

# **The Munich Lectures in Economics 2011**

*Time and the Generations*

by

Partha Dasgupta

University of Cambridge  
and  
University of Manchester

*Lecture 1*

November 15, 2011

People evaluate economies for prescribing and assessing, which taken together involve five sets of questions:

- (A) What does the economy look like?
- (B) What has it looked like in recent years?
- (C) What should our economic forecast be under "business as usual"?
- (D) How is the economy likely to perform under alternative policies?
- (E) What policies should be recommended for the economy?

National income accounts offer information relevant for answering (A), although it does so in an unsatisfactory way. Policy evaluation is a way to answer questions (D) and (E). The idea is to evaluate an economy *at a point in time* before and after a hypothetical change has been made to it. In contrast, the literature on "sustainable development" answers questions (B) and (C) by evaluating economic change when the change is brought about by the *passage of time*.

Question (A) stands apart from questions (B) to (E), at least if conventional practice among national income statisticians is any guide. For it is common practice to summarize the state of an economy by its GDP, or equivalently its (gross) domestic income.

Why is GDP is inadequate for answering (B)-(E)?

Both policy evaluation and sustainability assessment involve comparisons of different people's well-beings. Let us call the person doing the evaluation the *social evaluator*. The social evaluator could be a citizen (thinking about things before casting his vote on political candidates), she could be an ethicist hired to offer guidance to the government, he could be a government decision maker, and so on.

Denote time by  $t$ . We assume  $t$  is discrete:  $t = 0, 1, 2, \dots$

In order to focus on intergenerational issues, we ignore differences among people at any one time period. Let  $U(t)$  denote the flow of human well-being in period  $t$ . We represent the determinants of well-being in summary form by  $C$ , which we will call *consumption*. So let  $C(t)$  be consumption at  $t$ . The simplest case to consider is the one where  $U(t) = U(C(t))$ .

Imagine we have a forecast of future consumptions, that is, the  $C(t)$ s.

## **Policy Evaluation**

We now define a key moral object:

The social evaluator conducts a thought experiment on the forecast by asking how much additional consumption she ought to demand on behalf of tomorrow's people in payment for a reduction in today's consumption by one unit. We say that the *consumption discount rate* between today's and tomorrow's consumptions is that additional consumption demanded, less unity.

So, if  $r$  is that rate, we (or rather, the social evaluator) would demand  $(1+r)$  units of additional consumption "tomorrow" as a price for giving up one unit of consumption today, meaning that she would regard an additional unit of consumption tomorrow to be worth  $1/(1+r)$  units of additional consumption today. Then  $r$  is the consumption discount rate.



The Utilitarian formulation of intergenerational well-being (we write it as  $V$ ) in the initial period,  $t = 0$ , is:

$$V(0) = U(C(0)) + U(C(1))/(1+\delta) + \dots + U(C(t))/(1+\delta)^t + \dots$$

where  $\delta \geq 0$ , is a constant number. (1)

Intergenerational well-being is forward looking and inclusive of future people.

Denote the percentage growth rate in consumption at  $t$  by  $g(C(t))$ . A little work with the Utilitarian formulation of intergenerational well-being reveals that

$$1 + r(t) = (1+\delta)(1+g(C(t)))^\eta, \quad (2)$$

where  $\eta$  is a positive number, reflecting the degree of aversion to inequality in consumption across the generations. (It also happens to be an index of risk aversion.)

Now recall the intuitive argument as to why  $r(t)$  may be a positive number. We confirm that the above formula faithfully reflects that argument.

How should the social evaluator identify  $U$ ?

(1) Infer  $U$  from the choices people make as they go about their lives ("revealed preference").

(2) Choice behind the veil of ignorance (Harsanyi-Rawls).

(3) Altruistic parents concerned with dynastic welfare.

(4)  $V$  is to be arrived at through moral intuition about the tradeoffs among people to be permitted sequences (*Intuitionism*).

(5) Philosophical introspection (*Classical Utilitarianism* - Mill and Sidgwick)

Example: Economics of Climate Change:

Cline (1992):  $\delta = 0$ ;  $\eta = 1.5$

Nordhaus (1994):  $\delta = 3\%$  a year;  $\eta = 1$

Stern (2006):  $\delta = 0.1\%$  a year;  $\eta = 1$

NB: In the context of equation (2), the authors are close in their choice of  $\eta$ .

Notice also how close Cline and Stern are in their specifications of  $\delta$ .

The point estimate of consumption growth under business as usual in Stern (2006) is  $g(C(t)) = 1.3\%$  a year. Use this in equation (4) to obtain:

$\rho(t) = 2.05\%$  a year for Cline

$\rho(t) = 4.30\%$  a year for Nordhaus

$\rho(t) = 1.40\%$  a year for Stern

That is why Cline and Stern arrive at similar conclusions and why they differ in their recommendation from Nordhaus.

## **Sustainability Analysis**

### **Sustainable Development**

"... development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland Commission, 1987).

Note:

(i) "sustainable development" requires that relative to their populations, each generation should bequeath to its successor at least as large a *productive base* as it had itself inherited.

(ii) The requirement is derived from a relatively weak notion of intergenerational equity. Sustainable development demands that future generations have no less of the means to meet their needs than we do ourselves. It demands nothing more; it doesn't, for example, demand that development be *optimal* or *just*.

What does an economy's productive base consist of? It consists of stocks of:

(1) Reproducible capital (roads, building, machinery)

(2) Human capital (education, skills, health)

(3) Natural capital (sub-soil resources, ecosystems)

(4) Knowledge (arts, sciences and the humanities)

(5) Institutions (rule of law, social and cultural norms)

(6) Population



## The Progress of Nations

Country/Region	% annual growth rate 1970-2000					
	I/Y*	population per capita	TFP"	wealth	GDP	$\Delta$ HDI**
Africa	-2.1	2.7	0.1	-2.8	-0.1	+
Bangladesh	7.1	2.2	0.7	-0.8	1.9	+
India	9.5	2.0	0.6	-0.4	3.0	+
Nepal	13.3	2.2	0.5	-0.4	1.9	+
Pakistan	8.8	2.7	0.4	-1.4	2.2	+
China	22.7	1.4	3.6	4.8	7.8	+

\* comprehensive investment as share of GDP (average over 1970-2000)

" total factor productivity

\*\* change in HDI between 1970-2000

Adapted from Dasgupta (2001) and Arrow *et al.* (2004).

## Potential People

"For if we take Utilitarianism to prescribe, as the ultimate end of action, happiness as a whole, and not any individual's happiness, unless considered as an element of the whole, it would follow that, if the additional population enjoy on the whole positive happiness, we ought to weigh the amount of happiness gained by the extra number against the amount lost by the remainder. So that, strictly conceived, the point up to which, on Utilitarian principles, population ought to be encouraged to increase, is not that at which average happiness is the greatest possible ... but that at which the product formed by multiplying the number of persons living into the amount of average happiness reaches its maximum."  
(Sidgwick, 1907: 415-16)