

## ARTICLES

# The Unequal Exchange of Time and Space: Toward a Non-Normative Ecological Theory of Exploitation<sup>1</sup>

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## Introduction

In this brief essay, I would like to address the topic of unequal exchange—one that recurs in Maurice Godelier's work and is a cornerstone of Marxian social theory. Many social scientists, looking at the world around them, are intuitively convinced that there is such a thing as 'unequal exchange', but would admit to having a hard time defining it. The problem of 'unequal exchange' is a paradigmatically Marxian topic in that *our difficulties in conceptualizing it can be seen as part of the conditions for its existence*. Thus it cannot be understood other than through an analytically demanding combination of epistemological and ontological arguments that require at different steps in the analysis the approaches of both deconstruction and objectivism. This seems to be the only way open to those of us who want to pursue Godelier's (1998) understanding of power as based on consent; i.e., on the sharing of the same representations among the powerful and the powerless alike, such that the powerless will often see unequal exchanges as reciprocal. In this paper, I will first try to show how and why mainstream economic ideology must ignore the material substance of global commodity flows in order to reproduce the image of market forces as serving the interests of the many rather than the few. I will then suggest some analytical tools for deconstructing this image by identifying, beyond

and underneath the price tags, asymmetric flows of material, productive potential (gauged in terms such as energy, labor time and hectare yields). Finally, I will briefly reflect on the implications of this line of reasoning for contemporary discussions of the epistemological ambitions of anthropology.

## Exchange and the Value of Things

Few mainstream economists would recognize the notion of 'unequal exchange' as an acceptable and objective category of economics.<sup>3</sup> The implicit notions of 'fairness' that underlie economic reasoning hinge on the subjective experience of the participants in exchange, rather than in any objective analysis of the substance of this exchange. As long as exchange is conducted in terms of monetary exchange values, and prices are understood to reflect the rational or even benevolent logic of market forces, there is no way—other than under conditions of monopoly—that a market transaction can be classified as 'unequal'. A million dollars' worth of Swedish Volvos exchanged on the market for a million dollars' worth of Venezuelan oil is *by definition* perfectly 'equal' in terms of exchange value, which is the only gauge that neoclassical economic theory is capable of applying. It is simply beyond the horizons of neoclassical economic analysis to ask, for instance, what the

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<sup>1</sup> A draft of this paper was presented at the 2002 Society for Economic Anthropology meeting in Toronto in a special session with Maurice Godelier. Over the past thirty years, I owe much inspiration to Godelier's continuing concern with understanding power and social inequality and with unravelling the various mystifications through which power and inequality are reproduced. I am indebted to Eric Jones for several editorial suggestions.

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<sup>3</sup> Economists nevertheless acknowledge problems of inequality deriving from conditions of imperfect information. The economists' solution is thus to try to create conditions for more perfect information flow. I would add that one very crucial kind of information that seems universally to be "imperfect" is the physical properties of the traded products and thus their capacity to contribute to the accumulation of infrastructure/capital (see below).

difference between these two volumes of commodities might be in terms of productive potential; i.e., in terms of their physical contribution to the accumulation of productive infrastructure, or capital. However profoundly we manage to deconstruct the phenomenon of money as a semiotic delusion—aptly classified by Marx as a species of ‘fetishism’—the ideological and practical hegemony of exchange value remains more intact than ever. The foundations of Ricardo’s science were devised by and *for* British bankers and stock traders in the early 19<sup>th</sup> century (cf. Gudeman 1986), yet continue globally to pervade the lives and thoughts of dominator and dominated alike. But as the material and ecological inequalities of global society are accentuated, we have every reason to critically scrutinize the assumption that money and exchange value are the measures of all that is significant for understanding processes of economic growth and accumulation. Marxian theory has from the very start struggled with the analytical problem of how to effectively challenge the mainstream trust in money and in the fairness of market logic. Marx suggested that the market price of labor did not do justice to its “real” value. He thus offered a *normative* theory of value in the sense that it defined ‘value’ not in terms of the actual valuations of market actors—as in the neoclassic notion of ‘utility’—but in terms of an analytical construct (the labor theory of value) that claimed to show how things *ought* to be evaluated.<sup>4</sup> Beyond the mystifying price tags on labor that we know as wages, Marx thought that he had found the objective foundation of value. In some of his early work, Godelier experimented with applying the Marxian labor theory of value so as to identify unequal exchange between tribal groups in New Guinea (Godelier 1969). Such unequal exchange in labor time is not difficult to identify (cf. Emmanuel 1972), but as a critique of neoclassical economic theory it remains toothless as long as invested labor is presented as (a) a measure of *value*, and (b) as the *only* alternative gauge to warrant consideration.

Although meant to serve a commendable political purpose in Marx’s own time, this normative approach to ‘value’ must be rejected as analytically untenable. Marx realized that in order to challenge the market ideology it would be necessary to acknowledge some other gauge than exchange value, but made the mistake of confusing this other gauge with the notion of ‘value’. I believe that such approaches represent a dead end street. I doubt that it will ever be possible to convince economists or market actors that scientists have a better knowledge of the “real” value of things than the market actors themselves. So, what does this other gauge—invested labor—represent, if not value?

The answer may be easier to detect if we turn to another kind of normative theory of value, namely those theories that recognize, underneath the price tags, not primarily labor but more generally *energy*. This notion has a special heritage in ecological anthropology following the early contributions of Leslie White (1959), whose argument on energy appropriation was in fact presented as an elaboration of Marxist theory. There have been many proponents of energy theories of value over the years, including the so-called Technocrats in the 1930s and, over the last few decades, the ecologist Howard T. Odum (Odum 1988; Odum and Arding 1991; see also Bunker 1985). Odum’s notion of *eMergy* (or ‘energy memory’) echoes Marx in suggesting that the “real” value of a commodity should be gauged in terms of the amount of energy that has been invested in its production. To Odum, value is added to raw materials through the production process as increasing amounts of energy are invested in it, and differences in value between commodities reflect differences in invested energy.

Now, what both ‘labor’ and ‘energy’ have in common is that they are measures of *productive potential*. They are literally the ‘productive forces’ of any production process. But, contrary to Marx and Odum, there is no specifiable relation between the amount of productive potential that has been invested

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<sup>4</sup> I am well aware that Marxists would not agree with me that the labor theory of value is normative, but I maintain that a theory claiming to be able to identify true sources and measures of value must be so classified. See next section for an elaboration of this argument.

in a commodity and the way it will be evaluated on the market. Rather than reduce economics to thermodynamics, then, our task should be to see how the two are related. We have to keep them analytically separate while showing how they are interfused in actual social processes. In what follows I will try to show that the relation between energy and value, although of great significance, is better stated in terms diametrically opposite to those of Odum.

### **A Non-Normative Ecological Theory of Exchange**

Rather than say that we as social or natural scientists have access to a more authentic measure of 'value' than the people who do the valuing, I think we need to agree with the mainstream economists that 'value' is defined by the cultural preferences of consumers. This agrees well with anthropological studies of the semiotics of consumption following the work of Jean Baudrillard (1972) and Marshall Sahlins (1976), who argued that value or 'utility' is always symbolically constituted. Theories of value should tell us something about the evaluations that people actually make, not about how we as theorists think that they *should* value things. Normative theories of value make the mistake of inserting themselves on the same logical level as the phenomena they are to explain. To say that land, labor or energy is the ultimate gauge of value is itself a value judgement.

How can we posit the occurrence of 'unequal exchange' without recourse to a normative theory of value? This can be done by analytically demonstrating that there is, after all, in very general terms, a systematic relation between the investment of productive potential, on the one hand, and 'utility', value, or price, on the other. But this relationship is not usefully expressed, as Marx or Odum would have it, so that investment of labor or energy somehow translates into value. Rather, there is a kind of *inverse* relation between productive potential and price that follows with logical necessity from the juxtaposition of the Second Law of Thermodynamics and the social institution of market exchange. We know that energy is not so much "invested" as it is *dissipated* in a production process (Georgescu-Roegen 1971). Finished products must represent an increase

in entropy compared to the resources from which they were produced, yet they must be priced higher. If we consider, longitudinally, the transformation of a given set of natural resources into an industrial product, Odum's metaphysical measure of 'energy memory' will correlate positively with 'utility' or price, but objectively speaking, the amount of available energy will be *negatively* correlated with price. As utility or price increases, there will be less of the original, available energy (or what Georgescu-Roegen and others have referred to as 'negative entropy') left. This means that industrial centers exporting high-utility commodities will automatically gain access to ever greater amounts of available energy from their hinterlands. The more energy they have dissipated today, the more "new" energy they will be able to buy—and dissipate—tomorrow. Although most of this transfer of available energy to industrial sectors is dissipated in production, and a small share returned to their hinterlands in the form of industrial products, a significant part of it is indeed "invested" in an expanding, industrial infrastructure in core areas of the world system. A self-reinforcing logic involving economies of scale in industry and the geographical constraints of resource extraction (cf. Bunker 1985) will continuously augment this process of accumulation and the unequal exchange of energy and entropy on which it is founded. This, of course, is a very different way of describing what economists know as 'growth'. An intensification of industrial production will generally mean more competitive prices, expanding market shares, and rising profits for industrial sectors, which in turn means more purchasing power with which to appropriate even greater amounts of energy and other resources from peripheral sectors. An intensification of natural resource extraction, on the contrary, will ultimately lead to local resource exhaustion and ecological degradation, prompting investments to be shifted elsewhere. Note that this account of unequal exchange is *not* tantamount to an energy theory of value, but rather the opposite. Like Marx and Odum argued, it is necessary to refer to another gauge for assessing market exchange than prices, but unlike their work this account avoids the pitfall of parading this alternative gauge as a better measure of *value*. In

*not* offering an alternative theory of value, we not only avoid having to systematically contradict the evaluations that people actually make, we are also free to suggest additional gauges of productive potential that could be used alongside energy and labor to illuminate processes of unequal exchange. As I have previously argued, to observe that there is an asymmetric exchange of those resources that are crucial for the *material* accumulation of productive infrastructure is *not* the same as saying that these resources have a high *value*, a concept that should be reserved for actual valuations by market participants.

### The Unequal Exchange of Time and Space

I would like to suggest that one such alternative gauge of productive potential might be expressed as the unequal exchange of time and space. Both labor time and natural space are sources of available energy for industrial infrastructures, but I am thinking here of 'time' and 'space' as *human* as well as productive resources. Human time can be saved as well as invested (as labor) in production, and the same goes for space. When considered in relation to the fundamental rationale of most modern technology, this means that time and space can be redistributed in global society through unequal exchange. Most technology can be visualized as devices for "saving" time or space: "saving" time by increasing velocity (e.g., railways, cars, airplanes) and "saving" space by intensifying the use of land (e.g., through high-rise buildings or modern agricultural machinery). What we seldom take into account is that this local "saving" of time and space is made possible precisely by the expenditure or *loss* of time and space elsewhere in the global system. Just to give an early and fairly simple example, railways in the 1840s may have saved time—and accessed more space—for those who could afford to use them, but obviously at the expense of the labor time of vast armies of miners, loggers, steelworkers and railway workers, as well as of the natural spaces where clearcuts and strip mines were all that remained of the landscapes that had to be sacrificed in the name of technological progress. Again, this is not to propose that labor time or natural space could provide us with a gauge of 'value', only to observe that there

are alternative ways of gauging economic transactions that could provide us with objective measures of asymmetric flows.

The unequal exchange of time has to a large extent already been exposed by Marxian theory, notably in the work of Arghiri Emmanuel (1972), who showed that low-wage countries have to export greater volumes of products in exchange for a given volume of imports from high-wage countries than they would if the wage level were uniform. Yet I doubt that the Marxists themselves have fully grasped the implications of this analysis for our understanding of the very nature of modern technology. If machines from the very beginning of the Industrial Revolution can be visualized as devices for saving time *for some* at the expense of the time available to *others*, it would not make sense to view the "development of the productive forces" as a cornucopia promising to emancipate the global proletariat.

If we add the more recent recognition that there is also an unequal exchange of *space*—for example in the notion of 'ecological footprints' (Wackernagel and Rees 1996), such hopes of technological emancipation seem even more untenable. The Industrial Revolution was not so much an emancipation from natural constraints as the local accumulation of a capacity to export and redistribute such constraints in global society (cf. Wilkinson 1973). What the 'post-development' world might teach us is that technological 'progress' or 'growth' may not be the cornucopia that Ricardo and Marx believed, but local expressions of a global, zero-sum-like game. And what this means in terms of our understanding of concrete technology as a thoroughly *social* construct is even harder to digest, because it means that a tangible piece of machinery like a tractor or railway engine would *simply not be feasible* were it not for the uneven ways in which human time and natural space are *priced* in global society (Hornborg 2001). The contemporary, social condition of "time-space compression," identified by the Marxian geographer David Harvey (1990), relies on global processes of *time-space appropriation*. The high-tech sectors of global society presently celebrating their efficient use of time and space appear largely oblivious of the

extent to which this “efficiency” has been made possible by exploiting vast investments of human time and natural space made, historically and presently, elsewhere in the world system. Although such connections are generally concealed from their sight by virtue of geography or the passing of time, “developed” sectors owe as much to slavery and ecological devastation as to genius and entrepreneurship.

Our fundamental conundrum, in struggling to comprehend the mysteries of economic “growth,” is that production is a *material* process that yields—and hinges on—*symbolic* values. There is no mechanism to link an item’s relative, *material* contribution to a production process to its relative, *symbolic* value. The various components of a production process are reduced to a common, symbolic standard (money), by which they are evaluated and exchanged vis-à-vis each other, but there is no correspondence between this evaluative scale and their relative, *material* significance in the production process. The criterion for such assessments must hinge on the occurrence of *accumulation* of material and productive capacity in certain sectors of society, indicating a history of *unequal exchange of productive potential*. This permits a buildup of productive infrastructure in certain areas. Once such a perspective is adopted, of course, we are faced with the question of how such historical hindsight can be translated into an understanding of *present* terms of trade that could provide a foundation for policies aiming at more equitable trade relations. (This, however, is definitely beyond the scope of this paper.)

Methodologically, the perspective on economic growth outlined here could perhaps best be tested by systematically translating a given set of exchanges between two nations—say between England and one of its colonies around 1800—into hours of labor and hectare yields that were invested in traded commodities, and those that were “saved” (i.e., substituted for) by the buyers. Such analyses would probably become more difficult and complex to carry out the closer in time we get to our contemporary, more thoroughly globalized economy.

One of the benefits of the suggested framework is that it would help us to analytically distinguish

between different kinds of “environmental problems” in world system history. In view of the twin problems of importing available energy (‘negative entropy’) and exporting entropy, different historical and contemporary cases of environmental crisis require different analytical tools. There are cases, such as the Classic Maya or Easter Island, where ecological overshoot is not so much a consequence of long-distance resource extraction as of locally generated overexploitation of resources. There are clearly also a great number of cases, such as Roman North Africa, British North America, or the Sahel region of Africa, where environmental degradation was or is the result of the systematic appropriation of local resources by distant centers. A third type of environmental problem would be represented by 19<sup>th</sup> century London or 20<sup>th</sup> century Moscow, where the accumulation of distantly derived resources is not sufficiently balanced by an export of entropy (pollution, waste) generated in the process. Finally, the recent North-to-South export of the most polluting industries, as well as waste itself, suggests a fourth version of ecological crisis, where world system peripheries are converted into dumping grounds for entropy generated by affluent core areas. With reference to the final two versions, problems of “environmental justice” and “environmental load displacement” can thus be shown to have two distinct aspects, since peripheral areas can be exploited both as sources of ‘negative entropy’ and as sinks for entropy. I should emphasize that I have been using the notion of ‘unequal exchange’ not in the moral sense of not getting one’s money’s worth, but in the naturalistic or realist sense of an objectively asymmetric transfer of some quantity or metric (other than money) by which the productive capacity of one social group is augmented at the expense of that of another. My argument is that industrial capitalism is founded and dependent on such objective, net transfers of productive potential. It is thus not a moral argument at the level of analysis, but can of course *inspire* a moral argument when articulated with the observation that an asymmetric transfer (net import) of energy to one region or social group is the basis of a self-reinforcing accumulation of technological superiority and power vis-à-vis other regions or social groups.

### Can We Claim to Know More Than the Economists?

There is a long-standing assumption in economics that assertions of unequal exchange must imply an underlying standard of value. My main point in this paper, on the contrary, is that unequal exchange can be conceptualized without recourse to the notion of 'value'. To observe that there is an unequal exchange of available energy between world system centers and their hinterlands is no more of a value judgement than to observe that such an unequal exchange is a prerequisite to the survival of any living system. All organisms, for instance, must appropriate more available energy from their environments than they can return to them. The difference between world system centers and organisms, however, is that for the former, the appropriation of available energy is an asymmetric *social* exchange. Core areas of the world system accumulate industrial infrastructure by appropriating available energy and other material resources from an increasingly impoverished periphery.

For an anthropologist to present such an alternative—and admittedly more pessimistic—account of world trade and economic growth is more at odds with the mainstream discourse of the discipline today than it would have been thirty years ago, when the legitimacy of pursuing an etic (objective) perspective was generally taken for granted. How can an anthropologist today claim to be offering “truths” about human economies that are external and invisible to the participants’ own representations of exchange? Maurice Godelier is one of the comparatively few anthropologists who continue to keep this door open. In order for the consent of dominated groups to exist, he says, the unequal relations “must, in one way or other—by means of some mysterious process that we must analyze—present themselves as a *reciprocal exchange* of services” (Godelier 1994:105). Godelier clearly wishes to retain the anthropological prerogative to contradict the representations of the participants. This is indeed crucial if anthropology is to continue to deliver critical cultural analyses of power. Godelier has used the example of the Inca emperor’s relations to his subjects to show how an exchange perceived by the most disempowered participants as reciprocal—or even generous—can

be objectively analyzed as unequal. Thus, we should not be content with asking, as the economists do, if people “get what they want.” Conventional economic science is not at all equipped to deal conceptually with the physical dimensions and material logic of industrial accumulation. The preferences of the transactors are not in any way systematically geared to the material, accumulative potential of traded goods and services. This applies as much to the role of oil in industrial capitalism as to the role of maize in the metabolism of the Inca empire. Whether the illusion of reciprocity is maintained by the institutionalized maize beer parties of the Inca emperor or by Western notions of ‘market prices’, we must continue to have the ambition to know more about exchange than the participants in that exchange. In the modern world, this means claiming to know something about exchange that the economists don’t know.

### References Cited

- BAUDRILLARD, J.  
1972 *Pour une critique de l'économie politique du signe*. Paris: Gallimard.
- BUNKER, S.G.  
1985 *Underdeveloping the Amazon: Extraction, unequal exchange and the failure of the modern state*. Chicago: University of Chicago Press.
- EMMANUEL, A.  
1972 *Unequal exchange: A study of the imperialism of trade*. Translated by Brian Pearce. New York: Monthly Review Press.
- GEORGESCU-ROEGEN, N.  
1971 *The entropy law and the economic process*. Cambridge, MA: Harvard University Press.
- GODELIER, M.  
1969 La monnaie de sel des Baruya de Nouvelle-Guinée. *L'Homme* 9(2):5-37.  
1994 “Mirror, mirror on the wall... The once and future role of anthropology: A tentative assessment,” in *Assessing cultural anthropology*. Edited by R. Borofsky, pp. 97-109. New York: McGraw-Hill.

- GODELIER, M.  
1998 Deconstructions, changing perspectives and progress in understanding social phenomena: An anthropologist's point of view. *Folk* 40:5-23.
- GUDEMAN, S.  
1986 *Economics as culture: Models and metaphors of livelihood*. London: Routledge & Kegan Paul.
- HARVEY, D.  
1990 *The condition of postmodernity: An enquiry into the origins of cultural change*. Oxford: Blackwell.
- HORNBERG, A.  
2001 *The power of the machine: Global inequalities of economy, technology, and environment*. Walnut Creek, CA: AltaMira/Rowman & Littlefield.
- ODUM, H.T.  
1988 Self-organization, transformity, and information. *Science* 242:1132-1139.
- ODUM, H.T., AND J.E. ARDING.  
1991 *Emergy analysis of shrimp mariculture in Ecuador*. Working paper, Coastal Resources Center, University of Rhode Island, Narragansett.
- SAHLINS, M.  
1976 *Culture and practical reason*. Chicago: University of Chicago Press.
- WACKERNAGEL, M., AND W.E. REES.  
1996 *Our ecological footprint: Reducing human impact on the earth*. Gabriola Island, BC: New Society Publishers.
- WHITE, L.A.  
1959 *The evolution of culture: The development of civilization to the fall of Rome*. New York: McGraw-Hill.
- WILKINSON, R.G.  
1973 *Poverty and progress: An ecological model of economic development*. London: Methuen.