

A Course in Public Economics

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Introduction

There was a little girl, she had a little curl,
Right in the middle of her forehead;
And when she was good, she was very, very good,
And when she was bad, she was horrid.
Henry Wadsworth Longfellow

Competitive markets seem to have a great deal in common with the little girl who had a little curl. When they are good, they are so very good that our participation in them becomes part of our unconscious daily routine. If I want broccoli for supper, there is broccoli waiting for me at the grocery store. Down the aisle are the green peppers, locally grown in summer and Mexican in winter. The bananas are from Ecuador and the apples are from as far away as New Zealand. The presence of each item on the grocer's shelves is the result of a complex chain of decisions made by the grocer, the wholesaler, the shipper, and the farmer. Their actions are co-ordinated by prices, and this fact has important implications for the way in which specialized knowledge is utilized. The farmer does not need to know anything about shipping or the grocery business or the making of fertilizers, nor need he communicate to anyone his specialized knowledge of farming. He need know only the prices at which various crops can be sold, and the prices at which factors of production can be purchased. He makes his production decisions by combining information about these prices with his own knowledge of farming; and if he makes these decisions so as to advance his own interests, he does all that the market system requires of him. Similarly, the grocer, wholesaler, and shipper do not communicate detailed information about their own activities, but simply decide whether they are willing to trade at the prevailing prices. If their decisions are made in their own self-interest, they too are doing all that the market system requires of them. I'm at the end of the chain: all that I have to do is to decide whether I'm willing to pay a dollar for this particular bunch of broccoli. I hardly ever think about how the broccoli came to be there because, after all, it's always there.

And when they are bad, competitive markets can be truly horrendous. For example, self-interested economic decisions have led to any number of environmental tragedies. It

was observed in 1956 that many people living near Japan's Minimata Bay were suffering from a degenerative neurological disease. In 1968, this disease was officially identified as mercury poisoning caused by eating fish contaminated by industrial waste. The Japanese government has officially recognized in excess of 12,500 victims. In 1954 in the state of New York, the community of Love Canal was constructed on top of a former disposal site containing some 20,000 tons of toxic waste. Mounting evidence of miscarriages and birth defects led to the evacuation of 239 homes in 1978, and in 1980, evidence of chromosomal damage among the inhabitants led to the total evacuation of the community. The example of Love Canal led the American government to establish the Superfund Program, which subsequently identified hundreds of abandoned toxic dumps.¹

While such experiences have taught us not to dump garbage in our own backyards, we are still reluctant to apply this lesson globally. Progress on the control of ozone-depleting chemicals and carbon dioxide emissions – key factors in global warming – has been slow and halting. The logging and clearing of rain forests continues unabated, reducing the planet's ability to draw carbon dioxide from the atmosphere and replenish its oxygen content. The Food and Agricultural Organization reports that, of the seventeen major fisheries in the world, nine are in serious decline and four others are already commercially depleted.

These examples illustrate just one of the problems encountered by market systems (specifically, the presence of externalities) and there are a number of other problems. They are sufficient, however, to establish the following proposition. There is nothing either scientific or sacred about the market system. It is an institutional arrangement that has persisted and evolved over the past few hundred years because it has contributed greatly to our economic well-being. It isn't perfect, however, and in some situations, our economic well-being can be raised by regulating it or even by side-stepping it altogether.

The purpose of this book is to describe the circumstances under which markets perform well, and the circumstances under which they do not. The role of the government in correcting the faults of the market system is also examined.

1.1 TWO THEOREMS

Every economy must address three problems. Which goods are to be produced? How should they be produced? Who gets the goods once they have been produced? One way of solving these problems is to allow people to trade in competitive markets. The

¹ It should be emphasized that these tragedies have their origins, not in the market system, but in the pursuit of narrowly defined interests. Countries that do not use markets to allocate resources have encountered similar, and often worse, environmental problems. In the last half of the twentieth century, for example, the communist countries of eastern Europe experienced far worse pollution than the market economies of western Europe.

The value of the market system is that it can often make individual self-interest serve society's ends. Its failing is that it cannot *always* do so.

TIME AND THE TWO THEOREMS

Although economic models often imagine that people are making choices at a single moment of time, many important economic problems involve choices through time. Should you begin work now, or attend school for another year? Should you buy a house now, or wait until you have scraped together a bigger downpayment? How much of your income should you put aside for retirement, and how will that choice affect the timing of your retirement? It is therefore important to know whether the two fundamental theorems continue to hold in an intertemporal environment. By and large, they do, with an important exception. The two theorems hold for these economies:

- 1) The economy consists of a fixed number of people, who are alive in the current period and who will continue to live for T periods (where T might be infinite). These people trade in commodity markets during each period of their lives.
- 2) The economy will last for T periods, where T is some finite number. Some people are alive in the current period. In this period and in every future period, some people will be born and some will die, so that the identities of the people living in the economy are constantly changing. The death rate and the birth rate are not necessarily equal, so the population could change through time. This economy is called a **finite-horizon overlapping generations economy**.

An **infinite-horizon overlapping generations economy** has the same structure as its finite-horizon counterpart, except that it never ends (that is, T is infinite). The two theorems fail in this economy. Thus, the theorems hold in an economy in which there is an infinite horizon, or in an economy in which successive generations overlap, but not in an economy with both of these characteristics.

two fundamental theorems of welfare economics show that this solution is *potentially* a very good one.

The **first theorem** demonstrates that, under certain well-specified conditions (we'll return to these conditions shortly), there is no better solution than the one generated by competitive markets. Specifically, any alternative solution that makes someone in the economy better off must also make someone else worse off. The reasoning behind this argument is simple. A system of competitive markets ensures that all mutually beneficial trades take place, so that every remaining trade – every adjustment of the solution – benefits one person only at another's expense.

If a solution has the property that any other solution can only make someone better off at someone else's expense, it is said to be **Pareto optimal**. Arguably, we would not wish to accept a solution that is not Pareto optimal, for there would then be an alternative that makes someone better off without harming anyone else, and we would certainly prefer this alternative to the original solution. However, the observation that a particular solution *is* Pareto optimal doesn't mean that we need not consider alternatives.

There are many Pareto optimal solutions, and by definition, a move from one to another changes the distribution of economic well-being. If A and B are Pareto optimal

solutions, and a move from A to B involves robbing Peter to pay Paul, then a move from B to A involves robbing Paul to pay Peter. Our ideas about equity or fairness might cause us to prefer one or the other of these solutions.

Competitive markets generate a Pareto optimal solution, but that solution isn't necessarily an equitable one. Does it follow that competitive markets must be abandoned if a more equitable outcome is to be attained? The **second theorem** implies that there is no such necessity. This theorem shows that, if certain well-specified conditions are met, the government can shift the economy from one Pareto optimal solution to another by redistributing purchasing power and then allowing people to trade in competitive markets. There is a redistribution that takes the economy to any desired Pareto optimal solution.

An economy that reaches a Pareto optimal solution is commonly said to be efficient. The first theorem argues that competitive markets can be the vehicle that takes the economy to an efficient outcome. The second theorem argues that, in a competitive economy, there is no conflict between reaching an efficient outcome and reaching an equitable outcome.

1.2 MARKET FAILURE

Willem Buitter coined the term “the economics of Dr. Pangloss” in a critique of macroeconomics. Dr. Pangloss, a character in Voltaire's *Candide*, taught that “all is for the best in the best of all possible worlds.” Encountering a series of misadventures, he was repeatedly forced to choose between abandoning the belief that he lived in the best of all possible worlds, and acquiescing to the idea that every unfortunate incident was somehow for the best. The resilient Dr. Pangloss remained true to his beliefs. Buitter argued that some present day macroeconomists, having idealized the nature of our economies, were constantly confronted with the same dilemma, and proving equally resilient.

Had he not employed the term elsewhere, Buitter could have applied it to the world of the two fundamental theorems. These theorems first imagine that we live in the best of all possible worlds, and then conclude that, indeed, all is for the best. The assumptions that underlie this best of all possible worlds include:

- 1) Each person's welfare depends only upon the goods that he consumes, and each firm's profits depend only upon its own use of the factors of production.
- 2) There are established and enforceable property rights over every good.
- 3) There is a market for every good.
- 4) Firms behave competitively, and in particular, believe that their own actions have no appreciable effect on market prices.
- 5) Participation in markets is costless.
- 6) All market participants have the same information about the nature of the good and the circumstances under which it is traded.

If one or more of these assumptions does not hold, the market system does not give rise to an efficient outcome (i.e., the first theorem does not hold). These inefficient outcomes are called **market failures**. The principal types of market failure are discussed below.

1.2.1 Public Goods

A public good is one whose consumption benefits more than one person or firm. Some of these goods are **non-rivalrous**, in the sense that providing the good to one person necessarily allows the good to be provided to every other person at no additional cost. The lighthouse is one of these goods. If its warning beacon can be seen by one boat, it can be seen by every boat. The lighthouse's successor, the global positioning system (GPS), also has this property. The signals of the GPS satellites are beamed to the earth, and if they are available to one person, they can be made available costlessly to every other person.² Other goods are only partially non-rivalrous, in the sense that the quality of the benefit provided to each person diminishes as the number of people to whom it is provided rises. These goods are said to be **congestible**, and are much more common than non-rivalrous goods. Examples of congestible goods include parks and recreational facilities, police and fire protection, and roads and bridges. Every public good involves a violation of assumption 1.

Some public goods also have the property that, if they are provided to one person, they are automatically made available to everyone. Such goods are said to be **non-excludable**. The lighthouse is one example of a non-excludable public good. The GPS, by contrast, is not in principle non-excludable. Its signals could be sent in code, and the provider of the system could sell decoding devices to the manufacturers of GPS receivers. The provider would then be able to limit the number of users by limiting the number of decoders sold. The provider of the GPS (the U.S. defence establishment) has not chosen to do so, and hence the GPS is in practise non-excludable.³

A **pure public good** is both non-rivalrous and non-excludable, and hence violates assumptions 1 and 2. Competitive firms are unable to provide sufficient quantities of these goods. Non-excludability means that the firms are unable to set a fee for the use of the public goods that they provide, and hence can only cover their costs if the users make voluntary payments. This situation gives rise to the **free rider problem**. Each user is confronted with the following choice: he can contribute to the provision of the public good and enjoy its benefits, or he can keep his money in his pockets and enjoy its

² The satellite transmissions are non-rivalrous, but the electronic gadget that receives and interprets the signal is not. If the signals are available to you on your yacht near Fiji, they are also available to me on my yacht near Tahiti. However, your possession of a receiver does me no good whatsoever.

³ The American military initially reserved for its own use a part of the satellite signal, so that military units could determine their positions more accurately than members of the public could. Very precise positioning is a good from which potential users can be, and at one time were, excluded.

benefits anyway. Not surprisingly, people faced with this choice prove to be reluctant to part with their money.⁴ Total contributions are relatively small, so only a small quantity of the public good is ultimately provided. Every person would be better off if everyone could be forced to give a little more. Governments, when they finance the provision of public goods through taxes, are therefore engaging in a socially beneficial form of coercion.

While the under-provision of public goods takes its most dramatic form when the public good is “pure,” the provision of less-than-pure public goods is also problematic. If a good is non-rivalrous but excludable, a private provider of that good can only remain in business by charging the users a positive price. This practice results in the exclusion of some potential users. The provider’s interests are at odds with those of society, because society’s welfare is maximized by excluding no one.

If the good is congestible and excludable, by contrast, society’s welfare is maximized by excluding some users from each facility. Decisions about exclusions and the facility size must then be made simultaneously.

1.2.2 Externalities

An externality can occur when a person’s utility is affected by another person’s consumption or by a firm’s production activities. As well, an externality can occur when a firm’s profits are affected by another firm’s production activities or by an individual’s consumption. However, not all such interactions constitute externalities. An externality only occurs when appropriate monetary compensation is not made. Appropriate compensation induces the generator of the externality to take into account the effects of his actions on others, so that he curtails harmful activities and extends beneficial ones. For example,

- You are harmed if your neighbour throws noisy parties that prevent you from sleeping. Your neighbour is not required to compensate you for the harm done to you, so he doesn’t take your interests into account – the parties are long and loud. An externality is present here.
- The small stores at a shopping mall benefit from the presence of a large department store. The department store draws customers to the mall, creating additional business for the small stores. The leases signed by the stores reflect this benefit: the department store often pays no rent, and the small stores pay higher rent than they would pay in the absence of the department store. This arrangement shifts the burden of rent from the department store to the small stores, so that the department store implicitly receives compensation. No externality occurs.

Although externalities can occur only if assumption 1 is violated, violations of some of the other assumptions can also be important.

⁴ In North America, and perhaps elsewhere, this phenomenon is familiar to us from the fund-raising campaigns of public television and radio stations.

Coase [17] has emphasized the importance of clearly defined property rights in determining appropriate compensation. Suppose, for example, that two farmers are drawing water from the same river. If the up-river farmer increases his water consumption by so much that the down-river farmer cannot obtain sufficient water for his needs, who should pay whom? If the up-river farmer has the right to draw as much water as he likes, the down-river farmer must bribe the up-river farmer to induce him to take less water. If the down-river farmer has the right to sufficient water, the up-river farmer must compensate him for his loss. But if the property rights are not clearly established (i.e., if the farmers cannot agree as to whose rights have been violated), compensation is unlikely to be paid and an externality is likely to occur.

Compensation will not necessarily be paid even when property rights are clearly established. Suppose that a firm pollutes the air, to the detriment of everyone living downwind. Suppose also that the firm has the property rights. An externality is prevented only if people band together to bribe the firm to reduce its emissions; but if the harm done to each person is small relative to the individual cost of negotiating the bribe, no one will bother to negotiate. Compensation will not be paid and an externality will occur. Thus, violations of assumptions 2 and 5 can also play a role in externalities.

Another interpretation of externalities is that they occur because some markets are missing. A steel producer knows the market price of steel, so it can evaluate the reward for additional production. It also knows the market prices of labour, iron ore, and fuel, so it knows *some* of the costs of additional production. It increases production if the reward exceeds the sum of these costs. However, one of the costs of additional production is a decline in air purity. Since there is no market for air purity, the firm is not forced to bear the cost of degrading the atmosphere, and does not include this cost in its profit calculation. Under this interpretation of events, an externality occurs in part because assumption 3 is violated. While most non-economists would regard this view of pollution as exceedingly baroque, some economists believe that it is a useful way to analyze the problem. They argue that externalities can be eliminated by constructing artificial markets in which emissions permits – entitlements to pollute – are traded.⁵

Some externalities, such as the noisy party and the polluting firm, are easily recognized. Other externalities are less readily recognized. Two important examples of well-disguised externalities are common property exploitation and co-ordination failure.

Common Property Resources

A common property resource is a good which is not owned by anyone. Individuals acquire ownership of a common property resource simply by taking it. Self-interested individuals are likely to take as much as they can as quickly as they can. Early photographs of the Oklahoma oil fields show a virtual forest of oil derricks erected by competitors

⁵ These markets are artificial in the sense that the general public does not participate in these markets, but is instead represented by the government. Chapter 7 describes the workings of permit markets.

attempting to gain a greater share of the oil. The “land rush” depicted in so many Hollywood westerns is another example of this kind of behaviour.

In the case of renewable common property resources, the rush to be first can lead to the exhaustion of the resource. Many fisheries have been commercially depleted, and others are threatened with depletion. The commercial values of the whale, the rhinoceros, the elephant, and the sea turtle are great enough to threaten these species with extinction.

Co-ordination Failures

Co-ordination failures are a particular form of externality, and therefore involve a violation of assumption 1. They are treated here as a separate phenomenon only because they have some distinctive and interesting features.

In an efficient market economy, market prices convey everything that each economic agent needs to know about every other economic agent. Consider, for example, the markets for consumer goods. Each consumer believes that he can buy at the prevailing price as much of each good as he likes, and this belief is validated by the fact that he can, in fact, buy exactly the goods that he wants. Each firm believes that it can sell at the prevailing price as many units of goods as it wants, and is in fact able to do so. The transactions that consumers and firms want to make depend only upon prices, and they are able to carry them out.

Keynesian economics argues that this picture of the workings of the market economy is deficient. The quantity of goods that consumers want to buy is determined by their income, which is in turn determined by the quantity of labour that they can sell. Similarly, the quantity of labour that firms buy is determined by the quantity of goods that they can sell. A recession, the Keynesians argue, is a situation in which consumers do not buy goods because they cannot sell labour, and firms do not buy labour because they cannot sell goods. If this view is correct, each agent’s behaviour is influenced by quantities as well as prices.

Similarly, an agent’s decision to trade in a market might be influenced by his estimate of the probability that other agents will trade in that market. Multiple equilibria are then possible. There could be an equilibrium in which few people trade because few people are expected to trade, and another in which many people trade because many people are expected to trade. Since trading is mutually beneficial, welfare is higher when more people trade.

1.2.3 Imperfect Competition

A competitive firm expands its production until the price of the last unit of output is just equal to the market price of the resources needed to produce that unit. If the other firms in the economy are also competitive, the market price of these resources is just equal to the market value of the other goods that could have been produced with these same resources. In these circumstances, consumers learn about their options by examining prices. If a good’s price is high, they are warned that consumption of this

good requires them to forgo other goods that they themselves believe to be valuable. If a good's price is low, they are told that the consumption of this good requires them to forgo something, but not something of any great value. Consumers use these signals to decide which goods they should consume; specifically, they consume expensive goods sparingly and cheap goods freely. This mechanism – Adam Smith's "invisible hand" – causes the economy's limited resources to be allocated to the production of the goods that consumers most want.

This mechanism tends to break down if some firms are large enough to appreciably affect the prices at which goods are bought and sold. The most extreme case is monopoly, in which there is only one seller of a particular good. The price set by the monopolist is greater than the good's marginal cost of production (i.e., greater than the value of the goods that must be given up to allow its production). Consumers respond by buying fewer units of the good than they would if its price reflected its marginal cost of production.

Perfect competition is the only form of market organization under which a good's price is certain to be equal to its marginal cost. Hence, any violation of assumption 4 is likely to cause the free market outcome to diverge from the competitive outcome.

Arguably, imperfect competition is a symptom rather than a cause. The presence of imperfect competition suggests that something has prevented sustained competition among firms. One possibility is that production is characterized by increasing returns to scale, meaning that output more than doubles when the use of all factors of production is doubled. The largest firm is then able to produce and sell goods more cheaply than its competitors, and will eventually drive them out of business. Once it is alone in the market, it will behave as all monopolies do, restricting its output and raising its selling price. A second possibility is that entry into the industry involves such high set-up costs that potential competitors are unable to raise the necessary financial capital.⁶ Finally, it might be that a necessary patent is possessed by only one firm, ensuring its position as a monopolist.

1.2.4 Asymmetric Information

The price system is an important mechanism because it is **decentralized**, that is, because every economic decision is made by the people or firms directly affected by that decision. Each farmer knows which crops grow best on his own land, and he decides which crops will be grown there. Each firm knows which goods can be produced at its manufacturing plants, and the various ways in which these goods can be produced, and it makes decisions on exactly these issues. Each consumer knows his own tastes better than anyone else, and decides which goods and services he will purchase. All parties base their own actions on their own information and their knowledge of market prices.

⁶ High set-up costs can only lead to imperfect competition if there is some flaw in the capital markets that makes lenders unwilling to provide the necessary capital. Asymmetric information, which is discussed in the next section, can give rise to this kind of behaviour.

Consequently, they do not need to communicate detailed information about tastes and production processes to each other.

The value of the price system lies precisely in its ability to exploit information that is not widely known, but it can only do so if two essential kinds of information are known to everyone.

First, the market participants must be equally well informed about the *nature* of the good being traded. The purchase of a new computer, for example, would be a relatively simple matter if computers could be completely described by a small number of characteristics, say, processor speed and disc capacity. Computers with a particular speed and capacity would then differ in price only because their manufacturers were more or less efficient. A manufacturer which managed its inventory better, or more conscientiously sought out better deals on components, could offer its product at a lower price. Everyone would buy from this manufacturer, and the less efficient manufacturers would ultimately be driven from the market. The price system would work as it should. However, not all of the characteristics of computers are readily observable, and hence price differences are not easily understood. An inefficient producer might match the low prices of his more efficient competitors by substituting low quality components for higher quality components. If consumers were unable to discover the difference between these products, the less efficient producers would not be driven from the market.

Second, the market participants must be equally well informed about the *circumstances* under which the good is traded. Here are two situations that satisfy this condition:

- We meet on a rainy day, and you have an umbrella while I do not. I might offer to buy your umbrella, and after some haggling, you might agree to sell it. This trade would be mutually advantageous, in the sense that each of us would place a higher value on the thing received than on the thing given up. Both of us know the circumstances of the trade (specifically, that the person without the umbrella will get wet), and our haggling establishes that my aversion to getting wet is greater than yours.
- It's not raining when we meet, but the clouds look threatening. Neither of us is certain that an umbrella will be needed, but we are looking at the same grey skies, so we are equally well informed about that possibility. Any trade that occurs between us will again be mutually advantageous.

There are many situations in which the participants are not equally well informed, and the market outcome in these situations might not be efficient. Trades which are mutually advantageous might not take place, and trades that take place might not be mutually advantageous. Suppose that you have a toothache. You go the dentist believing that you need minor dental work, but the dentist instead suggests some major (and expensive) reconstruction. How do you know that this work actually needs to be done? How do you know that he is not simply creating a little extra business for himself? If you agree to the work, and if the work is largely unnecessary, the trade between you and your dentist is not mutually beneficial. If you are suspicious of his motives and refuse his advice, and the work is necessary, a trade which would be mutually beneficial does not take place. Similar situations arise when you deal with doctors, lawyers, stock brokers, and garage

mechanics. They have better information than you do, but you might be uncertain as to whether they are advancing your interests or their own.

1.3 INFORMATION AND THE SECOND THEOREM

The second theorem argues that the government, if it wishes to achieve a more equitable distribution of income, need not concern itself with the manner in which individual goods are allocated within the society. Instead, the government need only transfer income from the economically advantaged to the economically disadvantaged. The price system, operating in the wake of these transfers, will ensure that the allocation of goods within the society is efficient.

This statement of the theorem hides the complexity of the government's task. The transfers cannot be based upon market behaviour. Gearing an individual's transfer to his income or education, or to the frequency of his visits to Palm Springs, would alter his behaviour in ways that prevent the price system from generating an efficient outcome. Instead the transfers must be based upon the innate characteristics that determine each individual's success in the market economy. This requirement is sometimes easy to fulfill. People with certain mental or physical disabilities are unlikely to be successful in the market economy, and should be the recipients of transfers. It is, in other instances, impossible to fulfill. The distinctions between moderately successful people and very successful people might not be apparent to themselves, let alone to the government.

This informational requirement is so severe that governments are, in practise, forced to impose transfers that are partly based upon market behaviour. Taxes, for example, are levied on the purchases of goods and the receipt of income. Welfare payments are made to those who have no other source of income. The claim of the second theorem, that income redistribution does not adversely affect the efficiency of the economy, cannot be accepted without reservation under these circumstances. Indeed, the design of redistributive programs is strongly influenced by the need to reduce the associated efficiency loss.⁷

1.4 THE USEFULNESS OF THE TWO THEOREMS

Although the logic of the two theorems is impeccable, they are premised upon conditions quite unlike those that exist in actual economies. It follows that their claims have no obvious applicability to the economies in which we live. Why should we bother with them?

First, they alert us to the potential of the price system. Solving the fundamental economic problem – what goods are produced how and who gets them – requires a

⁷ The size and nature of the efficiency loss is also an important feature of the political debate over redistribution. The rich often argue that the poor "exploit" redistributive programs. The poor, on the other hand, imagine that the incomes of the rich accrue to them without particular effort or self-sacrifice, so that they can be taxed away without adverse consequences.