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CREATIVITY AND INTERDISCIPLINARITY: A RESPONSE TO RUBENSON AND RUNCO*

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Economic tools of analysis have occasionally been applied to phenomena that are viewed as psychological. The Bayesians (such as Levi, 1967) have used cost–benefit analysis to understand when we believe a proposition. Some economists have applied supply and demand curves to rats and pigeons in an attempt to understand how far "rational economic man" is needed for the fundamental economic results. Hamermesh and Soss (1974) provided an "economic" account of suicide in which income and age were important variables. Becker and Murphy (1988) have attempted to provide a rational economic account of addiction.

Applying economic tools of analysis to creativity, as have Rubenson and Runco, may seem at first glance not to be a promising research gambit. One of the primary assaults on mainstream neo-classical economics by the neo-Austrians (see Kirzner, 1973) is precisely that the maximization-under-constraints model of economists allows no place for creativity. To make matters worse, the authors may be undermining their efforts at proselytizing for the "economic approach" by their use of provocative examples such as the economics of tax evasion or the external "benefits" of cigar smoke. But then again, the authors may be more interested in stimulating thought than in winning assent.

The standard models of economics are useful for learning the optimal quantities of inputs a firm should use to produce a widget (given a known level of demand and a known technology). But there is much less agreement about how such tools can usefully be extended to deal with the process of devising a totally new kind of widget (or a totally new technology). The paradigmatic creative economic agent, the entrepreneur, often seems tacked-on in modern mainstream economic accounts.

Stigler and Becker (1977) argue that the comparative advantage of economists lies in the explanation of differences in human behavior on the basis of differences in constraints, not on the basis of differences in tastes or values. The more creativity is a matter of constraints (such as incentives to invest in "creativity capital") the more likely Rubenson and Runco are to have something interesting to say. The more creativity is a matter of different values or tastes (such as how risk-averse a person is), the less likely Rubenson and Runco are to have something interesting to say. Of course, the bold economist may someday

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try to give an optimizing account of risk-aversion, too. [Locay and I (Diamond & Locay, 1989) have attempted this in a limited way, using survival of the genes as the objective being maximized—but we only explain why humans are risk-averse, not why there are *differences* in the degree of risk-aversion. Rubin and Paul (1979) try to explain some differences.]

Rubenson and Runco enliven the debate about the usefulness of economic models in explaining psychological phenomena. But I believe that there are some respects in which their account could be enriched and strengthened. I will focus on the kind of creativity I have thought most about—creativity in science. In science, truth is the product and creative research is one of the inputs. Another input is the kind of puzzle solving work that Kuhn (1970) calls "normal science."

In my most extended account of the economics of science (Diamond, 1978, 1988b), I showed how scientists' decisions about theory acceptance as discussed by Kuhn *could* be explained by a model in which scientists maximize the scope and elegance of theories subject to constraints involving the allocation of time in the investment of human capital. I suggested that older scientists accept novel theories more slowly than younger scientists because it is optimal for the older scientists to invest less in creative research (and to invest more in normal science). In later work (Diamond, 1984, 1986) I adopted the more common (at least among economists) assumption that scientists maximize income and prestige (fame and fortune).

As Rubenson and Runco recognize, what their case (and my own) most needs now, is to sharpen and refine the abstract speculations by confronting them with empirical data. I would like to see more on the empirical determinants of creativity. How important are intelligence, risk-aversion, institutional incentives? Does the creator invest in "creativity" per se or in solving an artistic or scientific problem? How much is the creator subject to economic motivations and how much by the pure joy of the process (what economists sometimes call "psychic returns")?

Whatever other criticisms can be brought against Rubenson and Runco, they cannot be criticized for lack of intellectual ambition. In addition to arguing for the application of economic tools of analysis to understanding creativity, they also find space to argue for a policy conclusion: that our society underinvests in creativity.

The authors may be right, but their case needs to be strengthened. I believe that it can be shown that scientific research in our society is not at an optimal level: partly because we do not devote sufficient resources to science and partly because scientific institutions are not sufficiently efficient at making use of the current resources. (On the latter point, the authors will find comfort in the small but stimulating literature on rent-seeking activity in science, e.g., Carmichael, 1988; McKenzie, 1979; for a summary see Diamond, 1992b.) But this is not the same as saying, with Rubenson and Runco, that there is too little creative science relative to normal science (though I suspect that may be true too). Popper (1959) argued that good science consists of the proliferation of hypotheses. But most other views (such as Kuhn's) suggest that there can be too much creativity.

In their comments on policy (and implicitly throughout the paper), the authors assume that creativity is always good. Stated in the language of economics: the marginal benefit of creativity is always positive. But new ideas do not always prove better in science, anymore than genetic variation always proves better in organisms.

The problem is how do we encourage fruitful novelty and discourage unfruitful novelty? Students of creativity in science, too often focus on the novelty's successes, concluding that there is too little novelty (and too little acceptance of what novelty there is). Planck (1949), for example, is oft-quoted as saying: "A new scientific truth does not triumph by convincing its opponents and making them see light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it" (pp. 33–34). In early work (Diamond, 1978, 1980; Hull, Tessner, & Diamond, 1978), I found that older scientists are indeed somewhat slower to accept new theories than younger scientists. But if older scientists damage science by holding back fruitful novelty, might they not also benefit science by holding back unfruitful novelty as well? I attempted a single test of this hypothesis with the polywater episode (a paradigmatic case of unfruitful novelty) and found no relationship between age and the acceptance of a mistaken research project (Diamond, 1988a; see also Diamond, 1992a).

I intuitively agree with the authors that we are below the optimal level of novelty. But it would be wonderful if somehow, even in principle, we could imagine a way to measure the optimal level. And clearly it is not infinite, as the authors seem to imply. (The NSF, however, seems to agree that we are below the optimal level and is deliberately trying to increase the funding of creative, as contrasted with mainstream, scientists; see Marshall, 1989.)

Koestler (1967) argued that interdisciplinary work often leads to creativity. If Koestler is right, then the rigid disciplinary boundaries of our academic reward structure discourage creativity. Those like Rubenson and Runco, who apply the tools of one discipline to the problems of another are likely to be under-appreciated by both disciplines. In the long run, we should try to find ways to loosen disciplinary boundaries. In the meantime, may Rubenson and Runco's humidor be amply stocked with Havana cigars!

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