

CHAPTER 3

INTER-TEMPORAL ETHICS, MODERN CAPITAL THEORY AND THE ECONOMICS OF SUSTAINABLE FOREST MANAGEMENT

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Abstract: In this exploratory chapter, I examine how the disciplines of forest economics, capital theory and ethics, insofar as they pertain to decisions taken over time, each provide a lens with which to view the other. More specifically, I read texts of Kant, Laslett, Bourdieu, Cowen-Parfitt and Mitra-Wan-Ray-Roy and attempt to place the general theory of inter-temporal resource allocation within a larger conversation on intergenerational justice taking place in political and sociological theory. I thereby seek to develop a vocabulary for exploring alternative possibilities for social, political and communal bonding by giving meaning to terms such as sustainability, efficiency and equity for the ‘optimal’ allocation of common or environmental (measurable or non-measurable) resources over time.

There is no better way ... of compelling us to recognize the character of our subject, its problems and its limitations, than by asking questions of an ethical type. (Laslett, 1987)¹

The choices of ecosystem capital are complex and problematic precisely because these entail systems (holistic) aspects that defy reduction to the venerable fiction of commodities and gross substitution along undifferentiated needs. [The] results may be frustrating for those who seek simple answers, but such are not to be found. The decision on the appropriate rate of discount or allocation of ecosystem capital would entail judgements concerning the relevant context and constraints. (Kant, 2003b)²

As everyone knows, priceless things have their price, and the extreme difficulty of converting certain practices and certain objects into money is only due to the fact that the conversion is refused in the very intention that produces them, which is nothing other than the denial of the economy. (Bourdieu, 1983).³

It has never been usual, and it is certainly not easy, to think in terms of duration when considering issues of ethical and political theory. ... Here political theorists encounter a circumstance notorious to mathematicians and statisticians, that infinity is a fundamentally elusive concept (Laslett & Fishkin, 1992)⁴

1. INTRODUCTION

Economists do not have a comparative advantage when it comes to ethics, particularly equity and justice across generations, at least by virtue of the expertise that economic science⁵ affords them; and the science of forestry economics has been increasingly framed in the last twenty years so that issues of justice and intergenerational equity have been brought to the forefront and given a central role. Thus, in terms of the capital-theoretic issues that I want to present as being relevant to the economics of forestry, I have two options. The first is simply to ignore an imposing and rich critical literature, recently surveyed by Kant (2003a), on the grounds of disciplinary competence, if not of disciplinary relevance. The other option, the one that I do take in this chapter, is present the work in the light of this criticism, coping with it and learning from it as best as it can, and committed to an inter-disciplinarity, however fuzzy, in the belief that “we must do what we can with instruments whose inadequacies and capacity to mislead have been recognized and allowed for.”⁶ This being said, and especially since I am exercising this option under the rubric (and partial title) of the relevance of modern capital theory to the economics of forestry, I need to underscore my belief also in the importance of the technical work that I report; the danger of disciplinary hubris, an arrogation of a single discipline’s voice as the sole and substantive one, is easier to recognize in others than in oneself.

The outline of this chapter, then, is as follows. First, by an exegetical reading of Kant’s delineation of the boundaries of the economics of forestry, I spell out what I see to be the basic motivating vocabulary of this side of the subject, the grammar of a language game that explicitly engages inter-temporal ethics, and in its multifacetedness, goes both inside and outside economic theory bound to its more restricted notions of inter-temporal equity, conventionally fueled by utilitarian impulses and reflexes. Next, using the work of Laslett as a guide, work that deserves to be better known and engaged not only by economists, I place this vocabulary of inter-temporal ethics and sustainability into that of another conversation, one being conducted, for want of a better characterization, in the space of political theory. These larger issues of inter-temporal obligation and submission, when conceived within the relatively narrower frame of environmental economics, and in particular that of the economics of forestry, inevitably revolve around the notions of capital and the rate of discount. Thus, in a subsequent section, I draw on a neglected paper of Bourdieu to give (perhaps a fuller) meaning to the notion of ecosystem capital and use this more capacious view of capital to point to recent work of Cowen-Parfit that surveys and reconsiders the issue of a positive social rate of discount. With these markers and guideposts in place, I turn to capital theory, as conventionally but not universally articulated, and use the Mitra-Wan tree farm and the Mitra-Ray-Roy orchard to cull from the literature a “folk theorem” which, despite an imposing amount of work, has not been given the attention that it perhaps deserves. In a concluding section, I point towards the interstices and lacunae that are identified in the various vocabularies that I have read, recapitulated, recounted.

2. ON THE BOUNDARIES OF FOREST ECONOMICS

In his useful survey, Kant (2003a) brings future generations into sharp salience, and uses them to articulate basic principles of the economics of sustainable forest management (*SFM*).

The basic idea behind *SFM* is to manage forests in such a way that the needs of the present are met without compromising the ability of future generations to meet their own needs. Under the umbrella of ‘both-and’ principle, four sub-principles – principles of existence, relativity, uncertainty, and complementarity – will be of paramount importance to guide the evolution of the economics of the *SFM*. [These] five principles may become the foundations of the economics of *SFM* (51).⁷

I defer to the next section a consideration of the terms embodied in the phrase needs and ability of future generations, all of fundamental consequence for my subject, and turn to the explication and translation of the second sentence. The ‘both-and’ principle is seen as stemming from post-Newtonian physics and to be contrasted with the ‘either-or’ principle of Newtonian physics and of neo-classical economics, an important marker for several papers in the subject.⁸ These difficulties and indeterminacies of translation do not dog the four sub-principles.⁹

The ‘principle of existence’ suggests that we cannot ignore the existing situations because these conditions have survived a long time. The ‘principle of relativity’ suggests that an optimal solution is not an absolute but a relative concept. The ‘principle of uncertainty’ suggests that due to uncertainties in natural and social systems, a social agent may never be able to maximize his outcomes, but will always search for positive outcomes, and therefore resource allocation will be improved by adaptive efficiency and not by allocative efficiency. The principle of complementarity suggests that human behavior may be selfish as well as altruistic, people can have economic values as well as moral values, and people need forests to satisfy their lower level needs as well as higher level needs (51).

The first principle can be read in two opposing ways: first, to take account of existing conditions so as to change them, and not to avoid facing them simply because they have survived so long into the present; or secondly, to take account of them in a way that is resistant to change and reads their survival as an equilibrium that is not only stable but desirable, an equilibrium that presumably testifies, in the words of Burke, to a social contract.

Society is indeed a contract ... a partnership in all science; a partnership in all art; a partnership in every virtue and in all perfection. As the ends of such a partnership cannot be obtained in many generations, it becomes a partnership not only among those who are living, but between those who are living, those who are dead, and those who are to born. Each contract of each particular state is but a clause in the great primeval contract of eternal society, linking the lower with the higher natures, connecting the visible and the invisible world.¹⁰

It is this identification with Burkean conservatism that leads Kant to argue for “forest rotation based on the annual allowable cut” as opposed to Faustmann’s rotation; it has “dominated forestry practices all over the world for centuries against all economic arguments of forest economists (51),” and before advocating changes, “one” needs to be clear that the resulting “new situations would be, in total, better or worse, than existing situations (51).” The important qualification here is the phrase

in total; it cautions that all costs, including transaction and institutional costs, ought to be taken into account. More specifically, in his discussion of the forester's rotation, Kant draws attention to uncertainties in production, transactions costs and increasing returns. Thus, conservative or radical, the tension in the 'principle of existence' lies in subscription to the way in which the *status quo* has been conceived and formalized, and to the resulting argument that rests on this formalization and thereby validates interferences with it and to it. The confidence that one attaches to proposed changes derives from the confidence that the optimization problem mandating these changes has taken the essentials of the situation into account, on how its initial conditions have been formalized, aspects that it excludes and includes. In asking for the theorems that have been appealed to for the formulation of a theorem, Kant's 'principle of existence' is also gesturing in an important way, it seems to me, towards the ethics of theorizing.¹¹

It is through his second principle that Kant reaches out to a binary with an illustrious genealogy in both ethics and economics. The relative/absolute terminology forms the basic decomposition of meaning that Wittgenstein draws on in his 1929 lecture on ethics,¹² and when Kant emphasizes, for illustrative purposes, the distinction between Aboriginal and industrial values, and between different "frames of reference" leading to different principles of forest management, he is well within the orbit of Wittgenstein's discussion.

If we consider (6.422) an ethical law of the form "You ought ..." the first thought is "And what if I don't?" – as though it were a statement of *relative value*. With a judgement of absolute value the question makes no sense. To understand any judgement of [absolute] value we have to know something of the culture, perhaps the religion, within which it is made, as well as the particular circumstances that called it forth; what the man had done, what the question was when I spoke to him, and so on.¹³

Thus, in his second principle, Kant has moved from the relative comfort of the technicalities of the solution of an optimization problem to the absolute difficulties of its "correct" formulation.

It is perhaps here that I also need to mention how Keynes (1930) appropriates Wittgenstein's binary for his own purposes; namely, to distinguish between absolute and relative needs.

Now it is true that the needs of human beings may seem to be insatiable. But they fall into two classes – those needs which are absolute in the sense that we feel them whatever the situation of our fellow human beings may be, and those which are relative in the sense that we feel them only if their satisfaction lifts us above, makes us feel superior to, our fellows. Needs of the second class ... may indeed be insatiable ... [b]ut this is not so true of the absolute needs – a point may soon be reached ...when these needs are satisfied in the sense that we prefer to devote our further energies to non-economic purposes.¹⁴

Thus, when Kant deduces from his principle of relativity that "optimal solutions will be situation specific and will in many cases will be beyond market cases (51)," he is referring both to situations that Keynes had in mind as well as to those where the economic problem is pressing to such an extent, the absolute needs so overwhelming, that questions of immediate justice rather than those of efficiency come to the fore. And here as well, the question of what theoretically constitutes

absolute needs, and how a collective agreement is to be reached on their precise constitution, goes directly to what I am labelling by the phrase "ethics of theorizing." As such, there is an important overlap, a common orientation if one prefers, between Kant's principle of existence and his principle of relativity.

Kant's third principle, involving as it does the distinction between the *natural* and the *social*, and in particular in emphasizing a *social agent*, rests on the distinction between *adaptive* and *allocative efficiency*. In the review itself, he does not elaborate this distinction, confining himself to a footnote abstracting the work of Douglas North.

Adaptive efficiency is concerned with the kinds of institutions that shape the way an economy evolves over time. It includes the willingness of a society to acquire knowledge and learning, to induce innovation, to undertake risk and creativity, and to resolve problems of society through time.¹⁵

The issue here is not the subscription to these laudable objectives – who would disagree with them? – but one of how a *society* and a *social agent* is conceived so as to further the attainment of these objectives? And again, how are such a collective agreements to be reached? In emphasizing institutional design, Kant is clearly emphasizing the formulation of the optimization problem, and the purposes that it embodies, to which the new institutions are to respond. Put another way, institutions have to be designed with respect to a picture of some common objectives, and it is the articulation of this commonality, an agreement as to their outlines, the less fuzzy the better, that is the heart of the issue.

In Kant and Berry (2001), an attempt is made to go beyond the standard economic prescription of solving these issues of the "commons" through either a precise delineation of property rights or through government intervention involving price or quantity directives. The authors focus on what they term *resource regime*, and the dependence of output on such a regime through the *transaction function* as a crucial variable in the formulation of policy. Thus, they conclude their useful paper as follows.

[I]n developing economies the state regime will frequently not be optimal for management of forest resources located near populated areas. Similarly where forests are leased to private companies but the local communities are heavily dependent on these forests, a joint regime between the company and local communities may be optimal.

The ground is by now a familiar one. There are different stake-holders and any solution that does not takes their interests and leverages into account will be undercut to yield outcomes that can be improved upon. Optimal solutions are only optimal to the extent that they take adequate account of the conditions that go towards determining the problem. This is a rather obvious point but it is indeed surprising as to the extent to which disciplinary imperatives, rather than local conditions, motivate the relevant theorizing. The numerical and geometrical illustrations provided in (Kant & Berry, 2001) show how effectively this point can be made even when the complex notion of a *resource regime* is formulated in the stark simplicity and uni-dimensionality of a real number. Thus, Kant's distinction between *allocative* and *adaptive* efficiency is more a plea for care in the formulation

of the optimization problem rather than a distinction between theoretical and institutional economics or between qualitative and quantitative theorizing, neo-classical economics and its "other".¹⁶ Once we focus on efficiency, adaptive or allocative, we are focussing on maximization, on how best to attain our objective given the means that are available to us. The adjectival qualifiers simply alert one to how the objectives and the means are to be conceived and formulated. It is again a question of theorizing, and the ethics and politics that underlie it.

Kant's fourth and final principle, that of complementarity, is, at one level, a succinct summary of the issues that I have already tried to articulate. The crucial marker here, one that takes the place of *society* and *social agent* in the 'principle of uncertainty', is that of the *people*. It is only with reference to it that the binaries of selfish/altruistic, economic/moral, higher/lower are given play. I have already located these binaries in the work of Wittgenstein and Keynes in connection with the 'principle of relativity', and Kant (2003a) gives them further attention in the reading that recent literature, particularly that of Haines (1982), gives to the work of Marshall.¹⁷ While emphasizing the need for this important hierarchical decomposition of the space of unknowns, commodity space if one likes, that is at stake here, I shall not give it further consideration, and turn instead to the formalization of a public agency, the agent on whose behalf the optimization problem is being formulated, and for whom its solutions are being implemented.

In this connection, and given my emphasis on Laslett's work in the sequel, it is perhaps appropriate to begin with a 17th-century thinker who first interrogated the concept of the *people* and the contracts, agreements and arrangements that rest on it.¹⁸

The people, to speak truly and properly, is a thing or body in continual alteration and change, it never continues one minute the same, being composed of a multitude of parts, whereof divers continually decay and perish, and others renew and succeed in their places. They which are the people this minute, are not the people the next minute.¹⁹

Even now these sentences go to the nub of the matter: in their denial of the fact that *people* can have no durational existence and therefore cannot enter into political arrangements with a well-defined representative, they ask whether the understanding of *human behavior* is secured through the aggregation of the social from the individual, or does one, by necessity, have to rely on the social to give meaning and definition to the individual. This basic question regarding methodological individualism can be put another way. Can cooperative outcomes, to be sustainable, be generated only through competition and the pursuit of individual self-interest – the so-called Nash program? Or is a common history or tradition or a supra-individual agency, a collective such as a *state*, *society* or *community*, necessary for the requisite bonding and trust that is indispensable for the allocation of (common or environmental) resources? And if so, how is such an agency and a basis for commonality to be discerned, formalized and articulated? To approach the matter yet another way, one that gives an adequate emphasis to issues involving planning over horizons of time concerning which no single agent has purview, much less jurisdiction or control, how is one to attain the conceptual and philosophical

clarification concerning formalizations of social and community interdependence that is to be incorporated in any proposed optimization exercise?

Just as an illustration of how these two poles – an acceptance of the qualitative and essential difference between micro and macro frameworks versus an aspiration towards giving the latter a foundation through the former – are to be negotiated, I appeal to two thinkers that represent these positions. In the first place, Rawls is a thinker whose work is a sustained theoretical attempt at narrowing divergent interests and delineating positions on which members of a particular polity can reach consensus and agreement. Rawls (2001) writes:

Our aim is to uncover a public basis for a political conception of justice. In describing the parties we are not describing persons as we find them but rather ... according to how we want to model rational representatives of free and equal citizens. We impose on the parties certain reasonable conditions as seen in the symmetry of their situation with respect to one another and the limits of their knowledge (veil of ignorance).

The question is what does Rawls' theory of justice²⁰ say about *sustainability*, *efficiency* and *intergenerational equity*? How does the symmetry of individual parties, especially those not yet born, translate into optimization exercises based on a zero rate of discount? On what basis does one form a sustainable consensus? How does one delineate those considerations which are amenable to agreement and exclude those that are not? In the second place, and as a representative of thinking that is orthogonal to methodological individualism, I turn to Hegel. My interest in his *oeuvre* lies in its singular attempt to develop a tri-partite general equilibrium system based on the *family*, *civil society* and the *state*.

In dealing with ethical life, only two views are possible: either we start from the substantiality of the ethical order, or we proceed atomistically and build on the basis of single individuals. This second point of view excludes mind [spirit] because it leads only to juxtaposition [conglomeration, aggregation]. A living relationship exists only in an articulated whole whose parts themselves form particular subordinate spheres. French abstractions of mere numbers and quanta of property must be finally discarded ... Atomistic principles of that sort spell, in science as in politics, death to every rational concept, organization and life.²¹

In conclusion, two points emerge from the 'principle of complementarity': one relates to the character of the resource that is to be allocated, the extent to which *natural* is implicated and imbricated in the *social*; and the other, to the *agency* doing the allocating, the extent to which it is public and thereby divorced from the private.

All in all, my consideration of these four sub-principles draws attention to the broad interdisciplinary framing that the subject demands, and emphasizes, rather than a particular theory, the theoretical principles that go into its theorizing. However, one essential aspect of the situation has been totally neglected.

3. ON A CONVERSATION BETWEEN GENERATIONS

In the way that I have read them, Kant's four sub-principles for sustainable forest management *SFM* – existence, relativity, uncertainty and complementarity – as well as the authors I have appealed to illuminate them (with the possible exception of Filmer) do not involve time in any explicit way. They all deal with more classical

and timeless problems of political and ethical obligation. This is hardly accidental. In their 1979 introduction, Laslett and Fishkin (1979) stress that an "entirely new moral perspective may have to be worked out now to meet the intellectual demands upon us by environment, population and futurity." Under the rubric of what they term "arithmetic humanity in relation to politics, especially the correct boundaries which should surround any human collection so that a proper political society may appear", they stress the danger of "preoccupation with a small traditional agenda of classical 'problems' in political philosophy and of too much reliance on respected names from the past."

The issues to do with arithmetic humanity are continuous with those to do with democratic theory, and two-fold in their character. They are geographical, as when Peter Singer talks so urgently about our duties to distant yet contemporary humans in times of famine, and temporal when Peter Laslett addresses the problems of generations past and generations yet to come.²²

Thus, when Kant locates the basic idea behind *SFM* is to "manage forests in such a way that the needs of the present are met without compromising the ability of future generations to meet their own needs," he is locating his subject, at least in part, in precisely the terrain that Laslett investigates in two famous essays. In the remainder of this section, I try to bring Kant and Laslett together.

Laslett (1979) unpackages the term "generation" along three dimensions: a procreative one, as in all fathers or grandfathers; a temporal one, as in a group born within a particular interval of time; and finally, an attitudinal one, as a "unity capable of a attitude or of a responsibility," as in a post-war generation. Not unlike Filmer's criticism of the term *people*, or Burke's metaphysical use of an *eternal society*, Laslett shows how the word *generation*, in shuttling between the three meanings that he has identified, does not stand up to a rigorous analysis. Unlike static general equilibrium theory, say as articulated in (Debreu, 1959), it is not the difficulty of one agent Pareto-optimally appropriating for herself all of the societal resources that have been bequeathed to her; the problem lies in delineating a boundary to the term, in the recognition that one generation is intertwined in another, in giving meaning to the assertion that one generation consumes everything and leaves nothing for its successor.

Since the concept of a generation is elusive and confusing, it is difficult to see how one can talk at all convincingly about rights and duties in respect of such an unmanageable entity (39). ... [T]he concept bristles with ambiguities and difficulties of a logical and empirical kind. ... [P]alpable consequences for all of us seem to flow from the uses we make of the word 'generation'. These consequences are practical and moral (39).²³

Laslett asks whether he is obliged by the actions of his predecessors, and if so, what is it that obliges him?²⁴ This question clearly goes to the heart of inter-temporal ethics; and if the term *sustainability* is to be given a determinate and coherent meaning in this context, it clearly must be located in the domain that these questions open. Laslett proceeds by exploiting a slippage between the procreational and temporal usages of the term *generation*. He identifies an asymmetry in the former and building on it, applies it to the latter.

Parents have duties towards their children but the fact of procreation gives parents no rights in them. Children have rights in their parents, but no duties towards them, not, that is to say, duties towards them as progenitors. The duties in respect of procreation are owed their own offspring. In the ethical exchange between procreational generations, then, duties do meet rights; but not in respect of the same persons (48).

Laslett's proposal is that the "ethical reciprocity characteristic of procreational generations ... can by inexact analogy, be held to apply to temporal generations, that is to generational relationships in society at large, though within one collectivity only (49)." By exploiting an indeterminacy of meaning, he has extracted an operational principle of inter-temporal ethics. Just as Filmer appealed to the father-son relation to understand the monarch-subject relation, Laslett appeals to principles of equity within the family to articulate a principle of justice within society. The elaboration is worth quoting in full.

In the same way as Children within the family can expect nurture from their parents as a right, conferring no obligation upon them, so can the members of any generation of Englishmen take for granted the material, technical, cultural, social and political benefits which accrue to them from their predecessors. Their 'debt to the past' is to be satisfied by their duties to the future, and 'future' in this last phrase must be construed as 'the foreseeable future' (49).

The limitation to one collectivity, to Englishmen for example, is of fundamental importance because it is precisely that very collectivity which is to secure adherence to the principle. It is here that we come up against the concept of *arithmetic humanity* and the need to give boundaries to the society which is being theorized for. In terms of my earlier discussion, it is the non-procreational changes in the collectivity that overturn provisional solutions, and run through all of Kant's four sub-principles: of existence, relativity, uncertainty and complementarity.

It is important to understand that Laslett has secured a space of generational obligation that is distinct from political and social obligation. It is to the former, and to the former alone, that his basic principle is addressed. He adduces two sets of considerations for exempting from his theory the (material) support that children give their parents. He refers to such support as "predominantly social or even political in character – as an instance, in fact, of the universal obligation we all have towards contemporaries in need – rather than as generational (51)." The first of these is the conception of "nature of affection, familial and otherwise," as a commodity.²⁵ Parental love is not a commodity that asks for repayment, the relationship is not based on a *quid pro quo*.²⁶ Laslett's second consideration is based on the past; in particular, on an appeal to the Poor Law in English history whereby destitute parents were supported by the state irrespective of whether they had "grown-up independent children at the time." He emphasizes that the transfer of a right from society to one's progeny is a deliberate, and presumably, political decision. In summary, generational justice, Burke's eternal intergenerational contract, simply consists in these "unidirectional, hook-eye linkages."²⁷

In his reconsideration of the subject a decade later, Laslett's earlier essay is summarized as the following principle of inter-temporal justice.

It consists in an obligation on all present persons to conduct themselves in recognition of the rights of all future persons, regardless of geographical location and temporal

position. No generation is at liberty to ransack the environment, or to overload the earth with more people than can be supported, or even, though this is more debatable, to act in such a way as to ensure that the human race will disappear. The duty goes beyond beneficence, the idea that it would be better to act this way and magnanimous to our successors (15).²⁸

This is a deontological principle that stands on its own, which is to say, receives no warrant from some prior Rawlsian conversation, or a Hegelian conception of *geist* or some utilitarian pleasure-pain principle based on aggregation or a Nash program. But while it recognizes the *rights of the unborn*, it clearly does not go far enough in giving operational precision to *conduct*, to the words *ransack* and *overload*. What is to be noted, however, that Laslett accepts the ambiguity of the term *generation*, the fact that he cannot "give the generational contract a local habitation and a name, any more than could be done for the social contract itself," and moves on to a free use of "generational images, generational language, and the association of generational relationships (25)." Through two additional metaphors to complement his earlier one of a chain, that of a procession and a rope, he works his earlier ideas through the concepts of an *intergenerational tricontract* and the *intercohort trust relationship*.

It is through a picture of a procession that Laslett and Fishkin propose to get at the open-endedness, locality and irreversibility of inter-temporal justice. An individual in a procession cannot see where the procession begins and where it ends, communicate only with people immediately preceding and succeeding him, influence the progress of only those in it who follow him, and has only a rough idea as to whether the procession is headed in the direction that has been determined for it.

[T]he processional image is particularly useful because a visible segment of the procession apparent from a single point of observation does provide an intelligent sample of the whole, while preserving the condition that people should be perpetually entering from one side and leaving from the other. If the ideal observer tries to get up as high as possible above the procession to see as much as can be seen of it, however, he or she runs into the difficulty about length in relation to infinity. The observer would do best to stay metaphorically on the ground, but to seek a vantage point with the widest possible view of the procession as it passes (13).

There is a trade-off; the more of a procession that an observer attempts to see, the less of its character she sees. In the limit, she may see all of the procession, obtain a view *sub specie aeternitatis*,²⁹ but it is not clear what meaning she is to extract from such a view.

A deathless collectivity, identified with the political purposes of the state, and not itself subject to the limitations of duration imposed on political cooperation and exchange, might make dealing with the problems and puzzlements much easier. But the image of a eternal, all-inclusive collectivity embracing everyone alive, scarcely belongs in the arena of individual rights, government by consent of the governed, and the rule of law. Awkward as the processional image may be, awkward because the reality to be signified is itself so elusive, we are required to accept its logic in preference to the Hegelian march of the state through history (14).

It is through such pictures that Laslett imbibes the lessons from Samuelson's (1958) overlapping generations model, and rather than seeing the work's principal

contribution as a counterexample to the fundamental theorems of welfare economics, on the explication of the fact that these theorems hinge crucially on their underlying assumption of a fixed finite number of commodities, makes it a basis of an *intergenerational tripartite contract*. In answer to the reformulation of Wittgenstein's question as to "Why should I do anything for future generations [when] they have done nothing for me (28)," Laslett substitutes a tripartite arrangement for the two-generational procreative contract. Such an arrangement concerns *removed generations*, where the term refers to "those who do not overlap but stretch backward and forward from the present generation, itself thought of as a removed generation with respect to the others (25-26)."

Obligations between removed generations cannot in consequence be addressed at all under the two-generational contract. [T]he intergenerational tricontract ... seems particularly well-suited to securing justice between removed generations. [It] gives formal expression to the widespread conviction about the obligations of generations to those coming after them, not only removed generations but also those which overlap in the same time space and which under another aspect can be regarded as contemporaneous, successive cohorts or age-groups. This is the conviction that each generational entity must deliver the world to its successor in the condition in which it was received (29).

As in the 1979 analysis, it is the analogy, inexact analogy, to relations within the family that forms the basis for the tricontract, the principle that generational obligation is unidirectional, that it always moves forward in time.

To look upon the symmetrical interchange between parents and children as having anything to do with an agreement or a contract between them seems to me to lack all power to convince. It does so even as a metaphorical construct, a simile, or an analogy (29). Everyone, therefore, has rights to what he or she receives from his precursors or hers, rights that are or will be met by duties they perform to their successors. But they do not have ... any duties anterior to them, or any rights to those posterior to them (31).

Laslett's principle is important enough that it can be underscored: "the child generation receives transfers being made to it by the parental generation as of right under the contract, but that tricontract gives no title to transfers from the child generation, or to the grandparental generation from the parental generation (31-32)." But there is another aspect to Laslett's discussion in 1992 that was not there in 1979, and this concerns the contribution that children do make towards the support of their parents, that the flow of resources is not only, cannot only, be in one generational direction. Here he relies on the metaphor of a rope to supplement, intertwine if one prefers, the intergenerational tricontract with intercohort trust.

These cohorts, nearly all of which are based in practice on a year in time rather than a moment, continuously intertwine with each other over the whole length of human history. They do so like the strands that wind round one another to create a piece of thread, each strand being shorter than the piece of thread itself, which unlike the strands, is capable of indefinite extension (46).

When Laslett refers to *trust*, he does not conceive of it either as a commodity or as a grammar of relationships, but as an institution based on an object of value and constituted by three types of agents: trustor, trustee and a beneficiary.

In the trust, a trustor makes items of value over to trustees, not for the good of the trustees, but solely for the good of the beneficiaries. If the trust is ... discretionary, the trustees can and should vary the distribution of the assets, without necessarily referring to the trustor if available, provided always that the object of the trust, that is, the welfare of the beneficiaries, is enhanced. In selecting the trustees and specifying their duties the trustor must be presumed to know that they are sufficiently well-informed of the relevant circumstances and of what would be the best for the beneficiaries under changing conditions, and in view of how conditions might change in the future. If the beneficiaries should need counseling in the extent and character of their justifiable expectations from the trust, it is for the trustees to supply it (33).

The point is that the trustor cannot deliver the trust, now conceived in Laslett's usage, directly to the beneficiary for reasons having to do with time but whose further articulation is neither necessary nor relevant, but has to resort to a trustee, with *well-specified duties*, *sufficiently well-informed* both about the beneficiary and about the circumstances in which such a beneficiary may possibly find himself, and who could be called on for *counselling* of the beneficiary. It is a lot to ask, but an application to inter-temporal equity and justice, and in particular the economics of forestry, asks even more. The reason has to do with the confounding of roles stemming from the fact that the trustee and the trustor are also beneficiaries. For the trust, again in Laslett's usage, to be workable, it must be enveloped in an atmosphere of trust that deals with incompleteness, not of contract, but of the underlying implicit agreement³⁰ and of the vulnerabilities of each of the parties.

It is precisely to make all of this manageable that Laslett grounds the trust within a cohort. Just as a single collectivity localizes the intergenerational tricontract, so does a single cohort furnish a necessary limitation that makes it feasible for the actors to fulfill all of the roles that have been assigned to them. Members of a productive generation is concretely, rather than abstractly, acquainted with its non-productive elders, and can influence through the political machinery, a concrete set of politicians, rather than an abstract deathless collectivity, to cope with the requirements of inter-temporal distributive justice. Laslett emphasizes these limitations by questioning a "picture of the natural world being entrusted to humanity" and asking "how the entrustment of the world is to be conceived." It is again a question of the proper boundaries within which a theory is conceived, the collectivity for which the theorizing has been done.

The difficulties with the concept of the world itself as a trust to humanity serve to direct attention to the fact that ethical principles other than those informing contract and trust might be invoked for environmental purposes. This might be done in combination with versions of either of these two, or both of them, perhaps otherwise (45).

And here Laslett joins with Kant in the invocation of aesthetic and religious principles.³¹ We are back to a view of the world *sub specie aeternitatis*,³² Kant's reminder that the 1992 Earth Summit "acknowledged the social, cultural, recreational and spiritual values of forests, and viewed these benefits as fundamental to *SFM*."³³

In conclusion, it is difficult to deny that Laslett's notions of *inter-temporal tricontract* and *intercohort trust* go to the heart of the economics of forestry, but they are to be used without *hubris*, as a basis for a theoretical opening of a conversation rather than a closing of it, for examining the consequence of

perturbations of a model rather than the model itself, not for flaunting expertise but for drawing attention to the fact that the final word is simply not available, and that therefore the distance between the theorist and the theorized needs to be minimized rather than maximized.³⁴

Theorists, social theorists, political theorists, and ethical theorists have yet to get an effective hold on the realities that would have to enter into any truly adequate account of justice over time (46).

4. ON ECOSYSTEM CAPITAL AND ON AN ECONOMY OF PRACTICES

Kant (2003b) observes that “aesthetic, spiritual, religious and cultural attributes are not subject to commoditization,” and attributes of a system that can be commodified are orthogonal to those which cannot, and the “orthogonal attachment – incongruous nature – will restrict the aggregation of all attributes to a single economic (monetary) measure (119).” Kant proposes a notion of capital, *ecosystem capital*, to grapple with, and subdue, tendencies in theorizing in which such commodification is rampant and unchecked.

The ecosystem capital is valuable to human society not only for the products which may be thought of as commodities, that it contributes to the economic system but also for its functional contributions to the well-being of humanity. ... Thus, most of the contributions of ecosystem capital are derived by keeping its different components working in their existing functional relationship as a fully functionalized system [in which] each part is as ‘valuable’ as the whole and hence the value of any single component cannot be understood separately from its contribution to the whole (117-118).

In the previous section, I considered the difficulty in giving rigor to phrases such as the *well-being of humanity*, and in the one previous to it, the importance of theorizing that is self-aware in what it includes and excludes, in being transparent in what, and how, a theorist, as theorist, sees as a *fully functionalized system*. So when Kant asserts the holistic characteristics of *ecosystem capital*, he clearly does not have in mind static general equilibrium theory, as articulated in (Debreu, 1959) for example, but is trying to reach and say something beyond the standard theory. In this section, I try to understand his concept through Bourdieu’s 1983 notion of *symbolic capital* and the conceptual schema with which Bourdieu gives it meaning.

As far as the noun *capital* is concerned, Bourdieu’s conception seems entirely conventional.

Capital, which, in its objectified or embodied forms, takes time to accumulate and which, as a potential capacity to produce profits and to reproduce itself in identical or expanded form, contains a tendency to persist in its being, is a force inscribed in the objectivity of things so that everything is not equally possible or impossible (241).³⁵

In this definition, ideas basic to capital theory such as durability and irreversibility are incorporated,³⁶ but nuanced in that the transformation of resources over time, is qualified by the term *potential*, and rather than simply as a “stock of tangible, solid, often durable things such as buildings, machinery and inventories,” as in recent definition in Solow (2000), capital is seen as a *force inscribed in the*

objectivity of things. It is this that gives a singularity to Bourdieu's vision, in its holistic thrust in an "economy of practices which would treat mercantile exchange as a particular case of exchange in all its forms (242)."

A general science of the economy of practices, capable of reappropriating the totality of the practices which, although objectively economic, are not and cannot be recognized socially as economic, and which can be performed only at the cost of a whole labor of dissimulation (*euphemization*), must endeavour to grasp capital and profit in all their forms, and to establish laws whereby the different types of capital (or power, which amounts to the same thing) change into one another (242-243).

We have already seen this emphasis on *totality* in Kant's 'principle of existence,' but what is additionally involved here, it seems to me, is the 'principle of complementarity' whereby any water-tight distinction between the *social* and the *natural* is denied. By seeing the non-economic as economic, and complementarily, by embedding the economic within what is seen to be the non-economic, Bourdieu goes beyond Solow's definition and the questions that follow from it: how do you measure its stock? what is its rate of return? what is its rate of depreciation? To what quantitative extent do the rapidly growing East Asian economies owe their success to it? There is a reliance, perhaps even a crucial dependence on the language and apparatus of capital theory, along with a denial, perhaps even an assertion of impossibility, of aggregation to single number. There is an optimism that anything that *persists* over time, and directs circumstances into one channel rather than another, as any "special proclivity or talent that exemplify the value of some specifically Asian virtues of character and social organization: diligence, teamwork, compromise and so on," is amenable to the insights of capital theory.³⁷

An *economy of practices* then rests on the notion of "*symbolic capital*, that is to say capital – in whatever form – in so far as it represented, i.e. apprehended symbolically, in a relationship of knowledge or, more precisely, of misrecognition and recognition, presupposes the intervention of the habitus, as a socially constituted cognitive capacity (255)." This simultaneous *misrecognition and recognition* is simply a restatement of *euphemization*, and a reach to practices that are capital theoretic even though nonquantifiable, subject to economic laws even though treated as non-economic.

Economic theory ... by reducing the universe of exchanges to mercantile exchange, which is objectively and subjectively oriented toward the maximization of profit i.e., (economically) *self-interested*, it has implicitly defined the other forms of exchange as noneconomic, and therefore, disinterested (242).

With an invocation to the term *habitus*, I am in the very vortex of Bourdieu's *oeuvre*, and given the scope of this chapter, shall constrain myself only to observe that *habitus*, *field* and *capital* constitute concepts that "have no definition other than systemic ones, and are designed to be *put to work empirically in systemic fashion*. Such notions as habitus, field and capital cannot be defined, but only within the theoretical system they constitute, not in isolation."³⁸ It is in this kind of advocacy of holism that Bourdieu's work naturally dovetails into that of Kant.

With this background, I can move relatively quickly and observe that Bourdieu decomposes *symbolic capital* into three forms: *economic capital*, when it is

“immediately and directly convertible into money and may be institutionalized in the form of property rights”; *cultural capital*, when it is “convertible, under certain conditions, into economic capital and may be institutionalized in the form of educational qualifications”; and *social capital*, “made up of social obligations (“connections”), and when it is “convertible, under certain conditions, into economic capital and may be institutionalized in the form of a title of nobility.” After noting that *cultural capital* is further trichotomized into *embodied*, *objective* and *institutionalized* forms, I turn to *social capital*.

Social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectively-owned capital, a “credential” which entitles them to credit, in the various senses of the word (248-249).

The capital-theoretic emphasis is on durability and on fungibility, and both rest on purpose. Categories such as *obligations*, *rights* and *duties* that we earlier encountered under the rubric of political theory have now been appropriated by social theory, and given an economic basis for reciprocity.

Network of relationships is the product of investment strategies, individual and/or collective, consciously or unconsciously aimed at establishing or reproducing social relationships that are at once necessary and elective and that are directly usable in the short or long term. Creation of durable obligations subjectively felt (gratitude, respect, friendship) or institutionally guaranteed (rights) (249-250).

I am now finally in a position to give meaning to Kant’s ‘both-and principle’, possibly in a way different from his.³⁹ Arrow (2000) counters the “widespread consensus on the plausibility of the hypothesis that social networks can affect economic performance” by the “considerable consensus that much of the reward for social interactions is intrinsic” which is to say, individuals interacting for the sake of interacting, non-purposive and without any other discernible objective. “Indeed, this is what gives them their value in monitoring.” At the same time, there is no denying that “networks and other social links may also form for economic reasons” – to “guard against market failure” and to “exploit monitoring devices not otherwise available.” It is important to be clear that this simultaneous presence and absence of purpose – yes/no and both/and rather than either/or – is not necessarily contradictory. The point is that one pertains to the individual while the other pertains to the relevant group of which the individual is part. What is a given unchosen parameter from the individual’s perspective is an unknown choice variable from the perspective of the group. As we saw in Laslett’s emphasis on a single collectivity and in the limitation to a single cohort, the “process of *consecration* of the group presupposes and produces mutual knowledge and recognition, affirms the limit of the group, and is constituted by exchange of material and symbolic resources (250).”

Each member of the group is thus instituted as a custodian of the limits of the group: because the definition of the criteria of entry is at stake in each new entry, he can modify the group by modifying the limits of legitimate exchange through some form of misalliance. Through the introduction of new members into a family, a clan, or a club, the whole definition of the group, i.e., its fines, its boundaries, its identity, is put at stake, exposed to redefinition, alteration, adulteration (250).

This point can be made another way. Once the sovereignty and integrity of the realm of the market is accepted, and "existing social relations [taken] as a preexisting network into which new parts of the economy (for example, development projects) have to be fitted," one can focus on efficiency, however broadly interpreted, and "exploit complementarity relations and avoid rivalries." At the same time, there is no denying that "new projects will create their own unintended social relations, possibly destroying existing ones," and as such, one has to keep track of these variations, of how the parameterized background is changing. However, here again, it is important to be clear that in this treatment of something as being simultaneously fixed and changing – both/and rather than either/or – involves no contradiction. The point is not that one pertains to the moment while the other pertains to the evolution of that moment, and consequently what is a parameter from the perspective of static analysis becomes a variable to be tracked from the standpoint of dynamics, but rather that an entity which is a variable for sociological, or perhaps anthropological, analysis is, and ought to so remain, a parameter for economic analysis. "The market needs supplementation (for efficiency) by nonmarket relations", and the question as to whether the "market (or, for that matter, the large efficient bureaucratic state) destroy social links that have positive implications for efficiency" is important and long standing.⁴⁰ We are back to the Kant-Berry emphasis on working within particular resource regimes and being sensitive to their evolution.

I conclude my discussion of *ecosystem capital* with Solow's (2000) words regarding *social capital*, with his saying that "those who write and talk about social capital are trying to get at something difficult, complicated and important: the way a society's institutions and shared attitudes interact with the way its economy works. It is a dirty job, but someone has to do it; and mainstream economics has puristically shied away from the task."⁴¹

5. ON THE 'CORRECT' SOCIAL RATE OF DISCOUNT

So far, my consideration of the work of Kant, Laslett, and Bourdieu has revolved around the following questions: does a particular collectivity need a supra-collective agency to guide it? and if so, what is nature of the agency that is to assume the responsibility for such guidance? and in what domains does its guidance lie? Simply put, given my concern with issues of inter-temporal ethics and justice, does a society or a state need a supplementation of individual (generational) decisions by a public policy-prescriber? who does he represent? and how does the answer to these questions rebound on the validity and implementation of all that he proposes?⁴² And from all of the texts that I have read so far, it is clear that however we give meaning to the notion of optimality, and however we formulate commonality of resources, the optimal inter-temporal allocation of such (environmental) resources available to any collective (society, community, regional or ethnic group, nation state, a particular unity of nations) cannot, ought not to, be based on criteria that discount the weight that is attached to future generations or cohorts of that collective just because they are temporally removed. If the words *sustainability* and *inter-*

temporal equity are to have any analytical thrust, sustainable policies cannot be rejected, or decided upon, on criteria that have already incorporated in them some form of inter-generational *myopia* or *impatience*. The benefits of a forest, or of public investment in clean air, or of a project such as the Hoover dam, or of the preservation of Yellowstone National Park are hardly limited to the generation that commits the resources to secure them.

This observation is well-understood. Economists know well the relevant quotations from Ramsey, Harrod, and others,⁴³ and are aware that that in his 1935 work on economic growth, von Neumann (1935-36) also did away with time-preference and confined himself to an investigation of maximal *balanced* growth paths. This earlier work is now complemented by more recent surveys of Cowen (1992), Cowen-Parfit (1992), Kant (1999; 2000; 2003a; 2003b) and Peart (2000). And once the issues are considered within the broader rubric of inter-temporal justice and ecosystem capital, as in Kant, the arguments are only underscored. However, even though simple and well-understood, mainstream economic research has bypassed and ignored this basic observation on two grounds: (i) analytical tractability, and (ii) a recommitment to methodological individualism as typified by the analytical construct of the *representative agent*.

In terms of (i), the analytical difficulties of optimizing models with a zero rate of time-preference are easily communicated.⁴⁴ Any plan for the inter-temporal allocation of resources, if limited to a finite period and embodying a particular time-horizon, has to take as given – arbitrarily and prior to the determination of unknowns of the plan – the amount of resources that are to be left for generations beyond that arbitrarily chosen horizon. The only analytically viable option, then, is to work with an infinite time-horizon – to plan from now into an *indefinite* future, with the expectation that each successive year these plans will be reworked with additional information. But the problem with an infinite time-horizon is that the time-stream of benefits may not sum (integrate) to a finite number, and therefore the objective may not even be defined!

Ironically, the reasons for (ii) follow from the overwhelming influence that the Ramsey growth model (with an infinite time-horizon but with a positive discount rate) has gained in mainstream economic research. As this model became a central conceptual framework for the discussion of macroeconomic policy, issues of *time-consistency* and *incentive compatibility* led to a devaluation of a (national) policy maker to one of the many participants of the policy game, and to a reinterpretation of his objective function as that of an *infinitely-lived* representative agent. Under this blurring of the individual and the social, a planning model, with the planner formalizing the bonds of the collective, is recast as a positive model⁴⁵ of a decentralized economy in which each of a continuum of identical individuals is seen to be pursuing their own individual interests. With this important conceptual manoeuvre, a preoccupation with the short-run – with impatience reorienting an agent towards immediate benefits and profits – is rendered more “rational” and thereby more defensible. Thus, it is not surprising that research on models with a zero time-preference, analytically difficult to begin with, abruptly ceases in the eighties. The current conventional wisdom is to see it as “dispensable and misdirected.” The effects of this conventional wisdom are pervasive. The

bibliographies of standard textbooks in the field such as those of Arrow-Kurz (1970), Stokey and Lucas (2000), Aghion and Howitt (1998), or Majumdar, Mitra, and Nishimura (2000) simply ignore the earlier literature on the extension of Ramsey's undiscounted setting.⁴⁶

In subsequent sections, I continue the discussion of this point of view. For the moment, I conclude this section by noting the Cowen-Parfit distinction between the *probabilistic discount rate* and the *social discount rate*, a rate that is used simply because of the remoteness of the future. Cowen and Parfit (1992) write as follows.

Remoteness in time roughly correlates with a whole range of morally important facts. So does remoteness in space. ... But no one suggests that because there are such correlations, we should adopt a spatial discount rate. No one thinks that we would be morally justified if we cared less about the long-range effects of our acts, at some rate of n per cent per yard. The temporal discount rate is, we believe, as little justified.

6. ON THE ECONOMICS OF FORESTS AND OF ORCHARDS

In his surveys Kant (2003a) does not give any space to the work of Mitra-Wan-Ray-Roy, and I shall argue in the next section why this omission is not accidental. Here, I shall try to substantiate why the reformulation in this work is of fundamental analytical consequence for the subject.⁴⁷

In their seminal paper on the economics of sustainable forest management, Mitra and Wan (1986) shift their perspective from the number of trees of a particular age in a 'given' forest to the proportion of the acreage of that forest that is devoted to trees of a particular age.⁴⁸ Coupled with their assumption that there exists a particular age beyond which a tree rots and yields no timber, it allows them to recast a difficult infinite-dimensional functional-analytic problem into a finite-dimensional one of (albeit infinitely) repeated choice from a finite-dimensional simplex. Toward this end, consider a unit plot of land which, without any replenishment and with costless planting, can support forever trees of ages ranging from one to n years. A tree of age i , ($i = 1, 2, \dots$), when chopped down, yields b_i units of timber, and an n -year old tree yields nothing if grown beyond n years. Thus, time is measured in discrete (unit) intervals, and necessarily entails the obvious, but nevertheless crucially important, observation that the amount of acreage x_{i+1} devoted to trees of age $i+1$ tomorrow cannot be *more* than the amount of acreage x_i devoted to trees of age i today. Let me refer to this observation as a *feasibility* constraint; it surely distinguishes a problem in the economics of forestry from a problem of more general capital theory. Thus, in this today-tomorrow world, a given value of these two acreages (x_i, x_{i+1}) directly translates, through subtraction, into a proxy for the number of trees chopped down today, and hence the amount of timber consumed today.

Now, suppose there is agreement that the forest must be managed to maximize the aggregate amount of timber over the foreseeable future. The question then how is the forest to be managed? Even in such a simple setting, the word *sustainability* does not have an unambiguous meaning. One obvious candidate is a forest that does

not change its composition from year to year – the composition of the forest would be identical across all time periods. But an alternative would be a time-profile that is repeated – a forest would be sustainable if its changing composition over a period of time remains unchanged for subsequent, identically long periods of time. Mitra-Wan commit themselves to the former interpretation, and thereby reduce the problem of determining the composition of a maximal sustainable forest from an infinitely varying sequence, albeit with a determinate pattern, to a constant sequence, and thereby to a real number! Under this reduction, the first step involves a static optimization problem, trivially amenable to Kuhn-Tucker theory.

The interest, however, is not primarily in the composition of maximally sustainable forest but one that is optimal in terms of its timber yield, optimal especially if we prohibit discounting. This is to say that we work under the constraint that timber available today has the same *social* value as timber available a hundred, or indeed a thousand, years from today. As discussed above, we circumvent the problem of an undefined sum of timber by an appeal to the overtaking criterion of Atsumi (1965) and von Weizsäcker (1965), and it is the execution of this appeal that is my primary interest here. The point is a fascinating one. Consider the accounting or shadow prices churned up by the Kuhn-Tucker solution to the static optimization problem directed to determining the composition \hat{x} of the sustainable forest with a maximal yield, and given any other (infinite) sequence characterizing the possible evolution of the forest, compute the value-loss of timber in terms of these prices relative to \hat{x} . Consider, as a third step of the argument, the infimum (the greatest lower bound) of the value-losses of all possible paths of evolution of the forest. Under the feasibility constraint, these (uncountable since the possible paths are uncountable)⁴⁹ numbers are not all infinite, and hence the problem is well-defined and implementable. The third step is to show that for any given initial composition of the forest, there exists a path that attains this minimal value-loss. And now under an assumption that has guided this analysis, and has been a subtext of my description, can be made explicit. It is simply that the composition of the maximally sustainable forest is unique! Under this assumption, we have the *coup de grace*, the final fourth step of the argument, that any given initial composition of the forest, this minimal value-loss path is optimal.

The question then is what assumption on the primitive data of the problem, the n non-negative numbers (b_1, \dots, b_n) , guarantees that the composition of the maximally sustainable forest is unique? This is simply the assertion that the average productivity of the tree of a particular age, b_i/i , is maximized at a unique age, say σ , $1 \leq \sigma \leq n$. And with this assumption in place, it is all a matter of easy harvesting. Mitra-Wan consider two situations. The first concerns plot of land that is initially barren. The solution, the Faustman solution, is simply to chop down all trees of age σ , resulting is a path that minimizes the value-loss of all paths that can be generated from this (barren) plot of land and is therefore, by the Mitra-Wan theorem, optimal. The second concerns a plot of land which is already parcelled out among trees of varying ages. Now the solution is simply to chop down all trees of age equal to, or greater than, σ , resulting is a path that minimizes the value-loss of all paths that can

be generated from this plot of land, and is therefore optimal. The fact that Mitra-Wan prove this theorem by working with a set of prices that are different from the ones used to obtain the first solution need not concern us here; the principal analytical point is that in either case, the paths that are proved to be optimal minimize the period-by period (and therefore the aggregate) value-losses of any other path starting from the given plot of land, and it is this that allows us to show the optimality of the Faustman and other policies.

This being said, the question arises as to the extent to which the composition of a well-managed forest eventually resembles, which is to say converges, to that of the maximally sustainable forest. The answer here hinges on whether it is the aggregate of the timber or the aggregate of a (strictly concave) function of the timber in each period that is being maximized. In either case, there is a non-degenerate interval containing the maximally sustainable forest composition to which the optimal path converges. However, it is only in the latter (strictly concave) case, that this interval is degenerate in the sense that it reduces to a singleton. In other words, when the period-by-period utility function of timber levels is strictly concave, the optimal path forest composition converges to that of the composition of the maximally sustainable forest. In all other cases, and in particular the case of a linear period-by-period utility function, the optimal path may be periodic.

As I discussed in the previous section, it is the undiscounted theory that has been neglected in applications, and that the discounted theory – recursive dynamic programming – has received extended treatment. Thus, once the Mitra-Wan formulation is well-understood, the tracks for developing its discounted version are all well-laid out and well-understood; see Mitra (2000) for example. This is not to say that the results are not surprising. Mitra and Wan (1985) conclude the introductory section of their paper with the following two sentences.

In fact, this study together with Mitra and Wan (1981)⁵⁰ show[s] that the asymptotic properties of optimal programs are similar when the utility function is linear, regardless of whether there is positive or zero discounting. But these properties may be quite dissimilar, when the utility function is strictly concave, depending on whether future utilities are undiscounted (in which case we have the “turnpike property”, with the unique OSP as the “turnpike”), or positively discounted (in which case, a “turnpike property” need not hold, and periodic optimal solutions are definitely possible).

Moving beyond the economics of forestry, as developed by Mitra and Wan (1986; and 1985), to the economics of sustainable orchard management, a seminal paper of Mitra, Ray, and Roy (1991) views the earlier work as a contribution to “point-input, point-output” capital theory and extends it to “point-input, flow-output” capital theory. This is to say, it allows the trees in the forest to yield fruits in each year of their life possibly in addition to the timber when they are cut down. Thus, in addition to the output, point-output, when a tree of a particular age is cut down, it yields a flow-output at every prior year. The basic outline of the model and the benchmarks of the analysis remain broadly similar, but now the determination of the flow-output requires a determination of the number of trees of each age, and thereby leads to a veritable thicket of mathematical difficulties. It is of course outside the scope of this chapter to discuss these difficulties in any detail other than to point out that the authors consider a special case of the problem – one in which

there is positive discounting and no utility from the timber that is available once a tree is cut down. It is indeed an analysis of orchards! The authors' conclusions are summarized in the following two sentences.

Under a mild condition on the flow-output vector, we establish that optimal programs for every discount factor and every initial state (other than a unique stationary optimal state) will exhibit non-convergence. Furthermore, we provide a necessary and sufficient condition on the flow-output vector for which a neighborhood turnpike theorem; that is long-run fluctuations on an optimal program are "small" when the discount factor are "close" to unity.

7. ON A 'FOLK THEOREM' OF CAPITAL THEORY AND ON A DIRECTION FOR FUTURE WORK

Kant (2003a) begins the first substantive section of his survey by referring to Faustman's solution, and notes that "through 1999, 278 identifiable works have been published [and] 85% of these have been published since 1979."⁵¹ In this context, he sights the papers of Samuelson (1976), Anderson (1976), and Reed (1984) as the pioneering ones. In his own "dynamic approach to forest regimes in developing economies", Kant (2000) formulates and solves an optimal control problem. And since optimal control theory in its most accessible form relies on Pontryagin's principle, applications to the economics of forestry have relied most heavily on techniques developed for continuous time. And it is not a theorem that is applied but rather a principle, a presupposition and subscription to professional identity that requires the three hallowed steps: determination of the optimal controls from the maximization of the Hamiltonian, the determination of the auxiliary differential equations and the satisfaction of the transversality conditions. The early warning of Aumann (1965) retains its cautionary significance, and rigorous determination of the policy function is difficult⁵².

Mitra-Wan are clear that their work is simply an application of the principles of the general theory of inter-temporal resource allocation, as developed by Radner (1961), Gale (1967), Brock (1970) and McKenzie (1968, 1976, 1983, and 1986) to a setting that models salient features of the economics of forestry. It is then somewhat of an irony that in their recent work on a canonical model in capital theory, Khan-Mitra follow the guidelines laid out in the 1981 analysis of the economics of forestry. The following sentences from McKenzie's (1983) introduction lay out the setting for a fuller appreciation of this point.

Asymptotic theory for optimal paths of capital accumulation is more difficult when the utility function for the single period is concave, but not strictly concave. However, in the case of stationary models where future utility is not discounted, the theory is rather fully developed.⁵³ There is convergence to a subset of processes which span a flat on the epigraph of the utility function. This flat is often referred to as the von Neumann facet.

In the case of discounted utility and quasi-stationary models ... we must use the convergence of the von Neumann facets associated with discount factors to the von Neumann facet of the undiscounted model as the discount factor approaches 1. Then, as before, it is possible to appeal to the stability properties of the optimal paths for the undiscounted case that lie on the von Neumann facet. We may prove that optimal paths

are confined to smaller neighbourhoods of an optimal stationary path as the discount factor approaches 1 if the von Neumann facet for the undiscounted utility is stable, that is, contains no infinite cyclic paths.

What is remarkable in this statement is the reliance on the undiscounted case to yield insight into the properties of the discounted case. Thus even if one is interested primarily, if not only, in the discounted setting, and considers the undiscounted problem misguided for philosophical or ideological reasons, the analysis demands that attention nevertheless be paid to it. McKenzie puts the analysis of the discounted and undiscounted cases on the same table, so to speak, and this is of particular import, it seems to me, for a field which takes the scepticism of the magnitude of the discount factor as its cardinal tenet and an as an important marker of identity.⁵⁴ Indeed, a “folk theorem” for the general theory of inter-temporal resource allocation can be culled from McKenzie’s (1983) statement. It is simply that for any dynamic problem falling within the rubric of the theory, there is a threshold discount factor such that the stability properties of the optimal paths are qualitatively the same as those obtained for the undiscounted case for all discount factors above that threshold, and that complicated and rich dynamics, possibly including chaos, obtain for all discount factors below that threshold⁵⁵.

But now the direction for future work for the theory that I would like to indicate can be spelt out. It is not only a subscription to discrete time and to work within the rubric of the general theory of optimal resource allocation over time, as developed by Gale, Brock and McKenzie, but to be especially alert to the synthesis around the undiscounted case that the theory offers. Thus, in the specific context of the results obtained by Mitra and his coworkers, the next order of business is to integrate the undiscounted and discounted cases for both the economics of forestry as well as that of orchards; namely, to integrate Mitra and Wan (1985) and Mitra and Wan (1986), and to develop the undiscounted analysis for Mitra, Ray, and Roy (1991).

8. CONCLUSION

The concluding question then is what has been gained by putting my readers (and myself) through Kant’s four principles of forestry economics, Laslett’s intergenerational tricontract and intercohort trust, Bourdieu’s social capital and an economy of practices, the Cowen-Parfit reworking of the argument against social discounting and the Mitra-Wan-Ray-Roy work in capital theory – all under one set of covers? More specifically, how does the direction for further work identified in the previous section depend on the preceding ones? The fact that each of these texts, and the subjects they textualize, can be usefully pursued in isolation is incontestable; what is at issue is the possibility of other productive directions in the interstices that become evident when these texts are read *together*. To put it another way, given that reasons of efficiency demand that an economist work with particular presuppositions in keeping with her comparative advantage, conform to a particular disciplinary idiom and standard of rigour, project her work into a particular subspace; are there other considerations, perhaps of efficiency in the much longer run, perhaps even of inter-temporal ethics, that demand the development of the subject in which its various facets and factors are examined not only in isolation, but rather also in a way

that has the potential of mutual reinforcement and global insight? After specialization, when do the disciplines begin trade? This chapter, and the narrative it attempts to forge, is obviously tilted towards a particular answer to this question, and to the extent that this is justified, which is to say that this joint reading has provided, at least in part, a coherent and useful chapter, it is Section 5 on the 'correct' discount factor that provides the hinge between its two parts, between forest economics and inter-temporal ethics on the one hand, and between inter-temporal equity and capital theory on the other.

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NOTES

¹ See the second paragraph of Laslett (1987). My interest in Laslett also lies in ascertaining the meaning he gives to "questions of an ethical type."

² See the last section on summary and conclusions in Kant (2003b)

³ See the introduction of Bourdieu (1983, pp.242-243); this defense of economics by a professional sociologist/anthropologist is of interest in itself.

⁴ See the first paragraph of the section titled "Obstacles to the Understanding and Analysis of Justice over Time" in Laslett and Fishkin (1992, p 6). For a view from the community of mathematics, see Derbyshire (2004, Chapter 6) and the discussion of infinitesimals and of the 'infinitely large' in Halmos (1990).

⁵ The uneasy relation between science and ethics, at least in the meaning that is conventionally given to both of these terms, is outside the scope of this essay. For a contribution around the time of the "founding" of so-called neoclassical economics, the reader can do worse than see Huxley's 1886 essay in Huxley (1894). For the author's subscription to Wittgenstein's views, see Khan (2003).

⁶ This is a programmatic assertion in a 1992 volume devoted to "justice between age groups and generations"; see Laslett and Fishkin (1992, p. 11).

⁷ In this section, all numbers in brackets refer to page numbers in Kant (2003a).

⁸ In Kant (2003a, Footnote 18), there is a justification for this dichotomy that I leave to the expertise of others, though not without wondering how Heisenberg's uncertainty principle fits into the 'both-and' principle. Also see Kant (2003a, Footnote 1) and the references therein to the work of Dugger and Hamilton.

⁹ However, I shall return to the 'both-and' principle in the sequel in the context of the discussion of Bourdieu's work in Section 4.

¹⁰ This passage is quoted in Laslett (1979) and in (Laslett and Fishkin, 1992), and is of obvious importance to this essay. I shall keep returning to it in the form of allusions to a "deathless collectivity".

¹¹ For a more detailed elaboration of this phrase, see Khan (2003).

¹² For a reading of Wittgenstein's lecture from this point of view, see Khan (2003).

¹³ These two sentences are taken from pages 18 and 21 of Rhees (1965). The number 6.422 refers to a particular paragraph in Wittgenstein's *Tractatus Logico-Philosophicus*. For a more detailed explication of Wittgenstein's absolute/relative distinction, see Khan (2003).

¹⁴ See Keynes (1930, p. 365). For connecting this distinction to Wittgenstein, and to Hirsch's notion of "positional goods," see Khan (2004a).

¹⁵ See Kant (2003a, Footnote 20). Since no quotes are given, I am assuming that this is Kant's own paraphrase.

¹⁶ For a delineation of the "other" of neo-classical economics, and thereby its own delineation, see Endnote 8 and the references cited in the endnote.

¹⁷ I leave an investigation of this connection to future work.

¹⁸ For a more 'up-to-date' discussion, see Bird (1999). My motivation here, as in the rest of this essay, is to bring the issues into sharp relief without conceiving them to have been conclusively resolved one way or another.

¹⁹ See Laslett and Fishkin (1992, p.8) for this quotation from Filmer's *Patriarchia*.

²⁰ In addition to Rawls (1999 and 2001), see Sandel (1998) and Mouffe (1993) and their references.

²¹ See Hegel (1964, §156A) and Hegel (1964, p.263). For the reader without even a passing acquaintance with this work, a cursory perusal of its contents may be enlightening for its emphasis on ethics, and for its 'general equilibrium' sweep.

²² See Laslett and Fishkin (1979, pp.3-4).

²³ Until indicated, all numbers in brackets refer to page numbers in Laslett (1979).

²⁴ I cannot help returning at this point to the quotation from Wittgenstein furnished in Section 2 above.

²⁵ For the dangers of reckless commodification, see, for example, Kant (2003b, Section 4.1) and Khan (2002).

²⁶ In Laslett and Fishkin (1992, pp.28-29), Laslett writes, "It is an absurdity to construe the attitudes and behavior of children, the procreated, with respect to their parents, the procreators, in the mode if-you-do-something-for-me-now-I-will-in-due-course-do-the-equivalent-for-you. This is particularly so for procreation itself, which is surely the greatest of the goodies generators offer to the generated."

²⁷ These refer to Laslett's metaphor of a "chain made out of hooks and eyes, where hooks all have to lie one way, and at the point where the chain stops a hook without an eye is always hanging forward (48). It is permissible also to look upon these hook-eye linkages extending indefinitely into the future (49)."

²⁸ All numbers in brackets from now till the end of the section refer to Laslett and Fishkin (1992).

²⁹ The phrase is Wittgenstein's; see Rhees (1965, p.20). I shall refer to it further on in the sequel.

³⁰ For Laslett's difference between contract and agreement, see Laslett and Fishkin (1992, pp.32-33).

³¹ Laslett writes "Aesthetic and religious principles might be invoked and the issues construed in different ways than expounded here (45)." He also mentions the possibility of a theory along sociobiological lines.

³² See Endnotes 29 and 13 and the text they endnote.

³³ See Kant (2003a, p.48). In Section 2.2 of the same paper, he notes that "Ecological, aesthetic and spiritual values do not lend themselves to economic measurements (43)." For this connection to the dangers of commodification, also see Endnote 25 above.

³⁴ For this distinction, see Khan (2004b) and its references.

³⁵ In the rest of this section, all numbers in brackets refer to page numbers in Bourdieu (1983). I might note here that I find the neglect of this fundamental paper in current discussions of the "social capital" and of "social networks", as for example in Dasgupta-Sirageldin (2000), particularly egregious.

³⁶ Arrow (2000) singles out three aspects in any substantive discussion of capital: extension in time, deliberate sacrifice in the present for future benefits and alienability.

³⁷ This paragraph draws heavily on Solow (2000); and quotations are all Solow's words though used in ways different from his.

³⁸ See Bourdieu and Wacquant (1992, p.96). In this book, Bourdieu observes that "The question of the limits of a field is a very difficult one, if only because it is *always at stake in the field itself* and therefore admits of no *a priori* answer (100). *A capital does not exist and function except in relation to a field*. It confers a power over the field, over the materialized or embodied instruments of production or reproduction whose distribution constitutes the very structure of the field, and over the regularities and the rules which define the ordinary functioning of the field, and thereby over the profits engendered in it (101)." For a discussion of *habitus*, see pages 133-137.

³⁹ In this connection, see Endnotes 8 and 9 and the text they endnote.

⁴⁰ This paragraph draws heavily on Arrow (2000), and quotations are all his.

⁴¹ Even though I read Solow's text as strongly complementary to that Arrow's, I do not see in it the same doubts as to a possible integration of sociology and economics. Whereas Arrow urges the "abandonment

of the metaphor of capital and the term, "social capital," seeing the measurement of "social interaction", and presumably thereby of the concept itself, as "a snare and a delusion", Solow's only requirement seems to be the avoidance of "vague ideas and casual empiricism".

⁴² These are of course basic problems of political theory; for one discussion of public agency, see Bird (1999, Chapter 3).

⁴³ In his pioneering 1928 paper on optimal economic growth, Ramsey (1928) emphasized that "we do not discount later enjoyments in comparison with earlier ones, a practice which is ethically indefensible and arises merely from the weakness of the imagination." In 1948, (Harrod (1948) went further than Ramsey: "A government ... capable of planning what is best for its subjects ... will pay no attention to pure time preference, a polite expression for rapacity and the conquest of reason by passion." For an extended discussion, see Koopmans (1965 and 1967).

⁴⁴ In essence, these go back to the quotation from Laslett that constitutes my fourth epigraph. The paragraph to follow can be complemented by Derbyshire (2004, Chapter 1) for a more intuitive understanding.

⁴⁵ The "other" of a positive model is what economic theory sees as a normative model. However, there are obvious presuppositions, if not difficulties, underlying this positive/normative distinction.

⁴⁶ For a close discussion and extension of Ramsey's precise model, the classic references are Samuelson and Solow (1956), Samuelson (1965), and Koopmans (1965 and 1967).

⁴⁷ Its bears underscoring that the responsibility for this presentation lies solely with the author.

⁴⁸ The extent to which the work of Mitra and Wan goes beyond the pioneering work of Wan (1978 and 1989) and his references, deserves an essay on its own. In this connection, the reader may also want to see Kemp and Moore (1979) and Wan (1993, 1994).

⁴⁹ I mean an uncountable infinity as opposed to a countable infinity which, colloquially speaking, is also uncountable. This is related to Derbyshire's illuminating distinction between counting logic versus measuring logic in Derbyshire (2004, pp.82-86).

⁵⁰ This reference is now Mitra and Wan (1986), and would presumably lead purists fixated on the subject of priority and acknowledgement to antedate Mitra and Wan (1986) to 1981.

⁵¹ See his Footnote 3 in which he also gives a reference to Newman's review of these papers.

⁵² See Dasgupta-Mitra (undated), and Khan-Mitra (2002b, 2003b).

⁵³ In this connection, McKenzie references his papers McKenzie (1968 and 1976).

⁵⁴ Even though it has no sharp formulation of this issue, I think it important not to overlook Koopmans' work in this connection, as in (1965 and 1967).

⁵⁵ The substantiation of this program for the particular case of the RSS model is being conducted by Professor T. Mitra of Cornell and the author: for preliminary and partial results, the reader is referred to all of the papers referenced under Khan and Mitra. These are available on request.

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