TECHNOLOGY IS NOT A FREE LUNCH

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Introduction

There is concern that the biosphere is degrading. The Dasgupta Review of the Economics of Biodiversity expresses this as

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where G is the regenerative capacity of the biosphere and $\frac{1}{\alpha}$ is the amount of the biosphere used up in producing a unit of output.

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If the biosphere is not to degrade completely, $\frac{1}{\alpha}$ has to be reduced. It is hoped that technology can come to the rescue.

If Y grows without bound, then $\frac{1}{\alpha}$ has to approach zero if the biosphere is to survive. Dasgupta is sceptical about this.

Today I want to talk about a further problem. Technology has a downside that has not received much attention from economists and political scientists.

THE MODEL

We begin with a production function for the world

$$Y = A\, f(K, L, R)$$

where A is the level of technology, and R is the resource stock or biosphere.

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Assumption 1

The natural resource base, or biosphere, is finite and essential for production.

$$R \leq \overline{R}.$$

$$f(K, L, 0) = 0.$$

I add a term to the equation for the evolution of the resource stock.

$$R_{t+1} = R_t + g(R_t) - h(Y_t, A_t) - P(r_t, A_t)\delta(A_t)$$

where δ is damage due to malice, violence, or carelessness, and $P(r_t, A_t)$ is the probability that damage δ occurs in period t. P and δ are increasing in the level of technology A, and P is decreasing in the level of regulation r.

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Assumption 2

There exists $\overline{A}$ such that $\delta(A) > \overline{R}$ for $A > \overline{A}$.

Finally,

Assumption 3

$P(0, A_0) > 0$.

At the current (and therefore, every higher) level of technology, if there is no regulation, the probability that damage will occur is positive.

THE IMPLICATION

These three assumptions imply that if A grows large enough (and it is plausible that A is already large enough for damage to exceed $\overline{R}$), then unless r is kept high enough that $P(A_t, r_t) \to 0$ as $t \to \infty$, then for any $\epsilon > 0$, there exists a finite time horizon T such that the probability that the resource base survives until T is less than ϵ.

Discussion

Assumption 1 that the biosphere is finite and essential for production is uncontroversial, I think, and so is the fact that humanity possesses the technology to destroy the biosphere, for example, via a nuclear winter. The final assumption that the probability that a catastrophe will occur in every period in which A is high enough, is also, I think, reasonable.

These are sufficient to deliver the result that regulation has to be strict enough to send P to zero if catastrophe is not to be inevitable.

Discussion

Why is P increasing in A? This is because the spread of scientific knowledge itself makes that knowledge accessible to a larger number of people, albeit with a lag of several years. The internet and AI make it a lot easier to find out how to do not only useful things, but also how to put technology to destructive uses.

Discussion

As long as it takes a large number of people to cooperate to build and deploy a catastrophic weapon, the likelihood that enough such people will engage in such an undertaking remains small, if not zero.

Discussion

But information technology makes it easier and easier for smaller and smaller groups to acquire the necessary knowhow. This increases the probablility that some group will actually deploy a catastrophic weapon or do something stupid on a large enough scale to have a catastrophic result.

Discussion

As humans' power to manipulate the physical world as well as other people's thoughts grows, both the scale of a possible disaster and the likelihood of its occurrence grows. Manipulation of people's thoughts, directing them to rage and hatred of outgroups becomes a global problem, not a local one. Freedom of speech, if it permits such manipulation, is increasingly dangerous.

Technology, liberty, and safety, are an impossible trinity. We can have any two of them, but not all three.

Discussion

The laissez faire and reactive approach to regulating technology is likely to lead to disaster, since a lethal technology may be discovered and spread if regulation is purely reactive.

Discussion

The Westphalian norm that states should not interfere in the internal affairs of other states will become empty, if it has not already done so, because any state in which technology is unregulated is a danger to the rest of the world, so that there are no purely “internal" affairs left.

Discussion

The tradeoffs between the costs of regulating technology at a global scale and the risk of major disasters has to be faced. The costs can include slower benefits from technical progress, restrictions on liberty, and political centralization.