SURPLUSES, TRANSFERS, DEADWEIGHT LOSS AND BLUEBERRIES

Ellen Sewell[1]

Abstract

The two Big Ideas around which an introductory microeconomics course should be constructed are efficiency and equity. Policy decisions generally affect both. This paper demonstrates that a simple analysis of government intervention in the blueberry market illustrates the concept of deadweight loss and the impact of market intervention on efficiency. The division of the deadweight loss, combined with transfers, provides the basis for weighing the impact on equity. A fuller understanding of these concepts demonstrates the need to balance equity and efficiency considerations in the public policy arena. These concepts and their application are well within the reach of introductory students.

Key Words: efficiency, equity, deadweight loss, consumer surplus, producer surplus

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Introduction

A somewhat uncomfortable truth is that most principles of economics students do not progress beyond the introductory course(s). For them in particular, teachers of economics have only a brief opportunity to introduce the economic way of thinking, including the basic tools needed to gain a richer insight into public policy and the society in which they reside. Public policy debates center on the issues of efficiency and equity. These are the two Big Ideas around which an introductory microeconomics course should be constructed.

Academic economists have been somewhat reluctant to address questions of equity because the concept is dependent upon individual values. So equity considerations have traditionally been scarcely mentioned at the principles level. A cursory presentation of the current income (and sometimes wealth) distribution is often all that gets included. Recently, equity considerations have moved closer to the forefront in the public policy arena. While it may be inappropriate for an economist to impose values on the audience, it is certainly appropriate to provide a framework for understanding issues of equity. An analysis of efficiency, of course, has always been the backbone of a micro principles course.

An essential concept for the understanding of both efficiency and equity is deadweight loss. Fifteen years ago, deadweight loss was introduced in every leading text for an introductory microeconomics course. Today, all of the leading U.S. texts argue that the competitive market output is, in general, socially optimal, and that any deviation from this output results in an inefficient allocation of resources, but often the discussion abruptly ends there. It should not.

The coverage of deadweight loss has suffered a slow decline at the introductory level. Admittedly, there are well recognized problems in the precise measurement of consumer surplus and hence deadweight loss. According to Hausman (1981), the controversy over measurement was

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[1]   Assistant Professor of Economics, The University of North Carolina at Charlotte, 9201 University City Boulevard, Charlotte, NC 28223.

once sufficiently severe to cause both Paul Samuelson and Ian Little to conclude that the economics profession would be better off without these concepts. Yet both concepts are key inputs into public policy decisions. At the introductory level, only the very brightest student will be concerned by the possibility of non-constant marginal utility of income and its consequence. That problem can be effectively assumed away, as Marshall (1920) himself did.[2] Furthermore, measurement problems pale against the need for students to recognize that the theoretical concepts being studied can be applied in practice.

Blueberries

In the summer of 2016, an exceptionally abundant crop of blueberries, specifically wild berries in Maine, depressed the market price. The federal government through the Department of Agriculture stepped in to support a price above the equilibrium market price by purchasing 30 million pounds of blueberries.[3]

This intervention in the blueberry market was brought up by a student very early in an intermediate course that summer when the topic of market intervention was first introduced. He had noticed a picture online of a bear eating blueberries out of a trash container at a local foodbank. While the government had made efforts to distribute its purchased berries to organizations providing food to the poor, inadequate refrigerator/freezer capacity had forced some of the recipients to dispose of many of the berries. The student wanted to know whether the imposition of a limitation on production - harvesting in the case of wild berries - would have been a better alternative than the purchase and subsequent destruction of the berries.

This was a perfect opportunity to encourage the students to apply some of the basic concepts that were presumably mastered at the principles level. The students were asked how an economist would assess the adverse consequence(s) of the government intervention, assuming for simplicity, that all of the surplus berries were destroyed. They were also asked whether a restriction of output by the same 30 million pounds would have had a greater or smaller adverse impact and by how much as well as what the impact on equity would be? In the resulting discussion, it became quite clear that students lacked the tools to answer any of these questions.

Deadweight Loss

In the case of an output restriction, the blueberry analysis should have been straightforward, but only if these students had been introduced to the concept of deadweight loss. Traditionally, the concept was almost universally included in introductory micro texts to illustrate the social cost of monopoly. Harberger's (1954) famous triangle applies just as effectively in this case as in the case of a restriction in output due to monopoly. Today, the few texts that introduce the concept - now often called social welfare loss - monopoly is where it is introduced. Most commonly it is

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[2]   In Book V, Chapter II (page 195 in the eighth edition), Marshall recognizes that in his calculation of consumer surplus, "we allowed for the diminution in the buyers' need of corn [its marginal utility to them] as the amount bought increased. But we did not allow for any appreciable change in their unwillingness to part with money [its marginal utility]; we assumed that that would be practically the same…"

[3] http://boston.cbslocal.com/2016/04/15/maine-wild-blueberries-usda-government-buying/

simply the identification of a shaded, roughly triangular area.[4] The absence of elaboration results in a tremendous missed pedagogical opportunity.

The social damage from any restriction of output below the socially optimal output can be identified using simple cost-benefit analysis. This approach is intuitively plausible and, because it avoids the need to introduce surpluses, it can be readily incorporated into a presentation for high school students or non-majors. The social welfare loss is simply the excess of value over cost on those units that should have been produced, but were not. A pedagogical bonus is the chance to review and emphasize that the integral of marginal cost, the area under the competitive supply curve, is variable cost.

Equity Considerations

Allocative inefficiency and deadweight loss from a restriction of output may be identified using only simple cost-benefit analysis, but the impact on equity requires the introduction of consumer and producer surplus. This allows a division of the deadweight loss between the two sides of the market and identifies the associated transfer. The harm to consumers is the full loss of consumer surplus with a portion of that loss transferred to suppliers. The benefit to providers is the transfer less the portion of the deadweight loss associated with supply.

While the deadweight loss is comparable for a restriction of output due to monopoly or a government quota, there are differences worth considering involving equity. In the case of blueberries, there are intra-group transfers as well. How is the output allowed under the quota distributed across growers? Growers awarded a quota benefit, while those denied one clearly lose.[5]

This discussion provides an excellent opportunity to introduce another important concept that appears in few introductory texts: rent-seeking, or socially unproductive expenditures designed to secure a transfer. Suppose, for example, that blueberry farmers expended resources lobbying the government to impose a quota. Then part of the previously identified transfer must be added to the deadweight loss and deducted from the net benefit to producers.[6]

Overproduction

An advantage of approaching deadweight loss through costs and benefits is that the extension to the case of overproduction is straightforward. The deadweight loss as the excess of social cost (the area under the supply curve) above social benefit (the area under the demand curve) on those units which are being produced, but should not be, can be readily seen. Graphically, this is simply the roughly triangular area to the right of the equilibrium point and bounded by demand, supply and output. At an output of Q1, this is the shaded area to the right of the equilibrium point in the diagram below.

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[4]   The concept of deadweight loss is included in the Advanced Placement curriculum for microeconomics, but tests from the past five years focus only on the identification of Harberger's triangle.

[5]   It might be insightful to discuss whether a quota allocation based on a typical year's output is more equitable than allocations based on a lottery.

[6]   A bright student once asked whether this presumes that lobbyists have an alternative productive use for their time.
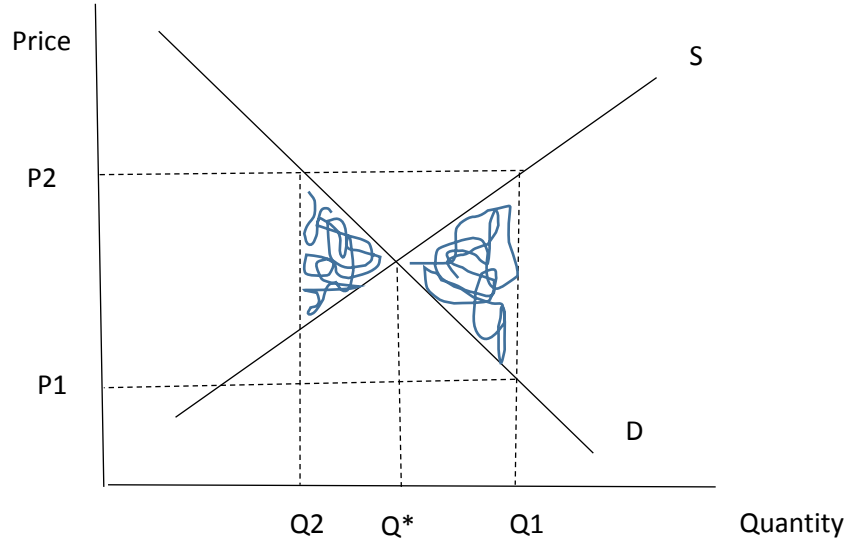
The analysis in terms of surpluses is considerably more challenging.[7] The deadweight loss is solely a function of output, but consumer and producer surplus are also dependent upon price. Further, for an output beyond the equilibrium quantity, an assumption must be made as to whether price is determined by demand (P1 in the diagram above), by supply (P2), or is somewhere in-between. An intermediate student should be able to demonstrate that deadweight loss is unaffected by price, but that a difference in price alters the distribution of the full surplus between consumers and producers.[8] While this exercise demonstrates the distinction between efficiency and equity, it is likely beyond the reach of an introductory student.

More Blueberries

The standard analysis of the consequences of overproduction makes an assumption that is not appropriate for the analysis of the blueberry market. That assumption is that the quantity produced is also the quantity consumed, so that the social value of the output is the full area under the demand curve up to Q1 in the diagram, where Q1 is the quantity both produced and consumed. In the case of blueberries, there is a gap between the quantity produced and the quantity consumed. If P2 is the target price, Q1 berries are produced, but only Q2 are demanded and consumed. The difference, Q1− Q2, are destroyed. Consumer surplus is now only the area under the demand curve above P2.

At this point, the overall impact of the intervention is explained most easily by breaking the output into those units that enter the market and are consumed, and those that are destroyed. Providing an output of only Q2 units to the market results in the familiar deadweight loss from under-provision, or the shaded left triangle in the diagram above. The remaining Q1-Q2 units are

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[7]   For many years I wondered why many students could correctly identify the deadweight loss associated with underproduction, but could not extend that analysis to overproduction. I suspect this is because deadweight loss was presented to them only in terms of surpluses and the extension in those terms is quite challenging.

[8]   The analysis in terms of surpluses is complicated by the recognition that one of them may now be negative for some quantity.

destroyed. The deadweight loss for these units is simply the waste of resources used to produce them. The economic cost of these units is the area under the supply curve, or the integral of marginal cost, for those units. Adding the two components, the full deadweight loss is the familiar triangle from under-provision plus the relevant area under the supply curve.[9]

This result is intuitively appealing to students. Where allocative efficiency is concerned, the only difference between allowing only Q2 units to be produced, resulting in a market price of P2, or buying and destroying the surplus berries at the target price of P2 is the economic cost of producing the extra berries. The difference in social welfare loss is simply the area under the supply curve between Q2 and Q1.

But what about equity? Farmers are clearly better off with the purchase of the surplus berries at a price of P2 than with a restriction of output at Q2.[10] Government expenditure on the berries is P2 (Q1-Q2), but costs also are incurred in the production of these berries. Farmers are better off by the amount of the additional revenue minus the additional cost, or the producer surplus on the Q1-Q2 units sold to the government. This is simply the area between P2 and the supply curve for the range of output between Q2 and Q1. And, of course, taxpayers are worse off by the amount of the government expenditure. But here, we need to remember that the purpose of the price support was to benefit farmers all along.

At this point, an attentive student is bound to ask how the analysis would be altered if the surplus berries had been successfully given to food pantries or distributed to the poor. Surely society is better off relative to destruction of the berries, but how much better off? Giving the surplus berries to food pantries would have reduced the deadweight loss by as much as the consumer surplus that would now be realized on those berries. This could be as large as the area under the demand curve between Q2 and Q1. But what is then left? Production and consumption are again equal, and the resulting deadweight loss is the right hand triangle associated with overproduction. Deadweight loss is only a function of output as long as consumption and production balance and the output is optimally distributed.

The discussion of reduction in deadweight loss when the surplus berries are given away, rather than destroyed, provides an opening for a discussion of the impact of the method of distribution on deadweight loss. If the surplus berries are priced at zero, then quantity demanded exceeds Q1. Maximum consumer surplus on these berries requires that they be distributed to those with the highest reservation prices. If some berries are distributed to consumers along the portion of the demand curve below P1 then consumer surplus falls and deadweight loss increases. Allowing the market distribution of a good assures consumption by those with the highest reservation prices, minimizing or eliminating deadweight loss.

With the mention of food pantries, it is difficult to suppress concerns of equity. Economists are in no better position to define equity than anybody else. Society must grapple with whether a transfer from one group to another is equitable. Policy makers must recognize that there are often tradeoffs between efficiency and equity. The purchase of blueberries with distribution to the poor adversely impacts efficiency, but this damage could be partially (or fully) offset through improved

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[9]   Again, the identification of deadweight loss by examining the changes in consumer and producer surplus resulting from the program is challenging to the average intermediate student. They have difficulties dealing with the new market participant, namely the government. They can be directed toward the correct conclusion by pointing out that the government expenditure on the Q1-Q2 units is a mere transfer to producers.

[10]   It was pointed out that some bears were apparently better off as well.

equity. Farmers benefit as do those low income recipients of free berries. The impact of any policy on efficiency and equity must be recognized and balanced by policymakers, as well as voters. And this should be understood by students of economics.

Price Floors and Ceilings

A second topic area where deadweight loss sometimes arises in the texts, although more typically at the intermediate level rather than in the introductory books, is the analysis of price ceilings and price floors. The analysis of a price ceiling is more straightforward, because production is equal to consumption. It results in the familiar deadweight loss due to underproduction. But like any price below the equilibrium, the ceiling results in a shortage. This is a perfect opportunity to introduce the concept of black markets.[11] For reasons unclear to me, students seem excited, even fascinated, by this topic.[12] This provides another chance to emphasize that free exchange minimizes deadweight loss by ensuring that those with the highest reservation prices receive the good. The concept of transaction costs can also be introduced to explain why all mutually beneficial exchanges do not occur.[13]

The analysis of a binding price floor poses the same challenges as the target price discussed above. If consumption and production balance at the mandated price, then the resulting deadweight loss from a price floor set at P2 is the shaded left triangle in the diagram. But this requires that no more is produced than consumers are willing to purchase at P2. One could reasonably argue that this is the case with haircuts, medical care, and any services where quantity produced and quantity consumed must coincide. Since the surplus goods are not produced, no costs are incurred for those units.

If quantity produced exceeds quantity sold and consumed, then the analysis is equivalent to the case of the surplus blueberries being unsold or destroyed. Costs of production are incurred with no associated benefit to consumers. Several of the leading intermediate microeconomics texts (but not all) recognize that the deadweight loss from a price floor could exceed the familiar triangular area to the left of the equilibrium point but stop short of explaining why or by how much.[14] Again, this is a missed opportunity to address the impact on both efficiency and equity.

Conclusions

Few introductory students, or even more advanced majors, are excited by economic theory *per se*. They are only fully engaged when they are convinced of its applicability to the world around them. The ability to analyze public policy proposals or decisions empowers them. Their enthusiasm blooms. Public policy debates focus on both efficiency and equity. While economists cannot set the standard for an equitable distribution of resources, they are generally well aware of the equity implications that must be balanced against efficiency considerations.

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[11] Authors differ in their use of the term black market. For some authors, the terms "black market" and "secondary market" are used interchangeably. For others, the term "black market" applies only to the case where transactions are illegal.

[12] A relevant paper grounded in basic economics and accessible to stronger introductory students is "The Economics of Ticket Scalping" by Jimmy Atkinson. My students enjoyed the paper and it sparked a lively discussion. http://jimmyatkinson.com/papers/the-economics-of-ticket-scalping/.

[13] Sadly, the concept of Pareto optimality has also faded from the leading introductory texts. A review of 10 of the leading texts did not turn up a single mention.

[14] See, for example, the leading text by Pindyck and Rubinfeld (page 324 in the 8th edition).

Deadweight loss is essential to the understanding of the consequences of any departure from the allocatively efficient output of a good. As such, it is also critical to the understanding of the beauty of competition and capitalism, but the concept of deadweight loss has been slowly vanishing from the introductory microeconomic texts. Without it, there is little indication to the introductory student that the damage to society from allocative inefficiency can be quantified.

With the question of equity moving to the forefront in public policy debates, the division of deadweight loss, combined with transfers, allows the students to understand the full picture. These concepts are not beyond the grasp of the introductory student. A single class period spent discussing the impact of a simple purchase of blueberries by the government resulted in a noticeable and lasting increase in engagement and enthusiasm. Students were empowered to understand the basis for public policy debates and decisions. Economics had moved beyond the textbook and into the public policy arena.

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