A DISTORTION-ANALYSIS PROTOCOL FOR ECONOMIC-EFFICIENCY ANALYSIS: A THIRD-BEST-ECONOMICALLY-EFFICIENT RESPONSE TO THE GENERAL THEORY OF SECOND BEST

Richard S. Markovits
A significant percentage of scholarly economics articles and a far higher percentage of scholarly Law & Economics articles focus on the economic efficiency of the non-governmental or governmental choices they investigate—roughly speaking, the difference between the equivalent-dollar gains a relevant choice confers on its beneficiaries and the equivalent-dollar losses it imposes on its victims.\(^1\) This Article delineates the protocol that both economists in general and Law & Economics scholars in particular use to predict or postdict the economic efficiency of choices, explains why this approach is wrong—viz., because it ignores The General Theory of Second Best,\(^2\) and delineates a distortion-analysis protocol for economic-efficiency analysis that responds to the interactions Second-Best Theory highlights, which I believe may well represent the most-economically-efficient way to generate economic-efficiency conclusions. This approach is denominated “distortion analysis” because it focuses on the impact of the choices whose economic efficiency is at issue on the distortion in the profits yielded by the marginal exemplars of the various types of resource allocation the choices affect—\(i.e.,\) on the difference between the profits yielded by and the economic efficiency of the allocations in question.

Economists have never tried to assess any choice’s impact on economic efficiency by identifying all or a random sample of the choice’s winners and losers and estimating these parties’ respective equivalent-dollar gains and losses. In part, this fact reflects the incentives that the beneficiaries/victims of any choice have respectively to exaggerate the magnitude of the equivalent-dollar gains/losses it would confer/impose on them (to the extent that their doing so increases the probability that any government choice in question will be made/rejected or any non-government choice in question will be allowed/prohibited). And in part, it reflects the prohibitive cost and difficulty of estimating the gains and losses that individual winners and losers experience through any method that does not rely on their testimony. The impracticability of this approach to
assessing a policy’s economic efficiency has led economists to base their economic-
efficiency assessments on welfare-economics propositions that relate the impact of a choice on economic efficiency to its impact on the Pareto imperfections in the economy—*i.e.*, to the various types of “imperfections” whose individual exemplars could cause economic inefficiency in an otherwise-Pareto-perfect economy (see Section 2). Although this general approach is almost certainly best, the particular welfare-economics proposition on which economists have relied and continue to rely is wrong.

The vast majority of economists base their approach to economic-efficiency assessment on the assumption that the fact that the economy will contain no economic inefficiency if it contains no Pareto imperfections implies that any choice that reduces (increases) the number or magnitude of the Pareto imperfections in the economy will tend on that account to reduce (increase) the amount of economic inefficiency in the economy. In making this assumption, these scholars ignore the lesson of The General Theory of Second Best that, since in general any Pareto imperfection one can eliminate will be as likely to counteract as to exacerbate the net joint effect of the Pareto imperfections that remain, there is no general reason to believe that the fact that a choice will reduce the number or magnitude of the Pareto imperfections in the economy will even tend on that account to increase economic efficiency if it will not eliminate all Pareto imperfections in the economy.

This Article is divided into six sections. The first distinguishes three general categories of economic-efficiency analysis that have been or could be executed. The second delineates the vocabulary and symbols I use to refer to different types of Pareto imperfections, different categories of resource-uses, different categories of resource allocation (*i.e.*, different categories of resource flows between or among alternative uses), and different categories of resource misallocation (*i.e.*, the categories of economic inefficiency that are respectively associated with each category of resource allocation that is useful to distinguish). The third articulates the vocabulary and symbols of the particular approach to economic-efficiency analysis—distortion analysis—that I think may well be economically efficient. The fourth concretizes the concept of a distortion by deriving formulas for various distortions in the profits yielded by the production of a
marginal unit of output whose production withdraws resources exclusively from the production of one or more units of another existing product. The fifth delineates and explains the relationships on which distortion analysis builds. The sixth and final section delineates the distortion-analysis protocol for economic-efficiency analysis that I think may well be economically efficient. In the text that follows, the expression “allocative efficiency” will sometimes be substituted for the expression “economic efficiency” to combat the tendency of readers to assume that choices that increase economic efficiency are always just and morally desirable, justice-considerations aside.³

1. Three General Categories of Economic-Efficiency Analysis—Vocabulary and Acronyms

I find it useful to distinguish three general categories of approaches to economic-efficiency analysis. I call the first—the category of approach that the vast majority of economists use—“first-best-allocative-efficiency analysis.” First-best-allocative-efficiency analyses ignore both or either The General Theory of Second Best and/or the fact that, even if the Pareto-imperfection-reducing choices whose efficiency it is used to assess are made, the economy will remain highly-Pareto-imperfect—*i.e.*, proceed on the assumption that any choice that decreases the number or magnitude of the Pareto imperfections in an economy without eliminating all such imperfections will tend on that account to increase its economic efficiency. The text uses the acronym FBLE to stand for “first-best-allocative-efficiency” (and “first-best allocatively efficient”). In part, this acronym seems appropriate because FBLE resembles the word “fable,” and FBLE analyses are based on the fable that a decrease in a particular Pareto imperfection necessarily increases economic (allocative) efficiency (or that the imperfection on which the analyst is focusing is the only imperfection in the system).⁴

The second general category of economic-efficiency analyses, which I call “second-best-allocative-efficiency analysis,” is the type of economic-efficiency analysis that would be not only perfectly accurate but also economically efficient if perfect theoretical analyses could be costlessly executed and perfect data could be costlessly collected. Second-best-allocative-efficiency analyses take perfect account of all the types of resource misallocation whose magnitudes the relevant choices might affect, develop
perfect formulas relating the extent of each such type of resource misallocation to the various Pareto imperfections that interact to cause it, and collect and perfectly analyze the implications of perfect data on (1) the magnitude these imperfections would have if the private or public choice under scrutiny were rejected, (2) the impact that the choice in question would have on them, and (3) the pre-choice and post-choice magnitudes of any other parameters whose relevance the theoretical analysis reveals. In what follows, the acronym SBLE is used to signify “second-best-allocative-efficiency” (and “second-best allocatively efficient”). SBLE is an appropriate acronym for this modifier because it resembles the word “sable,” which signifies a beautiful object that is prohibitively expensive, and SBLE analysis would be prohibitively expensive even if it were doable, given the imperfectness of the economy, the fact that a large number of resource-allocation categories must be distinguished, and the inevitable cost and inaccuracy of both data and analysis.

I call the third category of economic-efficiency analyses I want to distinguish “third-best-allocative-efficiency analysis.” Third-best-allocative-efficiency analyses are the type of economic-efficiency analyses that are allocatively efficient, given that Pareto imperfections are pervasive, choices affect the magnitudes of many categories of resource misallocation, and data and analysis are costly and inaccurate. Third-best-allocative-efficiency analysis differs from SBLE analysis in that it incorporates only those theoretical and empirical research-projects whose predicted allocative benefits exceed their predicted allocative cost. The text uses the acronym TBLE to stand for “third-best-allocative-efficiency” (and “third-best allocatively efficient”). TBLE is an appropriate acronym for this modifier because it resembles the world “table” and TBLE analysis is the type one should bring to the choice-evaluation table.


Economists distinguish seven types of Pareto imperfections—*i.e.*, “imperfections” whose individual exemplars could cause economic inefficiency in an otherwise-Pareto-perfect economy:
(1) imperfections in seller competition (monopoly, symbolized [by me] by M);

(2) imperfections in buyer competition (monopsony, symbolized by MS);

(3) externalities (symbolized by X or, more specifically, production externalities—symbolized by PX—and consumption externalities—symbolized by CX);

(4) taxes on the margin of income, symbolized by T;

(5) imperfections in the information available to choosers that they need to identify the choice that best suits them (non-sovereignty, symbolized by NS);

(6) non-maximization by choosers (symbolized by NM); and

(7) buyer surplus, the difference between the monetary value of something to a buyer and the price he had to pay to obtain it (symbolized by BS).

Economists also distinguish (or should distinguish) between various types of uses to which resources can be devoted:

(1) uses in which they increase the unit output of an existing product;

(2) uses in which they create a new (different and perhaps superior) product, a new (different and perhaps superior) distributive outlet, or additional capacity or inventory (which enable their owner to offer buyers faster average speed of supply through a fluctuating-demand cycle); and

(3) uses in which they reduce the average total cost of producing a relevant quantity of an existing product by modernizing an existing plant, constructing a new plant that uses existing technology, or discovering a new, cheaper production process.

The text that follows uses the symbol UO to stand for a unit of output or a unit-output-increasing resource-use, the symbol QV to stand for a quality-or-variety-increasing investment (an investment that creates a new [perhaps superior] product variant, a new [perhaps superior] distributive outlet, or additional capacity or inventory) or a QV-investment-creating resource-use, and the symbol PPR to stand for production-process
Economists also distinguish between “marginal” and “non-marginal” resource-uses. In fact, they use the word “marginal” in two different senses (that they do not conflate). When used in its non-mathematical sense to modify “resource-use” or a particular type of resource-use, the word “marginal” indicates that the resource-use in question is the least profitable but not unprofitable resource-use of the type in question. In this sense, the word “marginal” is contrasted with the words “intra-marginal” and “extra-marginal.” When used in its mathematical sense to modify “resource-use” or any particular type of resource-use, the word “marginal” indicates that the resource-use in question is infinitesimally small. When used in this mathematical sense to modify “resource-use,” the word “marginal” is contrasted with such words as “incremental” or “lumpy.” In the text that follows, I will use the word “marginal” (to modify both the noun resource-use and the expression resource allocation) in its non-mathematical sense. As we shall see, distortion analysis must be adjusted to take account of the fact that resource-uses and resource allocations that are marginal in the non-mathematical sense of being “least profitable but not unprofitable” may not be marginal in the mathematical sense of being infinitesimally small.

The text that follows also uses the expression “resource allocation.” In my vocabulary, a resource allocation differs from a resource-use in that the allocation refers not only to the use to which the resources in question are being devoted but also to the use or uses from which the relevant resources are being withdrawn. Thus, for each category of resource-use, one can identify a number of usually-counterfactual but analytically-useful categories of resource allocation that differ according to the assumption that is being made about the type or types of use from which the resources in question are being withdrawn. Thus, a marginal UO-to-UO resource allocation is one in which resources are withdrawn from the (presumably-otherwise-profitable but otherwise-least-profitable) production of one or more units of one or more products and devoted to the production of a marginal unit of a different product and a marginal QV-to-UO resource allocation is one in which resources are withdrawn from the creation of a
(presumably-otherwise-profitable but otherwise-least-profitable) QV investment and devoted to the production of a marginal unit of some good. I say that most of the categories of resource allocation on which this Article and distortion analysis will focus are counterfactual because, almost always, the resources that are devoted to the marginal exemplar of any particular type of use are withdrawn from a variety of other types of uses. For example, some of the resources used to create any marginal QV investment will be withdrawn from unit-output production, some from the creation of an alternative QV investment, and some from the execution of a PPR project. I focus separately on UO-to-QV, QV-to-QV, and PPR-to-QV resource allocations and misallocations despite this fact because I find it analytically useful to do so—i.e., because doing so makes it possible to break down what would otherwise be an extraordinarily complicated set of calculations into separate calculations that are more manageable. However, I want to emphasize at the outset that the viability of the distortion-analysis approach to economic-efficiency assessment does not turn on the soundness of this step.

The text that follows distinguishes a number of usually-counterfactual, analytically-useful categories of resource allocation. For example,

1. as just stated, the expression “UO-to-UO resource allocation” refers to the allocation of resources from the production of one or more units of one or more existing products to the production of one or more units of another product;

2. the expression “QV-to-QV resource allocation” refers to the allocation of resources from the creation of one or more QV investments to the creation of a different QV investment;

3. the expression “PPR-to-PPR resource allocation” refers to the allocation of resources from the execution of one or more PPR projects to the execution of a different PPR project; and

4. the expression “QV-to-UO resource allocation” refers to the allocation of resources from one or more QV-investment-creating uses to a unit-output-increasing resource-use.

In some contexts, it is important to note that UO-to-UO, QV-to-QV, and PPR-to-PPR resource allocations can take place either within an area of product-space whose products
are atypically competitive with each other or between or among areas of product-space whose products are not particularly competitive with each other (roughly speaking, can be either intra-industry or inter-industry).

Finally, the text that follows distinguishes a number of analytically-useful categories of resource misallocation that are counterparts to the various categories of resource allocation it defines. Thus, in the text that follows:

(1) the “UO-to-UO misallocation” an economy contains is defined to equal the amount by which economic efficiency could have been increased if, controlling for the allocative cost generated by the withdrawal of the resources devoted to UO production from the other categories of uses to which they would otherwise have been devoted, the goods in production had been produced in different proportions (assuming that the alternative allocation in question could have been secured without generating any additional allocative transaction costs or other economic-efficiency costs);

(2) the “QV-to-QV misallocation” an economy contains is defined to equal the amount by which economic efficiency could have been increased if, controlling for the allocative cost generated by the withdrawal of the resources devoted to QV-investment creation from the other categories of uses to which they would otherwise have been devoted, a different set of QV investments had been created (assuming that the alternative allocation in question could have been secured without generating any additional allocative transaction costs or other economic-efficiency costs);

(3) the “PPR-to-PPR” misallocation an economy contains is defined to equal the amount by which economic efficiency could have been increased if, controlling for the allocative cost generated by the withdrawal of the resources devoted to PPR execution from the other categories of use to which they would otherwise have been devoted, a different set of PPR projects had been executed (assuming that the alternative allocation in question could have been secured without generating any additional allocative transaction costs or other economic-efficiency costs); and

(4) the “total-UO/total-QV/total-PPR” misallocation an economy contains is defined to equal the amount by which economic efficiency could have been increased had the economy’s resources been devoted in different proportions to UO-increasing, QV-creating, and PPR-executing uses (assuming that the alternative allocation in question could have been secured without generating any additional allocative transaction costs or other economic-efficiency costs).
3. The Vocabulary and Symbols of Distortion Analysis

This section defines the basic terms that the distortion-analysis approach to economic-efficiency analysis employs and explains the symbols that stand for these concepts. More specifically, this section (1) defines the concept of a “distortion” as it is used in economic-efficiency analysis, (2) delineates various categories of distortions such analyses distinguish, and (3) explains why the fact that resource allocations that are marginal in the non-mathematical sense in which I will be using this modifier may not be marginal in the mathematical sense of that word creates a problem for distortion analysis.

In distortion analyses, a private figure is said to be “distorted” if it differs from its allocative counterpart. Thus, the private benefits (PB) a chooser can obtain by making a particular “resource-consuming” choice are said to be “distorted” to the extent that they diverge from the allocative benefits (LB) the choice will yield—i.e., the net equivalent-dollar gain that will result from the resources in question being used in the indicated way as opposed to their being destroyed in some allocatively-costless manner; the private cost of a choice (PC) to the chooser is said to be “distorted” to the extent that it diverges from the allocative cost (LC) of the choice—i.e., the allocative value that the resources the choice “consumes” (in the sense of using up) would yield in the alternative use(s) from which they were withdrawn; and the (private) profits (Pπ) a choice confers on the chooser are said to be “distorted” to the extent that they diverge from the choice’s allocative efficiency (LE). Obviously, since Pπ=PB–PC and LE=LB–LC, Pπ will be distorted when either PB or PC is distorted unless both are distorted and the two distortions perfectly offset each other. Somewhat more specifically, in my terminology, a PB, PC, or Pπ figure is said to be “inflated” if it exceeds its allocative counterpart and “deflated” if it is lower than its allocative counterpart.

The distortion-analysis approach that I will discuss in this Article distinguishes four basic categories of distortions. I will define the fourth after defining and discussing the first three.

The first three distortion concepts I will use are: (1) the aggregate distortion in some figure—the net distortion in the indicated private figure generated by all the relevant Pareto imperfections in the economy acting in concert; (2) seven individual-
Pareto-imperfection-generated distortions (one for each type of Pareto imperfection)—the distortion that would be created in some private figure by all extant exemplars of a particular type of Pareto imperfection if no other type of Pareto imperfection were present in the system; and (3) the distortion in an indicated private figure that would be created by all extant exemplars of two to six of the seven various types of Pareto imperfections that can occur in the economy—e.g., the distortion that would be generated in some private figure by the interaction of all the imperfections in seller competition and all the externalities in the economy if no other type of Pareto imperfections were present.

In the text that follows, the three types of distortions just delineated will be symbolized as \( \ldots \text{D(P\ldots)}(\ldots)_{\Delta} \ldots \). In this notation, the letter D stands for distortion; the letter P stands for private (as contrasted with allocative); and the letter \( \Delta \) indicates that the resource allocation to which the distortion information in question relates is a marginal allocation in the sense of being the least profitable but not unprofitable allocation of the relevant type to have taken place in the relevant area of product-space.

I will now explain the five ellipses in the symbol for the three types of distortion defined above. The letters that replace the first ellipsis—the ellipsis that appears before the D that precedes the first set of parentheses in the symbol—indicate the type or types of Pareto imperfections that are generating the distortion in question. If the distortion in question is “an aggregate distortion”—i.e., is the distortion that all extant exemplars of all types of Pareto imperfections cause in the indicated private figure, a “\( \Sigma \)” will appear instead of the first ellipsis. If the distortion in question is the distortion that would be caused by all exemplars of a particular type of Pareto imperfection in an otherwise-Pareto-perfect economy, the symbol that takes the place of the first ellipsis will indicate the Pareto imperfection in question. If the distortion in question is the distortion that would be generated by two to six types of Pareto imperfections in an otherwise-Pareto-perfect economy, the first ellipsis in the above expression will be replaced by symbols for all the Pareto imperfections that are in play separated by forward slashes—e.g., \( (M/X)D \) will stand for the distortion that would be caused by all imperfections in seller competition and all externalities in an otherwise-Pareto-perfect economy.
The non-subscript letter (B, C, or \(\pi\)) that appears instead of the second ellipsis in the symbol for the first three types of distortion indicates whether the private figure whose distortion the symbol references is a private-benefit, private-cost, or private-profit figure.

The third ellipsis in the symbol for the first three types of distortion is the first ellipsis in its subscript. This ellipsis is replaced by a “C,” a “U,” or a “(C+U)” where “C” stands for creation, “U” stands for use, and “(C+U)” stands for creation and use. Some elaboration is called for.

The expression “the creation of a marginal unit of output” refers to the production of that unit. The expression “the use of a marginal unit of output” refers to the sale and consumption of that unit of output as opposed to its allocatively-costless destruction.

The conduct that is covered by the expression “the creation of a marginal QV investment” varies with the nature of the QV investment in question. When the QV investment is an investment in capacity or inventory, its creation consists of the construction of the capacity or the production of the inventory. When the QV investment is an investment that yields a new product variant, its creation entails preliminary market research, product-design efforts and the production of prototypes, the market testing of proposed variants or actual prototypes, the construction and operation of pilot plants (to determine the feasibility of producing the product in commercial quantities, the cheapest way to produce the product, the most profitable approaches to quality control, and the cost of producing the product in needed quantities), and the execution of the promotional campaign that is run to launch the product. When the QV investment is an investment in a new distributive outlet, its creation involves the market research into the location and other attributes of the outlet that would be most profitable, the construction of the outlet, and the execution of the promotional campaign that is run to launch the outlet.

The conduct that is covered by the expression “the use of a marginal QV investment” also varies somewhat with the nature of the QV investment. When the QV investment creates inventory, the expression “the use of the QV investment” refers to the sale or consumption of the inventory (“sale” when the issue is the private benefits of using the QV investment—the equivalent-dollar gains the QV investor obtains by selling
as opposed to privately costlessly destroying the inventory in question—and “consumption” when the issue is the allocative benefits of its use—the net equivalent-dollar gains to everyone affected by its sale and consumption that are generated by its being sold and consumed as opposed to being allocatively costlessly destroyed). When the QV investment creates capacity, the expressions “the private and allocative cost of using the QV investment” refer respectively to the private and allocative variable cost of using the capacity to produce units of the good it is designed to produce, and the expressions “the private and allocative benefits of using the QV investment” refer respectively to the profits the QV investor will realize by using the capacity and selling the output it produced as opposed to costlessly abandoning it and the net equivalent-dollar (allocative-efficiency) gain generated when, rather than being allocatively costlessly destroyed, the capacity is used and the goods that it is used to produce are consumed. When the QV investment creates a new product variant, the expressions “the private and allocative cost of creating and using the QV investment” refer respectively to the private/allocative cost of constructing the plant that is used to produce the new product and the private/allocative variable cost of using that plant to produce the actual output of the new product, and the expression “the private and allocative benefits of using the QV investment” refer respectively to the profits the QV investor obtains by producing and selling units of the new product once it has been designed and launched as opposed to privately costlessly abandoning the project and the allocative-efficiency gains that are generated because, rather than allocatively costlessly abandoning the project, the investor chose to produce and sell the new product (to build and use the production plant and to sell the output he produces with it). When the QV investment creates a new distributive outlet, the expressions “the private cost and allocative cost of using the QV investment” refer respectively to the private/allocative cost of operating the distributive outlet, the expression “the private benefits of using the QV investment” refer to the profits the investor made by operating the distributive outlet as opposed to privately costlessly abandoning it, and the expression “the allocative benefits of using the QV investment” refers to the allocative-efficiency gain that is generated because, rather than deciding to
abandon this completed project in some allocatively-costless way, the investor decided to operate the distributive outlet in question.

The expression “the creation—i.e., execution—of a marginal PPR project” refers to the act of doing the production-process research the project entails. Relatedly, the expression “the use of a marginal PPR project” refers to the project-owner’s use of the information or production process the project discovered in his own production facilities, the use of that information or discovery by others to whom the project-owner sold any associated patents or licensed to use the protected information, and (when the issue is the allocative benefits the use of the PPR project generates) the use of that information or discovery as well by free riders who use it without paying for it.

The letters that will appear instead of the fourth ellipsis in the symbol for the three types of distortion defined above—the second ellipsis in the subscript of the expression, which follows the $\Delta$ in that expression—indicate the type of resource-use that has generated the benefits, cost, or profits to whose possible distortion the symbol in question refers. In this Article, the letters UO, QV, or PPR will always replace this fourth ellipsis. As already indicated, UO, QV, and PPR indicate respectively that the resource-use in question is unit-output-increasing, QV-investment-creating, and production-process-research-executing; and any letter that appears immediately after a $\Delta$UO, $\Delta$QV, or $\Delta$PPR indicates the area of product-space in which the marginal QV investment or PPR project in question is located or the product that the marginal unit-output-increasing resource-use produced is located.

Finally, the letters that appear in the fifth ellipsis in the symbol for the three types of distortion defined above—the ellipsis that follows the forward slash that appears in the subscript after the fourth ellipsis—indicate the type(s) of resource-uses from which it is being assumed the resources devoted to the resource-use previously specified are being withdrawn. No delta appears after the forward slash between the fourth and fifth ellipses because the resource-use(s) from which the relevant resources are withdrawn is (are) not marginal (is the first or perhaps first and second, etc., extra-marginal resource-uses in the specified category).
Some examples may be helpful. In my system, $\Sigma(D(P_{\text{UAOX}}))$ stands for the aggregate distortion (the distortion generated by the interaction of all relevant Pareto imperfections in the system) in the private benefits the producer of a marginal unit of product X obtained by producing that unit; $MD(PC_{C\Delta QVX/QV...})$ stands for the distortion that imperfections in seller competition would generate in an otherwise-Pareto-perfect economy (the monopoly distortion) in the private cost of creating the least profitable but not unprofitable QV investment to be introduced into area of product-space X if the resources used to create that QV investment were withdrawn from the creation of one or more other QV investments in one or more other unspecified areas of product-space (whose creation would presumably have been profitable had the actual QV investment in question not been created) and $XD(\pi_{(C+U)\Delta PPRX/PPR...})$ stands for the distortion that the extant externalities would generate in an otherwise-Pareto-perfect economy (the externality distortion) in the profits yielded by the execution of the marginal PPR project that relates to the production process used to produce product X and the use of the discovery it would yield on the assumption that the resources in question would be withdrawn from the execution of one or more alternative PPR projects in one or more unspecified areas of product-space that would otherwise have been profitable.

I now need to define and indicate the symbols I will use to stand for a fourth distortion concept this Article will use: the percentage distortion in the profits yielded by a particular (usually a marginal) resource allocation that is generated by a specified set of Pareto imperfections. This percentage distortion is defined to equal the ratio of the aggregate distortion in the profits yielded by the (marginal) resource allocation in question to its allocative cost—e.g.,

\[
M\%D(\pi_{(C+U)\Delta QV/...}) = MD(\pi_{(C+U)\Delta QV/...})/LC_{(C+U)\Delta QV/...}
\]

signifies the percentage distortion (%D) in the profits yielded by the creation and use of the marginal QV investment in some (unspecified) area of product-space that is created and used with resources withdrawn from some unspecified alternative use or set of uses.
4. The Notion of the Distortion in the Profits Yielded by a Particular Marginal Resource Allocation: Three Concrete Examples

This section concretizes the concept of a distortion by deriving and explaining formulas for three profit distortions that play a role in the analysis of the impact of various private and public choices on UO-to-UO misallocation.

A. MD(π(C+U)AUOX/UOY) on Various Simplifying Assumptions

This subsection focuses on the monopoly distortion in the profits that would be yielded by the creation and use of a marginal unit of product X on the following assumptions:

1. the only extant imperfections in seller competition are imperfections in the price competition that one or more final-goods producers face—i.e., it assumes that no input producer faces imperfect price competition;
2. as the final subscript in the expression in the heading indicates, the marginal unit of product X is produced with resources withdrawn exclusively from the production of another product Y; and
3. neither product X nor product Y has any complements.

In the proof that follows, P stands for price, MC stands for marginal cost—the additional cost that the producer of the indicated product must incur to produce its last unit, MRT_{Y/X} stands for the marginal rate at which the economy can transform product Y into product X—the number of units of Y that could be produced with the resources “consumed” by the production of a marginal unit of X, and MLV_Y stands for the allocative value of the marginal unit of Y—the net equivalent-dollar gain generated by the consumption of the marginal unit of the indicated product (as opposed to its allocatively-costless destruction).

On the above assumptions, the monopoly distortion in the profits yielded by the creation and use of the marginal unit of some product X can be derived as follows:

\[ \text{MD}(\pi_{(C+U)AUOX/UOY}) = \text{MD}(PB_{AUOX}) - \text{MD}(PC_{AUOX/UOY}) = \]

\[ (PB_{AUOX} - LB_{AUOX}) - (PC_{AUOX/UOY} - LC_{AUOX}) = \]
\[(3) \quad (MR_X - P_X) - (MC_X - MRT_{Y/X}[(MLV_Y)]) = \]

\[(4) \quad (MR_X - P_X) - (MC_X - [MC_X/MC_Y]P_Y) = \]

\[(5) \quad -P_X + (MC_X/MC_Y)P_Y = \]

\[(6) \quad MC_X([P_Y/MC_Y] - [P_X/MC_X]). \]

Some explanation is required. Lines (1) and (2) are definitional. In Line (3), the substitution of MR\(_X\) for PB\(_{UBOX}\) and P\(_X\) for LB\(_{UBOX}\) is validated by the analysis’ otherwise-Pareto-perfect assumption, the substitution of MC\(_X\) for PC\(_{UBOX}\) involves a change of equivalent symbols, and the substitution of MRT\(_{Y/X}(MLV_Y)\) for LC\(_{UBOX/UBOX}\) reflects the analysis’ assumption that all the resources “consumed” by the production of the marginal unit of X are withdrawn from the production of Y and a further assumption that no more than one unit of Y must be sacrificed to produce the marginal unit of X (if more than one unit of Y would have to be sacrificed for this purpose, AMLV\(_{SY}\) [the average MLV\(_{Y}\) for the sacrificed units of Y] would have to be substituted for MLV\(_{Y}\) ). In Line (4), the substitutions of MC\(_X/MC_Y\) for MRT\(_{Y/X}\) and P\(_Y\) for MLV\(_{Y}\) are validated by the analysis’ otherwise-Pareto-perfect assumption—in particular, by the facts that (1) in an economy in which producers must buy all the resources their production “consumes” (in which there are no externalities of production), no price discrimination is practiced by input suppliers (because there are no imperfections in seller price competition), and no sales, excise, or earned-income taxes are levied on the purchase of inputs by a producer (because there are no taxes on the margin of income), the relative private cost that the producers of two products must incur to produce their marginal units of output—MC\(_X/MC_Y\)—will equal the marginal rate at which the economy can substitute one for the other—MRT\(_{Y/X}\)—and in an economy in which no buyer is a monopsonist, no sales or excise taxes are levied, all buyers are sovereign maximizers, no buyer obtains buyer surplus on a marginal purchase, and no externalities are generated by consumption, the pre-tax price that a seller charges for his marginal unit of output will equal its marginal allocative value. Line (5)’s elimination of MR\(_X\) and (–MC\(_X\)) reflects the fact that the analysis’ assumption that all choosers are sovereign maximizers guarantees that MR\(_X\)=MC\(_X\) and concomitantly that MR\(_X\)–MC\(_X\)=0. Line (6) is generated by dividing the
two terms in Line (5) by $MC_X$, multiplying the resulting sum by $MC_X$, and reordering the terms inside the parentheses.

B. $(PX)D(P\pi_{C+UOX/UOY})$ on the Same Simplifying Assumptions

This subsection focuses on the distortion that final-goods production externalities would generate in the profits yielded by the creation and use of a marginal unit of some product X in an otherwise-Pareto-perfect economy when the resources used for this purpose are withdrawn exclusively from the production of another good Y and neither X nor Y has any complements.

P, MR, MC, MLV, and MRT have the same respective referents in the proof that follows as they did in the preceding subsection’s proof. However, the following proof does contain one new symbol—$MC^*$. The asterisk in $MC^*_X$ and $MC^*_Y$ indicates that the marginal cost figures in question have been adjusted to take account of the presence of Pareto imperfections in the system that have the potential to cause $MRT_{Y/X}$ not to equal $MC_X/MC_Y$. In the current context, the relevant Pareto imperfections are externalities of production. However, in the general case, $MC^*$ may diverge from MC not only because of externalities of production but also because of imperfect-seller-price-competition-related discrimination in the pricing of factors of production or taxes on the margin of income (*inter alia*, taxes levied on earned income or taxes levied on the sale of non-labor factors of production). *Ceteris paribus*, for example, if the production of X generates external costs while the production of Y generates no externalities, $MC_X/MC_Y$ will be lower than $MRT_{Y/X}$—i.e., the amount of Y one will be able to produce with the resources that could also be used to produce a marginal unit of X will exceed $MC_X/MC_Y$. If one lets $XMC$ stand for “external marginal cost,” $MC_X/MC_Y$ will be lower than $MRT_{Y/X}$ if $XMC_X/(MC_X+XMC_X)$ exceeds $XMC_Y/(MC_Y+XMC_Y)$—i.e., if $XMC_X$ constitutes a higher percentage of what might be termed the full marginal cost of producing X than $XMC_Y$ constitutes of the full marginal cost of producing Y.

On the assumptions stated above, the following analysis reveals the distortion that final-goods production externalities would generate in the profits yielded by the
production of a marginal unit of X with resources withdrawn exclusively from the production of units of Y:

\[(1) \quad (P_X)D(P_{π(C+U)axterox/UOY})=(P_X)D(P_{Baxterox})-(P_X)D(P_{Caxterox/UOY})=\]

\[(2) \quad (P_{Baxterox}-LBaxterox)-(P_{Caxterox/UOY}-LCaxterox/UOY)=\]

\[(3) \quad (MRaxterox-MLVaxterox)-(MC\textstyle\frac{Uaxterox}{UOY}-MRT_{Y/X}[MLV Baxterox/UOY])=\]

\[(4) \quad (MRX-PX)-(MC\textstyle\frac{Haterox}{MC Haterox}=\]

\[(5) \quad -MC\textstyle\frac{Haterox}{MC Haterox}+MC\textstyle\frac{Haterox}{MC Haterox}MCY=\]

\[(6) \quad MC\textstyle\frac{Haterox}{MC Haterox}([MC\textstyle\frac{Y}{MC \textstyle\frac{Haterox}}]-[MC \textstyle\frac{Haterox}{MC \textstyle\frac{Haterox}}])\]

The expression after (5) equals the expression after (4) because the analysis’ assumption of perfect price competition guarantees both that \(P_X=MR_X\) (so that \(MR_X-P_X=0\)) and that \(P_Y=MC_Y\). The expression after (6) is derived from the expression after (5) by dividing each term in the expression after (5) by \(MC\textstyle\frac{Haterox}{MC Haterox}\) and multiplying the two resulting terms by \(MC\textstyle\frac{Haterox}{MC Haterox}\).

C. \(\frac{M}{P_X}D(P_{π(C+U)axterox/UOY})\) on the Same Simplifying Assumptions

This subsection focuses on the distortion that the combination of imperfections in (final-goods) seller price competition and final-goods production externalities would generate in the profits yielded by the creation and use of marginal unit of some product X in an otherwise-Pareto-perfect economy on the same assumptions that the preceding subsections made. The following analysis derives the relevant distortion:

\[(1) \quad (\frac{M}{P_X})D(P_{π(C+U)axterox/UOY})=(\frac{M}{P_X})D(P_{Baxterox})-(\frac{M}{P_X})D(P_{Caxterox/UOY})=\]

\[(2) \quad (P_{Baxterox}-LBaxterox)-(P_{Caxterox/UOY}-LC Baxterox/UOY)=\]

\[(3) \quad (MR Baxterox-MLV Baxterox)-(MC Baxterox-MRT_{Y/X}[MLV Baxterox/UOY])=\]

\[(4) \quad (MRX-PX)-(MC\textstyle\frac{Haterox}{MC Haterox}=\]
\[(5) \quad -P_X + (MC_X^*/MC_Y^*) P_Y = \]

\[(6) \quad MC_X^* ([P_Y/MC_Y^*] - [P_X/MC_X^*]) = \]

\[(7) \quad MC_X^* ([P_Y/MC_Y^*] - [P_X/MC_X^*]) = \]

With one exception, *mutatis mutandis*, the explanation of this proof is the same as that of the proof in the first subsection. The exception is that in Line (4) \(MC_X^*/MC_Y^*\) rather than \(MC_X/MC_Y\) is substituted for \(MRT_{Y/X}\). Note that the results of the first three subsections of Section 4 reveal that \((M/PX)D(P\pi_{(C+U)_X}UOX/UOY) \neq MD(P\pi_{(C+U)_Y}UOX/UOY) + (PX)D(P\pi_{(C+U)_Y}UOX/UOY)\).

* * *

Before proceeding to discuss briefly the implications of the preceding analyses, I need to point out and explain something about the relationship between the magnitudes of the \(P_X\) figures in the formulas for \(MD(P\pi_{(C+U)_X}UOX/UOY)\) and \((M/PX)D(P\pi_{(C+U)_X}UOX/UOY)\) and the relationship between the magnitudes of the \(P_Y\) figures in these two formulas as well—*viz.*, I need to point out that and explain why the \(P_X\) that appears in the \(MD(P\pi_{(C+U)_X}UOX/UOY)\) formula will be higher than the \(P_X\) that appears in the \((M/PX)D(P\pi_{(C+U)_X}UOX/UOY)\) formula to the extent that some of the allocative production costs generated by the production of the marginal unit of \(X\) are external costs and that the \(P_Y\) that appears in the \(MD(P\pi_{(C+U)_Y}UOX/UOY)\) formula will be higher than the \(P_Y\) that appears in the \((M/PX)D(P\pi_{(C+U)_Y}UOX/UOY)\) formula to the extent that some of the allocative costs generated by the relevant units of \(Y\) are external costs.

To understand why this is the case, it is critical to recognize that the difference between the situation to which the \(MD(P\pi_{(C+U)_X}UOX/UOY)\) formula relates and the situation to which the \((M/PX)D(P\pi_{(C+U)_X}UOX/UOY)\) formula relates is that in the latter situation one or both of the relevant producers may not have had to pay anything for some of the resources their production of the relevant unit(s) of their respective products “consumed” in both situations—*viz.*, the relevant difference is not that in the latter situation the production of the relevant unit(s) of \(X\) and/or \(Y\) consumed more resources than it did.
in the former situation (more resources for which the relevant producers paid nothing). This “fact” is critical in the current context because it implies the following relationships:

1. the magnitude of $MC_X^*$ is the same in the latter, (M/PX)D situation and in the former, MD situation;

2. the magnitude of $MC_Y^*$ is the same in the latter, (M/PX)D situation and in the former, MD situation;

3. to the extent that in the (M/PX)D situation the producer of the marginal unit of $X$ paid nothing for some of the resources his production of that unit “consumed,” $MC_X$ will, on this account, be lower than both $MC_X^*$ in the (M/PX)D situation and $MC_X$ in the MD situation (in which $MC_X$ will not fall below $MC_X^*$ for this reason);

4. to the extent that in the (M/PX)D situation the producer(s) of the unit(s) of $Y$ that were sacrificed when the marginal unit of $X$ was produced would have paid nothing for some of the resources their production of those units would have “consumed,” $MC_Y$ in the (M/PX)D situation will, on this account, be lower than both $MC_Y^*$ in the (M/PX)D situation and $MC_Y$ in the MD situation (in which $MC_Y$ will not fall below $MC_Y^*$ for this reason);

5. since $MC_X$ will be lower in the (M/PX)D situation than in the MD situation to the extent that in the (M/PX)D situation but not in the MD situation the producer of the marginal unit of $X$ paid nothing for some of the resources his production of that unit “consumed,” $P_X$—which is directly related to $MC_X$—will tend to be lower in the (M/PX)D situation than in the MD situation; and

6. since $MC_Y$ will be lower in the (M/PX)D situation than in the MD situation to the extent that in the (M/PX)D situation but not in the MD situation the producer of the sacrificed units of $Y$ would have paid nothing for some of the resources their production would have “consumed,” $P_Y$—which is directly related to $MC_Y$—will tend to be lower in the (M/PX)D situation than in the MD situation.

I now can delineate two implications of the preceding analyses that bear significantly on the distortion-analysis protocol that I think may well constitute the approach to economic-efficiency assessment that is TBLE. First, both the fact that the values of $P_X$ and $P_Y$ in the formula for MD($\pi_{(C+U)\Delta UOX/UOY}$) will be different from the
values of \( P_X \) and \( P_Y = MC_Y \) in the formula for \((M/PX)D(P\pi_{C+U|UOX/UOY})\) and the fact that \((M/PX)D(P\pi_{C+U|UOX/UOY})\) would not equal \( MD(P\pi_{C+U|UOX/UOY}) + (PX)D(P\pi_{C+U|UOX/UOY}) \) even if the first “fact” were not true reveal that the formulas for the aggregate distortion in the profits yielded by marginal exemplars of UO-to-UO (and in fact various other types of resource allocation) will be more complex than would be the case if the opposite were true. Second, the formulas for all three profit distortions just derived reveal that the sign of each of these profit distortions will vary from product to product with the relative sizes (respectively) of the relevant \( P/MC, \ MC/MC^* \), and \( P/MC^* \) ratios. This reality reflects the fact (which should not be surprising) that if the profits yielded by the allocation of resources from the production of one product to the production of another are inflated, the profits yielded by the allocation of resources from the latter product to the former product must be deflated (and, relatedly, that if, from the perspective of economic efficiency, too many resources were withdrawn from the production of one product to be devoted to the production of another too few resources must have been withdrawn from the production of the latter product to be devoted to the production of the former product). The distortion-analysis protocol that I am proposing takes appropriate account of both these realities.

5. The Relationships on Which Distortion Analysis Builds

This section’s account of the relationships on which distortion analysis builds will focus on the usually-counterfactual categories of resource allocation that I think are analytically useful to distinguish. As I indicated earlier, this focus reflects my view that it will be third-best allocatively efficient to predict the economic efficiency of any choice by determining and summing its impacts on the economic inefficiency generated by the economically-inefficient exemplars of these categories of resource allocation rather than by calculating and summing its impacts on the economic inefficiency generated by the economically-inefficient exemplars of all realistic resource allocations. The third-best-allocative efficiency of distortion analysis does not turn on the correctness of this judgment—\( i.e., \) on the third-best allocative efficiency of this feature of the variant of the distortion-analysis protocol I will describe.
As we shall see, distortion analysis focuses on the distortions in the profits yielded by an economy’s marginal resource allocations. In any developed economy, a huge number of resource-uses and resource allocations of different kinds will be marginal in the non-mathematical sense of being the least profitable but not unprofitable uses and allocations of the relevant kind. Thus, there will be marginal uses of resources to produce marginal units of each product the economy produces, marginal uses of resources to create the marginal QV investment in each area of product-space it is convenient to specify, and marginal uses of resources to execute marginal PPR projects that relate to the production processes used to produce the products in each of the various areas of product-space in question. And for each such set of marginal resource-uses, it will be possible to distinguish a series of usually-counterfactual but analytically-useful marginal resource allocations that differ according to the types of uses from which one is artificially assuming the resources “consumed” by the marginal resource-uses in question are withdrawn—e.g., UO-to-UO, QV-to-UO, PPR-to-UO resource allocations rather than allocations to UO production from each of these sources in the realistic proportions in which resources are withdrawn from these alternative uses for the purpose of producing a marginal unit of some product.

If the relevant data could be obtained, one could generate separate distributions of the aggregate percentage distortions in the profits yielded by the marginal exemplars of each type of resource allocation that is analytically useful to distinguish. Each such distribution and (in some instances, more relevantly) each segment of each such distribution on which it is analytically useful to focus will have an absolute weighted mean, a weighted-average absolute deviation from that mean (weighted-average absolute difference between the magnitudes of the individual percentage distortions in the relevant distribution-segment and the weighted mean of the relevant distribution-segment), and a weighted-average squared deviation from its weighted mean where the weight assigned to any given figure is proportionate to the allocative cost of withdrawing the resources “consumed” by the associated marginal resource-use from their specified alternative uses—i.e., to the allocative value that the resources the relevant marginal resource-use consumed would have generated in their (specified) alternative uses. The distortion-
analysis approach to economic-efficiency assessment I will propose will focus on the impact of the private and public choices under consideration on these attributes of the relevant distribution-segments of the $\Sigma D(\Pi)$ distributions for the marginal exemplars of the relevant types of resource allocation.

Before proceeding to ground the four relationships on which distortion analysis relies, I need (1) to explain why distortion analysis focuses on only a segment of the $\Sigma D(\Pi)$ distributions associated with the respective types of resource misallocation it is used to analyze, (2) to specify the segments of such distributions on which distortion analysis focuses when it is used to analyze the impact of given choices on the amount of various types of misallocation, (3) to indicate how the distortion analyses of the impact of given choices on the amount of economic inefficiency of various types that is generated will differ from each other, and (4) to explain why distortion analysis should not be used to estimate the impact of a choice on one type of resource misallocation it is useful to distinguish and how the distortion-analysis approach I will describe will have to be adjusted when the impact of private or public choices on some types of resource misallocation is at issue.

I will begin by discussing the $\Sigma D(\Pi_{(C+U)/\Delta/\ldots})$-distribution segment on which the distortion analysis of the impact of a private or public choice on UO-to-UO, QV-to-QV, PPR-to-PPR, UO-to-QV and QV-to-UO, PPR-to-QV and QV-to-PPR, and UO-to-PPR and PPR-to-UO misallocation will focus (where what I will initially, misleadingly refer to as the two types of misallocation in the last three pairs of figures should be grouped together). Three points are salient, all of which derive from the following related facts:

1. UO-to-UO misallocation is analyzed on the assumption that the total amount of resources (measured by their allocative cost) devoted to unit-output production is fixed;
2. QV-to-QV misallocation is analyzed on the assumption that the total amount of resources devoted to QV-investment creation is fixed;
3. PPR-to-PPR misallocation is analyzed on the assumption that the total amount of resources devoted to PPR execution is fixed;
(4) UO-to-QV and QV-to-UO misallocation are analyzed on the assumption that the total amount of resources devoted to QV-investment creation and unit-output production combined is fixed;

(5) PPR-to-QV and QV-to-PPR misallocation are analyzed on the assumption that the total amount of resources devoted to PPR execution and QV-investment creation combined is fixed; and

(6) PPR-to-UO and UO-to-PPR misallocation are analyzed on the assumption that the total amount of resources devoted to PPR execution and unit-output production combined is fixed.

The first of the three related implications of these facts is:

(1) when UO-to-UO misallocation is at issue, if, from the perspective of economic efficiency, too many resources are devoted to the production of some products relative to others, too few must be devoted to the production of the latter products relative to the former;

(2) when QV-to-QV misallocation is at issue, if, from the perspective of economic efficiency, too many resources are devoted to the creation of QV investment in some areas of product-space relative to others, too few must be devoted to the creation QV investment in the latter areas of product-space relative to the amount allocated to the creation of QV investment in the former areas of product-space;

(3) when PPR-to-PPR misallocation is at issue, if, from the perspective of economic efficiency, too many resources are devoted to the execution of PPR projects that relate to the production of products in some areas of product-space relative to the amount devoted to this type of use in other areas of product space, too few must be devoted to the execution of PPR projects that relate to the production of products in the latter areas of product-space relative to the amount devoted to this use in the former areas of product space;

(4) when UO-to-QV and QV-to-UO misallocation are at issue, if, from the perspective of economic efficiency, too many resources are withdrawn from unit-output production for the purpose of creating QV investments, too few must be withdrawn from the creation of QV investments for the purpose of producing units of output, and if too few resources are withdrawn from unit-output production for the purpose of creating QV investments, too many resources must be withdrawn from QV-investment creation for the purpose of producing units of existing products;
when PPR-to-QV and QV-to-PPR misallocation are at issue, if, from the perspective of economic efficiency, too many resources are withdrawn from PPR execution for the purpose of creating QV investments, too few resources must be withdrawn for QV-investment creation for the purpose of executing PPR projects, and if, from the perspective of economic efficiency, too few resources are withdrawn from PPR execution for the purpose of creating QV investments, too many must be withdrawn from QV-investment creation for the purpose of executing PPR projects; and

when PPR-to-UO and UO-to-PPR misallocation are at issue, if, from the perspective of economic efficiency, too many resources are withdrawn from PPR execution for the purpose of producing units of existing products, too few must be withdrawn from unit-output production for the purpose of executing PPR projects, and if, from the perspective of economic efficiency, too few resources are withdrawn from PPR execution for the purpose of producing units of output, too many resources must be withdrawn from unit-output production for the purpose of executing PPR projects.

Second, and relatedly, the fixed-amount-of-resource assumption implies that, if the relevant resource-allocation choosers are sovereign, maximizing private-actor principals and the profits generated by a choice to withdraw resources from the production of one or more units of one or more products to use them to produce a marginal unit of another product is inflated, the profits that would be generated by a choice to produce an additional unit of the former product(s) with resources that would be withdrawn from the production of the latter product would be deflated—more generally, if the profits yielded by one resource-flow are inflated, the profits would have been generated by the opposite resource-flow must have been deflated. Third, and relatedly, the fixed-amount-of-resources assumption implies that, if the relevant resource-allocation choosers are sovereign, maximizing market-principals and some amount of misallocation is generated by economically-inefficient choices to produce units of one or more products with resources withdrawn from the production of units of other products, the same amount of misallocation will have been generated by economically-inefficient decisions not to produce the relevant units of output of the latter product(s) with resources that would have been withdrawn from the production of the former products—more generally, if a certain amount of resource misallocation is generated by economically-inefficient decisions to withdraw resources from use A and allocate them to use B, the
same amount of resource misallocation must be generated by decisions not to withdraw resources from use B and allocate them to use A.

The last point has several coincident implications. If the question at issue is the so-called “social cost of monopoly”—better expressed, the economic inefficiency generated by imperfections in seller competition, the salient corollary of the preceding result is that the total amount of misallocation associated with any type of resource allocation equals either (1) the misallocation caused when from the perspective of economic efficiency too many resources are used in one way rather than the other way in question or (2) the misallocation caused when from the perspective of economic efficiency too few resources are used in the latter rather than in the former way in question—i.e., the total misallocation of the relevant type is either of these two (equal) amounts, not the sum of these two amounts. In fact, it is misleading to say (as I have been saying) that the misallocations just delineated are “two misallocations”: since the “two” misallocations are each other’s flip-sides, there is really just one misallocation.

In the current context, the salient (coincident) implication of the preceding result is that protocols that attempt to assess the impact of a private or public choice on the misallocation generated by the economically-inefficient exemplars of some type of resource allocation from its impact on various attributes of some distribution of the \( \Sigma D(P_{\pi}) \) figures for the marginal exemplars of that type of resource allocation should focus on its impact on the attributes of only a segment of the relevant distribution. More particularly, when the resource allocation is UO-to-UO, QV-to-QV, or PPR-to-PPR, distortion analysis should generate its economic-efficiency conclusions from the relevant choice’s impact on the relevant attributes of the distributions of either the positive \( \Sigma D(P_{\pi_{\Delta, \ldots}}) \)s or the negative \( \Sigma D(P_{\pi_{\Delta, \ldots}}) \)s associated with the resource allocations in question. When the resource allocation is UO-to-QV and QV-to-UO, PPR-to-QV and QV-to-PPR, and UO-to-PPR and PPR-to-UO, the distortion analysis should focus either on the choice’s impact on the relevant attributes of the distribution of \( \Sigma D(P_{\pi_{\Delta, \ldots}}) \) figures for the marginal exemplars of the first type of resource-flow in each pair or its impact on the relevant attributes of the distribution of \( \Sigma D(P_{\pi_{\Delta, \ldots}}) \)s for the marginal exemplars of the second type of resource-flow in each pair. If one estimates a choice’s
impact on the first three types of misallocation listed above by adding together (1) the conclusion that distortion analysis derived from estimates of the choice’s impact on relevant attributes of the positive segment of the relevant $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$ distribution about the amount of misallocation caused by the relevant allocation’s being too large in some areas of product-space and (2) the conclusion that distortion analysis derived from estimates of the choice’s impact on relevant attributes of the negative segment of the relevant $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$-distribution segment about the amount of misallocation caused by the relevant allocations’ being too small in some areas of product-space, the absolute value of the total estimate will be twice as large as it should be, ceteris paribus. If one estimates a choice’s impact on the last three types of misallocation listed above by adding together the conclusions distortion analysis generated about the misallocation yielded by the economically-inefficient exemplars of each member of each pair of resource-flows just listed, the absolute value of its estimate will also be twice as large as it should be, ceteris paribus. One must be careful not to engage in such double-counting.

I now need (1) to indicate a difference between the $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$-distribution segments on which the distortion analysis of the impact of a choice on the first three categories of misallocation listed above will focus and the $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$-distribution segments on which the distortion analysis of the impact of a choice on the second three categories of misallocation listed above will focus and (2) to specify a question that this difference makes salient. Here is the relevant difference: although all the figures in the $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$-distribution segments on which the distortion analysis of the impact of a choice on the first three categories of resource misallocation listed above will focus will have the same sign, the figures in the $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$-distribution segments on which the distortion analysis of the impact of a choice on the last three categories of resource misallocation listed above will focus will rarely or never have the same sign. Here is the question that this difference makes salient: Will the impact of a private or government choice on the magnitude of a given category of misallocation that is generated relate in the same way to the choice’s effect on the weighted mean, weighted-average absolute deviation, and weighted-average squared deviation of the relevant $\Sigma\%D(P_{\pi_{\alpha_{...}}}/...)$-distribution segment when that distribution-segment contains some figures with positive
signs and some with negative signs as it will when the relevant distribution-segment contains only figures with the same sign? I will address this issue at the end of this section.

One final introductory point remains to be made. The economic efficiency of private and public choices will depend not only on their impacts on the magnitudes of the various categories of resource misallocation considered above but also on their impacts on the magnitudes of a wide variety of other categories of resource misallocation that are analytically useful to distinguish. The relevant list of these other categories of resource misallocation would include:

1. the misallocation that producers generate by choosing to produce their products with more-allocatively-costly, known production processes rather than with less-allocatively-costly, known production processes;

2. the misallocation that results when the goods that have been produced are misallocated among final consumers for reasons that do not relate to the associated wealth/income distribution;

3. the misallocation that the wealth/income distribution generates (A) because the amount of economic inefficiency that buyer error and externalities of consumption cause individuals to generate when making consumption decisions and decisions whether to engage in criminal activity is inversely related to their wealth and income (because poverty increases the extent to which individuals who are poor make economically-inefficient choices for these reasons by changing the choice that is in the relevant chooser’s interest as he conceives it), (B) because poverty increases the extent to which individuals who are poor make economically-inefficient choices not to invest in both their own human capital and the human capital of their children, and (C) because the amount of equivalent-dollar gains that any redistribution (say, to the poor) generates by satisfying those who have external preferences (materially disinterested preferences for others’ receiving or not receiving resources or opportunities) for such redistributions will usually differ from the equivalent-dollar losses that redistribution generates by displeasing those who have external preferences that are opposed to it.

This Article argues that a distortion-analysis protocol that focuses on the impact of a choice on specified attributes of relevant $\Sigma \%D(P_{1\ldots l})$-distribution segments may well be the third-best-allocatively-efficient protocol for analyzing the impact of any
private or public choice on the magnitudes of the six categories of resource misallocation on which the preceding discussion focused. However, I do not think that it will be TBLE to use any variant of distortion analysis to analyze the impact of a private or public choice on investment-in-human-capital-related and external-preference-related economic efficiency. Moreover, although I do think that it would be TBLE to use a variant of distortion analysis to analyze the impact of choices on the other categories of resource misallocation just listed, the variant of distortion analysis that will be third-best-allocatively efficient in relation to these other categories of misallocation will not focus on the impact of the choice under investigation on various attributes of any $\Sigma\%D(P_{\pi_{\Delta_{\ldots\ldots}}})$-distribution segment though it will investigate the number of allocative decisions of the relevant categories that the private or public choices whose economic efficiency is at issue critically affect by altering the aggregate distortion in the profits they yield.\(^6\)

I will now state the four relationships on which the part of the distortion-analysis approach that focuses \textit{inter alia} on UO-to-UO, QV-to-QV, PPR-to-PPR, UO-to-QV and QV-to-UO, QV-to-PPR and PPR-to-QV, and UO-to-PPR and PPR-to-UO misallocation builds. The discussion that follows assumes that the distortion analysis in question focuses on the positive segments of the $\Sigma\%D(P_{\pi_{\text{UO/UO}}})$, $\Sigma\%D(P_{\pi_{\text{QV/QV}}})$, and $\Sigma\%D(P_{\pi_{\text{PPR/PPR}}})$ distributions and on the $\Sigma\%D(P_{\pi_{\Delta_{\ldots\ldots}}})$ distributions for the resource-flow in each of the last three pairs of resource-flows that has a positive weighted mean:

(1) \textit{ceteris paribus}, the total amount of misallocation that will be generated by the allocatively-inefficient exemplars of any of the six types of resource allocation just delineated will increase with the absolute magnitude of the “weighted mean” of the relevant distribution-segment of percentage distortions in the profits yielded by the marginal resource allocations in the associated category of resource allocation where the weights assigned to the various marginal-resource-allocation percentage-profit-distortion figures in question are proportionate to the allocative cost of withdrawing the resources that the marginal resource allocation in question devotes to the specified use from their specified alternative use(s) (and where “weighted mean” is a possibly-infelicitous expression that refers to the weighted-average value of the figures in the relevant distribution-segment);
(2) *ceteris paribus*, the amount by which a given reduction (increase) in the weighted mean of the $\sum\%D(P,\pi,\Delta,\ldots)$-distribution segment that is relevant for the analysis of one of the above six categories of resource allocation will decrease (increase) the total amount of economic inefficiency generated by the economically-inefficient exemplars of that category of resource allocation will increase with the pre-choice or pre-policy weighted mean of the relevant $\sum\%D_{\Lambda,\ldots}$-distribution segment; relatedly,

(3) *ceteris paribus*, the total amount of misallocation that will be generated by the allocatively-inefficient exemplars of any of the above six categories of resource allocation will increase with the magnitude of the weighted-average absolute deviation of the relevant $\sum\%D(P,\pi,\Delta,\ldots)$-distribution segment where the weights assigned to each figure are also proportionate to the allocative cost of withdrawing the resources that the marginal resource allocation devotes to the specified use from their specified alternative use(s); and, relatedly and finally,

(4) *ceteris paribus* and controlling for the weighted-average absolute deviation of the relevant $\sum\%D(P,\pi,\Delta,\ldots)$-distribution segment, the total amount of misallocation that will be generated by the allocatively-inefficient exemplars of that category of resource allocation will increase with the weighted-average squared deviation of the distribution-segment in question where the weights assigned to each figure are proportionate to the allocative cost of withdrawing the resources that the marginal resource allocation in question devotes to the specified resource-use from their specified alternative use(s).
I will now proceed to ground these four relationships. Diagram I is constructed to illustrate them both when the relevant resource allocation is one of the three types in relation to which the relevant $\Sigma %D(P_{\pi_{AR/\ldots}})$-distribution segment contains only positive figures—i.e., when the relevant resource allocation is a UO-to-UO, QV-to-QV, or PPR-to-PPR allocation—and when the relevant resource allocation is one of the three types in relation to which the relevant $\Sigma %D(P_{\pi_{AR/\ldots}})$-distribution segment contains mostly positive but some negative figures—i.e., when the relevant resource allocation is a UO-to-QV and QV-to-UO, QV-to-PPR and PPR-to-QV, or UO-to-PPR and PPR-to-UO allocation.

After delineating the axes and curves in Diagram I and stating and discussing two simplifying assumptions that the construction of its curves manifest, I will use it to illustrate the four relationships on which distortion analysis builds first when same-sign $\Sigma %D(P_{\pi_{AR/\ldots}})$-distribution segments are relevant and then when mixed-sign $\Sigma %D(P_{\pi_{AR/\ldots}})$-distribution segments are relevant. Diagram I has two axes. Its vertical axis measures dollars, and its horizontal axis measures in dollars the total allocative cost.
(TLC) of withdrawing the resources (R) allocated to the type of resource-use in question from the alternative use(s) from which the relevant resource-allocation category assumes they will be withdrawn (TLCR/...). (In the notation that Diagram I and its discussion employs, one ellipsis stands for both the use to which the relevant resource is devoted and the use[s] from which the relevant resource is withdrawn—i.e., stands for both defining features of the relevant type of resource allocation.) Diagram I contains two curves—a marginal allocative value curve (MLVAR/...), which indicates the allocative value that would be generated by the specified use of successive batches of resources with an allocative cost of $1 in a particular area of product-space and a marginal allocative cost curve (MLCAR/...), which indicates the $1 allocative cost of withdrawing from their relevant alternative uses the successive batches of resources whose allocative product in those alternative uses would be $1 that could be allocated to the use in question in the relevant area of product-space. The preceding sentence includes the phrase “in a particular area of product-space” because the MLVAR/... curve, the MLCAR/... curve, and the TLCR/... axis in Diagram I provide information that relates to not just the resources used in a specified way (to increase unit output, to create a QV investment, or to execute a PPR project) but to resources used in the specified way in a particular area of product-space (say, to increase the unit output of product β, to create a QV investment in area of product-space β). 7

I will first describe and explain the shapes of the MLVAR/... and MLCAR/... curves in Diagram I and then list and discuss three unrealistic assumptions on which Diagram I’s construction of its MLVAR/... curve is based. In Diagram I, the MLVAR/... curve is constructed to be downward-sloping. This construction reflects the fact that, for two reasons, the allocative value generated by the allocation to any use of each successive batch of resources whose allocative cost is $1 will be lower than that of its predecessor: (1) even if the successive batches of resources whose devotion to the use in question would entail $1 in allocative costs were physically equally-large and had the same physical product in the use in question as did all previous resource-batches whose allocative product in their alternative use was $1, the allocative value of (A) the successive, equally-large increases in unit output that those resources would yield, (B) the
successive QV investments they would create, or (C) the successive PPR projects they
would execute would decline, and (2) the successive batches of resources of an allocative
cost of $1 that would be allocated to any given type of use would be progressively
physically-smaller because the alternative uses from which the physical resources in each
successive one-dollar-of-allocative-cost batch would be withdrawn would be
progressively more-allocatively-valuable. In Diagram I, $MLC_{\Delta R/\cdots}$ is constructed to be
horizontal at the height $1. This construction reflects the obvious fact that the marginal
allocative cost of each successive $1 in resources (measured by the allocative cost of their
allocation to the resource-use in question) is $1.

The construction of Diagram I manifests three highly-unrealistic assumptions that
relate to the $MLV_{\Delta R/\cdots}$ curve. The first, truly-heroic assumption is made purely for
expositional reasons. It is not designed to conceal various complexities with which
distortion analyses will clearly have to cope. In particular, Diagram I assumes that the
same $MLV_{\Delta R/\cdots}$ curve applies not only to the marginal resource-use of a given type in
every area of product-space in which resources are used in the relevant way but also to all
types of marginal resource-uses in all areas of product-space in which they take place.
*Inter alia*, this assumption implies that, at least for types of resource allocation that can
be increased over the relevant ranges without sacrificing economies of scale, the
allocatively-efficient amount of resources (measured in terms of the allocative cost of
withdrawing them from the resource-use from which they would be withdrawn) to devote
to the use to which any pair of $MLV_{\Delta R/\cdots}$ and $MLC_{\Delta R/\cdots}$ curves in Diagram I relates is
$OA$—the amount at which the $MLV_{\Delta R/\cdots}$ curve cuts the $MLC_{\Delta R/\cdots}$ curve from above at
point K.

The second unrealistic assumption that relates to the $MLV_{R/\cdots}$ curve—more
accurately to the way in which it will be used in the analysis that follows—is that this
curve will not be affected by any of the private or public choices whose economic
efficiency the distortion-analysis protocol might be used to assess. As the next three
paragraphs explain, this assumption is inaccurate regardless of the type of resource-use
that is at issue.
Assume first that the resource-use involved in the relevant type of resource allocation is unit-output-increasing. To the extent that the public or private choice whose economic efficiency is under investigation changes the income/wealth distribution, it will tend to change the relevant MLV\textsubscript{AR/...} curves by changing the demand curve(s) for the product(s) in question. And to the extent that the public or private choice in question (e.g., a public choice to internalize accurately what were external costs of production pre-choice) induces producers of the good(s) in question to shift to a more-economically-efficient (less-economically-efficient) production process, it will raise (lower) the MLV\textsubscript{AR/...} curve by increasing (decreasing) the number of units of output of the good(s) concerned that will be produced at any given allocative cost.

Assume second that the resource-use involved in the relevant type of resource allocation is QV-investment-creating. To the extent that the public or private choice whose economic efficiency is under investigation changes the income/wealth distribution in the relevant economy, it may well change the MLV\textsubscript{AR/...} curve by changing the dollar value to a possibly-changing set of relevant consumers of the additional quality or variety that successive QV investments provide; to the extent that the public or private choice whose economic efficiency is at issue changes the prices charged for the products created by the relevant marginal QV investments and their intra-marginal competitor-products, it will tend to change (in some direction) the economic-efficiency gains generated by the use of the relevant marginal QV investments by changing the relative sizes of their P/MC\textsuperscript{*} ratios, conceivably the P/MC\textsuperscript{*} ratios of the more-distantly-competitive products from whose production the use of the relevant marginal QV investments withdraws resources, and in any event, the difference between the relevant marginal products’ weighted-average P/MC\textsuperscript{*} ratios and the weighted-average P/MC\textsuperscript{*} ratios of the more-distantly-competitive products in question; and to the extent that the private or public choice whose economic efficiency is under investigation changes the amount of externalities the creation and/or use of the marginal QV investments in question generate, they can affect the MLV\textsubscript{AR/...} curve on that account both (1) by reducing (increasing) the allocative cost of creating the relevant QV investments and hence increasing (decreasing) the “amount of additional quality and variety” one obtains for each dollar of allocative
cost and (2) by altering the economic-efficiency gain generated by the use (as opposed to the allocatively-costless abandonment) of the marginal QV investments in question.

Assume third that the resource-use involved in the relevant type of resource allocation is PPR-executing. In this context, private or public choices that alter the income/wealth distribution in the economy in question can affect $MLV_{\Delta R/...}$ on that account by affecting the demand for the good(s) to whose production processes the relevant marginal PPR projects relate, and private or public choices that alter prices and thereby affect the allocative value that the resources the production-process discovery will enable its employers to save when producing their pre-discovery outputs and will induce its employers to use to produce the additional units of output the discovery will make it profitable for them to produce will generate in their alternative uses will also affect $MLV_{\Delta R/...}$ on that account. I could go on, but the inaccuracy of the invariant-$MLV_{\Delta R/...}$-curve assumption should by now be clear.

The distortion-analysis protocol I am claiming is TBLE does not explicitly address the inaccuracy of this feature of Diagram I’s “construction” of $MLV_{\Delta R/...}$. In part, my choice not to make it do so is based on the fact that the overall protocol does consider some of these effects under different headings: thus, some of the UO-to-UO misallocation-related effects that cause $PB_{UAQV}$ to be distorted will be picked up by the approach’s analysis of the relevant choice’s effect on UO-to-UO misallocation; some of the QV-investment-related and PPR-related consequences of the relevant choice’s impact on the amount of misallocation generated by choices among known production processes are also considered when analyzing the choice’s impact on UO-to-UO misallocation. However, there can be no doubt that I am assuming that it will not be TBLE to consider the remaining consequences of the tendency of the choices under review to alter the relevant $MLV_{\Delta R/...}$ curves. Of course, there is no reason why such interrelationships could not be considered if it appeared TBLE to do so.

The third unrealistic assumption that Diagram I manifests is the assumption that the $MLV_{\Delta R/...}$ curve is linear. This assumption, which facilitates the analysis that follows in a way that I will make clear, conceals an issue to which the TBLE version of distortion analysis would almost certainly have to respond. I will indicate why and how distortion
analysis will have to take account of the actual non-linearity of $MLV_{AR/...}$ curves at an appropriate juncture below.

In a moment, I will use Diagram I to illustrate why the four relationships on which distortion analysis builds obtain both when the relevant $\Sigma%D(P_{\pi_{AR/...}})$-distribution segments are same-sign and when they are mixed-sign. But before doing so, I need to make five preliminary points.

First, if the economic actor who makes the relevant marginal resource-allocation choice is a sovereign maximizer and no economies of scale apply to the category of resource allocation in question over the relevant range (so that inter alia the marginal resource allocation is infinitesimally small), $P_{\pi_{AR/...}}$ will be zero. Second, if the above two conditions are fulfilled, the distance between the MLC and MLV curves at the resource-quantity in question will indicate not only the amount by which the allocation of the indicated last unit of resources (measured in allocative-cost terms) from the indicated use to the indicated use in question will have increased (or decreased) economic inefficiency but also the negative of the aggregate distortion in the profits yielded by that marginal resource allocation: if $P_{\pi_{(C+U)\Delta/...}}=0$, the definition $\Sigma D(P_{\pi_{(C+U)\Delta/...}})=P_{\pi_{(C+U)\Delta/...}}-LE_{(C+U)\Delta/...}$ will imply that $\Sigma D(P_{\pi_{(C+U)\Delta/...}})=-LE_{(C+U)\Delta/...}$. Third, and relatedly, the aggregate distortion in the profits that would be yielded by the last infinitesimally-small allocation of resources that would be allocatively efficient is zero: if OA resources are allocated to the use indicated in Diagram I from the use(s) indicated in Diagram I because $P_{\pi_{AR/...}}$ was zero for the infinitesimally-small resource allocation of that type that would bring the total amount of resources the relevant allocation involved to OA, $LE_{AR/...}$ would also be zero—i.e., $MLV_{AR/...}=MLC_{AR/...}$ at point K. And fourth, the total misallocation generated by all allocatively-inefficient allocations of resources of the relevant type in the relevant area of product-space is the area between the $MLV_{AR/...}$ and $MLC_{AR/...}$ curves between the actual amount of resources the specified allocation involves and the amount of resources that would have been economically efficient for it to involve. Thus, if OB in resources are allocated in the relevant way, the misallocation generated by the economically-inefficient allocations in question will be area KHE, and if OW in resources are allocated in the relevant way, the
misallocation that will have resulted from the failure to devote an additional WA in resources to that allocation will be area UKV. Fifth and relatedly, if the MLV\(_{\Delta R/...}\) curve is not linear over the relevant range, a distortion analysis that ignores that non-linearity will mis-estimate the total amount of misallocation that the economically-inefficient exemplars of the relevant category of resource allocation generates if it bases its estimate on an assumption of linearity. Specifically, the assumption that each MLV\(_{\Delta R/...}\) curve is linear over the relevant range will lead the analysis (1) to underestimate the amount of misallocation that will be associated with any given \(\Sigma D(P_{\pi_{\Delta R/...}})\) figure if the MLV\(_{\Delta R/...}\) curve for the relevant resource allocation is concave to the origin over the relevant range and hence \((inter\ alia)\) to underestimate the amount by which a choice that would reduce the \(\Sigma D(P_{\pi_{\Delta R/...}})\) figure for the relevant type of resource allocation in the relevant area of product-space would reduce resource misallocation on that account and (2) to overestimate the amount of misallocation that will be associated with any given \(\Sigma D(P_{\pi_{\Delta R/...}})\) figure if the MLV\(_{\Delta R/...}\) curve is convex to the origin over the relevant range and hence \((inter\ alia)\) to overestimate the amount by which a choice that would reduce \(\Sigma D(P_{\pi_{\Delta R/...}})\) for the relevant category of resource allocation in the relevant area of product-space would reduce resource misallocation on that account.

I will now use Diagram I to illustrate the basis of the four relationships on which distortion analysis builds both when the effect of a choice on UO-to-UO, QV-to-QV, and PPR-to-PPR misallocation is at issue—\(i.e.,\) in relation to categories of misallocation in which all relevant \(\Sigma \%D(P_{\pi_{\Delta R/...}})\) figures are positive—and when the effect of a choice on UO-to-QV and QV-to-UO, QV-to-PPR and PPR-to-QV, and UO-to-PPR and PPR-to-UO misallocation is at issue—\(i.e.,\) in relation to categories of misallocation in which most but not all relevant \(\Sigma \%D(P_{\pi_{\Delta R/...}})\) figures are positive. I will initially assume in both situations that the \(P_{\pi_{\Delta R/...}}\) figures in question are zero (that the relevant resource allocations are infinitesimally small and the relevant resource allocators are sovereign maximizers). I will then relax this assumption and discuss the implications of the reality that, for some categories or instances of marginal resource allocations \(P_{\pi_{\Delta R/...}} > 0\).

I begin by analyzing the relevant relationships in relation to UO-to-UO, QV-to-QV, and PPR-to-PPR misallocation, categories of misallocation for which all relevant
\( \Sigma D(P_{\pi_{AR/...}}) \) figures are positive. On our current assumption that the relevant marginal resource allocators are sovereign maximizers, all the relevant situations will be ones in which in Diagram I the relevant resource allocation will have devoted more than OA resources to the use in question in each area of product-space in which the allocation in question took place. In particular, my analysis of this set of cases will assume that the pre-choice resource allocations in question devoted ON, OB, OC, OD, or OT of resources to the relevant use in any area of product-space in which the relevant category of resource allocation occurred.

Diagram I is constructed—i.e., points N, B, C, D, and T in Diagram I are placed—so that NB=BC=CD=DT. Relatedly, Diagram I is constructed—i.e., points L, H, I, J, and R are placed—so that LH=HI=IJ=JR. Given that the MLV_{AR/...} and MLC_{AR/...} curves are constructed to be linear, this placement has important implications for the relationships between LM, HE, IF, JG, and RS, which are respectively the positive \( \Sigma D(P_{\pi_{AR/...}}) \)s for the ONth, OBth, OCth, ODth, and OTth resource allocated to the use in question if \( P_{\pi} \) for that allocation was zero (as it would be if the allocation were infinitesimally small and the relevant actor were a sovereign maximize). In particular, given this construction, on these assumptions, the placement of points N, B, C, D, and T guarantee that (1) HE–ML (the difference between the distortion that would be operative at the margin if OB rather than ON of resources were allocated to the relevant use from the specified alternative use[s] in the specified area of product-space) equals IF–HE equals JG–IF equals RS–JG (where these latter differences can be defined analogously) and, relatedly, (2) if OD in resources are allocated to the relevant use from the relevant use(s) in one area of product-space and OB in resources are allocated to the relevant use from the relevant use(s) in another area of product-space, the mean distortion in the distribution of relevant \( \Sigma D(P_{\pi_{AR/...}}) \) figures will be IF. (The same conclusion would be warranted if the allocations of resources in question were ON and OT.)

I will now use Diagram I to illustrate the four relationships that underlie the distortion-analysis protocol for economic-efficiency assessment I am proposing when UO-to-UO, QV-to-QV, and PPR-to-PPR resource misallocation is at issue—i.e., when all relevant \( \Sigma D(P_{\pi_{AR/...}}) \) figures are positive—on the assumption (already stated) that the
MLV_{AR/...} curve for any individual category of resource allocation will be the same in all areas of product-space that receives resources through the resource allocations in question.

The first relationship on which the distortion-analysis approach builds is that, *ceteris paribus*, the amount by which a given private or public choice will decrease (increase) a particular category of resource misallocation it affects is directly related to the amount by which it decreases (increases) the (weighted) mean of the relevant $\Sigma %D(P_{\pi_{AR/...}})$-distribution segment—for the relevant type of marginal resource allocations. This relationship reflects the fact that, *ceteris paribus*, the total amount of misallocation generated by all the economically-inefficient resource allocations of any specified category whose marginal exemplars’ profit-yields are inflated will increase with the mean of the distribution of positive distortions in the profits yielded by marginal resource allocations of the category in question. Assume that the profit-yield of $n$ marginal resource allocations of a specified category are inflated and that the $\Sigma D(P_{\pi_{AR/...}})$s for each of these marginal resource allocations are not only positive but also the same so that the mean of the relevant $\Sigma D(P_{\pi_{AR/...}})$ distribution equals the $\Sigma D(P_{\pi_{AR/...}})$ for each marginal resource allocation of the relevant category. Now assume that MLV_{AR/...} is the MLV curve for the allocation of successive batches of resources whose allocative cost is $1 to the resource-use in question—*e.g.*, to the production of the marginal units of each of the economy’s products, the creation of the marginal QV investments in the economy’s various areas of product-space, and the execution of the marginal PPR projects related to the production process that would be used to produce the products produced in the economy’s various areas of product-space. As Diagram I illustrates, the total amount of misallocation generated by the economically-inefficient exemplars of the relevant category of resource allocation will increase with the $\Sigma D(P_{\pi_{AR/...}})$ figure for each such marginal resource allocation—*i.e.*, with the mean of the $\Sigma D(P_{\pi_{AR/...}})$ distribution. As we have seen, on our assumptions that the relevant resource-use choosers are sovereign maximizers and that the amount of resources involved in each resource allocation I distinguish can be varied by infinitesimally-small amounts without sacrificing any economies of scale, $P_{\pi_{AR/...}}=0$, and $\Sigma D(P_{\pi_{AR/...}})$ for the relevant category of
marginal resource allocation will equal $-(MLV_{AR} - MLC_{AR}) = (MLC_{AR} - MLV_{AR})$ for the marginal resource allocation in question. Thus, in Diagram I, (1) if $(MLC_{AR} - MLV_{AR}) = \sum D(P\pi_{AR})$ for each of the $n$ marginal resource allocations whose profit-yields are inflated (if the mean of the relevant aggregate-profit-distortion distribution) is RS, total misallocation will be $n(\text{area KRS})$; (2) if the distortion for each marginal resource allocation in question (the mean of the associated distortion distribution) is the smaller amount JG, total misallocation will be the smaller amount $n(\text{area KJG})$; (3) if the (mean) distortion in question is the still smaller amount IF, total misallocation will be the still smaller amount $n(\text{area KIF})$; and so on. Obviously, this conclusion implies the first relationship on which distortion analysis builds: controlling for the mean of the pre-choice relevant aggregate-profit-distortion distribution, the amount by which the policy increases (decreases) economic efficiency will increase with the amount by which it decreases (increases) the mean of the distribution in question. Thus, if one assumes that the pre-policy $\Sigma D(P\pi_{AR})$ for each marginal resource allocation of the relevant category and hence the mean of the relevant distribution-segment were both RS, a policy that reduces that distortion and mean by the smaller amount (RS–JG)—i.e., from RS to JG—will increase economic efficiency by $n(\text{area JRSG})$, while a policy that reduces that distortion and mean by the larger amount (RS–IF)—i.e., from RS to IF—will increase economic efficiency by the larger amount $n(\text{area IRSF})$. And, in the other direction, if one assumes that the pre-policy $\Sigma D(P\pi_{AR})$ for each marginal resource allocation of the relevant category and hence the mean of the relevant distribution segment were both IF, a policy that increases those distortions and hence that mean by the smaller amount (JG–IF) would increase economic inefficiency by less than would a policy that would increase them by the larger amount (RS–IF)—i.e., would increase total economic inefficiency by $n(\text{area IJGF})$ rather than by $n(\text{area IRSF})$.

I hasten to add that these results do not depend on the preceding, unrealistic assumption that the pre-choice $\Sigma D(P\pi_{AR})$ is the same in all areas of product-space that have positive $\Sigma D(P\pi_{AR})$. If we assumed that the relevant areas of product-space received respectively ON, OB, OC, OD, and OT in resources pre-choice through the resource allocations in question so that their respective $\Sigma D(P\pi_{AR})$s were LM, HE, IF,
JG, and RS and the mean of the associated $\Sigma D(P_{\pi_{AR/...}})$-distribution segment was still IF, the same conclusion would hold not only for any choice that reduced the $\Sigma D(P_{\pi_{AR/...}})$s in the relevant distribution-segment to lower positive figures but also for any choice that made some or all of these figures negative so long as it reduced the mean of the positive $\Sigma D(P_{\pi_{AR/...}})$s in the whole $\Sigma D(P_{\pi_{AR/...}})$ distribution.

Diagram I can also be used to illustrate the second relationship that favors the TBLE of the distortion-analysis approach—viz., the fact that, controlling for the magnitude of the impact of any policy on $\Sigma D(P_{\pi_{AR/...}})$ for each marginal resource allocation of a specified category for which that distortion is positive and hence for its impact on the mean of the distribution of such distortions, the amount by which the choice in question would increase or decrease economic efficiency will increase with the magnitude of the mean of the pre-choice distortion-distribution segment in question. Recall that, in Diagram I, RS–JG=JG–IF=IF–HE=HE–LM. Then note that, in Diagram I, (1) the amount by which a choice that reduces each $\Sigma D(P_{\pi_{AR/...}})$ by RS–JG from the larger pre-choice magnitude RS to the lower amount JG will reduce total resource misallocation on that account—$n$(area JRSG)—is larger than (2) the amount by which a choice that reduces $\Sigma D(P_{\pi_{AR/...}})$ for each marginal resource allocation of the specified category by the same amount (by JG–IF=RS–JG) from the smaller pre-choice magnitude JG to the still lower IF will reduce total resource misallocation—$n$(area IJGF)—and so on and so forth.

Diagram I can be used in addition to illustrate the third relationship that I previously claimed favors the TBLE of the distortion-analysis approach to allocative-efficiency assessment: the fact that, controlling for the (weighted) mean of the $\Sigma D(P_{\pi_{AR/...}})$ distribution for marginal resource allocations of a specified category whose profit-yields were inflated, the total amount of misallocation generated by economically-inefficient resource allocations of that category will increase with the weighted-average (on our current assumptions that all relevant resource-uses are equally large [i.e., are infinitesimally small], the average) absolute deviation of the distribution in question. To see why this relationship obtains, compare the following two situations that Diagram I can be used to illustrate. In the first, half of the positive $\Sigma D(P_{\pi_{AR/...}})$s are JG, and half are
HE. In the second, all of the $\Sigma D(\pi_{AR/...})s$ are IF. Since JG–IF=IF–HE, the mean (and weighted mean) of the first positive segment of the $\Sigma D(\pi_{AR/...})$ distribution is the same as that of the second. However, the average absolute deviation of the distribution associated with the first situation (JG–IF=IF–HE) is larger than the zero average absolute deviation associated with the second situation. For our purposes, the critical fact is that the total misallocation generated by the economically-inefficient resource allocations of the specified category that is present in the first (higher-average-deviation) situation—$(n/2)(area\ KHE)+(n/2)(area\ KJG)$—is larger than the total misallocation generated by the economically-inefficient resource allocations of that category that is present in the second situation—$n(area\ KIF)$. This result reflects the fact that the increase in misallocation associated with each increase in $\Sigma D(\pi_{AR/...})$ from IF to JG (area IJGF) is larger than the decrease in misallocation associated with each decrease in $\Sigma D(\pi_{AR/...})$ from IF to HE (area HIFE) despite the fact that the difference between JG and IF equals the difference between IF and HE. I should point out that this outcome reflects the same reality that underlies the second relationship just discussed—viz., the fact that the amount by which economic efficiency will be increased by any given reduction in the mean of the distribution of aggregate-profit (in the general case, aggregate-percentage-profit) distortions will rise with the magnitude of the pre-choice mean of the distribution in question (the reality that the amount of misallocation generated by the allocation of each successive batch of resources of given allocative value to some use that was economically inefficient will rise [that the distance between $MLC_{AR/...}$ and $MLV_{AR/...}$ increases as one moves to the right beyond the allocatively-efficient resource allocation OA]). I should perhaps note that the relationship on which we are now focusing does not depend on the fact that the mean absolute deviation in the second situation is zero. More misallocation will also be present in a third situation in which half the $\Sigma D(\pi_{AR/...})s$ are RS and half are LM (in which the average absolute deviation is the larger amount RS–IF=IF–LM) than in the first situation in which half the $\Sigma D(\pi_{AR/...})s$ are JG and half are HE (in which the average absolute deviation is JG–IF=IF–HE=1/2[RS–IF]) despite the fact that the means of the $\Sigma D(\pi_{AR/...})$ distributions in the two situations are the same (are both IF). Thus, total misallocation in the third situation ($(n/2)[area\ KRS]+[n/2][area$
KLM]) is larger than total misallocation in the first situation ([n/2][area KJG]+[n/2][area KHE]) because area KRS exceeds area KJG by more than area KHE exceeds area KLM—i.e., because area JRSG exceeds area LHEM.

Finally, Diagram I can be used to illustrate the fourth relationship that favors the TBLE of distortion analysis—viz., the fact that the amount of misallocation generated by the economically-inefficient resource allocations in any category will increase with the average squared deviation of the distribution of distortions in the profits yielded by the marginal resource allocations of that category whose profits were inflated (deflated), controlling for the average absolute deviation and mean of the distribution in question. To see why this relationship obtains, compare the following two situations that Diagram I can be used to illustrate: (1) a situation in which the aggregate profit distortion is LM in one area of product-space, RS in one area of product-space, and IF in two areas of product-space and (2) a situation in which the aggregate profit distortion is HE in two areas of product-space and JG in two areas of product-space. The two distortion-distribution segments in question have the same mean distortion (IF) and the same mean absolute deviation (HE–IF=JG–IF). However, the second distribution-segment differs from the first in two respects that bear on this fourth relationship: (1) more misallocation is associated with the second distribution-segment than with the first—2(area KHE)+2(area KJG)>area KLM+area KRS+2(area KIF)—and (2) the average squared deviation in the second distribution-segment exceeds the average squared deviation in the first—(2[HE–IF]²+2[JG–IF]²)/4>([LM–IF]²+0²+0²+[RS–IF]²)/4. These results illustrate the fact that, controlling for the weighted-average value of the figures in (on our assumptions, the mean of) a relevant aggregate-profit-distortion-distribution segment and the weighted-average absolute deviation of that distribution-segment (on our assumptions, the mean absolute deviation), the amount of misallocation will increase with the average squared deviation of the relevant distribution-segment.

I now want to relax the preceding analysis’ assumption that the ΣD(PπΔR/...)—distribution segment that is relevant for the assessment of any private choice or public policy on the magnitude of a specified category of resource misallocation contains only same-sign (in practice, positive) ΣDs. As we have seen, this assumption needs to be
relaxed because the aggregate-profit-distortion-distribution segment that is relevant to the analysis of the impact of choices on many categories of resource misallocation (including UO-to-QV and QV-to-UO, QV-to-PPR and PPR-to-QV, and UO-to-PPR and PPR-to-UO resource misallocation) will contain negative $\sum D(P\pi_{AR/...})$s as well as positive $\sum D(P\pi_{AR/...})$s even if one always focuses on the resource-flow in each of the above or any other relevant resource-flow pair for which the (weighted) mean $\sum D(P\pi_{AR/...})$ is positive.

More specifically, I now want to analyze

1. whether the fact that a private choice or public policy reduces the mean, average absolute deviation, and average squared deviation of the $\sum D(P\pi_{AR/...})$-distribution segment (in the general case, the weighted mean, weighted-average absolute deviation, and weighted-average squared deviation of the relevant $\sum D(P\pi_{AR/...})$-distribution segment) that is associated with a given category of resource (mis)allocation will also favor the conclusion that the choice will reduce the relevant category of misallocation when that segment contains negative as well as some positive items and whether the amount by which a private choice or public policy that reduces the (weighted) mean of a relevant $\sum D(P\pi_{AR/...})$-distribution segment will reduce the relevant category of resource misallocation on that account will increase with the pre-choice weighted mean of the relevant $\sum D(P\pi_{AR/...})$-distribution segment in mixed-sign cases as it does in same-sign cases and

2. whether the connection between each of these three impacts of a choice and its economic efficiency is different in “mixed-sign” relevant $\sum D(P\pi_{AR/...})$-distribution-segment cases as opposed to “same-sign” relevant $\sum D(P\pi_{AR/...})$-distribution-segment cases.

To do this, I will have to deal with situations in which (say) although most of the areas of product-space that received resources through UO-to-QV, PPR-to-QV, and UO-to-PPR resource allocations received more resources through such allocations than was allocatively efficient (more than OA resources) some received fewer than OA resources through such allocations—for example, received OW<OA resources in this way. That is why Diagram I contains point W and points V and U, which are directly above it respectively on the MLC$\Delta R/...$ and MLV$\Delta R/...$ curves. Diagram I also contains three additional points—X, Y, and Z, whose locations “counterbalance” points W, V, and U—i.e., point Z is picked so that the mean $\sum D(P\pi_{AR/...})$ for a situation in which OW in
resources are involved in the specified category of allocation to one area of product-space and OZ to the specified category of resource allocation in another area of product-space is also IF. I can now use points U, V, W, X, Y, and Z and various related figures to illustrate the fact that the relationships on which distortion analysis builds also prevail in mixed-sign cases — i.e., when UO-to-QV and QV-to-UO, PPR-to-QV and QV-to-PPR, and UO-to-PPR and PPR-to-UO misallocation are at issue.

To address the first issue listed two paragraphs ago, I will consider a case in which the same MLV and MLC curves apply for the category of resource allocation in question in all areas of product-space that receive resources through that category of resource allocation. For this purpose, I will focus on an example in which the relevant set of areas of product-space contains five that receive ON in resources, five that receive OB in resources, five that receive OC in resources, five that receive OD in resources, five that receive OT in resources, one that receives OW in resources, and one that receives OZ in resources. On these assumptions, the relevant aggregate-profit-distortion-distribution segment contains five LMs, five HEs, five IFs, five JGs, five RSs, one (–UV), and one XY. The analysis that follows will also reflect the following fact: since, by construction, the mean of both the \( \Sigma D(P_{\Delta AR/...}) \) figures for the five areas of product-space that receive respectively ON, OB, OC, OD, and OT resources and the \( \Sigma D(P_{\Delta AR/...}) \) figures for the two areas of product-space that receive respectively OW and OZ resources is IF, the mean of the relevant \( \Sigma D(P_{\Delta AR/...}) \)-distribution segment is also IF.

The initial question I want to address is: Will the four relationships on which distortion analysis builds that we just showed obtain in same-sign cases also obtain in the kind of mixed-sign case on which we are now focusing? First, will private or public choices that reduce the (weighted) mean of the relevant \( \Sigma D(P_{\Delta AR/...}) \)-distribution segment tend to reduce resource misallocation on that account, controlling for their impact on the (weighted) average absolute deviation and (weighted) average squared deviation of the relevant \( \Sigma D(P_{\Delta AR/...}) \)-distribution segment in question, in mixed-sign \( \Sigma D(P_{\Delta AR/...}) \)-distribution-segment cases as we previously showed they would in same-sign \( \Sigma D(P_{\Delta AR/...}) \)-distribution-segment cases? For convenience, I will start by assuming that the choice whose economic efficiency is under investigation will not change the sign of
the (weighted) mean of the $\Sigma D(\pi_{AR/...})$-distribution segment in question. Assume as before (to prevent any associated change in the [weighted] average absolute or [weighted] average squared deviation) that the choice in question will reduce the positive value of every positive figure in the relevant $\Sigma D(\pi_{AR/...})$-distribution segment by the same amount (and increase the absolute value of the negative value of every negative figure in the pre-choice relevant-distribution segment by the same amount [without changing that negative figure’s sign]). The doubts about whether the conclusion that applies to same-sign uses will also apply to mixed-sign cases stem from the fact that in the mixed-sign case the increase in the negative value of the pre-choice negative (below-average) $\Sigma D(\pi_{AR/...})$ figures will be associated with an increase in misallocation whereas, in the same-sign case, the counterpart decrease in the positive value of the pre-choice below-average $\Sigma D(\pi_{AR/...})$ figures will be associated with a decrease in misallocation (at least so long as the post-choice figures in the pre-choice same-sign case were not negative and absolutely larger than the pre-choice figures). However, the increase in economic inefficiency that choices that reduce the positive (increase the negative) sign of each $\Sigma D(\pi_{AR/...})$ figure in a relevant $\Sigma D(\pi_{AR/...})$-distribution segment will generate on that account in areas of product-space whose pre-choice $\Sigma D(\pi_{AR/...})$s were negative will not outweigh the decrease in economic inefficiency it will generate in other relevant areas of product-space whose pre-choice $\Sigma D(\pi_{AR/...})$s were positive and whose post-choice $\Sigma D(\pi_{AR/...})$s were either positive but smaller, zero, or negative with an absolute value that was lower than the absolute value of their pre-choice positive $\Sigma D(\pi_{AR/...})$s.

Diagram I can be used to illustrate this conclusion in the admittedly-favorable case of the symmetric $\Sigma D(\pi_{AR/...})$ distribution it presents. In this symmetric case in which the pre-choice $\Sigma D(\pi_{AR/...})$s at OZ and OW (XY and [–UV]) have the same mean value (IF) as the $\Sigma D(\pi_{AR/...})$s in the other resource-recipient areas of product-space and the absolute value of XY exceeds the absolute value of (–UV), a choice that causes an equal reduction in the $\Sigma D(\pi_{AR/...})$s for the two areas of product-space in question will reduce the magnitude of the relevant category of misallocation that is generated within these two areas of product-space combined unless (1) the total amount by which the resources allocated to these two areas of product-space combined for the specified use in
question from the indicated alternative use(s) exceeded (2) the total amount of resources that would be allocatively efficient to devote to this type of allocation in the two areas of product-space in question combined by more than (3) the total amount by which the total resources allocated to these two areas of product-space combined for the specified use in question from the indicated alternative use(s) pre-choice exceeded (4) the total amount of resources devoted to this category of allocation in these two areas of product-space pre-choice exceeded the amount that was allocatively efficient to devote to this type of allocation in these areas. Indeed, even if the choice would increase the total amount of misallocation that was generated by the economically-inefficient resource allocations of the relevant category to these two areas of product-space, it would not increase the total amount of resource misallocation of the relevant category that is generated overall unless it caused the (weighted) mean of the $\Sigma D(\pi_{AR/\ldots})$-distribution segment in question to be more negative post-choice than it was positive pre-choice. This last conclusion (which has an exact analogue in the same-sign case) reflects the fact that in many situations in which the choice under review would increase the amount of misallocation of the relevant category generated in the areas of product-space whose $\Sigma D(\pi_{AR/\ldots})$s were respectively most negative and most positive pre-choice, it would decrease the amount of misallocation of the relevant category generated in all the other relevant areas of product-space combined by more than it increased the amount generated in the two areas of product-space with the highest negative and highest positive $\Sigma D(\pi_{AR/\ldots})$s pre-choice combined unless the above condition was fulfilled. In short, ceteris paribus, in both mixed-sign and same-sign cases, choices will tend to reduce the amount of misallocation of a given category that is generated to the extent that they reduce the (weighted) mean of the positive or mostly positive $\Sigma D(\pi_{AR/\ldots})$-distribution segment that is relevant to the analysis of the impact in question.

Second, will the amount by which private and public choices that generate a given reduction in the (weighted) mean of the $\Sigma D(\pi_{AR/\ldots})$-distribution segment that is relevant for a particular category of research misallocation decrease the relevant category of economic inefficiency on that account increase with the pre-choice (weighted) mean of the distribution-segment in question when the relevant pre-choice segment has some
negative and some positive figures as it does when the relevant pre-choice segment has only positive figures? To avoid clutter, I will use Diagram I only imaginatively to explain why it will. For this purpose, substitute for the distribution of mixed-sign $\Sigma D(P_{\pi AR/...})$ figures I first posited a distribution each of whose figures was increased by the same amount. Now compare the economic-efficiency effect of a choice that reduced by some amount $\propto$ each figure in this second higher-(weighted)-mean distribution-segment with the economic-efficiency effect of a choice that reduced by the same amount $\propto$ each figure in the first lower-(weighted)-mean distribution-segment. In the usual case in which the absolute value of the post-choice (weighted) mean was lower than the absolute value of the pre-choice (weighted) mean, the choice would decrease economic inefficiency more in the second higher-(weighted-) mean situation because (1) it would reduce by more the misallocation caused by the overallocation of resources to all areas of product-space that received too many resources—whose $\Sigma D(P_{\pi AR/...})$s were positive—both pre-choice and post-choice, (2) it would increase by less the misallocation caused by the underallocation of resources to all areas of product-space that received too few resources—whose $\Sigma D(P_{\pi AR/...})$s were negative—both pre-choice and post-choice, and (3) would have an indeterminate effect (presumably, across all cases, no effect) on the amount of misallocation caused by the economically-inefficient exemplars of the relevant category of allocation in those areas of product-space that received too many resources pre-choice and too few post-choice from the perspective of economic efficiency—whose pre-choice $\Sigma D(P_{\pi AR/...})$s were positive and post-choice $\Sigma D(P_{\pi AR/...})$s were negative (since there is no reason to believe that the choice’s impact on the relative absolute value of the pre-choice and post-choice figures in question will be different in the two situations).

Third, will private or public choices that reduce the (weighted) average absolute deviation of the relevant $\Sigma D(P_{\pi AR/...})$-distribution segment tend to reduce resource misallocation on that account, controlling for their impact on the (weighted) mean and (weighted) average squared deviation of the distribution-segment in question, in mixed-sign $\Sigma D(P_{\pi AR/...})$-distribution-segment cases as we previously showed that they would in same-sign $\Sigma D(P_{\pi AR/...})$-distribution-segment cases? The answer to this question is that—if the (weighted) means, (weighted) average absolute deviations, and (weighted) average
squared deviations of the relevant $\Sigma D(P_{\pi_{AR/...}})$-distribution segments that are relevant in mixed-sign relevant $\Sigma D(P_{\pi_{AR/...}})$-distribution-segment cases are no different from their counterparts in same-sign relevant $\Sigma D(P_{\pi_{AR/...}})$-distribution-segment cases—the impact of choices on the (weighted) average absolute deviation of the relevant $\Sigma D(P_{\pi_{AR/...}})$-distribution segment will be even greater in the mixed-sign cases than in the same-sign cases, at least to the extent that the choices reduce the (weighted) average absolute deviation and (weighted) average squared deviation of the relevant distribution-segment (perhaps inter alia) by reducing the negative value of one or more of the negative figures in the pre-choice relevant-distribution segment.

Diagram I can be used to illustrate the reason for this conclusion. When the least positive figures in an all-positive set of $\Sigma D(P_{\pi_{AR/...}})$ figures are positive, any reduction in the (weighted) mean of the relevant $\Sigma D(P_{\pi_{AR/...}})$-distribution segment that results from an increase in a lower-than-weighted-average figure will be associated with an increase in the amount of the relevant category of misallocation generated in the relevant area of product-space. Think, for example, of a same-sign case in which the pre-choice mean of the relevant-distortion-distribution segment was IF because the original $\Sigma D(P_{\pi_{AR/...}})$-distribution segment contained one LM, one HE, one IF, one JG, and one RS. In this case, any choice that increase $\Sigma D(P_{\pi_{AR/...}})$ in the area of product-space in which it was originally LM by some amount less that (IF–LM) while decreasing the $\Sigma D(P_{\pi_{AR/...}})$ in the area of product-space in which it was originally RS by the same amount (an amount less than $[RS–IF=IF–LM]$) would be increasing the amount of the relevant category of misallocation generated in the former area of product-space while decreasing the amount of the relevant category of misallocation generated in the latter area of product-space (by a larger amount in the latter area of product-space). Now think of a mixed-sign case in which the pre-choice mean of the relevant-distortion-distribution segment was still IF but in which the resource allocation took place in seven areas of product-space, seven in which the relevant $\Sigma D(P_{\pi_{AR/...}})$s were respectively (–UV), LM, HE, IF, JG, RS, and XY. Now assume that the choice in question would reduce the negative value of $\Sigma D(P_{\pi_{AR/...}})$ in the area of product-space in which it was (–UV) pre-choice and reduce the positive $\Sigma D(P_{\pi_{AR/...}})$ figure in the area of product-space in which it was XY pre-choice. The
critical point is that in this situation the reduction in the absolute deviation of the former figure from the distribution-segment mean would be associated with a decrease in misallocation, not an increase in misallocation. Indeed, at least on the assumption that the MLV_{AR/...} curve is linear over the relevant range, the movement of the negative pre-choice \(\Sigma D(P_{\pi_{AR/...}})\) figure toward the distribution-segment mean would be associated with a reduction in the relevant type of misallocation in the relevant area of product-space even if the post-choice \(\Sigma D(P_{\pi_{AR/...}})\) figure was positive unless the post-choice figure equaled or exceeded the absolute value of the pre-choice figure. In fact, even if the increase in this \(\Sigma D(P_{\pi_{AR/...}})\) did result in additional misallocation of the relevant category in the relevant area of product-space because the post-choice positive \(\Sigma D(P_{\pi_{AR/...}})\) was higher than the absolute value of the pre-choice negative \(\Sigma D(P_{\pi_{AR/...}})\), the associated increase in misallocation would be smaller than it would have been in a same-sign case with the same \(\Sigma D(P_{\pi_{AR/...}})\)-distribution-segment mean in which the \(\Sigma D(P_{\pi_{AR/...}})\) figure that was raised was the lowest positive figure in the distribution. I should add that in this second case the reduction in the \(\Sigma D(P_{\pi_{AR/...}})\) figure in the area of product-space whose pre-choice \(\Sigma D(P_{\pi_{AR/...}})\) was XY will also be associated with a greater decrease in misallocation than would be generated by an equal decrease in \(\Sigma D(P_{\pi_{AR/...}})\) in the area of product-space with the highest \(\Sigma D(P_{\pi_{AR/...}})\) figure in the original example. I mention this last and with some hesitation because the point I am making does not depend on the fact that the average absolute deviation and average squared deviation of the relevant \(\Sigma D(P_{\pi_{AR/...}})\)-distribution segment in my second, seven-area-of-product-space example are higher than their counterparts for the relevant \(\Sigma D(P_{\pi_{AR/...}})\)-distribution segment in my first, five-area-of-product-space example.

To see that this is so, contrast the five-area-of-product-space example in Diagram I with another five-area-of-product-space example in which the differences between the amounts of resources allocated to the five areas of product-space are the same but the area of product-space that receives the smallest amount of resources from the relevant category of resource allocation receives less than OA resources. If we continue to use the same letters but simply shift N, B, C, D and T and hence (M, E, F, G, and S and L, H, I, J, and R) the same amount in excess of AN to the left (so that the average absolute
deviation and average squared deviation of this third distribution segment are the same as their counterparts for the first distribution-segment (though the former’s mean is lower than the latter’s), any reduction in the average deviation of the third distribution-segment just described that is secured without changing its mean by raising its lowest figure and lowering its highest figure by the same amount will still reduce misallocation more than it would be reduced by the same reduction in the mean of the first distribution-segment I described that was secured in the same way. In this case, the reason for this conclusion is that (1) the positive economic-efficiency difference between the economic-efficiency consequences of raising by a given amount the value of the lowest \( \Sigma D(P_{\Delta R/...}) \) figure in the mixed-sign case and the economic-efficiency consequences of doing the same in the same-sign case (the substitution of an economic-efficiency gain for an economic-efficiency loss or the reduction in the resulting economic-efficiency loss) exceeds (2) the negative-economic-efficiency difference between the economic-efficiency gains of reducing the highest \( \Sigma D(P_{\Delta R/...}) \) figure in the relevant same-sign case and doing so by the same amount in the relevant mixed-sign case.

Fourth, will private or public choices that reduce the (weighted) average squared deviation of the relevant \( \Sigma D(P_{\Delta R/...}) \)-distribution segment tend to reduce resource misallocation on that account, controlling for their impact on the (weighted) mean and (weighted) average absolute deviation of the distribution-segment in question, in mixed-sign relevant \( \Sigma D(P_{\Delta R/...}) \)-distribution-segment cases as we previously showed that they would in same-sign relevant \( \Sigma D(P_{\Delta R/...}) \)-distribution-segment cases? In the same-sign cases, I established the relevant relationship by pointing out that, for example, a choice would reduce the total amount of misallocation of the relevant category that was generated if it substituted for two \( \Sigma D(P_{\Delta R/...}) \)s one of which was a given amount below the mean of the relevant-distribution segment and one of which was three-times as much below that mean two \( \Sigma D(P_{\Delta R/...}) \)s both of which were twice as much below the relevant mean as were the \( \Sigma D(P_{\Delta R/...}) \)s in the situation described previously in this sentence: this conclusion reflected the fact in this situation the extra economic inefficiency that would result from the increase of the lower pre-choice \( \Sigma D(P_{\Delta R/...}) \) figure would be smaller than the decrease in economic inefficiency that would be generated by the decrease in the
higher pre-choice figure. The same argument will lead to the same conclusion in mixed-sign cases not only when both pre-choice $\Sigma D(P\pi_{AR/...})$s are positive but also when both pre-choice $\Sigma D(P\pi_{AR/...})$s are negative. However, the argument will not apply when one of the two pre-choice $\Sigma D(P\pi_{AR/...})$ figures was positive and one was negative. In particular, in such a case, if the increase in the lower (negative) affected $\Sigma D(P\pi_{AR/...})$ figure does not create a positive post-choice $\Sigma D(P\pi_{AR/...})$ figure that is higher than the absolute value of the pre-choice negative $\Sigma D(P\pi_{AR/...})$ figure in the area of product-space in question and the decrease in the higher (positive) affected $\Sigma D(P\pi_{AR/...})$ figure does not create a negative post-choice $\Sigma D(P\pi_{AR/...})$ figure whose absolute value exceeds the positive value of the pre-choice $\Sigma D(P\pi_{AR/...})$ figure for the area of product-space in question, the choice that reduces the (weighted) average squared deviation of the relevant $\Sigma D(P\pi_{AR/...})$-distribution segment by (1) making less negative or raising to zero or a positive number the negative pre-choice $\Sigma D(P\pi_{AR/...})$ figure for one area of product-space whose pre-choice $\Sigma D(P\pi_{AR/...})$ figure was negative and (2) making less positive or changing to zero or a negative number the positive pre-choice $\Sigma D(P\pi_{AR/...})$ figure for another area of product-space would increase economic efficiency on both accounts.

In short, the relationships I earlier established in same-sign cases between the impact of a choice on the (weighted) mean, (weighted) average absolute deviation, and (weighted) average squared deviation of the relevant $\Sigma D(P\pi_{AR/...})$-distribution segment for a particular category of resource allocation and its effect on the magnitude of that category of misallocation also obtain in mixed-sign cases as does the relationship between the pre-choice mean of the relevant $\Sigma D(P\pi_{AR/...})$-distribution segment and the economic-efficiency gain (loss) that will be generated if that mean is decreased (increased) by a given amount.

The second question I posed is: Are the effects of choices on the (weighted) means, (weighted) average absolute deviations, and (weighted) average squared deviations of relevant $\Sigma D(P\pi_{AR/...})$-distribution segments respectively more important or less important determinants of the choice’s economic efficiency in mixed-sign cases than they were in same-sign cases? Despite some of the claims made in the preceding paragraphs, I am unwilling to offer any conclusion on these issues. The reason for my
reticence is that the economic-efficiency relevance of the impacts that choices have on the (weighted) means, (weighted) average absolute deviations, and (weighted) average squared deviations of relevant $\Sigma D(P\pi_{AR/\ldots})$-distribution segments depends on the pre-choice magnitudes of these attributes of the relevant distribution-segments and I have no idea whether these attributes of relevant same-sign distribution-segments are larger or smaller than their counterparts in relevant mixed-sign distribution-segments.

Two related issues remain to be discussed:

1. will the analysis I based on the relationships that I have just established apply equally well to cases in which $P\pi_{AR/\ldots}$ does not equal zero because the least profitable but not unprofitable resource-use in question and its least unprofitable successor are lumpy, because the first extra-marginal resource-use in question is inherently less profitable than its marginal counterpart—i.e., because its \textit{ex ante} supernormal rate-of-return would be lower than that of the marginal resource allocation if it could be substituted for the marginal allocation without generating any transaction costs, and/or because the relevant resource allocator is not a sovereign maximizer and

2. if it does not, will it be possible to develop a variant of the distortion-analysis approach to economic-efficiency assessment that I believe may well be TBLE when $P\pi_{\ldots/\ldots}=0$ that will be TBLE when $P\pi_{\ldots/\ldots}>0$, and, if so, what is that variant?

Even if, as I suspect will usually be the case, it will prove to be TBLE to ignore the possibility of resource-allocator non-sovereignty and non-maximization when the resource allocators are private actors operating in market economies as opposed to government officials operating in non-market economies in which command-and-control techniques dominate, these issues will be salient for the many categories of resource allocation that involve marginal resource-uses that are lumpy because the first extra-marginal resource-use in question is inherently less profitable than its marginal counterpart—i.e., because its \textit{ex ante} supernormal rate-of-return would be lower than that of the marginal resource allocation if it could be substituted for the marginal allocation without generating any transaction costs. Thus, although it seems appropriate to me (\textit{i.e., TBLE}) to assume that choices by producers to produce or by consumers to consume a marginal unit of any product are marginal in the sense of being infinitesimally small as

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well as in the sense of being least unprofitable but not unprofitable (i.e., to assume that \( \pi = 0 \) for such choices), I do not think that this assumption can be justified when the relevant resource-use involves the creation of a QV investment or the execution of a PPR project (or the choice to use one production process rather than another). Such resource-uses almost always are affected by technological economies of scale over substantial ranges of scale. And even if, once these economies of scale are exhausted, no similar economies are present over higher ranges of scale (so that the last expenditure on such a project may be infinitesimally small and may yield zero profits), for two reasons, the relevant allocation of resources will not be a last, infinitesimally-small, additional allocation that is made to the project in question but the allocation to the whole project (which is unlikely to yield zero—i.e., just normal—profits): (1) the first and all subsequent, extra-marginal projects of the relevant kind are also likely to be lumpy (to involve substantial economies of scale at low scale-levels) and (2) the first and all subsequent intra-marginal projects of the type in question are also likely to be lumpy (will also involve substantial economies of scale at low scale-levels). Hence, although the fact that QV-investment and PPR projects will often be able to be expanded above their minimum efficient scales without any sacrifice of efficiency may obviate taking lumpiness into account when resource-flows are from QV-investment-creating or PPR-executing uses to unit-output-increasing uses, that fact will not obviate the consideration of lumpiness when the relevant resource allocation is to a QV-investment-creating or PPR-executing resource-use. Moreover, \( \pi_{\Delta R/...} \) will tend to exceed zero when the relevant marginal resource allocation is to a lumpy QV-investment-creating or lumpy PPR-executing use not only because successive lumpy projects in any area of product-space would tend to generate lower supernormal profit-rates even if they were inherently equally profitable but also because, in practice, the successive QV investments that are created in any area of product-space and the successive PPR projects that are executed in any area of product-space are almost always progressively inherently less profitable.

For four reasons, the fact that \( \pi_{\Delta R/...} \) will typically (indeed, almost always) be positive for marginal resource-uses of certain types renders the conclusions I reached about the determinants of the effects of choices on the amount of misallocation generated
by the economically-inefficient exemplars of resource allocations to non-lumpy uses incompletely applicable when the resource allocation in question involves lumpy marginal exemplars that yield positive profits:

1. The marginal resource allocation of the relevant category will not always be allocatively inefficient when $\Sigma D(P_{\pi AR/\ldots})>0$—viz., will be economically inefficient only when and to the extent that $\Sigma D(P_{\pi AR/\ldots}) > P_{\pi AR/\ldots}$;

2. Although any lumpy marginal resource allocation whose $\Sigma D(P_{\pi AR/\ldots})>0$ exceeds $P_{\pi AR/\ldots}$ (which will almost always be greater than zero but could conceivably be equal to zero) will be economically inefficient, the fact that a lumpy marginal resource allocation is economically inefficient does not guarantee that any intra-marginal resource allocation of the relevant category is economically inefficient since, if any such intra-marginal allocation would also be lumpy (as I presume it would be), it would be significantly more economically efficient than the marginal resource allocation of the category in question because it was intra-marginal and perhaps as well because it was inherently more economically efficient than the relevant marginal resource allocation;

3. When $\Sigma D(P_{\pi AR/\ldots})<0$, the marginal resource allocation in question will be economically efficient but its economic efficiency will equal $|\Sigma D(P_{\pi AR/\ldots})|+P_{\pi AR/\ldots}$ where $P_{\pi AR/\ldots}$ will almost always be greater than zero; and

4. Although on the above sovereignty and maximization assumptions any lumpy marginal resource allocation whose $\Sigma D(P_{\pi AR/\ldots})<0$ will be economically efficient, the fact that a lumpy marginal resource allocation was economically efficient does not guarantee that any extra-marginal resource allocation of the relevant category would be economically efficient since, if any such allocation would also be lumpy (as I presume it would be), it would be significantly less economically efficient than the marginal resource allocation of the category in question because it was extra-marginal and perhaps as well because it was inherently less economically efficient than the relevant marginal resource allocation.

Although these “realities” do not render the relationships I previously established irrelevant to the analysis of the effect of any private or public choice on the amount of misallocation generated by the economically-inefficient exemplars of categories of resource allocation whose marginal exemplars are lumpy, they do require the distortion-analysis protocol to focus on the impact of the choices whose economic efficiency are
under investigation on the previously-stated attributes not of relevant $\Sigma D(P_{\pi_{AR/\ldots}})$-distribution segments but of relevant $\Sigma D(P_{\pi_{AR/\ldots}})-(P_{\pi_{AR/\ldots}}/LC_{AR/\ldots})$-distribution segments and to consider as well the extent to which the private profitability and economic efficiency of successive lumpy intra-marginal and extra-marginal resource allocations to the uses in question would differ from their marginal-resource-allocation counterparts.

I do not want to leave the impression that I think that it will be easy or cheap to estimate (1) the relevant $P_{\pi_{AR/\ldots}}/LC_{AR/\ldots}$ figures or (2) the rates at which the relevant $P_{\pi_{AR/\ldots}}/LC_{AR/\ldots}$ and $LE_{AR/\ldots}/LC_{AR/\ldots}$ figures will decline in any area of product-space as one moves beyond the marginal QV-investment-creating or PPR-executing projects to successive extra-marginal projects or will rise as one moves below the marginal projects in question to successive intra-marginal projects. For among other reasons, the $P_{\pi_{AR/\ldots}}/LC_{AR/\ldots}$ figure will be hard to estimate because its estimation involves the determination of the normal rate of return for the project in question—a task that utility-rate regulators have found both difficult and expensive. However, I do not think that the need to determine the rates at which the $P_{\pi_{AR/\ldots}}/LC_{AR/\ldots}$ and $LE_{AR/\ldots}/LC_{AR/\ldots}$ figures in a given area of product-space did or would decline for the successive lumpy allocations that would raise total QV or total PPR from some amount below their equilibrium levels to amounts progressively above their equilibrium levels in relevant areas of product-space will make distortion analysis significantly less practicable in relation to categories of resource allocation whose marginal exemplars are lumpy than it is when the relevant marginal resource allocations can be analyzed as if they are infinitesimally small: recall that the distortion-analysis approach to estimating the impact of a choice on the misallocation generated by all economically-inefficient exemplars of the categories of allocation whose relevant marginal exemplars are infinitesimally small must take account of the actual shape of the applicable $MLV_{AR/\ldots}$ curves over the relevant range.


The distortion-analysis approach to economic-efficiency assessment builds on the relationships that the preceding subsection established. This section outlines the
distortion-analysis approach to economic-efficiency analysis that may well be third-best allocatively efficient. The account that follows assumes that the relevant economic-efficiency prediction or post-diction must be made in circumstances in which the cost of delay is sufficiently low for it to be TBLE for the analyst to strive to perfect any relevant theoretical analysis but not sufficiently low for it to be TBLE for the analyst to do all of the empirical research that would increase the predicted accuracy of his parameter-estimates and economic-efficiency conclusions. The account that follows also assumes (sometimes counterfactually) that it is not TBLE for the relevant analyst to consider the possibility that the allocative efficiency of “marginal-resource-allocation” decisions may be affected by human errors and that it will be TBLE to focus on the impact of the private or public choice under review on the various types of usually-counterfactual, analytically-useful resource allocations I have distinguished as opposed to focusing on the relevant choice’s impact on the amount of economic inefficiency generated by all the economically-inefficient actual resource allocations in the economy:

1. identify the various categories of usually-counterfactual, analytically-useful resource allocations and misallocations that are TBLE to distinguish;

2. generate initial estimates of the impact of the choice on UO-to-UO, QV-to-QV, PPR-to-PPR, UO-to-QV and QV-to-UO, PPR-to-QV and QV-to-PPR, and UO-to-PPR and PPR-to-UO misallocation in the following way:
   A. develop formulas for the aggregate percentage distortion in the profits yielded by marginal resource allocations in each of the above categories—formulas that relate each such distortions primarily to the various Pareto imperfections the economy contains;
   B. combine this theoretical work with existing information on and guesstimates of the pre-choice magnitude of the parameters in the above formulas to generate initial estimates of the pre-choice $\Sigma %D(P_{\pi \Delta R/\ldots})$ figures for an appropriately-large random sample of the marginal exemplars of the six categories of resource allocation in question;
   C. identify the member of each pair of the last three “categories” of resource allocation listed above that received more resources than was allocatively efficient, given the total amount of resources devoted to the two uses in question by determining the resource-flow in each pair whose marginal exemplars’ weighted-average
\(\Sigma \% D(p_{\alpha r/\ldots})\) figures were positive where the weights assigned to various figures (both here and throughout the protocol) are proportionate to the allocative cost of the resource-use to which they refer;

D. calculate the pre-choice \(p_{\alpha r/\ldots}/L_{\alpha r/\ldots}\) figures for the marginal QV-investment-creating and marginal PPR-executing resource-uses in any QV-to-QV and PPR-to-PPR resource allocation whose \(\Sigma \% D(p_{\alpha r/\ldots})\) figures are positive and for the marginal QV-investment-creating and marginal-PPR-executing uses in any UO-to-QV, UO-to-PPR, QV-to-PPR, or PPR-to-QV resource allocation that belongs to a set of such allocations whose (weighted) average \(\Sigma \% D(p_{\alpha r/\ldots})\) is positive;

E. calculate the pre-choice (weighted) means, (weighted) average absolute deviations and (weighted) average squared deviations of the segment of the \(\Sigma \% D(p_{\alpha r/\ldots})\) distributions in which resources are devoted to UO-increasing uses that contains only positive figures and of the segment of the \(\Sigma \% D(p_{\alpha r/\ldots})-p_{\alpha r/\ldots}/L_{\alpha r/\ldots}\) distributions for those resource allocations in which resources are devoted to QV-investment-creating or PPR-executing resource-uses that involves the direction of resource-flow for which the weighted-average \(\Sigma \% D(p_{\alpha r/\ldots})\) figure is positive;

F. analyze with the degree of precision that seems TBLE (see below) the impact that the choice whose allocative efficiency is to be scrutinized will have on each \(\Sigma \% D(p_{\alpha r/\ldots})-(p_{\alpha r/\ldots}/L_{\alpha r/\ldots})\) figure in the above distribution-segments (recall that for three of these distribution-segments \(p_{\alpha r/\ldots}/L_{\alpha r/\ldots}\) will be zero) by predicting its impact on the Pareto imperfections and other factors that determine the relevant \(\Sigma \% D(p_{\alpha r/\ldots})\) figures;

G. create distributions of the estimated post-choice \(\Sigma \% D(p_{\alpha r/\ldots})-(p_{\alpha r/\ldots}/L_{\alpha r/\ldots})\) figures in the distribution-segments that are relevant to the analysis of the six categories of misallocation listed above;

H. calculate the (weighted) means, (weighted) average absolute deviations, and (weighted) average squared deviations of the relevant post-choice \(\Sigma \% D(p_{\alpha r/\ldots})-p_{\alpha r/\ldots}/L_{\alpha r/\ldots}\) distribution-segments; and

I. derive initial estimates of the impact of the choice under investigation on the amount of resource misallocation generated by the economically-inefficient exemplars of each of these categories of resource allocation from (i) the preceding analyses’ conclusions about the pre-choice (weighted) means of the relevant \(\Sigma D(p_{\alpha r/\ldots})-p_{\alpha r/\ldots}/L_{\alpha r/\ldots}\)-distribution segments, the impact of the choice on their (weighted) means, (weighted) average absolute deviations, and (weighted) average squared deviations, (ii) estimates of the shapes of the relevant MLV\(_{\alpha r/\ldots}\) curves, and (iii) estimates of the
rates at which the $P_{\pi AR/...}/LC_{AR/...}$ and $LE_{AR/...}/LC_{AR/...}$ figures decline as one moves from the marginal QV-investment-creating or PPR-executing project to successive extra-marginal projects of these kinds in the relevant areas of product-space and of the rates at which these figures increase as one moves from the marginal QV-investment-creating or PPR-executing projects in these areas of product-space to successive intra-marginal projects of these kinds in these areas of product-space;

(3) use a variant of distortion analysis that pays more attention to ascertaining the number and average allocative cost of the various other categories of resource-allocation decisions (e.g., choices among alternative known production processes) whose allocation efficiency may be critically affected by the relevant choice’s impact on the aggregate distortion in the profits they yield to estimate the impact of the choice in question on the amount of misallocation generated by the economically-inefficient exemplars of those categories of resource allocations;

(4) analyze separately the impact of the choice under investigation on income-distribution-related economic inefficiency;

(5) calculate the impact of the choice under investigation on allocative transaction costs of all kinds and on the misallocation the government will generate to finance its operations;

(6) sum the conclusions reached at stages (2)-(5) to generate an initial estimate of the economic efficiency of the choice under scrutiny;

(7) analyze

A. the probability that enlarging the size of the random sample of marginal resource allocations of the categories in question the initial investigation took, collecting additional data on particular Pareto imperfections or other parameters that affect the value of the $\Sigma %D(P_{\pi AR/...})$ figures on which part of the initial analysis focuses, and/or doing further research into the impact of the choice under scrutiny on the value of relevant parameters would change one’s conclusion about the allocative efficiency of the choice in question (in comparison with either a do-nothing alternative or some available positive alternative) to various extents,

B. the weighted-average allocative value of any such increase in the accuracy of one’s assessment of the economic efficiency of the option under consideration (for example, no direct benefit would be yielded by an upward revision of the estimate of the allocative efficiency of a policy that would be enacted anyway at least in part
because the less complete analysis deemed it to be economically efficient), and

C. the allocative cost of collecting and using the additional data in question and doing the additional analysis in question (taking into consideration both the fact that those costs almost certainly would not equal the private cost of the relevant data-collection even if no allocative costs had to be generated to finance the data-collection in question and the fact that—regardless of how the associated expenditures were financed—their financing would generate allocative costs);

(8) if the results of the stage-(7) analysis imply that it would be *ex ante* third-best allocatively efficient to enlarge the sample of resource allocations to be investigated, to collect additional data on one or more parameters, and/or to do additional research into the effects of the choice under scrutiny on relevant parameters, do the relevant work and reanalyze the allocative efficiency of the choice under consideration;

(9) repeat stage (7) to determine whether additional data should be collected and/or additional theoretical work should be done (relating to the impact of the choice on relevant parameters) and, if the conclusion is that it should be, collect the relevant data and/or do the relevant theoretical work, and reanalyze the allocative efficiency of the choice under consideration; and

(10) continue this process until the stage-(7) protocol implies that it would not be TBLE to collect additional data or do additional theoretical work and then announce the conclusion that the preceding analysis generated in a publication that articulates its theoretical and empirical bases and the protocols that were used to develop the information in question.

The preceding protocol is designed to reveal the economic efficiency of a particular private or non-public choice. However, it is important to note that the distortion-analysis approach can also be put to other uses. Thus, part of the protocol could also be used to estimate the absolute and hence relative magnitudes of each usually-counterfactual, analytically-useful category of misallocation in a given economy and the total amount of misallocation in that economy. And a variant of part of the protocol that assumed that the choice under consideration would eliminate all Pareto imperfections of a particular type could also reveal the misallocation that imperfections of that type caused in the economy in question.
I want to close this section with an admission—viz., that distortion analysis and any other approach to economic-efficiency analysis that purports to be TBLE has a serious infinite-regress problem that I have so far ignored. As the outline indicates, an analyst who wants to adopt a TBLE version of the distortion-analysis approach would have to continuously assess the third-best allocative efficiency of collecting additional data on the parameters that the theory demonstrates would be relevant to the allocative efficiency of the choices under consideration. In virtually all realistic situations, such an analyst would also have to continuously assess the third-best allocative efficiency of doing additional theoretical work that would bear on the allocative efficiency of those choices. The infinite-regress problem derives from the following fact: before thinking about the TBLE of collecting particular additional data or doing particular additional theoretical work, the analyst who wanted to behave third-best allocative efficiently would have to give third-best allocatively efficient attention to whether he should think about the third-best allocative efficiency of doing the empirical or theoretical work in question. And before doing that, he should give third-best-allocatively-efficient attention to whether it would be third-best allocatively efficient to think about whether he should think about whether it would be third-best allocatively efficient to do the work in question. And so on and so forth. My outline of the third-best-allocatively-efficient variant of distortion analysis simply cuts this Gordian knot.
CONCLUSION

The General Theory of Second Best demonstrates that, if one or more of a series of optimal conditions cannot be or will not be fulfilled, there is no general reason to believe that fulfilling or more closely approximating the remaining conditions (reducing the number or magnitude of the imperfections in the relevant system) will even tend to bring one closer to the optimum. The intuitive explanation for this conclusion is that, in general, the imperfections one can eliminate will be as likely to counteract as to compound the effects of the imperfections that cannot be or will not be eliminated.

The General Theory of Second Best applies to all optima. However, in economics, its most salient application relates to the optimum of maximizing economic efficiency. It can be shown that economic efficiency will be maximized if seven so-called Pareto-optimal conditions are fulfilled (without generating any allocative transactions costs, sacrificing allocative economies of scale, or sacrificing the possibility of achieving efficiencies by combining assets that are complementary for non-scale reasons)—viz., if there is no monopoly, no monopsony, no externalities, no taxes on the margin of income, no imperfections in the relevant information available to choosers, no non-maximization, and no (misallocative) buyer surplus. The General Theory of Second Best demonstrates that, unless one can make an argument to the contrary that focuses on the ways in which the various relevant Pareto imperfections interact to cause each category of economic inefficiency the various individual types of Pareto imperfections can cause on their own, one cannot justify the assumption that any policy that reduces the number or magnitude of such Pareto imperfections without eliminating all of them will even tend to increase economic inefficiency on that account merely by citing the fact that the reduced or eliminated Pareto imperfection is a Pareto imperfection.

Economists have not responded appropriately to The General Theory of Second Best. The overwhelming majority of economic-efficiency analyses ignore it altogether—i.e., proceed on the assumption that any tendency a policy has to reduce the Pareto-imperfectness of an economy will always tend to make the policy economically efficient on that account. Indeed, even the few economic-efficiency analyses that pay some
attention to Second-Best Theory do not respond to it adequately—viz., ignore most of the categories of economic inefficiency the policies they analyze will affect, ignore most of the types of Pareto imperfections that will affect the impact of the policy in question on the categories of economic inefficiency they do consider, and (often) mis-specify the ways in which the imperfections on which they do focus interact to cause the categories of economic inefficiency they do consider. Moreover, the few economists who recognize that they are not taking account of The General Theory of Second Best attempt to justify their and the profession’s ignoring it with arguments that cannot bear the slightest scrutiny.

This Article develops a distortion-analysis protocol for executing economic-efficiency analysis in a world in which resources are used in a variety of ways, Pareto imperfections of all types abound, theoretical analysis is costly, and data collection is both costly and inaccurate. It argues that

1. in all cases, a more-or-less-refined variant of this protocol may well be the most-economically-efficient approach to generating economic-efficiency conclusions in such a world and

2. it may well be *ex ante* economically efficient to use some more-or-less-refined variant of this protocol to analyze the economic efficiency of proposed policies (or it might well be *ex ante* economically efficient to do so if policy decisions were guided by the conclusions these protocols generated).

I am fully aware that the protocol I have delineated requires further specification and justification and that its usefulness is contestable. I have tried to be open about the dubious features of my argument for its third-best allocative efficiency. My decision to publish this Article reflects my belief that its argument and the protocol merit consideration and my hope that others will contribute to their improvement.

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1 This note defines “the impact of a choice on economic efficiency” more precisely defined in the way that conforms with professional and popular understanding and creates a concept that is most useful, the impact of a choice on economic efficiency equals the difference between the equivalent-dollar gains the choice confers on its beneficiaries (the winners) and the equivalent-dollar losses it imposes on its victims (the losers). In this formulation, a winner’s equivalent-dollar gain equals the number of dollars that would have to be transferred to him to leave him as well off as the choice would leave him if
he did not agree to the transfer;

he either was intrinsically indifferent to the substitution of the transfer for the private choice or government decision (henceforth, choice) in question or was unaware of the linkage between the transfer and the relevant choice’s rejection;

his distributive attitude toward such transfers, non-parochial distributive preferences, or normative distributive commitments gave him no reason to prefer the transfer to the choice or vice versa; and

the transfer would not benefit or harm him indirectly by changing the conduct of others by altering their incomes and/or wealth.

Similarly, in this formulation, a loser’s equivalent-dollar loss equals the number of dollars that would have to be withdrawn from him to leave him as poorly off as the choice would leave him under the four assumptions just delineated. The text and the preceding sentences in this footnote refer to equivalent-dollar gains and losses rather than to dollar gains and losses because many of the relevant effects are not direct monetary effects. Indeed, in some instances, a winner may not be able to capitalize his equivalent-dollar gain. Take, for example, the equivalent-dollar gain that the owner of swampland who values it positively (for sentimental reasons) despite the fact that its market value is zero obtains from an environmental policy that cleans up the water in the swamp and/or the air over the swamp. If the policy does not improve the property sufficiently for it to have a positive market value post-policy, this winner will not be able to capitalize his equivalent-dollar gain.

I should note that although the above operationalization of the concept “the impact of a choice on economic efficiency” is controversial in the sense that, at least at first thought, almost all economists would contest the claim that it is correct even if they agreed with the criteria for correctness I have delineated, I do not think it is contestable—i.e., I think that, given those criteria, this operationalization is uncontestably correct. For an explanation of the grounding of the various elements of this operationalization and a discussion of various related definitional issues, see Richard S. Markovits, Truth or Economics: On the Definition, Prediction, and Relevance of Economic Efficiency, Chapter 1 (2008) (hereinafter Truth or Economics). For an explanation of the incorrectness of the various definitions of and tests for economic efficiency economists use—viz., the Pareto-superior/Pareto-inferior definition, the Kaldor-Hicks test, the so-called Scitovsky test, and the potentially-Pareto-superior definition, see id. at Chapter 2.


For a discussion of the economics profession’s tendency to make errors of these kinds, see Markovits, op. cit. supra note 1 at Chapter 5.

For a detailed critique of a wide variety of canonical economics and Law & Economics articles and bodies of literature that focuses on the FBLE character of the economic-efficiency analyses this scholarship executes, see id. at 271-338. For a critique of the various arguments that economists who acknowledge the existence of The General Theory of Second Best allege justifies their and the profession’s ignoring it, see id. at 338-42.

The only possible exception to this conclusion I can imagine is UO-to-QV and QV-to-UO misallocation. I believe that \( \Sigma D(\pi_{C+UQV/UO}) \) is positive for all marginal QV investments that do not generate knowledge that are created exclusively with the resources withdrawn from unit-output production. However, I acknowledge that \( \Sigma D(\pi_{C+UQV/UO}) \) may be negative for a percentage of knowledge-generating QV investments—viz., for those knowledge-generating QV investments whose \( ex \ ante \) profitability is substantially deflated because (roughly speaking), in an otherwise-Pareto-perfect economy, the combination of the QV investor’s ability to keep its product-discovery secret, the QV investor’s ability to prevent others from profiting from its discovery by making preemptive investments in businesses that will profit from its discovery before the market price of any such independent businesses that exist are increased by the prospect of the discovery’s being made, and IP law (which both prevents non-investors from profiting from the knowledge the investment generates and compensates the inventor for some or all or more than all of the benefits the investment confers on outsiders) would not prevent the relevant product-research investments’ \( ex \ ante \) certainty-equivalent operating profits from falling below the \( ex \ ante \) certainty-equivalent contribution to economic efficiency that the relevant research project should have been
predicted ex ante to yield: I hasten to add, that for at least the following six reasons, I suspect that this $\Sigma \%D(P_{\pi_{\text{QV/UO}}})$ is negative for only a small percentage of marginal QV investments:

1. Most QV investments do not generate knowledge;
2. The private cost of creating all QV investments that are created with resources withdrawn from UO-increasing uses are deflated by the imperfections in price competition faced by the unit-output producers from which the resources used to create the QV investment are withdrawn;
3. The operating profits generated by the use of all QV investments are inflated by the imperfections in price competition facing the unit-output producers from which the resources “consumed” by the use of the QV investment are withdrawn, and this inflation of the relevant operating profits exceeds the buyer-surplus deflation in these operating profits;
4. The operating profits generated by the use of most marginal QV investments is inflated by the monopolistic QV-investment incentives the investor has to make them;
5. For the overwhelming majority of knowledge-generating QV investments, the number of days that IP protection lasts times the probability that an individual researcher will make the relevant discovery first (i.e., will be awarded the patent) exceeds the number of days by which the researcher’s efforts advance the weighted-average-expected date of the relevant discovery sufficiently to outweigh the deflating effect of the fact that the breadth of IP protection is not all-encompassing; and
6. Many creators of knowledge-generating QV investments can significantly reduce the knowledge-generation-related benefits their investment confers on others by keeping their discovery secret and investing in complementary goods and business.

For a more complete discussion of this issue, see TRUTH OR ECONOMICS at 172-202.

For a discussion of this alternative variant of distortion analysis, see note 9 infra.


The errors that the failure of any distortion analysis to take account of the fact that $P_{\pi_{\text{AR}}} > 0$ for almost all marginal exemplars of QV-investment-creating and PPR-executing resource-uses will cause it to make (if it were otherwise perfect) will increase both with the magnitude of the weighted mean $P_{\pi_{\text{AR}}} / LC_{\text{AR}}$ for the relevant distribution-segment and with the extent to which the relevant $P_{\pi_{\text{AR}}} / LC_{\text{AR}}$ and $\Sigma \%D(P_{\pi_{\text{AR}}})$ figures in any such distribution-segment are positively correlated. In fact, the above two sets of figures are likely to be at most only weakly positively correlated. As we have seen, (1) the $P_{\pi_{\text{AR}}} / LC_{\text{AR}}$ figures are determined by the extent of the economies of scale for the projects in question and the difference between the inherent profitability of the marginal and first extra-marginal project of the relevant type, and (2) the $\Sigma \%D(P_{\pi_{\text{AR}}})$ figures are determined by the economy’s various Pareto imperfections and various other parameters. Most of the relevant Pareto imperfections and all of these other parameters are completely uncorrelated with the determinants of $P_{\pi_{\text{AR}}} / LC_{\text{AR}}$. The only exception is economies of scale. To the extent that absolute economies of scale (which are a determinant of $P_{\pi_{\text{AR}}} / LC_{\text{AR}}$) are positively correlated with economies of scale relative to the extent of the relevant markets (i.e., areas of product-space) and to the extent that such relative economies of scale are positively correlated with the P/MC ratios in the relevant area of product-space and the retaliation barriers, monopolistic QV-investment incentives, and monopolistic and natural oligopolistic QV-investment disincentives that distort $P_{\pi_{\text{AR}}}$, $P_{\pi_{\text{AR}}}$ and $\Sigma D(P_{\pi_{\text{AR}}})$ will be correlated, though the positiveness of the related correlation will be undercut by the fact that $\Sigma D(P_{\pi_{\text{AR}}})$ will tend to be directly related to the relevant P/MC ratios and monopolistic QV-investment incentives but will be inversely related to the operative retaliation barriers and monopolistic QV-investment disincentives. (In my vocabulary, a firm has a monopolistic QV-investment incentive [disincentive] to make a particular QV investment to the extent that the investment in question would increase [decrease] the profits yielded by its pre-existing projects by doing less [more] damage to these projects’ profit-yields by taking fewer [more] sales from them and inducing rivals to make less [more] harmful competitive moves than the rival QV investment the...
investment in question may not have deterred any rival QV investment)."

This note will illustrate this possibility in relation to the resource misallocation that is generated when a producer chooses to use a less-allocatively-efficient rather than a more-allocatively-efficient production process to produce its product. Assume, for example, that the relevant producer chooses to use production process one (PP1) rather than production process two (PP2) because PP1 is more profitable. Assume, more specifically, that PP1 is more profitable than PP2 because PP1 involves the same fixed costs and lower average variable and marginal costs. On these assumptions, the profits that the choice to use PP1 rather than PP2 generates will equal the sum of (1) the amount by which the use of PP1 reduces the private cost the producer must incur to produce the lower output of the product in question it would produce if it used PP2 and (2) the profits the use of PP1 enables the producer to realize by increasing its output above the level it would have found most profitable had it used PP2 (had its marginal costs been the higher marginal costs it would have faced had it used PP2). Both these components of the profits the producer will realize by using PP1 rather than PP2 can be distorted by various Pareto imperfections. Thus, the cost-savings the choice of PP1 will enable the producer to realize on the output it would also have produced had it used PP2 will be distorted by the difference between the external allocative production costs the producer would generate if it used respectively PP1 and PP2 to produce the output of its product it would produce if it used PP2 and by all Pareto imperfections that cause the private value to their alternative employers of the resources that the producer pays for that the shift from PP2 to PP1 enables it to save to diverge from the allocative product these resources would generate in these alternative employers’ employ (the externalities they would generate in these alternative employers’ employ, various imperfections in the price competition the alternative employers face when selling the units of output these alternative employers would use those resources to produce when the resources would otherwise be used to increase the unit output of some other good, the imperfections in price competition that both the resources’ alternative employers and these alternative employers’ relevant product-rivals would face when the resources in question would otherwise be used to create a QV investment, etc.). The private-cost savings the use of PP1 generates can also be distorted by sales or excise taxes that were levied on the sale of the non-labor inputs its use saves or the earned-income taxes levied on the wages the use of PP1 obviates the relevant producer’s paying. Similarly, the profits the choice of PP1 and PP2 enables the relevant producer to realize by expanding its unit output will also be distorted by all the Pareto imperfections that can cause (1) the marginal-cost curve it faces over the relevant range of output to diverge from the relevant section of the associated marginal-allocative-cost curve, (2) the demand curve it faces over the relevant range of output to diverge from the relevant section of the associated marginal-allocative-value curve, and (3) the production of the additional units in question to increase the amount of buyer surplus the producer in question generates. It should be obvious that there is absolutely no reason to believe that the distortions in the two components of the profitability of this choice to use PP1 rather than PP2 will even tend to counteract each other.

It should be clear that one can also discuss the impact that a private or public choice will have on the distortion in the profits yielded by a decision to substitute PP1 for PP2 by a particular type of Pareto imperfection (or by all types of Pareto imperfections). Thus, an effluent-tax policy that would accurately internalize what would otherwise be the external costs generated by the use of PP1 and PP2 would eliminate the production-externality distortion in the profits yielded by the choice to use PP1 rather than PP2 to the extent that the amount of external costs the relevant producer would generate when producing its pre-choice output depended on whether it used PP1 or PP2 to produce it. However, a tax policy that would internalize all air-pollution costs a producer generated but no water-pollution costs it generated could either increase or decrease the absolute value of the production-externality distortion in the profits yielded by a choice to use PP1 rather than PP2 and could change the sign of the relevant distortion as well if one of these production processes polluted the air and the other polluted the water.

I should add that because most choices that are made use one production process rather than another are not break-even choices (yield positive profits), the fact that the aggregate distortion in the profits yielded by the choice that was made was positive does not imply that the choice was economically inefficient. The choice that was made will have been economically inefficient only if the positive distortion in the profits it yielded exceeded those profits.
The text states that the distortion-analysis protocol for analyzing the impact of a private or public choice on the amount of misallocation producers generate by deciding to use less-allocatively-efficient rather than more-allocatively-efficient known production processes is different from the protocol for analyzing the impact of a private or public choice on UO-to-UO and the other five categories of misallocation on which the text focuses. It is for the following reason. When the impact of a choice on those six categories of resource misallocation are at issue, distortion analysis focuses on the aggregate distortion in and economic efficiency or inefficiency of the marginal resource allocation of the relevant category in various areas of product-space and tries to predict from those economic-efficiency/inefficiency estimates the total misallocation of the relevant type generated by all misallocative (marginal [when relevant], intra-marginal, extra-marginal) resource-allocation decisions of the relevant category on the assumption that the allocative efficiency and private profitability of successive resource allocations of the relevant type in any area of product-space will decline. When the resource allocations at issue are decisions to allocate resources that will be used to produce a given product either to PP1 or to PP2, the concepts of marginal, intra-marginal, and extra-marginal decisions is less apposite in part because the fact that one producer has already chosen to use one production process does not affect the profitability (and except in special circumstances) will not affect the economic efficiency of another producer’s making the same choice. For this reason, the distortion analysis of the impact of a private or public decision on the amount of misallocation producers generate when deciding which known production process to use does not focus on the way in which anything like a MLV service curve declines as one moves to the right over a relevant range but on the number and allocative cost of the decisions of the relevant category whose profitability may be critically affected by the impact the private or public choice at issue has on the aggregate distortion in the profits yielded by decisions of the relevant category that would be made in the future.