



Book I Market Mechanisms and Full Employment

By Dr. Mason Gaffney

Article citation:

Gaffney, Mason. "Book I Market Mechanisms and Full Employment." May 1973. Working Paper.

Fair Use Disclaimer

The Robert Schalkenbach Foundation, a non profit private foundation, is publishing this article, at no cost, pursuant to the Fair Use provisions of Section 107 of the Copyright Act which states that under certain circumstances, the fair use of a copyrighted material for purposes of criticism, comment, teaching, scholarship and research is not an infringement of copyright. If you have any concerns about the publication of this article, please contact us at info@schalkenbach.org.

The Robert Schalkenbach Foundation's Digital Collections and Archives is an extension of the Robert Schalkenbach Foundation's Engel Georgist Library. It collects, organizes, preserves, and provides free online access to researchers and the general public of Georgist literature including books, newspapers, pamphlets, scholarly articles and archival materials.

RSF is particularly proud to offer free online access to the works of the late Georgist scholar Mason Gaffney, made possible through the generosity of the Danica Foundation and with the consent of the Mason and Letitia Gaffney Trust.

Robert Schalkenbach Foundation: <https://schalkenbach.org/>

Engel Georgist Library: <https://www.librarycat.org/lib/EngelGeorgistLibrary>

RSF Digital Collections and Archives: <https://schalkenbach.starter1ua.preservica.com/>

Master Copy

McGaffney
5773

Book I, Market Mechanisms and Full Employment

Part A: Variable Proportions

The most ancient, basic, and self-evident economic relationship is that between land and opportunity. Tribes and nations have warred over rich land. The winners have spread out and prospered; the losers have crowded onto the hardscrabble and scratched, or gone to work for the winners. Mercantilist empire builders have sought to control raw materials to feed their war machines and industries, while resentful colonials countered by resisting the export of unprocessed primary products. A generation of historians lived and died with the Turner thesis of the frontier^{1/} as a safety-valve for jobless malcontents. "Next to the pressure of public opinion in the West, the labor movement in the East was the greatest factor in the agitation for reserving the public lands for settlers."^{1/} Land reform movements promise land for the jobless; public works programs promise to open new regions for them. Neo-Malthusians may go overboard in attributing the misery of India to overpopulation, but few doubt that the man/land ratio is of some importance. Our laws against free immigration reflect an abiding belief in the importance of man/land ratios.

This relationship has been clear to employers, too. Throughout the expansion of European settlement, employers have looked with dismay at the loss of workforce to new lands and have sought, with intermittent success, to contain labor. Edward Gibbon Wakefield advanced this philosophy in early Australia, containing labor by letting a few squatters engross the land,

^{1/} George Stephenson, The Political History of the Public Lands. Boston: Richard G. Badger, 1917, p. 103. Cf. also Roy Robbins, "Horace Greeley: Land Reform and Unemployment, 1837-1862," Agricultural History, January 1943, pp. 18-44.

free from pressures to develop or sell. He was so articulate and explicit that his name is synonymous with control of labor by artificial scarcity of land, a policy Australia later abandoned. In Spanish colonies such policies were standard and latifundismo prevails still over most of Latin America.

In Czarist Russia the collapse of the Mongols and later the Turks left the ruling military gentry and the Muscovite state with an embarrassment of empty land that threatened to drain their labor and weaken their control. Peter the Great imposed serfdom on the labor and freed his noble landlords from their obligations to the state, thus easing their way to holding land with skeleton crews. The State also held back much of the land directly. By 1860 the State owned two-thirds of it. Alexander II's ^{Minister} Valuev was the Wakefield of Moscow, blocking emigration and hoarding state lands. This was disliked by the expansionists, so Alexander III hit on a compromise (which we will find has parallels everywhere) of withholding state lands in European Russia (some 200 million acres, or 74 million desiatinas), thus compelling migration to the frontiers while maintaining the artificial scarcity of land.^{1/} Soviet Sovkhoz and Kolkhoz farms, with their vast areas and low yields, serve a similar role today. Inert land is of no value to labor, but of great value to owners of competing land which is kept dear by scarcity, and to imperialists who want their people spread out to hold vast areas.

Adam Smith wrote, "In Plenty of good land the English colonies of North America ... are ... inferior to those of the Spaniards and Portuguese ... But the political institutions of the English colonies have been more favorable to the improvement and cultivation of this land ... First, the

^{1/} Donald Treadgold, The Great Siberian Migration. Princeton University Press, 1957.

engrossing of uncultivated land ... has been more restrained in the English colonies than in any other ... The plenty and cheapness of good land ... are the principal causes of the rapid prosperity of new colonies. The engrossing of land, in effect, destroys this plenty and cheapness. The engrossing of uncultivated land, besides, is the greatest obstruction to its improvement."^{1/}

In these colonies and the United States the balance of power has swung back and forth many times between scarcity and abundance, between containment and expansion. Even in the seventeenth century, English employers resisted losing labor to the new world.^{2/} George III tried in 1763 to contain the colonials east of the Proclamation Line along the Appalachian crest, but they rebelled and poured through the Cumberland Gap to settle Kentucky and Tennessee. Next Alexander Hamilton assumed the role of George III, drawing a line at the Ohio River.^{3/} He rationalized his policy as befit the Age of Reason. The Hamiltonian formula is a textbook classic. He would promote manufactures by keeping settlers off the public lands, availing employers of more cheap labor. He would valorize the public lands by selling only slowly, mortgaging unsold lands to a funded public debt, rather than sell them to pay the debt. He would sell a small share of the lands but only in large blocs, to well-financed speculators, rather than encourage settlers. He would raise money by a tariff² to abate any financial pressure to sell land.

^{1/} Adam Smith, Wealth of Nations. New York: Random House, 1937, pp. 538-40.

^{2/} Abbott E. Smith, "New Light on Some of America's First Families," Journal of Economic History, May 1942.

^{3/} Merrill Jensen, The New Nation. New York: A. A. Knopf, 1950.

But the voters elected Jefferson, who opened the Northwest, bought Louisian^s, and started the Cumberland Road. Eastern employers and farmholders (the Whigs) resisted again--the West bid wages up and food prices down (note the absence of any "wage-price spiral" in this process).^{1/} The employers lost out to Old Hickory, preemption, state subsidy of internal improvements, easy money, revenue sharing ("distribution" in those days), and the canal boom. Next the Southern Democrats took the Wakefield role, but they reaped Abe Lincoln, California and Oregon, the Homestead Act, western railroads, and landgrant colleges. Generally, the balance of political forces in the nineteenth century overcame artificial scarcities and gave labor access to abundant land in the United States, and activated the land, minimizing problems of unemployment and poverty that were standard where the Wakefield-Valuev-Hamilton doctrines prevailed.

In recent American history, containment forces have rallied on industrial rather than regional bases. Farm policy, with up to 60 million acres in the soil bank, is the familiar prototype. Expansion forces have rallied around public works to develop submarginal land, sym^bbolized by the Bureau of Reclamation. Similar anomalies characterize most industries, forming a complex pattern to be viewed closely in later chapters. Essentially, these patterns perpetuate the containment-expansion conflict that is so transparently obvious in the period of westward expansion.

Classical economists formalized the man-to-land ratio in the law of diminishing return, now generalized as the law of variable proportions, and

^{1/} Stephenson, op. cit., p. 24.

modern texts preserve it. Most preserve it however in formaldehyde and fail to relate it to the live issues like what makes jobs. In other compartments they are capable of seriously entertaining models like the Harrod-Domar growth model which assumes invariable proportions; and "wage-price spirals" which implicitly suggest that labor is the only factor in the mix. Variable proportions in economics today is perfunctory obeisance to tradition, neglected in action and policy. It is to compensate for this neglect that this Part A on Variable Proportions is needed.

The relationship of abundant capital to jobs is also widely recognized, but in opposite ways by different viewers. Some employers run ads on how much capital it takes to create one job, but this has elements of self-serving propaganda, and it surely wants proof.^{1/} It is widely believed that imported capital helps raise "incomes," and inferentially wages, in LDCs, but this doctrine is suspect as self-serving too, both for recipients of the money and the agencies that convey it. Some Marxist and Keynesian models have cast capital more as a threat, and seen relief only in "growth" that would absorb the glut of capital and its products. Luddites of every era have seen capital displacing labor, and partial examples are on every hand.

With capital as with land, the value of the resource to labor depends much on how active it is. Here again the classical economists had the

^{1/} Norman Ture formalizes a good deal of such thinking in his Tax Policy, Capital Formation, and Productivity. New York: National Association of Manufacturers, 1973. But under the formality the whole case rests simply on assuming that capital complements labor (p. 14, "The Law of Diminishing Returns") as in a Cobb-Douglas function, and thus really says nothing more than a Warner and Swasey advertisement.

principle in hand. Smith and Mill saw "circulating" capital as "setting labor in motion," and "fixed" capital as not.

Mill said, "Capital may be temporarily unemployed, as in the case of unsold goods ... during this interval it does not set in motion any industry.... capital ... may be so employed as not to support laborers, being fixed in machinery, buildings, improvement of the land and the like ... Capital is kept in existence from age to age not by preservation, but by perpetual reproduction ... To set free a capital which would otherwise be locked up in a form useless for the support of labor, is, no doubt, the same thing to the interests of laborers as the creation of a new capital ... all increase of fixed capital, when taking place at the expense of circulating, must be, at least temporarily, prejudicial to the interests of laborers ... Suppose ... a capital of 2,000 ... half ... effects a permanent improvement ... He (the capitalist) will employ, in the next and each following year, only half the number of laborers."^{1/}

Smith said, "Any increase in the quantity of commodities annually circulated ... would ... produce [these] effects ... The capital of the country ... would really be augmented ... The quantity of productive labor which it could maintain and employ would be increased, and consequently the demand for that labor. Its wages would naturally rise with the demand ... The profits of the stock would be diminished ... The quantity of that labor, which equal capitals are capable of putting in motion, varies extremely according to ... their employment ... A capital ... employed in

^{1/} J. S. Mill, Principles of Political Economy. Boston: Lee S. Shepard, 1872, pp. 41-63, passim. See also J. S. Mill, Essays on Some Unsettled Issues of Political Economy. London: Longmans, Green, Reader, and Dyer, 1874, pp. 55-59.

the home trade will sometimes make 12 operations, or be sent out and returned 12 times, before a capital employed in the foreign trade of consumption has made one ... the one will give four and twenty times more encouragement and support to the industry of the country than the other."^{1/}

Wicksell revived it, "a true view of the famous wage-fund theory ... Capital in its free form is employed to advance both wages and rent ... If ... a given capital ... is employed year after year ... then each year about an equal part of that capital will be set free. That part ... constitutes the whole production of finished commodities and services (of capital) of the year. When the capitalist class has taken the surplus ... it must, in order to maintain its capital, reinvest the remainder -- which it does by hiring labor and land for new production. This part, therefore, is ... the annual wage-fund ... The wage-fund may undergo considerable changes, in so far as the average period of turnover of capital is lengthened or shortened ... it is only the part (of capital) annually set free which can purchase labor (or land)."^{2/}

Demand for labor does not depend, then, solely on the land per man, but also on how actively the owners use the land, as is evident in a country like Argentina. Use of land, as Adam Smith said, depends in its freedom from engrossment, a product of political institutions.

Demand for labor does not depend solely on capital per man, but also, as Smith, Mill, and Wicksell said, on how actively the owners use the

^{1/} Adam Smith, op. cit. pp. 338, 341, 349.

^{2/} Knut Wicksell. Lectures on Political Economy, translated by E. Classen. New York: The Macmillan Company, 1938, pp. 193-94.

capital. Active capital moves labor, while stagnant capital merely occupies land, and may displace more labor than it complements. This also depends on political institutions.

Frontier expansion is ambivalent in respect to labor. It taps new land and opens new fields for labor. Modern economists have stressed instead how frontiers create new investment outlets for (supposedly) excess capital. Here I believe they mislead us. Frontiers do not activate capital; they sink and freeze it. They dispose of capital all right, but not so as to help labor. Many Keynesians have misled us further by seeing the benefits of the frontier in terms simply of recycling stagnant money, as though men have fought and bled over land because they lacked insight to see easier ways of stimulating spending. In fact, favor towards spending lies deep in the cultural subconsciousness and is easy to evoke. Government debts and inflation are as ancient as wars and frontiers; belief that consuming powers prosperity is as ancient as belief in thrift. We find Mill, for example, lamenting the popularity and dominance of a doctrine which is unmistakably the same as that now appearing in most economics texts as "the paradox of thrift." "Big spenders" are folk heroes; "misers" are villains. So it has not required frontiers to overcome inherent cultural biases against big spending. But frontier expansion does change the mix of labor with land and capital, adding land at the cost of sequestering capital.

It is to specify these basic relationships among labor, land and capital that Part A is devoted. How much does factor mix vary in fact? What are the mechanics or anatomy of substituting labor for capital and land? How is it related to turnover? What determines turnover? We begin by addressing these questions.

Chapter 1. The Range of Factor Proportions, and Sensitivity to Parameters. Orthodox macro discourse today presupposes a rigid, fixed relationship between employment and output. We make jobs by raising GNP. "Growth," and only growth, makes jobs. Factor-mix does not change. Accordingly, income is distributed among factors in constant proportions, too. Alternatively, every firm is marginal--in macro it leads to the same results. The older Keynesians fought against any wage-cut, saying it would only reduce consuming power and touch off "vicious deflationary spirals." Modern FMP specialists interpret wage boosts the same way--they can only touch off "vicious inflationary spirals." Redistribution and substitution are not entertained.

In fact, factor mix ranges from one extreme to another. Factor mix is demonstrably sensitive to relative costs. And factor mix is dynamic, shifting constantly. Thus there is wide scope to substitute labor for land and capital. I submit examples here contrasting different farm products; industries, consumer goods; sizes of firms and wealth groups; sectors (public and private); and stages of production.

In the San Joaquin Valley, east side, land is versatile among many competing farm uses. These range from dryland grazing up to citrus, fresh tomatoes, and berries. Grazing might gross \$15 from the animal units; tomatoes might gross \$1,500 a year, 100 times as much. The specific prices are subject to secular and cyclical change, but the basic principles are not: the same land yields a little or a lot, depending on what you mix with it. To illustrate the diversity, Table 1 is a crop report from the Friant-Kern Canal Service Area. Not all the land is versatile among all the options, but a close study of the area has shown that the

Table 1. Crop production, Friant-Kern canal service area.

Crop	Acres	Value per Acre (\$)
Barley	15,696	51.09
Corn	10,490	96.68
Rice	907	167.66
Sorghums	17,279	74.77
Wheat	3,176	87.85
Alfalfa hay	63,460	144.11
Irrigated pasture	17,388	77.66
Beans, dry and edible	4,293	107.14
Cotton, lint (upland)	108,928	352.80
Asparagus	1,383	418.70
Beans (processing)	27	900.00
Beans (fresh market)	75	975.33
Corn, sweet (fresh market)	254	205.91
Lettuce	423	336.51
Cantaloupes, etc.	507	547.02
Onions, dry	686	495.70
Potatoes, early	12,711	366.04
Tomatoes (fresh market)	1,343	881.16
Alfalfa	1,279	151.79
Berries (all kinds)	80	1,215.60
Oranges and tangerines	24,952	915.51
Grapes, table	43,795	545.24

Table 1 (continued)

Crop	Acres	Value per Acre (\$)
Olives	7,172	327.45
Peaches	6,371	644.38
Prunes and plums	3,288	674.00
Walnuts	1,374	338.14

Source: U.S. Bureau of Reclamation, 1958. Minor crops omitted.

margins between the uses are ragged.^{1/} Almost every area has several options, and many of them are choices between the highest and the lowest gross. Labor's share of gross rises with intensity. Let us tentatively define intensity simply as nonland inputs $\div$ output.^{2/} For grazing, this is on the order of $\$6/\$15 = 40$ percent. For tomatoes it is more like $\$1400/\$1500 = 93$ percent.

Of course the return to land from tomatoes is highly leveraged and volatile, as a short-run gamble, but that is not our concern here. Averaging out the good years and the bad, the return to land from tomatoes is very sensitive to wage rates. A slight raise of 7 percent nearly wipes out the rent; a drop of 7 percent nearly doubles it. But the same wage changes would only slightly change the returns to land from grazing. Thus a slight drop of labor cost applies great pressure to shift land to tomatoes and other high-yield, labor-intensive crops, making a very elastic demand for labor.

The scope for this kind of change is manifest in the fact that most of California's farm output comes from a tiny fraction of her good farm land, that which is used intensively.

Of the several million acres of irrigable land in California, there were in 1960 21,000 acres in plums, 36,000 in freestones, and 65,000 in navels.^{3/} Most of it is used at low intensities, using little labor to

^{1/} Mason Gaffney, "Diseconomies Inherent in Western Water Laws," in Economic Analysis of Multiple Use, Proceedings of Western Agricultural Economics Research Council, Range and Water Section, 1961, pp. 55-82, 75ff. See also Irvin H. Althouse, "Water Requirements of Tulare County," Report to Tulare County Board of Supervisors, January, 1942 (mimeo), map in back pocket.

^{2/} This is simplified and introductory. Later I elaborate a more comprehensive definition.

^{3/} G.W. Dean, and Chester O. McCorkle, Trends for Major California Fruit Crops, California A.E.S., Extension Service Circular 448, 1960.

yield only a few dollars worth of barley, alfalfa, forage pasture, hay, sorghum, safflower, rice or cotton.

In irrigated farming water is an indirect land input, since a water right is the right to the water yield of a vast watershed. One might then think the tomatoes really use a lot of land in the form of irrigation water. But in fact the high-grossing crops such as tomatoes, citrus, peaches and berries are modest users of water. Pasture, alfalfa, and rice are thirsty crops, and they yield only \$50-\$200 per acre, not one-tenth of the high yielders.

The high-grossing crops use more labor per acre not just in the fields, but in the packing houses, the railroads, the stores, and the kitchens. A \$1,500 tomato crop will use more labor at every step to the consumer than a \$15 weight gain on a calf (and do it sooner). Thus a higher use of labor in the field increases demand for labor beyond the field. Reciprocally, lower costs between consumer and farmer, raising field prices by say 7 percent, would (in our example) double land returns from tomatoes and increase demand for labor on the farm.

In Iowa, a more uniform state, Shrader and Landgren have calculated that if all farmers followed the standards already practiced by the most advanced farmers, Iowa alone could supply the nation's output of feed grain.^{1/}

Farm land use in general varies so much from farm to farm that "farm sprawl" and "horticultural sprawl" are as common as urban sprawl. But this reminds us that all our cities are dominated by sprawl, which is essentially a condition of extremely different intensities on adjacent lands. Different mixes of land with nonland inputs are not the exception but the rule.

^{1/} William Shrader and N. Landgren, "Land Use Implications of Agricultural Production Potentials," in L. Fischer, ed., Shifts in Land Use. Nebraska Agricultural Economics Service, 1964.

Large industrial corporations make another contrast. Fortune ranks its "500" by "assets per employee." In 1964 they ranged from \$139,175 (Superior Oil) down to \$4602 (Ward Foods), or 3.3 percent as much. The ten highest were all oil companies, whose assets as measured by Fortune would tend to be "conservative," owing to the custom of using book values based on historical costs of appreciating reserves ("conservative" is a conventional way to say "radically understated"). Medians for broad industry groups ranged from \$74,739 (Petroleum Refining) down to \$8778 (Apparel).^{1/}

The manufacturing plants of one city make another universe to study. Norbert Stefaniak gathered a data base on the real estate of 950 manufacturing plants in Milwaukee County for his Industrial Location within the Urban Area.^{2/} He graciously availed me of raw data for the City of Milwaukee (626 plants). I adjusted the land area reported by each firm for values prevailing in its neighborhood (using for this purpose a map of land values in Milwaukee which I had constructed from 2,500 sales). I then ranked the firms by employee to land value ratio, with these results. The top 10 percent, so ranked -- i.e., the most labor-intensive--had 21.4 percent of the employees on 2.7 percent of the land value, or 7.2 men per \$1,000 of land value. The bottom 10 percent had 1.3 percent of the employees on 10.9 percent of the land value, or .11 men per \$1,000 of land value. Thus the top decile had 65 times more men per unit land value than the bottom decile.

These data covered industry in a conventional sense. If we add the "parking lot industry" we find one whose gross income is about 80 percent

^{1/} The Fortune Directory, August 1964, p. 22. Later years are comparable.

^{2/} Norbert Stefaniak, Industrial Location within the Urban Area. Madison: University of Wisconsin School of Commerce, 1962.

land rent, according to field studies conducted by George Verheyen in Milwaukee.^{1/} In this use, three or four men can handle a million dollar acre of downtown land.

Turning to consumer goods, clothing is labor-using, food is more land-using, and housing more capital-using. Interest on short term consumer debt is material, but not really large next to the spending financed. Interest on residential mortgages, on the other hand, is the lion's share of outlays for housing, and reveals a service flow much greater than the labor input. On-site labor is only about one-fifth of building costs to begin, and following that, interest (paid and imputed) far exceeds repayment of principal, both at first and over life. Older rented buildings become rather more labor-intensive. About 60 percent of gross rent goes for operation, maintenance, and administration of elevator apartments built before 1920.^{2/} They are also land-intensive --the other 40 percent must go mainly to persuade the landowner it is too early to demolish the old building to salvage the site. Some old slums on bad land or in bad neighborhoods yield little cash flow above expenses--they have become labor-intensive at the end.

Thus new housing is capital-using; old housing is land and labor-using. But a large and growing class of residence is mainly land-using from the start. With rising wealth, people turn more to land as a source of direct consumption and pleasure. The land to building value ratio rises with value

^{1/} George Verheyen, "Parking Lot Net Income, 1968-69," research report in writer's files. See also table in Parking, Fall 1968, p. 44.

^{2/} Institute of Real Estate Management, Apartment Building Expense Analysis. Chicago: Institute of Real Estate Management of the N.A.R.E.B., 1967.

of residential real estate, even in cities.^{1/} But when we get out to country estates, gentleman farms, riding and hunting neighborhoods, beach front sites, country club estates, 10-acre minimum zoning, Beverly Hills, California, New Canaan, Connecticut, Potomac, Maryland, Barrington, Illinois, River Hills, Wisconsin, and the like, then we find land to be the major input, and the residents to emphasize direct enjoyment of the service flow of land in their life styles and philosophies.

Factor mix tends to change with size of firms and wealth of individuals. As a broad statistical truth, the application of labor to property tends to be regressive, the larger holdings use less labor per unit of property value. Some examples follow.

The U.S. Census of Agriculture ranks farms by value of gross sales. In 1950, "Class I" farms, those grossing \$25,000 or more, had 22 percent of the land in farms, but 7 percent of the farm labor. The smaller producers of course then made the figures balance by applying more labor per acre.

The use of labor on land by and large increases with the improvements there--first in building them and then in using them. Farm machines tend to displace labor, because they plow, harrow, plant, cultivate, harvest, and bind--they are active, like labor. Farm buildings shelter and store outputs and inputs and labor itself, complementing labor. From 1900 to 1940 the U.S. Census of Agriculture reported separately on land and buildings. Table 2 supports the thesis of regressive use of land.

^{1/} President's Committee on Urban Housing, Technical Studies, Vol. II. Washington, D. C.: U.S. Government Printing Office, 1968, p. 351, Table 47.

Table 2A. Land, buildings, and implements and machinery;
average values per acre; by size of farm, 1940.

<u>Size Group</u>	<u>Land</u>	<u>Buildings</u>	<u>I & M</u>	<u>As %s of Land</u> <u>Bldgs</u>	<u>Value</u> <u>I & M</u>
Total, U.S.	\$ 21.90	\$ 9.81	\$ 2.88	44.8%	13.1%
Under 3	728.00	1,618.00	192.00	222.2	26.4
3-9	156.00	225.00	22.00	144.2	14.1
10-19	79.00	69.00	8.85	87.3	11.2
20-49	41.00	28.00	5.00	68.3	12.2
50-99	30.00	19.00	4.59	63.3	15.3
100-174	29.00	15.00	4.54	51.7	15.7
175-259	30.00	13.00	4.36	43.3	14.5
260-499	26.66	8.34	3.44	31.3	12.9
500-999	18.50	4.50	2.28	24.3	12.3
1,000 & over	8.29	1.13	0.64	13.6	7.7

Source: U.S. Department of Agriculture, 1940 Census of Agriculture,

Vol. 3, p. 80.

Table 2B. Land available for crops and land used for crops,
by acreage in holding, 1950.

<u>Acreage In Farm</u>	<u>Land Used For Crops (Million Acres)</u>	<u>Land Avail- able For Crops (Million Acres)</u>	<u>Per Cent of Land Available for Crops Which is Used For Crops (Computed)</u>
Under 3	.021,573	.024,695	87.4%
3-9	1.353	1.891	71.4
10-29	11.21	14.19	79.0
30-49	14.95	20.53	72.8
50-69	13.44	19.61	68.5
70-99	28.3	41.59	68.0
100-139	33.9	50.59	67.0
140-179	45.8	65.00	70.5
180-219	23.8	34.86	68.3
220-259	23.0	32.60	70.6
260-379	45.1	65.57	68.8
380-499	25.1	37.51	66.8
500-699	22.0	35.26	62.4
700-999	17.2	29.59	58.1
1,000- 4,999	30.6	63.15	48.5
5,000- 9,999	3.160	8.790	35.9
10,000 & over	2.775	9.343	29.7

Source: U.S. Department of Agriculture, 1940 Census of Agriculture,

Vol. 3, p. 75.

Returning to Fortune's top 500 industrial firms, I tested the thesis by ranking them by "net worth" or invested capital, and calculating profits (after taxes) per employee. Table 3 shows the broad results.

Like any data, these might be massaged a good deal more. In particular I surmise that adding unrealized appreciation to profits would raise the profits per employee more for the top ten than for the others, since six of the top ten are oil companies, and all ten are major mineral owners. But this information is not available.

The lowest ten include one net loser, without which the profits per employee would be \$690 instead of \$297. However negative profits are also relevant, and there are twelve firms in the 500 with net losses. Most of these are in the lowest 100, so it is entirely representative to find one loser among any group of ten. Therefore \$297 seems more representative than \$690.

The choice of profits/employee to test the case premises that profits in general are the earnings of and an index to the real assets of a firm. Net worth was used for ranking in order to reduce the bias of regressive^{on} fallacy.^{1/} Although it is only partly successful in that, the trends shown are strong enough to survive further purification.

A main problem with data based on corporate reports is the suspect nature of asset measures based on book values, which are partly but capriciously unadjusted for appreciation and general inflation. Stefaniak's 626 manufacturing plants in Milwaukee provide another measure of asset

^{1/} Had I ranked by profits, the top ten would not have changed much but the lowest ten would all have been firms with negative profits.

Table 3. Profits per employee, large and small industrial firms,
ranked by net worth.

Group	Net worth (\$M)	Profit after taxes (\$M)	Employees (000)	Profits/Employee (\$)
Top 10	40,090.	5,470.	1,662.	3,291.
All 500	133,660.	14,839.	9,966.	1,489.
Lowest 10	116.	8.826	29.687	297.

Source: Calculated from data in The Fortune Directory, 1964.

values, tax assessments. This measure is not unbiased, but at least is differently biased. Ranking the plants by equalized assessed value of real estate, the top ten percent have 89 percent of it, but only 69 percent of the employees. Table 4 shows what this means in terms of factor proportions in ten deciles.

Since the tenth or top decile has 89 percent of the value the spotlight focuses there. Comparing it with the other nine deciles the top one had .14 men per \$1000 valuation, while the lower 90 percent had .49.

Breaking the top 10 percent into ten parts, we find a similar pattern inside it (see Table 4, Panel B). The top one percent of the plants had 59 percent of the value with only 16 percent of the employees.

Data ranked by one of the variables being investigated is subject to the ambiguity known as regression fallacy. If we ranked the plants by number of employees, the top decile would consist in part of different plants, distinguished for their high employment rather than their high value, and the finding above would be much muted. Choice of the ranking variable is a matter of judgment and data resources in each case, and in my judgment the ranking by value is legitimate here to test the question if larger chunks of property employ less labor per unit value. Still, the spectre of regression fallacy hangs over any inference from data points, widely scattered, as these are. There are ways to purify the relationship, however.

According to Wallis and Roberts, a valid way to compare two variables, free of bias from choice of ranker, is simply to compare their variabilities, using any standard measure.^{1/} The one of higher variability is the one

^{1/} Allen Wallis and Harry Roberts, Statistics. Glencoe: The Free Press, 1956, p. 263.

Table 4. Employees per \$1,000 of assessed, equalized real estate value, 626 manufacturing plants, city of Milwaukee, 1960, plants ranked by value.

A. By Deciles										
	1	2	3	4	5	6	7	8	9	10
Percent of value	.002	.003	.004	.005	.007	.010	.014	.022	.045	.898
Percent of employees	.007	.016	.011	.018	.021	.026	.044	.052	.112	.693
Employees/Value	.80	.99	.48	.60	.52	.48	.57	.42	.44	.14
B. By Percentiles										
	91	92	93	94	95	96	97	98	99	100
Percent of value	.01	.01	.01	.01	.02	.02	.04	.06	.12	.59
Percent of employees	.02	.02	.03	.03	.02	.04	.10	.14	.12	.16
Employees/Value	.37	.47	.56	.47	.23	.33	.45	.44	.18	.05

Source: See text, p. 14. Data collected by Norbert Stefaniak, analyzed by M. Gaffney. Analysis programmed by Iris Long.

that increases faster as they increase together, a point which is visually obvious if one simply scatters points this way on a graph. Ranking the plants by employees, the distribution is less dispersed, by several measures (Table 5). Thus, by the test of Wallis and Roberts, larger plants are still less labor-using, after removing any regression bias. The manufacturing plants vary more in value than they do in employees, so the largest ones must have more value per man than the smaller ones.

Other evidence in my analysis of the data Stefaniak gathered suggested that the assessor tended to overassess labor-intensive firms relative to others. That is, he was influenced, consciously or not, by the number of employees, in valuing real property. Thus the data are somewhat biased against showing the tendency they do show, that the man-to-value ratio declines with size of firm.

Another neutral test is to rank data by the ratio of employees to value, and test how size varies with the ratio. Visually, this is like drawing a sunburst of nine radius vectors from the origin through the data points, dividing these points into ten sectors, each with 10 percent of the points. A data point in the top sector gets there equally because of large employment or small value, so the measure is unbiased as to size.

This test gives the following result. The top half (5 deciles), those with the most employees per unit value, had 52 percent of the employees and 14 percent of the value. The other half, those with the fewest employees per unit value had 48 percent of the employees together with 85 percent of the value. Thus about half the employees worked with 14 percent (or $1/7$) of the property while the other half worked with the other $6/7$, averaging six times as much property per employee. The firms with $6/7$ of the property

Table 5. Measures of dispersion of size of 626 manufacturing plants,
city of Milwaukee, 1960.

Ranker	Gini ratio	Percent in top Decile	Percent in top Percentile	Coefficient of Dispersion	Mean/ Median
Employees	.87	.74	.26	3.5	5.5
Assessed Value	.93	.89	.59	7.5	12.4

and half the labor of course are larger, in the sum of both inputs, than the firms with $1/7$ of the property and half the labor. Table 6 gives data for all deciles.

The difference between deciles one and ten is worth dwelling on. They have about the same number of employees, but number one, containing plants with the most real estate per employee, had 62 times more real estate.

Another example is timber culture. Smaller owners use much more labor per unit of output. This follows from, *inter alia*, their shorter cutting cycles. Labor is applied to timber land in a peak at the harvest of one cycle and the planting of its successor. The other years consume land and capital inputs. So longer cycles are less labor-using. It has long been an industry truism that larger firms by and large hold more reserves behind each unit cut, and hold trees longer before cutting. The largest of all, the USDA Forest Service, cuts slowest of all.^{1/}

Parallel findings in several mineral industries are reported by David Martin.^{2/}

Macro-economic specialists have, with a few exceptions, shared Keynes' acceptance of monopoly and concentration, putting down trustbusters as rustic eccentrics. As Senator Paul Douglas observed to Council of Economic Advisors Chairman Gardney Ackley, "... the new economics has contributed to this comparative indifference to competition ... anesthetizing people ... the attempt to cure unemployment by fiscal means is apt to push into

^{1/} U.S. Department of Agriculture, Forest Service, Timber Resources for America's Future, Forest Resource Report No. 14. Washington, D. C." U.S. Government Printing Office, 1958, pp. 75ff.

^{2/} David Martin, "Resource Control and Market Power," in M. Gaffney, ed., Extractive Resources and Taxation. Madison: University of Wisconsin Press, 1967, pp. 119-38.

Table 6. Employees and assessed value, 626 manufacturing plants,
city of Milwaukee, 1960, plants ranked by ratio of
employees to value.

	Decile									
	1	2	3	4	5	6	7	8	9	10
Percent of employees	.10	.02	.08	.11	.16	.08	.14	.07	.12	.11
Percent of value	.62	.03	.06	.07	.08	.03	.05	.02	.03	.01

the background any emphasis upon ... increasing competition ... Well how many front burners do you have? I have only seen two thus far, fiscal policy and monetary policy, but nothing for antitrust policy."^{1/}

Henry Wallich today attributes Japan's success to its lack of competition, aid to giant firms, and industrial control by bankers.^{2/} This was the pattern of German industry, too, in the periods before Erhardt. The data cited suggest, with Douglas, the FMP specialists are overlooking something. Smaller firms use more labor per unit value. If one wants to make jobs, wider distribution of ownership and control of property would seem to be a top priority.

A direct study of this matter by Jon Udell found that mergers of Wisconsin firms have been followed by large payroll declines from the merged properties. It follows that concentration of property ownership is one cause of unemployment.

Factor mix also varies among stages in production. Labor-using activities tend to cluster in cities. The presence of labor is much of what makes a city. Mining uses very little labor so that mines do not create great cities, a truism of economic geography. Mining contributes __ percent of GNP, but only __ percent of jobs. Refining primary products is again very resource-using, being the main consumer of energy by far, and energy production is resource-using. Again with the lumber industry,

^{1/} Fiscal Policy Issues of the Coming Decade, Hearings before the Subcommittee on Fiscal Policy, Joint Economic Committee, 89th Cong., 1st sess., 1965, p. 27.

^{2/} "Japan and the United States," Newsweek, April 16, 1973, p. 95.

^{3/} Jon Udell, Economic and Social Consequences of the Merger Movement in Wisconsin. Madison: Bureau of Business Research, 1969.

timber culture absorbs land and capital, while milling is labor-using, as are handling, moving, wholesaling, retailing, and building. In farming, the more extractive aspects like cash grain farming and cattle breeding are below par in labor's share. In Champaign City, Illinois the landlord's crop share is 50 percent, while returns to cattle breeders are also mainly returns to land. Feeders who put the steers and grain together are heavier on labor, as are dairy farmers, and, as we have seen, all the more intensive farmers. Even at that, 70 percent of the value of a 200-pound slaughter hog aged 6 months is the corn it ate, whose value in turn may be 50 percent rent. But if we look just at value added on site, feeding stock ^{is} ~~are~~ labor-using.

Manufacturing, as its etymology suggests, is labor-using, and there is a tendency to overstate the share of labor in the scheme of things by focusing on manufacturing as the typical or base economic activity. Retailing again is land-using, requiring the highest valued land, and today vast parking lots. Forty percent of the retail area in Milwaukee is in gasoline stations. There are 324,000 gas stations in the United States. A typical station pumps 20,000 gallons a month, marking up 5 cents each, for a gross value-added of \$1,000 a month. Across the street an apartment on an identical half-acre site and 20 units renting at \$240 each brings in \$5,000 a month. Site rent is five times as great a share of value added on the gas station in the example, and it is based on fact.

Recycling as contrasted to extraction is extremely labor-using. The raw material, being waste, has almost no value at all, so the entire final value is added by man.

Utilities are capital-using. They require about \$3 in assets for \$1 in sales, compared to a one to one ratio for other nonfinancial

corporations.^{1/} Much of this is due to the inflation of their distributive grids by urban sprawl and political forces that make them serve submarginal lean fringes at a loss.

Contrasting public and private sectors, the public sector is property-using. To be sure it has a reputation for wasting labor, and in some cases conspicuously does. But it pays the market for labor, while it borrows below the market. As to land, it still holds much more than anyone, tax free and unmortgaged, with little concern for the foregone gains. The military alone holds 20 percent of San Francisco and Washington, D. C. virtually idle.

We have seen that the national forests use more capital per man than private ones, especially small private ones. Richard Muth has concluded that the outstanding distinguishing trait of public housing is its higher capital-intensity. Civil engineers, generally working for governments, have become notorious for producing white elephants by treating capital--not labor--as a free good, and for overstating future benefits next to present costs by using low interest rates.^{2/} One can justify any project using a low enough interest rate, and ignoring land costs, and many agencies have, because at zero interest the present value of future rents in perpetuity equals infinity.

We have seen that private utilities are capital-using. Governments supply the most capital-using utilities, like water and sewer, which are

^{1/} "The 500 Biggest Corporations," Forbes, May 15, 1969, p. 91.

^{2/} A collection of such cases is documented in U.S. Congress. The Analysis and Evaluation of Public Expenditures: the PPB System. Joint Economic Committee, Subcommittee on Economy in Government. Washington, D. C.: U.S. Government Printing Office, 1969.

increasingly costly because of urban sprawl. Governments are always called on to put up social front money, to push back and invade frontiers, territorial and otherwise, where the payoff is too slow for private capital. Public buildings (other than schools), are often monumental, nonfunctional, cavernous, marbled, and better sited than their function warrants.

Few city governments have analyzed the costs and benefits of expansion carefully before plunging ahead. But the few studies that have been made suggest that the taxpayers of older areas may finance the development of new areas for years and decades before the newly serviced lands return enough taxes to pull their weight. It is another long span of years before they return the advance of capital, by generating fiscal surpluses above their share of public costs. Such is the lag of private building behind public works that the public capital is sunk for years before payout.

A perfectly analogous case that has received detailed study is the lag of private behind public capital in irrigation projects. The classic is Weeks and West.^{1/} Public capital flowed into irrigation 10-30 years ahead of complementary private capital, leaving the public to finance dead capital in the meantime. But that was before the great explosion of state and federal financing, and later problems have grown larger.

Finally, factor mixes change over time. They are very sensitive to relative costs, and institutional changes. They are also affected by changing technology, the "Original Cause" in Marxist history, but it is widely recognized today that the direction of inventiveness is determined

^{1/} David Weeks and Charles West, The Problem of Securing Closer Relationship between Agricultural Development and Irrigation Construction, University of California, College of Agriculture, Agricultural Economic Service Bulletin 435, Berkeley: University of California Printing Office, 1927.

by relative costs. Technology changes in response to costs, and is not simply an autonomous mover of history. It is a secondary response to relative costs, and follows similar rules, except that research and invention are themselves capital-using, because of the lag between effort and payoff, a lag that must be financed.

The dominant change over recent decades has been to substitute land and capital for labor. Available figures are too imprecise to bandy about dogmatically, because of unresolved uncertainties in defining capital and measuring land value. But increasing resource use per capita is a commonplace observation. Declining farm employment coupled with soaring farm land values is an obvious case. Exploding per capita drafts on minerals and energy resources are basic modern facts of life. Sectors and industries and firms differ, of course. In Maine, for example from 1950 to 1970, Gross Product per Employee in current dollars increased by 216 percent in agriculture, 92 percent in forestry, 550 percent in fisheries, and 20 percent in mining.^{1/} More generally, John Kendrick has figured for the United States the following. From 1889 to 1953, "...Gross physical output per weighted unit of tangible capital" rose at 1.0 percent per year compounded, while the same output figure "per weighted man hour" rose at 2.0 percent per year compounded.^{2/} Accordingly, Kendrick has figured the "Average Annual Rate of Change in Capital per Unit of Labor Input" for a large group of industries at 1.3 percent, 1899-1953.^{3/}

^{1/} Maine Business Indicators, Bowdoin College, Vol. XVII, No. 1, 1st Quarter, 1972.

^{2/} Cited in S. Fabricant, Basic Facts on Productivity Change New York: NBER Occasional Paper 63, 1959, p. 5.

^{3/} John Kendrick, Productivity Trends in the United States. Princeton: Princeton University Press, 1961, pp. 148-49, Table 39.

More recently, the U.S. Department of Commerce released a study of total factor productivity of nonfinancial corporations, 1948-1971. Capital inputs grew at a 4 percent annual rate; labor inputs at 1.2 percent. ^{1/}

None of these studies takes adequate account of the increase in publicly-financed infrastructure capital that matches and often overmatches the private capital. If they did, the trends shown would be stronger. It is doubtful, too, if they register the disproportionate rise in values of land, minerals, and resources generally.

The point here is that factor mixes are mutable, they are not rigid "givens." Policy can operate on them, in the quest towards full employment.

In an activity where labor is 95 percent of all costs, as in say berry growing, a 5 percent drop in wage rates will nearly double the returns to property. Land and capital are then drawn powerfully into labor-using enterprises. At the other extreme, the same 5 percent drop of wage rates does virtually ^{nothing} for the returns to property where interest is 95 percent of all costs, as in say the culture of slow-growing timber. A 5 percent wage drop there takes 5 percent of 5 percent of ⁵ .25 percent of all costs, from labor and adds it to property's 95 percent, a negligible advantage. Property does better in both cases, but its 100 percent gain in the labor-using activity is about 400 times better than its .25 percent gain in the property-using activity. So land and capital pour into the labor-using enterprises, absorbing surplus labor.

There is reason to think, ^{therefore} ~~i.e.~~, that factor mix can be flexible, and responsive to changes in costs. There is evidence that a great deal of land and capital is available in land-using and capital-using operations that could soak up surplus labor with some modest redirection of investments.

^{Cited in}
1/A "The Push to Get More From Men & Machines", Business Week,
9-9-72, pp. 80-81, p. 81.

The following chapters pursue this hopeful thought with more specific analysis of what factor mix means, and how we change it.