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**Five Kinds of Capital: Useful Concepts for Sustainable
Development**

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Five Kinds of Capital: Useful Concepts for Sustainable Development¹

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Abstract

The concept of capital has a number of different meanings. It is useful to differentiate between five kinds of capital: financial, natural, produced, human, and social. All are stocks that have the capacity to produce flows of economically desirable outputs. The maintenance of all five kinds of capital is essential for the sustainability of economic development.

Financial capital facilitates economic production, though it is not itself productive, referring rather to a system of ownership or control of physical capital. Natural capital is made up of the resources and ecosystem services of the natural world. Produced capital consists of physical assets generated by applying human productive activities to natural capital and capable of providing a flow of goods or services. Human capital refers to the productive capacities of an individual, both inherited and acquired through education and training. Social capital, the most controversial and the hardest to measure, consists of a stock of trust, mutual understanding, shared values and socially held knowledge.

In the course of economic history, the focus has shifted from material-intensive to information-intensive technologies. These technologies make it possible to economize simultaneously on the three classical factors of production: land, labor, and produced capital. Information technologies can be embodied (in physical capital) or disembodied, consisting of shared understandings and procedures (human and social capital).

Sustainable development must maintain or increase all productive capital stocks, including natural capital, which is currently often depleted through economic production. The maintenance of stocks of human and social capital is equally important. Thus the traditional trio of essential economic activities – production, consumption, and distribution – must be supplemented with a fourth function, that of resource maintenance.

¹ *This paper was prepared for the Section on Law and Socio-Economics of the American Association of Legal Scholars annual meeting, January 2003. Portions were adapted from Chapter 3 of Microeconomics in Context, an introductory, college level textbook by Neva Goodwin, Julie Nelson, Frank Ackerman and Thomas Weisskopf.*

1. Introduction

It is common to hear arguments over what some word “really means,” but of course words mean what human beings agree that they should mean. Even if they are what I call “unicorn words,” referring to something that does not actually exist, there can be an agreed-upon meaning that achieves communication. If I say, “I saw a unicorn,” you may conclude that I’m kidding, or that I’m nuts, but we both know that the thing I either did or didn’t see is a slender white horse with a whirled horn sticking out of its forehead.

In this paper I will discuss some uses of the word *capital*. I believe it is useful to accept a convention, when talking about economic systems, in which we identify a variety of kinds of capital – five, to be precise. I will talk a little about the familiar concept of *financial* capital, and more about the less familiar concepts of *natural*, *produced*, *human*, and *social* capital. There are several reasons why I believe it is useful to adopt this verbal convention.

- One has to do with the close association, in economics, between the concept of capital and the concept of a stock – when the word stock is understood in one of its meanings, as the opposite of a flow.
- Another reason might be called political. There are aspects of economic systems whose importance has been neglected by many of the people who have the power to shape our economic future. These aspects are more readily brought to the attention of people used to thinking in economic terms when they are given familiar economic labels. Environmental conservation and women’s rights, for example, may be given greater weight by economic policy makers if they are discussed in the context of natural and human capital. This political reason is backed up by the first one, since there is an internal logic to calling something “capital” if it can be understood as a particular kind of stock – namely, a stock of a productive resource.
- A final reason has to do with sustainable development. I am a co-author of a textbook called *Microeconomics in Context*, in which we argue that the commonly accepted trio of essential economic activities – production, distribution (or exchange), and consumption – must be complemented by a fourth: resource maintenance. We are especially concerned to draw attention to the need to sustain four of the five kinds of capital stock that we will discuss here. We make the argument that economic well-being will decline if our future ability to produce goods and services is diminished by failure to maintain these stocks.

2. Thinking about capital stocks

A stock is a quantity identified at a particular point in time. Examples, on which I will elaborate, could include, at *this* moment of *this* day, the balance in your checking account, the water in a pool at the base of a waterfall, the computer-driven sewing machines purchased by a clothing manufacturer, the houses in your neighborhood, your proficiency in learning new computer software, or the trusting relationships you count on when you urge a group of friends to join you in a project.

Flows, by contrast, are measured *over* a period of time. For example, the deposits and withdrawals you make to your checking account are flows. So is the water that goes off a cliff in a waterfall; its quantity can be measured per minute or per hour. You can think of the flow of sewing machines produced by a company that produces and sells these machines – or you could think of the flow of cloth going into the clothing factory, and the flow of finished goods coming out. The lessons someone may have given you in computer use were a flow of services. If you get your friends all fired up about your project, you could think of a flow of good will, produced by the stock of trusting relationships, as contributing to their mobilization. Flows are like a movie; stocks are like a still photograph. Flows can either add to stocks or decrease them.

For something to be considered a capital stock it must *have the potential to produce something that is economically desirable*. There are people who object to the use of terms that describe nature, human beings, or social groups in terms of their potential to produce something economically desirable. Legitimate objections focus on the fear that such terms are reductionistic in their effect. The fear is that when we speak of natural capital or human capital, we might imply that nature, and human beings, are important *only* as productive resources. It is, of course, important to make the point – and to make it as often as necessary – that the term "human capital" is not intended to be a synonym for human beings, any more than "natural capital" is imagined to summarize everything we care about in nature. These terms refer to much more limited subsets of the broader concepts with which they are linked.

2.a. Financial capital

Money can be regarded as a capital stock if it will be invested in some activity that produces something – at the very least if it will produce, for its owner, more money. In that case we would refer to it as financial capital. It is in the nature of most production processes that you have to pay for inputs before you can profit from outputs. Before it can make its first sale, a start-up business needs to buy or rent a building and equipment, hire staff, and lay in inventories of materials and supplies. Students need to pay for textbooks well in advance of receiving any increase in salary that their education might eventually gain for them. Local governments often take on a big project like building a major bridge before collecting the tolls that will pay for it. Financial capital is what allows all these productive activities to get going, in a money economy, in advance of the returns that will flow from them.

In actual fact, a great deal of financial capital, especially as it is used in international transactions, does nothing more than accommodate changes in ownership, for example in ownership of future shares of the agricultural output of some region, or of the currency of a nation that is expected to rise in value, or in ownership shares (also, confusingly, called “stocks”) of a corporation. Of all the kinds of capital I’ll discuss, the adjective, “productive,” is most often questionable when applied to financial capital.

2.b. Natural capital

Returning to our original list of examples, a pool of water – and, indeed, all of the water at any given moment in a particular ecological system – may be called a capital stock if it plays a role in some economically productive process. If this discussion were coming out of a different discipline – say, ecology – our decision to call it a capital stock could depend upon its playing a role in some *ecologically* productive process. There can be some convergence of the economic and the ecological points of view as we look beyond the most narrow and short-term view of the economy, noting that the ability of a pool to support various kinds of animal and plant life is a component of a productive ecological system, and that the economic system is, ultimately, a subset of the ecological system.

It was from a largely homocentric point of view that economists first began to label stocks of clean water and air, as well as forests, fisheries, and the ever evolving systems that support them – and us – as natural capital. While the term was originally used only for those aspects of nature that humans were actually using – and especially the parts that they were depleting, such as fertile topsoil – growing awareness of the intricacy and delicate balance of the relationship between the natural environment and human economies is encouraging many to think of our total natural environment as precious natural capital.

2.c. Produced capital

After financial capital, the most familiar item on the list I initially laid out was probably the sewing machines. In old economics textbooks you may well find mention of only two kinds of capital, financial and physical, and the discussions of physical capital would all have been about things made by human beings: roads, communication lines and other kinds of infrastructure, as well as factories and machines. They might have excluded houses, now recognized as part of the category of produced capital, essential for producing the economic good of shelter. And they would not have recognized that physical capital is of two kinds, natural as well as produced. We now define produced capital as, specifically, physical assets that are generated by applying human productive activities to natural capital, and that are used to provide a flow of goods or services, whether in the business sector, in homes or communities, or in the public purpose sector of governments and non-profits.

I referred, earlier, to the fear of a reductionist effect from associating the word “capital” with nature, humans and society. It may be that the reason this fear surfaces in this context is that the most well-known use of the term capital is, as just suggested, in reference to produced physical objects. When we think of a factory, a sewing machine, a hand-loom, a computer, or other objects which have been produced for the purpose of making other, economically desirable things, reductionism does not seem too inappropriate. The factory might be more than just productive capital – it could have aesthetic or historic or community-related meanings – nevertheless there is not a high likelihood of creating offense if we say “that factory is nothing more or less than a capital input to production.”

The point is, however, that even in talking about produced capital such a reductionistic approach is not necessary. We can refer to a violin as produced (and productive) capital without implying that that is *all* it is. However, because there are many circumstances wherein a reductionist attitude is taken to produced capital, and few voices are raised in protest, this strengthens the impression that the word is necessarily reductionistic. I will argue that we simply do not need to accept that. We can refer to human capital when referring to an individual's potential to produce something that is economically desirable, and still keep in mind that that is not all that matters in that, or any other, individual.

2.d. Human capital

With the introduction given in the previous section, let us now extrapolate from our discussion of the various kinds of physical capital, to think of human capital as a stock of capabilities, which can yield a flow of services. Your ability to work with computers is one of your individual productive capabilities. These capabilities depend not only on your knowledge, education, training, and skills; they also include useful behavioral habits as well as your level of energy and your physical and mental health. All of these aspects of human capital have some component of inherited characteristics, but they must also be created and enhanced through nurturance, education, and other aspects of life experience.

The word, labor, is often used to refer to the flow of effort, skill, and knowledge that humans directly provide as inputs into productive activities. Labor, because it is a flow, is usually measured over a period of time, such as by the number of person-hours of work at a particular skill level that has been used over a week or month.

There is a whole industry in the field of labor economics, in which quantifiable proxies are found for some of the more elusive, less quantifiable aspects of human capital – e.g., years of education are used as a proxy for knowledge; years on the job as a proxy for skill; and sometimes age as a proxy for experience. These numbers are then fed into econometric calculations in order to discover how much of the difference in people's income they can account for. Some interesting things emerge, especially when comparing male and female wages, or the incomes received by minority and dominant groups. All of the human capital proxies people can think of still don't account for all of the pay gaps that exist between more and less favored groups, leaving plenty of room for explanations based on prejudice, exploitation, etc.. At the same time, it is necessary to recognize that such analysis may also be leaving out important variables for which it has been impossible to find adequate, quantifiable proxies.

In recent years the World Bank has issued statements to the effect that, in many poor countries, the highest return will come from investments in female education.¹ Their reasoning is that these investments will contribute enormously to those countries' human capital. They have impressive numbers to prove their point, based on studies in which, for example, years of education among girls and women are regressed against indicators of health and nutritional status among children of specified ages. These are cases where the essential point – that a society is better off when the women are educated and able to

earn money – is so powerfully true that it can be demonstrated with even fairly crude proxy measures. But while these measures can indicate correlation, they of course cannot tell us about causality. The causal relationships, in fact, are in important ways political. That is to say, they have to do with the distribution of power, within families, communities, and the society at large. Female education does not only increase the wage-earning potential for women; in doing so it also gives women the domestic negotiating power to limit their family size, and aids them in making and implementing decisions relevant to their own and their family's nutrition and health. This is one of the areas where the political aspect of language is most evident. To those who say that it is dehumanizing to talk about human capital, I respond that this term has been a potent force in alleviating the even more dehumanizing effects of extreme poverty.

2.e. Social capital

The fifth kind of capital – social capital – is even harder to measure, and has sparked even more controversy. Let me start by talking about it in terms of stocks and flows. Auditors and appraisers, who are always pleased to find something new that they can be paid to measure, have taken enthusiastically to assigning dollar values to the “good-will” that is now commonly accepted as a part of the capital stock of a company when it is sold. In spite of measurement difficulties, I have no doubt that good-will is a real thing, and that a company's value can rise following a dramatic incident, such as Johnson and Johnson's recall of Tylenol when some bottles had been tampered with. There can also be an outflow of good-will if it becomes widely known that a company is mistreating its workers or cheating its stockholders.

In contemporary industrialized economies, the term “social capital” refers to the stock of trust, mutual understanding, shared values, and socially held knowledge that facilitates the social coordination of economic activity. Recognition of this concept by economists is fairly recent, and has been strengthened by the observation that variations in social capital across communities and societies can help to explain some of the differences in their economic development. It is most often used to refer to characteristics of a society that encourage cooperation among groups of people (e.g., workers and managers) whose joint, interdependent efforts are needed to achieve a common goal such as efficient production. Studies suggest that strong norms of reciprocity lead people to trust and to help one another, and that dense networks of civic participation encourage people to engage in mutually beneficial efforts rather than seeking only to gain individual advantage at the possible expense of others. Hence such norms and networks are frequently cited as important components of social capital.

Social capital resembles other forms of capital in that it generates a service that enhances the output obtainable from other inputs, without itself being used up in the process of production. If you urge your friends to help you organize a neighborhood clean-up day you will, as I suggested earlier, be calling on the flow of good will that emanates from a stock of trusting and collaborative relationships. If the event turns out to be poorly organized, and people feel that they have contributed their time and efforts with no

results, you may then find that you have used up some of your stock of social capital – the next time, fewer people may answer your call.

Not all capital can be classified clearly into only one form. When people deliberately create stocks of new hybrid seeds through selective breeding, for example, such seeds may be seen as partly natural and partly produced – and also as embodying human and social knowledge. Most actual cases, however, can be more clearly classified.

3. A brief historical overview

The field of economic studies has existed for about two and a half centuries. For the first 200 years of this time it seemed obvious – after Adam Smith and others pointed it out – that it was produced capital that made the difference between more and less productive systems. When early economists defined productive inputs under the three headings, “land, labor and capital,” the word *capital* meant, simply, produced capital. The term *land* could cover any parts of natural capital, but for the most part only land itself was seen as in limited supply: the rest of nature was assumed to be limitless, and was largely taken for granted. *Labor* was a similarly undifferentiated input; it simply meant person-hours of paid work. As an illustration of why we need new terms, during the next few paragraphs I will try to stick with the classical terms for the three productive inputs, as just defined.

The discipline of economics grew up with the Industrial Revolution. By 1950 a dozen or so human generations had been exposed to the experience that each new generation of capital – remember, I now mean simply produced capital – tends to be more productive than what has gone before. Technological improvements to capital were making both land and labor more productive. Nature was not, of its own accord, becoming more bounteous, but technological innovations were making it possible to get more food out of each field, to use more of the wood from each tree, and to turn previously useless forms of fossilized carbon – coal and petroleum – into energy that enormously augmented human capabilities.

Most dramatically, labor productivity – the value of the output that could be produced with each hour of work – was rising because of the capital accumulation. This is easily seen today, when you compare the value of the output that can be produced in a month by some American worker who can use equipment worth \$15,000, versus the product of an Indian who might be working with only \$15 worth of equipment.

Over the centuries that we are reviewing, increasingly productive workers were able to command higher salaries. Living standards went up many-fold for large parts of a rapidly growing human population, in a 250-year expansion of economic prosperity that was historically unprecedented. However, as labor became more expensive there was pressure on producers to economize on this factor of production, substituting both (produced) capital and the natural inputs from which all material things are ultimately made.

Prior to the industrial revolution, land had seemed to be the limiting constraint. Malthus, looking back over the previous history, had observed that labor was rarely in short supply; whenever there was enough food to support more people, the population would grow until shortage of land, or a period of bad weather, created starvation. He expected that this situation would always create a balance of food and population at a low level of prosperity. Then along came the industrial revolution which, through ever more efficient technology, and the machines in which it was embodied, kept ratcheting up labor productivity, generation after generation. This, in a nutshell, is why – so far – Malthus' gloomy predictions have not come true.

Now, however, we are facing a predicament. There is pressure to economize on labor, because it is expensive. There is growing pressure to economize on land – using that term to include both the stock of natural capital and also the flows that it produces. It is becoming evident that the human harvest of these flows is often unsustainable (fisheries are a prime example), while the waste products from production are degrading large portions of the world's stocks of natural capital. But there is also pressure to economize on capital – produced capital – because every new factory, machine, or consumer product is produced in ways that add to the pressures on the environment, and, to the extent that any materials are used up in the process, these materials must all originate in nature.

How, you might wonder, can you produce more, or even the same, value of output while simultaneously decreasing the use of all three classical inputs? This possibility can only be understood if we shift our vocabulary back from the classical three-input analysis to the more complex modern divisions and definitions of capital outlined earlier. What has been happening is a technological and social response that has sometimes been called dematerialization, or ephemeralization – a process in which information and other immaterial inputs are being substituted for many material inputs. Here are just a few examples.

- In some places, such as the American Midwest, laser technology is used to create perfectly level agricultural fields. This allows irrigation to take place with minimum water use.
- IPM – Integrated Pest Management – is a system that used knowledge and intelligence to substitute for chemicals, as farmers identify and destroy by hand some of the most pernicious pests, and learn how to live with others. In many cases it turns out that a balanced ecological system, without chemicals, makes up through reduced input cost for the output lost to pests. Moreover, under such systems, soil fertility increases over time, in contrast to the loss of fertility that occurs with the heavy chemical applications of industrial agriculture.
- Transportation at present relies heavily on climate-change-inducing fossil fuel use, while transportation infrastructure and equipment – e.g., roads and cars – also impose serious environmental costs. Electronic communication has not yet made a significant dent in materials-based transportation, but it has the potential to do so, through the internet, teleconferencing, etc.

- Green building design is finally beginning to get serious attention. Properly placed and usable windows, louvers, etc., can substitute for significant amounts of both heating and cooling. Roof run-off can be diverted to irrigate plantings. Intelligent systems can cut down dramatically on the energy needed for lighting – and so on.

The substitution of **ii** – information intensive – for **mm** – mostly material – technologies² is not happening as quickly as we might wish, in light of the severe strains now showing throughout the Earth's ecosystem. Nevertheless, it is proceeding in generally the right direction.

As the computer revolution and related events have rapidly expanded the category of "knowledge workers" – people whose jobs consist largely of processing and applying, and sometimes creating, knowledge and facts about the social and physical world – it has become evident that a continuing increase in productivity does not depend only on physical capital and sheer human effort. It also depends on intangible kinds of capital, including the knowledge, skills, and habits embodied in individuals, and the social knowledge and behaviors that make it possible to deploy individual human capabilities to best effect. To understand this better, I will briefly discuss the intersection of social capital and technology.

4. The role of technology

Usually when we think of using technology to increase productivity, we think of technology that is *embodied* in produced capital; for example, each generation of sewing machines has embodied some improvements that allow the users to accomplish what they want more quickly, or with less waste of material inputs, or to produce a higher quality of output.

On the other hand, technology can be *disembodied*, potentially enhancing the productivity of many different inputs used in production. Such intangible technologies may consist of shared understandings and procedures; for instance, some farming communities possess traditions that tell all farmers, in general terms, what to do to prevent soil exhaustion. One such tradition, found in both ancient and modern farming communities, is the idea of crop rotation. If a farmer continually plants the same kind of crop in the same field, over time the fertility of that soil is likely to diminish. Rotating complementary crops – for example, alternating legumes with nitrogen-depleting crops – can significantly increase output. This is an interesting example because it can be achieved with no additional input except the immaterial input of knowledge. Why, then, was the practice widely ignored during the early period of modern industrial agriculture, and why is it being rediscovered today? The answer is found not so much in the knowledge held by specific individuals as in the belief system of a culture. Such socially held knowledge can also be lost, or wasted by not being used. Declining rice yields in Myanmar at this time are a direct result of the central planning dictates to farmers in the best rice-growing area of the country, decreeing that rice must be planted there every

year. The farmers know perfectly well that rice fields need to be rested with crops that will refresh the soil, but the authoritarian government ignores this common knowledge.³

Much knowledge is socially held. Social capital includes the cultural beliefs and fashions of thought that determine what knowledge is applied, which scientific questions are researched, and which technological possibilities are explored. For example, growing public awareness of the dangers presented by global warming could be considered a form of social capital, because it increases the ability of society to respond to a significant threat to future well-being.

5. Sustaining capital stocks

The terms we have been using are helpful for understanding sustainable development. *Development* may be defined as improvement in the conditions and experience of life. This requires continued – in some cases increased – production of the goods and services that contribute positively to the quality of life. *Sustainable development* can only occur if this production occurs in ways that maintain or increase all of the necessary capital stocks. A sustainable socioeconomic system creates a flow of desirable goods and services by using its renewable capital stocks without depleting them. Although some portion of some (especially nonrenewable) capital stocks may be used up in the process of production, the overall quality and quantity of the resource base for sustaining life and well-being must be preserved.

These requirements are well known with respect to the physical forms of capital. It is evident that, if our stocks of housing, roads, communication systems, factories, and equipment are wearing out without being replaced, the standard of living as normally measured will decline. Humanity is also beginning to understand that there are even more serious problems related to natural capital. There is irrefutable scientific evidence that depletion of the ozone layer, pollution of the upper and lower levels of the atmosphere, extinction of many aquatic and terrestrial plant and animal species, and many other global and local ecological impacts pose serious threats to human health and the quality of our lives.

It is possible for economic activity continually to augment stocks of produced capital, more than offsetting any decline associated with the depreciation of buildings and equipment; and, indeed, the replacement of old produced capital with new often (though not always) brings improved quality. In contrast, the impact of economic activity on the stock of natural capital is most often negative; either the existing stock is drawn down (when natural resource inputs are used), or the quality of the stock is diminished (e.g., by the introduction of waste products). Moreover, the fact that the global biosphere is finite suggests that, sooner or later, there will be a limit to the size of the physical flow of production that can be maintained over time.

The necessity to maintain the intangible, unmeasurable stocks of human and social capital is equally grave, though perhaps less obvious. If formal education systems,

norms of childrearing, or socially accepted patterns of behavior change in ways that cause a deterioration in the level of education and health of a population, or in such cultural and ethical aspects of behavior as the prevailing standards and expectations of honesty, reliability, initiative, and originality, such deterioration will negatively affect future standards of living.

An expanded concept of sustainable development uses the acronym SAEJAS for Socially And Environmentally Just And Sustainable Development. Social justice is emphasized here for two reasons. One is that it answers the implicit question: Development for whom? SAEJAS development is necessarily improvement for all; to the extent that some benefit from it while others do not, it cannot be seen as successful. The other reason is that many studies show that inequality, to the extent that it is viewed as unfair, or that it creates circumstances of extreme deprivation for some members of a society, degrades social capital. In actual economic life cooperation is more important than competition for achieving efficiency and productivity; but it is harder to evoke cooperation in a situation of oppressive inequality.

It has become apparent that productivity is based on a much more complex set of variables than the old "land, labor and capital." Not only is it necessary to extract productive flows from the variety of kinds of capital resources; we must also ensure that these flows can be sustained. In this context there is urgent, real-world importance in the distinction between stocks and flows, the addition of resource maintenance to our standard list of economic activities, and an understanding of natural, human, and social capital – however we chose to label these concepts.

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NOTES

¹See, e.g. World Bank Newsletter, 10/31/1992, "Educating girls has a high payoff":

Investing in the education of girls yields high returns by cutting through a vicious cycle. Mothers channel much more of their income to expenditures on children than their husbands do, and educated mothers have healthier children. Educating girls yield other benefits as well. It cuts through the vicious cycle of illiterate mothers and daughters. Educated women choose to have fewer children. By increasing knowledge about health care practices and reducing the number of pregnancies of these women, female education significantly reduces the risk of maternal mortality.

² See Goodwin, Neva R., "Lessons for the World from US Agriculture: Unbundling Technology" in World Development, January, 1991 Vol. 19 no. 1.

³³ See GDAE discussion paper # 03-04 by David Dapice.

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