CONSEQUENCES AND CAUSES OF UNEQUAL DISTRIBUTION OF WEALTH

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by

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ABSTRACT

CONSEQUENCES AND CAUSES OF UNEQUAL DISTRIBUTION OF WEALTH

The wealth--transaction cost hypothesis posits a major form of market failure, as follows: Richer people and bigger firms start out with a higher ratio of capital to labor than that of poorer people and smaller firms. They "trade" with each other--hiring labor or borrowing capital--across a substantial barrier of transactions costs. Consequently, even after trade, richer people and bigger firms find capital relatively cheap and abundant, but labor relatively scarce and expensive; poorer people and smaller firms find the opposite.

As a result, richer people and bigger firms behave in predictably different ways from poorer and smaller, such as: Richer and bigger use a resource of given quality less intensively, eg. obtaining lower output per acre of land, but higher output per manhour. In general, richer and larger show a higher output per manhour and higher profitability (profit/income) but lower capital turnover (income/capital) and lower return on investment (often masked by accounting practices).

Richer and bigger enjoy a comparative advantage in owning superior resources, (eg. richer oil wells or more central land) and prefer more durable assets of all kinds. They enjoy an advantage in activities offering economies of scale (eg. monopolies), or intrinsically high labor productivity. They enjoy an advantage in more secure (less variable) investments, but also in more illiquid investments--which seem less risky to those with more capital!

Richer people have an advantage in obtaining more education and thus entering superior professions, while larger firms can hire superior

employees. For this and other reasons, richer people and larger firms have an advantage in dealing preferentially with one another, as do poorer and smaller. So comparative advantage leads to occupational, social, and geographic clustering by wealth and firm size.

In general equilibrium, the greater the inequality of wealth and firm size, the lower the output, employment and growth of the whole economy--as transactions costs increasingly block efficient use of labor and resources.

The wealth--future-orientation hypothesis posits that richer people and bigger firms show more future-oriented time preferences, that is, a greater relative preference for future goods over present goods. This, together with the wealth--transaction cost hypothesis permits a dynamic equilibrium model of distribution. In the model, unequal distributions of wealth prove quite stable over time. Extreme inequality takes a "dualistic" form with most of the population clustered in poverty at the bottom, and a very long tail of richer people strung out above. Moreover economic growth, absent redistributive policies, makes distributions more unequal.

To

M. MASON GAFFNEY

friend and teacher

who set me on the trail of distribution fourteen years ago

this dissertation is affectionately dedicated

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My first thanks to Mason Gaffney, who enticed me from the study of ancient Akkadian to tackle the greatest and oldest problem of them all: the persistence of poverty in the midst of wealth. And who showed me how, given proper assumptions, the problem yields to standard capital theory and marginal analysis. This dissertation elaborates and formalizes insights scattered through the many brilliant and witty articles, reports and letters that have floated into my mailbox over the years. Of course while Mase deserves credit for the basic concepts, the errors are solely mine.

My thanks next to my advisor, Peter Berck, who somehow survived my stupefyingly bad first drafts to convince me that mathematical rigor might carry more weight than assorted anecdote. And then, three hundred pages of equations later, told me I had written a typically female dissertation, as only a woman would have the patience to grind out a zillion little derivatives!

My thanks to Ivan Lee, whose elegant notes on microeconomic theory gave me the tools to construct all those equations.

My thanks to Dick Norgaard, who introduced me to the study of property rights and transactions costs.

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CONSEQUENCES AND CAUSES OF UNEQUAL DISTRIBUTION OF WEALTH

> "[T]he tendency of what we call material progress is in nowise to improve the condition of the lowest class in the essentials of healthy, happy human life... It is as though an immense wedge were being forced, not underneath society, but through society. Those who are above the point of separation are elevated, but those who are below are crushed down".
>
> Henry George, *Progress and Poverty*, 1879, p. 9.

> "The combined assumptions of maximizing behavior, market equilibrium, and stable preferences, used relentlessly and unflinchingly, form the heart of the economic approach as I see it."
>
> Gary S. Becker, *The Economic Approach to Human Behavior*, 1976, p. 5.

INTRODUCTION

0.1 The Wealth--Transaction Cost Hypothesis and the Wealth--Future-Orientation Hypothesis

Does the distribution of wealth affect output, wages, investment, growth, the distribution of firm size, and other features of an economy? If so, how?

How does economic behavior differ between richer and poorer people, or larger and smaller firms? What accounts for the stratification of populations into social and economic classes? What causes geographic patterns of wealth and poverty?

What makes unequal distribution of wealth so universal and persistent?

How much redistribution of wealth or income is desirable, or possible? Must "equity" necessarily conflict with "efficiency"?

Questions about the consequences and causes of unequal distribution seem to resist standard economic analysis. Many economists have therefore resorted to *ad hoc* treatments of parts of the distribution problem within specialized fields, such as regional development or labor economics. Or they have forsaken analysis for description, such as the "satisficing behavior" of business theory, or the "class struggle" of Marxism.

I believe with Gary Becker that standard economic analysis, "used relentlessly and unflinchingly," can account very well for such distributional phenomena--once we recognize a major form of market failure: Richer people and bigger firms start out endowed with a higher ratio of capital to labor than that of poorer people and smaller firms. They trade with each other across a substantial barrier of transactions costs. Consequently, even after trade, richer people and bigger firms find capital relatively cheap and abundant, but labor relatively scarce and expensive; poorer people and smaller firms find the opposite. I call this the wealth--transaction cost hypothesis.

Chapters 1 through 6 develop some of the "micro" consequences of the wealth--transaction cost hypothesis: differences in economic behavior of richer and poorer people, bigger and smaller firms due to their underlying differences in factor proportions and prices.

Chapter 7 develops some general equilibrium consequences of inequality, given transactions costs. And Chapter 8 develops some "macro" consequences, given an additional hypothesis: richer people and (managers of) larger firms have more future-oriented time preferences. That is, at a given rate of exchange, they will trade proportionally more present consumption for future consumption: the wealth--future-orientation hypothesis. This is a completely independent hypothesis, except in the sense that (as I will argue in Chp. 16) opportunities during childhood may determine preferences of adults.

Chapter 9-17, finally, explore evidence supporting (or contradicting) some of the major theoretical predictions.

0.2 Some Major Implications

Here are some of the major implications of the wealth--transaction cost hypothesis, together with the wealth--future-orientation hypothesis, (not necessarily in order of importance):

<*> Together, the wealth--transaction cost and wealth--future-orientation hypotheses provide a model of the distribution of wealth and income, encompassing and completing the human capital model of Gary Becker and others. (Gian Sahota argues in a review of personal income distribution theories that the human capital model's greatest weakness is its omission of inheritance and determinants of ability, particularly preschool investment--a gap filled here. [Sahota, 1978, p. 32.]) See the discussion in Chapters 9-11.

<*> Given the wealth--transaction cost hypothesis, the wealth--future-orientation hypothesis proves necessary to account for the dynamic stability of unequal distribution in non-primitive societies, --that is, to explain why inequality appears and persists virtually unchanged over centuries once societies become "civilized". For if richer and poorer people did not differ in their time preferences, the wealth--transaction cost hypothesis predicts that economies would constantly tend to equal distribution of wealth. Holding technology constant, the two hypotheses predict that the greater the difference in future-orientation, the greater the inequality of wealth. Holding time preferences constant, the two hypotheses predict that the greater the economies of scale in technology, the greater the inequality--hence the extreme diseconomies of scale in

primitive societies preclude inequality.

The two hypotheses together also predict that a dynamic unequal distribution equilibrium will take a "dualistic" form: most of the population will cluster around a quite stable position of very small wealth, while the rest will cluster around a less stable position of great wealth. This produces a pattern with a big clump of the population near the bottom, and a very long upward tail--the pattern in fact widely observed yet awkward to explain.

Finally the two hypotheses predict that changes in technology, producing growth, may also trigger oscillations in production and prices. See Chapter 8.

<*> The wealth--transaction cost hypothesis and the wealth--future-orientation hypothesis provide a simple theoretical explanation for the well-known empirical observation that extreme inequality of wealth hinders progress in less developed countries. It also supports the well-documented claim that redistribution of land --"land reform"--increases agricultural production. The two hypotheses also predict that extreme inequality will result in economic dualism: a very capital-intensive "modern" sector and a very labor-intensive "traditional" sector, with little in between--exactly the pattern commonly observed in less developed countries. See Chps. 7 and 8.

<*> The wealth--transaction cost hypothesis suggests that inequality in developed countries, while not so extreme as in less developed countries, nontheless reduces economic productivity by hindering the combination of capital and labor. So "equity" need not conflict with "efficiency"--quite the contrary. For assuming

transactions costs cannot be eliminated, and probably not even substantially reduced, the shortest way to increase efficiency may be to redistribute wealth. Developed countries do in fact redistribute wealth by providing public education, public health services, and other benefits. The wealth--transaction cost hypothesis suggests that these and other forms of redistribution--if carried out with a proper regard for incentives--improve economic performance.

<*> The wealth--transaction cost hypothesis undercuts the popular assumption that richer people and bigger companies contribute more to economic growth because they save and invest a larger share of income. For the market failure due to transactions costs means poorer people and smaller companies get a higher return on investment. I present evidence in Chp. 15 suggesting that this higher return more than compensates for a lower rate of saving. Consequently, public policies intended to stimulate growth by shifting income to richer people and bigger companies will probably dampen growth instead. See Chp. 15.

<*> The wealth--transaction cost hypothesis explains the locational preferences of richer and poorer people, bigger and smaller firms. As developed in Chp. 3, richer people and bigger firms enjoy a comparative advantage in industries of relatively low intrinsic labor-intensity, and offering relatively great economies of scale. Consequently, of the land devoted to any given industry--eg. grazing or coal mining--richer people and bigger firms occupy the more accessible, higher-quality areas. In any given industry, richer people and bigger companies control the more central resources, while poorer people and smaller companies control the more marginal ones.

<*> The wealth--transaction cost hypothesis can explain social class--a matter neo-classical economists have heretofore necessarily relegated to "preferences". For the transactions costs separating people of different wealth make it economically logical (maximizing utility) for people to deal preferrentially with others of the same background, as demonstrated in Chp. 2. Moreover, as shown in Chp. 3, differences in internal factor proportions and prices give richer and poorer people a comparative advantage in entering different occupations. Basically, richer people enjoy a comparative advantage in more secure, more capital-intensive, more educated occupations. And as mentioned, richer and poorer tend to own property in different locations. So the wealth--transaction cost hypothesis predicts clustering by wealth, occupation, and location. See the discussion in Chp. 14.

<*> In a transaction cost-less world, standard economic analysis predicts that richer people should work less than poorer people, due to "income effect". (Chp. 1, Sec. 1.6) The very rich should lead a life of utter idleness, as "the leisure class". Moreover, since they work less, richer people should get less education than poorer people! (Chp. 2, Sec. 2.3) By contrast, the wealth--transaction cost hypothesis predicts that richer people work longer hours than poorer people, and get more education. For transactions costs make very valuable the time they spend managing their assets. Their cheap capital means they can afford more education, and the skills they learn serve to stretch their scarce time. (Chps. 1 and 2, and Chps. 11 and 12).

<*> The wealth--transaction cost hypothesis squishes a couple of venerable "bugs" in the standard economic theory of the firm.

One old bug is the indeterminacy of firm size. In order to ensure that the factors of production exhaust the product, transactions-costless neo-classical theory must assume constant returns to scale; increasing returns would leave insufficient product for the factors (and cause alot of other problems too), while decreasing returns would leave too much product. But constant returns make firm size indeterminate. Under the wealth--transaction cost hypothesis, the underlying technology of a firm may show decreasing or increasing returns, but the firm as a whole must show net decreasing returns since the cost of management rises with the size of assets owned and controlled. The surplus product simply goes to the owners of the firm's assets. As shown in Chp. 2, firm size becomes a determinate function of the underlying technological economies of scale, the wealth of the owner(s) or equity value of the company, and the ability of the owner(s) and/or managers.

The other old bug is the failure of standard theory to explain the behavior of corporate managers. For managers of large companies often carry on in a fashion that strikes outsiders as anything but profit-maximizing. A number of non-neoclassical theories have arisen to account for such behavior eg. sales maximization. More recently, it has become fashionable to argue that managers of large monopolistic companies are, due to transactions costs, inadequately constrained by shareholders. Therefore they maximize utility instead of profits, and snatch a slice of monopolistic fruit. Many economists, especially of conservative stripe, find this argument hard to swallow. Among other drawbacks, it depends on a nebulous distinction between monopolistic and competitive firms. Moreover, managers of large non-monopolistic companies visibly act much like managers of large monopolies.

The wealth--transaction cost hypothesis assumes that all firm owners and managers maximize utility, in a world full of transactions costs. Bigger firms have a higher internal ratio of capital to labor than smaller ones, leading to systematic differences in behavior. Thus bigger firms mechanize more, hire more skilled and often more socially desirable employees and pay them better, and specialize in more capital-intensive industries, including more monopolistic ones. The apparent extravagance of large corporate managers simply reflects the cheapness of internal capital and expense of internal labor--due to sheer size, not monopoly rents.

0.3 The Wealth--Transaction Cost Hypothesis in the Literature

The wealth--transaction cost hypothesis fits easily into the now popular framework of "property rights". Pieces of the hypothesis itself appear scattered throughout the literature. But to my knowledge, noone has set forth the complete hypothesis.

Property Rights Theory:

In 1960, R. H. Coase showed that in a world without transactions costs, different configurations of property rights do not affect the allocation of resources. Without transactions costs, for instance, it does not matter if a factory has the right to pollute or citizens have the right not to be polluted; in either case, factory and citizens bargain their way to the same optimal level of pollution. [Coase, 1960.] (Which owns the initial pollution right does of course affect the incomes of citizens and factory owners.)

Like fish discovering water, economists suddenly awoke to the significance of property rights. For given the ubiquity and often large size of transactions costs--notably, costs of obtaining information, defining, negotiating and enforcing property rights--different configurations or "bundles" of property rights may have strikingly different allocative (as well as income) effects. For example, the factory may fume uninhibited under one alternative, and go broke under the other.

The economics of property rights as pursued since then has helped clear up a great variety of previously intractable problems, ranging from externalities to the behavior of firm management and government bureaucrats. [Furobotn and Pejovich, 1972; and many more].

"Externalities", it seems, simply arise whenever the transactions costs of rearranging property rights exceed the potential gains--whether to citizens trying to organize against pollution, or to businessmen forming a cartel against "market externalities". So externalities may arise whenever property rights are held in common, whether rights to use a resource like air, or common grazing or fishing grounds, or rights to enter a market.

Property rights theory also explains the behavior of firm managers, or government bureaucrats. These individuals maximize utility within a set of institutional constraints: the "property rights" inherent in the job. Transactions costs hinder shareholders from imposing truly profit-maximizing behavior on the managers, or citizens from imposing efficiency and service on the bureaucrats. In effect, shareholders, bankers, managers, workers, unions, public officials, bureaucrats, and many more, hold the resources of firms or government bureaus in common tenure; transactions costs among these property rights holders ensure continuing externalities.

Property Rights and the Wealth--Transaction Cost Hypothesis:

The distribution of personal wealth in a given economy is a configuration of property rights. Obviously it affects income; the more unequal the distribution of material wealth, the more unequal the distribution of property income. But does the distribution of wealth have marginal consequences, and if so, what are they?

The ownership of the labor supply in an economy can never perfectly match the ownership of capital, if only due to differences in age and random variations in ability. However, the more unequal the distribution of wealth, the greater the mismatch. And the greater the mismatch, the greater the potential gains from trade; that is, from making "contracts" to exchange or rearrange bundles of rights--in order to combine labor and capital belonging to different individuals.

But transactions costs may hinder the making and enforcement of such contracts to combine labor and capital.

Costs of making contracts include the cost of searching for and arranging suitable employment or investments. In a modern economy, the most conspicuous but not least are the substantial costs of operating the banking system and stock and bond markets.

Enforcement costs arise because the combination of one person's labor with another's capital creates a common tenancy of assets. So there inevitably arise the familiar conflicts of interest between boss and employee, landlord and tenant, banker and borrower.

Enforcement costs include what I call "supervision costs": the costs incurred by owners and managers of capital trying to ensure that employees, tenants or borrowers abide by their contracts. For these parties have an incentive to "shirk" (in property rights lingo) to the extent they can get away with it, or to steal or feather their own nests, or simply screw up. Meanwhile, owners and managers of capital may try to "shirk" too; hence labor unions, tenants organizations etc.

Risk plays a role too, not just in itself, but because it raises costs of making and enforcing contracts. That is, parties to a contract may wish to make their actions contingent on various future events. They must either anticipate all likely circumstances beforehand or continually renegotiate the terms of the contract. As Stephen Cheung points out, landlords may prefer to give short leases, even when they usually renew with the same tenants. For despite the disincentive effects on tenants, making leases afresh at frequent intervals gives landlords flexibility to deal with changing circumstances. Cheung, 1969]

I assume that <u>supervision costs necessarily require labor of the owner or manager of capital</u>. That is, if a person hires others to work with his capital, or invests his capital with others, the marginal product of his personal labor "supervising" exceeds zero. For given capital, the more a person supervises, the greater the return on his capital. For a given level of supervision, the greater the capital, the greater the marginal product of more supervision.

However, the more hours a day a person works, whether supervising or not, the higher the marginal cost of his time: his personal wage. But there are only 24 hours in a day and people must sleep, eat, and spend time enjoying other consumption. So at some level of work the personal wage becomes indefinitely large.

In good maximizing fashion, a person sets his personal wage equal to the marginal product of his labor, supervisory or other. Since that marginal product rises with wealth, so does a person's equilibrium wage and time spent supervising. But if the marginal product of supervision time rises, equilibrium return on investment necessarily falls with wealth. (Richer persons may enjoy economies of scale in certain investments. But beyond some size, diseconomies of supervision must dominate, lowering returns, as explained in Chp. 1.)

Other forms of transactions costs, such as taxes, regulations, and transportation costs, also drive a wedge between richer and poorer persons. In fact in the US, economists commonly speak of the Social Security and income "tax wedge" between employers and employees.

The Wealth--Transaction Cost Hypothesis in the Literature:

Pieces of the wealth--transaction cost hypothesis appear throughout the literature.

"Capital market failure" crops up everywhere. For example, Ken Arrow detects a "failure of the market for future goods" due to the cost of enforcing contracts, and the risk-aversion of lenders. [Arrow, 1974, p. 8]. Of bank loans in particular, Rainer Schickele observes that: "The principle of allocation is collateral security, not marginal productivity... These two principles tend to work at cross purposes: with increasing collateral security, the marginal productivity of capital tends to decline, and vice versa. Instead of allocating capital to where it is scarce, our credit system allocates it to places where it is ample". [Schickele, 1943, p. 240].

Less frequently, economists observe that capital market failure implies that the cost of capital falls with wealth. For example, Gary Becker notes that for this reason, a richer person gets more education than a poorer one of the same ability. [Becker, 1974, p. 79].

To my knowledge, only Mason Gaffney has systematically explored causes and consequences of the fall in the cost of capital with wealth. Only Gaffney, in fact, treats capital market failure as a central economic phenomenon--instead of a peripheral nuisance, noted and then brushed aside. He offers a theory of "time-indivisibility" of durable assets, notably land. That is, the (transaction) costs of renting or loaning inhibit the separation of ownership of assets from their use. As with other indivisibilities, or "tied sales" misallocation results. In particular, richer persons use land less intensively than do poorer people. [Gaffney, 1961]. Gaffney develops the implications of this proposition for public policies including property taxes [1971], income taxes, mineral leasing, and employment.

To model the economy with only capital market failure is like building half a seesaw. For a general equilibrium can't exist without a balancing labor market failure. Yet hardly anyone, not even Gaffney, connects a fall in the cost of capital with wealth to a rise in wage.

Thus the rise in personal wage with wealth, while as much an accepted fact as the fall in cost of capital, does not excite much attention. One exception is Staffan Burestam Linder's charming little book on The Harried Leisure Class. While Linder concerns himself more with effects of secular rather than cross-sectional increase in wealth, he makes many of the same predictions as does the wealth--transaction cost model. For example, greater wealth implies "lower rationality" of economic decisions (like purchases of durable goods) due to the higher cost of time gathering information. [Linder, 1970, p. 60].

Linder explains the secular rise in the cost of time by the secular fall in the cost of capital. However, although he draws on cross-sectional evidence, he does not extend this explanation to the cross-section.

On the other hand, human capital theorists do connect the cross-sectional fall in cost of capital with the cross-sectional rise in earnings, though usually not very explicitly. In 1945, Friedman and Kuznets found that actual earnings differentials between professionals and non-professionals greatly exceeded the differentials they computed would suffice to induce people to invest in professional training. They concluded,

> "there is nothing surprising about this finding. It is clear that young men are, in fact, not equally free to choose a professional or non-professional career... First, the professions require a different level of ability than other pursuits; second, the economic and social stratification of the population leaves only limited segments really free to enter the professions."

[Friedman and Kuznets, 1945, p. 88; cited in Atkinson, 1975, p. 83].

Subsequent statistical work has confirmed this result. (For a discussion, see Atkinson, 1975, pp. 82 ff.). A great deal of current statistical work, notably by Griliches, attempts to separate effects of ability on income from effects of family background, implicitly including the cost of capital.

Evidence supporting the wealth-transaction cost hypothesis appears in Robert Averitt's The Dual Economy: The Dynamics of American Industry Structure [1968]. Averitt divides American industry into two kinds of firms, "center" and "periphery". Center firms are large, cash-rich, stable, highly profitable, paying high wages to attract high quality workers, with high quality management, occupying concentrated markets, providing relatively little employment per dollar of assets, but a correspondingly high output per worker, etc. Periphery firms are the opposite. Averitt's descriptions of differences between center and periphery firms in fact match the predictions of the wealth--transaction cost hypothesis to the last details. However, Averitt offers no hint that these differences might arise from market failure. Rather, he sees center firms as epitomizing economic efficiency, which he seems to equate with capital-intensity. Thus, though center firms provide relatively little employment, "Given a choice between efficiency and employment, most economists favor efficiency." (!) [Averitt, 1968, p. 127].

The Wealth--Future-Orientation Hypothesis in the Literature:

Unlike the wealth--transaction cost hypothesis, the wealth--future-orientation hypothesis has been around for generations--at the center of the endless debate on whether and how much poor people or racial minorities are "responsible" for their plight. Edward Banfield makes differences in time preferences the basis for social class distinctions. [Banfield, 1974]. Thomas Sowell has outraged liberals by documenting rather persuasively that differences in cultural time preferences--instead of discrimination--account for varying rates of progress of different ethnic groups. [Sowell, 1975]. Chapter 16 examinines evidence for and against the wealth--future-orientation hypothesis.

CHAPTER 1

EFFECT OF WEALTH OR FIRM SIZE, WITH AND WITHOUT TRANSACTIONS COSTS

1.1 Summary[A]

How do richer people differ from poorer, or bigger firms from smaller, with and without transactions costs? Here's a simple model:

In a remote corner of the Land of Oz lies the country of the Clones. The Clones are farmers. As their name implies, the Clones resemble each other down to the last quirk in their utility functions--which depend on food and leisure only. Likewise their farmland--where production depends only on land and labor--is all the same quality. However, Clonelanders may own all different sizes of farms, or no land at all.

The Clones may work on their own land, if any, and do so unless very rich. They may also hire or be hired by other Clones at the market wage. But a Clone who hires additional labor must spend some of his own labor time supervising at a given rate. So transactions costs take the form of a supervision requirement.

Given these assumptions, the Clones logically divide up into four categories according to the size range of their land:

The "peasants", owning little or no land, farm their own land (if any) and hire themselves out at the going wage to richer landowners.

The "self-sufficient farmers", owning somewhat more land, farm their own land but neither hire nor are hired by others--as the supervision requirement makes neither profitable.

The "small landlords", owning even more land, hire and supervise peasants at the going wage and work alongside them.

The "large landlords", owning the biggest farms, do not personally touch the soil, but merely supervise hired peasants.

Cloneland is a perfect place to test the effects of differences in distribution of wealth or in the level of transactions costs (the rate of supervision required). Chapter 1 works out the "micro" effects of such differences on the four groups, peasants, self-sufficient farmers, small landlords and large landlords. Chapter 7 will add up these micro effects to find the general equilibrium effects.

The self-sufficient farmers.

The self-sufficient farmers provide the paradigm of differences in wealth (land size), given transactions costs. It's also possible to look at the farmers as a collection of different size firms, constrained by transactions costs to hire their owners' labor. So differences between richer and poorer farmers are equally differences between larger and smaller firms.

Here are the most salient differences: The richer the farmer, or larger the firm, the higher the farmer's implicit wage. Assuming no backwards bending labor supply curves, that means the richer the farmer, the lower his ratio of labor to land; hence, the lower his output per acre and the marginal product of his land, but the higher his average product of labor. Column A of Table 1.1 summarizes these and other results for the self-sufficient farmer.

The prediction that average product of labor rises with wealth or firm size is particularly useful and testable. For this prediction holds up under a wide variety of complications introduced in later chapters. Moreover, average product of labor is both easy to measure, and of all measures, least subject to distortion by conventional (or unconventional) accounting methods. And in fact reams of data confirm a rise in average product of labor with wealth or firm size. (Eg. look at

Table 1.1

Effect of Increased Land Size, or Increased Supervision Rate*

A: Landowner works directly on his land; does not hire or work for hire, (Sec. 1.5, Table 1.4).

B: Landowner works on own land, and works for hire at given wage, (Sec. 1.6, Table 1.5).

C: Landowner works directly on land and supervises hired labor, (Sec. 1.7, Table 1.6).

D: Landowner only supervises hired labor, (Sec. 1.8, Table 1.7).

	More Land				More Supervsion	
	A	B	C	D	C	D
1. Labor:						
Landowner's total	+	-	-	+	+	?
Landowner's applied	+	+	-		+ mstly	
Hired (or hired out,B)		-	+	+	- mstly	-
Applied (lndr's & hird	+	+	+	+	-	-
Total (applied & supr)	+	+	+	+	- mstly	?
2. Ratio, labor to land:						
Applied	-	0	0	-	-	-
Total	-	0	+	-	- mstly	?
3. Wage, MP labor:						
Employee's wage			0	0	0	0
Landowner's wage	+	0	0	+	+	+(?)
MP applied labor	+	0	0	+	+	+
Weighted average wage			-	+	+	?
4. Labor cost: = wage x total labor (in firm)	+	+	+	+	+then-?	?
5. Labor cost/acre:	+ then-	0	0	+?then-	?	?
6. Output:	+	+	+	+	-	-

Table 1.1, continued

	More Land				More Supervsion	
	A	B	C	D	C	D
7. MP land: = Profit/acre (const. returns only)	-	0	0	-	-	-
8. AP labor: Output/applied labor	+	0	0	+	+	+
Output/total labor	+	0	-	+	+	?
9. AP land: = output/acre	-	0	0	-	-	-
10. Labor share: = labor cost/output	+	0	0	+	+	+
11. Profit: = output - labor cost	+ then-	+	+	+?then-	-	-
12. Landowner's income: = profit + time value	+	+	+	+	+ or -	?
13. Landowner's consptn: = profit + wages	+	+	+	+	?	-
14. Landowner's utility: (fctn of consumption and leisure)	+	+	+	+	-	-

* Assuming constant returns to scale in the underlying production function, to avoid minor complications.

any Fortune 500).

Ample data also indicates that wages for comparable work rise with firm size [eg. Lester, 1967], while intensity of resource use falls [eg. Martin, 1967]. Both facts are usually attributed to monopoly; the self-sufficient farmers suggest a more general and profound explanation.

Moreover, due to transactions costs, the self-sufficient farmers dodge the old returns-to-scale dilemma that vexes the neoclassical theory of the firm. This is the dilemma: On the one hand, if production does not show constant returns to scale, the payments to the factors of production do not equal the product--with increasing returns the payments exceed the product, while with decreasing returns they fall below the product. If matter cannot be created or destroyed, where does the deficit come from, or the surplus go? But on the other hand, under the unlikely assumption that all production shows constant returns to scale, there are two unpleasant possibilities: 1. Production technology is linear homogeneous, which leaves firm size totally indeterminate. 2. More plausibly, technology shows increasing and then decreasing returns to scale, with a point of constant returns in between. Then all firms in an industry must be the same size, the size at constant returns.

With transactions costs, this nasty dilemma vanishes. The self-sufficient farmers' firms may show increasing or decreasing returns in their underlying technology as a function of land and labor. But the deficit or surplus over rent and wages automatically goes to the farm owner as part of his firm's profit. Alternatively, the farmers can be described as experiencing net diseconomies of scale in land size--since with transactions costs, a farmer's wage and labor supply depend on land size. The surplus just goes to the owner, and all is well in Cloneland.

The Peasants

The peasants farm their own land (if any) and also work for hire at a given wage. Considered in isolation, the peasants predict the effects of wealth differences absent transactions costs. The silliness of these predictions further confirms the plausibility of the self-sufficient farmers' model.

Most notably, because all peasants work at the given market wage, differences in wealth can only have "income" effects. So the richer the peasant, the less he works! Ranging from landless peasants to richer and richer ones, labor supply falls slowly and then more and more rapidly. Not even Veblen's The Theory of the Leisure Class envisions such a plunge in effort with increasing wealth.

The peasants of course can say nothing about the effects of differences in firm size. For absent transactions costs, and necessarily assuming constant returns to scale, there can be no effects. Firms are either indeterminate in size or all the same size and identical. In fact there can be no ownership of firms in the operative sense that a person customarily works with and derives income from "his" specific property. A uniform smear of labor simply spreads across the peasants' land like butter on bread, at a ratio of labor to land determined solely by the market wage. The market wage likewise fixes the average and marginal products of labor and land on all peasant land.

Table 1.1 Col. B summarizes the results for the peasants.

The Landlords

The small and large landlords show not only the effects of wealth differences but also, explicitly, the effects of varying levels of transactions costs.

The large landlord only supervises hired labor. His wage exceeds the marginal product of labor on his land, which in turn exceeds the market wage paid to employees. Differences in wealth affect large landlords just as they do self-sufficient farmers. In fact, if the large landlords' farms are assumed to produce food net of payments for hired labor or, as shown in Chp. 2, net of payments to rented land--the large landlords become mathematically identical to the self-sufficient farmers. So the self-sufficient farmer model applies quite generally to individuals or firms that hire outside factors of production in a world with transactions costs. It's sufficient that there be a person--an owner or top manager--whose labor input is crucial and, there being only 24 hours in a day, in increasingly short supply as firm size increases.

The small landlords, who both work and supervise hired labor, show some interesting peculiarities, discussed in the text. Table 1.1, cols. C and D under More Land summarize the full results of wealth differences for both large and small landlords.

Interestingly enough, an increase in transactions costs (an increase in the required rate of supervision) has many of the same effects as an increase in wealth. For, as would be expected, an increase in transactions costs lowers the amount of labor applied per acre of land. So output per acre falls as transactions costs rise, while output per hour of applied labor rises. Columns C and D of Table 1.1 under "More Supervision" summarize these results.

CHAPTER 2

DISTRIBUTION OF FIRM SIZE, ECONOMIC CLASSES, AND OTHER CONSEQUENCES OF INEQUALITY, WITH AND WITHOUT TRANSACTIONS COSTS

The Clones, like dutiful laboratory animals, lend themselves to a variety of little experiments that illuminate further the effects of wealth and transactions costs, and the absurdity of a world without transactions costs. The self-sufficient farmers and the large landlords serve as guinea pigs with transactions costs, while the peasants serve the same function without transactions costs. Sec. 2.1 summarizes these experiments. Sec. 2.2 draws some broader implications for behavior of the firm, firm size, and social and economic class.

2.1 Summary[A]

Natural Ability (Sec. 2.3):

Suppose (in temporary violation of their basic character) we vary the natural ability of Clones--so that the actual labor delivered by an individual equals the hours he works times an exogenous ability factor, b. Then, with or without transactions costs, greater ability raises a Clone's effective labor supply (hours times ability factor). But with transactions costs, a more able Clone applies more effective labor to a given piece of land, getting a higher output per acre. Without transactions costs, the amount of labor applied, and output per acre remain independent of the ability of the owner! Given transactions costs, a more able rich Clone works longer hours than a less able rich Clone, but a more able poor Clone works fewer hours than a less able poor Clone. Without transactions costs, a more able Clone always works longer than a less able Clone of the same wealth.

Education (Sec. 2.4):

Suppose a Clone farmer can extent his personal labor supply by selling an amount of his land, E, for education, which multiplies his hours of labor by an amount e(E), subject to diminishing returns. Then, with transactions costs, a richer Clone always gets more education. A larger firm always buys more employee training. This makes perfect sense; education allows richer individuals and bigger firms to trade what they have relatively (and absolutely) more of--land--for what they have relatively less of--labor. Without transactions costs, a richer individual always gets less education!--because he works less. Therefore, a richer individual actually earns a lower wage than a poorer one! As for firms, without transactions costs (and necessarily assuming linear homogeneous production), firm size does not affect employee training.

Supervision Rate and Performance (Sec. 2.5):

The landlords of Chp. 1 faced a fixed, exogenous rate of supervision. Suppose now that a large landlord can choose his rate of supervision. The more he supervises, the better his employees perform, that is, the greater their effective labor supply. (Presumably they work faster and more reliably). Given this assumption, the richer the landlord, the less he supervises, and the worse his employees perform. (However, the effective supply of hired labor still increases with wealth). Obviously, absent transactions costs, an owner's supervision does not affect employee performance!

Skill, Performance, and Rate of Pay (Sec. 2.6):

Suppose a large Clone landlord can improve his employees' performance by paying better. The higher the pay he offers, subject to diminishing returns, the more skilled the employees he gets, and the better employees of given skill perform. With this assumption, then the richer the landlord or larger the firm, the higher the pay of employees, and the better their performance. But absent transactions costs, wealth or firm size does not affect rate of pay or level of employee skill.

So there are opposing pressures on the performance of employees as wealth or firm size increase. In combination, a richer landlord supervises less but pays more--not clearly getting better or worse performance.

Rental and Leverage, With and Without Transactions Costs:

In the real world, the quantity of assets people or firms rent or borrow rises with wealth and firm size, though not as fast. So the richer the person or larger the firm, the lower the leverage: the ratio of rented or borrowed assets to owned assets. Moreover, rental and interest rates fall as wealth or firm size increase--well-known symptoms of capital market failure.

To reproduce this familiar pattern in Cloneland--a rise in debt with equity, but fall in ratio of debt to equity, and in rental or interest rates--we must assume transactions costs proportional to debt to equity ratio. This is quite a reasonable assumption if the transactions costs to lenders, either in supervising a loan or in insuring against loss, rise with the riskiness of the loan. This riskiness presumably rises with debt to equity ratio of the borrower.

With no transactions costs, and therefore assuming linear homogeneous production, there must necessarily be one fixed "market" rate of rental equal to the marginal product of land, just as there is a fixed wage rate, equal to the marginal product of labor. Under these circumstances assume for a moment the peasant (paradigm of a transactions cost-less world) rents additional land instead of working for hire on another's land. Then, since a richer peasant works less than a poorer one, he operates a smaller farm than a richer one! So instead of rising with wealth, debt falls with wealth, and debt to equity plummets, so fast that farm size falls. (Of course how much renting versus hiring the peasant does is indeterminate absent all transactions costs, as then the peasant has no necessary connection with the operation of his farm).

But if, due implicitly to transactions costs, the rental rate rises substantially with the ratio of rented to owned land--that produces the right results for a farmer or landlord permitted to rent additional land. That is, rented land rises with owned land, but ratio of rented to owned land falls, as does rental rate. In addition, under this assumption, the marginal product of rented land exceeds the rental rate--just as the marginal product of labor exceeds the wage paid employees.

Parcel Size, Supervision Rate and Reliability of Lessees (Sec. 2.8):

In the real world, larger landlords lease out larger parcels, bigger banks make bigger loans, and larger investors own larger blocks of particular stocks and bonds. Larger entities are more diversified than smaller ones, but due to this propensity for larger parcels etc., diversification does not rise as fast as wealth and firm size.

Larger landlords and banks also prefer "better quality" clients, to whom they charge lower rent or interest. (Bigger investors prefer blue chip stocks, whose higher price to earnings ratios, inverted, mean lower earnings per dollar invested. However the comparison of different size market investors is complicated by large economies of scale in access. See Chp. 14 for discussion.)

To reproduce this pattern in Cloneland--rental rate falling and parcel size rising with wealth of landlord, so that diversification does not increase as fast as wealth--requires assuming transactions costs.

So suppose a landlord can rent out his land in an arbitrary number of parcels, but each tenant requires a certain amount of supervision. If the rent landlords could get didn't vary with size of parcel, there would be no advantage to breaking up land into several parcels rented to different tenants. But suppose that market rent falls as parcel size increases--because larger parcels go to larger, less-leveraged tenants. Then the more land a landlord owns, the more parcels he rents out, but the number of parcels does not rise as fast as wealth. So parcel size increases with wealth, and rent obtained per acre falls.

Three variations on this model, too obvious to construct, yield additional predictions:

Suppose landowners vary in ability. Then a more able landowner rents out smaller parcels and obtains higher rent for the same total area of land.

Now suppose a landowner can vary his supervision per parcel. But the less he supervises the less rent he can expect to collect. That is, expected rent falls due to more defaults, and the variance of rent rises. Then the more land a landowner has, the less he supervises, the less rent he collects, and more variance he must tolerate.

But now suppose the landowner can choose the "quality" of his lessees. However, more reliable lessees demand a lower rent. Then the more land a landowner has, the more reliable his lessees, and the lower the rent he collects.

So a larger landowner will lease larger parcels at lower rents to more reliable lessees, but supervise them less. The expected collection rate, and the reliability of lessees, may rise or fall with land size--depending on which factor dominates.

Firm Size and Natural Ability (Sec. 2.9):

Suppose we vary the ability of a large landlord, who can both hire employees and rent additional land, subject to transactions costs. Then the more able a landlord of given wealth, the more employees he hires and the more additional land he rents. However, the ratio of labor to land rises and hence output per acre and leverage rise with ability, while output per manhour falls.

So given market wage and rental levels, then three factors fully determine the size of a landlord's farm as measured by area of land operated, number of employees, or output: 1) the area of land owned, 2) the landlord's natural ability, and 3) the underlying production function--the greater the economies of scale or smaller the diseconomies, the larger the farm.

2.2 Determination of Firm Size and Economic Class[A]

Determination of Firm Size (Conceptual vs. Operating Firms):

Every person in the Clone economy owns a conceptual firm. This firm directly owns his land (for convenience in modelling). And it can hire his labor free of transactions costs. The conceptual firm may hire out its owner's labor and/or rent out his land, or hire additional labor and/or rent additional land. The size of a person's conceptual firm, measured by land area, output, profit, or labor supply, depends on his wealth in land area owned, and his natural ability.

An operating firm, on the other hand, consists of a piece of land operated as a unit, together with direct labor and supervisory labor (if any): a "farm". It may or may not coincide with a conceptual firm. For example, when the peasant both works on his own land and for hire elsewhere, his conceptual firm includes or owns a smaller firm that operates his land. A landless peasant, or a landowner who rents out all his land to other firms do not own operating firms at all.

Absent transactions costs in either hiring labor or renting land, operating firm size depends neither on owners' wealth or ability, but solely on scale in the underlying production function. As described in Chp. 1, diminishing returns would splinter the economy into a zillion firmlets, while increasing returns would congeal it into one great corporate blob. But both diminishing and increasing returns leave the product not adding up to factor payments. A linear homogeneous production function leaves firm size indeterminate, while if the production function shows scale economies at small sizes and diseconomies at large sizes, the economy splits into identical firms all of the size giving constant returns to scale.

However, with transactions costs, wealth and natural ability affect operating firm size. The greater the transactions costs, the more closely operating and conceptual firms must coincide. In the limit where transactions costs prevent all hiring and renting, operating and conceptual firms become identical. Then the distribution of wealth and natural ability completely determine the distribution of operating firm size.

What happens at an intermediate level of transactions costs? Presumably, the greater the economies of scale in the underlying production function, the fewer the number of operating firms, and the more unequal their size distribution. (Economies of scale would raise the wages and rents offered by big firms, pulling more labor and land away from small ones). Underlying diseconomies should increase the number of operating firms, and make sizes more equal.

So, in a world with transactions costs, size of operating firms depends positively on wealth of the owner(s), ability of the owner(s) or managers, and economies of scale in production technology. A lack of transactions costs would rule out this commonplace relationship.

Economic Classes:

As described, the results of this chapter suggest that transactions costs cause a sort of economic stratification. Education rises with wealth. And wealthier persons deal preferrentially with one another.

The results also suggest an economic rationale for nepotism, "old boys' networks", and class discrimination in hiring or renting: employers or lessors may find relatives or persons of similar background more reliable--and can save supervisory labor (at a cost in gross or net output) by preferring such persons.

CHAPTER 3

WEALTH AND COMPARATIVE ADVANTAGE; INDUSTRY SPECIALIZATION; LOCATION; SOCIAL CLASS; MONOPOLY

In the real world richer and poorer people quite strikingly cluster together by occupation, place of residence, place of work, type of assets owned, including type of business owned. In particular, richer people tend to own (or own stock in) and work for larger businesses.

Likewise, in the real world larger and smaller companies cluster by industry and location. Larger companies tend to less labor-intensive industries, offering greater economies of scale, and often (but not always) allowing significant market power.

Transactions-cost-less economics explains clustering by wealth or firm size, if at all, by allusions to "tastes" or "economies of scale". But allowing transactions costs, such clustering follows immediately and rigorously from the venerable principle of comparative advantage. That is, richer people's and bigger companies' greater size of assets and higher internal ratio of capital to labor gives them a comparative advantage in activities with greater economies of scale or lower intrinsic labor intensity, and therefore in owning land or other assets most suited to those activities. *Mutatis mutandis* for poorer people and smaller companies.

Sec. 3.1 summarizes what is actually shown in Chp. 3. Sec. 3.2 draws some larger implications.

3.1 Summary[A]

3.3 Wealth and Comparative Advantage:

Define intrinsic labor intensity as follows: Suppose there are two production functions that depend on quantity of land and labor. Suppose there is a range over which, holding the marginal product of labor equal for both functions, the labor share of output is higher for the first function than for the second. (Since labor share equals marginal product divided by average product of labor, average product is therefore necessarily lower for the first than for the second over the same range). Then the function with the higher labor share (and lower average product of labor) is intrinsically more labor-intensive in that range.

Intrinsic labor intensity is a built-in property of production functions, to be distinguished from the fact that it's possible to carry on any particular form of production less or more labor-intensively by applying less or more labor to a given area of land. Low intrinsic labor intensity corresponds loosely to what we consider "high quality" in a resource or production process. For example, more fertile soil grows more vegetables with less effort.

Sec. 3.3 shows that, given transactions costs, larger landowners have a comparative advantage in production that is intrinsically less labor-intensive and/or shows greater economies of scale. This comparative advantage implies a geographical sorting by wealth. Richer landowners own land better suited to production that is intrinsically less labor-intensive or shows greater economies of scale, while poorer landowners own land better suited to production with the opposite characteristics. Comparative advantage also implies that the "highest and best use" of a particular piece of land may depend on the wealth of the owner.

3.4 Unequal Wealth and Classical Location Theory:

Classical location theory as originated by Von Thünen posits a market town located in a "featureless plain". Transportation costs depend solely on radial distance from market. Then economic activities with a relatively high per acre profit and high unit transportation cost enjoy a comparative advantage in more central locations, while those with a relatively low profit and low unit transportation cost enjoy a comparative advantage in more peripheral locations. Consequently, activities arrange themselves in a bullseye pattern around the center, with the highest per acre profit and transportation cost activity closest to market, and the lowest farthest from market. For example, in the model of 3.4, there is a ring of fruit trees around town, with a ring of grain around that, and a ring of horse pasture on the outside.

Wealth differences fit into this classic model as follows:

Assuming transportation is primarily a labor cost, then the intrinsic labor intensity of any production in any location depends both upon the natural (transportation cost-less) intrinsic labor intensity of the "highest and best use" activity in that location, and upon distance from the center. The lower the unit transportation cost, the less transportation adds to intrinsic labor intensity. Consequently, 1), intrinsic labor intensity of production rises from the inner to the outer edge of each activity. And 2), intrinsic labor intensity then drops abruptly at the boundary where one activity gives way to the next, lower transportation cost activity, (unless the next activity has much greater natural labor intensity, in which case intrinsic labor intensity may jump up at the boundary). So in net, intrinsic labor intensity (usually) forms a sawtooth curve moving out from the center.

From 3.3, transactions costs give larger landowners a comparative advantage in intrinsically less labor-intensive production. As a result, the richest landowners occupy the inside of each activity ring--that is, the best fruit land, the best grain land, and the best horse land--with a gradual decline in wealth with distance from the center, and then (usually) an abrupt increase at the next activity.

Moreover, at the fruit-grain and grain-horse boundaries, there are belts of land where highest and best use depends on the wealth of the landowner.

Similar results would hold if land varied continuously in qualities other than access to market. For example, suppose than on "more fertile soil", or in a "richer mine", the same area of land and hours of labor yield greater output. Production on such land is intrinsically less labor intensive. Then the largest landowners would occupy the most fertile soil or richest mines, and wealth would fall continuously as soil or mine quality fell.

3.5 Wealth and Supervision Costs:

3.5 shows that, all else being equal, production with relatively high supervision requirements is intrinsically more labor-intensive. Consequently, from 3.3 it follows that larger landowners have a comparative advantage in relatively low supervision requirement production.

This result implies that richer people and bigger firms should prefer more routinized and easily monitored kinds of activities, to save on scarce managerial time.

3.2 Broader Implications of Comparative Advantage[A]

Behavior of Richer and Poorer, Larger and Smaller Firms:

The paradigm model of the self-sufficient farmer in Sec. 1.5 predicts a variety of differences between richer and poorer, larger and smaller, assuming they all occupy the same quality land, engaged in the same production. Some of these differences hold up when land quality and production may vary; others do not.

Richer people and larger firms both have a comparative advantage in intrinsically less labor-intensive production and carry on any given production in a less labor-intensive fashion, that is, using a lower ratio of labor to land. So comparative advantage reinforces the prediction that output per manhour rises with wealth and firm size.

By contrast, the prediction of the self-sufficient farmer model that richer people and larger firms obtain lower output per acre--holds only where richer and poorer, larger and smaller, engage in the same production on the same quality land. Less intrinsically labor-intensive production, on better quality land, may yield higher output per acre than more intrinsically labor-intensive production on lower quality land, as shown in Sec. 3.4. A preference for low intrinsic labor intensity may outweigh the tendency of richer people and larger firms to obtain lower output per acre, obscuring their relatively light use of resources.

Social Class:

In the models of this chapter, comparative advantage makes persons of different wealth choose to own different kinds of land applied to different kinds of activities. So, implicitly, wealth determines occupation. However, the same argument that applies to choice of land can apply directly to choice of human capital investments: a person's wealth endowment (cash and physical asset inheritance as well as skills taught by family or school) determines his or her comparative advantage in choosing and training for an occupation. Thus a poor person has a comparative advantage in unskilled labor, while a rich one has a comparative advantage in lawyering. Chapter 14 discusses this point at length.

Chapter 2 showed that persons tend to restrict their hiring and renting to other persons of similar wealth. This tendency causes some economic clustering, along a continuum with no distinct levels. However, clustering due to comparative advantage in occupation and location can break up the spectrum of wealth into discreet levels. The population may appear stratified into clear "social classes", distinguished simultaneously by wealth, education, occupation, place of residence, place of work, and preferred types of physical and financial assets.

Monopoly and Comparative Advantage:

Both conventional theory and practical experience predict that activities offering large economies of scale invite monopoly. The conventional argument, which implicitly assumes transactions costs, follows from the explanation of operating firm size in Chp. 2: Holding constant wealth and ability of owners, the greater the underlying economies of scale in technology, the larger the average operating size of firms in an industry. The larger the average operating size of firms, the fewer the market can support, making it more likely that each has substantial market power. And then of course there are economies of scale in the exercise of market power, further increasing operating size.

But this conventional argument in isolation suggests that large firms in concentrated industries should be more leveraged--the opposite of reality.

Comparative advantage comes to the rescue, predicting that:

Not only do economies of scale lead to greater operating sizes of firms for owners of a given wealth and ability, they also attract previously wealthier owners, or companies that have already accumulated a larger mass of assets. So economies of scale in technology increase not only operating size, but also size of equity ownership of firms. (Of course, historically, the line of causation often runs the other way: firms that first exploit a new technology offering great economies of scale may get very large, and their owners very rich).

Then, if owners and managers of large firms come from the same economic and social background, they may find it easier to reach and maintain "gentlemen's agreements" to restrict output. Or they can more easily influence government to restrict output for them.

Comparative advantage also predicts the same about industries of low intrinsic labor intensity. That is, such industries attract large firms and wealthy owners. Hence, again, a few firms may end up dominating the industry, or simply controlling the best quality resources suited to that industry (eg. the best ore reserves), without any prior intent to monopolize. So in low intrinsic labor intensity may lie the explanation of concentration in industries, like oil and autos, that don't seem to offer any overwhelming technological economies of scale.

Thus large firm size and industry concentration may result more from underlying concentration in the ownership and control of wealth, than from technology. Technology--economies of scale and low intrinsic labor intensity--just explains <u>which</u> industries attract big firms and become concentrated. Were wealth more equally distributed, firms wouldn't get so big or industries so concentrated--a fact that is perfectly obvious in less developed countries where large firms belong to identifiable families. But even in the US, it's become a commonplace that, not technological economies, but "economies of scale in access to capital" account for the size of large firms. [eg. see Williamson, 1975]. And that wouldn't be possible without transactions costs.

Location and Land Use:

Real life land use patterns give but a very blurred reflection of the orderly succession of uses predicted by classical location theory. In fact, they give but a blurred reflection of the pattern as modified by transactions costs between richer and poorer: with richer landowners occupying the more centrally located or better quality parts of each activity region. In the real world, the boundaries between activities are ragged and ill-defined, in the U.S. most visibly so at the urban "fringe", where housing may "sprawl" for miles into farmland.

Another kind of transactions costs explain this raggedness: costs that hinder transfers of land between individuals. So persons of widely disparate wealth may at least temporarily own intermingled property, especially in a zone of transition from one use to another. In such a zone, as shown in Sec. 3.4, highest and best use of land depends on the owner's wealth. So transactions costs predict, instead of the sharp boundary of classical location theory, a mixing of uses in a zone of transition, generally with richer landowners in the lower-intensity, more peripheral use, and poorer ones in the higher-intensity, more central use. For example at the urban fringe in the U.S., single family housing developments typically "leapfrog" among tracts held by large speculators, hobby farms of the rich, etc.

3.3 Wealth and Comparative Advantage[C]

This section shows, loosely, that transactions costs give richer people and bigger firms a comparative advantage in production offering greater economies of scale, and/or lower intrinsic labor intensity. More precisely, the section shows:

1) Suppose there are two linear homogeneous production functions of land and labor. Then a richer farmer has a comparative advantage in production with lower intrinsic labor intensity, defined in Sec. 3.1.

2) Suppose there are two homogeneous production functions of land and labor, and suppose total elasticity of output is close to 1, and/or wages are low. Then a richer farmer has a comparative advantage in production with equal or greater total elasticity of output, and with equal or lower intrinsic labor intensity--the inequality holding in at least one case.

3) Suppose there are two arbitrary production functions of land and labor. Then comparative advantage depends not only on intrinsic labor intensity and total elasticity of output, but also on rates of change of intrinsic labor intensity and total elasticity. However, all else being equal, a richer farmer enjoys a comparative advantage in production where total elasticity of output increases faster, or decreases more slowly.

These results hold in two possible circumstances:

A. There are two different kinds of land in the economy, each with its own particular production function. In this case if richer farmers enjoy a comparative advantage in one kind of production, they will selectively occupy that kind of land, leading to geographic sorting by wealth.

B. Richer and poorer farmers occupy identical quality land, which can be (and is) used in two different forms of production. In this case, there is no unique highest and best use of land; highest and best use depends on wealth of the owner. B is really a special case of A, as will appear.

A. Comparative Advantage for Two Different Kinds of Land:

Suppose there are two kinds of land in the Clone economy. The two kinds of land differ enough that the highest and best use of one is always fruit, and of the other grain--regardless of the landowner's wealth. Then comparative advantage is determined as described in points 1, 2 and 3, above. That is, for linear homogeneous production, richer farmers have a comparative advantage in intrinsically less labor-intensive production, and so forth.

Points 1, 2, and 3 can be shown as follows:

Suppose, for simplicity, exactly half the Clone territory is fruit land and half is grain land. (Any other arbitrary ratio of fruit to grain land would do just as well). All the inhabitants are self-sufficient farmers as in Sec. 1.5. At the start, each farm, large or small, is half fruit and half grain land. Then if richer farmers can trade some of their grain land to poorer farmers in exchange for more fruit land, leaving both better off, that means richer farmers have a comparative advantage in fruit growing, and poorer farmers have a comparative advantage in grain growing.

If we let the farmers actually trade land, we expect that after trade, the richest farmers all grow fruit and the poorest all grow grain. Middle-sized farmers may grow some of each. If there are diseconomies of scale in fruit and grain production, we would expect a large range of middle-sized farmers to grow both fruit and grain. If there are economies of scale, we would expect farmers up to a certain size to grow only grain, and farmers over that size to grow only fruit.

A necessary and sufficient condition for the beneficial exchange of land between richer and poorer farmers, as shown in Appendix 1, Sec. 3.6, is that the ratio of marginal products of fruit and grain land be higher for richer than for poorer farmers. In fact, suppose r^d is the ratio for richer farmers and r^p is the ratio for poorer farmers, and $r^d > r^p$. Then any ratio of exchange of grain for fruitland, R = x grainland/x fruitland, leaves at least one farmer better off and the other no worse off, iff:

(3.1) $$r^d \geq R \geq r^p$$ (with at least one inequality)

So to discover what characteristics of production give richer farmers a comparative advantage in fruit, we need only find out what characteristics make the ratio of marginal products of fruit to grain land rise as a given farmer gets richer.

B. Comparative Advantage for Two Production Functions on the Same Land:

It's easy to show now that B is a special case of A, so whatever characteristics determine comparative advantage for two different kinds of land, also determine it for two production functions on the same kind of land--assuming both forms of production actually occur.

Suppose all land in the Clone economy is identical and can grow either fruit or grain. Suppose we also know that if the farmers choose their crops freely, half the land will end up in fruit and half in grain, but we don't know who will grow which.

So we make each farmer, large and small, plant exactly half his land to fruit and half to grain. Then we let farmers exchange land growing fruit for land growing grain on a 1 to 1 basis, that is, requiring that R in (3.1) equals 1. Now if it's more profitable for rich farmers to grow fruit, then their ratio of marginal products of fruit to grain land, r^d must be > 1. And if it's more profitable for poor farmers to grow grain, then their ratio $r^p < 1$. So $r^d > 1 > r^p$, and mutually beneficial trade can occur, with richer farmers trading land with grain for more land with fruit.

This little experiment shows we can find the characteristics determining comparative advantage for two functions on the same kind of land by the same procedure as for two functions on two different kinds of land: We give a farmer a piece of land, require him to grow fruit on one half and grain on the other, and see what happens to the ratio of marginal products of fruit and grain as we increase his land size. Only in this case, for richer farmers to have a comparative advantage in fruit, the ratio of marginal products must not only rise as wealth increases, but it must rise from below 1 to above 1 so that both fruit and grain can be profitable on the same land.

Characteristics of Production Determining Comparative Advantage:

Suppose a farmer owns T acres each of fruit land and grain land. To discover what characteristics of production determine comparative advantage, we will find out what characteristics make the ratio of marginal products of fruit and grain land rise as we increase T.

Define the following:

L_F -- labor applied to Fruit-land

L_G -- labor applied to Grain-land

CHAPTER 4

EFFECT OF GREATER WEALTH IN A MULTI-PERIOD ECONOMY

In the real world, save for occasional conquests and revolutions, distributions of wealth seem remarkably stable, often changing little over many decades. This stability, I believe, justifies the use of single-period models in Chapters 1 through 3, and again in Chapter 7. That is, since one period much resembles the next, a single period makes a representative slice of time.

Chapter 4 extends the basic "farmer" models of Chp. 1, with and without transactions costs, into many periods. The most immediate consequence is that, with transactions costs, the richer the individual, or larger the firm, the lower the internal discount rate and return on investment. Without transactions costs, of course, discount rate and return on investment are constant economy-wide.

Not only are real world distributions fairly stable, but they are stable despite often considerable upward and downward mobility of individuals and families within the distribution. So individual and family stability of wealth can't fully explain stability of distribution. Rather, some kind of equilibrating mechanism may be at work.

Chapter 4 shows a possible mechanism: If, with transactions costs, richer people are more future-oriented than poorer ones, this difference in time preferences can keep an unequal distribution stable. Without transactions costs, to keep unequal distribution stable, time preferences must remain constant throughout the economy.

Chapter 4 lays the basis for a dynamic model of unequal distribution in Chapter 8.

Sec. 4.1 sketches the actual models in Chapter 4. Sec. 4.2 draws some broader implications.

4.1 Summary[A]

Sec. 4.3, the consumer-investor, presents the classic problem of utility maximization over many periods, subject to a wealth constraint, and to given discount rates which may differ from one period to the next. There are no restrictions on the form of the utility function, such as separability, because such restrictions eliminate the classic result: consumer-investors choose consumption in each period so as to set their marginal rates of time substitution from one period to the next equal to one plus the given discount rate for each period.

As explained in Sec. 4.3, increasing future-orientation with wealth means that the richer a person, the higher the proportion of future to present consumption he chooses, at given discount rates. Constant time preferences mean that proportions remain constant, as wealth increases, at given discount rates.

Sec. 4.4: The farmer and his firm over time. Sec. 4.4 introduces a farming firm, which produces food from land. With transactions costs, production is subject to diminishing returns; without transactions costs there are constant returns. At the end of each period, the firm can invest or disinvest by buying or selling land at a given market price. The firm maximizes profit, taking discount rates as given, setting the price of land times discount rate equal to the marginal product of land in each period.

When the firm is combined with a consumer-investor--a farmer--discount rates in each period become endogenous, dependent on the farmer's initial land size. With transactions costs, the richer the farmer, the lower the marginal product of land. Without transaction costs, marginal product remains constant. So, since price of land times discount equals marginal product, then with transactions costs, the richer the farmer, the lower his discount rate, and firm's return on investment--at least between the present and next period. (Since the farmer can sell off land, a richer farmer may not stay richer indefinitely). Without transaction costs, there can be only one market discount rate.

Farmers can freely save or dissave by buying or selling land. But suppose none of them, rich or poor, wants to save or dissave. So distribution remains the same from one period to the next. With transactions costs, and hence diminishing returns, everyone keeps the same wealth only if richer farmers are more future-oriented than poorer ones. (Else, as will be shown in Chp. 8, richer farmers dissave, and poorer ones save, returning distribution to equality). Without transactions costs, to keep distribution unchanged, rich and poor must have identical time preferences.

Table 4.1 shows the effect of greater wealth on discount rate, wealth, income, capital turnover, and future-orientation.

4.2 Broader Implications[A]

Discount Rate, Wealth, and Firm Size:

The fall in discount rate with wealth and firm size is the other side of the balance from the rise in wage with wealth and firm size. General equilibrium, given transactions costs, is not possible without both. For instance, if poorer people and smaller firms pay or impute lower wages, and obtain a higher marginal product of land, they can bid a higher rent for any kind of land than richer people and larger firms. But, due to their lower discount rate, richer people and larger firms can still bid a higher price for the kinds of land in which they enjoy a

Table 4.1

Increased Land Size, T, in a Multi-Period Model With Stable Distribution

1. Discount rate and ROI: MP of land/land price	$r = g'(T)/c$	-
2. Consumption = Income = Profit:	$y = g(T)$	+
3. Wealth = Present value of firm:	$W = V = y(1+1/r)$	+
4. Capital turnover:	$TN = y/W$	-
5. Future orientation:		+

comparative advantage, as shown in Chp. 3.

A fall in discount rate with wealth and firm size is of course a necessary consequence of "capital market failure", which economists acknowlege more often than the corresponding labor market failure. Nonetheless, some find it hard to believe that the rich and big firms really get a lower return on investment--see discussion in Chp. 6 and Chp. 9.

Wealth and Future-Orientation:

Sec. 4.4 simply assumes that, to maintain a stable unequal distribution, future-orientation rises smoothly with wealth. A more realistic assumption is that average future-orientation rises with wealth. This assumption would produce social mobility: At each level of wealth, those with greater than average (for that wealth) future-orientation would be saving and growing wealthier; while those with lower than average future-orientation would be dissaving and growing poorer. Yet overall distribution needn't change.

A rise in future-orientation with wealth exaggerates differences between richer and poorer due to transactions costs. Even without the rise, richer people would necessarily have a lower discount rate than poorer ones. The rise in future-orientation enlarges the difference in discount rates. Without transactions costs, of course, differences in future-orientation cannot affect the uniform market discount rate.

CHAPTER 5

DIFFERENCES BETWEEN LARGE AND SMALL, GIVEN APPRECIATING AND DEPRECIATING CAPITAL, AND VARIATIONS IN LAND QUALITY

In the real world, production doesn't happen "instantaneously" as assumed in the first four chapters. Rather, it usually happens in cycles, which may be as short as the few minutes to fry a hamburger in a fast food joint, as long as the decades between planting and cutting a tree, or as long as the life of a Roman aquaduct. Over that cycle, assets may appreciate like the tree, or depreciate, like the aquaduct.

How do richer and poorer people, larger and smaller firms-- "Large" and "Small" for short--behave given such possibilities? How does their behavior differ if they all occupy the same quality land, as assumed in Chapters 1, 2 and 4? How does it differ if they can occupy different quality land according to their comparative advantages, as shown in Chapter 3?

Sec. 5.1 describes the models and basic results of Chp. 5. Sec. 5.2 suggests some broader implications.

5.1 Models and Basic Results[A]

Sec. 5.3 presents the basic "point input--point output" model of the appreciating asset, like trees in the forest. Sec. 5.4 presents the "point input--continuous output" model of the depreciating asset, such as buildings in a city.

In both models, landowners determine the optimal life cycle of their trees or buildings by maximizing the present value of their land. This optimal life cycle, (given a wage and discount rate), is an intrinsic property of the production function, just like the intrinsic labor-intensity, as defined in Chp. 3. Sec. 5.5 shows why Large may have a comparative advantage in activities with intrinsically longer cycles.

The models show how Large and Small differ in a number of economic measures (Table 1), notably length of cycle, gross income per acre, profit per acre, average product of labor, labor share of output, and capital turnover. The measures are calculated under two polar assumptions, with two subcases each :

1. Large and Small occupy the same quality land.

a. The differences of Large and Small are measured by an outside observer who imputes the same wage and discount rate to both.

b. The differences of Large and Small are measured in terms of their own internal wage and discount rate.

2. Large occupies so much better quality land than Small that quality differences swamp differences due to wage and discount rate.

a. Better quality land yields the same output with less labor.

b. Better quality land produces more with the same labor.

There's a good practical reason for comparing effects of the two polar assumptions: In any real world empirical work, it may be very difficult to measure the difference in quality of resources owned by richer or poorer people, larger or smaller firms. So it's important to know which differences, like cycle length, are sensitive to resource quality; and which, like average product of labor, are not sensitive.

Perspective--observer's or owner's--can make a difference too. For example, when an observer measures the value of property, (land plus improvements like trees or buildings), he implicitly or explicitly assumes some average or "market" wage and discount rate. The owner of property measures value by his own internal wage and discount rate--

different for Large and Small. As a result, it appears to an observer that most landowners, Large and Small, do not maximize present value (or profit), --because they do not use the cycle length that is "correct" for the wage and discount rate he imputes.

Empirical studies of differences between Large and Small generally ignore perspective. They may even mix internal and external perspectives, for example measuring property value at "market", and labor costs by the actual wage bill. So it helps the interpretation of data to know which differences hold regardless of perspective, and which do not.

Principal Results:

1. The major results of earlier chapters still hold: As in Chp. 3, Large has a comparative advantage in owning "better quality" land, that is, land where production is less intrinsically labor intensive. Such land is of course more valuable per acre. Regardless of land quality, Large always shows a higher average product of labor. By external measures, and except in one odd case by internal measures too, Large shows lower capital turnover--gross income divided by value of property. It's of course well-documented that average product of labor rises, and capital turnover falls with firm size.

2. By external measure on the same quality land, and in general on better quality land, Large enjoys a higher profit share of income. It's well-documented that profit share of income does in fact rise with firm size. This higher "profitability" of bigger firms is usually attributed either to monopoly profits, or, at the University of Chicago, to greater "efficiency". In fact, higher profitability may merely signal greater capital-intensity.

3. For both trees and buildings, Large uses a longer cycle of

production than Small, on the same quality land. Assuming staggered production, this means that Large's trees or buildings are older on the average. However, for a given wage and discount rate, the better the quality of land, the shorter the cycle. Hence, if Large owns very much better quality land than Small, Large may in fact use a shorter cycle than Small. So it is impossible to predict whether Large uses a longer or shorter cycle than Small, unless they demonstrably occupy the same quality land--such as identical, adjoining property.

4. Large and Small do not differ consistently in other economic measures, unless they occupy the same quality land. Thus, as in earlier models, Large generally gets lower gross income per acre--output per cycle divided by cycle length--on the same quality land, but higher gross income per acre on much better land. Also as in earlier models, Large shows a higher labor share of output on the same quality land, but a lower labor share on much better land.

5. The tree and building models differ in few, but significant, ways. For example, on the same quality land, Large owns a higher ratio of trees (appreciating asset) to land by value, but a lower ratio of buildings (depreciating asset) to land by value, as measured by an outside observer. On much better land, the ratio of improvement to land value is always lower, for trees or buildings. So, to an observer, Large always shows a lower ratio of depreciating assets to land.

There's one curious circumstance where Large may get higher instead of lower gross income per acre on the same quality land. In the tree model for low labor costs and a long enough cycle to make interest costs quite important, gross income may rise a bit before falling as cycle lengthens. That is, there may exist a region of increasing returns to cycle length. For example, imagine that Small cuts a forest for firewood while Large cuts it less often for lumber. The output may be so much more valuable as lumber that gross income increases up to a point as cycle lengthens. (I doubt this ever really happens.)

6. The way in which better land is better makes a difference in some cases. For example, if better land requires less labor for given output, labor per acre and labor cost per acre fall as quality improves. If better land yields more output for given labor, labor per acre and labor cost per acre may rise as quality improves. Thus, although on the same quality land, Large uses less labor, but pays or impute a higher labor cost--on better quality land, Large may use less or more labor, and pay less or more for it.

Table 5.1 summarizes results for all measures of differences between Large and Small.

7. For convenience, the tree and building models allow only one "current" input: labor. (The cost of a "current" input, like labor, appears on a firm's income statement; while the cost of an "investment", like a land purchase, appears on a firm's balance sheet). All the results follow from the assumption that, due to transactions costs, Large pays or imputes a higher wage. But the results still hold allowing other current inputs like materials, provided that on the average, Large pays or imputes a higher price for all current inputs including labor. To assume otherwise would violate the basic assumption in Chp. 1, that transactions costs ultimately outweigh any economies of scale (like bulk discounts), creating net diseconomies. So the predictions of the models can be tested on data from real life firms.

8. For very short cycles of production, the tree and building models

become identical to each other and to the "instantaneous" production, profit-maximizing models in previous chapters. If production is not essentially instantaneous, but cycle length times discount rate is very small (much less than one), then profit-maximization still gives the optimum cycle length, but the models differ from each other and from instantaneous production models. In other words, unsurprisingly, profit-maximization closely approximates present value-maximization if very little interest accumulates during a production cycle--true for small cycle length times discount rate. But if cycle length times discount rate is not small, profit-maximization gives too long a cycle for trees, and too short a cycle for buildings--compared to the correct cycle given by present value-maximization.

Table 5.1
(See Tables 5.3 & 5.4 for Derivations)

	Economic Measure	TREE MODEL				BUILDING MODEL			
		Grtr Wealth		Better Land		Grtr Wealth		Better Land	
		Observer	Owner	Lowr Labr	Highr Prod	Observer	Owner	Lowr Labr	Highr Prod
1.	Cycle length: z	+	+	-	-	+	+	-	-
2.	Cycle x discount: rz	+	- mstly*	-	-	+	- mstly	-	-
3.	Output/cycle OP	+	+	-	+	+	+	-	+
4.	Gross income/acre: Y = OP/z	+ ir† - dr	+ ir - dr	- ir + dr	+	-	-	+	+
5.	Labor/acre: L	-	-	- mstly	+	-	-	-	+
6.	Labor cost/acre: wL	-	+ mstly	-	+	-	+	-	+
7.	Rent/acre: R = rV	0	-	+	+	0	-	+	+
8.	Profit/acre: P=Y-wL	+th-**	-	+	+	+ th-	-	+	+
9.	Av.prod.labor: AP=Y/L	+	+	+	+	+	+	+	+
10.	Labor share: LS=wL/Y	-	+	-	-	-	+	-	-
11.	Rent share: RS=R/Y	- ir + dr	-	+	+	+	-	+	+
12.	Profit share: PS= P/Y	+	-	+	+	+	-	+	+
13.	Land value/acre: V	0	0	+	+	0	0	+	+
14.	Total val/acre: W=P/r	+	+ mstly	+	+	-	+ mstly	+	+
15.	Impr.val/acre: IM=W-V	+	"	- or?	+	-	"	-	?
16.	Ratio IM/V	+	"	-	-	-	"	-	-
17.	Capital turnover: TN = Y/W = r/PS	-	- mstly	-	-	-	-	-	-

* "mostly" -- see text and Table 5.3 or 5.4 for explanation.
† Increasing returns and decreasing returns to time. See text & Table 5.3
** "+ then -" as cycle length goes from min to max. See text & Tables 5.3 & 5.4.

5.2 Broader Implications[A]

The tree and building models in fact apply to a wide variety of activities. Hence they predict differences in behavior of richer and poorer people, larger and smaller firms in many different circumstances:

Applications of the Tree Model for Appreciating Assets:

The tree model applies at least roughly to any production process that results in batches of goods which increase in value with time until sold or used at the end of a cycle. The cycle may be intrinsically long, as for trees, or intrinsically short, as for baked goods.

Wine aging in a cellar is another familiar example of goods produced on a long cycle. The cellar owner again maximizes the present value of land: space in his cellar. For cellar space, like forest land, is the limited resource to which the owner imputes rent. New wine can be laid down to age only when the old wine has been sold.

Manufactured goods also fit the model. In most cases, producing goods on a longer cycle increases their quality and value, to a point. (The workmen aren't so rushed; the first coat of paint can dry before the second is applied, and so on). Again, the owner maximizes the present value of scarce factory space.

And inventory held for retail also fits the model. Of course, most inventory does not increase in quality while the retailer holds it. But up to a point, the price the retailer can get increases with the time he holds the inventory. This happens simply because it takes time to make sales. The retailer must wait for customers to come by; the higher his prices, the fewer come, and the less they buy. So the value of a batch of goods can be written as an increasing function of the time they remain in inventory (until they significantly deteriorate). The retailer sets his prices to maximize the present value of limited shelf and storage space, thus choosing the rate his inventory turns over.

So the tree model suggests that, holding constant the quality of the location, richer people and bigger companies age wines longer, produce better quality goods, and sell equivalent goods for higher prices while carrying longer inventories. Not holding constant the quality of location, this contrast may not hold. For in more valuable locations, it pays to speed up the cycle, replacing the wine more often, cranking out goods faster, and turning over inventories faster.

Applications of the Building Model for Depreciating Assets:

A building delivers a flow of services, from construction or purchase time, until demolition or selling time. Usually, the service flow declines steadily, at least as the building gets old. Whether or not service flow declines, the building depreciates--because it approaches the end of its useful life. (It would depreciate even if its service flow remained constant, then suddenly ceased, like the one hoss shay). The amount of depreciation over the building's life just equals the cost of construction or purchase.

The building model applies at least roughly to any asset that yields a flow of services or income until replaced. Such assets include roads, machinery, reference books in a library, refrigerators, cars, clothing and "durables" in general. In addition, such assets include things that produce a continuous flow of physical output over their lives, such as fruit trees or power plants.

So the building model, like the tree model, also covers a broad range of production. In fact, most production can be treated as a combination of the tree and building models--such as a factory whose plant and equipment produce batches of goods for sale.

Note that the same asset may be appreciating or depreciating at different stages in its physical life. For example, a refrigerator appreciates on the manufacturer's assembly line; it then depreciates in the purchaser's kitchen.

So the building model says that richer people and bigger firms as a generalization carry a lower ratio of depreciating to non-depreciating assets. On the same quality land, they replace roads, buildings, machinery, orchards, etc. less frequently. On better land, they may replace more often.

<u>A Comment on Mining</u>:

The tree and building models do not quite fit one major form of economic activity: the mining of non-renewable resources. It seemed excessive to construct a separate mining model. However, mining poses some interesting problems.

It is obvious without a model that Large has a comparative advantage in owning better quality mines: better located, with higher grade ore, thicker seams--in general where extraction and transportation costs claim a lower share of output. It is also obvious that Large has a comparative advantage in holding mineral resources for appreciation before production begins, while Small has a comparative advantage in operating nearly-depleted mines.

But, does Large deplete a given mine slower or faster? Analogy with tree and building models suggests "slower". But the correct answer may depend on the characteristics of the mine.

Schematically, the cost of a mine has two components. First, there is the initial investment digging shafts or wells, building roads or laying pipes. Then there are extraction costs. The greater the initial investment--eg. the closer the shafts, the bigger the crushing plant--the greater the capacity of the mine. And the greater the capacity, the larger the flow of output for a given extractive cost, and the shorter the life of the mine.

Clearly, for a given initial capacity, Large extracts slower, due to higher labor costs. But does Large invest more or less in capacity? On the one hand, greater capacity saves future labor costs. But on the other hand, greater capacity shortens the life of the mine, possibly increasing labor costs over the life of the mine. The exact tradeoff may differ for different sorts of mines.

Note that, as for trees and buildings, a given mining company's production cycle may be shorter than the life of the mine. One company may hold a mine for appreciation from discovery to start of production. Another may mine it during its best years. And a third company may scratch out the remains. But, unlike tree or building owners, mine owners must necessarily buy new land at the end of each cycle of production.

CHAPTER 6

WEALTH, FIRM SIZE, AND RISK

The models so far have not treated risk explicitly, though risk-averse behavior presumably contributes to transactions costs. But the models do in fact lead to some significant and novel predictions about differences in behavior toward risk between richer and poorer people, larger and smaller firms.

Sec. 6.1 summarizes the predictions of the models. Sec. 6.2 draws implications for the long-standing controversy over whether richer people and larger firm managers are--or should be--less or more risk-averse.

6.1 Predictions

Suppose we define a good called "security", which depends on two aspects of risk: a) the proportional variability or "riskiness" of net income, as measured by standard deviation over expected value, and b) the proportional skewness of risk, as measured by the third moment (positive for an upward skew, and negative for a downward skew) over expected value--"proportional third moment". Security varies inversely with riskiness. It varies directly with proportional third moment. So people may seek riskiness with an upward skew: a small chance of large gain balancing a large chance of small loss. They may avoid riskiness with no skew or a downward skew: a small chance of large loss balancing a large chance of small gain.

Notice that this definition of security explains the gambler who buys fire insurance not, a la Friedman and Savage, by the relative size of fire risk and odds at the track, but by the relative skew of the risks. Fire risk is skewed down, and track odds are skewed up. Odds in risky endeavors like inventing and wild-catting are presumably skewed upwards, possibly making them very attractive to people with relatively little to lose.

Sec. 6.4 shows formally the properties of riskiness and proportional third moment. There's a close relationship between them: most actions that lower riskiness--like buying insurance, pooling risks, or reducing leverage--also bring proportional third moment closer to zero. So when risk is skewed upward, there's a loose trade-off between lower riskiness and higher positive proportional third moment.

The models of the preceding chapters suggest that richer people and managers of larger firms consume more security, as the empirical evidence seems to show. They are also less likely to be in a position of high positive proportional third moment, as again the empirical evidence seems to show.

In brief, assuming security is a normal good, consumption will increase with wealth and firm size unless the cost of producing security rises drastically. Richer people and bigger firms have many advantages and some disadvantages in production of security: They hire better people (but supervise them less), they are less leveraged, and they enjoy economies of scale in risk-pooling. But the latter two advantages, plus sheer size, reduce upward skew of riskiness and hence the attractiveness of entrepreneurial risk-taking or innovation. Sec. 6.3 reviews these arguments.

Of course security is a future good, although riskiness and proportional third moment can only be measured after the fact. So people actually consume perceived discounted security. As shown in Sec. 6.5, the fall in discount rate with wealth or firm size may greatly affect perceived security (or insecurity).

In a couple of plausible situations, as shown in Sec. 6.5, the lower the discount rate, the higher the perceived riskiness:

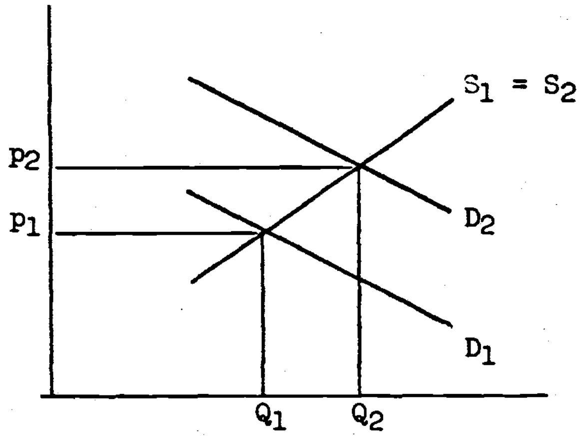
a) receipt of income preceeds liability. This is par excellence the case when someone borrows money to make an investment due to pay off before the loan must be repaid. Such a loan may seem far less risky to a desperate or rosy-glassesed small businessman than to his fish-eyed banker. For the businessman gives proportionally more weight to the near receipt than to the more remote liability.

b) an investment yields a stream of income (or other benefits) that grows increasingly risky with distance in the future--an apt description of virtually all investments. If riskiness rises fast enough with distance into the future, such an investment may look so much riskier to a richer than a poorer person, that the poorer person can outbid a richer one. That is, a richer person adds so much larger a risk premium to his discount rate as to value the investment lower than the poorer person. Examples of such investments might be used cars and machinery, nearly-depleted oil fields, etc.

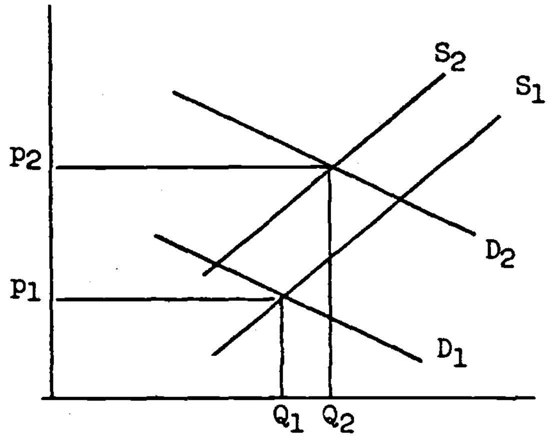
On the other hand, a lower discount rate raises instead of lowers perceived security when riskiness arises primarily from illiquidity. An illiquid asset is one whose market is "thin". Hence a seller may have to wait a long time to find a buyer offering a good price. A lower discount rate gives richer people greater waiting power, and hence a comparative advantage in owning illiquid assets: Old Masters, country estates, controlling blocks of stock, etc.

6.2 Wealth, Firm Size, and Risk-Aversion

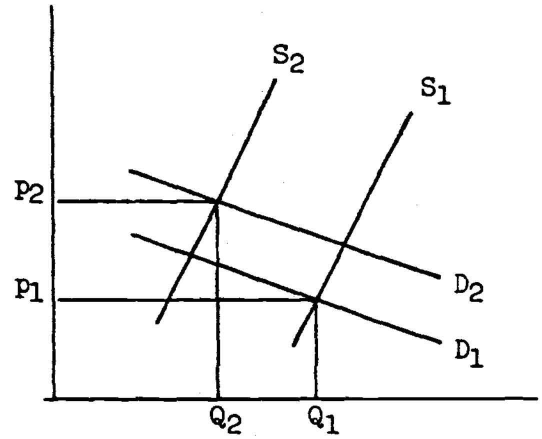
What of the controversy over whether richer persons and managers of



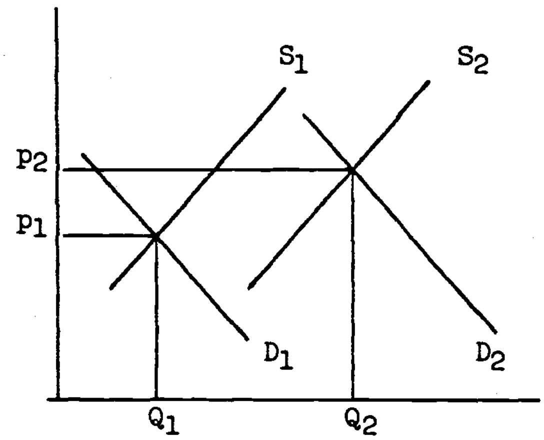
Case 1: Supply does not shift but demand shifts out.



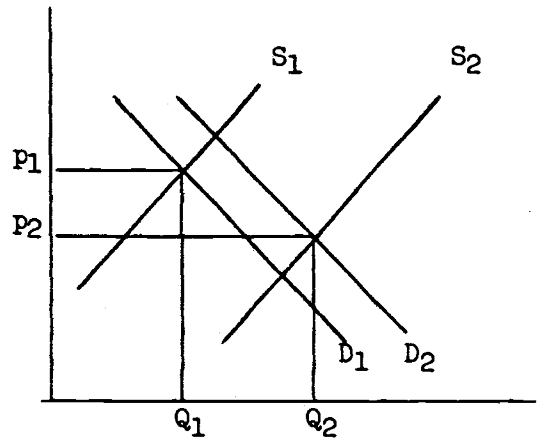
Case 2a: Supply shifts in slower than demand shifts out.



Case 2b: Supply shifts in faster than demand shifts out.



Case 3a: Supply shifts out slower than demand shifts out.



Case 3b: Supply shifts out faster than demand shifts out.

Fig. 6.1: Changes in price and quantity of non-market goods, assuming demand always shifts outwards with wealth or firm size, but supply may shift in or out or not at all.

larger firms are or should be less or more risk-averse?

Partly the controversy depends on definitions, and partly on analysis.

a. "Richer persons or larger firm managers are less risk-averse because they can undertake larger absolute risks." Perfectly true, but not very interesting. For they may still take smaller proportional risks. The analysis above assumed "security" to depend on proportional risk: "riskiness".

b. If risk-aversion depends simply on the demand for security, then the mere assumption that security is a normal good--one whose demand curve shifts outwards with wealth or firm size--makes richer persons and larger firm managers more risk-averse. If security is a superior good, that makes them very much more risk-averse.

c. Risk-aversion could depend on the implicit price of security. If the demand curve shifts out faster than the supply curve then the implicit price rises and resources move to increased production of security at the expense of other production. This is clearly what Caves and others mean when they argue that managers of larger firms are more risk-averse. On the other hand, if the supply curve shifts out faster than the demand curve, the implicit price falls, and resources move away from security to production of other goods. This could be called decreased risk-aversion. In either case, however, consumption of security increases.

d. It's possible to argue that, due to their superior risk-pooling ability, richer persons and managers of larger firms can better undertake investments that are riskier in isolation. This argument does not truly concern risk-aversion at all, but the technology of risk-pooling. It amounts to a claim that risk-pooling offers such huge economies of scale that an individually riskier investment adds less riskiness to a larger portfolio than an individually safer investment adds to a smaller portfolio. So richer persons and managers of larger firms can take on individually riskier investments, and yet still have safer portfolios.

Does risk-pooling truly offer such dramatic economies of scale? Four points cut against the argument.

First of all, economies of scale in risk-pooling require some statistical independence of investments. Independence may hold for routinized investments like insurance policies or small bank loans. But more unusual investments probably depend heavily on common factors like quality of management or the state of the stock market.

Second, to save on supervision costs, richer persons and larger firm managers prefer bigger individual investments. This preference limits the number of investments in the pool, and hence the gains from pooling.

Third, for the same reason, they also prefer investments that require less supervision--probably making them intrinsically less risky.

Finally, consider employees' incentives. Suppose that employees get punished for losses. But the more investments they take on, the greater the probability of <u>some</u> losses, --even though standard deviation falls. So taking on more investments makes employees' personal riskiness higher and proportional third moment more negative. They logically limit investments, at a sacrifice in gains from pooling.

These points also weaken any claim that larger firms should innovate more. Innovations are not highly poolable investments, and they probably require close supervision and good employee incentives.

e. Sometimes the argument in d. may go one step further: "Richer persons and managers of larger firms have so great an advantage in risk-pooling that they can take on such risky investments as to enjoy both lower riskiness and a higher return on investment."

This argument violates the assumption of Chp. 1, necessary for general equilibrium, that transactions costs must eventually outweigh any economies of scale. And the argument is internally contradictory anyway. For richer individuals and managers of larger firms have a comparative advantage in risk-pooling for exactly the same reason they get a lower return on investment: transactions costs. Transactions costs simultaneously keep them from investing their money at higher rates of return, and keep poorer persons and smaller firm managers from getting together to pool risks. To put it another way, risk-pooling and other activities showing economies of scale are just some of the many ways richer people and larger firm managers mitigate transactions costs.

6.3 Implications of Previous Chapters for Consumption of Security

Definition and Measurement of Security:

As described in Sec. 6.1, assume an individual's security depends on the riskiness of his expected income stream (wages plus profit or share of profit), and on the skewness, as measured by proportional third moment (PTM).

Note that the riskiness and PTM of an individual's income may differ considerably from those of the firm he owns or manages. As an extreme example, if an individual draws the entire expected net revenue of his firm as salary, expected profit is zero and riskiness of profit is infinite. Yet the riskiness of the owner's income might be quite low. And the riskiness and PTM of a firm manager's income includes the possibility he may be fired--a fact which should not directly affect the riskiness or PTM of the firm's profits. (It may affect riskiness indirectly by making the manager act more risk-averse.)

Obviously, the riskiness and PTM of firm owners' and managers' total income affects their decisions about the firm's operations, more than the riskiness and PTM of the firm's profit in the abstract. That poses a problem of measurement, since data on riskiness and PTM may exist only for firms. But assume, as seems reasonable, that riskiness and PTM for firms and for their owners and managers largely coincide.

Consumption of Security:

Demand for security obviously must increase with wealth and firm size. For security is surely a normal good. Assuming future-orientation increases with wealth, as argued in Chp. 4, security may even be a superior good.

So unless supply of security falls drastically with wealth or firm size, consumption must increase. (Given transactions costs, the supply of leisure does in fact fall drastically with wealth and firm size. Hence the assumption of Chp. 1 that, even though leisure is a normal good, consumption of leisure falls with wealth or size of firm managed.)

Why might supply of security rise or not fall more than demand rises as wealth or firm size increase?

The Supply of Security--Factors Reducing Supply:

A simple assumption underlies the models presented so far: Less well supervised employees produce less from given land. Likewise, the expected value of rent collected from tenants falls as the supervision rate falls. Yet there are only 24 hours in a day, and richer people value their time more highly. So richer landowners necessarily supervise less. Consequently, per acre output and rent fall with wealth.

Obviously, lower supervision of tenants--resulting in a higher default rate--increases the riskiness of rent, and lowers an already negative PTM.

Assume the same holds for employees. Lower supervision of employees increases the riskiness of output.

And lower supervision also logically lowers PTM. Less well supervised employees more often blunder or steal than achieve an unexpected feat of productivity (for which they would receive little or no reward). Innovation presumably has a positive PTM. But innovation also requires strong motivation and close attention, --liable to fall as supervision falls.

PTM logically falls with wealth or firm size for another reason: market size or physical environment increasingly limit possible proportional gains. For example, a struggling small businessman might have a slight chance of "making it big", possibly multiplying his wealth a hundredfold, versus a large chance of losing his small shirt--for a net positive PTM. And a small oil company has a much better chance to make a relatively big strike than does a big oil company. But the manager of a large corporation faces a good chance of a modest appreciation in the value of his shares of stock, versus a slight chance of losing his job--for a net negative PTM.

These factors all shift the supply curve of security inwards.

The Supply of Security--Factors Increasing the Supply:

As shown in Chapters 2 and 3, richer persons or managers of larger firms respond to their shortage of supervisorial time in many ways other than just reducing supervision. These responses simultaneously reduce riskiness and either raise PTM, and/or move it closer to zero.

(1) Better Employees:

First of all, richer persons hire more skilled and reliable employees, at a higher wage. In so doing, they conserve supervisorial time at a sacrifice in net instead of gross output. But hiring better employees surely reduces riskiness and raises PTM as well.

(2) Lower Leverage:

Second, richer persons generally choose lower leverage, both operating leverage and financial leverage--again as a means of conserving supervisorial time. But, as shown in Sec. 6.6, lower leverage brings lower riskiness. It also brings PTM closer to zero, raising negative PTM but lowering positive PTM, as shown in Sec. 6.4.

a. Operating leverage. By definition, operating leverage equals gross income divided by net income--gross minus operating costs.

Operating leverage falls with firm size due to rising comparative advantage in activities with low intrinsic labor-intensity, as shown in Chapter 3. So costs of hired labor and other current costs fall as a proportion of output. In general, richer persons and larger firm managers prefer more durable assets--assets showing a proportionally high ratio of income flow to depreciation costs.

b. Financial leverage. Financial leverage in Sec. 2.7 equals gross income divided by gross income minus rental payments. More generally, it is gross income divided by gross income minus debt service. (Debt service can be analyzed as rent plus installment purchase, so the difference isn't that great.)

Financial leverage falls with wealth because richer landowners can conserve their labor (direct or supervisory) by renting less additional land. (Corporations can similarly conserve managerial labor by taking on less debt.) In fact, as Sec. 2.7 shows, if rent per acre were fixed--as it would be in a world without transactions costs--richer landowners would actually rent so much less additional land as to operate smaller farms! Only if per acre rent falls as leverage falls (and possibly also as quantity of rented land increases) do acreage of rented land and farm size increase with wealth. This fall in rent reflects the assumption that it costs more per acre to supervise a small, highly-leveraged rental agreement than a large, less-leveraged one.

Of course a landowner faces a tradeoff between operating and financial leverage. He can lower his operating leverage by renting more land, --at the cost of raising his financial leverage.

(3) Economies of Scale:

Any activity probably offers some economies of scale in risk-pooling. Moreover, as shown in Chapter 3, richer individuals and larger firms enjoy a general comparative advantage in activities offering economies of scale, --presumably including those offering particularly great economies of scale in risk-pooling. And given minimum (ordinary) economies of scale in any activity, richer individuals and larger firms can diversify at lower cost.

As shown in Sec 6.4, risk-pooling reduces riskiness and moves PTM closer to zero, raising a negative PTM but lowering a positive one.

(4) Lower Supervision Cost Activities:

As shown in Chapter 3, richer individuals and larger firms enjoy a comparative advantage in activities with lower supervision costs. If, as seems plausible, riskier activities require more supervision, then richer individuals and larger firms have a comparative advantage in less risky activities. Less risky activities plausibly show a PTM closer to zero.

Discount Rate and Perceived Security:

Since security is a future good, people consume perceived discounted security, not riskiness and PTM as measured after the fact. As described in Sec. 6.1, and demonstrated mathematically in Sec. 6.5, a low discount rate makes some common kinds of investments look riskier to low discount rate persons, but illiquidity look less risky.

The Supply and Demand for Security Combined:

The demand curve for security shifts outwards with wealth or firm size. If security is a superior good, the demand curve may shift outwards quite rapidly.

Reduced supervision pushes the supply curve inwards. But better employees and tenants, lower leverage, risk-pooling and less risky activities push it outwards. Except perhaps for better employees, both pressures tend to reduce positive PTM. So the net effect isn't clear. But it seems plausible that supply at least doesn't fall.

So production and consumption increase with wealth or firm size, resulting in lower riskiness of income and profit, and, presumably, lower rates of employee turnover. Since lower riskiness also means PTM's closer to zero, rates of personal bankruptcy or firm failure fall. And if innovation requires a high positive PTM, innovation falls too.

But what about the implicit price of security in terms of other goods? Does the supply curve shift out slower than the demand curve, so that the implicit price rises, and resources transfer from producing more of other goods to producing more security? Or does the supply curve shift out faster than the demand curve, with the opposite result?

Considering the possibly large outward shift in the demand curve, and the conflicting pressures on the supply curve, the first possibility seems more likely.

But the question might prove hard to resolve empirically. For of course the same actions that reduce riskiness and bring PTM closer to zero also conserve scarce supervisorial time. How could one really tell if richer individuals and larger firm managers keep leverage lower and pool risks more than they would if wealth and firm size did not affect the demand for security?

The price and extent of insurance seem at first glance to offer some measure of the implicit price of security in terms of conventional goods. But even insurance also conserves time that might be spent keeping a closer watch on things. (Few losses stem purely from "acts of God". Hence the "moral hazard" to insurers: insurance makes losses more probable.)

In any case, it's certainly plausible that large firm managers do in fact divert considerable resources into producing "the quiet life" for themselves.

CHAPTER 7

GENERAL EQUILIBRIUM EFFECTS OF MORE INEQUALITY OR SUPERVISION COSTS

The "supply-siders" claim more inequality is good for the U.S. economy. More inequality clearly isn't good for the simple Clone economy of Chapter 1.

Even without transactions costs, more inequality lowers total labor supply and output of the Clone economy, though it raises the economywide wage! With transactions costs, more inequality lowers total labor supply and output even more. It raises wages of richer people, drives down wages of poorer people, and lowers average wages for the whole economy. Perversely, more inequality raises economywide output per manhour, by reducing employment proportionally more than output. (So much for the shibboleth of high labor productivity!)

Higher transactions costs, given inequality, have much the same effect as more inequality given transactions costs.

Sec. 7.1 summarizes basic results of Chp. 7. Sec. 7.2 draws some further implications for land use patterns, and communist revolutions.

7.1 Summary[A]

Suppose for convenience there are only two farmers in the Clone economy of Chp. 1. Call the farmer with half or more land the "landlord" and the other farmer the "peasant". When distribution is unequal, the landlord may hire the peasant, subject to a supervision requirement, with neither acting as monopolist or monopsonist.

What happens as distribution of land between the two becomes more unequal?

What happens if the required rate of supervision increases?

Table 7.1 summarizes the overall results as distribution of land goes from equality to complete inequality between landlord and peasant, and as transactions costs rise, given inequality.

As inequality increases, the economy goes through three phases, as explained in Sec. 7.3:

In Phase I, the supervision requirement precludes the landlord from hiring the peasant, so the two behave as independent landowners of different size. Sec. 7.4 describes Phase I.

In Phase II, the landlord hires and supervises the peasant, but continues to perform the same work alongside.

In Phase III, the landlord merely supervises his employee.

What happens within the phases depends on the required supervision rate.

Greater Inequality at a Zero Supervision Rate (Sec. 7.5):

At a zero supervision rate, Phase I does not exist. The moment distribution becomes unequal, the landlord hires the peasant and works beside him at a wage initially equal to the marginal product of labor on both pieces of land at equal distribution.

As distribution becomes more unequal, income effect leads the landlord's personal labor supply to fall faster than the peasant's hired labor supply rises at a given wage. So the wage rises to equate supply and demand for hired labor. As the wage rises, total labor supply and output fall.

The economy goes into Phase III when the landlord stops doing any work himself. Now the peasant supplies all the labor of cultivation on both his own and the landlord's land. As the peasant's own land decreases, income effect leads him to offer more hired labor at the

Table 7.1

Effect of Increased Inequality with Supervision Cost: A

Effect of Increased Supervision Cost, Given Inequality: B

<table>
<tr><th></th><th colspan="2">A</th><th colspan="2">B</th></tr>
<tr><th></th><th>lo*</th><th>hi</th><th>lo</th><th>hi</th></tr>
<tr><td>1. Labor:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Peasant's total personal:</td><td>+</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Self = applied:</td><td colspan="2">-</td><td colspan="2">+</td></tr>
<tr><td>Hired:</td><td colspan="2">+</td><td colspan="2">-</td></tr>
<tr><td>Landlord's total personal:</td><td>-</td><td>+</td><td>+</td><td>+?</td></tr>
<tr><td>Self:</td><td colspan="2">-</td><td colspan="2">+</td></tr>
<tr><td>Supervisory:</td><td colspan="2">+</td><td>+</td><td>-?</td></tr>
<tr><td>Applied = self + hired:</td><td colspan="2">+</td><td colspan="2">-</td></tr>
<tr><td>Total; personal, applied:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>2. Applied labor per acre:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>On peasant's land:</td><td>-</td><td>+</td><td colspan="2">+</td></tr>
<tr><td>On landlord's land:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>Simple average:</td><td>-</td><td>+</td><td colspan="2">+</td></tr>
<tr><td>Overall (weighted average).</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>3. Wage and MP labor (MPL):</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Peasant:</td><td>+</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Landlord; wage:</td><td colspan="2">+</td><td>+</td><td>?</td></tr>
<tr><td>MPL:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td>Difference; wage:</td><td colspan="2">+</td><td>+</td><td>?</td></tr>
<tr><td>MPL:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td>Simple avg; wage:</td><td>+</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>MPL:</td><td>+</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Weigtd avg:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td>4. Output:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>On peasant's land:</td><td colspan="2">-</td><td colspan="2">+</td></tr>
<tr><td>On landlord's land:</td><td colspan="2">+</td><td colspan="2">-</td></tr>
<tr><td>Total:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>5. MP land = rent:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>On peasant's land:</td><td>-</td><td>+</td><td colspan="2">+</td></tr>
<tr><td>On landlord's land:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>Simple avg:</td><td>-</td><td>+</td><td colspan="2">+</td></tr>
<tr><td>Weighted avg:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
</table>

* "lo": "low supervision rate". "hi": "high supervision rate".

Table 7.1, cont'd

<table>
<tr><th rowspan="2"></th><th colspan="2">A</th><th colspan="2">B</th></tr>
<tr><th>lo</th><th>hi</th><th>lo</th><th>hi</th></tr>
<tr><td><u>6. Output/manhour</u>:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>On peasant's land:</td><td>+</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>On landlord's land:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td>Overall:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td><u>7. Output/acre</u>:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>On peasant's land:</td><td>-</td><td>+</td><td colspan="2">+</td></tr>
<tr><td>On landlord's land:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>Overall:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td><u>8. Labor share of output (labor cost/output)</u>:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>On peasant's land:</td><td>+</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>On landlord's land:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td>Overall:</td><td colspan="2">+</td><td colspan="2">+</td></tr>
<tr><td><u>9. Ordinary income</u>:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Peasant's:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
<tr><td>Landlord's:</td><td colspan="2">+</td><td colspan="2">?</td></tr>
<tr><td>Total:</td><td colspan="2">-</td><td colspan="2">-</td></tr>
</table>

given wage. So the wage falls again to equate supply and demand for hired labor, and total labor supply and output rise again. However, total labor supply does not rise back to its level at equal distribution, and the peasant's wage does not fall back to its value at equal distribution. So total production does not rise back to its equal distribution level either.

Section 7.5 develops in detail the effect of greater inequality in the absence of a supervision requirement. Table 7.2 in Section 7.5 summarizes the results.

<u>Greater Inequality, Given a Supervision Requirement (Sec. 7.6):</u>

Given a supervision requirement, and hence a supervision cost, the landlord does not hire the peasant the moment distribution becomes unequal.

First, Phase I applies. In Phase I, by the assumption that labor supply is a concave function of land size, total labor supply falls. For as distribution becomes more unequal, the peasant's labor supply on his shrinking piece of land falls faster than the landlord's labor supply increases. So total output falls.

The ratio of labor to land rises on the peasant's land, so that the peasant's wage, which equals his marginal product of labor, falls. The ratio falls on the landlord's land, so that the landlord's wage and marginal product of labor rise. Section 7.4 describes Phase I in detail. Table 7.3, column 1, in Section 7.6 summarizes effects of increased inequality in Phase I.

The landlord hires the peasant only when distribution has become sufficiently unequal that the marginal product of labor on the peasant's land equals the marginal product of labor on the landlord's land less supervision costs. Phase II begins here.

At the start of Phase II, the landlord pays the peasant a wage equal to the marginal product of labor on the peasant's land. As distribution becomes more unequal, this wage falls at first, then rises again. However, total labor falls continuously. The higher the supervision rate, the larger the region of distribution within Phase II in which the wage falls, and the less the net increase (if any) in wage during Phase II. Also, the higher the rate, the larger the decrease in total labor supply, and hence output.

The economy goes into Phase III when the landlord ceases to cultivate the land, but only supervises the peasant. Even for a zero supervision rate, increased inequality leads the peasant to offer more hired labor than the landlord demands, so the wage falls. However total labor supply and output rise. But the higher the supervision rate, the lower the landlord's demand for the peasant's hired labor, and the faster the wage falls. For a high enough supervision rate, total labor supply and output fall.

In Phase II, the landlord's wage rises or falls in proportion to the peasant's wage--since the landlord performs identical labor. In Phase III, the landlord's wage simply rises.

At a very low supervision rate, the economy behaves mostly like the economy with no supervision rate. At a high supervision rate, the economy behaves pretty much as in Phase I: total labor supply, output, and the peasant's wage decline continually as distribution becomes more unequal.

Section 7.6 develops in detail the effects of greater inequality, given a low or high supervision rate. Table 7.3, column 2, in Section 7.6, summarizes the effects in Phase II. Column 3 summarizes the effect of greater inequality in Phase III. Column 4 summarizes the combined effect of greater inequality given a low or high supervision requirement.

Section 7.7 develops the effects of a higher supervision rate, given inequality. Table 7.3, Section 7.7, summarizes the results. Column 1 shows Phase II, column 2 shows Phase III, and column 3 shows the combined effect.

7.2 Further Implications[A]

1. The results of Chp. 7 have implications for land use patterns in an economy where land varies in quality: If greater inequality lowers the wage of poorer people, then it makes previously submarginal land supramarginal for any economic activity. In the classic location theory model of Chp. 3, greater inequality spreads out the bullseye of activities, pushing the boundaries between activities further from the center. Consequently, the more unequal the distribution of wealth, the greater the area and the lower the average quality of land a particular activity occupies. So paradoxically, greater inequality simultaneously reduces output, and increases the area of land in production.

As an example, in parts of Latin America large haciendas run low intensity cattle operations on the fertile valley bottoms--quite visibly pushing peasant farming out onto what should be submarginal land: the steep eroding hillsides.

2. Western economists love to point out the hideous inefficiencies of state planning in the communist countries. Chp. 7 suggests why, despite these inefficiencies, communist revolutions (not conquests) have to varying degrees succeeded in generating economic growth and raising average standards of living in previously very poor and stagnant areas, like the Soviet Union, China, or Cuba. For prior to revolutions, these

countries suffered from extreme inequality and archaic, corrupt government, which created a high level of transactions costs. According to Chp. 7, such inequality and transactions costs make an economy very inefficient. So communist revolutions, with their strong redistributive policies, presumably brought a net reduction in economic inefficiency.

CHAPTER 8

DYNAMIC EQUILIBRIUM DISTRIBUTION IN A SIMPLE ECONOMY

In the real world, distributions of wealth have other salient characteristics besides stability:

1. Save in the most primitive societies, distribution is and has been throughout the history of civilization, relentlessly unequal. Even after massive redistribution, as in communist revolutions, inequality seems to reassert itself.

2. The upper "tails" of distributions are far too long for any plausible random process to account for them. That is, the rich are far too rich to explain by luck.

3. Where distribution is extremely unequal, as in all but the very primitive less developed countries, it takes a characteristic "dual" form. A few "oligarchs" occupy the top of the social scale, and a large poverty-stricken mass occupies the bottom, with virtually no middle class in between. Many observers find a tendency to dualism in developed countries, and even among different size firms! For example, Robert Averitt describes American industry as The Dual Economy [Averitt, 1968].

4. Economic growth in most less developed countries makes distribution yet more unequal. In developed countries, or at least in the U.S and Great Britain where the evidence is clearest, growth does not seem to worsen inequality.

If transactions costs create decreasing returns to scale and if, as hypothesized in Chp. 4, future-orientation increases with wealth, a very simple further hypothesis can explain the above observations: At small wealth, decreasing returns to scale dominate; while at large wealth, increasing future-orientation dominates.

8.1 Results and Further Implications of Chp. 8 Models[A]

Equal and Dual Distribution in a Simple Economy:

Return to the multi-period Clone economy of Chp. 4, where a number of identical self-sufficient farmers occupy identical quality land which they can freely buy and sell at a market price. The hypothesis that decreasing returns dominate at small wealth, while increasing future-orientation dominates at large wealth has these consequences:

For a small enough area of land per capita and small enough number of farmers, only equal distribution is a stable dynamic equilibrium position. If individuals are displaced up and down from the equal distribution land size, the ones with more land sell to those with less--so everyone gradually returns to equal distribution.

Suppose land area per capita and/or number of farmers increases. As long as land per capita stays below a critical value, equal distribution remains a position of stable dynamic equilibrium. However, a new position of stable very unequal dual dynamic equilibrium arises with one or a few very rich farmers--"landlords"--and the rest poor farmers--"peasants". A large disturbance can "flip" the economy from stable equal distribution equilibrium to the stable dual distribution equilibrium.

If land per capita exceeds the critical value, equal distribution becomes an unstable dynamic equilibrium position. A stable dynamic equilibrium exists only at an unequal dual distribution.

A dual distribution means there are two positions of dynamic equilibrium, that is, two separate levels of wealth where individuals keep the same wealth from period to period at the market land price. The lower position is individually stable; persons displaced from it save or dissave their way back to it. The upper position is individually unstable; persons displaced from it save or dissave further and further from it. But if there is only one person, or a few persons acting in concert at the upper position, they can affect the price of land enough to make the upper position stable when combined with the lower position.

Allowing for some random disturbances, dual distribution in the Clone economy should look rather like Fig. 8.1. The peasants cluster tightly around the lower postion, A. Because their position is individually unstable, and presumably they have difficulty collaborating, the landlords smear themselves widely around the upper position, B. So distribution in the Clone economy resembles real-world distribution both in the tendency to dualism and the very long upward "tail".

Causes and Consequences of Greater Inequality:

As noted, an increase in land per capita and/or size of population may shift an equal dynamic equilibrium to an unequal one. Such an increase also makes an existing unequal distribution more unequal. An improvement in technology that increases the output per acre, or lessens the diseconomies of scale due to transactions costs, also makes the dynamic equilibrium distribution more unequal. Finally, the more future-orientation increases with wealth, the more unequal the dynamic equilibrium distribution.

As distribution becomes unequal, or more unequal, the price of land rises. Table 8.1 shows what happens to selected economic variables as distribution moves from unstable dynamic equilibrium at equal distribution to stable dynamic equilibrium at unequal distribution. Notably, although the average discount rate rises, due to the numerical predominance of peasants, the weighted or "social" discount rate falls, --due to the overall predominance of the landlords.

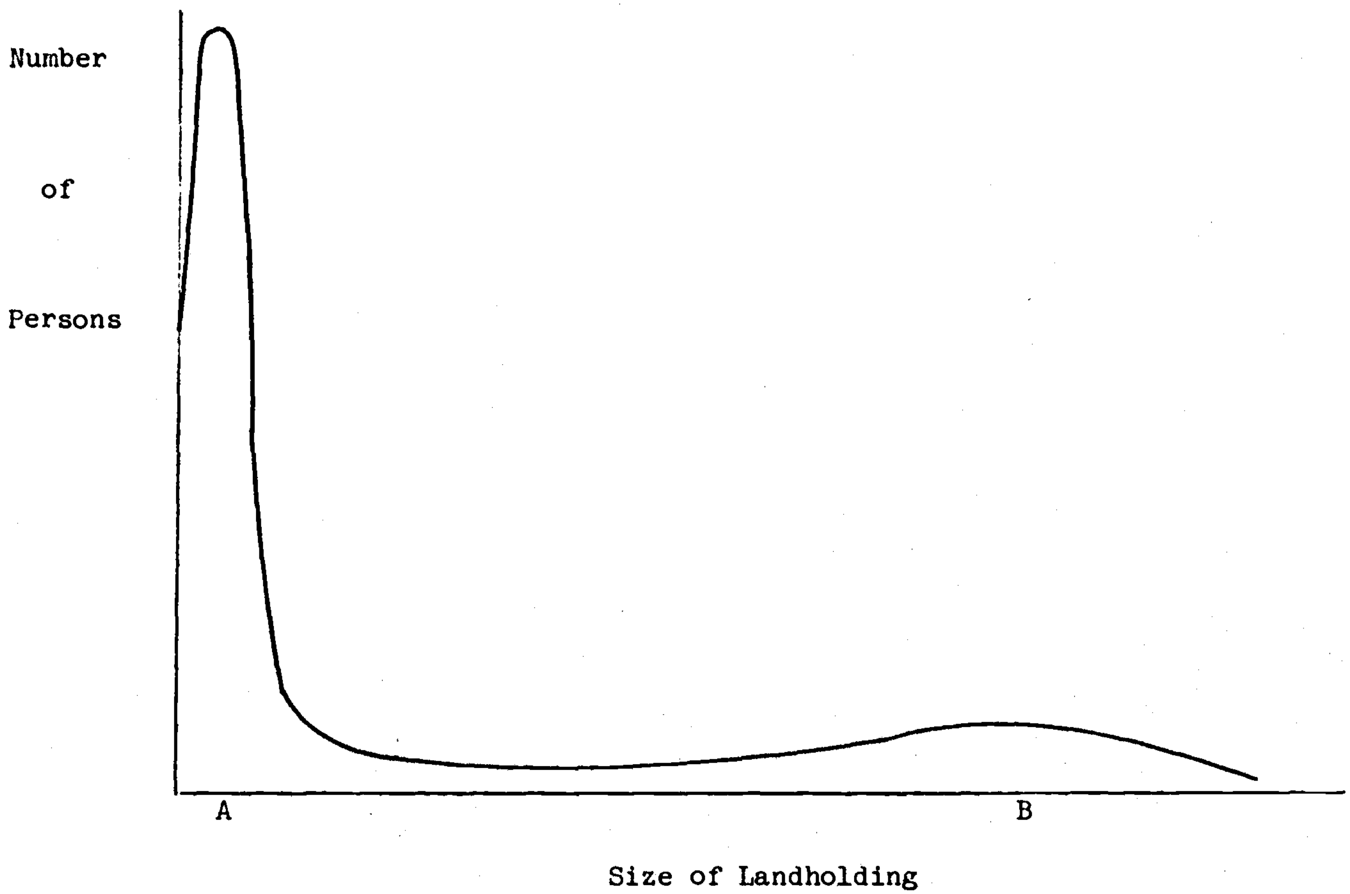


Fig. 8.1: Number of persons plotted against size of landholding. A is a position of intrinsically stable dynamic equilibrium. B is a position of intrinsically unstable dynamic equilibrium, which becomes stable only when combined with A, and with a relatively small number of persons at B. If individuals are from time to time displaced a small distance from A or B, they return faster to A, making a sharper peak at A than at B.

Table 8.1

Changes as Distribution Moves from Equal to Unequal Dynamic Equilibrium

1. Price of land:	+	
2. Discount rate and return on investment:		
Peasants:	+	
Landlords:	-	
Peasants' - landlords':	+	
Average:	+	a)
Weighted average or "social rate of discount":	-	
3. Gross output = income = profit = consumption:		
Peasants:	-	
Landlords:	+	
Total:	-	
4. Potential income = liquidation value of firm:		
Peasants:	-	
Landlords:	+	
Total:	- ?	
5. Wealth = present value of firm:		
Peasants:	-	
Landlords:	+	
Total:	+	
6. Income/wealth = capital turnover:		
Peasants:	+	
Landlords:	-	
Total:	-	

a) Assuming peasants dominate a simple average.

The models in this chapter permit only exogenous "growth", due for example, to changes in the production function. There is no net investment. But clearly, were the models altered to permit endogenous growth, the more unequal the distribution, the lower the potential rate of growth from a given net investment.

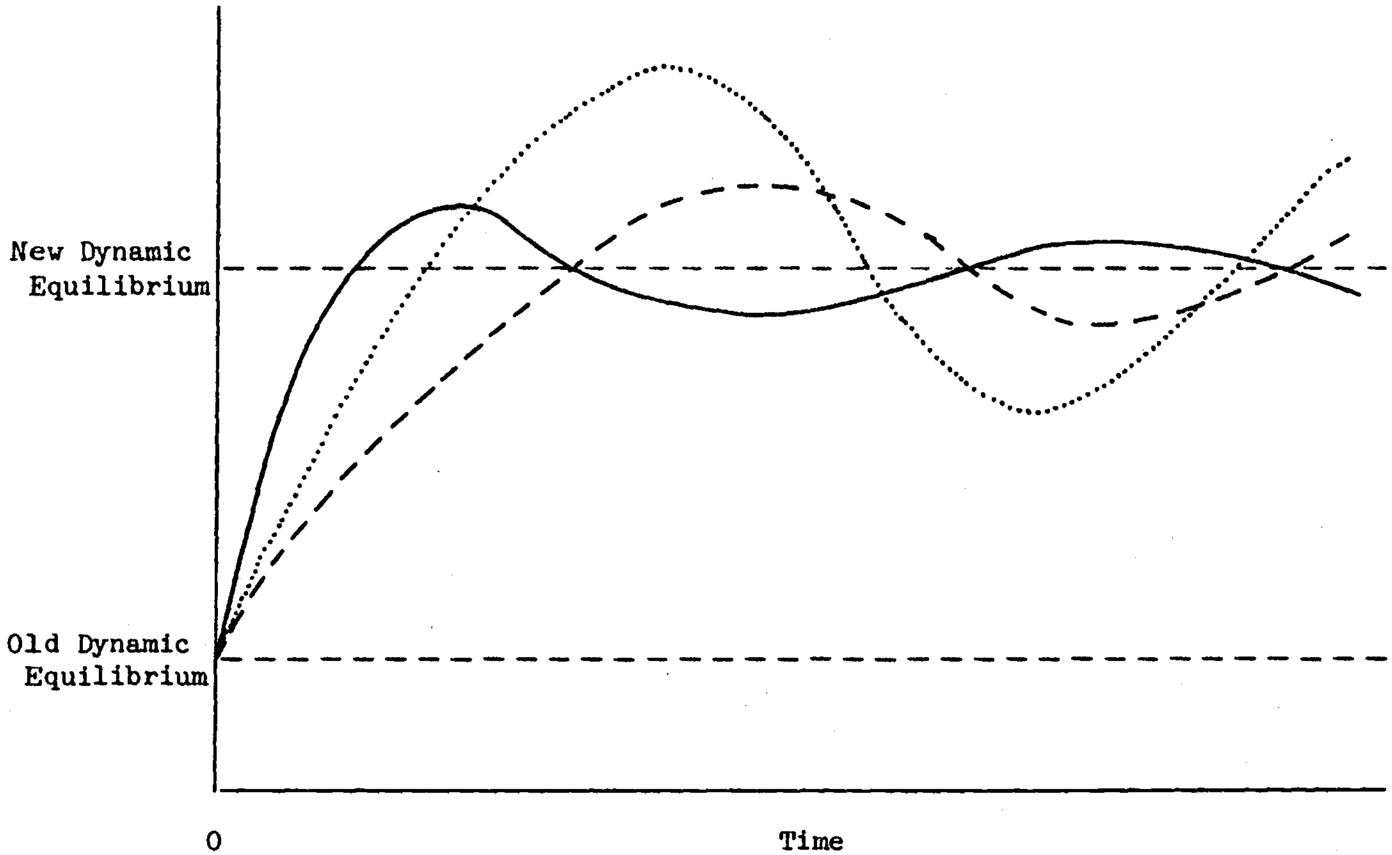
Growth and the Path to Dynamic Equilibrium:

Growth, whether exogenous or endogenous, shifts the position of dynamic equilibrium from its current location to a position of greater inequality. It sets the landlords to buying land from the peasants, moving both towards the new position.

But a system, like a weight on a spring, may oscillate about a position of dynamic equilibrium. Similarly, growth may start the landlord-peasant system to oscillating about the new equilibrium position. It suffices that there be a lag in the peasants' and landlords' perception of growth.

Fig. 8.2 shows a typical run of a computer model of a two-person economy, one peasant and one landlord. "Growth"--an increase in per acre productivity over a preset number of periods--shifts the dynamic equilibrium distribution to a new more unequal position. However, the system oscillates a while around the new position, with total output, land price, and distribution out of phase with each other.

Different assumptions about parameters produce different results. For some assumptions, damping prevents any overshooting of the new equilibrium position. Other assumptions produce explosive oscillations, --making the computer program "crash".



Total output of economy -- solid line
Size of landlord's land -- dashed line
Land price -- dotted line

Fig. 8.2: Consequences of growth. Improved technology increases output (solid line), increases landlord's land size (dashed line), and raises price of land (dotted line). Lag in perception of growth causes oscillations about the new dynamic equilibrium.

Future-Orientation and Redistribution:

Chps. 4 and 8 assume future-orientation rises monotonically with wealth. As noted in Chp. 4, it would be more realistic to assume that average future-orientation rises with wealth. So at any given wealth some people are more future-oriented than average, and are therefore saving, while others are less future-oriented than average and are therefore dissaving.

Chps. 4 and 8 also assume everyone has the same set of wealth-dependent preferences, that is, the identical utility map. It would be more realistic to assume future-orientation depends on past wealth as well as current wealth. That is, time preferences are learned, and change more slowly than external circumstances. Then people have genuinely different sets of preferences, depending on their histories.

One can even hypothesize a simple feedback relationship between wealth and time-preferences: Richer people have greater control over future consumption than do poorer people. Therefore, they learn to care more about the future than do poorer people. (There's no sense caring about what one can't control--hence the fatalism of the poor. Much more on this in Chp. 9). Moreover, people who happen to be more future-oriented than average get richer, and vice versa.

Finally the psychological literature shows that people unconsciously pick up most of their views from regular associates, and of course prefer to associate with those who share their views. The longer and more closely a group of people associates--in a family, a neighborhood, a club, or at work--the more their views converge. In effect, they come to share a "culture". [Blake, Mouton, 1981].

Recall that transactions costs give people of similar wealth good practical reasons to associate preferrentially with one another. So suppose upper levels of wealth do contain disproportionate numbers of people who learned greater future-orientation from direct experience, or got rich because they just happened to be more future-oriented. Then their attitudes rub off on family members and other associates, who come primarily from the same background. Vice versa for lower wealth levels. The result: distinct differences in class "culture", including time-preferences.

So here are two powerful forces for inequality. First, a rise in future-orientation with wealth can make inequality a position of stable dynamic equilibrium. Second, differences in wealth can reinforce differences in time-preferences, building them into class culture.

Consequently inequality may rapidly reappear following even the most radical revolution. Mao Zedong's Cultural Revolution appears to have been an attack on such reemerging inequality.

On the other hand, persistent redistributive efforts--public health, public education, income supports--may reduce class differences in time-preference, by reducing actual inequality. Such redistributive efforts then become self-reinforcing, for the less the class differences in time-preferences, the more equal the position of dynamic equilibrium. Public education may have a particularly great impact, as it not only redistributes wealth in the form of human capital, but makes a society's culture more uniform.

The developed countries have for generations pursued redistributive policies to varying degrees; most less developed countries have not. This difference perhaps helps explain why alot of growth in the developed countries has not apparently increased inequality; while only a little growth in less developed countries in recent years appears to have greatly increased inequality. (Of course, socialist governments have a propensity to redistribute so clumsily as to virtually kill all incentives to work or invest--but that's another story).

8.2 Summary of Sections in Chp. 8B

Sec. 8.3 describes the conditions necessary for individual and general dynamic equilibrium in a simple economy, and shows when such equilibrium is stable or unstable. In this economy, the dynamic equilibrium land price is the price at which farmers neither buy nor sell land. If diminishing returns to scale dominate at small wealth, and increasing future-orientation dominates at large wealth, then the dynamic equilibrium price as a function of land size falls and then rises again in a "U". The "critical land size" corresponds to the lowest price at the bottom of the "U". This "U" means farmers of different land size can be in dynamic equilibrium at the same market price of land.

Sec. 8.4 works out the conditions for equal and unequal dual dynamic equilibrium in a two person economy. To make a stable dual equilibrium possible, the "U" must be steeper on the left than on the right. Then, if the two farmers between them own less than or equal to twice the critical land size, only equal distribution is stable, or possible. If they own more land, equal distribution is unstable, while dual distribution becomes stable.

Sec. 8.5 presents a computer simulation of equal and unequal dual dynamic equilibrium in a two person economy, with results described above. In each period, the peasant and landlord buy or sell land, with supply and demand depending on each one's current consumption,