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'X-Efficacy' vs X-Efficiency

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Introduction

I want to argue that, whatever some might think, Leibenstein was not so much a mad uncle in the Harvard faculty's attic (e.g. Stigler 1976 *cf.* Holden 2005), but rather a brilliant evolutionary economist struggling to escape. My point is that the non-allocative concept of X-efficiency only makes consistent analytical sense in an evolutionary and complex systems theory-based evolutionary framework, and, moreover, implies the existence of a companion concept: X-efficacy.

X-efficiency is about the economics of what you do when you know what you're doing: X-efficacy is the economics of how you know what you're doing in the first place. Unpack the difference between allocative and non-allocative efficiency and you arrive at the distinction between X-efficiency and X-efficacy.

Leibenstein first explained the difference between allocative and non-allocative (i.e. X-) efficiency in 1966 in the *American Economic Review*. For the next two decades, he explained it over and over again, sometimes at length (1976, 1978, 1979), other times in précis (see Button 1989, Vol. II). He developed a raft of applications to entrepreneurship, productivity, institutions, inflation, management and economic development, and further sought to show how X-efficiency theory impacted upon the core of neoclassical microeconomics, including the maximization hypothesis in relation to the context and incentives of economic action. Many young researchers subsequently followed and

developed his lines of work, and he had a profound impact on behavioral and institutional economics and especially in the mold of Herbert Simon. Some (e.g. Stigler 1976) thought the whole concept shocking because it went too far, while others (e.g. Loasby 1976) thought it trivial because it didn't go far enough.

By 1979, Leibenstein was explaining general X-efficiency as a clear example of what he proposed as micro–micro theory, and suggesting that it represented a clear sense of a new research frontier in economics, the first since the macroeconomic revolution of the 1930s. With hindsight, there was actually a revolution in microeconomics going on at the time, but it was in game theory (which is also a micro–micro theory and something that Leibenstein was an early advocate, especially in relation to 'effort games'). Leibenstein's focus on the behavioral realities of activity and coordination was subsequently relegated *en passant*, and a renewed push on coordination anomalies and principal-agent problems entered the space that Leibenstein had helped to open. By the late-1980s there was little further reference to Leibenstein (although see Franz 1988), and his 'Carnegie school' exemplars of micro-micro (Simon, Cohen, Cyert, Day, Elliason, Nelson and Winter) had variously transmuted into Schumpeterian evolutionary economists. And with the rise of non-linear dynamics in the late 1980s and complexity theory in the 1990s, he soon became better known for his observations of feedback (bandwagon) effects in consumption dynamics (Leibenstein 1950).

The point I want to make is that the logical continuation of Leibenstein's tragically interrupted program is quite naturally into the analytical domain of complex systems theory and evolutionary economics. This is where many of his students went, and along variously behavioral, organizational, institutional and Schumpeterian lines. But, due principally to the richness of his program, what they inevitably failed to carry was the single-minded focus on the meaning and nature of efficiency in an open economic system. In part consequence, modern evolutionary economics is still highly underdeveloped in relation to business and consulting applications, as well as to broader notions of social welfare. In this short essay, I want to argue that Leibenstein's X-efficiency notion is both ripe for further conceptual

development into evolutionary and complex systems theory, and also that it sits at the core of the modern micro meso macro framework (Dopfer *et al* 2004, and a point also made in Dopfer's essay in this volume) as the analytical translation layer between generic and operational domains; and, moreover, suggests a companion concept: X-efficacy.

What is X-efficiency?

As indicated, Leibenstein made something of a career of explaining the same idea over and over again, and so it is somewhat redundant to explain it yet again. Yet it is a subtle concept at first, and, despite his best efforts, seems to have been misunderstood more than not. X-efficiency is basically the theory of why ideal technical efficiency is always frustrated by the actions of real people in real organizations. There are three main reasons (Leibenstein 1966: 406–7):

(1) intra-plant motivational efficiency
(2) external motivational efficiency
(3) nonmarket input efficiency

Which result from :

(1) The incompleteness of labor contracts,
(2) That not all inputs are marketed or available on unequal terms,
(3) The production function being incompletely specified or known, which leads firms to tacitly cooperate and imitate one another

These have each branched into somewhat separate bodies of literature:

(1) Information economics and new Keynesian economics with efficiency wage theory (Akerlof, Yellen, Stilitz, Mankiw et al),
(2) Product market competition and the internal efficiency of firms (a hybrid of game theory and mechanism design in its higher reaches)
(3) The study of uncertainty and the growth of knowledge in the evolutionary theory of the firm (in the Cyert & March, Nelson & Winter tradition, also Loasby 1999)

The breaking of difficult problems into sub-problems for analysis is certainly a sound methodology, yet there is always the risk that in doing do we can lose sight of any underlying homology in the respective problem domains. And I think this is the case here with respect to an analytic conception of rules. Essentially, although all three reasons relate to different subject domains, they are all analytically the same problem of the analysis of the quality of rules that agents are carrying and using, whether individually (behavior, contracts) or in relation to systems (organizations, markets) or populations (i.e. institutions). Leibenstein's framework was fundamentally empirically grounded and was manifestly intended to be valued by its usefulness in identifying and diagnosing the sources of inefficiency in economic operations. This naturally fitted into the consultant's notion of progress in economic science, if not always with the theoretical definition of the same.

The core of Leibenstein's argument, then, is as such: improvements in X-efficiency (better connections) swamp, from a welfare perspective, improvements in Pareto efficiency (better distribution of resources), and so the economist seeking to be useful will focus primarily on X-efficiency not Pareto efficiency. Growth theorists such as Robert Lucas make similar arguments about the efficacy of growth over allocative efficiency for the run of human welfare, and this is a fair comparison of the scale of the issue. Economic growth and evolution is the ultimate source of improvement in human welfare, and concern with X-efficiency correspondingly has an order of magnitude over improvements in Pareto efficiency in the material consequences for the human condition.

The empirical observation of significant slack in organizations led to theoretical development about why this might exist and what can be done about it but in terms of managerial practise and in terms of institutional design, as above. Yet a further implication of the profiling of organizational slack (X-inefficiency) was to direct thinking toward the possible 'dynamic efficiency' of this. Like George Richardson (1960), Leibenstein argued that the the flexibility to experiment and do new things should be considered along-side the operational efficiency of a firm. At any point in time, this reads as cost that is carried as 'organizational slack', but yet through time is integral to sustained performance. Efficiency

means more than just doing the best you can with current knowledge and resources, i.e. cost minimization. That is hard enough, but the real optimization problem is harder still, for it also must involve the allocation of resources to learn and grow (see also Downie 1958, Cyert and George 1969, Earl and Wakely 2004: ch 11, Earl and Potts 2004). Leibenstein's (often elliptically put) point is that those resources may hide in contractual ambiguity and organizational slack. X-efficiency is both a static problem and a dynamic solution. This is why neoclassical economists thought it shocking, and why evolutionary economists thought it trivial.

X-efficiency is a concept that refers to the real world of actual individuals and organizations and is focused about understanding the ways in which they could be better. It is a theory about choice and action in specific organizational environments, and not a general theory of markets or the economic order. But by providing this foundation, it enables a deeper understanding of how the market order actually works. X-efficiency is the theory of why the same inputs do not always uniquely map to the same technically efficient output. But in asking this question, Leibenstein opened a door to connect behavioral and organizational theory (micro-micro) to the broader course of economic evolution (micro-meso-macro). In the next two sections, we review X-efficiency from the evolutionary and complex systems theory perspective: first on connections (X-efficiency and non-integral space); and second on generic and operant analysis (X-efficiency & X-efficacy).

X-efficiency and non-integral space

Despite being perhaps sometimes better known for 'Bandwagon, Snob and Veblen Effects', the theory of non-allocative efficiency is, in my view, Leibenstein's signal contribution. Furthermore, I see it as a profound contribution to evolutionary economics, even if mostly read as a footnote to neoclassical micro-theory (e.g. Holden 2005). Yet, in parsing this distinction, it seems critical to understand that Leibenstein's analysis was always doomed to be misunderstood when interpreted into the neoclassical framework of utility and

production possibility surfaces as defined over the space of the reals (R^n_+). X-efficiency makes good sense in the analytical space of evolutionary analysis, yet it makes no sense when read into the analytical space of neoclassical micro-theory, which Leibenstein did insist upon doing. This is what Loasby (1976: 915) meant when he said:

> 'Professor Leibenstein is too conservative. He wishes to provide a new foundation for conventional welfare economics, while using criteria that depend upon the production possibilities of the old foundation. Modern micro-theory is all of a piece; the Pareto optimality which Professor Leibenstein wishes to keep has meaning only in the analytical system which he wishes to displace.'

This was of course effectively the same point that Stigler (1976) made in his dismissive critique of X-efficiency theory, namely that if the theoretical framework is based about a utility and technology field, then there is no such defined concept as an equilibrium that is off the production function. If observed reality seems so, then it must be because some other (non-observed) utilities are being maximized. Leibenstein was always tangled in this argument, and ever sought to distinguish this from multiple or complex utility functions and behavioral resolutions with respect to information and effort (e.g. the theory of inert areas). Yet, Stigler and Loasby remain correct in their criticism: if you are using the framework of field theory (and all his mathematical formulations and diagrams clearly conform to this framework, including the mathematical appendix in *Beyond Economic Man*), then its implications are equally resolute. If substitution is the only way to move in the space, then allocative efficiency is the only type of efficiency that can be consistently defined in that same space. X-efficiency is logically meaningless in a strictly neoclassical framework. But this might not be a problem with the idea and framework; it might instead be a problem with the space. And that is exactly my diagnosis: Leibenstein's ideas on efficiency are fine; it is the analytic space in which he chooses to express them that is problematic. X-efficiency makes no sense in an integral space, but it makes perfect sense in a non-integral space. Yet in order to elucidate this distinction, we shall need to unpack somewhat the meaning of efficiency in X-efficiency.

A good place to start is with the meaning of 'X' in X-efficiency? First of all, I think Leibenstein made a mistake in calling it 'X'-efficiency (or rather in not returning to the place-holder) but perhaps a necessary one. To call it non-allocative efficiency (which it is) would have been to draw attention to the negative definition (and so the illogic of a not-X efficiency concept). Yet it certainly would have been presumptuous to call it 'Leibenstein efficiency' (*á la* Pareto efficiency). (Note that P.W.S. Andrews (1949) called the same concept 'managerial efficiency'.) It is of course not unreasonable that it might be called Leibenstein efficiency, but that still does not solve the definitional problem. Leibenstein was never unclear when he referred to his efficiency notion as of the domain of non-allocative efficiency, and especially so in the *JEL* article (Leibenstein 1979). But he avoided ever giving it such title, and ever preferred to work with lists and arrays of other ways in which inefficiency manifested. In doing so, he opened the domain of analysis to range freely. But analytically considered, he was pulling his punches.

All of the ways of non-allocative efficiency amount, ultimately, to the ways that non-substitution can affect an element in a system (or the properties of a lower-level system in a higher-level system, e.g. an individual in an organization or market). These are the ways of the associations and connections as generated by the 'rules' that agents carry and the way in which they mesh together. This is not a process of continuous substitution but rather of discrete movements in a complex landscape (i.e. state-space, e.g. Kauffman 1993). Leibenstein's concept of efficiency can be corralled about the choices and actions of economic agents with internal rules operating in an external rule environment (*Leibensteins* in the agent-based sense, *Homo Leibensteinus* in the analytical sense) and then analyzed in relation to change in connections or rules. A non-allocative concept is inherently a non-substitution concept, and a non-substitution concept is best viewed in terms of networks (non-integral systems) and their dynamics. Which leads us inexorably to complex systems and evolutionary theory, which are together about how systems of connections are coordinated and how they change.

Following Simon (1969), Mirowski (1989), Loasby (1991) and Kauffman (1993), Potts (2000: 74) recently argued in *The new evolutionary microeconomics* that this domain of efficiency was, in its dynamic aspect, best understood as analytically corresponding to a state of complexity in the non-integral state-space of connections:

> 'Leibenstein remained ultimately somewhat unclear about the ultimate nature of micro–micro theory, and in particular failed to distinguish between a theory of elementary units and the units of elementary theory. The distinction is crucial and revealed by the construct of a complex system as a theory of elementary units in which the elementary units are themselves lower level systems. Once this principle is recognized, it becomes clear that the micro–micro theory in fact transcends the micro-theory in generality. It is significant that every subject that the domain of Leibenstein's micro–micro theory addresses is of the abstract form of a complex system. The micro-micro theory is the study of a complex of elements and thus fits within the rubric of an evolutionary microeconomics.'

My point was that Leibenstein's framework and ideas about 'what's inside the black-box' of the organization, and of the behavioral propensities of agents, makes better sense when considered in terms of complex systems theory (evolutionary micro *cf*. micro–micro). That the same inputs don't always amount to the same outputs can be understood in terms of the difference being connections.

- Inert areas are missing or weak connections.
- The role of entrepreneurship is to make connections.
- Effort, by which Leibenstein always insisted meant working smarter as well as harder, is about finding organizationally appropriate connections and about the variable workflows that happen over these.
- The concept of pressure is about the extent of competitive connections and a clear reference to evolutionary selection mechanisms as a force of 'pressure'.
- The concept of organizational slack is about maintaining the continuous opportunity to make new connections.

There have been few subsequent endeavors advance this graph/network theory-based revisionist interpretation of Leibenstein's framework (although see Earl and Wakely 2004: chapters 4, 9), yet I hope my suggestions here might nudge this program somewhat further along. Leibenstein's ideas were deep and essential and his applications were considered and important. His models, however, were somewhat awkward, and this is explicable by the fact that they were expressed in a fundamentally inappropriate analytical space.

Generic & operant analysis: X-efficacy economic evolution

X-efficiency is a measure of the associative or complementary connections that exist between all inputs, and which determines their translation (or computation) into outputs. This is non-allocative efficiency to be sure, but I think it is better understood as a kind of 'efficacy' that relates generic rules for action to the operational outcomes of those rules when applied.

Efficiency means getting things done well, and the first moment of this distribution is getting things done at all. Let's call that efficacy. Efficacy (*adj*. the ability to produce an intended result, *OED*) means assembling a system of connections that works to achieve some desired problem solving objective. Efficacy is about building a system of rules that works. Efficiency is then about how that system works in relation to other real or hypothetical systems under competitive conditions. Efficiency is a statement about the relation between known input combinations and known outputs through various transformations (as ranked by efficiency). The discovery of efficiency is a second stage process that follows from the discovery of efficacy in the solution to old and new problems.

Economic growth is more than just re-allocation, it is also re-connection, and this is something that Leibenstein clearly understood from his travels and work on development economics, as well as from his micro observations of firm performance and growth. So we need to distinguish between efficacy as an evolutionary quality of comparitive connections

and efficiency as a mechanical quality of comparitive distributions. This can, I suggest, be achieved within the new framework of micro meso macro analysis.

The micro meso macro framework is a new analytical abstraction of evolutionary economics – which is itself a generalization of neoclassical economics from integral to non-integral space (see Potts 2000) – for the study of ongoing coordination and change in open economic systems. It is analytically based about the concepts of rules, carriers and operations (see Dopfer *et al* 2004, Dopfer 2001, 2005, Dopfer and Potts 2006). A rule is an idea that can be used by a carrier (e.g. an agent) to perform operations (e.g. transactions or transformation). A rule and its set of actualizations defines a meso unit. The economic system is then made of meso in the sense that it is made of actualizations of ideas. The concept of a meso unit is a way of parsing this space to account for dynamics as a novel meso unit enters – for this, indeed, is the definition of economic evolution. Each meso unit consists of a rule that is carried by a number of micro agents (i.e. carriers), and each carrier uses the rule with certain efficiency (X-efficiency). The macroeconomy is then defined as a system of meso units, and economic evolution is the emergence of a new meso unit and its corresponding trajectory (a three-phase process) as driving the evolution and self-organization of a new economic order. Like Leibenstein's potted summaries of X-efficiency, that's it in a paragraph. At article length, see Dopfer et al (2004); at book-length, see Dopfer and Potts (forthcoming).

Above we made a prime distinction between Leibenstein from the integral and non-integral perspective based on graph and complex systems theory. We can now make a further distinction arising from the micro meso macro framework between Leibenstein in terms of generic and operational analysis. This is where we shall find the meaning of X-efficiency from the evolutionary perspective.

Evolutionary economic analysis makes a prime distinction between generic and operant levels of analysis. Generic analysis relates to rules, and is the central focus of evolutionary analysis. Operant analysis relates to manifest outcomes (e.g. transactions and

transformations), and so is the prime focus of efficiency analysis and neoclassical economics. These two domains are of course related, and the way they are related is captured by the analytical scope of the concept of X-efficiency, which intermediates the efficacy of rules (as complex micro-meso and meso-macro systems) and the operational use of these rules as also subject to the criterion of allocative efficiency. Generic refers to the rules and operant refers to what is done with them, and that is, surely, the broader analytic space of the concept of X-efficiency.

An X-ample: the X-inefficiency of a firm is all of the operationally effective phenomena that limit the achievement of technical efficiency, as in a car plant with poorly designed labor contracts, bad-supervision, etc. But it a leap of breath-taking confidence to suppose that this is rightly comparable to a known theoretical optima, with respect to which this is being compared. In reality, the usual comparison is best practice, but that is also widely subjective. Yet what can always be definitively and objectively compared is with respect to efficacy, namely the function of working at all, as the ability to make cars at all through an efficacious system of rules. A country can make cars well, or not (X-inefficiency). It can also make cars at all, or not (X-inefficacy).

The X-inefficiency of space exploration programs is certainly legion, but the X-efficacy is less so: there just a few countries that have it, and a lot that don't, variously because they have no such surpluses, or because they simply can't. The growth and evolution of economic systems is conditional not just upon the X-inefficiency associated with how you actually do what you can do, but also with the X-efficacy of how you arrive at doing new things at all. Efficiency means the quality of doing something well. It presupposes the definition of what that something is and the dimensionality in which it will be achieved. That is as true in physics as it is in economics. Given an objective and a set of 'costs' of achieving such under differing paths, an efficiency criterion can be supplied according to the maximization of some function, and in the closed world of economic micro-theory, it consists of little else.

Yet this view is ontologically unwarranted in a truly open economy, for the basic reality of an economic system is that of something ever beset on all fronts by novel ideas or rules (the Smith/Schumpeter/Hayek hypothesis). The real economic question is not the allocation of scarce resources, for market mechanisms will soon resolve that (an assumption made by general equilibrium and evolutionary economists alike). Rather, the true (or at least deeper) question is with how novelty is dealt with and, if adopted, with what consequence. For evolutionary economists, this logic is straightforward and leads to analysis of processes of change whether in individuals, organizations or aggregated systems. But for those same evolutionary economists, the meaning of efficiency is also long gone, having given way to selection and other process arguments at the outset (Alchian 1950, Metcalfe 1998).

Yet we might re-capture the notion of efficiency in evolutionary reasoning with reference to X-efficiency in relation to rule efficacy. By their Austrian heritage, evolutionary economists necessarily abandon welfare economics, but, being both empirical scientists and human, they have not done so willingly. The concept of X-efficacy may provide a way forward here, and may do so, essentially, by shifting the measure zero from distance from idealized perfection (elegant but undefined) to distance from absolute incompetence (ugly but workable).

Efficacy means the fitting together of rules. X-efficacy is when this works effectively and X-inefficacy is when it doesn't. It is a complex systems criterion, meaning that the system of connections does something effective, which can also be put easily into computational terms as an algorithm that eventually halts (and at a non-trivial solution). The concept of concept of X-inefficacy is then the basic evolutionary problem of rules almost fitting together but for micro-micro problems. We would add to this that meso and macro problems might also be involved in explaining why rules don't fit together. If we will take the X out of X-efficiency and call it *Leibenstein-efficiency*, then the quality of rules fitting together has an order I would suggest calling *Hayek-efficacy*, and with all other possibilities being *Hayek-inefficacious*. There is no discussion of the concept of efficiency prior to a discussion of the concept of efficacy. What works at all comes first; and what works best is

a second order concern. Neoclassical economics has traditionally focused on the latter, but evolutionary economics has focused on first understanding the former. And I think that this was also Leibenstein's point. Pareto (i.e. allocative) efficiency only makes sense at the operational level, but there is also as Leibenstein illuminated the notion of generic efficiency.

X-efficiency economics analyzes the relation between the set and system of rules (and their efficacy) and the final allocation of resources (and its efficiency). The zero point of X-efficiency is minimal efficacy, i.e. something that at least works. In contrast, Pareto efficiency has no null point, but rather a set of indifferent distributions that presume everything works over a finite continuous set. But it is not. It never has been. By having a null point in minimal efficacy, X-efficiency is inherently a process theory of the growth of both novelty and knowledge and, therefore, central to the theory of both evolutionary economics and of the growth of knowledge. This is what the framework of micro meso macro is designed for, namely analysis of how new rules (meso) enter and re-coordinate the economic system, and the prime evaluative criteria for this is X-efficacy. X-efficiency theory then develops this further as a theory of the micro forces that act upon this process in terms of the efficacy of rules and the practicalities of carriers. The theory of X-efficacy has not been developed yet, but an impressionistic sketch has it focused about the conditions of lexicographic consumption (e.g. Earl 1986) and the conditions of lexicographic production as evolves along ever-changing minimal standards of adequacy. There is a great deal of work that remains to be done here.

Conclusion

An economic system is composed of a set of rules carried by a set of agents. Each agent is connected to other agents and each rule is connected to other rules. Economic evolution consists of a new rule entering the system, which results in new agent adoption and so new connections. This is called a meso trajectory and it is how economic systems evolve. But

the question remains: what is (non-allocative) efficiency in this process? X-efficiency corresponds to the space of possibilities defined by the states of efficacy with respect to (at least) technical rules. Dopfer and Potts (forthcoming) distinguish between four classes of rules (cognitive, behavioral, social and technical) that define the frontiers of possibility and, unlike Leibenstein, prefer not to privilege technical rules over others. Yet the basic point remains: first, there is efficacy in rules fitting together, and then and only then do we enter into the domain of a meso trajectory of adoption and retention, and so to the problems associated with X-efficiency as conditioned by X-efficacy. X-efficiency is not subordinate to Pareto efficiency, it is superordinate to X-efficacy. (Pareto efficiency, in turn, is conditional upon X-efficacy.)

Leibenstein's work is integral to the modern revival of evolutionary economics (since Nelson and Winter 1982). Yet the basic problem remains that his intensely empirical ideas were confounded by expression in a framework that was singularly ill suited to the predominant paradigm of discourse in neoclassical micro-theory. He was an evolutionary economist trapped in a Harvard economist's body. Keynes, Schumpeter (especially), Simon, Shackle and Hayek all had similar experience; but, in each case, they developed a new framework. Leibenstein, on the other hand, sought to bend the existing framework to fit. That was bold, I think, but not smart. Had he lived longer, Leibenstein might too have tended in the evolutionary direction, and that would have been valuable for evolutionary economics, as it still lacks a coherent theory of efficiency. Still, it is not too late. By reconsidering Leibenstein from the modern framework of evolutionary economic analysis (see Dopfer *et al* 2004), we can attain a better conceptual understanding of the meaning of efficiency in a complex, open, evolving system of economic individuals who originate, adopt and retain efficacious rules that they then use with varying operational efficiencies to solve problems under selection pressure.

The argument of this chapter has been based about a complexity *cum* evolutionary view of Leibenstein's concept of X-efficiency. There have been two overarching points. First, X-efficiency is a non-allocative concept of efficiency, which means that it is also a non-

substitution concept that refers to the connective properties of systems (Potts 2000: ch 2). This is what is inside the 'black box', namely specific connections between input factors, and it is the quality, or efficacy, of those connections that determines the relation between not just inputs and outputs, but also the dynamical possibilities (or opportunity space) of the system under investigation. The implication for theory is that although Leibenstein implied that X-efficiency and Pareto efficiency were amenable to the same kinds of theoretical analysis, they are not. Pareto efficiency is well defined in an integral space (of complete connections) whereas X-efficiency is by definition a property of a non-integral space in which only some connections exist. The upshot is that complex systems theory is a far more natural analytical foundation for the study of Leibenstein's concerns with entrepreneurship, effort, organizations, etc, than is the space of reals and maximization, as enticing as both of these initially might seem.

The second point follows from the first, and recognizes that Leibenstein's notion of efficiency is not just only explicable in a complex systems framework, but also that it is central to an evolutionary view of the economic system. In the micro meso macro framework, there is a prime distinction between generic and operant analysis as to whether it relates to the rules or carriers of rules (generic) or to the transactions and transformations that are made in relation to resources with those rules (operant). This distinction precisely captures the location of Leibenstein's X-efficiency, as the relation between generic and operant domains. Pareto efficiency only has meaning at the operational level and has no correspondence with the generic level of rules. X-efficiency – insofar as it relates to the behavioral, organizational and institutional rules in relation to technical rules – is entirely about the generic domain.

And this is the sense in which X-efficiency is both central to evolutionary analysis and peripheral to neoclassical analysis. Dopfer *et al* (2004), Dopfer (2005) and Dopfer and Potts (forthcoming) have called the quality of rules fitting together as efficacy, and we may then further interpret the measure of the quality of translation of efficacious rules into state that relates to a technical optimum (which would also be Pareto efficient) as X-efficiency. This

is not a general micro-micro framework, but rather something more specific: namely a theory of the translation between the generic and operant domains. And, as a general framework, this is a contribution to micro-meso-macro, not just micro-micro. Much work remains to be done, and the central project still on the micro-micro analysis of how new ideas are originated, adopted and retained, and how this results in economic evolution at the micro level of the individual agent and at the macro level of the new economic order. This takes us beyond X-efficiency and into a new evolutionary economics as based upon the analysis of X-efficacy.

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