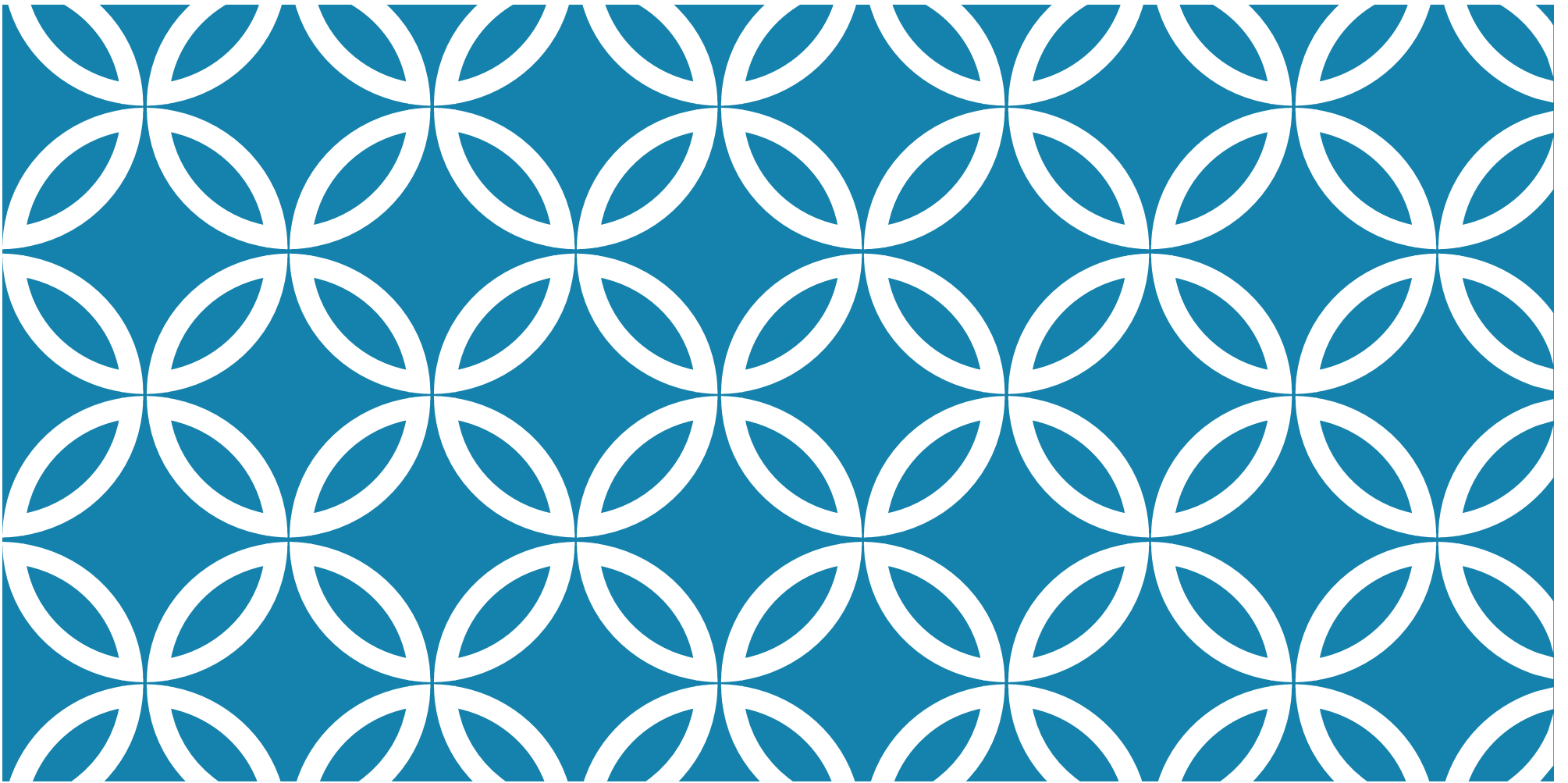
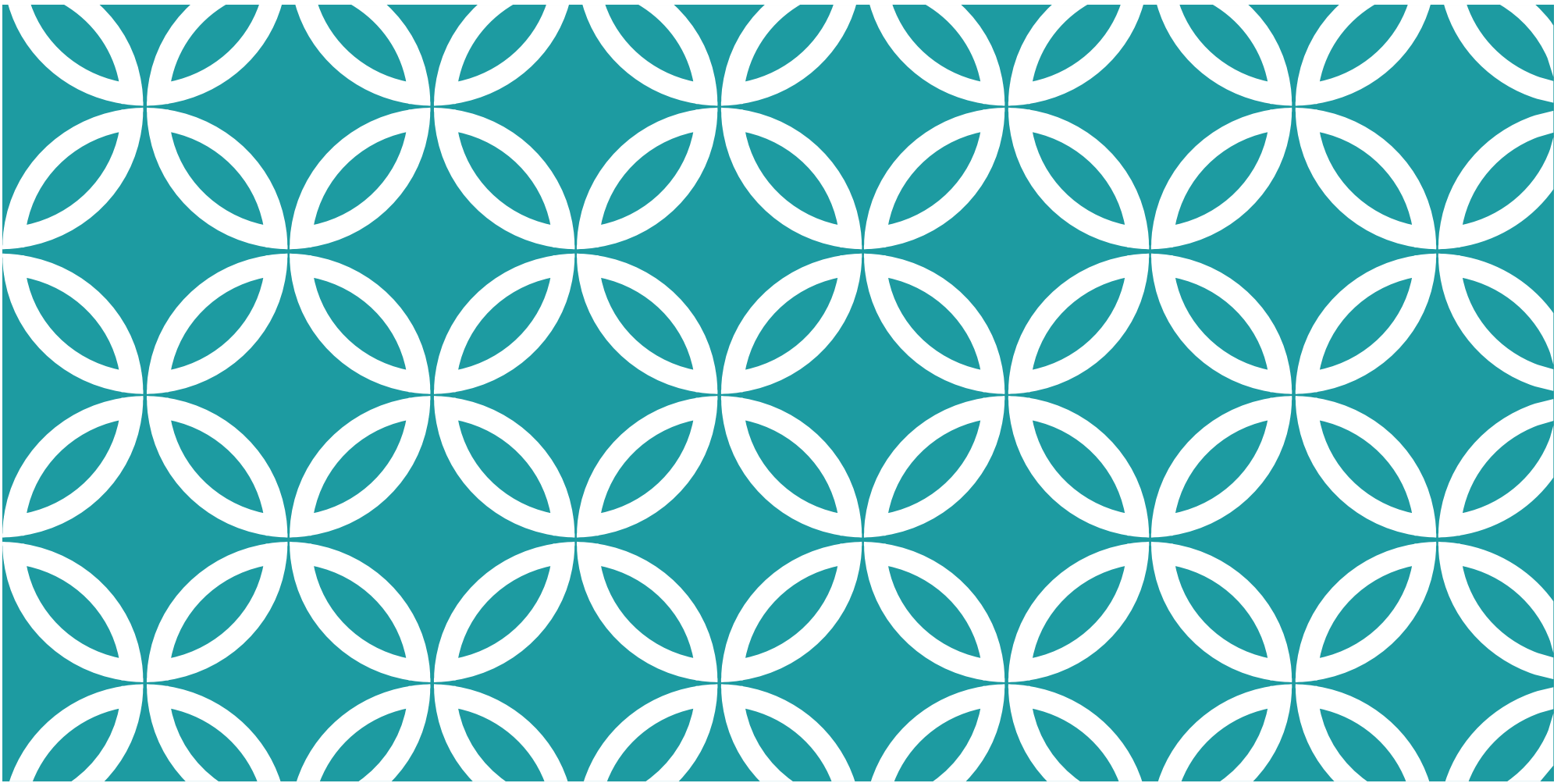




ECONOMICS OF EDUCATION

EE 473



THE APPLICATION OF ECONOMICS TO EDUCATION

AN ECONOMIC DESCRIPTION OF EDUCATION

- ❖ Education - the process of learning new skills, of finding out new information or of understanding various phenomena – can be analyzed by theories of cognition, theories of behavior and through most Social Science disciplines
- ❖ Human capital – an individual's embodied skills above their raw labor ability – can be obtained in many forms:
 - ❖ schooling and training
 - ❖ experience or simply watching those who already have a larger stock of human capital

❖ Educated people are typically more skilled, allowing them to earn more; they may also be more health-conscious, allowing them to enjoy life more, or more civic-minded, contributing to society's goals

❖ In choosing how to deploy their human capital to any of these ends, individuals are making decisions about **resources, economic resources**

❖ The fundamental assumption of economics is that the resources available to achieve any objective are **scarce**

❖ Scarcity can be countered by the efficient utilization of resources: a given objective is efficiently achieved if the lowest possible amount of resource has been used; and if resources are saved in achieving one objective, they can be put toward achieving another separate one.

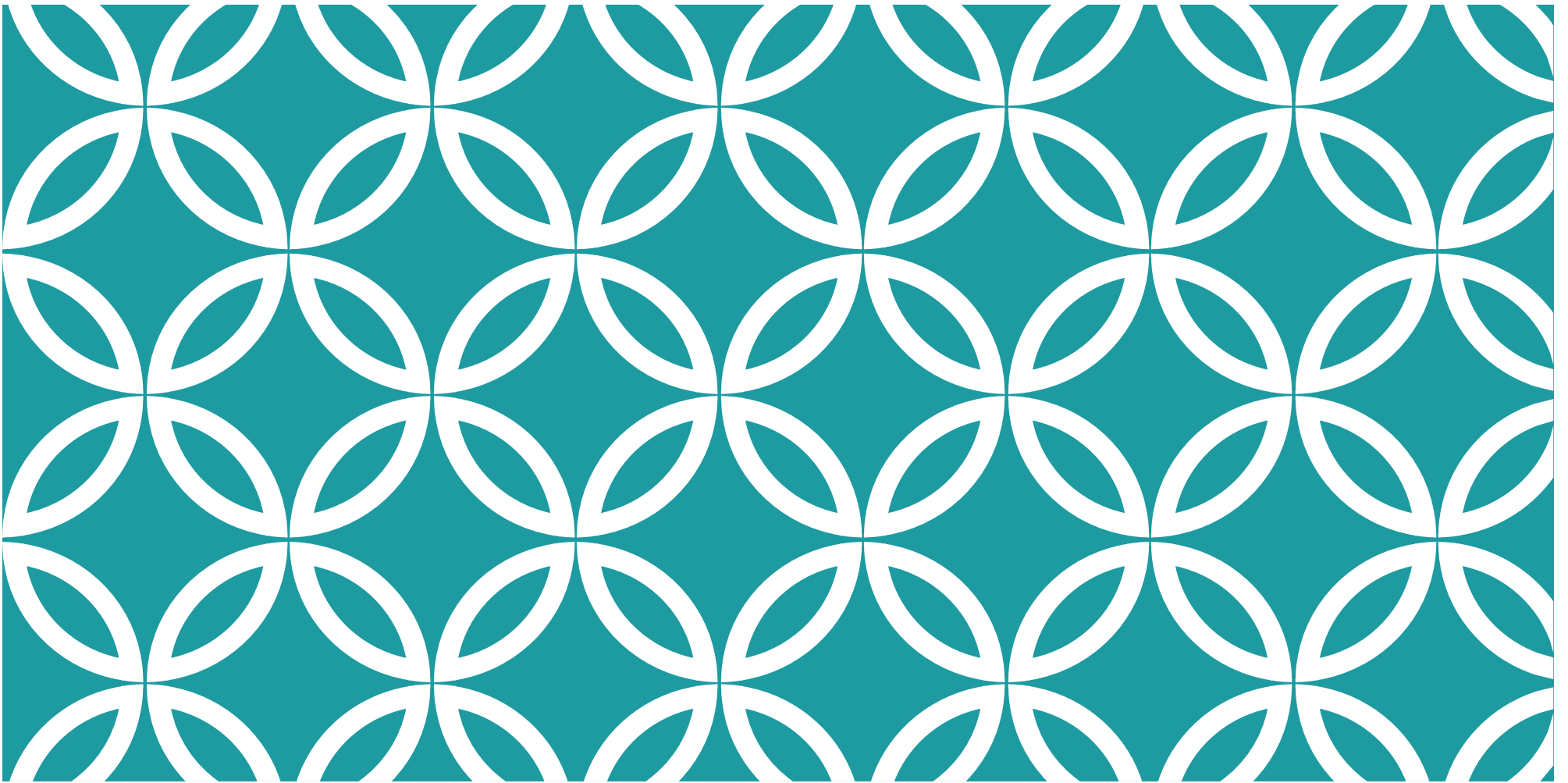
THE ROLES OF ECONOMISTS

1. The labor market – Education is a primary determinant of wage, included in most estimates of earnings, and for many drives the demand for learning and for training
 - ❖ From apprenticeships to higher education, the labor market and education are interlinked at this microeconomic level
 - ❖ Aggregating up the individual labor effects, education may have macro-economic effects and raise economic growth
2. Economists have a role in formulating behavioral and demand theory, studying how education changes behavior and alters information sets
 - ❖ This applies to individuals, households and communities, across all domains: at work, in consumption and during leisure

3. The study of educational organization such as schools or universities: this encompasses their technologies, use of factor inputs and their objective, cost, and revenue functions
4. Market analysts – the equilibration of the supply or and demand for education will depend on how the market constituted: schools may be competitive or cartelized and education may be traded either through vouchers, loans or allocated by fiat
 - ❖ The efficiency and equity of these market structures and exchange mechanisms merits attention
5. Accountants – education has become an increasingly important activity within all economies: from early years kindergarten instruction to continuing education and trainings, the accumulation of skills spans a lifetime, absorbing substantial scarce resources

TOTAL EDUCATION EXPENDITURE AS A PERCENTAGE OF GDP

	2005	2006	2007	2008	2009	2010	2011	2012
India	3.13	3.09	N/A	N/A	3.21	3.32	3.72	3.83
Japan	3.48	3.46	3.46	3.44	N/A	3.78	3.78	3.85
Germany	N/A	4.28	4.35	4.42	4.89	4.92	4.81	4.95
United States	5.07	5.39	5.25	5.30	5.25	5.42	5.22	N/A
United Kingdom	5.19	5.25	5.16	5.12	5.31	5.95	5.75	N/A
Australia	4.91	4.74	4.66	4.63	5.09	5.57	5.11	4.91
France	5.50	5.44	5.45	5.44	5.74	5.68	5.52	5.53
Canada	4.80	N/A	4.80	4.66	4.87	5.37	5.27	N/A
Norway	6.87	6.38566	6.54	6.29	7.10	6.75	6.46	7.37
South Africa	5.06	5.07257	4.97	4.87	5.25	5.72	5.96	6.37
Denmark	8.08	7.72783	7.61	7.49	8.49	8.62	8.55	N/A
Sweden	6.56	6.41067	6.22	6.39	6.86	6.62	6.49	7.66
ASEAN Countries								
Brunei Darussalam	N/A	N/A	N/A	N/A	N/A	2.05	3.68	3.21
Cambodia	N/A	N/A	1.60	N/A	N/A	2.60	N/A	N/A
Indonesia	2.87	N/A	3.04	2.90	3.53	2.81	3.19	3.41
Lao PDR	2.41	2.96	3.08	2.28	N/A	2.77	N/A	N/A
Malaysia	N/A	4.49	4.37	3.96	5.97	5.12	5.93	N/A
Myanmar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Philippines	2.43	2.53	2.60	2.69	2.65	N/A	N/A	N/A
Singapore	3.22	2.87	2.96	2.78	3.03	3.11	3.07	3.12
Thailand	4.23	4.34	3.84	3.75	4.13	3.75	5.16	4.93
Vietnam	N/A	N/A	N/A	4.89	N/A	6.29	N/A	6.30
World	4.20	4.17	4.09	4.40	4.75	4.61	4.53	N/A



ECONOMIC METHODS

1. Efficiency Studies
2. Cost- Benefit Analysis
3. Economic Methodology

1. EFFICIENCY STUDIES

- ❖ Efficiency involves getting the most out of the resource available and therefore has two sides:

What is 'got out' compared to what is 'put in'

- ❖ Efficiency can be assessed internally, in terms of input resources to gain a given education outcome, and externally, in terms of subsequent outputs achieved from a given resource dose of education

Behrman (1996) distinguishes the three main forms of efficiency

1. Allocative (internal) efficiency is where inputs are distributed toward the production of various outcomes in order that the values of marginal products for each input are the same across all uses – E.g. university faculty should be optimally deployed both on teaching and research
2. Input-choice efficiency occurs where inputs are selected so that their marginal contribution equals social marginal cost – E.g. wages paid to teacher input should be compared with factor prices of infrastructure inputs in generating desired educational outcomes
3. Output (external) efficiency applies when the quantities of outcomes are such that social marginal cost equals to social marginal benefit - E.g. the number of enrolments or costs of provision of medical education, should be sufficient to meet a society's health preferences

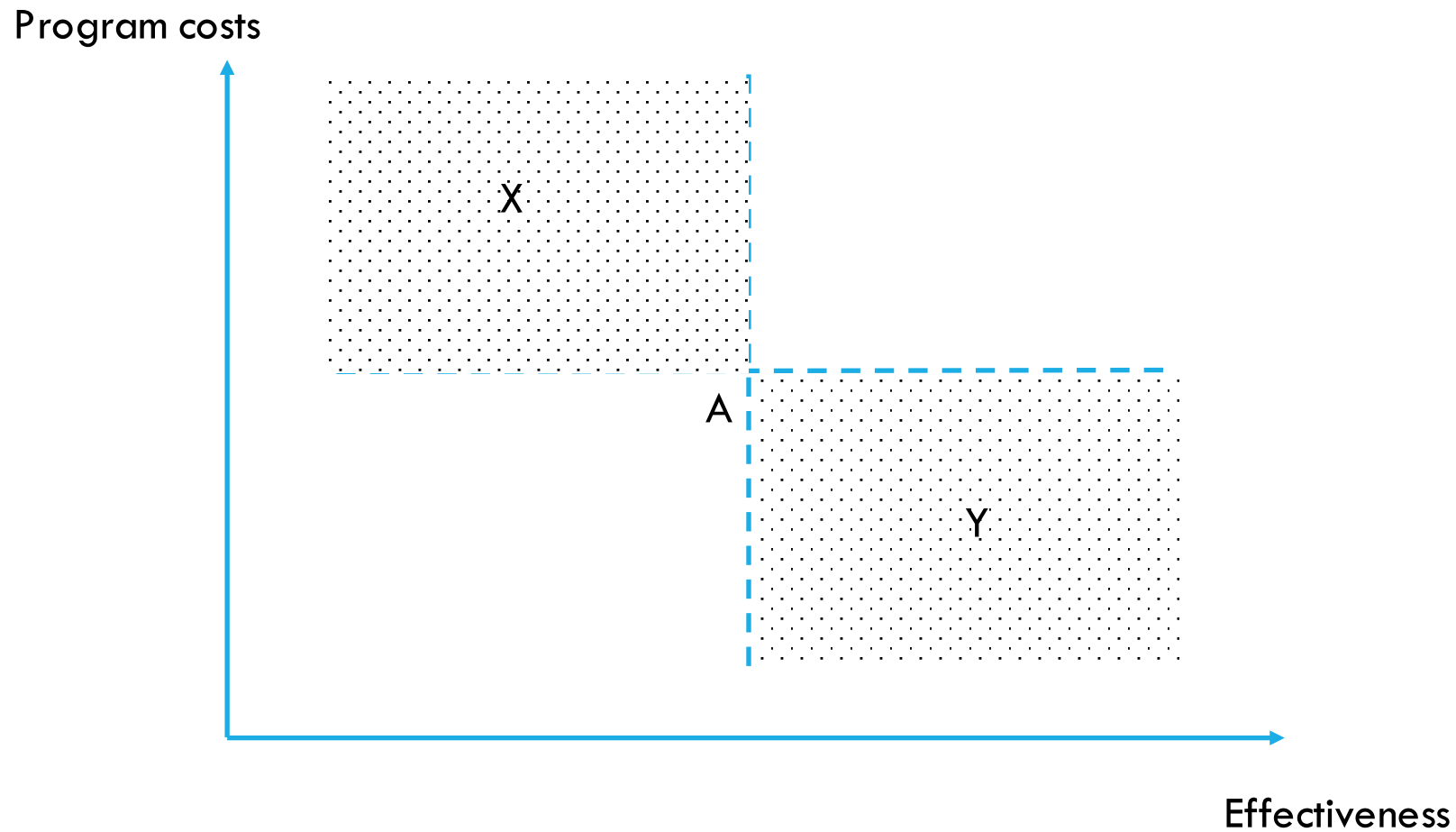
One way of examining internal efficiency is via **cost-effectiveness analysis**

- ❖ Cost-effectiveness analysis relates costs to outcomes in a numerical form: this may be a ratio, equivalent to a unit cost per outcome, but the functional form for analysis is general

$$\text{Cost effectiveness Ratio} = \frac{\text{Total Costs}}{\text{Total Academic Achievement}}$$

- ❖ Cost-effectiveness analysis is used to decide how to, rather than whether to, implement a given policy goal; it therefore helps in deciding whether to, implement a given policy goal; it therefore helps in deciding which version of an educational program should be funded (assuming that outcomes can be effectively compared across versions)

COST-EFFECTIVENESS OF EDUCATION PROGRAMS



COST-EFFECTIVENESS OF EDUCATION PROGRAMS

- ❖ The basic relationship: program A is the reference program
- ❖ Any programs in quarter X would definitely be rejected
- ❖ Any programs in quarter Y would definitely be preferred

(Assuming the transaction costs from program A to X or Y are trivial)

- ❖ A financing constraint needs to be imposed to decide on the relative merits of programs in the remaining quarters

- ❖ Although this is a proper test of efficiency in comparing inputs with outputs, data are often insufficiently available for such testing
- ❖ For cost effectiveness analysis, a definition of effectiveness is needed: outcomes may be defined as program completion; employment; student learning; student satisfaction; and/or college placement

❖ There is no obvious reason to choose one over another

- ❖ The appropriate choice of outcome may depend on:
 - ❖ How widespread the benefits of program participation are
 - ❖ What the impacts are for those who benefit the most from participation
 - ❖ How the gains depend on students' initial characteristics
 - ❖ How individual students choose between programs
- ❖ For any given outcome, an effect size may be calculated such effect sizes, calculated as the standardized mean difference between two programs, represent a metric for comparing outcomes

- ❖ Accurate cost data are needed
- ❖ Tsang's (1988) review of cost studies highlights many deficiencies and difficulties – these include:
 - ❖ The problems of measuring capital costs
 - ❖ Estimating rates of depreciation
 - ❖ Double counting of some costs, particularly transfer payments
 - ❖ The definition of the educational unit when an activity is a joint one (that is whether cost-effectiveness should be considered for the individual or the school)
- ❖ Many cost analyses use expenditures rather than opportunity costs, with the costs of students' and parents' time often omitted from the analysis; transition costs – E.g. divestment of physical capital should be considered and generally few studies have robust and full data available on actual expenditures

MODELLING OF THE EDUCATION PRODUCTION FUNCTION

A second area for research on internal and external efficiency is through modelling of the education production function

- ❖ Production function studies model schools, colleges, or universities as institutions which ‘**manufacture**’ **educational outcomes**, so as to discover which types of resource and which allocations have the greatest effect on outcomes and how input-choice and allocative efficiency could be improved
- ❖ One performance measure is the **academic achievement of students**
- ❖ Production function models explore these relationships, but at a much more detailed level, yielding more information about the education process than cost-effectiveness analysis and typically looking at whether or not increasing resources (e.g. lowering class size) results in superior education outcomes
- ❖ This modelling of the production function may be tested via regression analysis, although (non-parametric) data envelopment analysis can also be utilized

MARKET ANALYSIS

- ❖ The market for education programs and services is equilibrated through demand and supply, and study of each of these may yield insights into agents' behavior
- ❖ One the demand side – student enrolment, participation and effort levels can be investigated
 - ❖ How levels of public subsidy affect the demand for education and how capital market constraints may preclude optimal outcomes
- ❖ One the supply side – many education providers are run by governments and subsidized, but they may still co-operate, collude or compete to provide education
- ❖ The structure, conduct and performance of these providers is important and the mode of interaction of suppliers with demanders can be assessed for its efficiency

2. COST-BENEFIT ANALYSIS

This compares the costs of undertaking an education program with the benefit of that program using pecuniary values

- ❖ Cost-benefit analysis is used to identify whether or not a policy is worth undertaking, rather than how it should be undertaken
- ❖ The fundamental rule is simple:

If the benefits of a program $>$ the costs, then that program is worth undertaking

(If the costs are regarded as inputs, and the benefits are the outputs, then a cost-benefit approach is analogous to a study of efficiency)

- ❖ Such analyses require, **identification of the costs, including opportunity costs; specification of the benefits expressed in money terms; a justifiable discount rate, because costs and benefits are likely to be incurred at different times; and an explicit statement of which perspective the analysis is to be viewed from** (as many programs affect more than just the students in class)

The incidence of education itself may be only imperfectly observed

- ❖ For modelling, years of schooling are typically used, although **one year of schooling is unlikely to be uniform across different population cohorts or academic levels**
- ❖ School quality measures should be incorporated in simple quantity estimates, particularly if the intention is to model education as an input into the production of other social outcomes
- ❖ The bias from this measurement error may be substantial
- ❖ The differences in prior ability or home endowment across groups may only be imperfectly observed and so modelled

Cost benefit analysis itself may be difficult to operationalize (Herrnstein, 1997)

A scale mismatch may also occur: the costs of undertaking a single act may differ significantly from repeated or sequential endeavors – E.g. the benefits from five years of study at school are not simply five times the benefit of one year

One way of examining costs and benefits is through rate of return appraisal (Psacharopoulos, 1995)

- ❖ To estimate an **internal rate of return, that is, that return which equalizes the discounted costs and benefits of undertaking a program of education**
- ❖ This rate is compared to a critical discount rate for funding projects, such as a government test discount rate or bank lending rates
- ❖ **If the internal rate of return to education exceeds the rate of return to alternative investments, that is, if the benefits exceed the costs, then education should be undertaken**
- ❖ This measure is used to estimate, the gains from going beyond compulsory education for the individual and the gains from government subsidized places
- ❖ Comparing expected rates of return across a range of educational investment should lead to an optimal investment strategy

A second application might be look at the costs and benefits of discrete changes in education provision

- ❖ Bishop (1996) estimates the costs and benefits from changing the volume of school provision
 - ❖ Lengthening the school year in the US from 180 to 200 days and adding 45 minutes instruction to each school day would raise total expenditure by 15 -20%
 - ❖ The long term educational benefits may be substantial:
 - ❖ as well as more learning, students would forget less over the summer vacation
 - ❖ Savings in child care would also offset this extra cost significantly
- ❖ Bishop (1996) estimates that the net present value of benefits would be around five times the costs, plausibly making a longer school year a worthwhile investment

A third variant to estimating the costs and benefits of alternative investment strategies is to look at external efficiency through growth models

- ❖ With **positive externalities**, that is, effects of education which spill over to other agents, then education may raise aggregate economic growth beyond its effect on the educated individual; growth accounting models may estimate such effects (Blundell et al., 1999)
- ❖ At a more disaggregated level, education institutions are important sites of economic activity: they attract students into a region and the faculty's and students' expenditures are typically on locally produced goods
- ❖ The economic impact may be estimated using **multiplier analysis**, where injections into and leakages outside the region are compared through a coefficient linking the total change in economic activity to the initial investment – If this coefficient is greater than one, positive multiplicative effects are evident (Bleaney et al., 1992)

3. ECONOMIC METHODOLOGY

- ❖ Studying efficiency and cost-benefit analysis – are primarily quantitative and draw on cross-sectional survey data
- ❖ Not many experimental trials have been undertaken on school education
- ❖ This is despite a general recognition that one of the key problems in estimating the benefits of education is **selectivity bias of enrollees**: students only enroll on courses they expect to be effective, this makes inference about non-participants difficult
- ❖ Although there are many advances in selection correction statistics, the fact that people choose the education that is best for them limits the power of inference about marginal expansions of education provision

Measurement error may be substantial if there is **heterogeneity in students' abilities and in their environments** – it will not therefore be easy to establish that the education has caused the resulting outcomes

In order to identify causality, it is important to distinguish the separate effects of environments on students' achievements

Manski (1995) divides these into **endogenous, context, and correlated effects**

❖ **Endogenous effects** are those where the individual behaves in a way that depends on the prevalence of behavior in that group – so if student's peers are high-achieving, that is likely to affect that individual's own achievement

❖ **Context effects** are those where achievement depends on the background of a class – so achievement may be influenced by the socioeconomic or gender composition of the group

❖ **Correlated effects** are those where individuals are influenced by the same factors – students may have similar outcomes because they are taught by the same teachers or attend the same institution

Experimental trials, would clarify the benefits of education, abstracting out many covariates. Yet experimental trials are no solution.

- ❖ Manski (1995) describes why experimental regimes may not operate so effectively in education, unlike their role in research on health
 - ❖ Fundamentally, it must be possible to translate an experimental program into an actual program – there are several reasons why this translation might not be straightforward
 - ❖ People like to choose their education and have more heterogeneous tastes, much more so than for health treatment
- ❖ Many education programs last several years, during which period many of the original contexts may have altered - Experimental trials are often small-scale and may have unknown effects when applied across a whole cohort
 - ❖ The effects of education programs are especially difficult to observed if the benefits of education stem from learning things others have not or if there are general equilibrium or market effects from an educational program (Heckman, et al., 1999)



❖ If the focus of research should be on what works and what happens in schools, then experiments to reveal underlying causal relationships may be less appropriate; descriptive surveys and accounts of actual practices and behaviors may have greater explanatory power

❖ For all these reasons, therefore, a range of methodological issues need to be attended to in discussions of the evidence

❖ The difficulties of using sample surveys (and experiments), there is significant literature—both empirical and theoretical which has applied economic principles to education

❖ This empirical research illustrates how, in practical ways, questions about education provision, process and performance can be answered and theories tested

❖ Using all available evidence together with economic theory offers causal simplicity

❖ Economic principles are uniform, stable and compositional and this allows a picture to be constructed around a few accepted concepts



REFERENCE

Belfield, C.R. (2000). *Economic Principles for Education: Theory and Evidence*. Edward Elgar Publishing, Inc.