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# **PUBLIC INTERVENTION IN EDUCATION (Stiglitz ch. 16, Gruber ch.11)**

- Rationale for public intervention
  - Efficiency and equity effects of different forms of public intervention
  - Some empirical evidence
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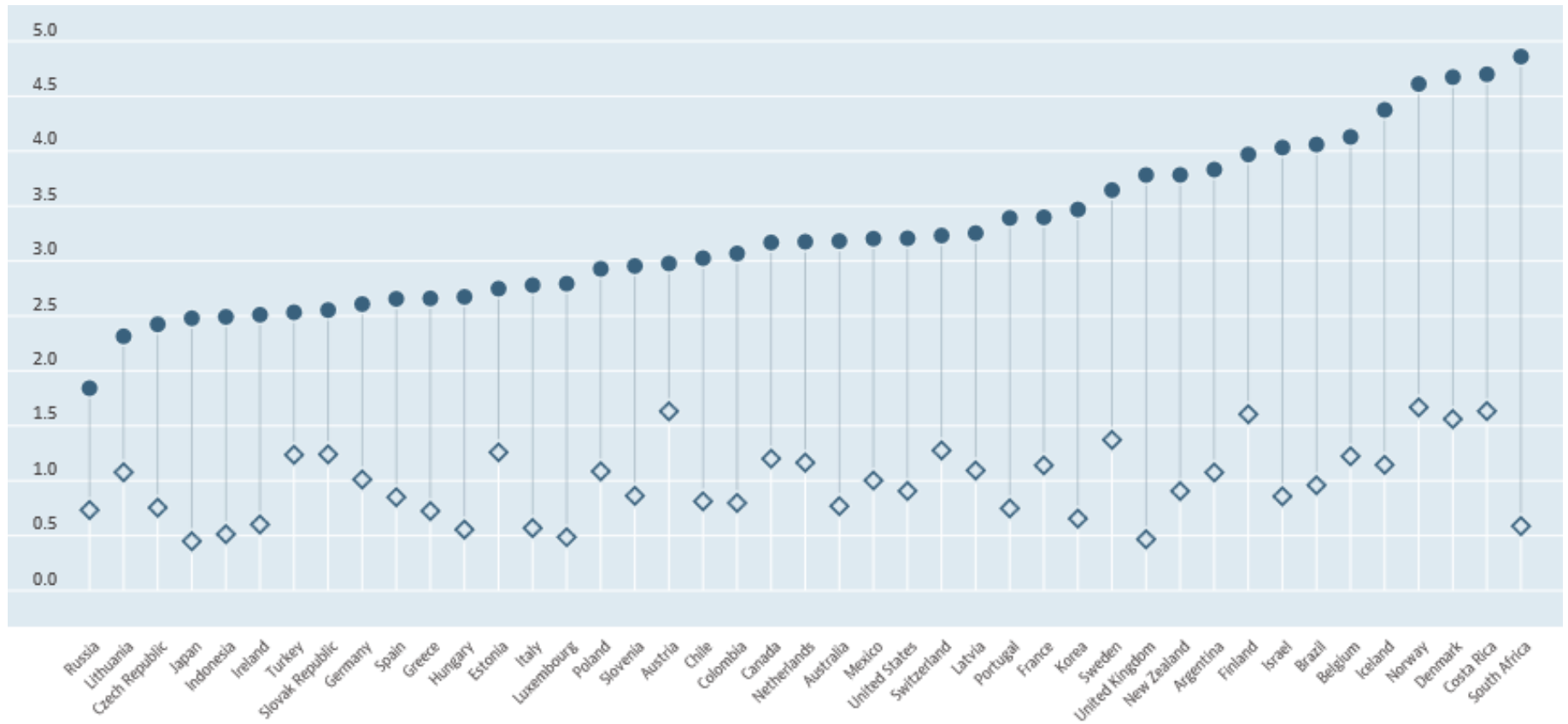
# Public spending on education

(data sources: Eurostat [https://ec.europa.eu/eurostat/statistics-explained/index.php/Government\\_expenditure\\_on\\_education#Evolution\\_of\\_education\\_expenditure\\_over\\_2002-2016](https://ec.europa.eu/eurostat/statistics-explained/index.php/Government_expenditure_on_education#Evolution_of_education_expenditure_over_2002-2016))

OECD: <https://data.oecd.org/eduresource/public-spending-on-education.htm>)

- Public spending on education is around **4.7% GDP in the EU28** and 10% of all public expenditures (2016 data).
  - At the EU-28 level, government expenditure on 'education' as a ratio to GDP remained relatively stable over the 2002-2016 period, then decreased from 5.0 % of GDP in 2002 to 4.7 % of GDP in 2016.
  - Public intervention is concentrated in primary and secondary education.
  - Differences across countries: in the EU28 public expenditures on education go from 6.9% of GDP in Denmark (2016 data) to less than 3.3% of GDP in Ireland (3.9% in Italy).
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# Public spending on education: Primary to post-secondary non-tertiary / Tertiary, % of GDP, 2016 or latest available



- Primary to post-secondary non-tertiary
- ◇ Tertiary

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# Questions addressed by economists

- ❑ Why should the government be involved in education?
  - ❑ How does the government intervene in education?
  - ❑ How does school choice or vouchers affect efficiency?
  - ❑ What is the return to education?
  - ❑ What is the government's role in higher education?
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# Economic theory: The individual decision to invest in human capital /1

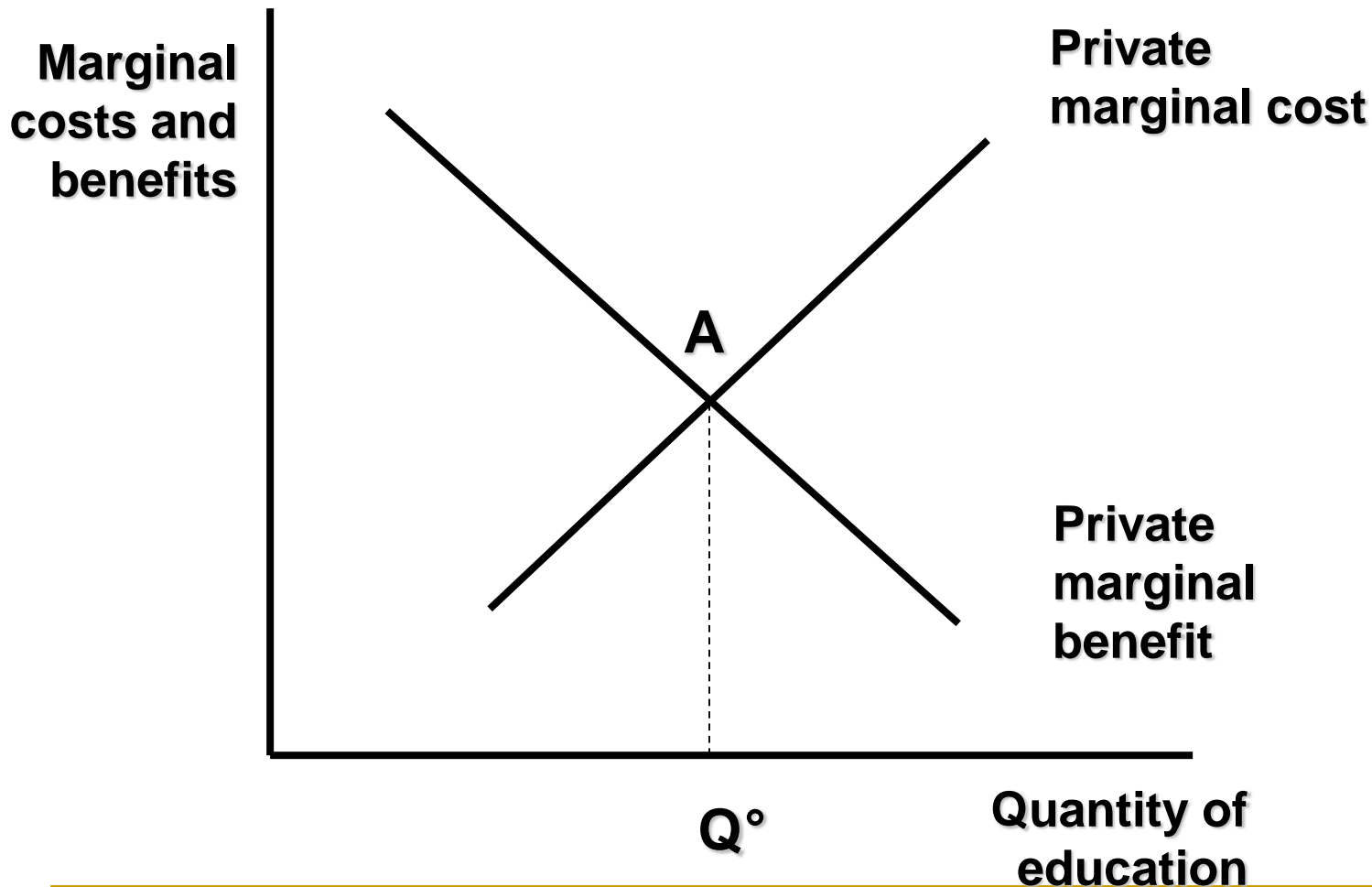
- **Human capital model, assumptions:**
    - individual decision is based on the comparison of marginal **private costs** and marginal **private benefits**
    - more education → higher productivity
    - higher productivity → higher wages
  - **Private costs** of investment in education:
    - Direct monetary costs: tuition, books, etc
    - Opportunity costs: forgone earnings (they increase with years of education and age)
    - Non monetary costs: effort to continue education
  - **Private benefits :**
    - Higher future earnings (more educated workers have *higher* employment probabilities and higher and faster growing wages relative to non educated workers)
    - Utility derived from the higher level of education and knowledge
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# The individual decision to invest in human capital/2

- The individual compares the marginal costs and marginal benefits of the investment in education
  - The marginal benefits curve is decreasing as education increases, because it is assumed that *education returns are positive but decreasing at the margin* (each additional year of education produces a positive, but decreasing return)
  - The marginal costs curve is increasing with education (an additional year of higher secondary and tertiary education is more expensive than an additional year of primary education, largely due to the increase in opportunity costs).
  - The optimum level of education for the individual is reached when: **private marginal costs = private marginal benefits**
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# How much to invest in education: the individual decision



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# Theory: Different individuals (heterogeneity)/1

- Why educational choices are different across individuals?
  - Different educational choices reflect differences across individuals in the costs and benefits of investing in education.
  - We consider two main sources of differences:
    - **The Individual ability**
    - **The family financial background**
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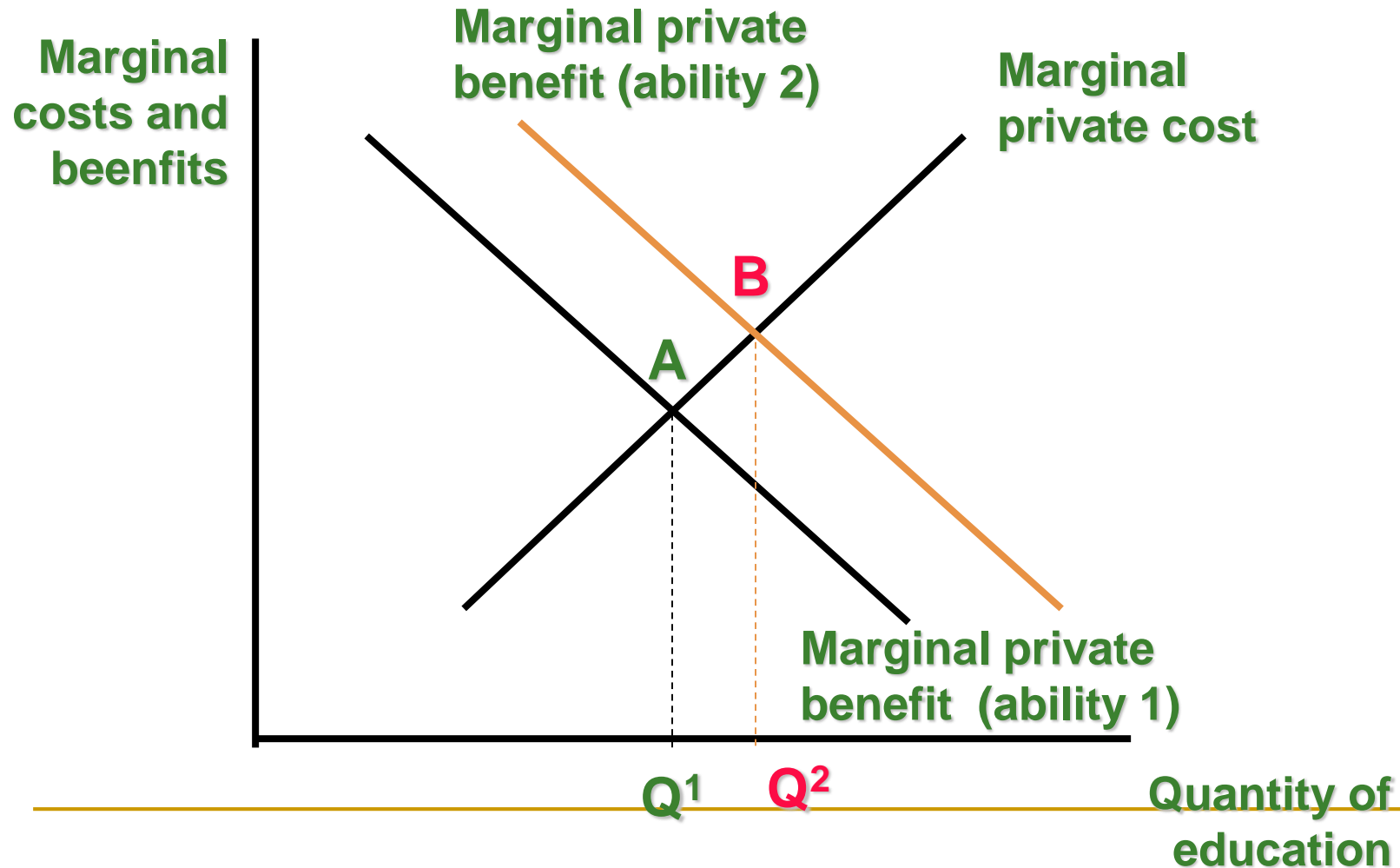
# Theory: Different individuals / 2

## The importance of individual abilities:

- More gifted individuals, given other variables, will get higher wages in the labour market relative to the less gifted ones at each level of education.
  - Their marginal benefit curve will be to the right of the less gifted.
  - Given the costs of investing in education:
    - ➔ more able individuals will choose higher educational levels.
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# Private costs and benefits of education for different abilities:

ability 2 > ability 1



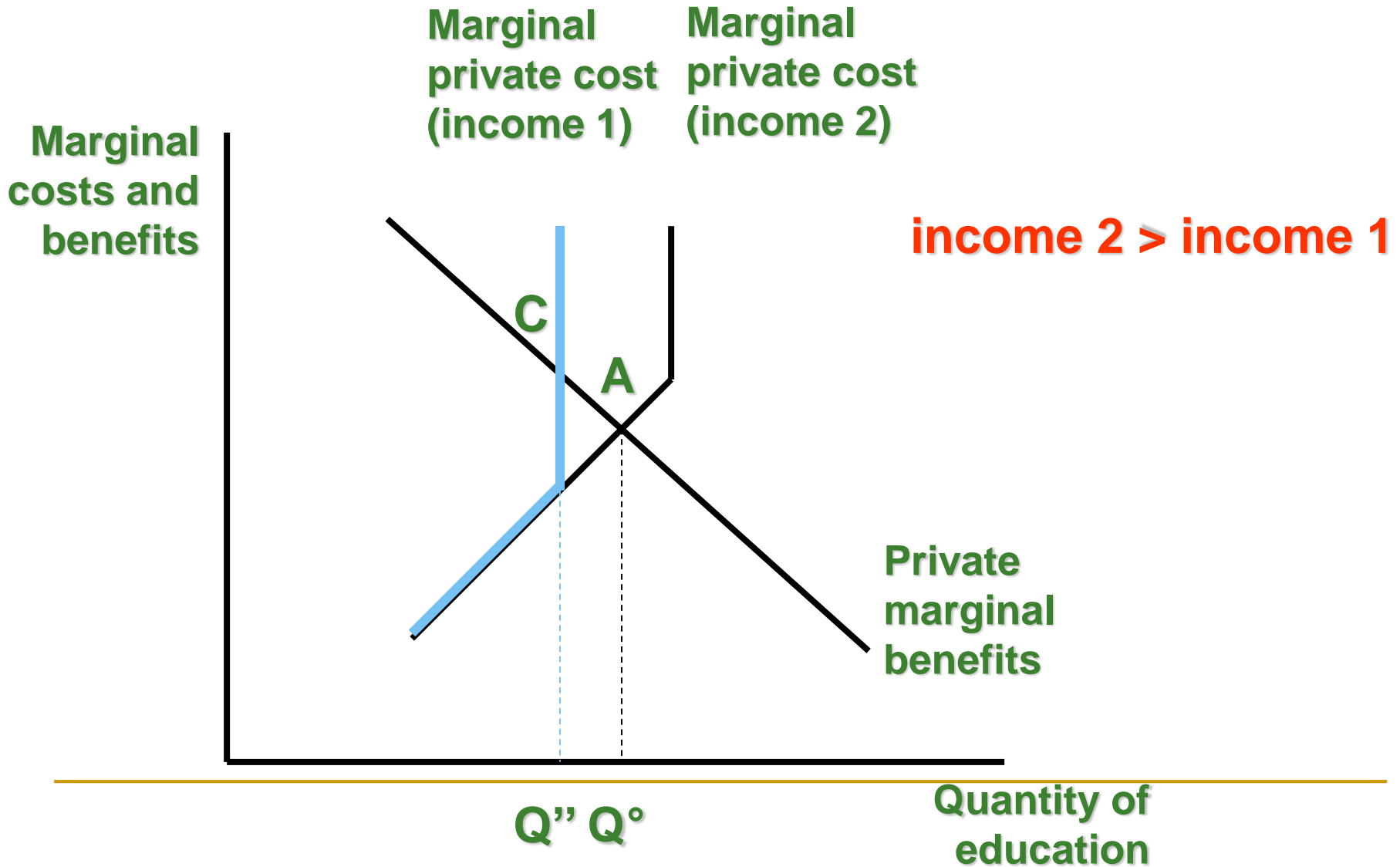
# Theory: Different individuals /3

## ■ The importance of the family background

*If it is difficult and costly to get loans* for the investment in education, the wealth of the family of origin becomes relevant in educational decisions.

- When the family financial resources end, **the marginal costs curve becomes vertical:**
    - only individuals with higher household wealth may reach their optimal choice,
    - individuals with lower financial wealth are obliged to select a sub-optimal level. They will be less educated and will get lower wages in the labor market relative to those from wealthy families.
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# Private costs and benefits of education, with limited financial resources and absence of capital markets



**The result is that individual choices depend on ability and financial resources:**

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**A) individuals with higher ability, and/or**

**B) individuals with higher income/wealth...**

**... will invest more in education**

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**Equity and efficiency issues**

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# Why should the government intervene in education?

## Rationales for public intervention

### ➤ **Efficiency reasons: market failures**

- Positive externalities (productivity, citizenship)
- Imperfect information and long time lags between decision and outcome;
- Merit good (parents may be shortsighted, because of too high discount rate or ignore benefits);
- Credit market failures

### ➤ **Equity (distributional) reasons**

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# Rationales for public intervention: Positive externalities

**Social benefits are higher than private benefits:**

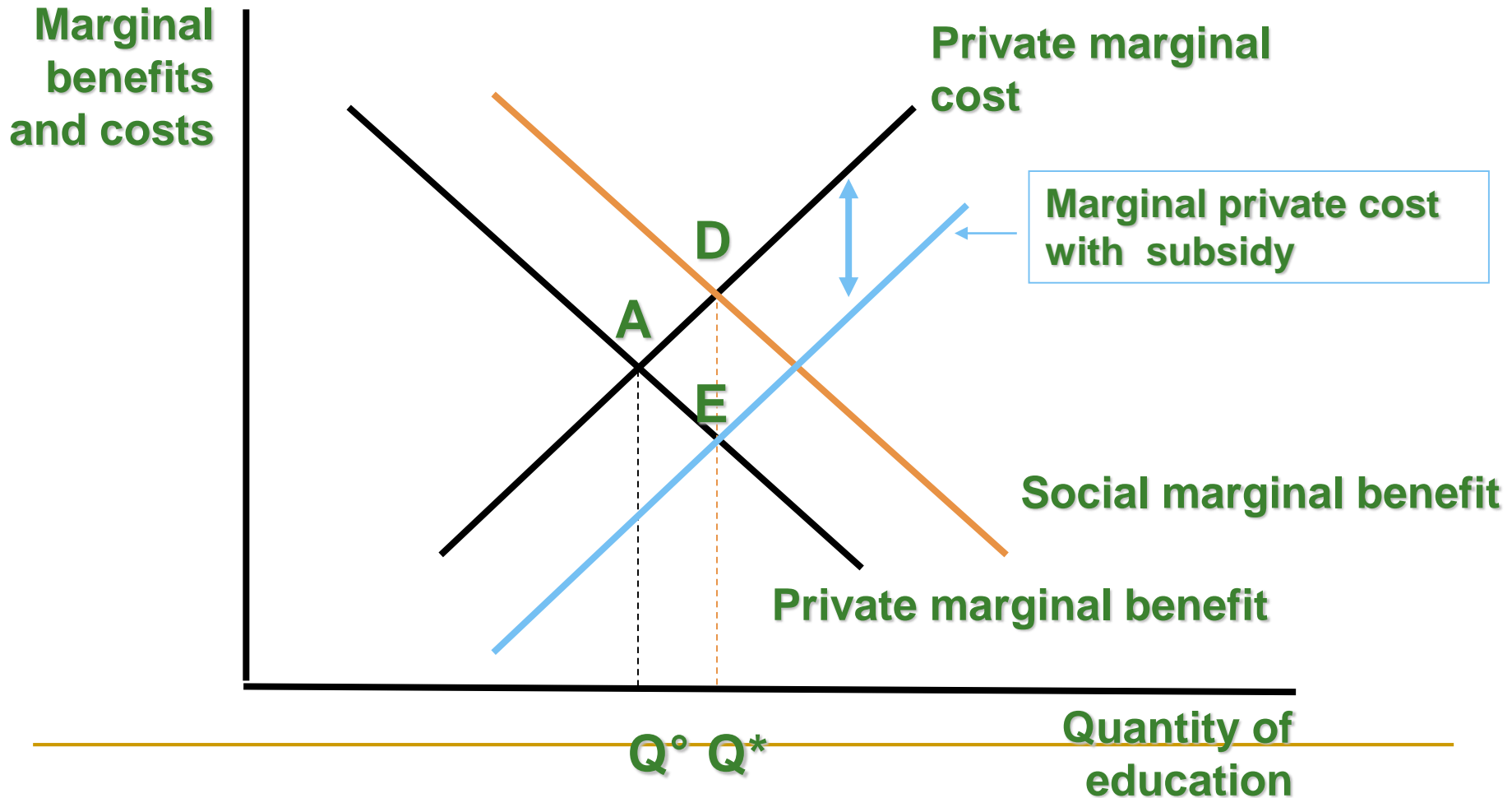
- According to the *human capital model*:
    - an higher educated workforce has a higher productivity and facilitate technological innovation and economic growth
    - the quality of life and social cohesion is improved with a higher educated population (less crime, more informed voters better health conditions, greater social inclusion of ethnic minorities and immigrants,...)
  
  - If investment choices are left to private decisions there is however a risk of underinvestment in education
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# Positive externalities: productivity

- The extra *productivity* from education is largely internalized by the individual through higher wages.
- However, social benefits from higher productivity occur in two ways:
  - The first is “spillovers” to other workers: a person’s productivity could raise the productivity of their coworkers, thus raising their wages and well being.
  - The second is through taxes: if higher productivity is reflected in higher pay, then the government collects more tax revenues as a result.
- In order to support a greater investment, the government may introduce a subsidy which reduces the private marginal costs of investing in education or provide free public education.



# Positive externalities in education



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# Rationales for public intervention/2

## Imperfections in credit markets

- **Main reason for government intervention in education:**
    - *If credit markets are absent or are incomplete* and it is not possible to borrow money (or credit is rationed) to invest in education, **the wealth of the family of origin becomes** very important in determining educational decisions.
    - This result is **inefficient**, since individuals with similar abilities, but from poorer family background will have to choose a lower educational level than the optimum and social inequalities will persist across generations (no upward mobility).
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# Credit Market Failures

- In principle, a family could borrow against a child's future earnings to finance the education, but unlike a home purchase, there is no collateral.
  - The creditor cannot really observe if the child is a good risk to pay back the loan or not, and will generally offer too little credit in a situation like this
  - The solution to credit market failures would be to make loans available to finance education, but usually governments only use this approach for higher education, while they provide a fixed level of publicly-funded education (education considered a merit good and risk aversion of low income households)
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# Other rationales for public intervention/3

- **Imperfect information** on the characteristics and quality of the service (education is an *experience good*) or on the future benefits (probability of employment)
  - **Scale economies:** given the high fixed costs private supply may generate monopoly conditions in less populated areas
  - **Certification role:** necessity to regulate and certify private education in order to reach minimum standards
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# Rationales for public intervention/4

## Distributional equity

- ❑ Education is one of the main drivers of social and income mobility.
  - ❑ Low income and low educated families have difficulties in getting the necessary capital and information to invest in human capital and they risk investing too little in the education of their children, thus increasing the gaps in income distribution and **perpetuating social inequalities across generations**.
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# How much public resources should be invested in education?

- **Theory:** invest up to the point where **SMB=SMC**.
- **Equity and efficiency trade off.** Two extremes:
  - **Equity:** support especially those with lower family background and those with lower abilities to reduce social inequalities (*progressivity in inputs to reach equity in outcomes*)
  - **Efficiency:** concentrate scarce resources on the more gifted to increase efficiency. Support competition between public and private schools and reduce public production.
  - The **efficiency and equity trade off** should be considered together with the **redistributive effects of public intervention**. The choice depends on social preferences on the trade off and on the distribution of income and ability in the population.

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# Redistributive effects of public financing to education/1

- If public education is financed through taxation, we may have opposite effects on income distribution:
    - *Regressive effect* when higher and tertiary education is subsidized: in this case everybody pays for it through taxes, but especially students from higher income families have access to it. Public subsidies to higher education thus increase as income increases.
    - *Progressive effect*: since taxation is usually progressive and education increases social mobility, the higher income individuals pay more for education subsidies
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# Redistribution effects of public financing to education/2

- Which effect prevails depends on how progressive taxation is and on how easy it is to access education
  - *In compulsory education, the **progressive effect** is prevalent, since all have access to education.*
  - *In higher and tertiary education the **regressive effect** may prevail. Those individuals which do not go on studying usually pay more taxes than the subsidies they receive. Those continuing education are advantaged: they are more likely to pay less than the subsidies they receive.*
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# Which level of education should be supported with public resources?

- **Primary education:** merit good and positive externality; high social benefits and progressive distributional effects justify public intervention. In most countries it is completely financed with public funds
  - **Secondary and tertiary education:** private benefits are more likely to be higher than social ones and there is a higher participation of higher income students. Risk of regressive distributional effects. For these reasons in most countries it is only partially subsidized with public resources
  - In most countries gifted students from low income families are supported with **scholarships and student loans.**
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# How to support education: Forms of public support to education

**In most countries mixed forms of intervention:**

- **Public provision** (especially for primary education): production costs are paid with public resources (general taxation)
  - **Subsidies to families** : fiscal deductions, subsidies to cover education costs, school vouchers to pay for private schools
  - **Support to gifted and/or low income students:** scholarships and students loans
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# Free public education: pros and cons

## Public provision

### Pros:

- It is possible to control directly the quality of the service
- It is easier to guarantee access to all and reduce discrimination and/or segregation

### Cons:

- Low competition and public inefficiencies
- Low diversification of educational supply and risks of excess supply
- It is an in Kind benefit, with risks of **crowding out** private spending (for those who could afford it) and provision

### Alternatives to public provision:

- financial support (subsidies) to private schools (producers)
  - financial support to consumers to reduce the price of education (school vouchers)
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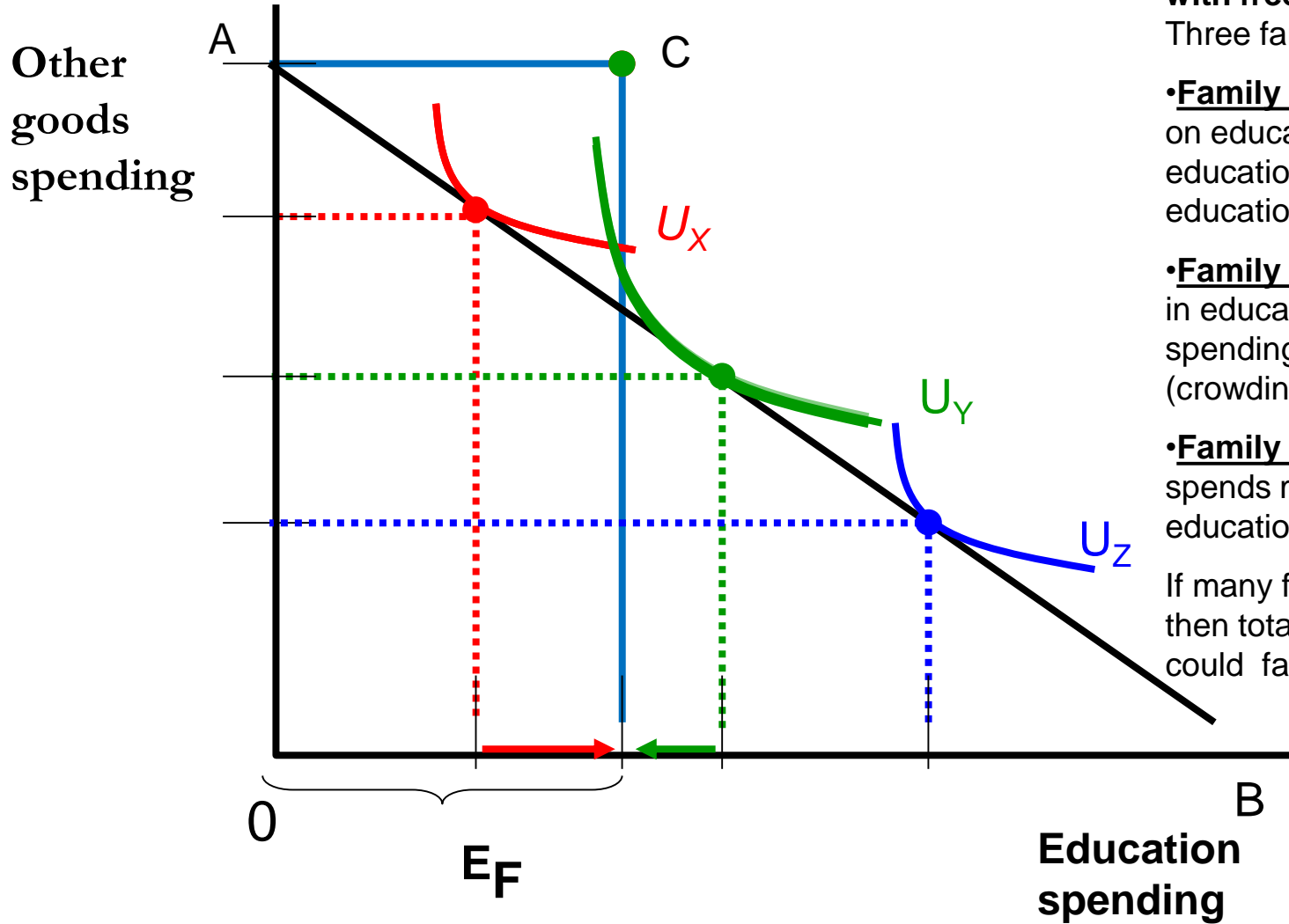
# Free Public Education and Crowding Out /1

- Peltzman (1973) argued that it is possible that public education could *lower* the educational attainment in society.
  - Assumptions of Peltzman model:
    - It is assumed that public schools are of lower quality compared to private ones (as in the US).
    - In order to consume **higher quality private schooling**, the consumer must forgo the entitlement to free public education.
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# Free Public Education and Crowding Out /2

- According to Peltzman's model the typical provision of public education is like **an in-kind benefit** and it creates potentially perverse incentives.
- In Peltzman's model **some parents choose lower-quality public schools over higher-quality private schools in order to take advantage of the free education entitlement.**
- **Public educational spending could crowd out private spending** on education as individuals reduce their own spending in response to this free public option as in the figure below.

# Crowding out effects of free public education



**AB** budget constraint **without** free public education. **ACB** with free public up to  $E_F$ .  
Three families  $X$ ,  $Y$  and  $Z$ :

- **Family X** used to spend little on education, with free education spends more on education

- **Family Y** reduces investment in education to  $C$  to avoid spending its private funds (crowding out)

- **Family Z** is not affected as it spends more on high quality education.

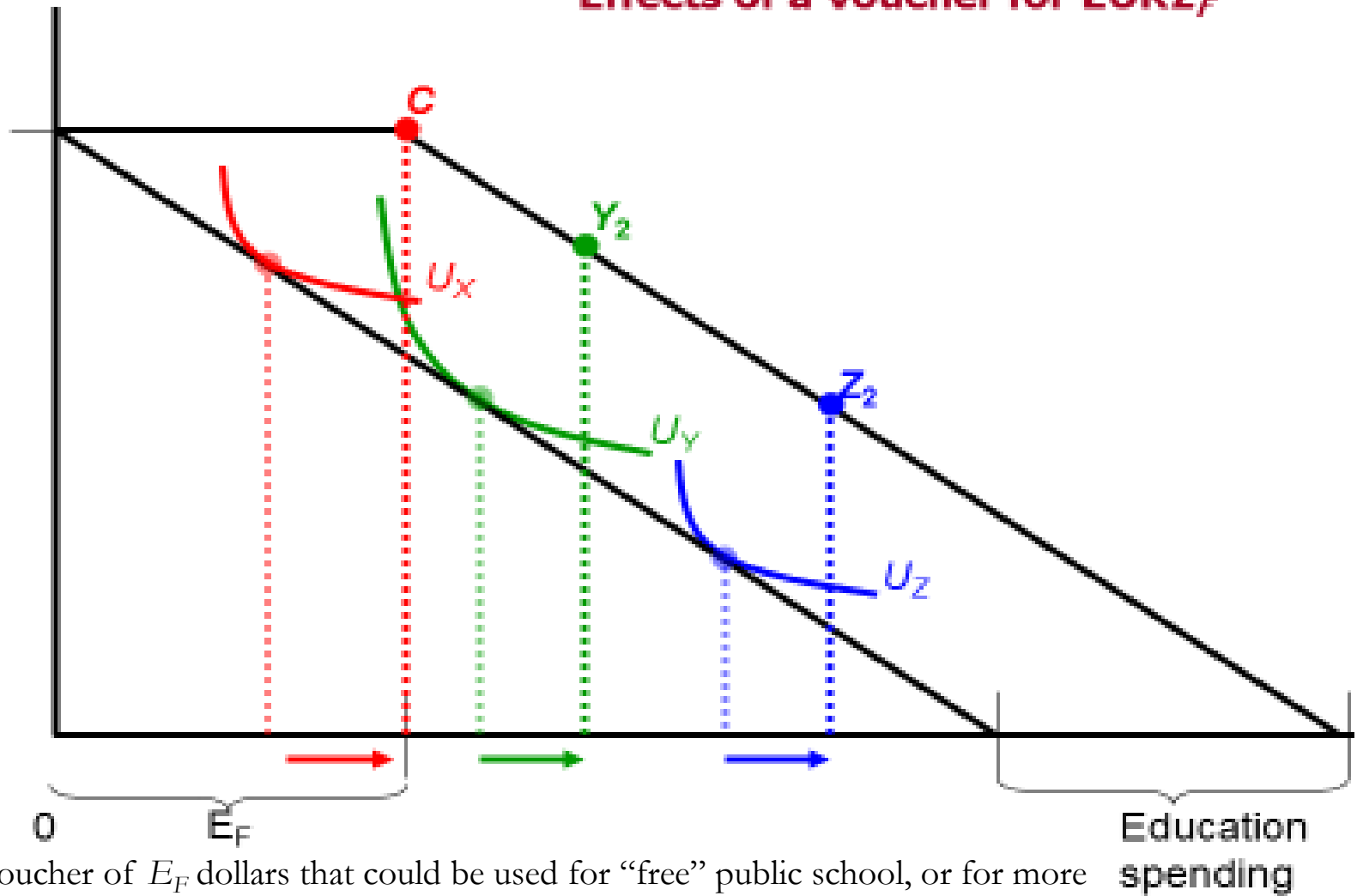
If many families like **family Y**, then total educational quality could fall rather than rise.

# Solving the Crowd-Out Problem: Vouchers

- *Educational vouchers* give parents a credit that can be used for the cost of tuition at any school, public or private.
- **Pros:** as shown in the Figure below, vouchers
  - Allow a high freedom of choice to families and promote commitment (**consumer sovereignty**): they allow individuals to match their educational choices with their tastes.
  - **Competition:** competitive pressures will allow the education market to work more efficiently In theory, vouchers put discipline on public schools by making private schools a more realistic option. Inefficient schools will be driven out of the education market, just as competition forces out inefficient firms.
  - **Offset crowding out** of private spending
  - Support to low income families may be achieved by **targeting the voucher to family conditions**

## Effects of a voucher for $E_F E_F$

Other goods



Imagine a voucher of  $E_F$  dollars that could be used for “free” public school, or for more expensive private schooling. The budget constraint shifts outward for the amount of the voucher. All families increase spending in education

Source, Gruber J. (2005), Public Finance and Public Policy, chapter 11



# Problems with School vouchers / 1

- **Greater social and economic stratification**, due to incomplete information and lack of complementary resources in low income families. Social exclusion may be accentuated if private or good schools are not obliged to accept difficult or low income students
- **Excessive school specialization** (football schools,...) to attract particular market segments and **risks of collusion** among schools and families and need to control the quality of services acquired with the voucher. Can be offset with accreditation and testing systems.
- Effectiveness in increasing the investment in education depends on the **elasticity of education demand**. If it is low these measures do not increase investment much;
- If the subsidy is designed as a fiscal deduction, it has a **regressive effect** (supporting more the higher income families);
- **Natural monopoly** argument, especially in rural areas (due to high fixed costs), no efficient to have small school competing with each other..

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# Problems with School Vouchers/2

- Another potential problem with vouchers is **they may be not effective for some families**. In the figure above family *Z* used the voucher, yet education attainment rose only modestly.
  - For families like family *Z* in the figure above, who don't change their educational attainment by much, the voucher is basically the same as a cash transfer.
  - To the extent that vouchers can be targeted to families such as *Y*, (rather than *Z*), then educational spending goes up by a larger amount. In practice, however, this is difficult to do.
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# Estimating of the effects of school vouchers in the US

- **Rouse (1998)** evaluated effects of a small-scale voucher program in Milwaukee (USA): in 1990, the state of Wisconsin allowed near-poor families in Milwaukee to apply for a voucher for any **nonsectarian private school**.
- Over-subscribed private schools had to select voucher applicants randomly, using a lottery. Evaluation compared the performance of students that were randomly accepted into the over-subscribed schools (Treatment group), with applicants who were randomly rejected (Control group).
- The results suggest that the treatment group saw an increase in academic performance, with a rise in test scores of 1-2% per year relative to the control group.
- Evaluation of public school choice in Chicago (**Cullen, Jacob and Levitt, 2003**), which also used a lottery to determine admission to oversubscribed **public schools**, shows that, unlike vouchers for private schools, going to a more selective public school did not influence academic outcomes.

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# Estimating the effects of voucher programs in developing countries

- In many developing countries, public schools may be of particularly low quality.
  - Angrist, et al. (2003) studied a **Columbian voucher program** that paid for more than half of the costs of private secondary school. The vouchers were distributed by lottery and this consented a counterfactual evaluation.
  - The authors found that students who got the vouchers were 10% more likely to finish 8<sup>th</sup> grade, primarily because they did not repeat as many grades. They also had higher test scores.
  - Overall, the vouchers cost \$24 per winner, yet the benefits were between \$36 and \$300 per person per year, a very successful program.
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# Conclusions on Vouchers and School Choice

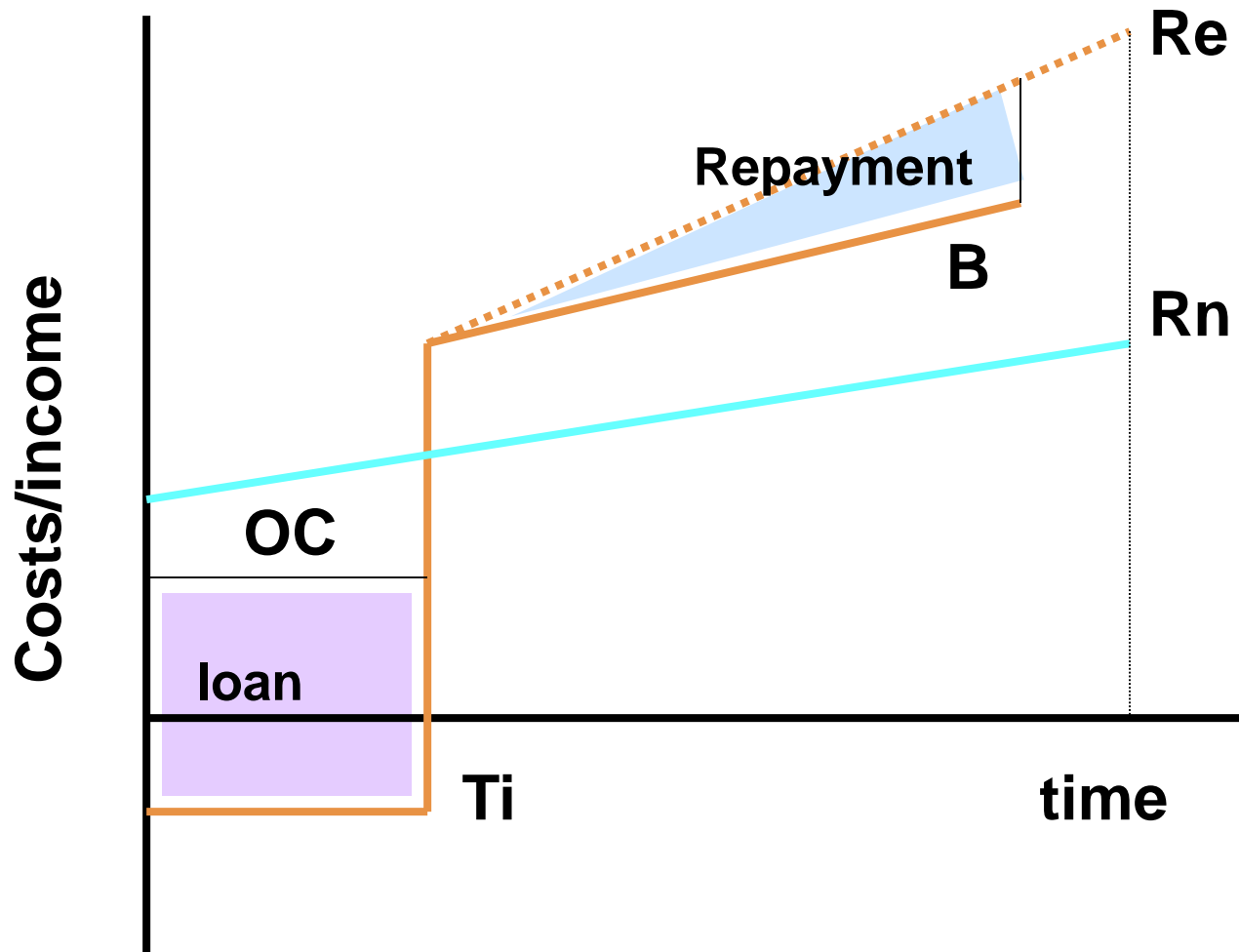
- There is little evidence to support the notion that public school choice has major beneficial effects on outcomes.
  - Vouchers appear to improve academic performance for those who move to private schools, but raise serious equity issues.
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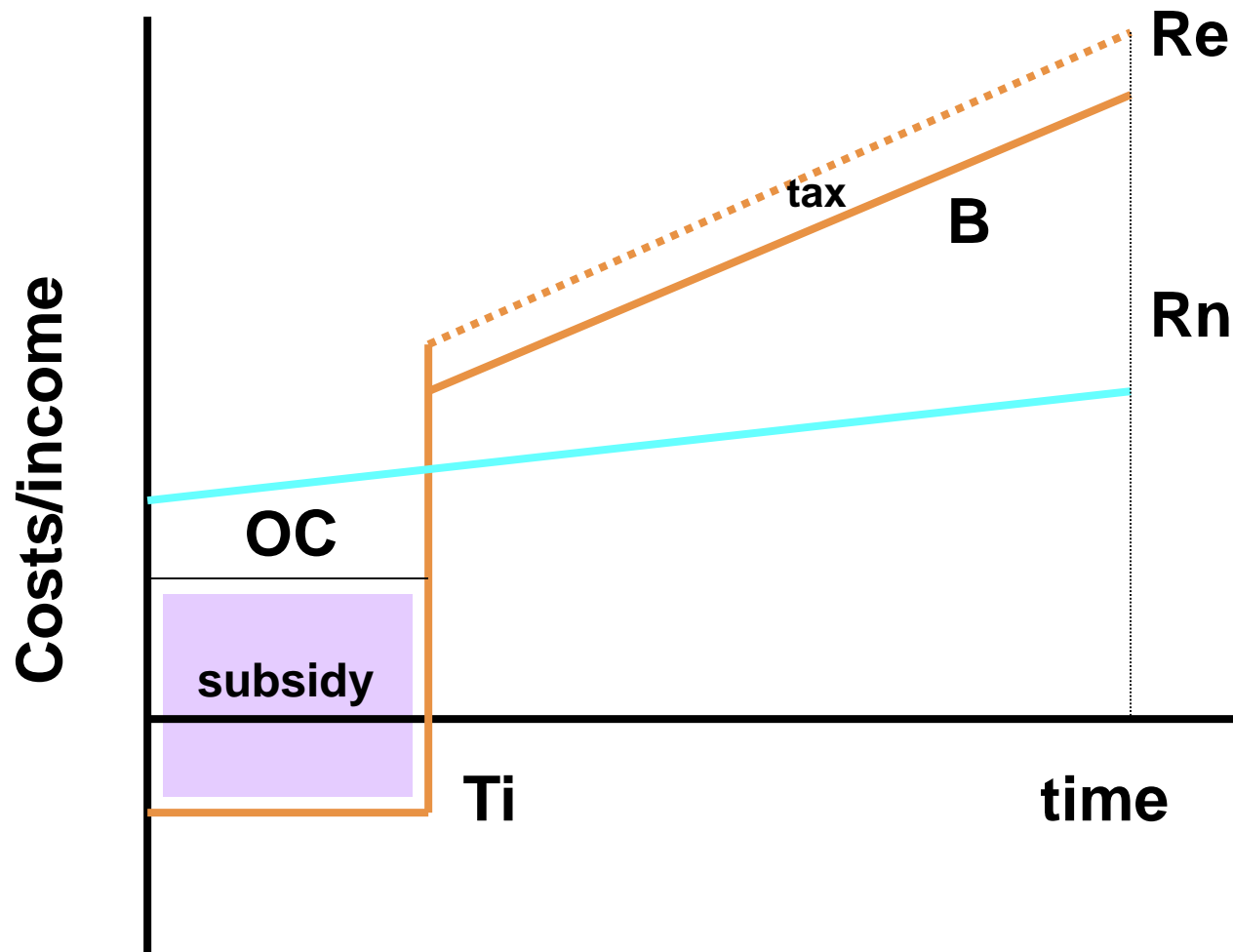
# Financial support to students

- **Student loans** at reduced interest rates to be reimbursed once employed on the basis of the income (income contingent). They overcome the problem of incomplete credit and capital markets
  - **Graduate Tax:** additional tax on those who complete their higher education. It is a form of socialisation of the investment risk on those who have taken it.
  - **Scholarships/grants:** the cost of education for the more able students is entirely on the collectivity. This costs will be repaid by the higher taxes paid by the educated higher income. Higher redistributive effect favouring students, which could be corrected by means tested scholarships.
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# Students loans

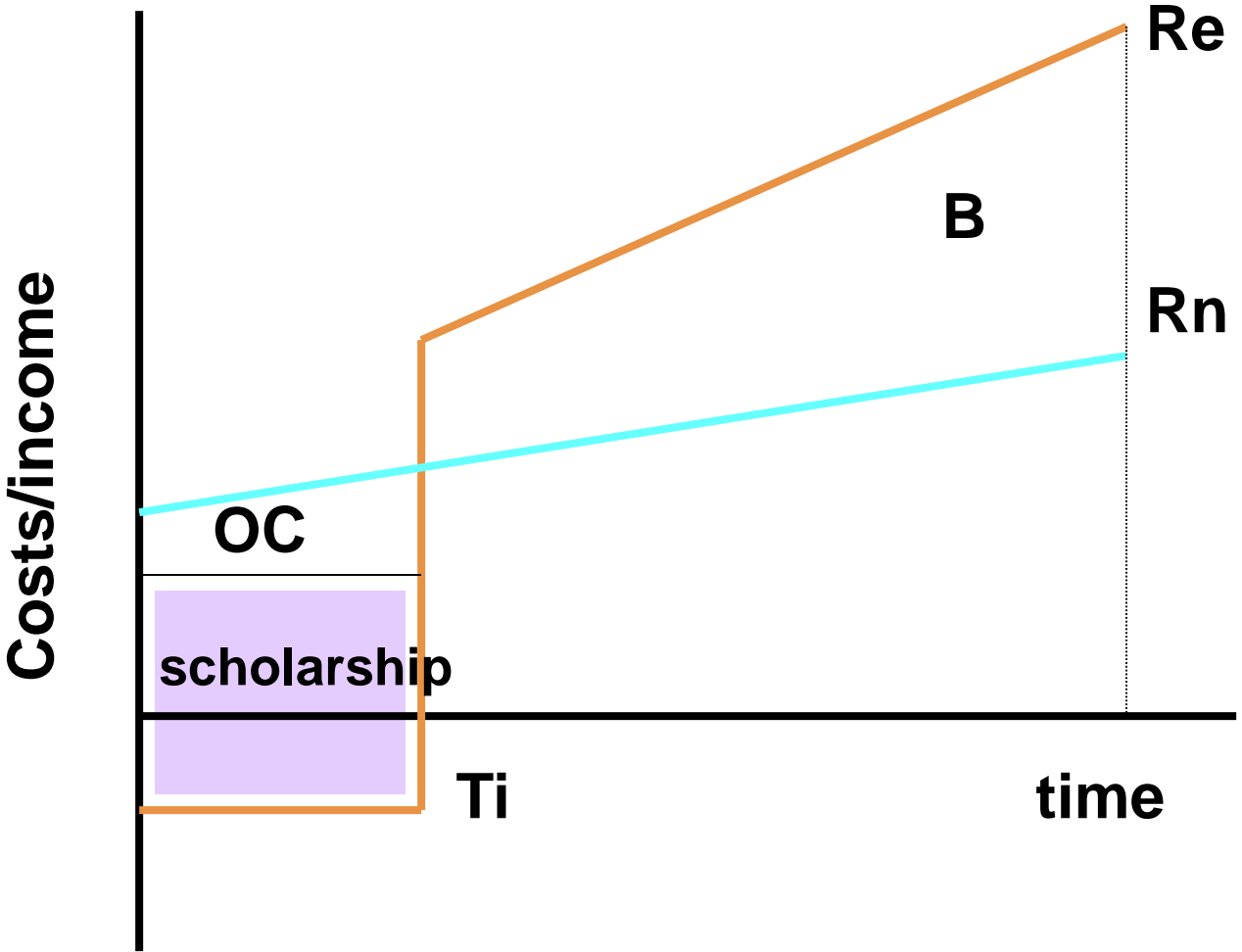


# Graduate Tax





# Scholarships



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# How to support student and achieve efficiency and equity?

- Distributional equity would suggest to use **scholarships rather than loans**, given the higher risk aversion of low income families.
  - In addition a support system based on loans may **discourage women** which present shorter employment histories.
  - In order to avoid these risks in some countries (such as Sweden and Australia) the **repayment of the loan is related to future earnings in a progressive way** and in some cases women with children enjoy specific repayment conditions.
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# Open and controversial issues in education policy/1

- **Are there positive externalities?**

Another view of education claims that *social benefits are lower than private ones* because education does not increase productivity, but only acts as a screening device to individuate those individuals with higher ability and productivity and higher motivation. In this case there no rationale for public support.

- **Does increased educational expenditure improve the quality of educational services and education performance?**

Wide literature and evaluations (also using twins). Most show a positive correlation.

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# Effects of Education on Productivity

- The most important question in the literature is **whether and how education affects productivity, as measured by wages.**
  - However it is difficult to separate the effects of education from ability because underlying ability is unobserved.
  - Researchers have used innovative techniques to control for the bias from underlying ability.
  - The overall message of the literature is quite consistent: each year of education raises wages by 7 to 10%, after accounting for unobserved ability.
  - This is strong evidence for the human capital model.
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# Estimating the return to education and evidence for screening/1

- A simple approach to estimate the return to a year of schooling in terms of higher wages is to compare people with more education (the treatment group) to those with less education (the control group).
  - This approach however is likely to suffer from omitted ability bias: more motivated students end up getting more education, and earn higher wages.
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# Estimating the return to education and evidence for screening/2

- One approach to control for this bias is to *directly* control for underlying ability.
  - A researcher could include the following in a regression:
    - Standardized test scores
    - IQ
  - Yet these are crude measures of ability, and do not take into account all of the omitted factors.
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# Estimating the return to education and evidence for screening/3

- Another approach uses quasi-experiments, with as much as possible identical treatment and control groups, where the only difference is the amount of education received.
  - Duflo (2004) studied a large-scale public school project in Indonesia between 1973 and 1978.
    - More schools were opened in some areas than others. The treatment group of students lived in areas with more school construction; the control group lived in areas with less construction.
  - The treatment group saw a larger rise in educational attainment, and much higher wages as adults.
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# Open and controversial issues in education policy/2

- How important is **school quality** in affecting education results? How to define school performance standards?
  - Does **school decentralisation** improve efficiency and quality of education? If spending and quality standards are defined at the local level and there is high territorial mobility there are greater risks of social segregation, but also greater competition among schools which improve efficiency. Need of a common certification system of educational performance and information on school standards to ease school choice
  - How to **distribute public resources for education** (weight of efficiency vs equity considerations). Should public financing be related to quality and performance standards?
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# The Impact of School Quality

- Some studies have examined the impact of higher quality schools on the returns to education.
  - “Quality” is often defined as class size and spending per student.
  - *Experimental* evidence from the US (Tennessee) suggests smaller class sizes lead to much higher test scores.
  - Yet, a recent attempt to reduce class size in California did not have the expected positive effects, perhaps because other factors were changing too. For example, the rise in number of classrooms may have led the state to hire new, unqualified teachers.
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# Some data and empirical evidence on education

- **Large differences across countries** in public spending and in educational attainment levels
  - **Positive correlation between spending and educational attainment** and **between education and lifelong training**
  - **Positive but imperfect correlation between educational attainment levels and countries' growth rates.**
  - In most countries **high correlation between the educational attainment of parents and children**
  - Recent trends of **increasing decentralisation** in educational services, **greater role of private provision** and financing through **school vouchers**
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	Public expenditure (% of GDP)		Private expenditure (% of GDP)		Expenditure on public & private educational institutions per pupil/student (PPS for full-time equivalents)	
	2004	2009	2004	2009	2004	2009
<b>EU-27</b>	5.06	5.41	0.65	0.79	5 487	6 504
Belgium	5.95	6.57	0.34	0.38	6 251	7 659
Bulgaria	4.40	4.58	0.62	0.66	1 810	2 874
Czech Republic	4.20	4.38	0.58	0.58	3 664	4 621
Denmark	8.43	8.72	0.32	0.33	7 645	9 114
Germany	4.62	5.06	0.92	0.80	6 184	7 299
Estonia (2)	4.92	6.09	0.38	0.36	2 823	4 172
Ireland	4.65	6.50	0.32	0.37	5 723	.
Greece	3.83	.	0.19	.	4 148	.
Spain	4.25	5.01	0.61	0.72	5 258	6 953
France	5.80	5.89	0.55	0.61	6 121	6 988
Italy	4.56	4.70	0.42	0.45	5 916	6 275
Cyprus	6.77	7.98	1.18	1.53	5 960	8 590
Latvia	5.08	5.64	0.82	0.58	2 403	3 722
Lithuania	5.17	5.64	0.47	0.66	2 356	3 509
Luxembourg (3)	3.87	3.15	.	.	.	.
Hungary	5.44	5.12	0.52	.	3 642	.
Malta (4)	4.79	5.46	0.44	1.36	4 076	6 836
Netherlands	5.46	5.94	0.97	1.01	7 016	8 359
Austria	5.48	6.01	0.39	0.51	7 804	8 945
Poland	5.41	5.10	0.59	0.77	2 723	3 928
Portugal	5.10	5.79	0.13	0.38	4 233	5 298
Romania (2)	3.28	4.24	0.40	0.11	1 437	2 386
Slovenia	5.74	5.70	0.83	0.68	5 527	6 610
Slovakia	4.19	4.09	0.75	0.72	2 594	3 985
Finland	6.42	6.81	0.13	0.16	6 242	7 085
Sweden	7.09	7.26	0.19	0.18	7 130	7 950
United Kingdom	5.16	5.67	0.93	1.87	6 046	7 847
Iceland	7.47	7.82	0.74	0.74	7 375	7 702
Liechtenstein (5)	2.43	2.05	.	.	.	.
Norway	7.42	7.32	0.05	0.11	8 629	10 179
Switzerland	5.72	5.55	0.58	0.60	.	.
Croatia (6)	3.87	4.33	0.28	0.36	.	4 103
Turkey	3.07	.	0.08	.	.	.
Japan	3.59	3.61	1.21	1.60	6 820	7 484
United States	5.32	5.47	2.33	2.03	9 948	11 370

(1) Refer to the internet metadata file ([http://epp.eurostat.ec.europa.eu/cache/ITY\\_SDDS/en/educ\\_esms.htm](http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/educ_esms.htm)).

(2) Data for 2005 instead of 2004 other than for public expenditure.

(3) Excludes tertiary education; data for 2007 instead of 2009.

(4) Break in series between 2004 and 2009.

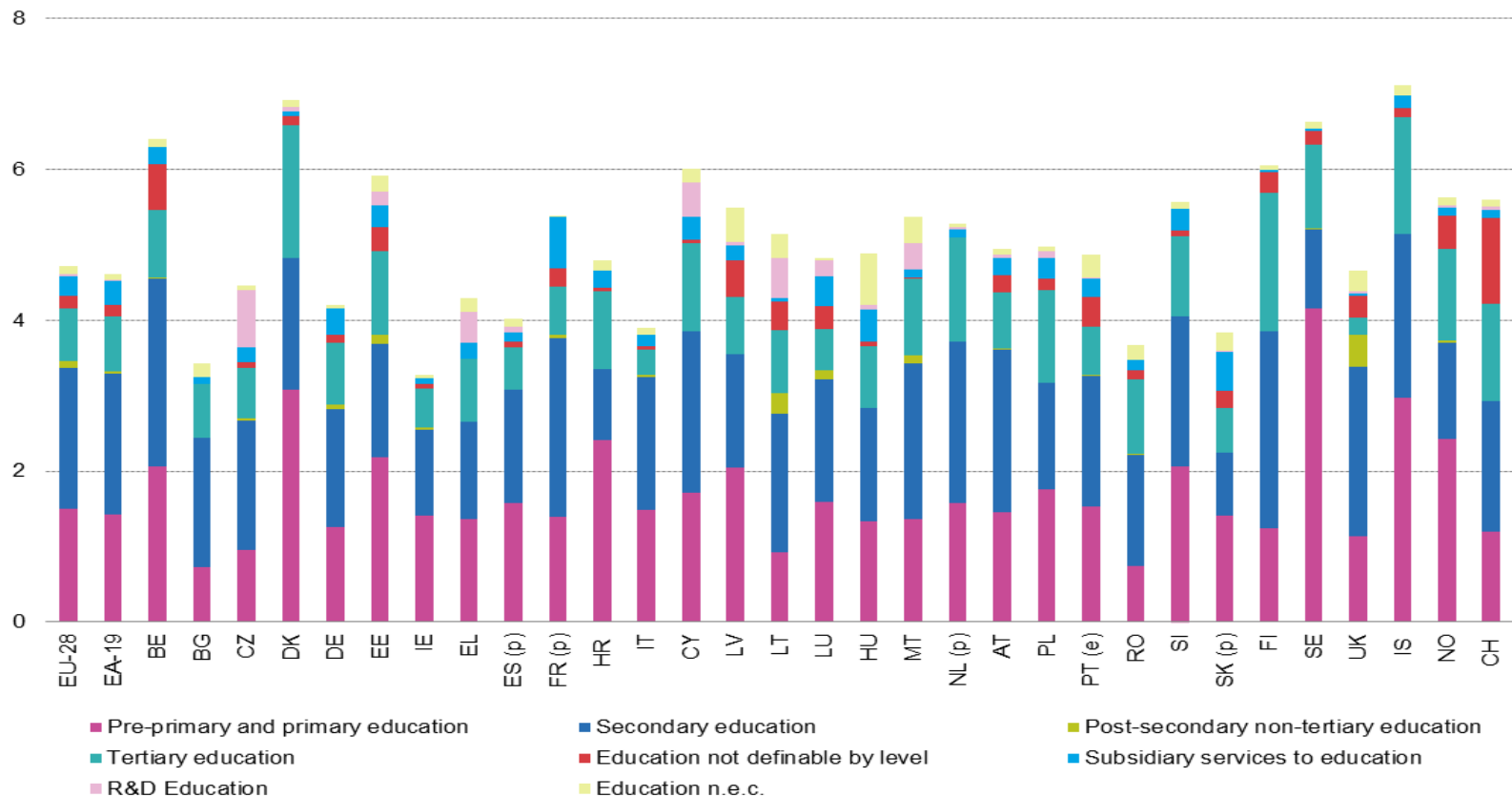
(5) Data for 2008 instead of 2009.

(6) Data for 2005 instead of 2004 for private expenditure.

Source: Eurostat (online data codes: educ\_figdp, tps00068 and tps00067), UNESCO, OECD

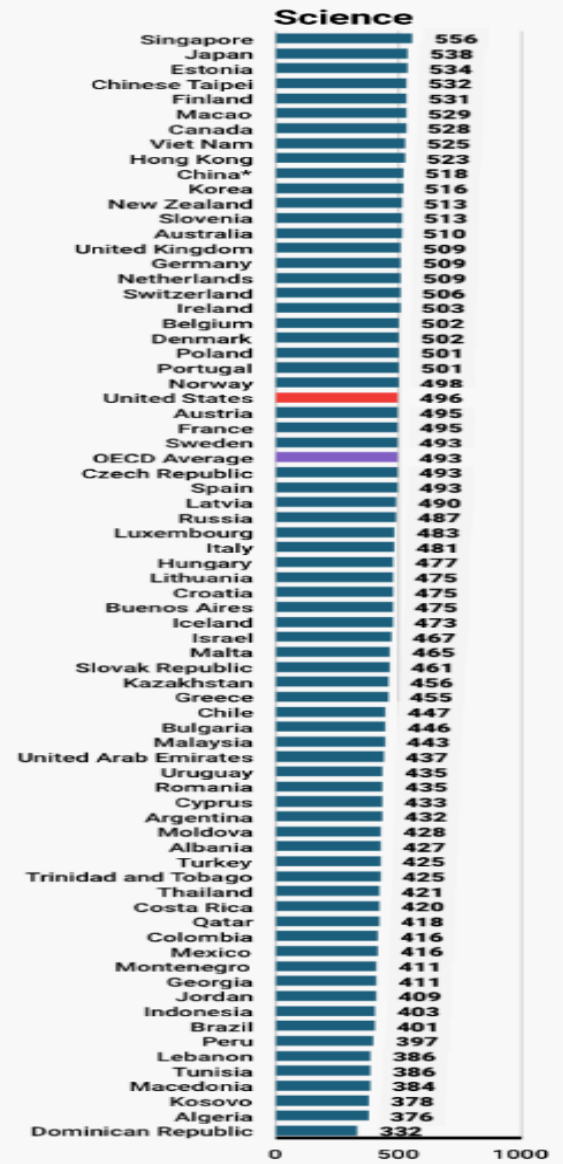
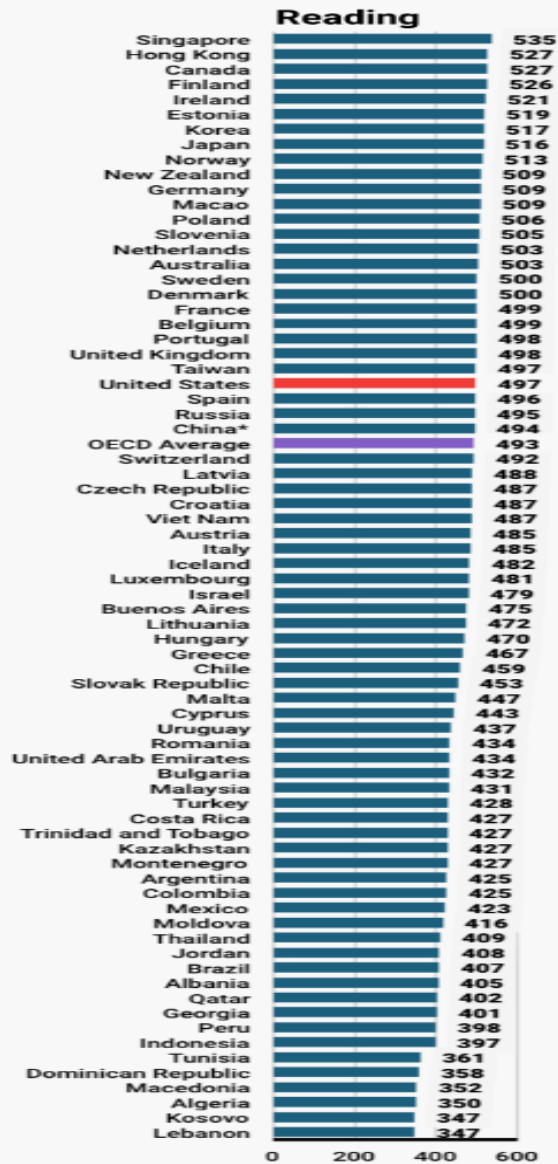
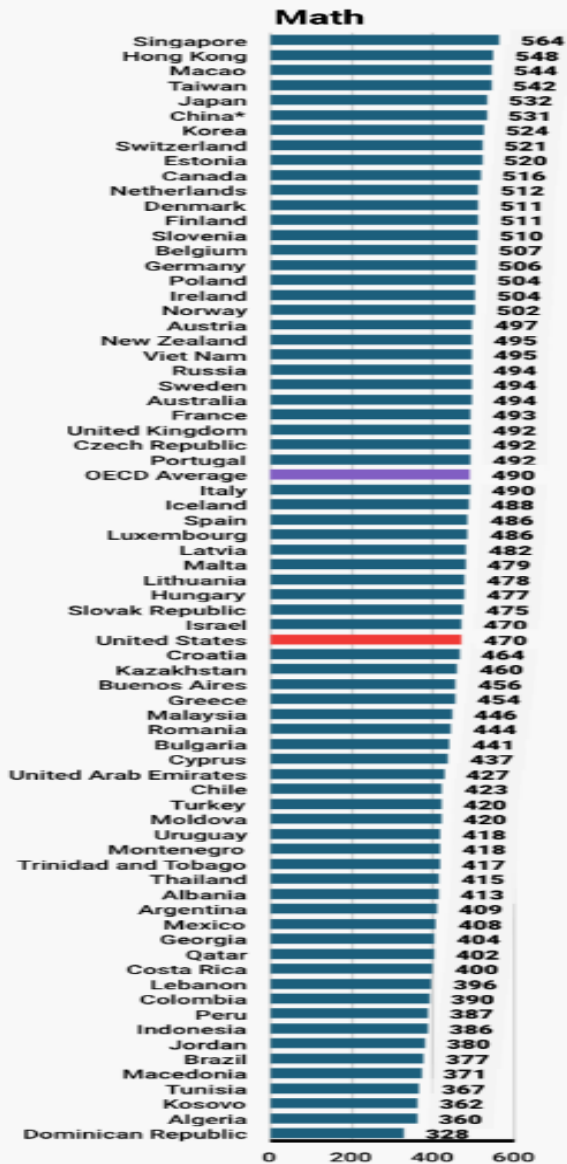
# Total general government expenditure on education by education level, 2016 (% of expenditure on education)

source: Source: Eurostat ([gov 10a exp](#)), see [country codes](#)



(p) provisional value  
(e) estimated value

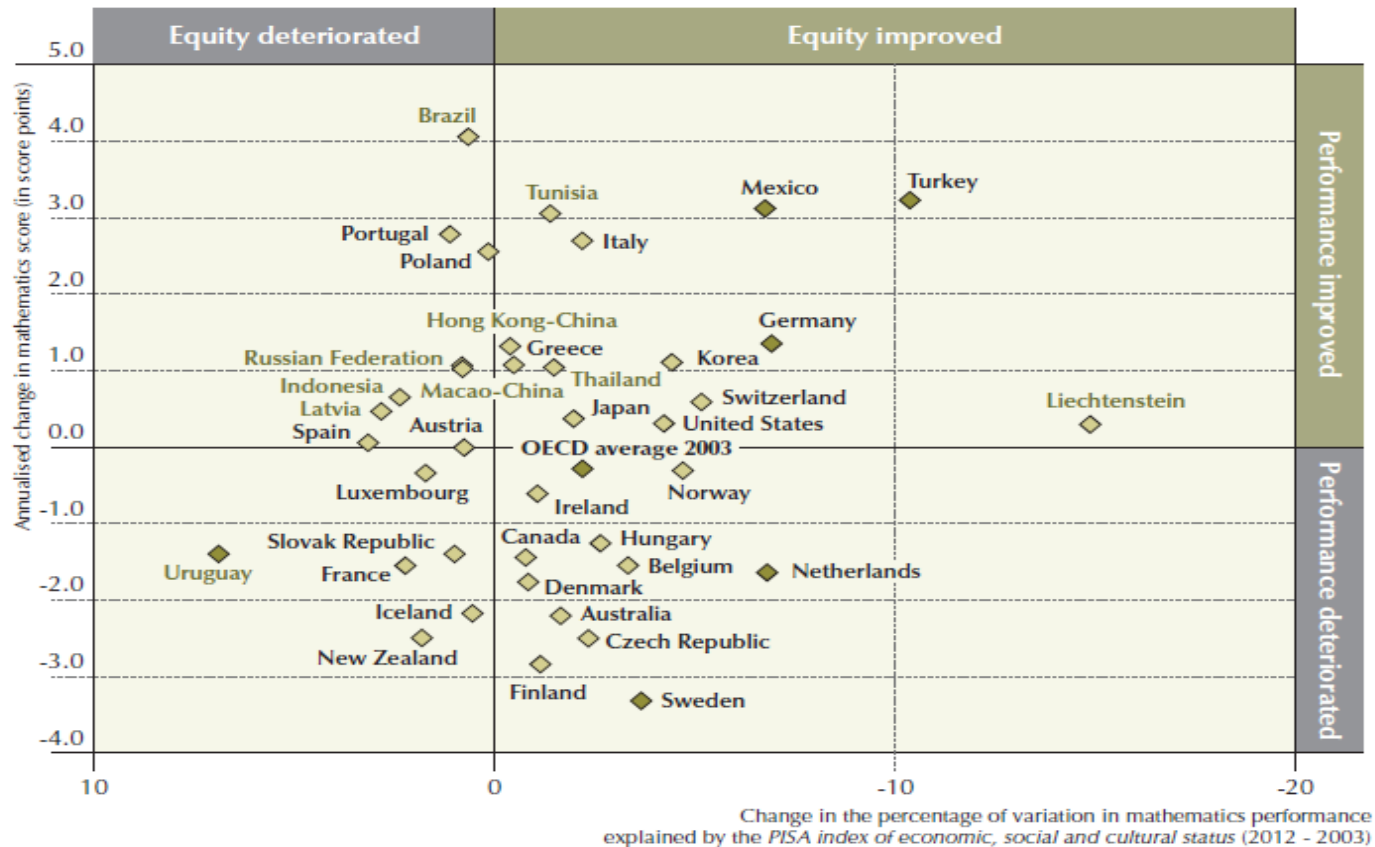
# 2015 PISA AVERAGE SCORES



SOURCE: OECD. \*China is represented by the provinces of Beijing, Shanghai, Jiangsu, and Guangdong

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## Change between 2003 and 2012 in the strength of the impact of socio-economic status on performance and annualised mathematics performance



**Notes:** Changes in both equity and performance that are statistically significant are indicated in a darker tone.

The annualised change is the average annual change in PISA score points from a country's/economy's earliest participation in PISA to PISA 2012. It is calculated taking into account all of a country's/economy's participation in PISA.

For comparability over time, PISA 2003 values on the *PISA index of economic, social and cultural status* have been rescaled to the PISA 2012 scale of the index. PISA 2003 results reported in this table may thus differ from those presented in *Learning for Tomorrow's World: First Results from PISA 2003* (OECD, 2004).

OECD average considers only those countries with comparable mathematics scores and values on the *PISA index for economic, social and cultural status* since PISA 2003.

Only countries and economies with comparable data from PISA 2003 and PISA 2012 are shown.

Source: OECD, PISA 2012 Database; Figure II.2.12.

Table 8.1: Information about educational attainments

	Educational expenditures	Years of formal education		PISA math score
		Men	Women	
Australia	6.0	13.0	12.8	108
Austria	5.7	12.1	11.5	105
Belgium	6.4	11.3	11.2	110
Canada	–	13.0	13.1	110
Czech Republic	4.4	12.5	12.3	107
Denmark	7.1	13.6	13.7	106
Finland	6.0	11.9	12.2	113
France	6.1	11.7	11.4	106
Germany	5.3	13.7	13.1	104
Greece	4.1	10.7	10.3	92
Hungary	5.6	11.8	11.5	101
Iceland	7.4	13.7	12.9	107
Ireland	4.4	12.8	13.1	104
Italy	4.9	10.2	9.9	96
Japan	4.7	12.6	12.1	111
Korea	7.1	12.4	11.3	112
Luxembourg	–	13.7	13.2	102
Mexico	6.3	8.9	8.5	80
Netherlands	5.1	13.1	12.7	111
New Zealand	6.8	12.5	12.7	108
Norway	6.9	13.8	13.9	102
Poland	6.1	11.5	11.8	101
Portugal	5.8	8.1	8.4	96
Slovak Republic	4.2	12.5	12.3	103
Spain	4.9	10.6	10.4	100
Sweden	6.9	12.3	12.6	105
Switzerland	6.2	13.4	12.3	109
Turkey	3.8	9.9	9.3	88
United Kingdom	5.9	12.8	12.6	–
United States	7.2	13.8	13.9	100

Note: Expenditure on educational institutions as a percentage of GDP for all levels of education - 2002; Italy and The Netherlands 2001; average number of years in formal education of 25 to 64 years old - 2003; PISA normalized score of 15 year old in mathematics - 2003 (U.S. = 100). Source: OECD, *Education at a glance*, 2005.