

RAWLSIAN INVESTMENT RULES FOR “INTERGENERATIONAL EQUITY”: BREACHES OF METHOD AND ETHICS

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HARVARD PROFESSOR OF PHILOSOPHY, John Rawls, can be credited with provoking the most recent angst over the issue of intergenerational equity. Rawls views intergenerational equity as a policy issue necessitating governmental intervention to manage “social saving and investment” for the benefit of the least advantaged generation. Economists John Hartwick and Robert Solow credit John Rawls’s treatise, *A Theory of Justice*, as the inspiration for their investment rules aimed at achieving intergenerational equity. For Rawls, saving and investing are equitable if these political judgments and actions increase or enhance the “welfare” of the least well-off generation of people (Rawls 1971, pp. 284–93).¹ Hartwick and Solow, however, address this Rawlsian concern not by focusing on the *needs* of the least favored generation, but rather by prescribing investment rules that assure each future generation a nondeclining level of per capita

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¹To apprehend his egalitarian approach to justice, Rawls urges one to apply a type of thought experiment in which the individual is asked to imagine one’s self experiencing a type of consciousness from behind a *veil of ignorance*. The individual is then asked to function as a kind of decision-making spirit. Behind the veil of ignorance, the individual has no specific knowledge about immediate circumstances of his existence. The veil of ignorance, as defined by Rawls, leaves the individual necessarily ignorant of any circumstances attendant to self-ownership, property, or resource scarcity. This situation establishes the *original position* from which egalitarian principles of justice are to be self-evident (Rawls 1971, pp. 136–42). For a spirited critique of Rawls’s veil-of-ignorance technique see Hoppe (1998, pp. xiv–xv). Hoppe is particularly critical of Rawls for ignoring the issue of resource scarcity.

consumption. In advancing their own versions of Rawlsian intergenerational egalitarianism, both economists have employed aggregate neoclassical models in which individual generations of people are assumed to be able to act for the welfare of all generations. This paper focuses on the troublesome breaches of method and ethics implicit in the agenda proposed by Hartwick and Solow.

Their breaches in method arise from the well-recognized but not universally acknowledged fact that the “positivist” methodology applicable to the physical sciences is not and has never been appropriate to the scientific study of human action. In brief, these respective areas of scientific inquiry reflect a sharp duality of method (Mises 1998, pp. 17–18).² The “apparent regularity” of observed phenomena in the physical sciences has accommodated application of mathematics and quantitative techniques to the physical or natural sciences. But such techniques are inapplicable to the case of individual human beings who act to achieve subjectively chosen ends; to achieve these ends, they bear the subjectively reckoned opportunity costs of employing scarce, privately owned means. Human action, the focus of the social sciences, is manifested in goal-oriented behavior of conscious individual human beings, whereas the object of study in the physical sciences is not (Rothbard 1997a, p. 12). While the science of human action is empirical in the sense that it is premised on the introspectively apparent fact that individual human beings act to achieve desired ends, no quantifiable laws of action are possible (1997a, pp. 32–33). No formal quantitative techniques are applicable because, for each individual human being, the benefits and costs of any particular act only emerge as subjective rankings in the minds of thinking human beings. Moreover, these subjectively established rankings are subject to variation as the circumstances of time and place facing the individual actor change.

Hartwick and Solow employ an analytical framework that is essentially neoclassical, meaning that it is formal and mathematical. While Hartwick and Solow make no explicitly methodological statements in their analyses, the neoclassical models central to their analyses are premised on a methodology that presumes objective content for and a “functional relationship” between aggregated variables. The presumption of objective content provides the loose but invalid connection to positivism. Their presumptions of objective content and aggregability necessarily mean that their analytical framework is entirely divorced from the actions of individual human

² See also Mises 2006 (pp. 34–36; 2003, pp. 9–12).

beings. This approach to economic inquiry eschews methodological individualism and treats generations of people as actors undertaking investment actions on behalf of all generations, present and future.

Methodological breach, in the case of Hartwick and Solow, centers on the fact that the concepts of capital that they presume to apply only have a coherent meaning in a praxeological context—that is, within the context of the goal-oriented action of individual human beings. The ends chosen in acting reflect those aspirations that are most highly ranked by individuals but can only be revealed by their demonstrated choices (Rothbard 1997a, p. 212). Hartwick and Solow fail to grasp the fact that concepts such as price, consumption, capital, saving, Hotelling rent, opportunity cost (including user cost), profit, and depletion only manifest themselves in the goal-seeking actions of individuals rather than in metaphorical but nonetheless nonexistent actions of generations of people. Hence, as examples, the notions of "intergenerational equity" and "constant level of consumption for each generation" are revealed to be epistemologically empty concepts. Issues of equity and constant consumption are obviously contingent on the valuations of people populating future generations and the future scarcities that will emerge from the goal-oriented actions undertaken by such people. Hence, no epistemological framework exists in which to even define intergenerational equity, to say nothing of formulating an "inter-temporally egalitarian policy" to achieve it.

John Hartwick supposes that current generations are not making sufficient allowance for depletion of exhaustible resources and are not making sufficient "investment" to assure at least a constant level of per capita consumption for future generations. To address this concern, the Hartwick Rule offers the following injunction:

Invest all profits or rents from exhaustible resources in reproducible capital such as machines. . . . Under such a program, the current generation converts exhaustible resources into machines and "lives off" current flows from machines and labor. . . . For the case of per capita consumption remaining constant over time, one could say that no generation was better off than another. (Hartwick 1977, pp. 63–65)³

³Hartwick's ideas on investment are premised on the assumption that resource exhaustion is a virtual certainty. The market price of the unrecovered resource is assumed to increase through time with increasing scarcity brought on by what is assumed to be the "inevitable exhaustion." Economic conservation, then, is a matter of exploiting the resource at a rate that establishes equivalence between the rate at which the net present value of *in situ*

While John Hartwick's aggregative examination of intergenerational equity was published several decades ago, his analysis has had a powerful influence on contemporary thinking about policy.⁴ On the extent of Hartwick's influence, John Pezzey and Michael Toman have recently observed the following:

Hartwick's rule is probably the single most powerful influence on sustainability policy . . . Many governments and multilateral institutions have invoked it, consciously or not, when declaring the importance of investing rents from natural resource depletion in building up capital in the rest of the economy. (2002, pp. 63–65)

Robert Solow is impressed by Hartwick's injunction in suggesting that:

the policy of investing resource rents in reproducible capital suggests irresistibly that some appropriately defined stock is being maintained intact . . . consumption can be regarded as the "interest" on that stock. *This interpretation turns out to be quite right.* (Solow 2002, p. 72; emphasis added)

In other words, Solow is prepared to use Hartwick's prescription as a type of analytical paradigm in examining the issue of intergenerational equity.

Hartwick and Solow share certain perspectives on intergenerational equity but differ in the way in which they view the scope of the "problem" and the nature of what they view as the solution. For example, Hartwick implicitly sees the requisite level of investment as an example of market failure that is the responsibility of an interventionist government to correct. Robert Solow is very sympathetic to the implicit market failure theme of the Hartwick Rule. But Solow makes the market failure assumption more explicit largely because he sees Hartwick's injunction as an interventionist paradigm with more extensive application to a much broader set of concerns. For example, Solow sees the relevant "capital stock" in much more inclusive terms to include resources of an essentially "environmental nature." Hence, Solow envisions the Hartwick Rule as a paradigm

deposits increases and the rate of return obtainable by the investor in competing investments. This simple decision rule is the Hotelling Principle (see Hotelling 1931). Morris Adelman has debunked the exhaustion assumptions of the Hotelling Rule (Adelman 1995; 1993). See also, Brätland (2007, pp. 386–93). Adelman's perspective is discussed below.

⁴ Hartwick has reprised this scheme in his 2000 book, pp. 88–101.

applicable to public investment in resources yielding services not availed through market exchange.

In such cases, the same general principles apply [principles as outlined in the Hartwick Rule] as to other forms of capital. The same intellectual framework will cover reproducible capital, renewable and nonrenewable resources and environmental "capital." (Solow 1992, p. 13)

But for both Hartwick and Solow, ethical breaches accompany those of method. The ethical breaches are apparent in the denial and contravention of private property implied in their broad policy prescriptions. Just as the modern day research in intergenerational equity ignores the importance of individual human action, it also tends to turn a blind eye to the boundaries established by ethically established rights of private property. Hartwick and Solow both implicitly sanction public ownership and control of what should otherwise be privately controlled resources. The steps necessary to achieve this public ownership involve flagrant ethical flaws in their ambitious interventionist agenda.

THE HARTWICK RULE

Hartwick views extractive resources as part of a nation's "capital stock." In most countries, these resources are located within lands that are decreed by governments to be owned by the public. Hartwick's prescription that Hotelling scarcity rents be invested in "reproducible capital" is premised on the notion that the rents are a legitimate measure of resource exhaustion borne by society as a whole, and that capital maintenance is merely a matter of physical replacement of physical things that are to serve as substitutes. He takes the view that Hotelling rents, as represented by the royalty receipts of governments, should be seen as a form of social savings that should be used in a certain way for the benefit of both current and future generations (Hartwick 1997, p. 972). Hartwick has responded by constructing a mathematical model implicitly reliant on assumptions of the following sort: (a) Hotelling scarcity rents are reflected in public royalty revenues and are an objective indicator of social user cost; (b) capital maintenance is physical replacement rather than a praxeological undertaking of individuals; and (c) aggregative analysis in which governments rather than individuals are the actors; and (d) institutions of governmental resource tenure that foreclose just acquisition of private rights of property. Hartwick's methodological and ethical breaches emerge out of these assumptions.

A. Breaches of Method in the Hartwick Framework

In part, the methodological breaches implicit in the Hartwick Rule can be traced back to ethical issues bearing on the presumptive ownership of resources by landlord governments. This assumption led Hartwick to treat Hotelling rents as though they were somehow unrelated to or not contingent upon the underlying property rights governing resource recovery. Other methodological errors in Hartwick's formulation arise from errors first committed by Harold Hotelling in formulating his theory of exhaustible resources. Harold Hotelling was first and foremost a mathematician, not an economist, whose avocation was the attempted application of mathematical concepts to economic issues (Darnell 1989). True to typical form, Hotelling's approach to economics was premised on the use of formal models in which variables are objective magnitudes amenable to empirical assessment. However, for one to treat variables as objective, one must adhere to strong, virtually impossible assumptions of equilibrium. With such equilibrium assumptions, issues of human action and uses of property by individuals are made essentially extraneous to the analysis. But in fact, the legitimately defined concepts underlying Hartwick's theory are essentially praxeological and have no coherent meaning outside the context of individual human beings using property to attain chosen ends.

1. Hotelling Rents as Objective Data Rather than a Praxeological Concept

Neoclassical economists like John Hartwick and Harold Hotelling implicitly find themselves treating neoclassical equilibrium as a presumptive description of reality. This assumption of equilibrium allows economists to treat future prices of the exhaustible resource as pre-existing realities. Genuine uncertainty plays no role. The same objectivist assumptions hold for all costs of extraction. The Hotelling Principle is actually premised upon an equilibrium in which the praxeological process of equilibrating speculation is somehow an *ex post* accomplished fact. Hence, given the assumptions of the Hotelling model and Hartwick's use of it, there is no scope for entrepreneurial action. In essence, the praxeological nature of Hotelling rents is denied. Were such an equilibrium state possible, Hotelling rents would be an empirically measurable economic phenomenon.

Within this objectified framework, Hotelling rents, for the market as a whole, are assumed to be growing as the global scarcity of the respective exhaustible resources increases through time. As noted above, this rate of growth in the net price of the resource is

established as the equilibrium rate of return of competing investments. To the extent that this equality is ever attainable, the present value of marginal Hotelling rents would be equal for each future time period. In idealized circumstances, marginal Hotelling rents, as realized in current acts of extraction, would be precisely equivalent to marginal opportunity cost or incremental user cost as reflected in the expected present value of future net receipts relinquished. At the margin, Hotelling rents and Hotelling user costs are the opposite sides of the same act. User cost is the incremental reduction in the present value of future rents relinquished through the current acts of extraction. It is this framework upon which Hartwick's investment rule is built.

But this deterministic precision is nonsense in light of the fact that true markets are dynamic and uncertain, in which case action necessarily requires judgment (Brätland 2000, pp. 14–15). Hotelling rents are praxeological constructs realizable through voluntary human action and the unencumbered use of private property. Hotelling rents do not exist in any legitimate form outside of the bounds of human action and personal use of private property. To this extent, the act of extracting a resource in any time period involves a reckoning of a user cost. The reckoning is really a matter of judgment in the face of genuine market uncertainty. Hence, Hotelling rents never emerge as objective data to anyone—including the extractive firm. User cost, as the obverse of scarcity rent, is always a subjective magnitude; it is a property owner's reckoning of the present value of the marginal net gain relinquished by the current act of extraction or resource recovery. It is an entrepreneurial conjecture based on the acting entrepreneur's understanding of the market's future. Moreover, in a realistic disequilibrium world, no two actors are likely to see the future of the market in exactly the same way; owner-entrepreneurs may evince optimism or pessimism, boldness or timidity at any one moment in time. These subjective reactions to the future make the reckoning of any user cost a matter of entrepreneurial judgment (Lachmann 1986, p. 66).⁵

⁵ In addressing the general issue of "user cost" in the firm's efforts to establish "profits," Peter Lewin observes:

It is the division between "true profit" and profit unadjusted for user cost that is the problem. . . . The judgment involved in measuring the [former] affects the profit calculation and lends it an unavoidable element of arbitrariness. This means that profits, even

Clearly this empirical barrier has stark implications for presumed governmental uses of Hotelling rents that have been proposed by the Hartwick Rule; the judgment involved lends them (rents) an unavoidable element of arbitrariness. Even if assessed retrospectively, rents necessarily contain elements of subjective judgment or convention. Extractive firms in the same industry, even if they owned identical extractive operations, could impute the same Hotelling rent only if they had imputed user cost at the same rate. Hence, the act of trying to discern Hotelling rents cannot simply be a matter of examining accounts. On the limitations of cost accounts Mises notes the following:

cost accounting . . . does not operate with uniquely determined magnitudes that can be found out in an objective way. Its essential items are the result of an understanding of future conditions, necessarily always colored by the entrepreneur's opinion about the future state of the market. (Mises 1998, p. 346)

The correct inference is that Hotelling rents are a praxeological concept and an epistemological empty box from the perspective of a regulatory authority or a landlord government.

2. Capital Maintenance as Physical Replacement, Not a Praxeological Act

Only individual human beings act; all action involves the use of property by the owner even if action is restricted to the use of one's body. All uses of property by the owner involve a valuation or ranking of alternative uses. The most highly valued relinquished use of property is the opportunity cost of its use. Only individual property owners bear opportunity cost; social aggregations of individuals do not bear costs. But these realities are far removed from Hartwick's thinking. Under properly defined and properly acquired rights of private property, Hotelling user costs of exhaustion would be reckoned by owners and would be borne by those owners. This reckoning would govern actions undertaken to maintain capital. The problem arises from John Hartwick's assumption that the citizens of a territorial state are the legitimate collective owner of the land and the resources within that territory. For this reason, Hartwick is able to make no reference to the process by which exhausted deposits of the affected resource are explored and replaced by individual investors responding to increasing, privately borne user cost. This oversight

measured retrospectively, necessarily contain elements of subjective judgment or convention. (1999, pp. 164–65)

leads Hartwick to assume that the government must bear the responsibility for replacing exhausted resources with other forms of physical capital. In other words, this prescription disregards the role that could be performed by private property owners facing implications of resource exhaustion.

Under legitimately established property rights, *user cost is not an external cost but rather an internal cost borne largely by the legitimate owners of the extractive enterprise* (Brätland 2006, pp. 38–39). In the extractive industries, private entrepreneurs undertake replacement investment routinely and repeatedly. *In fact replacement of resources is a praxeological undertaking to maintain capital.* For many so-called exhaustible resources, the reserve base expands through exploration and development by private property owners (Adelman 1995; 1993). At the margin, exhausting reserves become less profitable thus inducing entrepreneurs to discover and develop new deposits. This replacement process requires no "public investment." The array of investment options and the subjectivity of opportunity costs associated with investment choices convey the reality of the process by which capital is maintained (Brätland 2007, pp. 386–93). The process of replacement is essentially a process by which all developers manage their respective portfolios seeking the highest rate of return consistent with their subjective attitude toward geological risk and market uncertainty. This process only unfolds through acts of speculation aimed at maintaining the income of privately owned assets.⁶

3. Hypostatization: Treatment of Generations as Actors

In his 1962 book, *Ultimate Foundations of Economic Science*, Ludwig von Mises labels this treatment of social aggregations as an example of "hypostatization." Mises defines hypostatization as the act of ascribing substance or real existence to mental constructs or concepts. Mises offers the following observation on the error in this type of thinking when thinking about "society, for example": "society itself is neither a substance, nor a power, nor an acting being. . . .

⁶ More than any other economist, Ludwig von Mises fully understood the productive nature of speculation. In his book *Socialism*, he trenchantly noted:

Speculation provides for the adjustment of supply and demand over time and space. . . . The alleged contrast between profitability and productivity does not exist. . . . Speculation performs a service which cannot possibly be eliminated without curtailing not only profitability but productivity as well. (1953, p. 144)

Society does not exist apart from the thoughts and actions of people” (2006, pp. 70–72).⁷

Hypostatization implicitly permeates the entire field of intergenerational equity and is patently evident in the Hartwick Rule. Each generation is treated as an individual actor undertaking actions to preserve the level consumption for future generations. Concern is focused on the investment necessary *by each generation* to maintain a constant or nondeclining level of consumption for each succeeding generation. Hence in applying the Hartwick Rule, the government is the principal agent assuming the responsibility of assuring that intergenerational equity is indeed achieved. As an example, note the following comment on the application of the Hartwick Rule offered by Geoffrey Heal:

if a country invests an amount equal in value to the market value of its use of exhaustible resources, then it solves the Rawlsian problem and achieves the highest possible level of utility for the least well-off generation. Remarkably, it also achieves the highest feasible constant level of utility given the economy’s initial stocks of capital and resources. (1998, p. 8)

Aside from the fact that “utility,” as a quantifiable magnitude, does not exist either for an individual or a generation of people, the generation is presented as the entity that does the investing (Brätland 2006, p. 16). But as noted above, this assumption ignores the central and critical role of private rights of property and reliance on the action of individual human beings. Yet, to reiterate a central point, only individual human beings act; generations of people cannot own property and cannot act.

In major part, this lapse into hypostatization can be attributed to the misguided and largely unchallenged notion that intergenerational equity is a public good requiring action by the state. While Hartwick himself does not explicitly state that intergenerational

⁷Friedrich Hayek was also critical of the tendency to ignore the individual in the metaphorical treatment of social aggregations in the social sciences:

[M]ethodological collectivism . . . treat[s] wholes like society or the economy, . . . as definitely given objects about which we can discover laws by observing their behavior as wholes . . . [as] social phenomena not as something of which the human mind is a part and the principles of whose organization we can construct from the familiar parts, but as if they were objects directly perceived by us as wholes. (1991, pp. 93–94)

equity is a public good, this assumption is implicit in his presentation and, incidentally, virtually all literature dealing with intergenerational equity. In his book, *A Theory of Justice*, John Rawls notes:

It follows that arranging for and financing public goods must be taken over by the state and some binding rule requiring payment must be enforced . . . it follows that the [social] minimum . . . maximizes the expectations of the least advantaged group. By adjusting the amount of transfers . . . it is possible to increase or decrease . . . the long-term prospects of the least favored extending over future generations. Each generation must . . . put aside in each period of time a suitable amount of real capital accumulation. (1971, pp. 267–85)

Public goods are defined as being (1) nonrivalrous in consumption and (2) yielding benefits that do not allow the provider to exclude others from enjoying the benefits of the goods. With these properties, the theory of public goods seems to necessitate an interventionist role for government in dealing with externalities affecting large numbers of people. This interpretation accords with that of John Rawls's view of "social minimum" that each generation is presumably obligated to provide for the least favored generation.

The above definition of "public good" is misleading in that the classification of something as a public good is a premised on valuation that can only be made by individual human beings (Hülsmann 1999, p. 16). Moreover, given that subjective valuations of individuals are central to a thing being classified as a good, "their private or public character depends on how few or how many people consider them to be goods, with the degree to which they are private or public changing as these [subjective] evaluations change" (Hoppe 2006, pp. 8–9).

4. Aggregate Production Functions and Hartwick's Reproducible Capital

Hartwick's methodological breaches also arise from his reliance on mathematical models of a nation's entire economy. In fact, Hartwick's model is an example of the way in which mathematical specification can dominate economic content and economic conclusions of the analysis. He assumes the existence of a production function for an entire nation in which aggregate output is defined as a *single good*. This output is specified as a mathematical function of three aggregated inputs: physical capital, exhaustible resources, and labor (Hartwick 1977, p. 972). In this function, proportionate increases in these three factors yield a greater than proportional increase in output (increasing returns to scale). Also, (physical) capital is infinitely

substitutable for exhaustible resources.⁸ As Hotelling rents increase though time (as they are assumed to do from increasing scarcity), output and consumption are maintained as these rents are invested in “reproducible physical capital” (p. 973). With these latter assumptions, Hartwick has, in major part, defined away the presumed challenge of maintaining at least a constant level of consumption for future generations. Regardless of the fact that the input of exhaustible resources may become increasingly small as exhaustion is assumed to occur, the level of per capita output and consumption are maintained by investing the expanding levels of Hotelling rents in the so-called “stock of reproducible capital.”

But Hartwick’s mathematical exercise is clearly empty and meaningless. Considered more broadly, one must always be critical of efforts to employ aggregate production functions in any form of economic analysis. Peter Lewin observes:

If all of the relevant inputs are correctly identified, then it is possible, in principle, to replicate (therefore duplicate) the process [of production]. . . . Replication, identification or production of the “same” event is thus quite simple. In the social sciences, however, everything depends on correctly identifying these relevant conditions. Although simple, well-understood physical processes, like some production processes, are easily replicated, the transition from these to the aggregate economy level is extremely problematic.

At the very simplest level, there is the insurmountable problem of aggregation of the diverse outputs and inputs and the correspondence of aggregate statistical value to the theoretical symbols (supposedly in purely physical terms). (Lewin 1999, pp. 74–75)

Lewin goes on to refer to the aggregate production function as a metaphorical device inviting conversation and not to be interpreted

⁸Consider Hartwick’s aggregate, per capita, Cobb-Douglas production function in which x is per capita output, k is per capita capital, y is per capita exhaustible resources, and l represents a unit of labor:

$$x = k^{\alpha} y^{\beta} l^{\delta}, \quad \alpha + \beta = 1, \quad \alpha + \beta + \delta > 1.$$

In this aggregate production function, α , β , and δ are respectively output elasticities for capital (k), exhaustible resources (y), and per capita labor (l). The output elasticities for the three factors of production each have values less than one, but which sum to a value greater than one. Hence, the function reflects increasing returns to scale.

literally (p. 75). Hartwick's model should be seen in this skeptical light.

Hartwick is committed to the idea that "capital" can somehow be spontaneously reproduced by governmental siphoning of royalty revenues from resource extraction into expenditures on "machinery." In his words, "invest all profits or rents from exhaustible resources in reproducible capital. . . ." But in this case the reproducibility is contingent on a governmental investment rule. This perspective is an absurdity. Capital is a praxeological reckoning that only emerges within plans of entrepreneurs (Mises 1998, p. 512). The reckoning of capital is a praxeological function that only has meaning within a market framework fostering economic calculation. There is nothing automatic about the creation and maintenance of capital; the extent to which it is reproducible is strictly an entrepreneurial judgment about the extent to which capital replacement is warranted in light of conjectured future net revenues. Hence, the injunction that governments invest their Hotelling rents in reproducible capital is meaningless.

B. Ethical Breaches Implicit in Hartwick's Rule

The ethical breaches in Hartwick's investment rule all bear on the origin and nature of the private rights of property. Three breaches of ethics arise from the land ownership institutions presumed to be legitimate in the real world model he chose as a rationale for his theory. The first breach of ethics revealed in Hartwick's investment rule is seen in the fact that landlord governments do not, in general, have any legitimate property rights in lands bearing exhaustible resources.⁹ In the choice of the Canadian model as an inspiration for his theory, he was implicitly sanctioning government nationalization of lands bearing exhaustible resources. But John Locke observed that "commands of the state" are never a means by which ownership rights come into being. Murray Rothbard has expanded upon Locke's theory of property by presenting the logical actions that may be undertaken by *individual human* beings to secure rightful or ethical ownership (Rothbard 2004, pp. 91–93). Rothbard notes that the individual owns himself and hence the product of his own efforts. Also, the individual may become a legitimate owner of external property through a voluntary gift or grant from another party. In addition, the individual may, by appropriating a hitherto

⁹The exceptions would be uncoerced purchase by government or by a voluntary donation to government. However, an uncoerced purchase could not be financed through a coercive procedure for raising revenue.

unused and unowned resource and applying his own labor in the use of the unclaimed resource, rightfully claim ownership; this latter means to ownership has been labeled *original appropriation*.¹⁰ With respect to resources already owned, the individual may acquire legitimate ownership by making or manufacturing goods that have value in use and/or value in exchange. Finally, the individual may acquire property rights through the actions of *voluntary* exchange with another individual.

Publicly “owned” lands have generally been acquired by governments through edicts or the arbitrary exercise of political power; no ethically legitimate action of original appropriation and voluntary exchange brought these lands into governmental ownership. The preceding observations on the legitimate origin of property ownership leads one to the logical and correct inference that a government does not have proper title to the so-called “public lands” even though its monopolistically held coercive power to enforce claims is clearly acknowledged. The principle one applies in making this latter inference is the requirement that title to *previously unowned assets* such as exhaustible resources can only be established by an act of *original appropriation* or by legitimate purchase free of coercive taxation to raise funds for the acquisition. Such a requisite act of original appropriation would be satisfied by the entrepreneurial discovery of and production from a discovered deposit (Rothbard 1998, pp. 71–72).¹¹

A second ethical breach follows from the first. The lack of any just property claim to subsurface resources on the part of the landlord government necessarily implies the absence of any rights to a revenue share (royalty) of any subsequent production of an exhaustible or depletable resource. In essence, the governmental confiscation of these revenues should most accurately be seen as a governmental tax imposed upon the respective extractive industries, not as the collection of economic rent by a landlord owner. The resource defined by the land surface should be recognized as a separate resource distinct from *in situ* resources; the same legal principles of original appropriation should apply to *in situ* resources as should apply to the original appropriation of land surface. As Murray Rothbard has emphasized

¹⁰The phrase “original appropriation” is John Locke’s (1970, pp. 305–06).

¹¹Under Rothbard’s proposal, the means to acquisition of resource ownership is cast as Lockean original appropriation.

the answer depends on the justice of property title established in each specific case. *Where, for example, an oil company . . . lays claim to the oil field which it discovers and drills, then this is its just "homesteaded" private property, and it is unjust for the . . . government to tax or regulate the company. . . . the government's claim is illegitimate and invalid, and the company [i.e., lessee], in the role of homesteader is properly the owner and not merely the renter of the oil land.*

. . . Ethically, any new company that enters the scene to discover and drill oil is the proper owner of its "homesteaded" oil area. (1998, pp. 71–72; emphasis added)

Hence, the Hartwick Rule embodies a breach of ethics premised on an invalid theory of property.

The third breach of ethics in the Hartwick Rule stems from the implicit sanction of antiproperty institutions (regulations) employed by all landlord governments to extract royalty receipts from entrepreneurial firms functioning as lessees. Not only is the presumptive ownership of royalties by landlord government illegitimate, the institutional strictures imposed upon lessees to capture royalties are a further assault on property rights of lessees. The royalty receipts accruing to any landlord government arise from the enforcement of court-enforced covenants imposed to protect the interests of the "royalty owner" [the government]. But these covenants are in fact an infringement on private property rights of lessees who have borne risk and invested capital in uncertain extractive ventures. *Aside from the fact that governments have no ethically legitimate claim to the royalties, the upshot of this additional assault on property rights is that royalty receipts accruing to the landlord government are not representative in any legitimate way of true Hotelling rents that could emerge if property rights of the lessee-developer were ethically respected (Brätland 2001, p. 694).*

The issue is resolved if first discoverers acquire full ownership of resource deposits through the process of "original appropriation." Surface owners would no longer have a contingent claim to a share (royalties) of the resource produced from beneath their property and would not be able to use state-imposed law to override the timing and investment decisions of the owner. As a full owner, the discovery firm would be able to manage the resource as a capital asset (Rothbard 1998, pp. 71–72). The costs and benefits of replacing these capital goods would be borne and enjoyed by the individual entrepreneurial firms.

ROBERT SOLOW'S EXPANSION OF HARTWICK'S RULE

In attempting to formulate his own views of intergenerational equity, Robert Solow was influenced greatly by John Rawls's *A*

Theory of Justice but, unlike Rawls, he focused more specifically on the role of natural-resource management. Also, by focusing on natural resources, Solow saw an opportunity to apply John Hartwick's investment rule as a paradigm for a more broadly defined type of intergenerational equity. Solow uses Hartwick's investment rule as a metaphor to define an expanded governmental role in the maintaining and repairing of an aggregate resource base that includes a very broad definition of environmental resources. One could aptly say that Solow sees the world as one colossal exhaustible resource to be managed collectively by individual generations for the benefit of all future generations that will ever exist. For Solow, private property plays no particular role in assuring intergenerational equity, which means that the praxeological nature of investment and resource depletion is ignored. Moreover, for Solow, private rights of property are no particular barrier to the governmental confiscation of resources necessary to intervene in the name of intergenerational equity. In other words, the so-called "savings" necessary to implement Solow's investment agenda is acquired through confiscatory taxation. Hence, Solow's attempt to apply Hartwick's Rule in addressing Rawlsian concerns also harbors breaches of both method and ethics.

A. Solow's Two Theoretical Propositions

Solow contrives two theoretical propositions from "Hicksian ideas" focusing on issues of capital and income. In his book, *Value and Capital*, John R. Hicks states: "We ask, not how much a [businessman] actually does receive in the current week, but how much he would be receiving if he were getting a standard stream of the same present value as his actual expected receipts. That amount is his income" (1946, p. 184). This return is the income yielded to the individual through his *ownership* of a "capital asset." As described by Hicks, sustainable income suggests a capital asset or assets yielding a return over time. Hick's stated purpose in offering this definition was to convey a definition of what businessmen "can consume without impoverishing themselves" (p. 172). In other words, this definition of income for the businessman would be sustainable indefinitely. Sustainable income for the individual businessman will be the net of the expenditure of resources required for the maintenance of those assets yielding the time-stream of income. To the extent that the actor avoids these expenditures, capital is consumed, but to the degree that additional maintenance expenditures are made that assure an increase in sustainable income, the individual has been engaged in acts of "saving" (Mises 1998, p. 261).

But Robert Solow seeks to apply these concepts to the presumed "decision making of a nation" or a generation of people. The underlying premise in Solow's thinking is that resources can be managed at an aggregate level to achieve goals that are defined in aggregative terms. His earlier explorations into the neoclassical theory of growth provide a classic example (Solow 1956, pp. 65–94). His treatment of intergenerational equity provides another. This fact is made evident in the way Solow intends to apply these Hicksian perspectives on consumption and income to an entire economy viewed as an aggregate whole. It is in this latter context that Robert Solow develops his two "theoretical propositions" for investment in furtherance of intergenerational equity. The following passages are quoted at length to more thoroughly note the nature of his errors in understanding the issue of intergenerational equity for society as a whole.

The first [theoretical proposition] tells us [that] . . . [a]t each instant, net national product indicates the largest consumption level that can be allowed [each] year if future consumption is never to be allowed to decrease. . . . The economy's net national product in any year consists of public and private consumption and public and private investment. . . . The components of investment . . . have to be valued. That is where the "rightness" of prices comes in. . . . The right prices will make full allowance even for the distant future, and will even take account of how each future generation will look at its future. . . . This story makes it obvious that everyday market prices can make no claim to embody that kind of foreknowledge. (1992, p. 16; emphasis added)¹²

Solow's first theoretical proposition purports to establish a quantifiable relationship between net national product and the maximum portion of aggregate income that can be consumed during a particular time period without jeopardizing consumption that can be enjoyed by future generations. But Solow does not have conventional consumption in mind in talking about NNP. He is including, for example, the services yielded by environmental assets and a broad gamut of things not traded in conventional markets. This

¹²Solow presses the point:

Least of all could the prices of natural resource products, which are famous for their volatility, have this property; but one could entertain legitimate doubts about other prices, too. The hope has to be that a careful attempt to average out speculative movements and to correct for other imperfections [such that] . . . *adjusted prices . . . might serve as a rough approximation to the theoretically correct ones.* (1992, p. 16; emphasis added)

notion seems to mean that requisite investment must be based on a type of “welfare imputation.” Hence, in evaluating the investment necessary to achieve intergenerational equity, Solow rejects the use of market prices because of their presumed inaccuracy and imperfections. Instead, Solow advocates the use of theoretically correct prices or “shadow prices” that make appropriate allowance for “the distant future” in assessing the legitimate level of productivity.

In his second theoretical proposition, Solow enunciates what he sees as the relationship between net national product and a “broadly defined capital stock”—namely that the former is an interest return on the latter.

[T]he second [theoretical proposition] . . . [p]roperly defined and properly calculated, this year’s net national product can always be regarded as this year’s interest on society’s total stock of capital. It is absolutely vital that “capital” be interpreted in the broadest sense to include everything, tangible and intangible, in which the economy can invest or disinvest, including knowledge. . . . And the interest rate that capitalizes the net national product will generally be the real discount rate implicit in the whole story. Investment and depletion decisions determine the real wealth of the economy, and each instant’s NNP [net national product] appears as the return to society on the wealth it has accumulated in all forms. (Solow 1992, p. 17; emphasis added)¹³

Robert Solow claims to have gained a deep insight by interpreting these two theoretical propositions in conjunction with each other. For example, in Solow’s first principle, NNP is seen as the highest attainable “consumption” that can be achieved by a generation from a given stock of capital as it exists at any particular moment in time. *But in his second principle, this same NNP is interpreted as the product of the “stock of capital” and the “unchanging discount rate.”* He concludes that if one goal of economic policy is to make investment and depletion decisions this year in a way that does not erode “sustainable income,” it must simultaneously be a program of investment that maintains the broadly defined capital stock. “The neat interpretation of allowable consumption as the interest on an initial patrimony or resource endowment seems quite appropriate. It is a reminder of the old fashioned obligation to ‘maintain capital intact’” (Solow 2002, p. 72). These thoughts of Solow’s reveal a number of related methodological errors that are examined in the following pages.

¹³Robert Solow credits Martin Weitzman with this idea (Weitzman 1976, pp. 156–62). However, Solow’s proposition is nearly a paraphrase of Fisher’s definitions of capital and income (Fisher 1965, p. 52).

B. Methodological Breach Implicit in Solow's Propositions

Since Solow's world is replete with market failure, his theoretical propositions are intended to reflect an expanded application of Hartwick's collectivist investment rule. Like Hartwick, Solow clings to a physical view of capital that is devoid of any praxeological meaning and erroneously attaches meaning to aggregates such as net national product (NNP) which he views as a type of return on the broadly defined capital stock. He presumes to "correct" NNP through the use of shadow prices that are epistemologically empty and totally meaningless from a praxeological perspective. He ignores or fails to understand that capital is a praxeological concept that only has coherent meaning within the context of individual human action. Solow views generations of people as actors who should be employing an unchanging social discount rate—a rate that is ostensibly unhinged from the market rate of interest, which emerges from the time preferences of actors pursuing their own ends.

1. "Properly redefining NNP" through "theoretically correct shadow prices"

Clearly the matter of a "corrected net national product" is intended to play a central role in Solow's formulation. The error committed with respect to this issue has two facets. The first centers on the methodological legitimacy of the concept of net national product (NNP), as the term is used in common economic parlance. The second facet arises in the fact that Solow's analysis bears upon the adjustments that he presumes to make by employing "theoretically correct" prices or shadow prices. Unfortunately, the concept of net national product is illegitimate even in a market-based system with calculational foundations. On the epistemological emptiness of the concept of NNP, Ludwig von Mises observes

it is nonsensical to reckon national income or national wealth. As soon as we embark upon considerations foreign to the reasoning of a man operating within the pale of a market society, we are no longer helped by monetary calculation methods. The attempts to determine in money the wealth of a nation or of the whole of mankind are as childish as the mystic efforts to solve the riddles of the universe. . . . If a business calculation values a supply of [a commodity] at \$100, the idea is that it will be possible to sell it or to replace it against this sum. If a whole entrepreneurial unit is estimated [at] \$1,000,000, it means that one expects to sell it for this amount. But what is the meaning of the items in a statement of a nation's total wealth [or income]? What is the meaning of the computation's final result? . . . The businessman can convert his property into money but a nation cannot. (Mises 1998, p. 218)

One of the principal motives for Solow's pretense that NNP legitimately measures something is that intergenerational equity, in its modern sense, is implicitly aimed at some type of intertemporal redistribution of "welfare" between generations. The concept of "properly imputed" NNP lends credence to the illusion that something can be "divided up" and managed in such a way that intertemporal transfers can be centrally managed (Rothbard 1997b, pp. 171–79). Elsewhere Mises employs even more withering language to suggest the vacuity of the idea behind the NNP or national income concept and the implicit redistributionist agenda behind its use.

The concept of national income entirely obliterates the real conditions of production within a market economy. It implies the idea that it is not activities of individuals that bring about the improvement (or impairment) in the quantity of goods available, but something that is above and outside these activities. This mysterious something produces a quantity called "national income," and then a second process "distributes" this quantity. . . . The political meaning of this method is obvious. (Mises 2006, p. 77)

But Solow would modify the already invalid NNP concept to address still broader purposes. To attain these more broadly defined ends, Solow presumes to adjust its content by employing theoretically correct shadow prices. Shadow prices are generally defined as "an imputation of value of a commodity or service which has no market price . . . that may be calculated reflecting the marginal opportunity cost or the marginal value of their use as inputs" (Pearce 1992, p. 391). Unfortunately, the latter two concepts have no objective reality because they have no praxeological foundation. That is, the shadow prices do not reflect the actions of parties employing property to achieve chosen ends. Hence, the shadow-price concept is "operationally empty." This grossly apparent error only tends to highlight the critical importance of private property and monetary exchange in arriving at legitimate market prices. But one of the gigantic blind spots in the economics of intergenerational equity is its nearly total failure to address private rights of property owners. By ignoring private property rights, all activities within the economy appear to be candidates for a "market-failure designation." Of central importance is the fact that private property empowers the property owner and confers rights to choose uses to which property is put. *The central issue bears upon the ways in which the institution of private property creates incentives and imposes costs that prevents wasteful uses of what is owned.* In being able to choose desired uses and impose a cost upon other parties seeking the services of scarce resources, the owner has the ability to define its economic scarcity.

Whether a good is scarce or plentiful from this standpoint depends, in major part, on the wishes of the owner(s) of that good. . . . Whether a particular good will be scarce or plentiful relative to the demand for its use then depends on how much property that good's owner demands for it. The question of how to "best" produce something cannot be answered outside of the framework of a property rights system that determines what factors are economically available for its production. Indeed the availability of factors in an economic sense plays a role in determining what should be produced in the first place. (Mahoney 2002, p. 43)

Ownership imparts a social signal of scarcity in the use of resources that shadow prices or theoretically correct prices cannot hope to replicate. Hence, Solow's prescribed use of shadow prices to correct NNP and provide guidance for establishing the true productivity of alternative investments only compounds the absurdity of his proposal.

Solow imputes another meaning to NNP that reveals additional errors: "net national product measures the maximum level of current consumer satisfaction that can be sustained forever" (1992, p. 16; emphasis added). In responding to this observation, one must first acknowledge that NNP is an aggregation. It would seem that Solow is guilty of the presumption that interpersonal comparisons of utility are possible. All interventionists are trapped by the uncomfortable reality that utility does not exist and that value, in all circumstances, can never be more than a subjective ranking of alternatives made by individual human beings. Hence, welfare inferences of whatever stripe are necessarily empty. There is no legitimate policy inference that can be drawn with respect to consumer satisfaction and the aggregate number purporting to represent net national product or national income. But equally important is the fact that the actions determining the breakdown between consumption and what is to be saved for capital investment are praxeological in nature and can only be made by private entrepreneurs attempting to arrive at rational uses of private property. This latter issue is addressed in the following section.

2. A "Broadly Defined Capital" and the Praxeological Nature of True Capital

In his commitment to applying the Hartwick approach to intergenerational equity, Solow believes that a nation should invest an amount equivalent to some sort of broadly-imputed economic reckoning of resource depletion. In Solow's view, attaining this goal solves the Rawlsian problem for the nation and simultaneously

achieves the Rawlsian objective of assuring the highest possible level of welfare for the least well-off generation. But in Solow's assessment, this result also achieves the highest feasible constant level of "utility" given the economy's initial stocks of capital and resources. Solow's so-called resource base is much broader than that assumed by Hartwick in his formulation of an intergenerational investment rule. Solow repeatedly emphasizes that the capital stock must be defined on the broadest possible basis. But the "broadly defined capital stock" to which Robert Solow makes reference is an aggregation of disparate things that defy any coherent, rational reckoning.

Nonetheless, Solow advances the notion that

the same approach [reference to the Hartwick Rule] can be applied to environmental assets. . . . The environmental case is more complex, because even a stylized model of environmental degradation and rehabilitation is more complex than a model of resource depletion. The principle is the same, but the execution is even more difficult. (1992, p. 19)

Solow is able to make such a statement because he is implicitly assuming that some sort of valuation is imputable for these heterogeneous "things." At this stage, Solow intends to apply theoretically correct shadow prices. With the use of these shadow prices Solow apparently intends to establish some sort of commensurability that could serve as a guide for public policy on intergenerational equity. With shadow prices, Solow presumes to make welfare inferences for future generations and to make judgments on what type of broadly defined capital stock will assure future generations a constant level of consumption—"broadly defined."

Solow embraces a totally erroneous view of capital and is oblivious to the fact that outside of the institutions of property and monetary exchange, there can be no calculational basis for maintaining capital intact. As noted earlier, capital itself is a praxeological concept. If one were to employ the Misesian definition in which capital is the net dollar equivalent of all assets committed to a particular undertaking at a defined moment in time, this amount would presumably be the starting point for the construction of a capital aggregate. If one could legitimately assume general equilibrium, free of the realities of uncertainty and change, an aggregation of such individual reckonings of society's capital stock would have some claim to legitimacy (Kirzner 1966, p. 121). But capital is a matter of judgment and action directed toward the attainment of a future net return. "It is a product of reasoning, and its place is in the human mind. It is a mode of looking at the problems of acting, a method of appraising them from the

point of view of a definite plan" (Mises 1998, p. 512). Mises stresses the fact that capital calculation is necessarily undertaken by individual entrepreneurs—not by society as a whole. Entrepreneurs make their plans in uncertain and evolving market environments. The planning process of entrepreneurs requires judgment and foresight. The future is not known and is not predetermined in any way, implying that the appraisal of capital or the assessment of the worth of a business is always a matter of judgment on the part of the entrepreneur. "Capital is always accumulated by individuals or groups of individuals in concert, never by the *Volkswirtschaft* or society" (Mises 1998, p. 513). Hence, the concept of capital only has coherence and logical meaning within the context of an entrepreneurial plan. Moreover, this kind of planning is only possible in a market economy in which capital maintenance is reckoned in market prices that emerge from arm's length exchanges between property owners.

But what of all the additional things that Solow would bring into his broadly defined capital stock? While the preceding comments are a legitimate criticism of Solow's methodology, they do not address what are clearly his broader concerns of intergenerational equity. Solow would somehow agglomerate incommensurable things into his "broadly defined capital stock." Nonetheless, capital and its depletion cannot be types of metaphorical aggregates as seem to emerge in Solow's grand plan. Capital cannot be defined in terms of broad inclusive aggregates of tangible or intangible things that may or may not yield benefits to populations or generations as a whole. In his intent to aggregate all of these "useful and vital things," Solow makes no mention of individual property owners engaged in market exchange. He chooses to ignore or perhaps misunderstands that capital itself must first be private property. Its depletion or depreciation must be a private, subjective reckoning employing the tools of economic calculation. The existence of capital must involve a personal commitment of privately owned resources to uses consistent with entrepreneurial objectives. If one of the numerous things that Solow would include in the capital stock is to become legitimate capital, it must be privately owned and made an integral part of entrepreneurial plans. Private property and monetary exchange allow the owner of capital to make *rational* decisions about the use and maintenance of privately owned capital goods. It is through this private stewardship of private property that resources are bequeathed to the future.

However, certain "resources" may not be owned and, to some, may appear to be used in a way that fosters environmental damage, nuisance, or change that seems inconsistent with what some would

view as intergenerational equity. In these cases, concerns of intergenerational equity can only be assured by policies that (a) foster a stricter enforcement of existing rights of private property; (b) facilitate original appropriation of unowned resources in the Rothbardian sense described above (Rothbard 2004, pp. 91–93); or (c) make possible privatization of resources currently held by governments. Concerning environmental issues that arise in the context of intergenerational equity, properly defined rights of private property are essential because implicit in the concept of private property is the concept of tort protection from damage perpetrated by the actions of others (Brätland 2006, p. 34). These protections provide assurance that actions are based on a reckoning of cost inclusive of any possible advertent or inadvertent damage that may be done to the property owned by other people.

3. “The Unchanging Rate of Discount” in Solow’s Second Theoretical Proposition

In Solow’s second theoretical principle, *GNP is interpreted as the product of the properly defined “stock of capital” and the “unchanging discount rate.”* Presumably Solow is making reference to the mythical social rate of discount that plays such a central and popular role in much of interventionist economics. Only this rate is ever viewed as being “unchanging.” The idea of a social rate of discount is premised on the notion that there is a rational basis for social discounting of the future that deviates from market rates of interest. But does the idea of a constant social discount rate have any praxeological legitimacy? Before proceeding further, one should first be clear that the very subject of social discount rates is premised on society acting as some sort of collective. Note the rationale for using a social discount rate offered in a leading dictionary of economics: “individuals’ collective behavior toward the future differs from their behavior as individuals” (Pearce 1992, p. 398). Is there any legitimate embodiment or example of “collective behavior”? At one point, Solow actually acknowledges that “generations do not make decisions; families, firms and governments do” (Solow 1992, p. 17). Yet the entire thrust of Solow’s discussion seems to suggest that generations of people are the actors making investment decisions requisite to the achievement of equity for future generations. For Solow, generations inherit “a capital stock in the very broad and inclusive sense that matters. In turn, each generation makes consumption, investment, and depletion decisions” (p. 17). But the maintenance of this broadly defined capital stock becomes the responsibility of a generation of people acting in some sort of collective to avoid “high consumption” and to

live up to the ethic of intergenerational equity. "A concern for sustainability implies a bias toward investment . . . enough investment to keep the broad stock of capital intact" (p. 18).

As noted above, Ludwig von Mises has expended some effort to debunk this notion of collective action and collective behavior:

Society is not an entity in itself. . .

But awareness of this fact does not justify dealing with social relations as if they were something else than relations, or with society as if it were an independent entity outside or above the actions of individual men. (Mises 1958, pp. 251–52)

An unchanging *social* rate of discount would need to be based on an unchanging rate of time preference on the part of individual members of society. But time preferences can change and do change just as all preferences are subject to change. Clearly, an unchanging social rate of discount does not and cannot exist in any legitimate sense.

Solow and other theorists do not cast the analytical problem as an intertemporal trade-off between benefits enjoyed today versus benefits enjoyed in the future. Rather, in the case of intergenerational equity, the relevant trade-off is between the benefits enjoyed today by a current generation of people and the benefits enjoyed in the future by another generation of human beings. Hence, theorists presume that the problem cannot be viewed simply as a matter of maximizing expected net worth, as would be the case in private investment decisions. Intergenerational equity calls for an egalitarian treatment of generations with the logical inference being that any positive discount rate implies an asymmetry in treatment between present and future generations.¹⁴ Nonetheless, as emphasized above, intergenerational equity, to the extent that the phrase has any legitimate meaning, is contingent upon the ability of individuals to secure and even expand the rights of private property for the people currently living. Clearly, the idea of a social rate of discount, in the sense

¹⁴Not surprisingly, Solow is not entirely clear on what he really thinks about this issue:

You may wonder why I allow discounting at all. I wonder too: no generation "should" be favored over any other. The usual scholarly excuse—which relies on the idea that there is a small fixed probability that civilization will end during any little interval of time—sounds farfetched. We can think of intergenerational discounting as a concession to human weakness or as a technical assumption of convenience (which it is). (1992, p. 10)

meant by Robert Solow, is antithetical to that end since its use is implicitly premised upon governmental use of private property.¹⁵

Solow is under the sway of collectivist dogma and is unable to accept the notion that praxeological reckonings of the trade-offs between the present and the future must be made by individual human beings. These individuals are dealing with scarcity and facing the need to make a rational reckoning of the uncertain future returns that may be achievable through acts of saving (Mises 1958, pp. 250–56). Personal acts of saving are at the heart of whatever provision is made for future generations. Capital goods are a reflection of this provision for the future and emerge only in acts of saving in which individuals forsake consumption in the present in exchange for the prospect of a net return in the future. In reckoning this trade-off, people generally place a higher ranking on what can be consumed or enjoyed in the present over what can be availed in the future. But for each individual, this ranking is a subjective reflection of personal time preference and judgments of uncertainty associated with the passage of time. Willingness to save is contingent on an expectation that the individual will be availed of some premium sufficient to reverse rankings arising from a positive time preference. In other words, a future dollar plus the expectation of some sufficiently large premium or return is preferred to the dollar in the present. This premium is sufficient to induce the individual, cognizant of uncertainty, to become a net supplier of present goods and net demander of future goods. But to the extent that originary interest is a manifestation of human action, it can never be unchanging, in the way that Solow seems to suggest. As conditions change or as personal preferences are altered, originary interest must also change.

C. Ethical Breach Implicit in Solow's Investment Rule

The breaches of ethics in Solow's treatment of intergenerational equity arise from the contravention of property rights implicit in the state's acquisition of resources. Like Hartwick's prescriptions for intergenerational equity, Solow's agenda involves acquisition of revenue by the state for which the state has no ethically legitimate claim (Hoppe 2001, p. 13). For example, "the split between private and

¹⁵The market rate of interest—or the originary rate—has a definite calculational foundation that is consistently ignored by Solow. The originary rate only becomes a useful expression of economic scarcity, uncertainty and time preference in an economic environment in which property rights of individual human actors are secure and in which market exchange is indirect—that is, supportive of monetary exchange.

public investment has to be made in essentially political ways, like the split between private and public saving" (Solow 1992, p. 20; emphasis added). With this statement, Solow has stepped off the ethical precipice. Centralized management of resources is to be introduced through a process of property predation undertaken by democratic governments. The acting agent is not the individual property owner ranking different courses of action in the uses of his property; rather, the agent is the government acting as a proxy for generations of people. Governments make decisions in the name of society for the benefit of current and future generations. Obviously, these actions are not anchored or grounded in private rights of property. The terms "saving" and "investment" take on a meaning quite alien to secure rights of private property. They are euphemisms that actually refer to governmental theft through taxation: "theft is theft, whether undertaken by one man against another, or by a group, or even by a majority of people within a given territorial area. The fact that a majority might support or condone an act of theft does not diminish the criminal essence of the act or its grave injustice" (Rothbard 1998, p. 164).¹⁶ Hans-Hermann Hoppe has trenchantly noted the role of such theft in the context of presumably "beneficent state intervention."

Whatever any given state does in terms of positively evaluated contribution to society, and however great or small the extent of such contributions might be; whether the state provides for . . . society's infrastructure, money, steel or peace; or even if it does all of these things and more, it would be completely fallacious to enumerate all of this and leave it at that. *What must be said in addition is that the state can do nothing without the previous noncontractual expropriation of natural [ethical] owners.* Its contributions to welfare are never an ordinary present, even if they are given away free of charge, because something is handed out that the state does not rightfully own in the first place. *If it sells its services at cost, or even a profit, the*

¹⁶In this same publication, Rothbard employs equally blunt language in commenting on the ethical legitimacy of taxation:

If the State, then, is a vast engine of institutionalized crime and aggression, the "organization of the political means" to wealth, then this means that the State is a criminal organization, and that therefore its moral status is radically different from any of the just property-owners that we have been discussing in this volume. . . . For, as a criminal organization with all of its income and assets derived from the crime of taxation, the state cannot possess any just property. (Rothbard 1998, p. 183)

means of production employed in providing them still must have been appropriated by force. And even if it sells them at a subsidized price, aggression must continue in order to uphold the current level of production. ... It must be stressed that the state rests on an institutionalized appeal to motivational energies that people in their private lives would regard as criminal and accordingly would do everything to suppress. (Hoppe 1989, p. 164; emphasis added)

Moreover, as noted above, Solow's proposed use of an unchanging discount rate is a further assault on property rights. Scarcity necessarily implies that the rate of discount can never be administered at an interest rate below the market rate as some theorists seem to suggest. To impose a lowered discount rate would mean that the rationing device of private property would no longer be fully operative since such a rate could only be applied by a government having obtained resources through taxation or other types of taking. The notion that a lowered social discount rate should be employed in the name of intergenerational equity would also imply a public policy in which the time preferences of individual human beings would be overridden and private rights of property would necessarily be less secure.

CONCLUDING COMMENTS

John Rawls outlined an interventionist investment "ethic" intended to enhance the welfare of the "least favored" generation. John Hartwick and Robert Solow devise a Rawlsian agenda intended to assure at least a "constant level of consumption" for each generation, but each treat this goal very differently. Hartwick views constant consumption in more traditional terms and as a goal achievable by government reinvestment of the Hotelling rents that are supposedly reflected in governmental royalty receipts. On the other hand, Solow views consumption in much broader terms to encompass the benefits of what some would loosely label "environmental resources."

Hartwick's methodological breaches are evident in (1) his assumption that Hotelling rents are an objective magnitude reflected in royalty receipts when, in reality, these rents are a subjective entrepreneurial reckoning that can only be made by property owners; (2) his assumption that the user cost associated with resource depletion is an external cost borne by society as a whole when, in fact, user cost is privately borne by property owners and serves as a private inducement for capital replacement; (3) his treatment of generations as actors when in fact only individual human beings act; (4) his use of aggregate production functions and his definition of capital stock

as an aggregation of physical things; and (5) his injunction that Hotelling rents be invested in reproducible capital when in fact capital is never reproducible but only replaced by entrepreneurial property owners making judgments concerning the future of markets.

Ethical breaches in Hartwick's analysis arise from the fact that governments generally do not have an ethically legitimate property claim to nationalized lands or the royalties generated from these lands. Land ownership can only arise initially through acts of original appropriation. The collection of royalty revenues by governments is in fact a theft of private property. The additional ethical breach is that the leasing institutions employed by governments to collect royalties are a further assault on property rights, destroying any assumed equivalence between royalty receipts and what would otherwise be Hotelling rents.

Like John Hartwick, Solow seeks to present an agenda that achieves a nondeclining level of what he refers to as "consumption." But for Solow, consumption embraces a very broad gamut of benefits. Also like Hartwick, his theory deals with aggregates intended to apply to an entire nation. Solow builds his theory around definitions of capital and income that would *only* have legitimacy and relevance to an individual making decisions with the benefit of economic calculation. Income is defined as that level of consumption that can be sustained by a nation without eroding the value of capital. Solow contrives two theoretical propositions as guidelines for public policy to achieve intergenerational equity. First, net national product (NNP) becomes the amount that can be consumed by society without jeopardizing the sustainability of consumption for future generations. But Solow admonishes that market prices cannot be used to reckon the investment necessary to maintain the desired level of consumption and the maintenance of a "broadly defined capital stock." For Solow, consumption must include the services yielded by, for example, environmental assets, which must be included in the aggregated capital stock. The second theoretical proposition offered by Solow is that the modified or imputed NNP should be seen as being equal to the product of an *unchanging social rate of discount* and the broadly defined capital stock.

Solow's theoretical propositions reveal the following methodological breaches: (1) the NNP is itself a meaningless aggregation and even more of an absurdity when "corrected" with what are postulated to be "theoretically correct shadow prices"; (2) theoretically correct shadow prices are empty because they are reliant on the imputation of opportunity cost—an epistemological impossibility; (3)

Solow's broadly defined capital stock agglomerates incommensurable things and, hence, ignores the central importance of calculational reckoning behind any legitimate concept of capital; (4) the unchanging social rate of discount is premised on an interventionist political agenda it has no legitimate praxeological existence; and (5) like Hartwick, Solow mistakenly treats generations as actors; these "social aggregations" exist only in actions of individuals.

Ethical breaches found in Solow's prescription are similar to those found in Hartwick's analysis in that they revolve around assaults on private property. Specifically, the revenue required to maintain Solow's broadly defined capital stock will, in effect, be confiscated private property in the form of tax receipts.

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