Chapter 2

WELFARE ECONOMICS AND PUBLIC FINANCE

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Abstract This contribution deals firstly with the differences between market action and government action, and then explores the justification for government intervention based on concepts of economic efficiency and equity. The chapter then proceeds to discuss individual cases in which unregulated private market outcomes are generally considered to violate this criterion.

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1. INTRODUCTION

In a market economy, it is commonly accepted that the role of government should be limited. This philosophical approach not only dominates economic thinking back to the time of Adam Smith's *Wealth of Nations* in 1776, but can also be clearly seen in eighteenth-century political philosophy in the writings of Locke, Jefferson, and Madison, among others. It is a philosophical approach that is plainly expressed in the U.S. Constitution adopted in 1789.[1] The modern interpretation of the principle of limited government within the field of economics envisions a more active role for government than the founding fathers would have held. It is, however, still based in the idea that public sector intervention should be limited. In particular, government intervention should be limited to cases in which the outcome of the private unregulated market is somehow judged to be undesirable. That is, in each case, the market outcome is compared to some ideal and only when it fails to meet that ideal is there a role for government intervention.

In modern economic analysis, the two criteria generally used to judge a market outcome are efficiency and equity. Efficiency is defined as economic (or Pareto) efficiency, while equity deals with the more ambiguous issue of fairness. These two criteria differ substantially as the first (efficiency) is a positive, objective criterion, while the other (equity) is a normative, subjective criterion. Because of this difference, arguments for government intervention in cases when markets fail to achieve efficiency are somewhat less controversial than are arguments for government intervention based on equity considerations. It is worth explicitly noting that the commonly used term "market failure" corresponds *only* to cases in which the private unregulated market outcome fails to meet the conditions for economic efficiency and is not generally used for judgments on equity grounds.[2]

Economic thinking about the role of government in the economy has undergone a drastic change over the past three decades due primarily to the insights provided by public choice analysis. It was once thought that any case in which a market failed to meet the conditions for economic efficiency *necessarily* implied that the government should intervene and move the market toward the efficient outcome. Recent economic thinking incorporates the idea that public sector institutions are also imperfect, that there is a cost of using them, and thus there is no *a priori* reason to believe that government intervention into an imperfect market will necessarily lead to a more efficient outcome. This is perhaps best illustrated in the following quote from George Stigler:

> A famous theorem in economics states that a competitive enterprise economy will produce the largest possible income from a given stock of resources. No real economy meets the exact conditions of the theorem, and all real economies will fall short of the ideal economy—a difference called "market failure." In my view, however, the degree of "market failure" for the American economy is much smaller than the "political failure" arising from the imperfections of economic policies found in real political systems. The merits of laissez-faire rest less upon its famous theoretical foundations than upon its advantages over the actual performance of rival forms of economic organization.[3]

Indeed, it is now accepted that in some cases an unregulated "bad" market outcome may still be preferable to the one achieved with government intervention.[4] The burden has shifted from one in which government involvement was justified in all cases of imperfect market outcomes to one in which government involvement is justified only in cases where the potentially imperfect outcome with government involvement is likely to be better than the imperfect outcome with an unregulated private market. Thus, modern public sector economists tend to be in favor of an even more limited role of government than were public sector economists of the past.

This chapter proceeds by first discussing the differences between market action and government action, and then exploring the justification for government intervention based on concepts of economic efficiency and equity. The

chapter then proceeds to discuss individual cases in which unregulated private market outcomes are generally considered to violate these criterion.

2. THE DIFFERENCE BETWEEN MARKET ACTION AND GOVERNMENT ACTION

The private sector (markets) and the public sector (government) may simply be thought of as two alternative institutions that can be used to allocate scarce resources in an economy. In a *market* economy, characterized by private ownership, it is important to remember that these resources are not owned collectively by society, but rather are owned privately by individuals. The market process that allocates these resources works through the voluntary, uncoerced specialization and exchange undertaken by individual owners. In contrast, collective action undertaken through the public sector uses the coercive powers of government to alter the choices of individual owners. This is the first of two fundamental differences between market action and government action—the reliance on voluntary choice versus coercion to allocate resources. When market exchange occurs it is clear that both parties have been made better off (or were both expecting to be made better off), while with government action it is frequently the case that some parties have been made better off while others have been made worse off.[5]

The second fundamental difference between market action and government action rests in the nature of planning and choice. In the public sector planning is done centrally, while in private markets planning is done individually. Government intervention can thus be thought of as replacing individual planning with central planning. In markets, individuals are left to make choices based on the personal costs and benefits they face according to their individual preferences. When action is done through the public sector, the choices and decisions must be made collectively. Collective choice is a much more difficult process than individual choice as it requires a mechanism for aggregating the preferences of many diverse individuals. To make good collective choices requires registering or knowing a vast amount of information about individual preferences. The fact that no single central planner could possibly know all the information necessary to make these good choices was a key element of F.A. Hayek's (1945) defense of capitalism over socialism. In modern market based economies, democratic voting procedures, rather than the selection of a knowledgeable central planner, is generally used as the process to make collective choices. These voting rules, however, inherently have problems with registering the intensity of preferences, getting individuals to truthfully reveal their preferences, and providing enough incentive for voters to become well informed about the choices they must make.[6]

Models of public sector intervention in cases of market failure have historically modeled government as being represented by a socially benevolent dictator who had all the information necessary to make changes that would improve the efficiency of resource allocation. Modern day economic analysis, however, generally models the process of collective choice as one dominated by rationally ignorant voters, powerful special interest groups, vote-maximizing elected officials, and budget-maximizing bureaucrats. It should be apparent that this has important implications for government intervention, both to correct market failure and to achieve normative equity goals. Interest groups and bureaucrats will tend to cloak their self-interested demands for transfers, budgets, and legislation as policies to address market failures or equity goals, even when that is not the true intention of the policy. For this reason, stringent constraints on government intervention and regulation appear necessary.

3. THE CONCEPT OF ECONOMIC EFFICIENCY

Within the neoclassical economic paradigm, economic efficiency is the benchmark by which both market outcomes and government intervention are judged. Economic efficiency requires two conditions be met:

(1) all actions generating more social benefits than costs should be undertaken, and
(2) no actions generating more social costs than benefits should be undertaken.

If both of these conditions are met, a Pareto Optimal allocation will be attained—that is, one in which it is impossible to reallocate resources in such a way to make at least one person better off without harming another person.[7]

When market exchange occurs it is clear that both parties have been made better off, while when government action occurs it is frequently the case that some parties have been made better off while others have been made worse off. If all parties to an exchange benefit it is clear that the action is consistent with efficiency. In cases where government intervention benefits some parties and harms others, the efficiency implications are not so obvious. The traditional metric by which such actions are judged is the "potential Pareto criterion" (sometimes referred to as the Hicks-Kaldor criterion).[8] The potential Pareto criterion is met if enough benefits are generated such that it would be hypothetically possible for the winners to completely compensate the losers. In essence, the potential Pareto criterion amounts to a cost/benefit test for government intervention. It is important to note that substantial issues arise with a strict application of this rule. For example, if the benefits of building a road exceed the losses to property owners from taking their property for use in construction, the potential Pareto criterion would justify taking the property for

public use *regardless* of whether any compensation was paid to the owners at all.

Almost exclusively in public finance, the efficiency criterion is applied to whether the quantity of some economic activity is the efficient quantity, and the benchmark efficient quantity is generally derived or illustrated in a supply and demand diagram in which the supply curve measures the marginal social cost of the activity, while the demand curve measures the marginal social benefit of that activity. This is illustrated in Figure 1 where MB_S and MC_S are the marginal social benefit and marginal social cost respectively.

In Figure 1, Q* corresponds to the efficient output level. All units up to Q* satisfy condition (1) listed above because they all generate more social benefits than costs. Units beyond Q* should not be produced given condition (2) listed above because they generate less social benefits than costs.

Private individuals acting in markets make decisions to buy and sell based on the private (or personal) costs and benefits they face. If all of the costs and benefits from an activity are isolated to only the parties privately involved in the transaction, then it will be the case that the private costs and benefits on which the market decision is based fully reflect all of the social costs and benefits of the action.[9] More precisely, actual market outcomes are determined by the intersection of demand and supply curves that reflect only the marginal private benefits (MB_P) and marginal private costs (MC_P) of the activity. Thus, in cases where the marginal private benefits equal the marginal social benefits ($MB_P = MB_S$) and the marginal private costs equal the marginal social costs ($MC_P = MC_S$), the equilibrium quantity produced in a competitive private market will be precisely the Q* shown in Figure 1. Cases in which private and social costs (or benefits) diverge will result in a private market outcome that is not consistent with the efficient level of output. These are cases of market failure that are to be explored in further detail in this chapter.

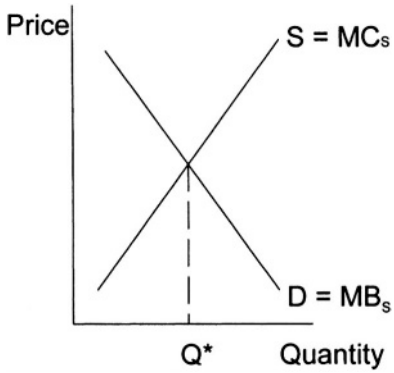

FIGURE 1. Market Efficiency.

4. THE CONCEPT OF EQUITY

The intervention of government into markets to address equity concerns is a more controversial issue than is the intervention of government into markets to correct cases of market failure to achieve economic efficiency. At the heart of this controversy is the lack of a positive, objective definition of equity. Even the best attempts in the economics literature to objectively define fairness have failed upon closer scrutiny.[10]

Many modern scholars argue that the fairness of an outcome cannot be determined without knowledge of the process that determined the outcome.[11] More precisely, they adopt a procedural theory of fairness in which a fair outcome is defined as one that is the result of a fair process. Within this framework it is possible to have outcomes that are clearly unequal, but are fair nonetheless because they were the result of a fair process. Correspondingly, it is possible to have apparently equal outcomes that are unfair because they are the result of an unfair process. If one perceives the market as a fair process, then any distribution of income or wealth that results from it must, by definition, be fair.

The immense difficulty in applying these different fairness concepts can be seen when analyzing the merits of alternative tax proposals. If one views taxes as a way of allocating the cost of financing government across individuals, it appears fair to assign taxes in accordance with ability to pay (although the degree to which taxes rise with ability to pay would still be an issue). Alternatively, if one views taxes as the price citizens pay for government output, then taxation according to benefits received appears to be the fair method of assigning taxes. A citizen who does not benefit from a particular government program should not be forced to pay for it, regardless of their income. This example makes it clear that even in the restricted area of tax policy, the concepts of fairness and equity are difficult to define in a manner that is considered agreeable by everyone.

While there is clearly popular support for democratic governments to intervene into markets for equity reasons, it is less clear whose definition of equity should be used as the basis. In cases where government involvement to achieve equity goals detracts from the efficiency of markets, the equity justification may stand at odds with the logic of using government to promote economic efficiency. Perhaps ironically, one could apparently argue on this same ground that there could be equity based justifications for *not* allowing government to correct a market failure if reaching the efficient outcome would detract from a stated equity goal.

At the heart of social welfare analysis is the idea that while there are many possible efficient allocations of resources (imagine all the points along the contract curve in an Edgeworth box for example), not all of these points are

equally preferred from the standpoint of equity. Operationally, it has been standard practice in public finance for economists to incorporate equity goals into economic models through an explicit representation of a social welfare function, the social welfare function simply being some algebraic transformation of the utility levels of the members of the society.[12] The social welfare function can then be maximized subject to the production or other constraints imposed on the economy to obtain the solutions that maximize social welfare. Because these models require arbitrary weights to be placed on the utility levels of different members of society, the value of such mathematical exercises depends on whether one agrees or not with the subjective weighting choices made by the author of the model.

Regardless of whether the justification is on efficiency or equity grounds, there are several widely accepted areas in which government intervention might be justified. The remainder of this chapter is devoted to more in depth discussions of these areas, which are (1) public goods, (2) externalities, (3) monopoly, (4) incomplete information, (5) economic stabilization, and (6) redistribution.

5. PUBLIC GOODS

The first case of market failure that will be discussed is that of public goods. A public good is defined as any good that is both joint-in-consumption (sometimes called nonrival-in-consumption) and nonexcludable. To be a public good, a good must have *both* of these characteristics. This section first defines these two characteristics and explores the conditions necessary for the efficient provision of a public good. It then proceeds to explain why a private market may fail to efficiently produce a public good and whether a real world public sector is capable of producing the efficient level of a public good.

A good is "joint-in-consumption" if the consumption of the good by one individual does not lower the amount of the good available to others. Each unit of a good that is joint-in-consumption can be shared by all consumers, and the marginal cost of providing the good to one additional user is precisely zero. A radio broadcast signal provides an example of a good that is joint-in-consumption. If an additional listener turns on their radio, they may receive the signal without detracting from the amount of the signal available to others. In addition, if the population within the listening area were to increase, the broadcast signal is available to these additional listeners with no additional cost of production. A public good that is subject to congestion as the number of users grows is sometimes referred to as an impure public good. A road in a rural area may have so little traffic that the addition of one additional car does not detract from the availability, or value, of the road to other users—so it is joint-in-consumption. That same road placed in the downtown of a

metropolitan area, however, may become congested and lose its jointness-in-consumption—and thus would no longer exhibit this characteristic. Thus, the publicness of a good depends not only on the good itself, but also on the environment in which it is consumed. Thus, an impure public good may be a public good in some situations, but not in others.

A good is nonexcludable if it is impossible (or at least prohibitively costly) to exclude nonpaying consumers from receiving the good. Consider, for example, a Fourth of July fireworks display provided in a public park. If an admission fee to the park were charged, some individuals might choose to watch the fireworks display from just outside the park to avoid paying the entry fee. In cases where individuals may still receive the benefit from the good without paying, they will have an incentive to do so, particularly in cases where the lack of their individual payment does not have a significant impact on the total quantity of the good provided. This potential for "free riding" by users of the good is the source of the potential market failure in the case of a public good. If a private firm cannot exclude nonpaying customers, their revenue will not fully reflect the social benefit derived from the production of the good. This will be a case in which the marginal private benefit of the activity reflected in the market demand curve is less than the marginal social benefit of the activity ($MB_P < MB_S$). Because free riding lowers the private benefit to the firm of producing the good, it will be supplied in a less than optimal quantity—if it is supplied at all. This free-rider problem is at the heart of the arguments for market failure, and public sector provision, in the case of public goods. We will return to the issue of whether markets can, in some cases, find ways to overcome the free-rider problem and thus efficiently produce public goods after first deriving the necessary conditions for the efficient provision of a public good.

As is the case with any good, the efficient level of production may be found by equating the marginal social benefit and marginal social cost curves as was done in Figure 1. There is one fundamental difference, however, in the construction of the marginal social benefit curve between private and public goods. To construct a marginal social benefit curve (the market demand curve) in the case of a pure private good, it is necessary to *horizontally* sum all the marginal benefit curves of the individuals in the market (the individual demand curves). In the case of a good that is joint-in-consumption (regardless of its excludability), it is necessary to *vertically* sum all the marginal benefit curves of the individuals in the market. The reason for the difference is that in the case of a good that is joint-in-consumption each unit is jointly shared by all and thus the total social benefit produced from a given unit is the sum of the benefits derived by all individual consumers who share in the consumption of that unit. In the case of a private good, each unit is rival-in-consumption so that the total social benefit produced by the good is only the private benefit received by the

single individual who obtains and consumes the good. The construction of the market demand curve (D) or marginal social benefit curve (MB_S) for a public good in a society of three individuals, Larry, Moe, and Curly with individual demand curves given by d_L, d_M, and d_C, is shown in Figure 2.

The economically efficient quantity of this public good (Q*) is illustrated in Figure 2 and it is found by the intersection of the marginal social benefit curve with the marginal social cost curve. For simplicity, here it is assumed that there is constant marginal social cost in the provision of the public good. The condition that must be present for the efficient provision of a public good is that the sum of the marginal rates of substitution across all individuals (here equivalently modeled as the individual marginal benefits) must be equal to the marginal cost of production (or equivalently, the marginal rate of transformation in a general equilibrium model). This condition is often referred to as the "Samuelsonian condition" for the efficient provision of a pubic good because Samuelson (1954) was the first to formally derive it. His original article was followed by the publication of the diagrammatic representation of this condition in Samuelson (1955).[13]

How will the output level of this public good in a private unregulated market compare to the efficient quantity shown in Figure 2? Because of the nonexcludability of the good, the free-rider problem discussed above will result in a private provision equilibrium in which the quantity produced is less than the efficient quantity.[14] Despite the rather clear implications of the neoclassical maximization model for the inefficiency of private provision of public goods, many scholars are very critical of the real-world applicability of this model.

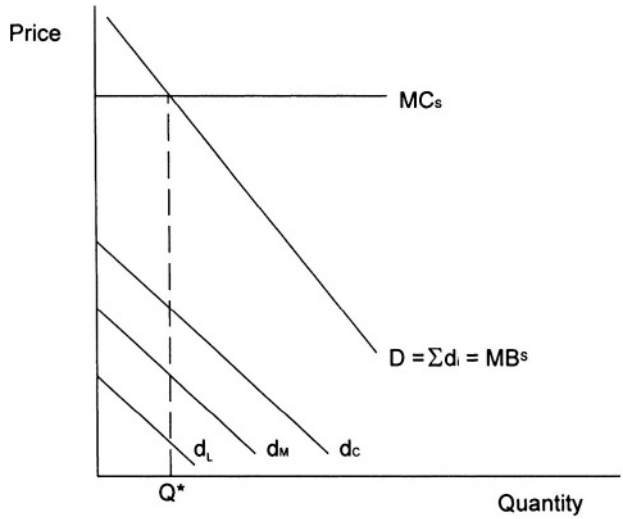

FIGURE 2. Efficient Provision of a Public Good.

Radio broadcasts, for example, meet both conditions for a public good, but rather than the private market underproviding broadcasts, the Federal Communications Commission actually restricts the number of radio stations allowed in the private market under the logic that the private market would otherwise *oversupply* radio broadcasts. Similarly, lighthouses were traditionally listed as a textbook case of a public good. Subsequent research by Coase (1974) and Peacock (1979), however, has found that lighthouses in nineteenth-century England were indeed privately provided. Finally, Holcombe (1996) points out that Bill Gates became the richest man in the world producing a good, computer software, that can be argued to meet the conditions for being a public good (particularly prior to the development of copy protection technology). While examples such as these don't prove that markets can provide public goods efficiently, they certainly cast doubt on the radical claim that markets can not provide public goods.

When considering whether the private market can efficiently produce public goods, it is important to remember that cases of market failure represent cases in which the full gains from trade have not been realized. Thus, cases of market failure represent profit opportunities for entrepreneurs who can find innovative ways to overcome the sources of the market failure. Because the source of underprovision is the free-rider problem, innovative methods for overcoming this problem can allow private markets to efficiently provide public goods. In the case of radio broadcasts, for example, the use of advertising, rather than direct sale of the broadcast to consumers, allows the industry to overcome the free-rider problem. In the case of lighthouses in nineteenth-century England, rather than funding them by sale of the services directly to ships, the services were sold to nearby ports who found that a lighthouse was essential to be able to attract ships and compete with other ports.

In addition to finding alternative payment mechanisms to circumvent charging the final consumer, another method by which private markets can overcome the free-rider problem is through bundling the public good with another good or service as a tie-in sale.[15] In the case of computer software, for example, the sale of customer support and manuals for the software are bundled with the purchase of the software itself, giving consumers an incentive to pay for the software to receive these other benefits. Shopping malls often provide public goods such as restrooms, common areas with benches and fountains, and security that are not financed by charging individual users. Instead, their provision is financed through the higher lease or rental prices for mall space that results from attracting more customers to the mall. Similarly, neighborhood associations, condominiums, and apartment complexes often provide public goods (such as pools, parks, meeting facilities, fitness facilities, or playgrounds) for their residents that are financed through the higher rental rates (or homeowner

fees) that result from the increased value to residents of having these goods provided for their use.

Examples such as these are used by many authors to question, at a fundamental level, the applicability of the standard neoclassical market failure argument in the case of public goods because it is derived under such restrictive conditions and assumptions about the allowable means of financing the provision of the public good, and because it ignores the great incentive given to private markets to overcome cases of market failure.[16] The ability of private markets to efficiently provide even the most fundamental of public goods, such as a legal system, courts, and contract enforcement, has been shown by Benson (1990). Clearly much additional research is needed to fully understand the conditions under which the private provision of public goods is possible and efficient. In addition, there remains substantial debate as to whether there are many goods that would classify as pure public goods in the first place.[17]

Next, it is worth considering the issue of whether real world public sector institutions are capable of producing the efficient quantity of a public good. While this might not be much of a problem for a benevolent, fully-informed central planner, it can be quite a challenge for a real-world political institution. If collective choices about the provision of public goods are made under majority rule voting, it is possible to derive the amount of the public good that will be supplied by government using the median voter theorem.[18] Let us return to the example of a public good in a community of three individuals that was illustrated in Figure 2. Assume, momentarily, that the good will be financed through a system in which each voter pays one-third of the marginal cost of production. Given this cost sharing agreement, the most preferred quantities of each of the three voters, shown by Q_L, Q_M, and Q_C, are shown in Figure 3.

Under simple majority-rule voting, the median voter theorem applies, so that the median voter's most preferred outcome wins, because it will beat all other alternatives in pair-wise majority voting. Here, the median voter is Moe, so the level of production shown by the quantity Q_M would be produced through the collective choice mechanism. But how will Q_M compare to the efficient level of production of the public good given by Q*? Only in the case where the median voter's tax share exactly equals his or her share of the marginal benefit of production will Q_M equal Q*. If the median voter's tax share is greater than his or her benefit share, Q_M will be less than Q* and if the median voter's tax share is less than his or her benefit share, Q_M will exceed Q*. It is this final case that is illustrated in Figure 3.

The general principle illustrated here is that the closer are tax shares to reflecting the benefits individuals receive from public goods, the closer will be the production of the good by the public sector to the efficient quantity. A tax situation in which each person is charged a tax price equal to their precise marginal benefit at the efficient output level is known as Lindahl pricing, after

the work of Lindahl (1919) that was later formalized by Johansen (1963). The Lindahl tax prices for the three individuals are shown in Figure 4 as T_L, T_M, and T_C.

Note, however, that all that really matters for efficient provision under majority rule voting is whether the *median voter's* tax share equals his or her benefit share. From an efficiency standpoint, whether this is true for the other

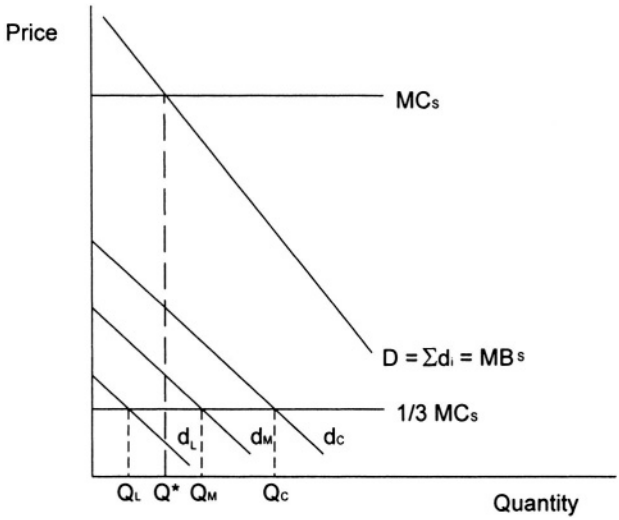

FIGURE 3. Public Sector Provision of a Public Good Under the Median Voter Model.

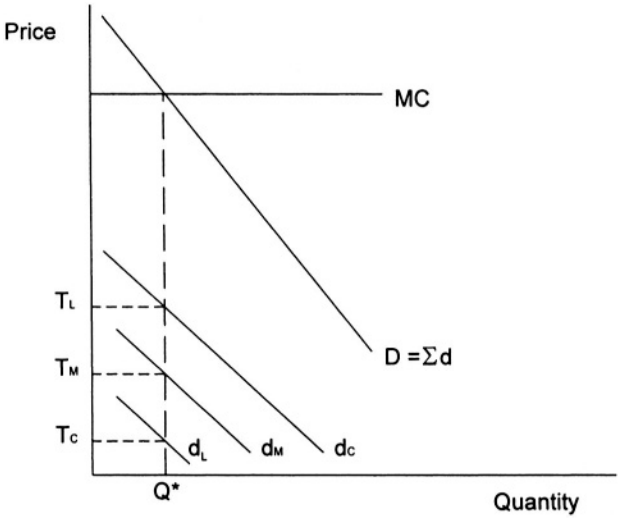

FIGURE 4. Determining Lindahl Tax Prices for a Public Good.

individuals in the society doesn't affect the outcome.[19] Thus, Lindahl pricing is not a necessary condition for efficient provision, but is rather a sufficient condition. If this simple majority rule voting model is an accurate representation of the collective choice process, then the issue as to whether the public sector can efficiently provide a public good simply depends on the degree to which the median voter's tax share approximates his or her share of the marginal benefit of a public good's provision. There are two significant problems with using this as a guide to tax policy, however. First, it is impossible to accurately estimate the benefit shares of individual citizens, and second, if this is the announced method for determining tax shares, individuals have a strong incentive to misrepresent their true preference for the public good in order to lower their tax burden (by claiming they get less benefits than they really do from the public good).[20] In reality, when one considers the remote chances that the median voter's true tax share approximates his or her benefit share, it's clear that just like in the market sector, the efficient provision of public goods by government is unlikely. In any particular case the issue is thus whether the potentially inefficient market outcome is closer or further from efficiency than the potentially inefficient government outcome.

Before moving on to the next area of market failure, it is worth considering one simple extension of the model of public sector provision above. It is now widely accepted in economics that the public sector bureaus charged with the actual production of these public goods are far from efficient. In particular, individuals within these bureaus have very little incentive to control costs. Since the incentives for internal efficiency are less in public sector bureaus than in private firms, it is the case that public sector provision of the good will generally be more costly than private provision of the same good.[21] In addition, following the work of Niskanen (1968, 1971), the individuals in charge of public sector bureaus are often modeled as attempting to maximize the size of their budgets.[22] By presenting "all-or-nothing" type proposals to their sponsor or funding agency, they can secure a budget that is significantly larger than the sponsor's most preferred amount. In fact, in a case where the demand curve of the sponsor is linear, the bureau can obtain funding for a quantity that is up to twice as large as the sponsor's most preferred quantity. If we briefly consider a situation in which the median voter's demand curve (d_M) is used to represent the preferences of the sponsor, and assume the case of Lindahl pricing (that in the previous analysis resulted in efficient public sector provision in which the median voter's most preferred quantity Q_M was equal to the efficient quantity Q*), Figure 5 shows the relationship between the quantity preferred by the median voter (Q_M) and the quantity that would be supplied by a budget maximizing bureau (Q_B).[23] This is obtained by the construction of an "all or nothing" demand curve, shown in Figure 5 by d_{AON}.

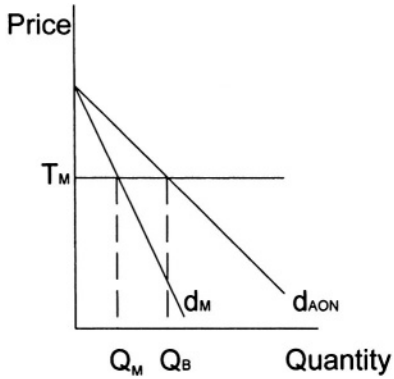

FIGURE 5. Public Sector Provision of a Public Good Under the Bureaucracy Model.

This analysis shows even if tax shares could be allocated in such a way that the efficient quantity of the public good was most preferred by the median voter, potential problems with the incentives of the public sector bureaucracies providing the good may cause the output of the public good to diverge from the efficient quantity. If we were to add into this analysis the fact that the median voter's tax share was probably not equal to the accurate Lindahl tax price, so that Q_M in Figure 5 wasn't the efficient quantity to begin with, it becomes even more clear that efficient public sector provision of public goods is indeed unlikely.[24]

To summarize, this section first defined a public good, proceeded to show the method for determining the efficient provision level for a public good, and then discussed how the free-rider problem created the potential for market failure—in that markets might tend to underproduce public goods. Cases in which markets seem to apparently produce public goods fairly well were discussed, and then cases in which government production was likely to diverge from efficiency were presented. It seems clear that if efficient production is the goal, that simply demonstrating a good meets the criteria for a public good is not sufficient to warrant government intervention. Indeed, there appears to be an additional burden of proof that the government provision is likely to improve upon the private market outcome.

6. EXTERNALITIES

The second area of market failure to be considered is the case of externalities. Generally an externality may be thought of as a case in which a non-consenting third party is affected, either positively or negatively, by an action undertaken by other individuals. An important distinction, however, arises between cases of pecuniary and technological externalities.[25] A pecuniary externality is a third-party effect that occurs through the pricing system, while

a technological externality is a third-party effect that occurs outside the pricing system. As an example, a McDonald's opening up next door to a Burger King would lower the profits of the existing Burger King. Because this occurs through the market pricing system, this would be considered a pecuniary externality. Because they occur within markets, pecuniary externalities do not create market failures, and are not a justification for government intervention. In fact, the ability of some firms to enter and compete with existing firms (the infliction of these pecuniary externalities) is *necessary* for market efficiency. Holcombe and Sobel (2001) discuss this distinction between pecuniary and technological externalities in more detail and show that when the government intervenes to compensate for pecuniary externalities that it actually moves market outcomes away from efficiency. While the distinction between pecuniary and technological externalities is well developed in the case of the production of business firms, Holcombe and Sobel (2000) provide the first treatment of this difference applied to externalities between individuals. Their analysis suggests that interdependent utility functions are a case of pecuniary externalities that do not require government corrective action.

A technological externality exists only in cases where there is a missing market, an undefined property right, or an unpriced resource at play. Air pollution, water pollution, and overutilization of common property resources are examples. If, to alter the previous example, McDonald's were to emit pollution into the air that interfered with Burger King's ability to produce its hamburgers, this would be a case of a technological externality. Technological externalities may either be positive (external benefits) or negative (external costs). In cases where technological externalities exist, there will be a divergence between the marginal social benefits (or costs) and the marginal private benefits (or costs). Figures 6a and 6b illustrate these two cases.

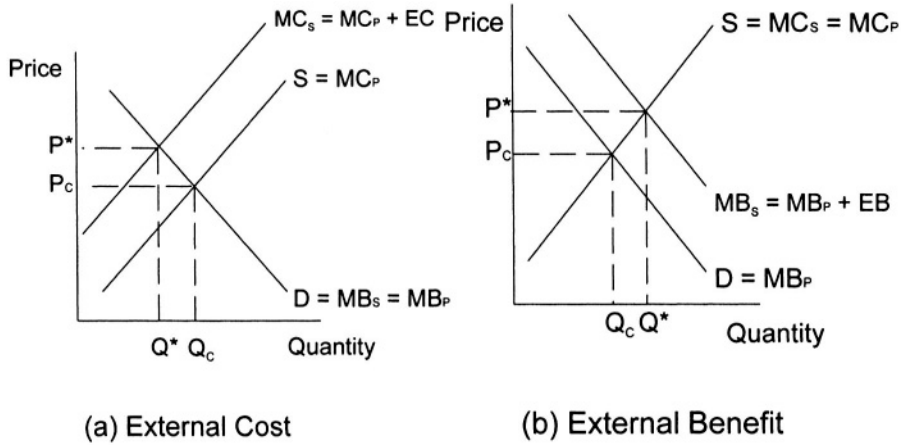

FIGURE 6. Private Market Failure in the Case of Technological Externalities.

Figure 6a illustrates the standard neoclassical analysis in the case of an external cost in the amount of EC per unit of the good produced (assuming no externalities on the benefit side of the market). The total marginal social cost (MC_S) is equal to the marginal private cost (MC_P) plus the external cost (EC). Because the private market responds only to the private costs involved, which are an understatement of the true social costs, the competitive private market outcome Q_C will be greater than the efficient outcome of Q*. The good will also be underpriced (that is, $P_C < P^*$) because the market does not fully incorporate the true social cost of production. Figure 6b illustrates the analogous case for external benefits in the amount EB per unit of the good produced (assuming no externalities on the cost side of the market). Here total marginal social benefit (MB_S) is equal to the marginal private benefit (MB_P) plus the external benefit (EB). Because the private market responds only to the private benefits involved, which are an understatement of the true social benefits, the competitive private market outcome Q_C will be less than the efficient outcome of Q*. As in the case of external costs, a good with external benefits will also be underpriced ($P_C < P^*$).

The above analysis was for the case in which the external cost (or benefit) was a constant amount for each unit of the good produced (thus the parallel, vertical shifts in the supply and demand curves). When this condition is violated, it is possible that the competitive market outcome may still be efficient in the presence of an externality. In particular, consider a case in which the external cost is, say $5 on the first unit produced, $4 on the second unit, $3 on the third unit, and so forth until the marginal external cost goes to $0 on the sixth and subsequent units. If water pollution from a firm is killing fish in a lake, for example, it is likely the case that after a certain level of production that additional units produced (and additional pollution emitted) do not create any additional marginal damage. In the case of external benefits, say for example an individual's choice of educational attainment, it may be the case that the external benefits generated by the first few years of schooling are large, but that as additional years of schooling are acquired, these external benefits eventually go to zero beyond some educational level. If the marginal external costs or benefits fall to zero *before* the level of production that would be provided by a competitive private market, then there will be no relevant externality at the margin, and thus no market failure. This case of "inframarginal externalities" is illustrated in Figures 7a and 7b.

As is illustrated in Figures 7a and 7b, when the externalities are inframarginal, the private market outcome is efficient because the externality is not relevant at the margin (i.e., at the equilibrium quantity). To distinguish the case in which there is an externality relevant at the margin, such as in the cases shown in Figures 6a and 6b, those are sometimes referred to as "Pareto-relevant externalities," to contrast them with the case of inframarginal externalities.[26] It

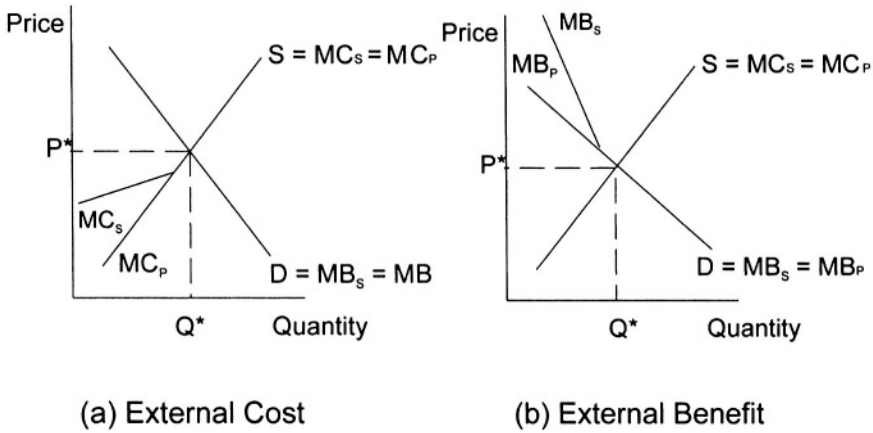

FIGURE 7. Private Market Efficiency in the Case of Inframarginal Externalities.

is possible, however, that in the case of an inframarginal externality if demand (or supply) were to decline, that the externality would become Pareto relevant.

Based on the seminal work of A.C. Pigou, for decades the dominant thought was that in the case of a Pareto-relevant externality, that government intervention in the form of a tax or subsidy would be required to move the market toward the efficient outcome.[27] Returning to the case of an external cost in Figure 6a, the government could impose a per-unit tax in the amount of the external cost. The private market supply curve would shift up vertically by the amount of the per-unit tax, and as long as the per-unit tax (T) was equal to the amount of the external cost (EC) created per unit, then the new private market supply curve would mirror the true marginal social cost curve, and the market equilibrium quantity would move to the efficient output level of Q*.[28] In the case of an external benefit as in Figure 6b, the government could grant a per unit subsidy (S) equal to the amount of the external benefit (EB) created by each unit. This would shift the private market demand curve upward vertically by the amount of the subsidy. The resulting demand curve inclusive of the subsidy would mirror the true marginal social benefit curve, and the market equilibrium quantity would move to the efficient output level of Q*.[29]

The imposition of these "Pigovian" taxes and subsidies in practice is difficult, however. Proper policy requires that the government officials in charge of determining the tax and subsidy amounts have knowledge of the exact amounts of the true external costs or external benefits in the market. Furthermore, individuals would have an incentive to misrepresent their true preferences in this case if the information they were required to provide to the government impacts their tax or subsidy amount. Finally, even if it were possible to know the true external costs or benefits, one must ask what incentive government would have to impose taxes or subsidies in those amounts. If the government were

allowed to tax (or subsidize) a particular market, the tax (or subsidy) imposed would likely reflect many political factors other than the externality. A real-world legislature might, for example, impose the revenue maximizing per-unit tax, or increase the subsidy beyond the amount of the external benefit in an attempt to win votes for an upcoming reelection. Additionally, because a firm or individual would lobby just as hard to avoid or prevent a $100 technological externality as a $100 pecuniary externality, a vote-seeking politician may attempt to enact policies that prevent or compensate for both types of externalities, and as Holcombe and Sobel (2001) show, government intervention to prevent or correct pecuniary externalities results in less, rather than more, efficient market outcomes.

The pioneering work of Coase (1960) has fundamentally altered the way economists think about externalities. A key insight of his analysis is that all externalities are the result of undefined or poorly defined property rights. The policy prescription seems clear, to alleviate the market failure requires only the assignment of the property right so it can then be priced, and traded, in the marketplace.[30] However, Coase's insight goes farther. As long as the group involved is of small enough number, voluntary bargaining between the parties, without any government involvement, will alleviate the externality.[31] Returning to the earlier example, Burger King could offer to pay McDonald's to stop emitting the air pollution that is interfering in Burger King's production process. Suppose for the sake of example that Burger King would be willing to pay up to $1,000 to stop McDonald's from polluting, while McDonald's could install an antipollution device and eliminate the pollution it emits for $800. As is now well known, the Coase Theorem states that in the absence of significant transactions costs (which would get in the way of the bargaining process), the final allocation of resources will be efficient, and will also be independent of the initial assignment of the right. That is, the same outcome will prevail regardless of whether the government were to intervene and give the right to pollute to McDonald's (in which case Burger King could then offer to pay McDonald's $900 to stop polluting, which they would accept given the antipollution device costs only $800) or if the government were to intervene and give the right to clean air to Burger King (in which case McDonald's would then offer to pay Burger King up to $800 for the right to allow them to pollute, which Burger King would reject, resulting in McDonald's having to install the antipollution device). Since the "high bidder" would be the same in both cases (here Burger King), they would secure the use of the resource and the same outcome would prevail in both cases, and it would be the efficient outcome.[32] However, again, it is important to stress that there is no necessity for the government to intervene to establish the property right because the two firms would have an incentive to bargain out a Pareto-improving solution on their own.

Perhaps the biggest implication of Coase's work is that transactions costs are the fundamental source of unresolved market failures. In cases where a large number of individuals would have to be involved in the bargaining process, high transactions costs might prevent successful bargaining. In the case of large numbers, where bargaining might not occur, the final outcome *will* depend on the initial assignment of property right as it will tend to stay in the hands of the party to whom it was initially assigned.

Based on the insights provided by Coase's analysis, government intervention in the case of externalities when it is warranted (in the case of an unresolved, Pareto-relevant, technological externality) should be limited to establishing or defining private property rights. In some cases, such as the air and oceans, this may not appear feasible, but innovative methods such as tradable pollution permits and tradable fishing rights can accomplish the same task. The modern approach in the case of market failure due to externalities, then, tends to be one of the government creating or establishing more markets (through the defining of property rights), and allowing these markets to work uninhibited, rather than through direct government interventions such as taxes or subsidies along the lines of Pigovian analysis that restricts the role of markets.

7. MONOPOLY AND ANTITRUST

The next case of market failure to be considered is that of monopoly. It is well established in economics that a monopolist will produce a smaller level of output than the efficient level of output that would be produced under ideal competitive market conditions.[33] This is illustrated in Figure 8 where Q* is the efficient level of market output, Q' is the profit-maximizing output produced by the monopolist, and P' is the profit-maximizing price charged by the monopolist given the firm's marginal revenue (MR) and marginal cost (MC_S) conditions shown.

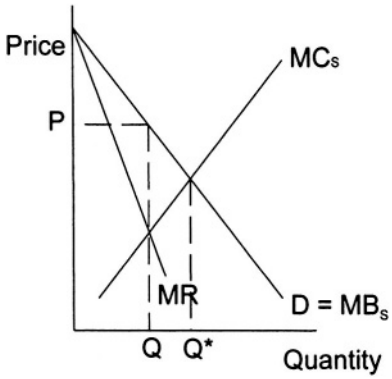

FIGURE 8. Market Failure in the Case of Monopoly.

To understand the proper response of government to a case of monopoly requires making a distinction between two general classes of monopoly—which I shall refer to as artificial monopoly and natural monopoly. An artificial monopoly is a case in which there is only one monopoly firm in the market *because of* an artificial barrier to entry in the industry created by government licensing, law, or regulation. Examples of such cases are the U.S. Postal Service's monopoly on first class mail delivery and local cable providers receiving exclusive contracts from local governments to supply the area with cable service. In these markets, if the artificial barrier to entry was removed, the market would see the entry of new firms to compete with the monopolist. In these cases, it is clear that the market failure itself is due to the preexisting government regulation and that the solution to alleviate the failure is to repeal the law or regulation so that the market is again contestable.[34]

The case of natural monopoly is one in which a single monopoly producer is the natural result of an unregulated competitive market process because a single firm can supply the market at a lower per unit cost than can any combination of smaller firms. Examples of this case may be seen in local markets with a smaller number of consumers, such as one grocery store in a small town or a single newspaper for a small city. However, these examples highlight the extreme difficulty in determining what is, and is not, a monopoly situation because of the somewhat subjective nature of defining the relevant market. While the local newspaper may be the only newspaper, it certainly is competing with many other firms (such as radio and TV stations) in the more broadly defined market of information services. Regardless of whether there are competitors producing closely related goods or services, the most important policy prescription for government in these cases is to ensure that the market remains contestable—that is, that there are no artificial barriers created that would prevent new firms from entering into the industry and competing with the existing monopolist.[35] Just the threat of facing new competition will act as a constraint on the pricing policies of the existing monopolist and lessen the problem of inefficiency.

Traditional economic regulation of a monopoly, either in the form of price regulation or rate of return regulation, is not a very satisfactory solution to the problem of monopoly. Not only do these types of regulation give the monopolist an incentive to misrepresent their true costs and profits, but they generally also result in overcapitalization of assets by the firm.[36] Perhaps more importantly, modern analysis suggests that regulatory agencies tend to get captured by the firms that they regulate and end up working for the interest of the industry at the expense of consumers.[37] Once created, these regulatory agencies may work to help a multi-firm industry act as a cartel, or to help a monopolist maintain its monopoly position in the industry. It is telling along these lines

that once in place, antitrust laws are generally invoked by competing firms, rather than by consumer interests.

If a monopolist firm earns its monopoly status by eliminating competitors through competitive practices like providing consumers with better products at lower cost, it is hard to argue that the monopoly should be subject to government action. Monopolies are rare in the real world, and even the largest giant corporations in the U.S. have a well established history of falling by the wayside. Railroad giants like Norfolk and Western and Union Pacific saw air transportation and trucking evaporate their market; typewriter giants like Royal and Smith Corona were devastated by the introduction of the personal computer; and marketing giants like Montgomery Ward and KMart have fallen to the wayside as modern retailers such as WalMart have provided consumers with better value at lower prices. One only has to look at the high rate of turnover in the Fortune 500 list to know that market power is a temporary phenomenon, at best. The optimal policy for dealing with monopoly power is thus to ensure that markets remain open and contestable so that new firms can, if they wish, enter to compete in the market.

8. INCOMPLETE INFORMATION

Because information is both costly to provide and to acquire, economic analysis suggest that consumers will generally make decisions with less than perfect information as they economize on their use of scarce resources. It is relatively simple to show mathematically that market situations characterized by less than perfect information are less efficient than outcomes based on full information if one ignores the cost of providing and acquiring the information.[38] Once these costs are factored in, however, an equilibrium with incomplete information may be more efficient than one with full information. Similarly, when government mandates that producers provide certain information to consumers through product labeling or advertising, these policies must be judged by whether the benefits they create outweigh the cost of the additional information. After all, a profit maximizing business firm will sell consumers all the information about the product that they wish as long as consumers are willing to pay a price sufficient to cover the cost to the firm.

It is generally the case that the potential for information problems tends to be more severe for items which consumers purchase infrequently than for items which are purchased on a repeat basis. Consumers not only acquire information through repeated purchases, but the cost to a firm of attempting to take advantage of a consumer is much greater because of the potential for significant losses in terms of lost future repeated dealings with the customer. Information problems thus have the potential to be greater in cases of infrequently purchased items, such as major appliances, or items from souvenir

shops in tourist areas. Economic analysis suggests that brand names are one way in which firms can attempt to provide a quality signal to a consumer for an infrequently purchased item. A traveler stopping at a McDonald's restaurant in Topeka, Kansas, even if he or she has never been to the city before, is ensured a similar quality item to the one provided at the McDonald's restaurant in his or her home town. Furthermore, expenditures on building brand-name capital can be a signal to consumers that the firm is unlikely to be "here today, gone tomorrow" given the large investment expenditure they must recoup.

The most important role for government regarding informational exchanges between buyers and sellers is to provide for a mechanism by which parties can be held liable for making false claims. As long as these mechanisms are in place, the issue is no longer one of the accuracy of information, but of the quantity or quality of the information supplied in the market voluntarily by buyers and sellers. It is also important to note that information can be supplied by outside third-party sources, such as *Consumer Reports* magazine or by producers allowing third-party testing laboratories such as Underwriters Laboratories Incorporated (UL) or Better Housekeeping to test and certify their products.

Markets in which one side of the exchange has more information than the other can be subject to the problem of adverse selection which can destroy the potential for an efficient market outcome. Akerloff's (1970) market for lemons is perhaps the most well-known example of this phenomenon. When the sellers of used cars have more knowledge about the condition of the car than do buyers, the average retail price will reflect the average value of the relative proportions of good and bad quality automobiles in the market. However, at this price a larger number of lower quality cars will be offered for sale (because it is a price above the automobile's true value) while the better quality cars will disappear from the market (because this average price is below the automobile's true value). Similarly in the provision of health insurance, individuals have more information about their potential future health expenses than do the firms providing the insurance. As the average policy price reflects an average, those individuals who expect to incur large future expenditures will choose to purchase insurance, while those individuals who expect to incur small future expenditures will choose not to purchase insurance. This leads to higher average policy premiums that tend to exacerbate this problem. Despite the potential problems in the unregulated market in these cases, the exact role for government intervention is not clear. In the case of health insurance, the government could require everyone to purchase insurance. There are other complications arising from such a policy, however, that might greatly outweigh the benefits. Alternatively, in the case of the used car market the policy prescriptions are even less clear.

The fact that well functioning used car and health insurance markets exist, however, greatly diminishes the relevance of the theoretical results in the cases of incomplete information. As we have previously discussed, it is important to remember that cases of market failure represent cases in which the full gains from trade have not been realized. Thus, cases of market failure represent profit opportunities for entrepreneurs who can, and do, find innovative ways to overcome the sources of the market failure. The development of HMOs, for example, is potentially an example of this type of market innovation in the case of health insurance.

9. ECONOMIC STABILIZATION AND MONETARY STABILITY

The argument for government intervention to stabilize economic fluctuations over the business cycle is interesting for its lack of philosophical underpinning. Are inflationary booms and economic recessions cases of market failure? Or is it more the case that the stability potentially provided by monetary and fiscal policy can be argued to be a public good that markets cannot efficiently provide? Is a stable monetary environment with low and predictable inflation a public good that can only be efficiently provided by a government or can it be provided through private competing currencies?

Certainly the cases for and against the use of active countercyclical macropolicy are better left for treatment in the field of macroeconomics. The empirical evidence, however, seems to be getting stronger that fiscal policy is not nearly as potent as was once thought in economics under Keynesian models, and that even the best intentioned monetary policy can be destabilizing to an economy due to the timing problems created by lags and the limitations of forecasting.[39] In addition, the insights provided by public choice analysis call into question the ability of the political process to carry out proper fiscal policy. Vote-seeking politicians will generally have an incentive to expand expenditures and cut taxes, and to finance expenditures with debt financing to the greatest extent possible, regardless of the state of the economy. In regard to monetary control, it has long been held that an independent central bank, one removed from the pressures of the political process, will tend to perform better than a politicized central bank.[40] A recent interest has even developed in returning to a system of competing private currencies, rather than government control of the money supply.[41]

Thus, just like in the other cases above, the past several decades have seen a dramatic change away from the view that government intervention in this area is automatically and unquestionably justified, and toward one in which the limitations of real world public sector institutions call for cautious and calculated

intervention only in cases where government can reasonably be expected to actually improve upon the unregulated market outcome.

10. REDISTRIBUTION

The final area to be explored in this chapter is the role of government in income redistribution. The normal defense of government involvement in this area is on the grounds of equity considerations, making it a more controversial case for intervention than in cases where markets fail to achieve economic efficiency. A notable exception, however, is Hochman and Rodgers (1969) who construct interdependent utility functions across individuals and show that contributions to individuals with lower incomes have the properties of a public good (jointly benefitting everyone through the interdependent utility functions, and not being able to exclude those who don't contribute from enjoying this gain from others' contributions). Using a standard private provision model, they show that the level of contributions to those with lower incomes is less than the efficient quantity. Their results, however, have been met with some controversy as the reality of the assumption of interdependent utility functions is quite arbitrary and lacks empirical justification. In addition, Holcombe and Sobel (2000) argue that interdependent utility functions are precisely equivalent to pecuniary externalities between individuals, and thus they do not create a market failure and require no government correction.

The social contractarian framework also lends itself to a possible justification for redistribution by government.[42] Is it conceivable that at the constitutional decision stage, before everyone knew their future positions in society, that everyone might unanimously agree to put in place a social insurance policy under which those who received the most income would pay taxes that are then transferred to those who receive the least income? If so, then it potentially could be a unanimously agreed upon role of government.

On the other side, arguments against government redistribution can also be made on equity grounds using a procedural theory of fairness, discussed at the beginning of this chapter as standing in contrast to outcome-based theories of fairness. Because a fair outcome is defined as one that is the result of a fair process, it is possible to have outcomes (here income distributions) that are clearly unequal, but are fair nonetheless because they were the result of a fair process (the market allocation mechanism). One could apparently counter this with an argument that the market allocation mechanism is a unfair process. Again, because we are dealing with an issue of subjective value judgements, there is very little room for objective science to help settle this dispute. Nonetheless, following the original line of reasoning, the forceful redistribution of wealth by government may be thought of as an unfair process

because of its coercive nature. If so, then any outcome of this forceful redistribution must necessarily be unfair regardless of the equality present in the final outcome.

Even if one agrees that there is a role for government in redistribution, there is still a lack of agreement about the degree or extent of the redistribution because of the lack of a positive, objective definition of equity. Furthermore, the greater the extent of the redistribution, the larger will be the distortions and movements away from efficiency in the markets that are taxed to provide the funding for the redistributive activities. Perhaps most compelling is the fact that any attempt to redistribute wealth or income through the public sector will necessarily alter the incentive to produce, not only for those taxed in order to finance the transfer, but also for those receiving the transfer benefits. It is impossible to use market prices to efficiently allocate resources, communicate information, and motivate economic participants without also relying on those prices to determine the distribution of income.[43]

Finally, it is worth discussing whether real world political institutions are (1) more efficient than private firms at providing redistribution, and (2) capable of directing the payments toward those individuals who need it most, rather than to those with the most political influence. Because public sector redistribution crowds out private sector redistribution, it is unclear exactly how much private sector charity there would be in the absence of government involvement. Going back in history to the early 1900s, prior to the U.S. federal government's involvement in redistribution to the extent it is today, most adults were members of private mutual-aid societies. Members joining one of these "clubs" contribute and when anyone in the club was in need, other members would provide assistance. The extent of fraudulent claims was vastly lower in this private system than it is today in the public sector welfare system because the members generally all knew one another.

Recent events after the September 11, 2001 terrorist attacks on the World Trade Center provide some additional evidence on private charitable giving. Rather than proposing a massive government redistribution scheme, President George W. Bush on national television called for individuals to voluntarily contribute to private charities that provided assistance to those who were affected. In response, within five weeks after the attack, 70 percent of Americans had reported giving some type of charitable support (58% reported giving money, 13% blood, and 11% time donations). By the end of November, less than three months after the attacks, relief organizations had raised over $1.1 billion in voluntary donations.[44] The massive outpouring of private volunteers who gave their time and labor, as well as those who made financial contributions is substantial evidence that in cases where redistribution is widely deemed as appropriate, that it will be given in generous quantity. The massive extent of charitable giving after the World Trade Center attack would seem

to be evidence against the formal model presented by Hochman and Rodgers (1969) in which charitable giving is virtually impossible to provide through private markets due to the public good nature of the contributions.

Modern public economic research focuses less on exploring the merits of, or the optimal conditions for, redistribution and rather is more focused on attempting to explain the patterns of actual redistribution that occur. In the United States, for example, only about one-sixth of all transfers are means tested (that is, the qualifications for receiving the transfer are dependent on income). The fact that many redistribution programs tend to benefit middle income households, or large organized industries, is not surprising from the standpoint of public choice theory. First, because winning the vote of the decisive median voter is of critical importance for securing electoral victory, one might predict that transfers would be taken from both the upper and lower tails of the income distribution and targeted at the middle.[45] Secondly, concentrated interest groups will always have an advantage at securing transfers from widespread and unorganized groups who do not have the political power to oppose the redistribution. Subsidies to operas and home mortgage interest deductions seem to be two examples of redistribution clearly not aimed at the lower end of the income distribution.

While the justification for government intervention in the case of redistribution is subject to much debate, the fact is that modern democratic governments generally devote more than half their budgets toward transfer activities. Evidence suggests, however, that these transfers are captured by those groups with political influence, rather than those most in need. Because government redistribution crowds out private charities that are more effective at directing the payments to those most in need, it is potentially the case that transfers to those most in need could be increased by reducing or constraining the role of government in redistributive activities.

11. CONCLUSION

This chapter has summarized the cases for and against government intervention into markets to improve social welfare, either through increasing economic efficiency or equity. Beginning in the late 1800s through the mid 1900s, there was rapid development of very rigorous neoclassical economic theory to these cases, and founded upon this analysis was a presumption that government intervention could automatically be used to solve most of these problems. The downfall of Keynesian macroeconomic theory coupled with the development of public choice theory in the late 1900s, however, has shifted the tide somewhat. Modern analysis incorporates the idea that real world political institutions, just like markets, are subject to failure. In many cases of market failure, the best policy will be that of no policy because government intervention is likely to result in an even more inefficient outcome than is already

present. The late twentieth century has seen a dramatic evolution from an era in which the mathematical proof of market failure was a sufficient condition for government intervention to one in which it is not.

ACKNOWLEDGMENT

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NOTES

1. For an insightful analysis of the constraints imposed on the U.S. government by the U.S. Constitution relative to the constraints imposed by the Articles of Confederation that proceeded it, see Holcombe (1991).
2. Bator (1958) is widely cited as a fundamental paper listing the cases in which market failure is likely.
3. Quote taken from Stigler (1993), p. 402.
4. For similar academic arguments along these lines see Buchanan (1962) and Buchanan (1975).
5. Buchanan (1962) discusses the implications of this difference for the potential of government action to improve on inefficient market outcomes.
6. See Mueller (1989), Chapter 18, and Munger (2001) for discussions of the problems with voting.
7. Readers interested in a more formal treatment of the conditions necessary for economic efficiency in a competitive general equilibrium (Arrow-Debreu) framework are referred to Myles (1995), Chapter 2. A nice concise graphical interpretation can be found in Cullis and Jones (1998), Chapter 1. The notion of Pareto optimality was first derived in Pareto (1909). Little (1959), however, was the first person to name the condition as such.
8. The original development of this criterion can be found in the works of Hicks (1940) and Kaldor (1939). Cullis and Jones (1998), Chapter 2, contains a nice review of this criterion as well as the later improvements to the criterion introduced by Scitovsky (1941).
9. It should be noted that economics generally makes the assumption that each individual is the best judge of his or her own welfare (or utility) and that social welfare may be captured as simply a sum (or weighted sum) of the welfare of the individuals that make up the society.
10. Baumol (1982) for example, attempted to define a fair outcome as one in which there was an absence of envy. While intuitively appealing, Holcombe (1983, 1997) illustrates several cases in which an outcome is envy free, but it is clearly not fair. Thus even the absence of envy does not imply fairness.
11. This procedural theory of fairness is generally associated with Rawls (1971) and Nozick (1974) and is widely applied in the field of constitutional economics. For general overviews of this field see Gordon (1976) and Buchanan (1990).
12. For an overview of several functional forms see Cullis and Jones (1998), Chapter 1. A more in depth analytical treatment may be found in Varian (1978), Chapter 1, and Heathfield and Wibe (1987), Chapter 5.
13. It is again worth pointing out that this condition is necessary for the efficient provision of any good that is joint-in-consumption, regardless of whether it is excludable or nonexcludable. Only in the case where the good is additionally nonexcludable is it a public good

subject to the potential for market failure due to the free-rider problem. Goods that are joint-in-consumption but are excludable are often called club goods, and while there is the potential for some consumers to be inefficiently excluded from consuming the good under private provision, Buchanan (1965) shows how clubs can arrive at the optimal production of the good. In his model, often called "the theory of clubs," the optimal sharing group (club size) and optimal quantity of the good produced are simultaneously determined. The optimal club size will be finite as long as the good is subject to congestion.

14. Readers interested in the mathematical derivation of the private provision equilibrium are referred to Myles (1995)), Chapter 9, or Cornes and Sandler (1996), Chapter 6. While the standard Nash equilibrium outcome in this private provision model produces an outcome in which the public good is undersupplied, other characteristics of this equilibrium do not seem to fit real world data and experimental evidence very well. Because of this, models with alternative conjectural formulations other than Nash have been developed, but have still not proved very satisfactory.
15. Klein (1987) provides a nice examination of how tie-in sales can allow markets to efficiently provide public goods.
16. See Cowen (1988) for a comprehensive examination of the many critiques of standard market failure arguments such as this.
17. See Holcombe and Sobel (1995) for evidence on this point. Their paper also contains an example of a widely used empirical model that is useful for estimating the degree of publicness a good exhibits.
18. The median voter outcome is sometimes called Bowen equilibrium and is generally attributed to the work of Bowen (1943). Hotelling (1929), Downs (1957), and Black (1958) also made important contributions to median voter theory.
19. If decisions were subject to a unanimous voting rule, however, Lindahl prices for every individual would create unanimous agreement at the efficient output level. Wicksell (1896) was a famous proponent of the use of the unanimous decision rule for collective choice, and the statement above is sometimes more formally stated as Lindahl prices create Wicksellian unanimity at the efficient output level. For a more in depth discussion of the relationship between the median voter model, Lindahl prices, and Wicksellian unanimity see Holcombe (1985).
20. In addition, as Denzau and Mackay (1976) show, Lindahl pricing can result in outcomes that seem rather odd from an equity standpoint. For example, to finance the provision of a radio transmission tower (where the height of the tower or strength of the signal was the good in question), the person with the highest marginal benefit from expanding the quantity of the good (and thus the person with the highest tax share) would be precisely the person in the group with the weakest signal that would be improved by the additional production. The person with the strongest signal, living next door to the tower, would have a Lindahl tax price of zero as they gain no marginal benefit from additional provision of the good.
21. See Mueller (1989), Chapter 14, for a summary of the overwhelming empirical evidence on this point.
22. The applicability of the bureaucracy model as a model of real world outcomes remains a controversial issue. Niskanen himself has acknowledged the limitations of this model, see Niskanen (2001). For evidence against the applicability of the simple bureaucracy model see Bohm (1987) and Jackson (1982).
23. See Breton and Winetrobe (1975) for the analytical treatment of the equilibrium size of a budget-maximizing bureau.
24. In fact, it would require that the median voter's tax share was significantly larger than his or her benefit share (or equivalently his or her tax price was larger than the Lindahl tax price)

such that with the expansion in the quantity produced under bureaucratic supply, that QB would equal Q* even though the median voter's most preferred quantity, QM, was less than both.

25. The terminology that distinguishes pecuniary from technological externalities was first used by Scitovsky(1954).
26. Buchanan and Stubblebine (1962) were the first to formally note the distinction between inframarginal and Pareto-relevant externalities.
27. See Pigou (1924). Baumol (1992) contains an excellent review of optimal Pigovian tax policy in the case of a negative externality.
28. The government, however, should not use the revenue collected from this tax to compensate those suffering from the external cost because it would not give other individuals the appropriate disincentive to avoid suffering the cost. For example, if subsidies were paid to compensate owners of houses near airports for the noise they suffer, there would be less incentive to avoid building houses near the airport. If compensation were paid, more houses would locate near the airport, increasing the external cost per takeoff.
29. Note, however, that to generate the revenue required to grant the subsidy would require imposing a tax in another market which, except in the case of a lump-sum tax, would create an additional distortion in the economy.
30. While property rights to resources should be clearly defined for market efficiency, Holcombe and Sobel (2001) show that individuals should not be allowed to claim ownership rights to the *value* of the resources they own. Establishing rights to the value of resources internalizes pecuniary externalities and results in markets moving away from efficiency rather than toward it.
31. A famous example of this is the case of the spillover that exists between apple growers and honey-producing beekeepers, that was originally cited by Meade (1952) as a case of a technological externality that would result in market failure as not enough beekeepers would locate next door to apple growers as would be efficient. Cheung (1973), however, found that in the state of Washington, there was a long history of contractual arrangements in which beekeepers were paid for their contributions to apple growing.
32. The traditional illustration of the Coase Theorem as presented here ignores any income effects that result from the establishment of the property right. Even if income effects are considered, an efficient outcome will prevail, but it will be a different efficient outcome. To illustrate, imagine that the two cases correspond to two different points in an Edgeworth box, both of which are off of the contract curve. In both cases, bargaining will lead to a Pareto optimum along the contract curve, but which efficient outcome emerges will depend on the starting point.
33. Here I give the treatment of monopoly less attention than the cases of public goods and externalities. This relative weighting is traditional in the field public economics as monopoly, and the regulation of monopoly, are often covered in more detail in the field of industrial organization. A reader interested in a more in depth treatment of these issues is referred to Tirole(1988).
34. A contestable market is one in which it is relatively costless for new firms to enter into the market to compete with existing sellers.
35. Splitting a natural monopoly into several smaller firms would be an unwise policy choice because it would lead to several smaller firms, each with a higher cost of production than the single large firm.
36. This overcapitalization by a firm under rate-of-return regulation was first shown by Averch and Johnson (1962), and is known as the Averch-Johnson effect.

37. Readers interested the capture theory of regulation and papers dealing with the problems of traditional economic regulation are referred to Stigler (1971), Posner (1975), Peltzman (1976), and Benson, Greenhut, and Holcombe (1987).
38. Like monopoly, incomplete information is a subject generally relegated to the field of industrial organization, so here I only treat it in a cursory manner. Again, a reader interested in a more in depth analysis is referred to Tirole (1988).
39. See Rasche and Thornton (2001) and Gwartney, Stroup and Sobel (2000), Chapter 15 for evidence along these lines.
40. See Toma (2001), Alesina and Summers (1997), and Eijffinger and Schaling (1995) for a discussion of and evidence on central bank independence and economic performance.
41. See Solomon (1996), Craig (1996), and Good (1998) for additional information about competing currencies and private money.
42. This body of literature explores the evolution of constitutions (which are known in this literature as social contracts) and is also known as the field of constitutional economics. For a general overview see Gordon (1976) and Buchanan (1990). The idea of redistribution as a preconstitutional social insurance scheme was first developed in Buchanan and Tullock (1962).
43. A strong argument along these lines is made in Chapter 1 of Friedman and Friedman (1980).
44. Data is from "A Survey of Charitable Giving After September 11th, 2001" undertaken by the Independent Sector, October 23, 2001 available at http://www.independentsector.org/PDFs/Sept11_giving.pdf and from Robert A. Sirico, "Charity Bill Would Expand Private Gifts," *The Grand Rapids Press,* November 28, 2001 available at http://www.acton.org/research/editorials/sirico/charitybill.html.
45. This theory is sometimes called Director's law of income redistribution (named after Aaron Director who proposed it), and an exposition of it can be found in Stigler (1970). Tullock (1971) also presents a similar argument.

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