ABSTRACT

Does Competition Advance or Retard Economic Development? – An Institutional View

Frederic B. Jennings, Jr., Ph.D.
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The neoclassical theory of growth through endogenous technical change is based on gain-seeking agents, spillovers and increasing returns to research. The models seldom move beyond orthodox statics, substitution and rationality in their assumptions, optimization in their method and equilibrium in their results. So we need to emerge from mechanics to evolutionary arguments standing on novelty and dynamics where learning extends the rational bounds of heterogeneous agents through time in a process of knowledge creation. The organizational form most amenable to innovation, however, may not be competition but collaboration. The institutional justification for rivalrous social incentives stands on its substitution assumptions, so is inapplicable to complementary outputs such as of information. This suggests some more research is needed to reconcile learning phenomena with the competitive values of a market-driven economy.

This paper represents economic growth as a complementary interdependent dynamic complex system in which all individual agents interact diversely and unpredictably over time. A transportation network conception captures systemic connectivity in a model of planning horizons showing how learning in changing contexts supports strong claims for complementarity in economic relations. So will this horizontal theory yield the implication that competition not only is inefficient but also results in a myopic culture (invisible to any orthodox static construction ignoring horizon effects). The institutional implications of horizontal theory are reviewed with respect to their ramifications for economic growth, transmission of knowledge and the shift from materialistic consumption to intangibles in the new information economy. A case shall be made for cooperation, not competition, as an efficient form of social organization, restoring consonance between efficiency, equity and ecological health.

KEYWORDS: efficiency, cooperation, complementarity, planning horizons
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I. Introduction

The question addressed in this paper requires a redefinition of terms. What should we mean by development? There are three obvious options: more things, information or organization, in some combination. Economic growth of physical output is not the goal in an age of ecological limits and deprivation of mature human needs. So how one should measure development is the first matter to be considered.

There are two types of good to be analyzed: physical things and intangibles, all engaged in a systems setting of interdependent effects. The process unfolds through historical time on a path-dependent track at the expense of all that might happen instead (the opportunity cost), for better or for worse. But ‘goodness’ (Boulding 1962, p. 140) in economic development should be defined at the start.

The notion of planning horizons serves as an index of progress here. Horizon effects are introduced and tied to prices and growth, then aggregated in network contexts to frame their role in development. This analysis shows that competition – though aiding growth of physical output under rising costs – also retards economic development under increasing returns to production and through horizon effects, suggesting cooperation is our route to efficiency, not competition (Jennings 2005, 2008).

The relation of this result to neoclassical growth theory is addressed in terms of method, definitions, styles of framing and implications. The basic claim is that competition is only efficient with rising cost: the efficiency attributes shift to cooperation with increasing returns as well as for all intangibles. So if the development process entails a shift toward intangible goods away from material needs – as argued – then competition does not advance but rather retards economic development.

The argument is as follows. First, development will be identified as horizontal and discussed. Second, the cognitive features of planning horizons are explored and then, third, their impact on price is addressed. Fourth, the nature of growth and development will be examined in this setting to show competition is only progressive.

1 The argument here is that ecological limits constrain and define sustainable growth, and that the deprivation of higher order human needs shows up in the form of materialism as symptomatic of frustrated wants (cf. note 2 below).
for things produced with decreasing returns, while under increasing returns and for intangibles cooperation is sought. Fifth, the shape of production technology (increasing vs. decreasing returns) and substitution and complementarity are reviewed to show what is wrong with neoclassical models: they identify scarcity as the essence of our relations, when abundance is far more relevant. If so, competition is stifling economic development, rather than aiding growth as widely believed. The implications are summarized in a concluding section.

II. What Do We Mean by Development?

The standard neoclassical theory of economic growth and development uses a model of physical output as a proxy for social welfare. There are at least two problems with this. First, ecological economics speaks of ‘limits to growth’ due to the relative scale of physical throughput to our ecosystemic constraints: ‘more’ may not be ‘better’ aboard this Spaceship Earth economy (Boulding 1966a). Second, the organizational theorists speak of materialistic consumption as symptomatic of need deprivation: with higher-order ambitions thwarted, we stress subgoal pursuits – such as acquisitive values and narcissistic concerns – to compensate for this stoppage. An augmentation of physical output may not enhance social welfare in a contained ecology or in the presence of frustrated desires. If so, one must start by framing the question differently than most do.

Institutional economics stands on a view of interdependence, suggesting that the effects of actions spill out forever on everyone else. If so, externalities are pervasive, forcing a systems approach: we live in a world that is more like a network than any aggregation of independent units such as supposed in neoclassical theory. Actions spur irreversible changes that may expand and not attenuate as they radiate outward, gathering force in a

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2 E.g., cf. Maslow (1954, 1968); also Wachtel (1989), Kohn (1986), Scitovsky (1976) and McGregor (1960). Argyris (1960, pp. 262-63) said that conventional organization treats its members like children; mature people in these settings show symptoms of ill health, including “frustration, failure, short time perspective and conflict.” He voiced concern about organizational fragmentation on pp. 268-69: “The nature of the formal principles of organization causes the subordinates, at any given level, to experience competition, rivalry, intersubordinate hostility and to develop a focus toward the parts rather than the whole.” McGregor (1960, p. 310) warned that:

The deprivation of needs has behavioral consequences. ... The man whose needs for safety, association, independence or status are thwarted is sick, just as surely as he who has rickets. We will be mistaken if we attribute ... passivity, or ... hostility, or ... refusal to accept responsibility to ... inherent 'human nature.' These forms of behavior are symptoms of illness – of deprivation of ... social and egoistic needs.

McGregor (1960, p. 311) went on to explore the connection to rampant consumerism and materialism in modern society:

...the fact that management has provided for these physiological and safety needs has shifted the motivational emphasis to the social and egoistic needs. Unless there are opportunities at work to satisfy these higher-level needs, people will be deprived; and their behavior will reflect this deprivation. ... People will make insistent demands for more money under these conditions. It becomes more important than ever to buy the material goods and services which can provide limited satisfaction of the thwarted needs. Although money has only limited value in satisfying many higher-level needs, it can become the focus of interest if it is the only means available.
cumulative fashion (Myrdal 1978). If so, we move down a path-dependent track in real historical time at the cost of foregone options. These opportunity costs stay unseen, except in imagination through a theoretical lens selectively trained on its own essentials, silent on everything else. This is a case for pluralism: the more ways we can think about things, the less likely we’ll leave something out that matters for that application.

Furthermore, the approach is synthetic – concerned with inductive inference of what Samuelson called ‘regularities’ – more than taxonomy or reduction into a rigid deductive frame. Only in neoclassical theory are representations strictly couched in mechanistic constructions of functionalism and one-way causality. In network contexts, systems theory is used to analyze interdependent dynamics or reciprocal linkages in economic constructions. Simplistic classifications on neoclassical lines shall lead us astray in these complex settings. A Euclidean model cannot fill the bill.

These things said, the meaning of economic development takes us beyond the growth of physical output into a new domain of factors stemming from ‘bounded rationality’: if myopic concerns are rewarded by a competitive frame, then rivalry may be ‘X-inefficient’ to use Leibenstein’s (1966) term. Material things are not the only objects of economics; we also value intangibles, subject to other rules. As Romer (1996, p. 204) put it:

New growth theorists now start by dividing the world into two fundamentally different types of productive inputs that can be called ‘ideas’ and ‘things.’ Ideas are nonrival goods that could be stored in a bit string. Things are rival goods with mass (or energy). With ideas and things, one can explain how economic growth works. Nonrival ideas can be used to rearrange things... Economic growth arises from the discovery of new recipes and the transformation of things from low to high value configurations.

3 Samuelson (1963, p. 235) commented on Friedman’s (1953) case for unrealistic assumptions in economics thus:

... I’d rather have the valid tail of a theory than have an invalid dog’s body attached to that tail. What is required is not Occam’s Razor so much as God’s Hatchet. ... We must not impose a regularity ... in the complex facts which is not there. Good science discerns regularities and simplicities that are there in reality...

4 Rescher (1979, pp. 46-49), observed that “the network model of cognitive systematization,” as distinct from “its Euclidean counterpart ... dispenses altogether with ... axiomatic supports” and it replaces...

...stratification of theses into levels of ... fundamentality by a conception of enmeshment. ...The network appeal is unreductive. ... [It] shifts the perspective from unidirectional dependency to reciprocal interconnection. ...

A heavy charge can be laid against the Euclidean model on grounds of the enormous hold it has established on philosophical and scientific thought in the West. Its exclusion of circles and cycles on grounds of their violating the prohibition of Aristotelian logic against ‘circular’ inferences and reasonings impeded the conceptualization of reciprocal causal models in science for over two thousand years.
But Romer (1994, 1996) doesn’t go far enough in looking at network effects as a means of extending the Solow-Swan (1956) models into endogenous growth through learning. Take, for example, Metcalfe’s law as an attempt to measure network effects: that the value of a network is roughly proportional to the square of its users. This relationship adds a whole new extension to growth economics, straying far from scarcity models.

Substitution – negative feedbacks in the language of systems – is only one form of interdependence; the other is complementarity or positive feedback loops. Senge (1990, pp. 79-80) identified three essential elements of any system theory: “balancing (or stabilizing) feedback [in] goal-oriented behavior”; “reinforcing (or amplifying) feedback [in] the engines of growth”; and “delays” in time making “consequences of actions occur gradually. … All ideas in … systems thinking are built up from these elements.” In the language of economics, such can be called substitution, complementarity and time-horizons (or the more general term – planning horizons – to be addressed below). Neoclassical theorists skirt the notion of complementarity, using a term from public goods theory of ‘nonrival’ goods instead. There is a very good reason for their reluctance to open the Pandora’s Box of positive feedbacks in economics, similar to their reason for avoiding increasing returns: substitution assumptions stand in the ‘hard core’ of this approach and cannot even be relaxed without discarding the frame.5

But network effects can be defined as an interdependence between the value to one individual of any good or service and the number of users. In this sense, snob and bandwagon patterns show network effects, as do stock exchanges, software markets, fashions and website use. Substitution assumptions alone do not apply in these settings; systems of interacting components show reciprocity too. Any embrace of positive feedback can open neoclassical models into realms of nonconvexity in which they do not close, so will violate theory acceptance

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5 As Stiglitz (1985), p. 21, said: “the traditional competitive equilibrium analysis … is indeed not very general; the theory is not robust to slight alterations in the information assumptions.” Blaug (1976, pp. 156-57) called attention to the inflexibility of ‘hard core’ assumptions in the course of explaining Lakatos’ concept of MSRP (the methodology of scientific research programs):

“The history of science”, Lakatos observes, “is the history of research programmes rather than of theories” and “all scientific research programmes may be characterized by their ‘hard core’, surrounded by a protective belt of auxiliary hypotheses which has to bear the brunt of tests.” The “hard core” is irrefutable by “the methodological decision of its protagonists”… The “protective belt”, however, contains the flexible parts of an SRP and it is here that the “hard core” is combined with auxiliary assumptions to form the specific testable theories with which the SRP earns its scientific reputation.
standards that equilibrium must exist. Positive feedback systems are open to change, like an evolving ecology; they are not subject to closure. Reciprocity and nonconvexity undermine these norms. Substitution is only one side of the coin; the other is complementarity. If ‘atoms’ are rival and ‘bits’ are not, then neoclassical growth theory ought to abandon its stand: scarcity models of substitution do not cover the ground.

Warsh (2006, p. 399) opened his final chapter on Romer’s endogenous growth theory thus:

*We’ve come to the end of our story – the tale of how one paper in technical economics precipitated the redefinition of the basic factors of production, of how, during a few years in the 1980s, land, labor, and capital became people, ideas, and things, thanks to a useful new distinction between atoms and bits. ... So there is a new economics of knowledge. What has changed as a result? The answer, it seems to me, is not much – at least not yet.*

This is certainly true. The promise of a new theory of knowledge – an evolution of growth and development – is very great, as people like Veblen (1898), Hayek (1937, 1948) and Schumpeter (1942) said long ago. But any embrace of systems theory opens some matters intractable in neoclassical terms (Jennings 1999, 2008).

For example, scarcity yields to abundance in network configurations. As Warsh (2006, p. 298) put it:

*The question Romer had framed as a graduate student had an answer now. ... How could economics be so ... fundamentally wrong about growth? The answer was that a basic economic principle was missing – ... the nonrivalry of knowledge as the ... source of increasing returns. Scarcity was indeed a cardinal principle of economics, but it was not the only cardinal principle. The economics of knowledge was about abundance.*

Indeed, throughout information technology, abundance has replaced scarcity in economic relations. As Matthew (2001, p. 2) recently put it, in an essay on “The New Economy”:

*In the networked economy, the more plentiful things become, the more valuable they become. ...Value is derived from plenitude, the concept of abundance. ... Abundance is everything. Ubiquity drives increasing returns in a networked world. In fact, the only factor becoming scarce in a world of abundance is human attention.*

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6 Cf. Mirowski (1989). Mirowski (1986, p. 193) warned that: “Legitimation comes to be confused with the norm of closure, so there arises a very low threshold of toleration for debate which does not seem headed toward closure.” Also cf. Boulding’s (1962, p. 133) remark that “teaching … is the one clearly observable process in the universe where the strict laws of conservation do not hold…”
The scarcity of human attention is the focus of planning horizons. Due to the reproduction of information “at near-to-zero marginal costs,” as Elsner (2004, p. 1032-33) explained: “The ‘new’ economy, thus, has entered a stage of informational abundance which bears little resemblance to the conventional mainstream economic assumption of scarcity.” Quoting Lamberton (2001, pp. 115, 117f), Elsner continued:

“The limitations of information as a commodity...” call for a “thoroughgoing innovation in organizational design” to include “a very high level of collaboration.” This renders economics a science of (...) adequate coordination mechanisms rather than a science of individual maximization, general equilibrium and ‘optimality.’

So what do we mean by economic development in “a science of … adequate coordination mechanisms” based on collaboration? That is the question raised by Warsh’s (2006, p. 408) last statement on Romer’s discovery:

Economics has never been more exciting. Its greatest challenges lie ahead, to discover the deeper secrets of the wealth of nations, the faculties that Adam Smith called our moral sentiments – what it is about human nature that we call humane.

Perhaps Simon (1983, p. 107) said it more clearly, about the discovery of the humane, at the close of his series of lectures on “Reason in Human Affairs”:

Reason ... is instrumental. It can’t select our final goals... All reason can do is help us reach agreed-on goals more efficiently. ... It would be quite enough to keep open for our descendants as wide a range of alternatives as our ancestors left for us... In accomplishing [this] more limited goal, will an appeal to enlightened self-interest suffice? ... Success depends on our ability to broaden human horizons so that people will take into account, in deciding what is to their interest, a wider range of consequences. It depends on whether all of us come to recognize that our fate is bound up with the fate of the whole world, that there is no enlightened or even viable self-interest that does not look to our living in a harmonious way with our total environment.

This is the notion of planning horizons and their role in development. But what is the precise significance of Romer’s break with tradition? For more than 200 years, economics has stood on assertions of scarcity throughout human relations. The old ‘diamond-water paradox’ states this scarcity issue, when – though water is more important for life – diamonds are ‘dearer’ in price. Scarcity raises price, while abundance shoves it down. This,
some argue, is the defining condition of economics: as ‘the study of scarcity problems.’ Scarcity yields a basic conflict of interest in society: your gains subtract from my own. Scarcity is economists’ oldest and most fundamental premise: substitution rests thereon. This sort of ‘conflict mentality’ motivates standard doctrine.

The new information economy yields some meaningful questions about this approach. Information and non-rival goods or intangibles (as the more general term) place substitution in doubt as a defining characteristic. Complementarity opens an alternative version of economics, standing on abundance. Substitution takes human needs as opposed in a zero-sum game based on decreasing returns in production. Abundance sees our aims as aligned in a harmonious way: instead of wine vs. beer we enjoy our wine with cheese. The basic conception is of a concert over a conflict of value. If human desires are not divergent – if reciprocity is the rule – then coordination is more efficient than competition. An introduction of planning horizons will help untangle the knot.

### III. Horizons Economic Development

The planning horizon – as a concept – deserves special attention in any economics of knowledge as a ‘force locomotif’ of growth (Romer 1996, p. 204). The notion needs definition, though, in a realistic context of interdependent decisions spilling externalities outward forever on all. Perhaps of greatest significance is horizons’ epistemological status: as a synthetic inductive inference, not as a self-asserted deductive variable used for ‘convenience,’ not truth. The planning horizon exists in every act of human choice, which is itself a normative process of multidimensional causal projection. So we don’t talk about ‘infinite’ or ‘optimal’ planning horizons, but about their range of projection, why it changes, and how ‘horizon effects’ influence social behavior and welfare. Before reviewing its economics, the horizontal concept should be defined.

Decisions are not made on known outcomes, but rather among imagined projections set in the mind of the agent at the instant moment of choice. These projections have a range we call the planning horizon, but horizontal length cannot be observed or measured in cardinal units, for anyone else or oneself. *Ex ante*, one can think of the planning horizon in any act ($H^*$) as a probability-weighted average of the scope of contingent projections in advance of their realization; *ex post*, however, the actual $H^*$ is set where reality leaves expectation. Thus $H^*$
appears wherever surprises swamp projections; an agent can think her horizon is long until events show it as short. The planning horizon denotes an ordinal index of bounded rationality (Simon 1982-97).

Another way to think of the planning horizon is as a ‘measure of fit’ between theoretical images and the reality where they apply. This correspondence theory of human cognition is well-described by Boulding (1956, passim); Simon (1981, p. 104) observed that “long-term memory operates like a second environment, parallel to the environment sensed through eyes and ears, through which the problem solver can search and to whose contents he can respond.” Pylyshyn (1984, p. 251) put it well:

*It is my view that there is only one empirical hypothesis responsible for the productive success of the entire range of imagery models...: When people imagine a scene or an event, what occurs in their minds is, in many ways, similar to what happens when they observe the corresponding event actually happening.* [original emphasis]

Apprehending $H^*$ as a measure of fit between image and Truth (to which we have no direct access: this is the Problem of Induction and the ultimate aim of theory) yields some meaningful insights on the planning horizon as an index of knowledge applied to choice. So would ideas guide decisions: $H^*$ is seen as a way of thinking about our frames in their context, about how well assumptions are matched to extant conditions in theory use. Suppositions unfit to their realms of application will shorten horizons, making us more myopic in our reactions than we would otherwise be. Examples are offered below.

In a world of interdependence, especially among complements, planning horizons measure conscience (Jennings 2007b). Here the problem is like oligopoly, where I need to know your reactions before I can figure out mine. Without orthodox substitution and independence assumptions,7 both ethics and theories of organization come into play as important. Thus planning horizons – in network contexts – serve as an ordinal index of conscience and as a measure of rational bounds or of fit between image and truth.

A more familiar representation of $H^*$ is as a triple measure of run length, the ‘scale’ of private decisions (Jennings 2007a), and of impatience in temporal frames. So will planning horizons affect time spans, range of

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7 As Krupp (1982, p. 390) explained: “Axioms of independence ... lead directly to the laws of substitution... Independence means that the behavior of the elementary unit can be described without reference to the behavior of other units.” But “interdependence can lead to complementarity,” according to Krupp, which shall imply a different outcome, such as that described by Myrdal (1978, p. 774) in his explanation of “why circular causation normally will have cumulative effects.”
vision and discount rates. In sum, the less shortsighted we are: the longer the time span of our decisions; the wider the scope of effects we consider; and the more patient we grow (in terms of financial lending and borrowing). Any horizontal lengthening will thus shift economic relations: making graphs flatter and more elastic; capturing more externalities; and inducing greater investment funding.

Perhaps the most important domain for horizonal theory is stated by Boulding (1966b, pp. 22-23) in his wistful lament over our lack of a measure for knowledge:

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\text{The question of what is economics can be almost as troublesome as what is knowledge? \ldots One longs, indeed, for a unit of knowledge, which perhaps might be called a ‘wit,’ analogous to the ‘bit’ as used in information theory; but up to now at any rate no such practical unit has emerged. \ldots The bit, however, abstracts completely from the content of either information or knowledge \ldots [and] for the purposes of the social system theorist we need a measure which takes account of significance \ldots Up to now we seem to have no way of doing this...}
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Elsewhere, Boulding (1962) elaborated at length on the value of a measure of organization and evolution:

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\text{The first Question \ldots is whether it would be possible to find a measure of the extent of evolution in the distribution of entropy. This would be \ldots a measure of \ldots organization \ldots [or] \ldots of the rate of evolution. \ldots It is not the value sign which matters here, however, but the vector, that is, the sense of both direction and magnitude. \ldots}
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\text{Several important problems might be closer to solution if we had a measure of evolutionary change. \ldots The key to \ldots understanding \ldots evolution is an analysis of the teaching process. Here \ldots the strict laws of conservation do not hold. \ldots Teaching is in no sense an exchange, in which what the student gets the teacher loses. We can break down the teaching process perhaps into two others: the first might be called the printing process. \ldots}
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\text{There is also \ldots a more fundamental process at work: I shall call it \ldots ‘inspiring.’ This is the process by which the teacher supports and cooperates with a process of internal growth in the mind of the student. \ldots It is the process also by which ideas and ideologies inspire the growth of cultures and societies. This is \ldots a complex and puzzling process, which we understand very imperfectly...}
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\text{It is clear that in the ‘teaching’ process we are dealing with something akin to the growth of organization. Knowledge, indeed, can be regarded as a form of organization. \ldots One despairs \ldots of ever getting any simple}
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measure of the quantity of knowledge. Nevertheless a measure of the quantity of organization would be of some help here, and might be valuable in testing the ‘success’ of a learning process.

These considerations ... lie at the heart of most of the major problems of our day. Consider, for instance, the problem of economic development. ... The transformation of a society from a lower level to a higher level of organization ... is an evolutionary, developmental, and almost embryological process...

Somewhere lurking in the wings of this ... argument is ... the whole problem of value. ... The value coordinate is clearly a scalar, like organization. ...Because I have some confidence in the generally monotonic character of the relationship between organization and ‘goodness’ – that is, that both generally increase together – I would argue that the development of a workable measure of organization would at least be a first step toward the construction of an ethical calculus. The want of this measure however may impede progress toward the solution of many problems, not only in biology and in the social sciences, but also in ethics.

The planning horizon meets the criteria outlined above by Boulding, and by Simon (1983, p. 107) too: “Success depends on our ability to broaden human horizons so that people will take into account, in deciding what is to their interest, a wider range of consequences.” So H* offers a measure of rational bounds, of organization, knowledge and teaching, and of impatience and time-preference in economics. Now it is time to see how planning horizons relate to pricing and growth.

IV. A Horisontal Theory of Pricing and Growth

A planning horizon (H*) exists in every human act. Though H* is not observable, our projections have a range for each contingent track considered, in a balance of attention among competing demands. Attention is selective, so our choice of essentials counts: if frames don’t fit to applications (due to rigid assumptions), then our planning horizons shorten relative to what they might have been. The case for realistic conceptions shows up in horizon effects, stemming from improper applications of models. The paper describes an example.

Planning horizons serve as an aid to thinking about decisions and foresight. But H* resists cardinal measures; sadly, ‘wits’ are equally as innumerable as ‘utils.’ So we speak of horizon effects as ordinal changes in planning horizons, without any calibration of axes such as we’d all like to have. Fortunately, much
understanding can be gleaned from horizon effects in an ordinal frame. We know a lot – though never enough – about horizon effects. Knowledge will grow if others seize the idea and take it further.

The relation of price to $H^*$ is seen in the following way. The longer the planning horizon – due to internal factors (such as self-confidence, knowledge, effort and energy) and to external factors (such as stability of the decision environment, trust in others’ reliability, and no unexpected disruptions) – the lower will be the marginal costs ($M^* > 0$) and the markup ($E^* > 1$), where $P^* = M^* \cdot E^*$ applies to all market forms. Perhaps Margolis (1960, pp. 531-32) said it the best; his statement is one in a long debate about time in relation to cost:8

... The greater the uncertainty ... the shorter will be the planning horizon and the greater will be the ... costs...

The implications ... are that the greater the ignorance of the market the higher will be the estimate of the costs and the more inelastic the estimate of demand. What price should a firm charge if it has hopes of later expanding its market? The higher the price the greater the expected short-run profits and the greater the sacrifice of expected information about the mass market. The lower the price the more information it gains about the future market possibilities. ...

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8 Knight (1921, esp. pp. 186-87) described the problem in his opening sentence with clarity:

Great difficulties are met with in stating a clear and straightforward exposition of price theory because of the fact that the given conditions or data of the problem are so different according to the length of the time period which the explanation takes into account. ... The essential fact in economics is that different changes take place at different rates, that for certain time periods certain aspects of the situation may be assumed to remain unchanged, while for longer periods some of these will undergo change. The data or given conditions are different when different periods of time are under consideration. ...

A helpful discussion of Marshall’s views in this regard can be found in Shackle (1965, ch. 3, pp. 27-42); also cf. Frisch (1950). Stigler (1939, esp. pp. 306, 311-12, and 320-21) closed his paper in a manner revealing the problem as methodological:

... a complete presentation (for any given set of price anticipations) involves a third axis, time, and the marginal and other cost functions become surfaces. ... But ... it is no longer possible to handle the problem ... by the use of plane geometry, since future prices are now important variables.

J. M. Clark (1940, esp. pp. 246-48) said “the whole functional relationship is probably so complex as to defy mathematical plotting.” Then Clark (1955, esp. p. 459) noted that:

This complex of variables would overload any possible system of graphic presentation. A family of three-dimensional surfaces – the third dimension being time – with a different surface for each initial price or price situation, would still be a simplification.

Also cf. Turvey (1969, esp. pp. 285-87), who concluded on p. 287 that:

...The definition of marginal cost as the first derivative of cost with regard to output is too simple to be useful. Both cost and output have time dimensions, and both may be subject to uncertainty.

Margolis (1960, pp. 531-32) even outlined the keystone point on pricing and tied it to learning and growth! All this implies – since marginal cost, along with markups on cost to price (based on demand elasticities), should duly fall as planning horizons extend – that price depends on the planning horizon in any and all economic contexts. Formally stated, since marginal cost ($M^* > 0$) and markups ($E^* > 1$) must both fall as $H^*$ rises, then it follows that $P^*$ (the product of $M^*$ and $E^*$) is a declining function of $H^*$ as well. If so, then standard theory is not determinate in itself, and makes a hidden, tacit assumption that $H^*$ is fixed, but at an unspecified level. Horizon effects lead to changes in price independently of other stimuli. If so, our explanation of pricing behavior and other related phenomena is incomplete. This, in turn, implies that we must develop a new explanation based on planning horizons and learning. Horizontal theory excavates suppressed dimensions of economics into illuminating conclusions.
A useful way to think about the relation of planning horizons to pricing is that the planning horizon in choice is like the ‘move horizon’ in chess. Standard assumptions – of free agents, known outcomes, stable wants – do not apply in chess. One must abstract from moves and details to address the problem of chess (or of oligopoly too). Chess is a process of planning in the face of strategic contingencies shifting with each turn. Outcomes are projected uncertainly, and the purpose – to win – neither restricts nor requires actions sufficiently to identify moves. The field of chess is as much an opponent’s style of play as the board. The chessboard demands a different approach to understanding choice than neoclassical theory allows.

The better that tradeoffs are understood and near-move contingencies culled, the more moves ahead can a player project. The emphasis here is on planning in unpredictable changing conditions. Choices in chess are path-dependent and spatially interreactive. They are also irreversible, as in real life (unlike in a store). One must step back from positions on the chessboard to see its economics. The move horizon in chess is analogous to the time horizon in choice, but the time dimension is only extended by our knowledge of other relations, so planning horizons remain the focus. Planning horizons serve as an index of ‘savvy’ in practical life.

Formally, one can think of these static constructions (setting $P^*$ as the product of $M^*$ and $E^*$) as members of a horizontal family. Cost and demand curves shift with horizon effects in predictable ways, since longer-run curves, ceteris paribus, are more elastic (or flatter) than shorter-run curves. If each static graph is on a transparency in a horizontal file drawer (with longer horizons toward the back), the horizontal part of Figure One is a side view of that file tracking $P^*$ and $M^*$ for different $H^*$s (while leaving $Q^*$ unexpressed).\footnote{This finding can be derived – if done properly – from Alchian’s (1959) nine propositions on cost, despite the erroneous effort by Hirshleifer (1962) and its acceptance by Oi (1967) and Alchian (1968): cf. Jennings (1985, ch. 5). Formally, $M^* = MR = MC$ at $Q^*$ (the maximum profit condition), with $E^* = [\varepsilon^*/(\varepsilon^*+1)]$ where $E^* > 1$ because $-\infty < \varepsilon^* < -1$ [and here $\varepsilon = \frac{\ln Q}{\ln P} = \frac{(dQ/Q)/(dP/P)}$, the elasticity of demand, which can be thought of as the percentage response of $Q$ to a one-percent increase in $P$]. The whole expression can be derived very simply by substitution from the definition of MR as $dR/dQ$ (where $R = P \times Q$) with respect to $Q$ or $P$, which can be written simply as $P = MR \times [\varepsilon/(\varepsilon+1)]$, yielding $P^* = M^* \times E^*$, where the asterisk (*) denotes the level actually chosen as best by an agent. The horizontal outcome is summarized thus: $dM^*/dH < 0$ with $d^2M^*/dH^2 > 0$; $dE^*/dH < 0$ with $d^2E^*/dH^2 > 0$; so $dP^*/dH < 0$ and $d^2P^*/dH^2 > 0$. If so, then for $g = d\ln Q/dt$, the growth rate of sales, $dg^*/dH > 0$ with $d^2g^*/dH^2 < 0$ (cf. Margolis 1960, Jennings 2008).}

But Figure One is only for a single price-setting agent, without accounting for externalities (pecuniary or otherwise). In neoclassical theory, aggregation from individual prices to group patterns is set by industries, which impose substitution by fiat. This is fine for beer vs. wine in the context of having a drink, but does not
work for general agglomerations of wine, beer, cheese and pretzels, especially if the relevant choice is to throw a party or not.\(^{10}\) A transportation network captures the problem in a more flexible way.\(^{11}\)

In this setting, concerns should focus on externality issues with respect to the impact of any particular price on the profits of other price-setters, either *ceteris paribus* for their prices (a Cournot assumption) or *mutatis mutandis* as appropriate. Either way, net interdependence within any group with respect to \(P_j\) is the difference between an uncompensated \(P_j^*\) and a \(P_j'\) adjusted for external profit effects. The impact of \(P_j\) on \(i \neq j\)'s profit is simply \(s_{i \neq j} = (Q_{i \neq j}/Q_i) \times (P_{i \neq j}^* - M_{i \neq j}^*) \times [\varepsilon_{i j}^*/(\varepsilon_j^*+1)]\), so net effects are a combinatorial \(S_I = \Omega s_{i \neq j}\).\(^{12}\) Consequently, \(P_j' = P_j^* - S_I\): if \(S_I < 0\) then we have net substitution within this group with respect to price \(P_j\); this is the standard industry model. But with \(S_I > 0\), we have net complementarity. The interdependence within any group with respect to a single member can thus be expressed in general terms.\(^{13}\)

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\(^{10}\) In this case all of these products are complementary, competing with non-party options.


\(^{12}\) \(S_I\) is only a simple summation if these agents are independent, which was ruled out at the start.

\(^{13}\) Our measure of ‘net interdependence’ in any group \(I\) with respect to member \(j\) is \(S_I = \Omega s_{i \neq j}\), where compensation \(s_{i \neq j}\) to or by each \(i \neq j\) member is: \(s_{i \neq j} = (Q_{i \neq j}/Q_i) \times (P_{i \neq j}^* - M_{i \neq j}^*) \times [\varepsilon_{i j}^*/(\varepsilon_j^*+1)]\), whose sign is that of the cross-elasticity of demand for \(i\) with respect to \(j\), \(\varepsilon_{ij} = d\ln Q_i/d\ln P_j\), where own-elasticity of demand for \(j\) is \(\varepsilon_j^* = d\ln Q_j/d\ln P_j < -1\). Then \(P_j' = P_j^* - S_I\), as explained in the text.
But now, with blinders of substitution (negative feedback) cast aside, we have an institutional problem. In the presence of substitution, competition will lead to greater output than collusion: that is the orthodox story. Yet among complementarities, just the opposite will hold true: cooperation augments output and growth, where rivalry undercuts it. Substitution assumptions shall not apply in the presence of complementarities; indeed, in this situation, competition creates scarcity. The institutional system, be it competitive or cooperative, enhances substitutes – starving complements – or just the reverse. Sadly, we must choose, at the cost of foregone options.

Wherever economic incentives support rivalry in society, complementary output is stifled. A nondecomposably intertwined tangle of substitutes and complements sets up a problem of choice: which is more important, substitution or complementarity? Do we know? Have we studied the question? Can we design our institutions for competition across substitutes and collusion among complements, when that distinction is so preference- and purpose-specific? Is there any way around this problem of interdependent typologies?

In the formal analysis of a transportation network context, the term $S_i$ expresses the balance of substitution and complementarity in any group with respect to one member. The question to ask concerns the impact of a horizon effect – for longer or shorter, wider or narrower, better or worse – on that balance. This question has an answer, under one important condition of interhorizonal complementarity.

Interhorizonal complementarity means that private horizon effects spread contagiously outward to cause social horizon effects. If you and I affect each other, then your reliability invites me to become more predictable too: understanding operates as a local public good in this sense. Such is also the chessboard problem: masters’ horizons shrink against duffers since dumb moves are made.\textsuperscript{14} The interpersonal interdependence of planning horizons is complementary:\textsuperscript{15} you represent a disturbance term in my decision environment. If you become more reliable, I can do so as well. We are role models for each other; we learn through imitation: horizon effects spread through novel ideas, structures and designs. That is the essence of Romer’s (1996, p. 204) point.

So what effect does interhorizonal complementarity yield on the interrelation of prices and output? This is the key to horizontal theory: longer planning horizons – social or private – change economic relations in favor

\textsuperscript{14} This expands the number of near-move contingencies to be considered, and also weakens the grand master’s planning incentives.

\textsuperscript{15} An exception could be a jealous reaction to friends’ successful learning.
of complementarity and away from substitution: $dS_I/dH_j^* > 0$ in the general case.\textsuperscript{16} Simply put, horizontal lengthening alters social relations away from conflict toward a concert of interest: this is achieved through wider internalization of externalities, and through greater rationality undermining coercive force. Longer horizons expand the alignment of social and personal goals;\textsuperscript{17} they also improve ecological health through an activation of conscience, and they draw individuals into a more cooperative frame of mind (Jennings 2007b). The lesson of planning horizons is the importance of complementarity throughout economic relations (Jennings 2008).

V. Toward a Horizontal Theory of Growth

The key to economic development is horizontal length. The more rational we become, the more ethical and harmonious social relations will be. If frames fit better to their applications, horizons will lengthen accordingly. Indeed, the conflict orientation of formal economic constructions – standing on substitution assumptions – seems to be the problem. Partial models of equilibrium based on decreasing returns and closure have no relevance to the organic complexity of vital living systems (Koehler 1938, Katz and Kahn 1969). Such are marked by complementarity; only a narrow view of the problem invites substitution assumptions. Neoclassical theory has misspecified our economic relations as based on substitution derived from scarcity in a material world, at the cost of complementarity among immaterial goods as well as between our planning horizons.

So what does all this have to do with growth and development in economics? The answer is, a great deal. Let us steal a glance at what development truly means, seen through a lens from Maslow’s (1954, 1968) psychology

\textsuperscript{16} $P_j' = P_j^* - S_I$ for any group I of firms, where $S_I$ is the difference between the compensated (joint-profit maximizing) $P_j'$ and the $P_j^*$ set independently of its pecuniary impact on the other ($i \neq j$) firms’ profits. Interhorizonal complementarity means $dH_{ij}^*/dH_j^* > 0$. If so, then $dS_I/dH_j^* > 0$: an increase in $H_j^*$ yields – through its contagious effects on $H_{ij}^*$ – a shift of $S_I$ away from substitution in favor of complementarity. For any $ij$ element of $S_I$, namely $s_{ij} = (Q_{ij}/Q_j) \times (P_j^* - M_{ij}^*) \times [\epsilon_{ij}^*/(\epsilon_j^* + 1)]$, an extension of $H_j^*$ will likely reduce the magnitude of both $Q_{ij}/Q_j > 0$ (as a weighting scalar) and $(P_{ij}^* - M_{ij}^*) > 0$, while increasing own-elasticity ($\epsilon_{ij}^* < -1$) and thus the negative magnitude of $[\epsilon_{ij}^*(1 < 0)]$, while the cross-elasticity ($\epsilon_{ij}^*$) is shifted away from substitution ($\epsilon_{ij}^* > 0$) toward complementarity ($\epsilon_{ij}^* < 0$), so $d\epsilon_{ij}^*/dH_j^* < 0$ as well. So regardless of the sign of $S_I$ (as an aggregation of $s_{ij}$ across any group I around member $j$), $dS_I/dH_j^* > 0$: a mutual lengthening of planning horizons shifts our relations away from substitution in favor of complementarity (in virtually all economic contexts).

\textsuperscript{17} The goal of incentive alignment applies to all levels of organization. In a business setting, “the biggest impediment to … integration of personal needs and organizational considerations lies in managers’ lack of understanding about … the ways self-interests shape … personal realities…” Two things affect the economic efficiency of all management systems and group procedures: “The concept alignment provides management with a model for understanding how individuals attempt to fuse and integrate their personal needs with the needs of the organization” (Culbert and McDonough, 1985, pp. 125-26 and 138-39; also cf. Jennings 1999, p. 69).
of self-actualization. Maslow argued that personal growth entails an advance from material needs that – once met – give way to higher-order intangibles such as self-esteem, learning and love. All these more refined demands do not involve physical goods, so abundance supplants scarcity in economic relations as civilizations mature. But there is a necessary condition: social institutions must adapt to this change.

In other words, social horizons – as they lengthen and develop – push our relations away from atoms to bits (substitution to complementarity). Yet these gains are also repressed by inappropriate theories as well as social policies standing thereon. The economic competitive frame – based on substitution assumptions – is no longer relevant to an emerging information economy in which complementarity appears to be “far more important” (Kaldor 1975, p. 348). This is the widening gulf between neoclassical theory and truth: the nature of economic connection has shifted away from material goods, substitution and conflicts of value to intangibles showing complementarity in a concert of value. Romer’s (1996, p. 204) point – that we should distinguish nonrival goods from material things – simply falls short of the problem.

Material goods and decreasing or constant returns to scale lead to substitution, justifying competition as our route to efficiency. Yet Romer’s admission of bits applies to all intangible goods (such as not only information, teaching, learning and research, but also love, ethnic culture, ecological health and ethics): even a cursory look at what competition is doing in all of these areas is sufficient to reach a conclusion. *Competition in the presence of complementarity is inefficient;* competition does not relieve but *creates scarcity* in this setting. Complementarity is the inverse of substitution in this sense; structurally, it demands social cohesion (namely, collusion) to thrive. The scarcities spawned by rivalrous systems applied where they have no place show up in two particular forms: static constraints on output due to the impact of fragmentation in realms where integration is needed; and dynamic constraints from horizon effects in a myopic culture resulting from markets’ starving of intangibles.

Short sight and narcissism – manic consumption, ethical lapses and ecological loss – strife, violence, social turmoil, anger and disengagement – these symptoms of organizational stress stem from massive failures in both theory and application. The basic nature of economic connection – beyond decreasing returns – is not substitution but complementarity (Jennings 2008). And decreasing returns itself – founded on nothing more than
assertion – is not the way of our world in any context other than short-run theory. A few comments on the history of decreasing returns should be made to justify a dismissal of rising cost technology in production.

Smith’s (1776, Book I, Ch. 3) statement that “the division of labor is limited by the extent of the market” defines increasing returns. Warsh (2006, p. 46) framed a book on Romer’s distinction of atoms from bits on…

...two fundamental theorems of Adam Smith [which] lead off in quite different and ultimately contradictory directions. The Pin Factory is about falling costs and increasing returns. The Invisible Hand is about rising costs and decreasing returns. Which is the more important principle? ... These are the bifocals of Adam Smith. Through one lens, specialization (as in the Pin Factory) leads to the tendency we describe as monopolization. The rich get richer; the winner takes all; and the world gets pins [or pinned, perhaps? – FBJ] ... Through the other lens, the situation we describe as ‘perfect competition’ prevails. The Invisible Hand presides... No manufacturer is able to achieve the upper hand. As soon as one raises his prices, someone else undercuts him and price returns to its ‘natural’ level. ... No one perceived the contradiction at the time. But then, it was only pins.

Marshall’s long-run supply curves declined, though ‘representative firms’ faced short-run conditions subject to rising cost. Once Clapham (1922) raised the question of ‘empty boxes’ in need of filling with respect to production theory, Pigou (1927, pp. 193 and 197; 1928, pp. 252-53 and 256) – the Samuelson of his age – responded in this way: increasing costs are “impossible”; these “cases … do not occur” such that “supply price cannot … increase with increases of output” so are “excluded completely”; “only the laws of constant or decreasing supply price … are admissible.” Increasing returns unfolded into economic innovations from monopolistic competition to Keynesian theory. Yet these activities were repressed when the field entered an Age of Denial in 1939.

‘The Hicksian Getaway’ posited rising cost, discarding Pigou and thirty years of debate with the stroke of a pen. Hicks (1939, pp. 83-85) said that without this supposition “the basis on which economic laws can be constructed is … shorn away.” Seeking to “save … the threatened wreckage … of general equilibrium theory,” he added: “At least this getaway seems well worth trying” though “we are taking a dangerous step…” He closed with a curt dismissal: “Personally, however, I doubt if most of the problems we shall have to exclude for this
reason are capable of much useful analysis by the methods of economic theory.” Samuelson (1947) based his dissertation on the Hicksian frame, followed by Arrow and Debreu (1954) and subsequent generations of theorists. So was economics stuck in a rut where it remains.

A brief resuscitation of falling cost occurred in the 1960s in response to Alchian’s (1959) scheme of nine propositions on time in production, but his idea was soon neutralized by ‘The Hirshleifer Rescue.’ Hirshleifer (1962, pp. 235 and 237-38) claimed that “the classical analysis is consistent and correct,” thus succeeding in his aim of “rescuing the orthodox cost function” by upholding “the powerful logic of the law of diminishing returns” through an allegedly minor notational change. Oi (1967, pp. 590 and 594) reviewed these arguments to find common ground between the Hicksian and the Alchian-Hirshleifer frames, so concluded that “a dynamic theory of production along the lines of Hicks provides us with an essentially neoclassical explanation for progress functions. … To attribute productivity gains to technical progress or learning is, I feel, to rob neoclassical theory of its just due.” Alchian (1968, pp. 319-20) next declared the issue resolved: decreasing returns were now “a general and universally valid law.” In forty short years, the field turned away from Pigou’s exclusion to Alchian’s sweeping endorsement of rising cost.

Then Kaldor (1972, 1975) restored the Pigovian view, referring to Smith, Marshall and Young (1928) with apologies to the late Chamberlin. During the 1970s, I investigated ‘The Hirshleifer Rescue,’ and the argument is a non sequitur from Alchian’s nine propositions: Hirshleifer’s claim makes stronger assertions than Alchian ever claimed or intended, disproving his ‘rescue’ of orthodox theory (Jennings 1985, pp. 99-101):

The upshot of this grievous mistake is that any incorporation of learning by doing and technical change into cost and price theory has been deferred. The point lies in fifty long years during which we have painted a ‘well-behaved’ world, forestalling development of our conceptions in the direction of proper behavioral science.

There is no case for decreasing returns, simply asserted (then later denounced)\(^\text{18}\) by Hicks with ‘The Hicksian Getaway,’ and secured by Alchian as an unbreakable “law” after ‘The Hirshleifer Rescue.’ Kaldor (1972, 1975)

\(^{18}\) Hicks (1977, pp. v-vii) called his ‘getaway’ “an indefensible trick” that “ruined the ‘dynamic’ theory of Value and Capital”:
restored increasing returns and tied it to complementarity in a series of formative papers, but the Age of Denial continues, seen even in Romer’s work with respect to material output. This is because systems of positive feedback, complementarity and increasing returns are resistant to closure, requiring disequilibrium models: open systems on path-dependent tracks where history matters and interrelations are uncontained.

The real problem in this setting concerns a boundary issue. As Georgescu-Roegen (1970, pp. 2-3) said: “no analytical boundary, no analytical process…” If substitution cannot be assumed, then competition is not efficient: what would an economics of networks swimming in complementarities be? Standard dogmas solely apply to scarcity issues and substitute tradeoffs; systems theory is needed to analyze ecosystemic constructions. The economic process consists of “more than a jigsaw puzzle with all its elements given…” Neoclassical theory seems to have failed in its central ambition, due to its stubborn denial of falling cost. If complementarity is – as Kaldor (1975, p. 348) claimed – “far more important for an understanding … of the economy than the substitution aspect,” we have been doing it wrong.

The relevant boundary of economic growth is horizontal. Horizon effects are complementary. Complementarity argues that cooperation is efficient, not competition as in neoclassical theory. The primary impact of rivalry on human well-being is strongly negative, forcing us into a myopic culture at the expense of ecological

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I must begin with negations. They gave me a Nobel Prize (in 1972) for my work on ‘general equilibrium and welfare economics’ … referring to Value and Capital (1939)... This is work which ... was done a long time ago, and it was with mixed feelings that I found myself honoured for that work, which I myself ... have outgrown. How that has been I shall try to explain.

What I now think about Value and Capital is the following. The ‘static’ part, with which it begins, is an elaboration of Paretian demand theory... The vistas that opened up were in their way exciting; so it was difficult when writing not to exaggerate their importance. Thus it was that I perpetrated the too well-known sentence in which I so preposterously exaggerated the importance of the perfect competition assumption, declaring that its abandonment would involve the ‘wreckage … of the great part of economic theory’. I should have said ‘the greater part of the particular piece of theory with which I was at the moment concerned’.

In spite of all that has since happened to that particular piece of theory – the further elaborations at the hands of Samuelson, of Debreu and of so many others ... – the time came when I felt that I had done with it. But what I really regretted was that it had played so large a part as it did in the ... ‘dynamic’ part of Value and Capital.

The way in which I began in setting up that ‘dynamic’ problem I still feel to be right. ... Where I now feel that I went wrong was in my attempt to represent ... equilibrium ... supposing that [the effects of current transactions] could (somehow) be contemporaneous with the transactions themselves, so that an equilibrium ... could be reached. That however was nonsense. In Capital and Growth ... I could see that it was nonsense. ‘It does deliberate violence to the order in which in the real world (in any real world) events occur.’

It was this device, this indefensible trick, which ruined the ‘dynamic’ theory of Value and Capital. It was this that led it back in a static, and so in a neo-classical, direction.

Since then ... I have endeavoured to avoid the relapse into statics. I have endeavoured to keep my thinking more securely in time, concerning myself with processes... It is not enough to think in terms of time-series. The time-units must be linked together and they must be linked in time, future becoming present, and present becoming past, as time goes on. One must assume that the people in one’s models do not know what is going to happen, and know that they do not know just what is going to happen. As in history! It was helpful to go to history ... to remind one of what one had to mean.

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19 As Georgescu-Roegen (1967, p. 104) observed, after quoting Mitchell’s and Schumpeter’s critiques of economic abstraction: Standard economics, by opposing any suggestion that the economic process may consist of something more than a jigsaw puzzle with all its elements given, has identified itself with dogmatism. And that is a privilegium odiosum which has dwarfed the understanding of the economic process wherever it has been exercised.
health, peace, security and maturity, ethics, social cohesion, innovation and development. The introduction of ‘bits’ into a framework committed to ‘atoms’ simply undermines the entire approach. Either economists should go back to bed with their equilibrium models or we ought to wake and deal with the tensions we have forged. There is no other recourse. The emperor sleeps without clothes.

VI. Addressing the Empire: The Failures of Competition

In my Stanford dissertation (Jennings 1985, ch. 5), I blazed a path through the maze. Above, a relation of planning horizons to discount rates was posed, through the role of impatience. By definition, savers and lenders are more patient than borrowers. Indeed, the purpose of finance involves a Pareto-efficient exchange: the market discount rate becomes an equilibrium price for intertemporal equalization of marginal rates of impatience. Those with long horizons and ample assets are more likely to lend to those who want money now in spite of a larger payback later. Social planning horizons are reflected in ‘natural’ interest rates in free market economies.

If so, then longer horizons will lead to reduced discount rates – more rapid development – *ceteris paribus* in nonhorizontal realms. A formalization of this analysis shows an ordinal linkage of longer horizons to lower rates of interest, thus to higher rates of growth. This is another way that $H^*$ – as a measure of organization, knowledge and evolution (Boulding 1962, 1966) – engenders ‘goodness’ in a theory of value. The whole scenario is summarized in *Figure Two* below.
Figure Two: A Horizontal Representation of Economic Growth

Legend for Figure Two

**Case 1:** Here \((P_1^*, Q_1^*)\) is set with a short horizon \((H_1^*)\), yielding a high discount rate \((r_1^*)\), high price \((P_1^*)\) and low output \((Q_1^*)\).

**Case 2:** Here \((P_2^*, Q_2^*)\) is set with a long horizon \((H_2^*)\), yielding a low discount rate \((r_2^*)\), low price \((P_2^*)\) and high output \((Q_2^*)\).

But the observed effects are \(srQ_2^*\) which is growing at \(g_2^* > 0\) toward the ‘target’ \(Q_2^*\) at \(P_2^*\) on the long-run demand curve \(LRD\).

But there is at least one potential objection to this scheme from ecological economics: greater physical output may not be ‘good’ in a Spaceship Earth economy if it threatens the ecosystem by which it is contained. This is why economic development was not defined as ‘more stuff’ but rather in terms of social well-being – and the issue of ‘need deprivation’ raised – at the start of this paper. Economic growth in a ‘full’ world – distinct from an ‘empty’ one – does not necessarily yield a greater throughput of physical goods. Indeed, the pattern of narcissistic consumption is not a sign of wealth but of frustrated desire: as McGregor (1960, pp. 311 and 317) said a long time ago: “Although money has only limited value in satisfying many higher-level needs, it can become the focus of interest if it is the only means available.” He also observed that: “Fish discover water last.”
We only see where we are from outside, by casting off focal blinders. The problem is that competition is not the route to longer horizons, social or private. Any extension of planning horizons, either through learning or social stability, is a very different thing from materialistic conflicts of value. As Boulding (1962, p. 133) said:

...the key to the understanding of the process of evolution is an analysis of the teaching process. Here is the one clearly observable process in the universe where the strict laws of conservation do not hold. Energy and matter can only be exchanged: knowledge can be produced. ... Teaching is in no sense an exchange, in which what the student gets the teacher loses.

Substitution does not apply in this setting; complementarity yields a different design for resource use, social incentives and rules. Any organizational form amenable to long planning horizons will lead to economic development tuned to ecological limits. Indeed, economics becomes horizontal: longer planning horizons will make everything work a lot better, as we take into account more of our radiant impact on others, so will act more rationally and conscientiously. In an interdependent domain, this is the key to all else, as Simon (1983, p. 104) and Boulding (1962, 1966) have so well explained. The only barrier to understanding – and perhaps to implementation – is our resistance to novel assumptions. We economists need to wean ourselves from a conflict

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20 Cf. Tannenbaum and Hanna (1985, pp. 99-103), who observed that “the considerable and growing interest in the change process … has heavily focused on the moving on and has to a large extent neglected or avoided the need to hold on.” They add some insight here:

The psycholanalyst Ernest Schachtel (1959) insightfully explains: “The anxiety of the encounter with the unknown springs ... from the person’s fear of letting go of the attitudes to which he clings for safety, of the perspectives which these attitudes give him on the world, and of the familiar labels for what he sees in the world ... Letting go of every kind of clinging opens the fullest view. ... But it is this very letting go which often arouses the greatest amount of anxiety (p. 195). The eminent physicist Werner Heisenberg (1974) has observed: “When new groups of phenomena compel changes in the pattern of thought ... even the most eminent of physicists find immense difficulties. ... Once one has experienced the desperation with which clever and conciliatory men of science react to the demand for a change in the thought pattern, one can only be amazed that such revolutions in science have actually been possible at all” (p. 162). James Baldwin (1961) shares this wisdom in his powerful book: “Any real change implies the break up of the world as one has always known it, the loss of all that gave one identity, the end of safety. And at such a moment, unable to see and not daring to imagine what the future will now bring forth, one clings to what one knew, or thought one knew; to what one possessed or dreamed that one possessed. Yet it is only when man is able ... to surrender a dream he has long cherished, or a privilege he has long possessed, that he is set free ... for higher dreams, for greater privileges” (p. 117).

... Because the need to hold on is so basic to any change process, it is critical that we understand it much better than we do. ... The nature of any system change and the degree to which it is realized ultimately depend upon ... the individuals who are involved in the change. No system can effectuate change unless that change is supported – ideally with enthusiasm – by the individual members of the system. Basically, the need of the individual to hold on and the processes for ... letting go and moving on ... must be of central importance to us.

Earl’s (1983, p. 121) behavioral study of economists’ training concluded thus:

Our analysis leads to two connected ways of explaining the dominance of neoclassical economics. One is that it is safer and more rewarding to be an equilibrium theorist of the conventional kind. The other is that upbringings affect the constructions young economists form of what it is that economists do and they then act in conformity with this image unless given an exceedingly strong cause to behave otherwise. Kuhn’s (1970) suggestion that a scientific revolution will not succeed until older scientists have died off seems entirely reasonable from a behavioral standpoint. If a mature scientist is to undergo a personal scientific revolution she will have largely to dispense with a well-formed world view. Since the choice will not usually be clear-cut, such a transition, if made, would entail a period during which she suffered nothing short of a scientific nervous breakdown.
mentality, and understand that “we have met the enemy and he is us” (Kelly 1987). The magic of complementarity is awaiting our embrace.

VII. **Summary and Conclusions**

Romer’s inclusion of rival and nonrival goods in a scarcity model of growth is significant, as Warsh said. But the issue extends beyond nonrivalry in R&D activity into a general endorsement of complementarity in economic relations. Systems theory inferred through induction – reinforced by horizon effects – shows another angle of vision dodged by orthodox scarcity models. Substitution assumptions, although relevant, do not cover all forms of economic interdependence; substitution and complementarity are conjoined in most situations, opening an institutional question avoided by industry aggregation and marginal productivity theory (Nelson 1981, pp. 1053-55). Is competition or cooperation better for development? How do we answer the question if we cannot assume substitution to the exclusion of complementarity?

A path through the imbroglio is supplied by a theory of planning horizons and their effects on the balance of interdependencies in $S_t$. Horizontal lengthening causes substitution to wane and complementarity to increase its significance, so our institutions also ought to adapt toward cooperation away from rivalrous structures. Otherwise, scarcity is created and horizons shrink. Another way of looking at this is that competition is stifling output under increasing returns and for all intangible goods. So our rivalrous systems spawn a myopic culture of fragmentation, narcissism, ethical lapses, ecological loss and discord throughout human relations.

The problem exposes a conflict mentality underlying conventional laws and economic constructions: substitution and scarcity models show one face of a two-sided coin, avoiding complementarity in economic affairs. If increasing returns – à la Pigou, Kaldor and many others – should be accepted as the most general form of output technology, orthodox substitution assumptions erode to a special case. Social behavior radiates symptoms of failing institutions stemming from misapplied theories of choice (cf. note 2 above). Systems approaches are needed for increasing returns and complementarity, and horizon effects suggest a way to resolve efficiency
questions. Interhorizonal complementarity indicates that cooperation is our route to efficiency, equity and ecological health through an extension of planning horizons (Jennings 2003, 2005).

So would the question be answered. *Competition does not advance, but rather retards economic development* through its starvation of complements such as planning horizons, spirituality, ethics, social and ecological conscience and other intangibles. Society is poorly served by rivalrous systems in place; conflicts of value are reinforced by adversarial legacies spreading from mainstream models. Substitution ought to accede to complementarity in our relations; such shall liberate us to address some meaningful issues at hand.

Thus we call for renewal and a horizontal economics, so horizon effects spawned by competition can be healed. The promise of a new age awaits us if we abandon scarcity for abundance in economic development and personal growth. The only impediment to advance is a fear of change,21 as yet another effect of rivalry on institutional learning. Cooperation encourages openness, information, knowledge and love, fostering growth of intangibles starved by rivalrous systems. So might we emerge from myopia into a new economics.

**REFERENCES**


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Tannenbaum and Hanna (1985, pp. 118-120) addressed the problem thus in the conclusion of their insightful and sensitive treatment:

...It is puzzling ... that so little attention has been given ... to ... the need to hold on... ...This avoidance has ... at least three fundamental reasons to explain it – reasons that are subtle and that probably lie below the level of comfortable awareness for most people.

First, there is a culturally embedded fear and reluctance to explore elements in the preconscious or unconscious self... Second, there is the culturally grounded and pervasive fear of feelings (loneliness, rejection, unlovability, helplessness, hurt, pain, anger, aggression), particularly of their expression. Most individuals are fearful of their own feelings, and they are threatened by and not sure how to cope with the feelings of others. ... Third, there is the need to mourn... To mourn means to face death – little deaths, to be sure, but death, nevertheless – in order to make a rebirth possible. Each of us is ultimately vulnerable, and yet most of us typically blind ourselves to this truth. ...

In closing, we can only leave the reader with a gnawing dilemma. We have long been convinced that the area to which we have just given our attention is a seriously neglected one – particularly at the organizational level – in research, theory and practice. ...Efforts directed at deep change often fail or fall short of desired results because the need to hold on and its working through seem to be so persistently avoided. At a time in history when the demands for change constantly impinge on organizations, this avoidance carries with it most serious consequences. ... At present, we have little wisdom to offer as to how this dilemma can be resolved. But we do have faith that, with an increasing and more pervasive understanding ... it will be resolved in the best interests of all participants in organizational life.

Shortly after Kornai’s (1971) book on *Anti-Equilibrium* and a long series of other scathing critiques of equilibrium theory, Arrow (1974, pp. 28-29) issued a statement – though undefined as to its specific impetus – clearly addressed to the need for ‘moving on’:

*The problem is that agreements are typically harder to change than individual decisions. When you have committed not only yourself but many others to an enterprise, the difficulty of changing becomes considerable. ... What may be hardest of all to change are unconscious agreements, agreements whose very purpose is lost to our minds. ... Even if experience has shown the unexpectedly undesirable consequences of a commitment, the past may continue to rule the present. ...This thinking ... gives rise to the greatest tragedies of history, this sense of commitment to a past purpose which reinforces the original agreement precisely at a time when experience has shown that it must be reversed.*


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