

# **Why Manufacturing Matters: A production-centered path to economic growth and social justice**

Jon Rynn, 8/14/2000

Many of us would agree that manufacturing is central to a modern economy. Indeed, to many people the matter seems obvious, perhaps not even worth discussing. But the conventional wisdom, as heard from the speeches and writings of some of the most powerful people in the United States, from the President to Alan Greenspan, from corporate CEOs to media pundits, is that we have entered a post-industrial, electronic era of globalization. In this globalized century, so we are told, what matters most will be determined by the unimpeded operation of free, unregulated world-wide markets. The stock market, not the factory floor, sets the fate of nations and peoples.

This paper is an attempt to offer an alternative framework for understanding national and global economies, by explaining the functioning of an economic system in terms of its capability to produce, not its freedom to exchange. The wealth of nations, as Adam Smith pointed out, is not money, but the productive capacity of its people. As Friedrich List asserted in the 1820's, this productive capacity is at the root of national power:

The causes of wealth are something totally different from wealth itself. A person may possess wealth, i.e. exchangeable value; if, however, he does not possess the power of producing objects of more value than he consumes, he will become poorer. A person may be poor; if he, however, possesses the power of producing a larger amount of valuable articles than he consumes, he becomes rich. The power of producing wealth is therefore infinitely more important than wealth itself... This is still more the case with entire nations than with private individuals

Manufacturing constitutes the modern means of productive capacity. Any nation or group of nations that is deficient in this capacity will be at the mercy of those countries which are more competent. All peoples, rich or poor, need a strong manufacturing base in order to thrive economically and protect themselves politically. In the United States, the decline of manufacturing has progressed to a frightening degree.

## **The Production Crisis in the United States**

Many authors have written about the deindustrialization of the United States. I wish to concentrate in particular on the group of industries which make production machinery. Production machinery is the equipment that industrial societies use to create

virtually all goods and services. As an illustration, let us trace how the average American uses the products of such machinery after leaving work (I have italicized the production machinery).

The cars that people drive from work are produced by putting together parts made by *machine tools*, using *material-handling equipment*, including *assembly lines*; the gas that goes into the car is processed by *petroleum refinery equipment*, and the oil is taken from the ground by *oil extraction machinery*. After arriving home, dinner might be served. The food that people enjoy is processed by *food products machinery*, which use crops harvested with *agricultural machinery*. The houses in which people eat such food are built using manufactured materials, put together with *construction machinery*. The newspapers and books they read after dinner are produced by first *paper-making*, and then *printing machinery*. The light they read by is generated by *steam turbines* in far-away electrical stations; the chairs they sit in are put together with the help of *wood-working machinery*. The clothes that they wear are formed by *industrial sewing machines*, using textiles generated by *textile machinery*. At night, the computers that they use to peruse their email and the Internet, and the TV that they watch, are made possible by *semiconductor- and tube-making equipment*, and the windows they look out of are made using *glass-making machinery*. People in industrialized societies are constantly surrounded by the artifacts of an industrial economy based on production machinery, without being aware of the sources of their wealth.

Capital goods, such as the steel that goes into the cars, or the chemicals used for most industrial processes, are just as necessary as production machinery. Capital goods are the intermediate goods that are used to produce the final goods. Final goods, which are the goods that most consumers see, are in reality the end product of a long sequence of the use of production machinery and capital goods. These industries are the hidden strength of any economy.

America's production machinery and capital goods industries will disappear entirely by approximately the year 2020 if present trends continue. As seen on the following table, imports as a percentage of domestic consumption have been doubling approximately every 12 years since 1970 for these categories of machinery. In 1970, imports made up 6.4% of consumption, which doubled by 1980 to 12.7%. Import percentage then doubled again by 1994 to 25.7%. At this rate, by about 2006 imports will account for 50% of these critical industries, and by 2020 they could completely

disappear, probably to be supplied mostly from Japan and Germany. (Import dependence is the value of imports divided by the value of domestic consumption; domestic consumption equals domestic shipments plus the value of imports, minus the value of exports; all dollars are 1987 constant dollars.).

<b>Selected Production Machinery, Value of U.S. Shipments: (in millions of constant 1987 dollars)</b>	<b>1970</b>	<b>1980</b>	<b>1994</b>	<b>Import Dependence</b>		
				<b>1970</b>	<b>1980</b>	<b>1994</b>
Metal-cutting Machine Tools	6,347	6,906	2,903	8%	22%	52%
Metal-forming Machine Tools	2,896	2,265	1,359	3%	11%	27%
Industrial Trucks and Tractors	2,284	2,918	3,601	3%	7%	30%
Oil and Gas Field Machinery	3,776	9,582	3,205	3%	7%	80%
Construction Machinery	15,320	20,246	14,417	3%	7%	23%
Mining Machinery	2,435	3,028	1,374	3%	5%	34%
Farm Machinery and Equipment	10,895	16,857	10,685	9%	14%	22%
Turbines and Turbine Generator Sets	5,956	4,766	4,987	2%	8%	18%
Internal Combustion Engines, N.E.C.	8,060	13,665	12,399	8%	15%	19%
Food Products Machinery	2,759	3,342	3,098	8%	14%	16%
Textile Machinery	2,387	1,660	1,515	27%	43%	58%
Printing Trades Machinery	1,917	2,874	2,781	9%	19%	42%
Paper Industries Machinery	2,193	1,871	2,190	11%	20%	28%
Special Industry Machinery	7,870	6,751	11,491	1%	6%	15%
<b>Total:</b>	<b>75,095</b>	<b>96,731</b>	<b>76,005</b>	<b>6.4%</b>	<b>12.7%</b>	<b>25.7%</b>

Source: For shipments, The National Bureau of Economic Research, Eric J. Bartelsman, Randy A. Becker, and Wayne B. Gray, NBER-CES/Census Manufacturing Industry Productivity Database 11/25/98; see also NBER Technical Working Paper 205, October 1996. For Import/Export data, see Robert C. Feenstra, NBER Working Paper no. 5515, March 1996, and NBER Working Paper no. 5990, April 1997. Available on <http://www.nber.org>.

The first three columns of numbers in the table show the domestic output of the production machinery industries. In most cases, the change in output from 1970 to 1994 has been negligible or downward. Since manufacturing output has increased since that time, more production machinery has been consumed than has been produced by American companies; the increased use of production machinery, therefore, has to be bought from abroad, which is shown in the last three columns.

The steel industry, even before the dumping of cheap steel in 1997, has been declining (all values in 1987 dollars):

Steel Works, Blast Furnaces, & Rolling Mills	Shipments (millions of 1987 dollars)	Import Dependence	Value Added per Hour	Wage per hour	Production Workers (1000s)
1970	68,476	8%	36	15	3,855
1980	59,320	12%	38	16	7,898
1994	46,030	18%	71	19	5,500

Source: Same as previous table

Here we see that domestic output declined, even as use has increased, so that imports have increased as well. Wages have stayed virtually the same, even though the value-added, which is a measure of the value that the steel industry adds to the input of iron and other materials\*, has doubled.

For the production machinery industries that were discussed above, the average value-added per hour climbed from \$40 per hour in 1970, to \$49 in 1980, to \$59 in 1994 (all in 1987 constant dollars). But the average hourly wage actually went down, from \$13 per hour in 1970 to \$12 per hour in 1994. With a low wage, these critical industries will cease to attract high-quality workers. In fact, there is currently a severe shortage of trained machinists, which is further adding to the difficulties of manufacturers. According the 1990 Census, there were over 500,000 machinists in 1990, but less than 2,000 apprentices!

The manufacturing sector continues to hemorrhage jobs. The number of production workers for the production machinery industries shown here declined from 502,000 in 1970 to 311,000 in 1994. According to the Bureau for Labor Statistics, from 1998 to 1999, the U.S. economy lost 200,000 manufacturing jobs (172,000 in 2000), gained 2,769,000 service jobs (2,717,000 in 2000). Several parts of the service sector, by themselves, gained more employment than manufacturing as a whole lost. Retail trade gained 415,000 jobs (the same in 2000); Government (mostly States), about 350,000 in 1999 and 2000; and Finance, Insurance and Real Estate, 268,000 in 1999 (94,000 in 2000) (see <ftp://ftp.bls.gov/pub/special.requests/ee/blsa.dat>; all figures for January). This structural shift of the economy is accelerating a long term trend in the economy.

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\* Value-added is a measure of economic output that is useful for understanding the role of various parts of the economy. It is the difference between the revenue received and the nonlabor costs incurred, such as materials and machinery. In other words, it is generally the compensation of employees plus profits.

According to the Bureau of Economic Analysis, from 1958 to 1969 the manufacturing sector held steady at between 26% and 27% of the U.S. economy, as measured by value-added. By 1980, the percentage had fallen to 21%; by 1997, only 17% of the economy was generated by manufacturing. (*Survey of Current Business*, August 1996, p. 133-154).

As a result of this decline in manufacturing, the trade deficit is skyrocketing. While the Administration and many economists try to sell us the idea that the trade deficit is the result of our healthy economy, the real reason is much more straightforward. Since manufacturing is shrinking, we need to import more manufactured goods. As of 1999, for instance, 47% of computers and peripherals bought in the U.S. were imported, as were 52% of motor vehicles, and 54% of semiconductors and related devices (see U.S. Industry and Trade Outlook 2000). The entire trade deficit in goods was \$247 billion in 1998, \$346 billion in 1999, and \$106 billion in just the *1<sup>st</sup> quarter* of 2000 (see <http://www.bea.doc.gov/bea/di/trans1.htm>). Several countries, such as China and Japan, received 250 billion paper dollars in return for physical goods such as the cars, home audio equipment, and other prized possessions of the typical American household. They gave us goods, we gave them paper money. Why were they so full of the giving spirit?

Part of the reason for foreign largesse is that foreign holders of dollars reinvested the money in the U.S. For instance, in 1996 \$122 billion came into the U.S. from foreign governments, mostly for buying U.S. Treasury bonds; 206 billion private dollars were invested in U.S. securities and Treasury bonds (*Survey of Current Business*, July 1997, p. 43-85. According to the New York Times (8/13/2000), "Through early August, foreign companies had announced 1,202 deals to buy American companies, with the purchases valued at \$266 billion. For all of 1999, there were 1,701 deals valued at \$305 billion." In addition, the dollar is often used as the international medium of exchange. But how long can this continue? If the stock market slides, will foreign investment stop? If confidence in the dollar declines, speculators could drive the dollar down to such low levels that the price of imported goods would rise spectacularly. Like the Brazilians, we would be vulnerable to high inflation because we don't produce enough goods to fill national demand. Wages would not be responsible for inflation; incompetence in production would lead to dollars chasing fewer goods, which would result in higher prices for those goods.

## **Constructing a production-centered alternative: The centrality of manufacturing**

The manufacturing strength of the U.S. economy is rapidly eroding. Whole communities are not only losing their jobs and way of life, the entire national economy is losing the skills and resources that those communities embody. Instead of helping those communities, Americans are currently relying on a short-term strategy of importing goods from other countries; in the long-term, the United States, like any other nation, is vulnerable to a drastically lower standard of living without a strong manufacturing sector.

The decline in manufacturing has been justified and defended by a finance-centered view of the world which holds sway in the corridors of power in the United States. Without an alternative framework, we can offer myriad policy proposals, but economists will always argue that our proposals will lead to a worsening state of affairs. We cannot simply say that “manufacturing is important”, and leave it at that. If we do, we could imagine a financial manager responding in the following fashion:

“Sure manufacturing is important. But so is everything else in the economy. The value of manufacturing is measured in the same manner as any other sector: according to its price on the market. A steel mill worth X amount of dollars is just as valuable as an amusement park worth X amount of dollars, or an office building, or a fleet of jets. The worth of a chief executive officer who makes \$3,000,000 is 100 times the worth of a machinist who makes \$30,000, because that is what the market has determined, and the market is almost always right.”

In this finance-centered world view, money measures worth. Thus, since the production machinery industries only constitute 2% of the economy, they would be considered to be relatively unimportant. The first part of a production-centered alternative, therefore, is to show that money is not wealth; *different parts of the economic system have different functions, and the entire system will fail if one of those functions does not exist.*

The primary example of this principle is the manufacturing sector of an economy. Virtually the entire economy consists either of manufacturing itself, or depends on manufacturing. Part of conventional wisdom is that we are now a “service” economy. But if we look at each of the seven segments of the service economy, we can see that each segment is either part of manufacturing, or is completely dependent on manufacturing for its existence (all figures are from the US, *Survey of Current Business*, 11/97).

First, all transportation and communications industries (5.7% of the economy in 1996) involve the use of transportational and communications equipment. The airline industry uses jets and airport facilities, both of which must be manufactured in factories. Railroads have always been very capital intensive, and truckers wouldn't go very far without their trucks. In addition, all transportation services are dependent on the infrastructure – roads, airports, ports, and railways. The telecommunications industry, including the internet, uses telephones and switching equipment, as well as broadcasting equipment.

Second, utilities (2.8%) should not really be considered services. They are engaged in physical production. Electrical utilities literally create electricity. Natural gas systems move gas from the ground to the consumer. Sanitary services process and recycle human waste, and water services transport and clean water. Certainly, energy and clean water are the results of physical processes; they are also dependent for their transformation on production machinery.

Third, the retail and wholesale sectors (15.5%) are retailing and wholesaling the goods that are generated by the manufacturing industries. Even if the internet swallowed up the entire retail sector, therefore, it would not surpass 8.7% of the economy; hardly a “revolution”. The internet is not a “new” economy; it is a small part of the “whole” economy.

Fourth, the health services sector (5.9%) has been profoundly conditioned by the advances made in medical instrumentation in the last several decades. Drugs must be manufactured, as well as scalpels, MRI machines, and all of the other components of the practice of modern medicine, not to mention the hospital buildings which must be built.

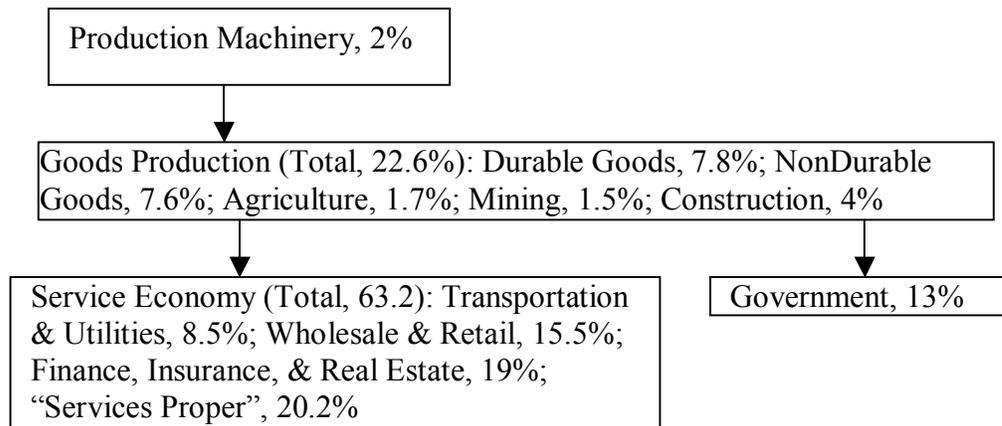
Fifth, what I will call “services proper” has grown from 9.5% of the economy in 1959 to 20.2% in 1996. This is a very diversified set of industries. Some industries are closely allied to manufacturing. The largest segment is business services, and computer services make up about one-third of this subsector. This is the home of the software industry, closely tied to the computer industry. Software exists in order to control hardware; software be considered to be part of goods production. Another service, repair services, should also be part of the goods producing sector, since physical goods are transformed by repairing them. Engineering services, also growing, are mostly used in the manufacturing sector.

The other part of “services proper” is closer to pure “services” as most people think of them, and these also depend on machinery. “Personal services” include places like laundromats, barbers, and beauty shops, all users of high quality tools and machinery. The entertainment industry, which despite its celebrity only constituted about 1.1% of the economy in 1994, also is a heavy user of equipment. The other “services proper” – legal, private educational and social services, management consulting, temporary employment agencies, hotels and lodging, and several others – might be considered purely “services”, and constitute approximately 6% of the economy. Even these services depend on buildings, information processing, and communications.

Sixth, the finance, insurance, and real estate industries (19%) transfer the goods generated by the rest of the economy among sectors. But as we have seen, most of the rest of the economy is either directly or indirectly involved in goods production. Therefore, the financial sector of the economy is dependent on the capacity of the manufacturing sector to create wealth in the form of goods. The financial sector can only receive a return on its investment, ultimately, if the investment generates new production. In addition, the globalization and expansion of finance and insurance would have been impossible without the technologies of communication and information. Real estate involves the exchange of buildings constructed with and maintained by machinery, using the same surplus that the finance and insurance sectors rely on.

Finally, the government (13%) is supported from the proceeds of the rest of the economy, which itself is based on manufacturing. Thus, it is almost impossible to find a part of the service economy that is not, in some way or other, based on the output of the manufacturing sector.

We can therefore diagram the U.S. economy as follows; the percentage after each category indicates the percentage of the economy (in terms of value-added in 1996):



Source for percentages: *Survey of Current Business*, “Gross Product by Industry, 1947-96”, 11/97

The arrows indicate the direction of production. First, production machinery is used to produce goods. These production machinery industries are tiny (although another 2% comes from imports). Production machinery is used in the next stage of the economy, the goods-producing sectors. These account for about 23%. The next stage of the economy is the services stage, including government, or 76% of the economy.

Manufacturing matters, first, because the rest of the economy is dependent on manufacturing. An economy without a manufacturing sector is not a *post*-industrial economy, it is a *pre*-industrial economy. A modern nation without a manufacturing sector will become a colony of other nations, in fact if not in name.

**Constructing a production-centered alternative: All manufacturing sectors are necessary**

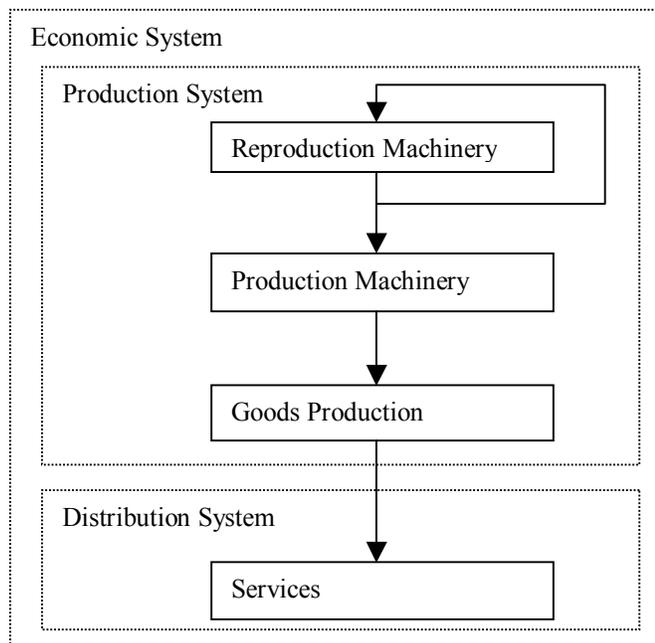
Within an economic system, then, different parts serve different functions. Without both manufacturing and services, a modern economy could not exist. Within *manufacturing*, different parts also serve different functions. Goods-producing industries could not exist without production machinery industries. Thus there are three irreplaceable sectors of a modern economy: services, goods production, and production machinery (along with their associated capital goods).

What produces production machinery? There is a subset of production machinery, which I will call *reproduction machinery*, which both makes production

machinery and more reproduction machinery. For instance, machine tools both shape the metal parts which are used to construct production machinery such as construction machinery, and the metal parts which are used to make more machine tools. Steel-making equipment makes the steel which is used to make production machinery, and the steel which is used to make machine tools and more steel-making equipment. Steam turbines generate the electricity which is used to make production machinery, as well as the electricity which is used to make machine tools, steel-making equipment, and more steam turbines. Semiconductor-making equipment fabricates the semiconductors which are used in production machinery, as well as the semiconductors which are used in machine tools, steel-making machinery, and steam turbines. All of these technologies are used to help make more of each other.

Reproduction in nature can lead to very fast growth, as in population explosions. Modern industrial growth is dependent on the explosive growth possibilities inherent in the collective interaction of reproduction machinery.

Thus, there is a fourth, necessary stage in the structure of the economic system. Instead of conceptualizing an economy as an amorphous blob of competing firms, as in neoclassical economics, we have the outline of a *structure* of an economic system:



Reproduction machinery makes production machinery and more reproduction machinery, production machinery generates goods, and goods are used to generate revenue in the services sector. The reproduction machinery, production machinery, and goods production stages are the *stages of production*, which exist in the *production*

*system*, while the services constitute the *distribution system*. Together, the production and distribution systems are the components of a wider entity, the *economic system*.

The structure of the economic system, as described above, implies a larger point: a system, such as an economy, must be able to both *generate* output and *allocate* that output. Both functions, generation and distribution, are necessary. The manufacturing sectors *generate* output in an economic system, while the retail and financial sectors *allocate* that which the manufacturing sectors have generated. The diagram above shows, in a more schematic way, the general idea that the rest of the economy is dependent on the manufacturing sectors.

Each of the stages of production may be further divided into four *categories of production*. It would do an economy little good to have a large amount of machine tools and no steel-making equipment, or a thriving construction machinery industry but no cement-making industry. You can't make a part unless you have the material to make the part; similarly, you can't make the part unless you have some sort of energy source to operate the production machine; finally, you can't make the part unless you have a design for the part or a way of monitoring the part-making process. In other words, in order to produce something it is necessary to make a *material*, to *structure* the material, to convert *energy*, and to process *information*. Each of these four processes requires its own class of machinery, which I will call *material* production machinery, *structural* production machinery, *energy-converting* machinery (including transportation equipment), and *informational* machinery.

In addition, reproduction machinery can be divided into the four categories. Machine tools shape parts, and thus they are structural reproduction machinery; steel-making equipment creates material (that is, steel), and therefore are an example of material reproduction machinery; steam turbines generate electricity, and are the most important form of energy-converting reproduction machinery; and semiconductor-making equipment make semiconductors, and are therefore informational reproduction machinery.

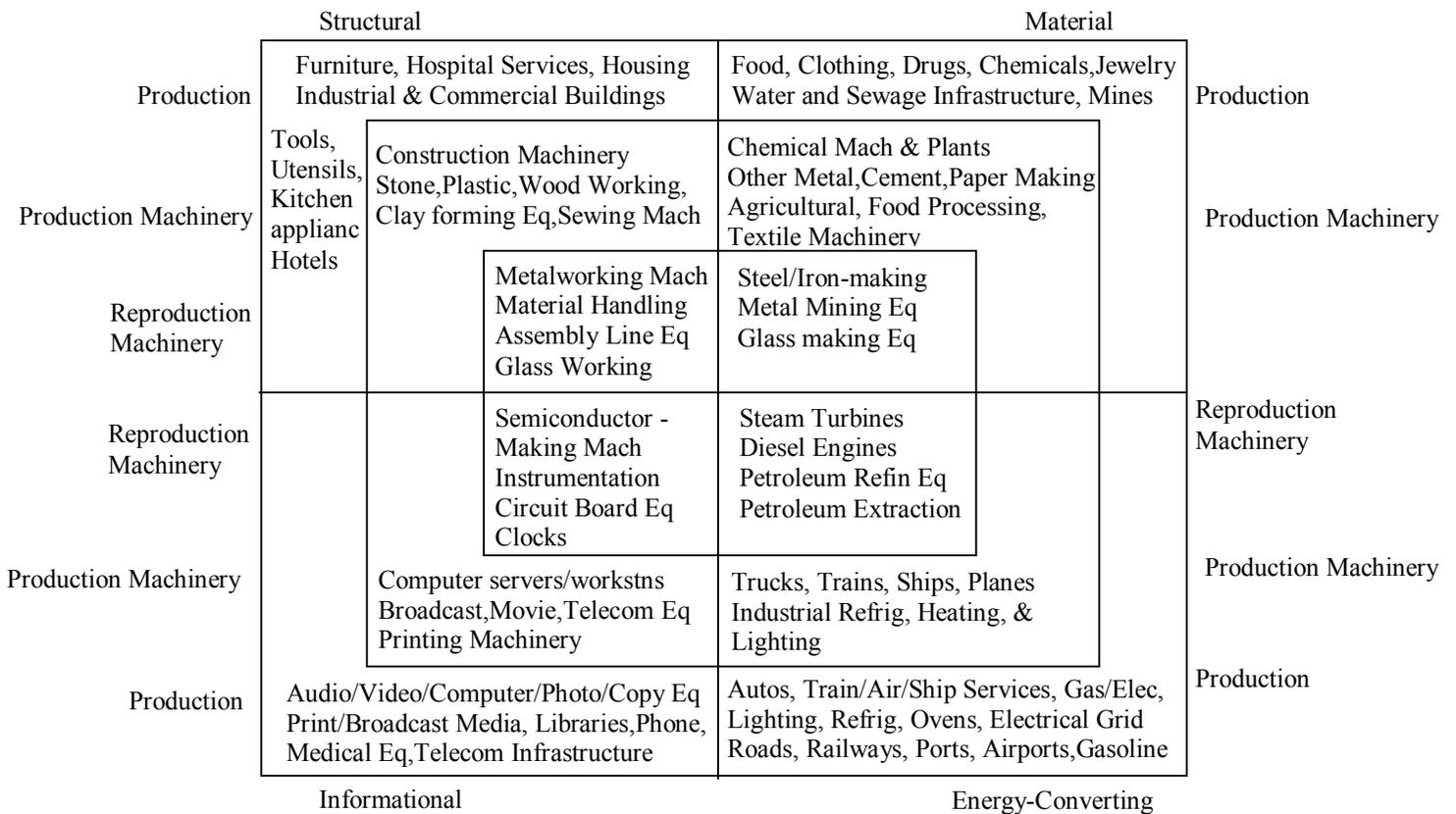
The goods production sectors can also be split into these four categories. Every *category* of production at every *stage* of production is irreplaceable, and all stages and categories are necessary for the proper functioning of a modern economic system.

The following diagram shows the stages and categories of production combined to form what I will call a *production matrix*:

Structural Production		Material Production	
Structural Production Machinery		Material Production Machinery	
Structural Reproduction Machinery		Material Reproduction Machinery	
Informational Reproduction Machinery		Energy-Converting Reproduction Machinery	
Informational Production Machinery		Energy-Converting Production Machinery	
Informational Production		Energy-Converting Production	

Each sector will be referred to as a *production niche*. For instance, there is an energy-converting production niche, and a material reproduction machinery niche; all twelve niches form a *production system*. In biology, the term “niche” has been difficult to define rigorously. As one biology text puts it, “an organism’s niche is its ecological role – how it ‘fits into’ an ecosystem”. More generally, Webster’s dictionary defines an ecological niche as “the position or function of an organism in a community of plants and animals.” In the same way, a production niche is the position or function of certain production technologies in the structure of the production system.

I have attempted to categorize most of the industries of the production system (including many services) in the production matrix in the diagram below:



The categories on the outside of the large box indicate the categories and stages of production. The industries specified within the niches are derived from United States classifications and data.

As can be seen, any modern economy requires an enormous variety of industries. It has been customary to view an industry either as an isolated market or as one among many functionless entities within an economy. Instead, the economy in this paper is presented as a system characterized by functional differentiation, and organized into a structure characterized by categories and stages of production.

The guiding philosophical viewpoint is based on biology and political science, not on neoclassical economics and the physical sciences from which economics takes much of its inspiration. In the life sciences, production is central to much of the discipline. The processes of the cell involve the production of various large molecules, while the processes of the body consist of various transformations and conversions of energy, as well as the distribution of those transformations. Ecological researchers trace the paths of

production and consumption in an ecosystem, from plants which produce to plant-eaters which consume, from plant-eaters which create meat to carnivores that consume it, and to the recyclers that transform all organic matter back to mineral form.

Biological systems also involve functional differentiation, whether within the cell in the form of organelles, the body of an organism in the form of organs and systems, or the ecosystem in the form of niches. While measurement of physical characteristics is essential, just as measurement of money values is necessary in a production-centered view of the economy, the functional differentiation of the parts within biological systems is deemed more important. Just because the heart is a small percentage of the weight of the human body does not mean that we can get along without it.

Growth in biological systems can be exponential, or explosive, as it is in modern, manufacturing-based economies. Reproduction is the basis of these processes.

This biological philosophical foundation has the further advantage of helping to integrate an analysis of economic systems with environmental concerns. If the economy is an ecosystem, then it becomes easier to understand how the economy effects and is effected by natural ecosystems. For instance, nothing in the foregoing framework has indicated that the wholesale destruction of forests, oceans, and ecosystems helps to advance economic growth.

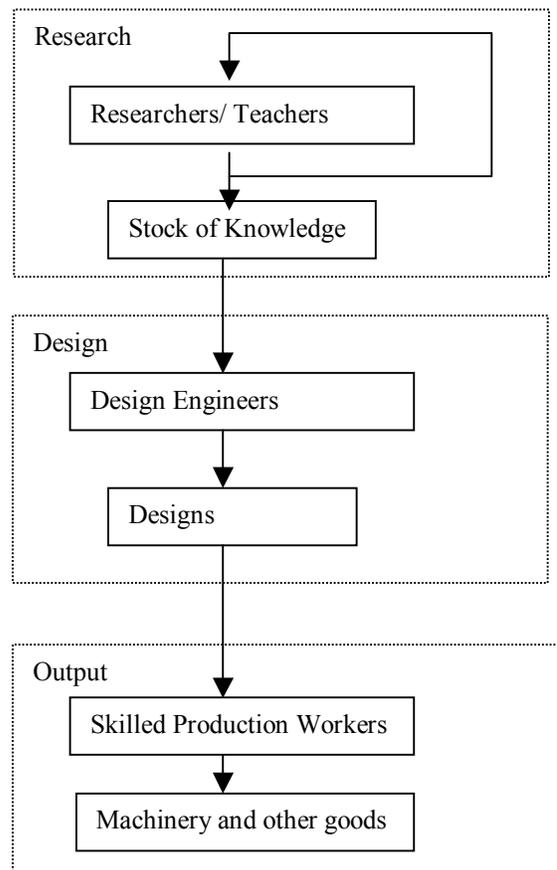
Economic growth, instead, is made possible by a number of factors. First, the structure of the production system reveals that reproduction machinery, and the capital goods that are generated by such machinery, makes explosive growth possible. Second, technological change in the reproduction and production machinery niches will have a direct effect on the goods production industries, thus leading to greater output and economic growth. Third, the people who do the producing – production workers, engineers, and research scientists – must be given the necessary resources, freedom, and power needed to create and improve the manufacturing processes which underlie all economic activity.

Like the production niches which they serve, the number of research scientists, engineers, and skilled production workers is small relative to the economy. Scientists, engineers, university teachers, and computer programmers together only totaled 4.2% of the population in 1996. Workers involved in goods production of all kinds, including mechanics, repairers, farmers, and truck drivers, constituted 27.9% of the labor force in

1996. But “precision production occupations”, that is, skilled production workers, were only 3% of the entire labor force (US Statistical Abstract, 1997, Table 645).

Like the production niches, the importance of researchers, engineers, and skilled production workers is much greater than their numbers. Like the economy as a whole, the creation of goods by producers takes place in a series of stages. Research scientists generate a *stock of knowledge*, which is then used by engineers to create *designs*. These designs are then communicated to skilled production workers and operational managers, who use the designs to manufacture *machinery and capital goods*.

Thus, the following, simplified stages can be said to occur in the production of machinery and other goods:



Researchers can produce more researchers in a university, by serving as teachers. These researchers/teachers train engineers who design machines and manufacturing processes. The researchers also provide the main stock of knowledge which engineers use to create their designs. The engineers are critical in this process: as striking engineers at Boeing wrote on a placard, “No nerds, no birds”. These designs are then used to create the actual output, either machinery and capital goods, or the final consumption goods. I

call this sequence a human capital system, and the people are human capital workers. Every production niche contains a human capital system.

Technological change is created by the various components of the human capital system, be they researchers, engineers, or skilled production workers. These people need good incomes and a bright future in their fields if they are to make the investment of being trained in these skills. The manufacturing industries must be growing, or people will not be motivated to pursue human capital careers.

Human capital workers must also have the protection of powerful organizations, such as unions, so that their voices are heard in national debates, and so that their interests are not ignored. If people feel that a career in manufacturing will lead to a powerless position in the society, they will not feel comfortable committing their lives to manufacturing.

### **Promoting manufacturing and democracy in all global regions**

An economic system includes a complex set of interlocking, mutually self-reinforcing production niches, which depend for their growth on motivated, well-trained human capital workers. On the one hand, this production matrix of industries has been responsible for the incredible production gains many societies have made since the Industrial Revolution. On the other hand, this system is vulnerable to disruption and decline, and difficult for most regions of the world to construct and assemble.

For the champions of globalization, the answer to the complexity of the economic system is to encourage global free trade as a panacea. For them, the economic system encompasses the entire planet; one production niche can thrive in one part of the world, and another can grow in a different part. As long as there is no national protection, the argument goes, we will have the best of all possible worlds. A self-respecting financier might make the following counter-argument to this paper: “You nationalist fool. In a global economy, not every nation needs to manufacture. Sure, goods are important – I couldn’t live without my BMW – but that’s the point. I can *import* an automobile, or audio equipment, or computer. Americans don’t need to make anything – let the Japanese and Chinese do it!” A production-centered framework must help to explain not only why manufacturing matters, but why manufacturing matters for every country.

There are several reasons why manufacturing matters in a particular country. First, the human capital systems of each production niche form a web of relationships which require a certain physical and cultural proximity in order to function properly. These relationships, both within and between production niches, are built on constant, accessible interactions. The people in these systems also need to have a close physical interaction with the processes of manufacturing. These production niches are mutually self-reinforcing; that is, an improvement in one leads to improvements in other niches, which eventually results in further improvements in the original niche, and so on. These virtuous cycles depend on the capability of the researchers, engineers, and skilled production workers of each niche to talk to each other and to observe, up close, the improvements and potentialities of the various technologies. This can only happen when all of these industries are in one region.

The second major reason why manufacturing is important for each country is that manufacturing capability confers wider, international power on the holder of that capability. In the United States, Europe, and Japan, which collectively hold most of the world's manufacturing power, this requirement may not be immediately apparent. But for the rest of the world's peoples, their lack of manufacturing capability has been a great source of international weakness that needs to be addressed. Dependency on others for the most important aspects of manufacturing has generally been a recipe for unequal power relations between countries.

Every nation, and indeed every individual, must be able to participate, in some way, in as many aspects of the production-oriented part of the economy as possible. Social justice includes the ability to participate in a political democracy within a country, and social justice must also include participation in *productive capacity*. In a world of large nations, such as the United States, and small nations, such as Cambodia, however, how can each nation possibly have similar manufacturing potential? How can a people maintain their political space while participating in a large, complex economic system?

The answer, I believe, can be found in the European Union (EU). The EU maintains the sovereignty of the political state, while allowing for a *global region* large enough to encompass *all* production niches within the production matrix. One of the major reasons that the United States has been economically strong throughout its history is that the U.S., too, has been large enough to contain a complete economic system within its borders.

Thus, a strategy for global economic growth must include an effort to join the countries in various regions of the world together in a cooperative program of manufacturing development and maintenance. This will satisfy the two requirements of manufacturing in one country: first, a group of countries will be large enough to contain all production niches, giving rise to mutually, self-reinforcing interactions and economic growth; second, each region will gain the international power needed to give every person within the region protection against other regions.

However, such aggregations of countries, such as the EU, can only work properly if they are based on democratic principles. Unless all countries in a region are democratic, mistrust will block many of the interactions, unions and other efforts by human capital workers to protect themselves will be threatened, and the governments of the dictatorial nations will be able to usurp the fruits of economic growth, mainly for military production. Therefore, an agenda for global social justice should include the goal of bringing together *democratic* nations.

Democracy should not stop in the political sphere, however. Economic democracy, in the form of employee ownership and control of the firm, should also be a core principle for the development of manufacturing. Where governments directly establish manufacturing firms, worker-control should eliminate the possibility of corruption. In all firms, democratic organization is more efficient than a hierarchy, because the human capital workers are able project greater influence in an environment of trust, freedom of expression, and respect. The German system of codetermination is the closest we find to a national system of worker democracy, while the Mondragon system in Spain and kibbutzim in Israel are excellent examples of smaller, more ideal worker democracy systems.

Economic democracy also includes the capability to control the assets of financial capital. Democratically-controlled governments can use their financial muscle to create, or in the case of the United States, recreate, entire production niches. But if a thriving worker democracy sector or trade union movement exists within a country or region, then it is possible to create financial institutions which encourage manufacturing and worker control. The union-led capital fund in Quebec and other parts of Canada, and the Working People's bank of Mondragon, Spain are examples of these institutions.

The following table is meant to be suggestive of a possible global configuration of global regions, along with an accounting of the state of each region, in terms of population, gnp, gnp per capita, political democracy, and completeness of the national system of production (from UN population and income data):

<b>Global Region</b>	<b>Population</b>	<b>GNP(\$000)</b>	<b>GNP per capita</b>	<b>Political Democracy</b>	<b>Completeness</b>
North America	309,504,000	9,250,956,596	29,890	All countries	Almost complete, decline
Latin America	519,011,000	2,133,910,775	4,111	Most	Incomplete
Europe	521,690,000	9,352,237,813	17,927	Almost all	Almost complete
Africa	639,872,000	432,329,591	676	Mixed	Incomplete
China	1,284,958,000	1,162,910,572	905	None	Incomplete
Northeast Asia (Japan & Korea)	197,597,000	4,132,028,218	20,911	All, except N.Korea	Complete
Southeast Asia (incl. Austral&NZ)	548,795,000	942,559,179	1,718	Mostly	Incomplete
Former USSR	282,395,000	391,646,613	1,387	Mixed	Incomplete, declining
Indian subcontinent	1,345,239,000	560,313,141	417	Almost all	Incomplete
Middle East & North Africa	405,207,000	1,350,698,452	3,333	Very few	Incomplete
World as a whole	5,532,578	29,709,590,950	5,370	Most	Complete

Sources: <http://www.un.org/Depts/unsd/social/population.htm>,  
<http://www.un.org/Depts/unsd/social/inc-eco.htm>

Most of the people of the world are poor and living within incomplete economic systems. The United States, as shown in the first part of this paper, is in danger of losing its engine of growth. Europe and Japan are closest to the ideal of having complete economic systems within political democracies.

Within the developed countries, as well, minorities and women have generally been shut out of manufacturing professions. Unless minorities and women are involved in these fields, they will never have access to the levers of power within an economy. Economic power can be defined as the capability to produce a certain amount of goods and services in a particular period of time. This also includes the capability to produce the *means* to produce those goods and services, that is, to produce reproduction and production machinery and their associated capital goods.

Entire countries and regions, too, will not have economic power unless they have engineers, researchers, and skilled production workers. Even the United States is being depleted of these most precious skills.

By analyzing the economy as a production-centered system, I have proposed the following conclusions:

- Service industries depend on manufacturing
- All sectors (production niches) of manufacturing and industry are necessary
- A production system must be based within a region of one or more countries
- Many countries should come together to form global regions
- Political democracy is essential
- Economic democracy in the form of worker control is very efficient
- Financial economic democracy can lead to manufacturing growth
- Minorities and women must become involved in production careers
- The environment and the economy are inseparable

Using this analysis, we can judge the efficacy of globalization. We see that trade is necessary *within* a global region, not among them. Trade can serve important functions *between* global regions by diffusing technological innovations. But each global region should have an independent capability to produce within *all* of the economic niches of a production system.

This production-centered, democratic view of the economy can be used as a framework to bring together the diverse, international groups that cooperated so effectively in Seattle. We seek a different kind of globalization: democratic, environmentally benign, job-creating, economically empowering; in short, systematically inclusive of all peoples of the world.

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