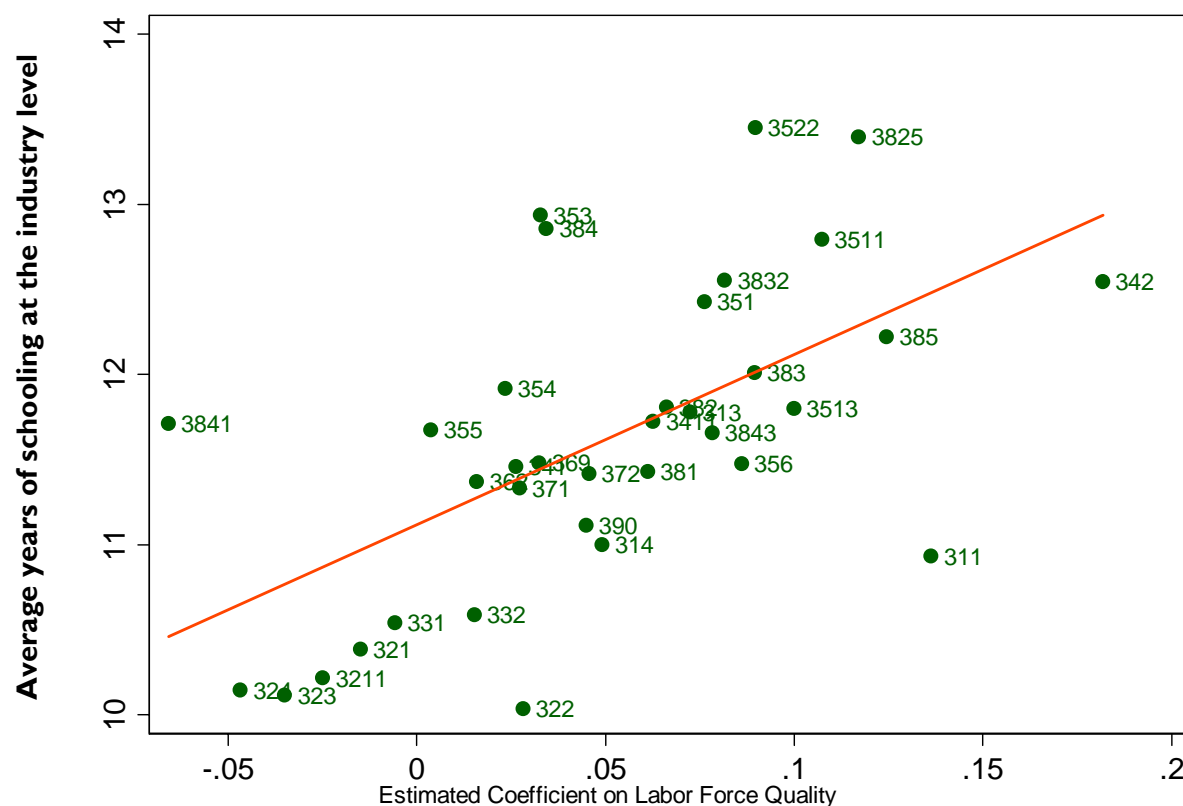
Low-Skill

- 321: Textile
- 3211: Spinning
- 323: Leather
- 322: Apparel
- 324: Footwear

Source: Ciccone and Papaioannou (2005) and UNIDO

Education and the skill-bias of technological change (II)

Educated societies (i.e. with better *quality* education) were more successful in adopting knowledge-intensive new technologies during the 1980s/1990s.



Industry Skill Intensity

High-Skill

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Source: Ciccone and Papaioannou (2005) and UNIDO

Indirect effects of education on growth (IV)

Education can foster investment in physical capital due to capital-skill complementarities:

- Physical capital is relatively more important for skill-intensive sectors and tasks;
- Effects of computerisation in the United States:
 - Capital invested in information and communication technologies (ICT) complements educated workers and substitutes low-skilled employees;
 - ICT capital complements cognitive tasks and substitutes manual tasks.

The financial system and economic growth

Financial sector development and efficiency can foster economic growth in various ways:

1. Positive impact on investment and growth:

- see e.g. cross-country studies on effects of financial liberalisation; and banking deregulation: 0.5-1.0% increase in investment, reduction of the cost of capital by 100bp;

2. Positive impact on productivity (efficiency of production):

- sustained increase in total factor productivity;
- especially beneficial for industries which for technological reasons depend on external finance;

Financial development and capital reallocation

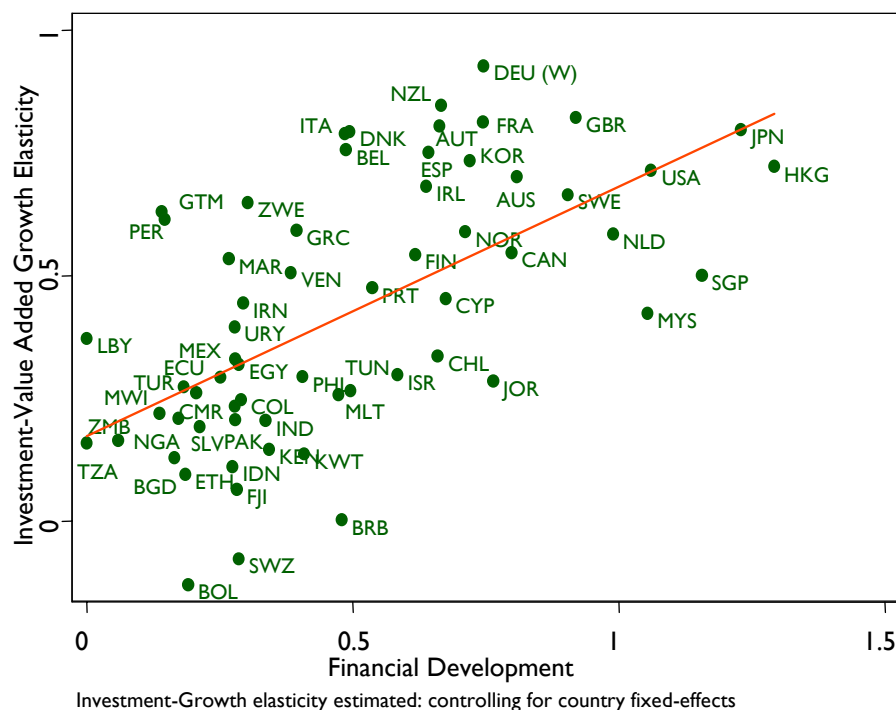
Well-developed financial systems support Schumpeterian “creative destruction”:

- in countries with deep capital markets and efficient financial intermediaries, capital is reallocated more rapidly across firms and sectors, thus increasing the economy’s total productivity growth;
- in Europe especially, financial development and market integration across borders is important to facilitate capital reallocation, promote innovation and strengthen competition (see recent ECB research).

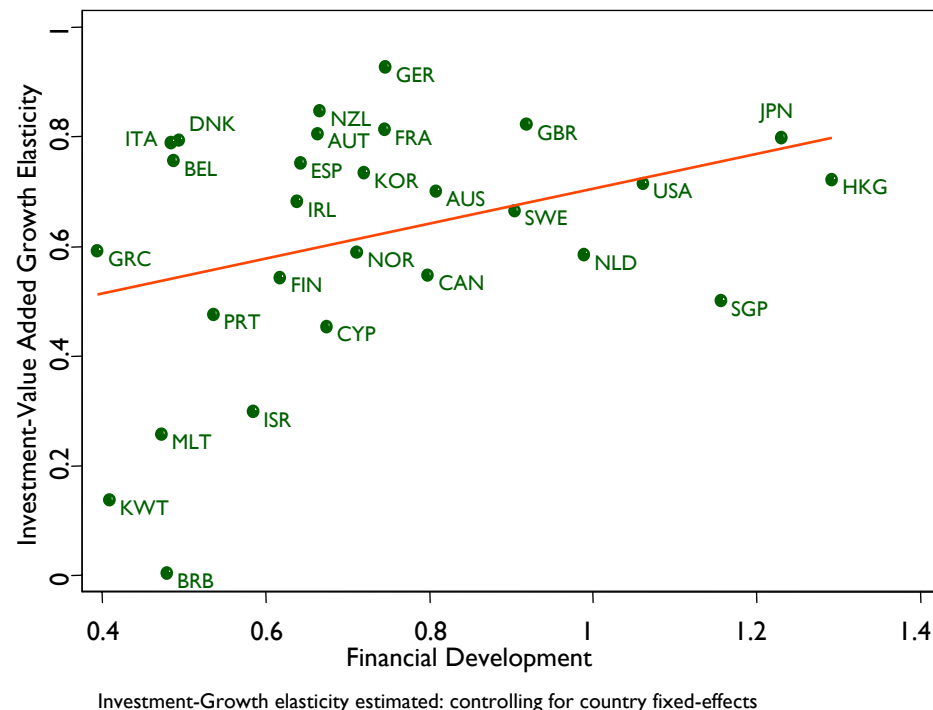
Financial development and capital reallocation

Positive relationship between the efficiency of capital reallocation (i.e. fast response to new investment opportunities) and the size of capital markets

All countries



High-income countries



Source: Ciccone and Papaioannou (2007); UNIDO; based on Wurgler (2000)

Financial literacy and education

Financial literacy is important to reap the full benefits of financial innovation:

- essential for proper retirement planning, diversification of financial risk, participation in stock markets;
- especially in context of ageing populations and shift from public to privately-funded pension schemes.

Pervasive financial illiteracy even in advanced economies:

- in particular among less educated, lower-income groups;
- programmes to enhance financial literacy are needed and can be successful;
- best means to increase the level of financial literacy is to invest in education.

Financial integration and development and monetary policy

Improved functioning of monetary union through the development and integration of Europe's financial system:

- **deep and integrated financial markets facilitate the transmission of the single monetary policy across the euro area in a smooth and effective manner;**
- **better risk-sharing contributes to a more balanced systemic response to asymmetric shocks and a greater synchronisation of business cycles.**

Overall, financial integration and development will help reduce the volatility of output and employment across the euro area.

Education, productivity and monetary policy

Education, via its positive effects on productivity growth and labour utilisation, influences the environment within which monetary policy operates:

- **raises the growth potential of the economy, thus increasing the “speed limit” at which the economy can grow in a sustained manner that is consistent with price stability;**
- **higher potential growth in the euro area is especially important in view of ageing populations;**
- **fosters labour market adaptability and efficiency, as well as mobility (across sectors, firms and borders) and thus facilitates the functioning of an important adjustment mechanism, especially in a monetary union.**