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competitive economics:

equilibrium and arbitration

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Competitive Economics: Equilibrium and Arbitration

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PREFACE

This book is intended as a survey of some of the most important results in a number of active areas of recent mathematical economics research, and a discussion of their relevance to current situations. The two main themes are game theory and social welfare.

Game theory is the theory of what happens when n agents have an input into a process, and each tries to maximize a different function of the resulting output. This is a very general formulation of the traditional picture of economic agents who maximize utility. It is a basic representation of human beings acting in groups.

Social welfare theory is mathematical treatment of normative questions in economics, going beyond Pareto optimality. *What is best for a group ?* Under assumptions of cardinal, interpersonally comparable utility (and by Arrow's theorem this is more or less needed) reasonable social welfare functions exist. Axioms similar to the conditions of Arrow's theorem can characterize uniquely various evaluations of the well-being of society. We use in particular what we call *social arbitration functions*, closely related to the Nash bargaining solution. This provides a method of scientifically studying previously unanswerable questions.

The study of the market system by models of equilibrium has achieved new results since 1970. The theory of the core and results in strategyproofness (and information spaces, which we do not cover) help clarify the uniqueness of the market system and the question: *is there an alternative, other than rationing by force ?* St[illegible] of [illegible] demand functions, of nonexistence of noncooperative equilibrium, and of the number of equilibria show that previously unknown phenomena may occur. New Models such as temporary general equilibrium and rational expectations equilibrium show the role of expectations. With game theory, the theory of oligopoly has advanced.

Governments face the principal-agent problem in deciding how to allocate public goods, a problem for which nothing so simple as the private goods market exists. The principal's problem is that he depends on various agents for information and for performing certain things, but that the agent's goals do not coincide with his. Thus he must design a system in which their self-interest as much as possible is in doing what he wants.

The final chapter is concerned with potential applications of this material to certain current economic problems: the environment, financing of public facilities, energy and resources, the business cycle, inflation, and unemployment, income distribution and welfare.

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NOTE ON THE USE OF THE BOOK

This book is directed simultaneously at graduate students, professional economists, and management scientists, mathematicians and others with mathematical skills, and government and private planners and administrators as well as the lay public. Professional economists and management scientists will probably be interested in Chapters 2-8 which survey a number of topics in modern mathematical economics from a game-theoretic viewpoint. Mathematically inclined readers can also read this material with no economic prerequisites. Non-mathematically inclined readers should skip the heavy mathematics in Chapters 2-7. From chapter summaries, conclusions, and non-mathematical portions of the text they may still be able to obtain a good knowledge of the concepts involved and the results which have been proved. Chapter 1 and Chapter 8 are less mathematical, more directed at the reader who is not a specialist in this area, and are a discussion of some current economic problems.

TABLE OF CONTENTS

CHAPTER 1

HISTORY AND BACKGROUND

1.1 INTRODUCTION

Since the United States is representative of market system economies, we shall only discuss briefly the economic history of the United States. This very brief summary is to give some idea of the stages the U.S. economic system went through. In brief, the U.S. started as small colonies on the brink of starvation. It then become a thriving largely agricultural economy. Britain viewed America as existing for its economic benefit, especially as a supplier of raw materials, and introduced corresponding restrictions on our economy. The American feeling that we were economically exploited played a large role in the American revolution.

The nineteenth century was noted for conflicts between regions over tariffs, slavery, and banking and monetary practices. In addition manufacturing, and trade flourished in an atmosphere of few restrictions on the capitalist. Monopolists could drive their rivals out of business and forget the public interest. Farming expanded to the West but farmers had serious economic problems. Every twenty years or so there would be a panic.

The most notable event in American economic history is the *Great Depression*. The reforms of the New Deal did not solve it, although they may have helped prevent a recurrence. Instead the solution was the massive government spending of World War II.

After World War II there were about twenty years of great prosperity. Then came the Vietnam War. Since it was unpopular with a sizable proportion of the population, as were the anti-poverty programs of the Great Society, there was some deficit spending. By about 1970 there began a combination of low growth and high inflation called "stagflation," which lasted throughout the decade with varying degrees of intensity. Concern about the environment, about oil prices and energy, declining productivity, the plight of the small farmer, illegal strikes by public employees, the decline of the dollar, special unemployment problems among the young and minority groups, housing problems, and the near bankruptcy of New York City was typical of the decade and still continues.

The failure of existing economic concepts to explain a situation of both unemployment and high inflation seems to call for new economic concepts. Game theory is relevant to a situation in which a few powerful competitors bargain for shares of markets and income. Such situations occur because of the power of giant corporations, unions, and other organizations.

The problem of balancing interests in protecting the environment seems also to call for another type of new concept, a practical way of aggregating the utilities of an action to different members of society.

The advantage of the market system is in theory that in it everyone has an incentive to work towards what is for the good of everyone. Yet these two problems indicate problems for it. As we will later find there are some impossibility theorems which can be interpreted as saying ideal performance cannot be realized. Yet there are also positive results, and we will stress these latter.

1.2 THE U.S. ECONOMY TO 1930

The principal motive for European colonies was economic, although official pronouncements gave equal weight to conversion of the native inhabitants. Colonies were thought of as sources of raw materials, first gold and silver, then furs, lumber and naval stores, and agricultural products such as indigo and sugar. Especially important in the future U.S. was tobacco, without which the Virginia colonies would perhaps have failed.

The American Revolution grew in part out of American resentment at British taxes and economic regulations. It was financed largely by printing paper money, as were the French and Russian revolutions. J. K. Galbraith (1975) speculated that all those revolutions would have been impossible without inflated paper money.

In effect this means, that as the revolutionary government incurred debts, it simply printed more paper money to pay them. This increase in the money supply caused inflation. A suit of clothes eventually cost a million dollars. Other American wars have been financed in the same way as the Revolution by continentals, so the Civil War by greenbacks. World War I was financed mostly by selling bonds which could be bought with borrowed money, again expanding the money supply and causing inflation. (An increase in income taxes paid about one-third of the cost). World War II was financed about half by taxation and half by bonds sold under more restrictions. Price controls and rationing were used to limit inflation, which was 63% over the total war and post-war period, mostly afterwards.

The American economy and population grew rapidly in the first half of the nineteenth century. The economic situation of the ordinary people was better than in Europe.

The banking and monetary systems were chaotic, especially in the West. Foreign coins and bank notes of hundreds of banks were commonly circulated. Western banks frequently had very dubious policies, for instance very little cash to cover their deposits and loans made to poor credit risks. However these practices were actually beneficial to the region. The inflated money and easy loans were liked by farmers in debt and those who borrowed to set up new industry.

The East on the other hand opposed these practices, and managed to get a Bank of the United States created (1791-1811 and 1816-1836) to control the monetary system. One of Andrew Jackson's major concerns was to eliminate this bank, and he succeeded in doing this.

The other major economic conflict prior to the Civil War was over the tariff. The Southern economy was dominated by export agriculture, especially cotton, grown on large plantations by slave labor. The Northern economy was more oriented towards manufacturing. Thus a high tariff, a tax on imports, helped the North by reducing competition with European manufacturers, but hurt the South by increasing the price of imports it received in the return for cotton. Actually, if there is no danger of dependence on another country, and trading is competitive, it can be shown in principle that tariffs are harmful. In practice, there is some danger in being economically dependent on another country which can use its economic strength for political ends. Moreover export economies have frequently been associated with situations in which a few rich plantation owners exploit many poor laborers.

The North managed to keep a high tariff in force much of the time, and this was a significant source of division between the two regions.

After the Civil War the South became a region of backwardness and poverty, characterized by tenant farming and malnutrition, up to the time of the New Deal.

Elsewhere there was great industrial expansion in the United States. This was the era of laissez-faire, or unrestricted capitalism. Great business empires were built by methods which seem dubious. Labor unions were not effective and the government did not regulate business activity significantly. This was the era of social Darwinism, when the rich justified their wealth and the ruthless competition through which it had been obtained as "survival of the fittest."

In the West, soft money was a major issue. The U.S. was on a gold standard. Opponents of hard money argued for free coinage of silver at a fixed ratio. Since silver was much more abundant than gold in the United States, this would have increased the money supply and thus caused inflation, and eased problems of debt among farmers and those starting new businesses. The gold standard was somewhat deflationary, since the American economy grew more rapidly than the supply of gold.

An income tax was first passed at the time of the Civil War. In the 1890's a 2% income tax was passed but was vigorously opposed and later declared unconstitutional. At this time about 1% of the American people had 50% of the wealth. In 1913 an amendment was passed making income taxes constitutional, and shortly after, another income tax. During the later New Deal, income taxes became much more progressive. Today the top 1% of the population has 25% of the total wealth (Pen, 1971).

Much of the economic expansion was financed by foreign capital. Only with World War I did the United States reverse this position of being a borrower. The railroads in particular required heavy investment which never really paid off, although fortunes were made by individuals in the railroad business.

About every twenty years there was a panic, when banks would collapse, business was poor, and wages were very low. These were times of severe suffering, though they lasted only a year or two. J. K. Galbraith links these to the collapse of intense speculation in the time immediately preceding. Other possible causes include agricultural failures and a continuing business cycle.

At the turn of the century it became evident that capitalism had to be regulated by law in order to prevent monopoly and to eliminated unfair, dishonest, and harmful business methods. Such regulation begain in the administration of Theodore Roosevelt, and has greatly increased since.

1.3 THE DEPRESSION AND WORLD WAR II

For business, 1921-1929 was a time of prosperity in the United States, although farmers and working people did not share much of the benefits. According to J. K. Galbraith, productivity increased 43%, but wages were nearly constant, so that nearly all the increase in productivity went to corporate profits, which tripled. Since profits went to the rich, who do not consume all their wealth for supply to balance demand, this money had to be re-invested. Investment takes place only in a climate of optimism and confidence, which was lost during the stock market crash of 1929.

Speculation is a case of positive feedback. The more rapidly prices rise, the more desirable it is to hold things temporarily to make a profit. There is no limit within the system, but psychological factors cause an eventual collapse. Positive feedback systems are unstable.

There were also widespread dishonesty and unsound practices connected with the building up of stock prices. There was much consolidation of businesses. Half of all nonbanking corporate wealth was in 200 companies in 1930, controlled by about 2,000 individuals. People were allowed to buy stock on small margins, that is they put down only a small share of the stock price, to buy and sell. However naturally they were responsible for the whole price if it later fell. Issues of stocks were made for no other reason than to profit from speculation. The Federal Reserve System contributed to the increase of speculation by lowering interest rates, in order to ease the financial problems of Britain and France.

After the stock market collapsed came the Great Depression. Its severity is illustrated by the following figures from the Bureau of Labor Statistics, where 1926 figures are 100.

	Prices	Employment	Payrolls
1929	95	97	100
1930	86	84	81
1931	73	72	61
1932	60	60	41
1933	65	64	44

Seventeen million people were at one time on relief. Moreover the nation did not recover until World War II. President Hoover's policies were aimed mainly at restoring confidence, although his relief efforts and Reconstruction Finance Corporation were probably helpful.

President Roosevelt attacked the depression by a wide range of programs known as the New Deal. Although these programs did not cure the depression, they have become a lasting part of the American system, and have helped make the distribution of income more equitable as well as possibly preventing a recurrence of the depression.

The figures above indicate a 35% deflation in four years. Deflation is very hard on debtors and reduces business activity. So the administration tried to inflated the currency by raising the price of gold from $20.67 per ounce to $35 per ounce in 1933-34. However since the government had previously called in all gold and forbidden its private ownership, this did not greatly affect domestic prices.

The Securities and Exchange Commission was formed to regulate the stock market. One of the most effective measures came from Congress and not the administration, and was the Federal Deposit Insurance Corporation, which insured bank deposits against failure of the bank. Moreover the FDIC regulated banks more closely to prevent failure. The Federal Reserve System was reformed.

In agriculture, programs were undertaken to restrict production so as to raise prices, and to conserve soil from erosion. Crop insurance, and government supports of the price of agricultural goods were initiated. Since that time, agriculture has essentially been removed from the market system. It could be said that in the United States, agricultural policy is a mild form of socialism. It became a policy for the government to maintain and store food surpluses, and to distribute surplus food by what is now the Food Stamp Program. To ease the burdens of debt, loans were refinanced at low interest rates, and there was also legislation on mortgages. One of the most successful projects was the Tennessee Valley Authority a combination of water control, electric power production, and other activities. Rural electrification was done elsewhere.

In industry minimum wages and maximum working hours became standard. There was also a program to encourage fair competition, but it was later found that the results had hampered competition. Unions, which were very weak in the 1920's, became much stronger. Social Security was begun with programs of old age and unemployment benefits (in cooperation with the states) and provisions for dependant children and the disabled.

The Works Projects Administration was able to employ about a third of the unemployed on public works projects. It constructed 122,000 public buildings, 664,000 miles of roads, and 77,000 bridges, as well as doing many other things.

Why was the Great Depression so much more long-lasting than earlier ones ? Proposed explanations include Dust Bowl agricultural problems, the international depression, the high indebtedness in proportion to income, and the extent of previous overinvestment, especially in durable goods. As previously mentioned, the prosperity of the twenties had gone more to capital than workers. Instead of increasing consumption, those who had it re-invested the money. As a result capacity was built up far above the levels of consumption. Even in 1926 there was excess capacity.

Economists today feel that to end the depression what was needed was much greater levels of government spending. World War II quickly ended it. The average government budget during World War II was roughly 75 billion dollars, where as the highest government budget during the depression years was less than 9 billion (in 1930 only 1.4 billion). In a computer model of the depression economy, H. Theil found a program of taxation and spending that ended it in four years. Much of this material on the depression has been taken from H. Scheiber, H. Vatter, and H. Faulkner (1976).

Conceivably the excess capacity built up in the twenties and the reduced living standard of the thirties helped the economy to make the remarkable effort needed in World War II. The government spending which eliminated the depression as in earlier wars, caused pressure for severe inflation. In principle this problem could be solved by taxation, but this did not prove to be so in practice. A six-fold increase in taxes did not nearly match the increase in spending. Instead rationing and price controls were instituted. These were effective to the extent that the average inflation rate during 1943-1945 was less than 2%. The savings rate went up to 25%, the highest level in American history. J. K. Galbraith attributes part of the success of wage and price controls to the monopoly (oligopoly) power of giant corporations. There was much more difficulty in regulating the more competitive food and clothing markets.

Immediately after the war there was high inflation (about 15%) and instead of the depression many expected to resume, a continuing prosperity.

1.4 THE POST-WAR ERA

The period from 1948 to 1967 was one of prosperity, growth, and low inflation rates. Recessions occurred in 1949, 1954, 1958, and 1961. These appear to be mainly due to the normal