Opportunities Lost and Regained in the Land of Opportunity Cost

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ABSTRACT

The economics profession, as a whole, has a gravely confused understanding of opportunity cost, a concept widely regarded as one of the most fundamental in economics. The muddle arises because of the existence of two contrary conceptions of opportunity cost which are presumed to be the same but only one of which is correct. The problem is serious because, while the correct idea leads to analytical coherence, the incorrect one generates confused thinking and incoherence in standard supply and demand analysis. The problem can be eliminated, however, by some judicious reconstruction. Coherence can be restored by retaining the term opportunity cost for the referent of the correct definition, and introducing a new term, trade-off cost, for the referent of the incorrect definition. Evidence to support the purely logical argument is provided by leading mainstream US texts written by prominent economists and experienced economics educators, including several Swedish Bank Prize winners. Thirteen introductory texts, five intermediate texts, four graduate texts and one applied research work are surveyed. In those that mention opportunity cost, none work solely with the correct definition, a majority deploy both definitions simultaneously as if they were identical, and a minority are based entirely on the incorrect definition. The result is that millions of economics students and graduates have received, and continue to receive, confused and deficient understandings of opportunity cost which are inconsistent with standard supply and demand analysis.

JEL Codes: D01, D24, A10, A20

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1. Introduction

Opportunity cost is widely regarded as a fundamental concept of mainstream economics without which it is impossible to think like an economist. Yet, as argued below, the economics profession as a whole has a very confused and analytically deficient understanding of this concept. This is a highly unsatisfactory state of affairs for a core concept in a discipline that seeks analytical rigour.

Using purely logical analysis, this paper advances the following claims:
(i) Contemporary economics is analytically confused about opportunity cost.
(ii) The confusion is based on the existence of two contrary concepts or definitions of opportunity cost, which are treated as equivalent but only one of which is correct.
(iii) The correct concept leads to coherence in standard supply and demand analysis while the incorrect one generates incoherence.
(iv) The confusion can be removed and coherence restored by distinguishing the two concepts, retaining the term opportunity cost for the referent of the correct definition, introducing the name, trade-off cost, for the referent of the incorrect definition, and recognizing a range of errors flowing from the incorrect concept.
These claims derive from the analysis of accounts of opportunity cost presented in leading economics texts. These texts, surveyed later, are well-known, authored by prominent economists (including several Swedish Bank Prize winners), and widely used in the education of economists in the US and overseas. Although the sample is moderately small (23 works), it can be regarded as representative for two reasons. One is that the treatment of opportunity cost in introductory texts has converged on a fairly standard template, differences between treatments being variations on a common theme rather than significant alternatives. The template comprises a concept arising in the context of scarcity and choice, explanations of the concept accompanied by simplified illustrations, and subsequent applications to production possibility frontiers (PPFs), comparative advantage, economic costs and profit, and supply and demand analysis. The other reason is the general profile of opportunity cost in economics education. Typically, it receives its greatest attention in introductory texts, after which its profile rapidly declines to zero. Discussion is sparser in intermediate texts, and essentially disappears at the graduate level, most probably on the assumption that introductory texts have done a good job on a straightforward idea. In the absence of corrective interventions at higher levels, any confusions and errors in the introductory texts carry over to the profession at large which is then endowed with deficient understandings of the concept.

That all is not well in the profession’s comprehension is suggested by the empirical evidence of Ferraro and Taylor (2005). Their main survey found that the understandings of opportunity cost by 199 US faculty and doctoral students, as revealed by answers to a fairly straightforward multiple choice question, were no better than that to be expected from lay people or guesswork. Equally unflattering results were obtained for undergraduates. While the authors’ remedy was better teaching of a concept correctly defined in textbooks, this paper indicates the problem, and a key to explaining their results, is embedded at a far deeper level.  

The opening sections of the paper advance the arguments at a logical level, before supporting and exemplifying them at more concrete levels in later sections. Sections 3, 4 and 5, which outline the differences between opportunity cost and trade-off cost and their theoretical implications, constitute the heart of the discussion. As the confusion between these concepts is deeply entrenched, readers are requested, on their first reading, to suspend prior convictions and approach the discussion with an open mind before engaging in critical evaluation.

2. The Context

The context of the present discussion is always that of orthodox rational choice theory in which an optimising agent faces a range of \( n \) mutually exclusive alternatives from which the best alternative is to be chosen, where best is determined by the agent. Clearly, many possible trade-offs exist, with every alternative needing to be valued in order that the best be determined. Once the best is selected, all other alternatives are necessarily rejected and become opportunities foregone or abandoned in favour of the superior opportunity. Since they are given up, they are regarded as a cost of choosing the preferred alternative. In orthodox theory, the rejected alternative with the highest value is taken as the measure of the true cost of the decision and is called the opportunity cost of that decision.

This context imposes a certain logical structure on the situation being analysed in at least two respects. The first restriction concerns the specification or nature of the alternatives. These must be properly identified so that they are the possible final outcomes of choice. The alternatives facing the agent need to be the complete bundles of items that have the potential to satisfy the agent’s objective, and not parts of these bundles taken in isolation. Given two commodities or activities, A and B, the alternatives will be bundles of quantities of A and quantities of B, and not changes (or marginal variations) in A or B within these bundles. This means the principle, ‘adjust choice until MB = MC’, describes a process for choosing between
alternatives to obtain an optimal decision, but does not describe the actual alternatives themselves between which the agent chooses. Marginal changes within alternatives are thus not properly specified alternatives, and hence not members of the choice set that determine the opportunity cost of the given decision. If bundle $X$ could maximise the agent’s objective, then bundle $X$ is one of the alternatives, and not components of $X$ such as $\Delta A$ or $\Delta B$. This point is particularly relevant to the treatment of PPFs and comparative advantage.

The second restriction relates to the number of alternatives. This is discussed further below where it is indicated that to demonstrate opportunity cost properly and to satisfy generality, choice sets should be based on $n \geq 3$, and not on $n = 2$ which is typically used.

3. The Problem: Conceptual Confusion

Modern economics texts, as a whole, present two contrary concepts or definitions of opportunity cost and treat them as equivalent. Only one concept, however, is correct. Confusion between the two is widespread and deeply ingrained, so it is important to clarify the differences with care.

Some formulations of the correct conception are as follows:

   Opportunity cost is the (net) value of the best rejected alternative.

   Opportunity cost is the (net) value of the highest valued of the opportunities foregone.

   Opportunity cost is the (net) evaluation placed on the most highly valued of the rejected alternatives or opportunities.\(^3\)

Eight key properties of this definition merit attention, all of which follow from the definition or its context. First, and most importantly, the definition incorporates a valuation ranking of the alternatives as an essential element. Opportunity cost only exists as the highest value of the rejected alternatives (even when rejected alternatives have equal highest values). Second, all alternatives must be valued in order to determine the highest and second highest values. Third, there is only one opportunity cost, because there can only be one second highest value. Fourth, opportunity cost can only be known after the optimal decision is determined – it cannot be known beforehand because knowing the next-best depends on knowing the full valuation ranking (best, second-best, third-best etc). Fifth, opportunity cost is therefore an output of the decision-making process, not an input. Sixth, opportunity cost is an absolute quantity, measured in units of value (utils, say), and not a relative quantity. Seventh, values are not objective and independent of the decision-making agent, but subjectively determined by the agent. Eighth, the often omitted ‘net’ term is explicitly included here because alternatives may involve costs and benefits, and it is the net value that matters.\(^4\)

The incorrect conception can be stated in various forms.

   The opportunity cost of an activity is the value of what must be forgone to undertake the activity. (Frank and Bernanke, 2009: 7)

   The [opportunity] cost of something is what you give up to get it. (Mankiw, 2009: 27)

   What we give up is the cost of what we get. Economists call this the opportunity cost. (Parkin, 2010:9)

These statements, taken as they stand, present the opportunity cost of an alternative as no more
than whatever is given up, foregone or sacrificed to acquire that alternative. Eight key properties are logically associated with this concept. First, it contains no reference to a valuation ranking criterion, so that opportunity cost is divorced from its central defining characteristic. Second, it is completely based on trade-offs – the entire focus is on the sacrifice of something to obtain something else. Third, decisions can have multiple opportunity costs because, on this conception, each and every foregone opportunity represents an opportunity cost regardless of whether it has the highest value or not. Any one of the abandoned alternatives constitutes a sacrifice or opportunity cost so that the idea of a single true cost for a decision vanishes. Fourth, all of them together could also be a candidate because their sum also represents what has to be given up. Fifth, opportunity cost can now be known prior to the determination of the optimal decision. Sixth, opportunity costs can become, via their comparison, an input into the process of determining the optimal decision. Seventh, the units of measurement are no longer always absolute but can be relative, for opportunity cost can now be measured as a ratio (a sacrifice divided by a gain). Eighth, this definition allows objective (physical) measurements of opportunity cost using purely technical constructions independent of agent valuations.5

That we are here dealing with two distinct concepts is evident. Their different, and often opposing, key properties also mean that the incorrect concept is not an approximation to, or simplified version of, the correct one. The incorrect definition confuses a necessary condition for a necessary and sufficient condition. What the two concepts have in common are trade-offs or rejected alternatives which constitute the necessary condition. The key differentiator is the valuation ranking criterion which supplies the sufficiency condition for opportunity cost and prevents any further significant similarities between the two concepts.

Some readers may think my representation ungenerous in the sense that authors using the incorrect concept are knowingly describing the correct concept in loose or approximate ways. Closer inspection reveals, however, that my representation is justified for two reasons – first, the two concepts are conflated in the texts and no qualification is ever entered that the latter is merely a rough version of the former; and second, authors do mean, and are committed to, the incorrect concept in most of their discussion of opportunity cost. Later sections provide evidence, along with further discussion of the defensibility of current practice.

4. The Ultimate Source of the Confusion

The primary reason why confusion exists over the conceptualisation of opportunity cost is because trade-offs are being used to define opportunity costs without reference to the valuation ranking criterion. Every opportunity cost involves a trade-off, but every trade-off does not involve an opportunity cost. That is, trade-offs are necessary but insufficient conditions for opportunity cost. The foundation of the confusion is clear in the following.

All trade-offs involve a cost – an opportunity cost. (Parkin, 2010:33)

The opportunity cost measures the trade-off between the two goods that each producer faces. (Mankiw, 2009: 54)

Economists use the term opportunity cost to describe such trade-offs: The opportunity cost of roses in terms of computers is… (Krugman and Obstfeld, 2006: 25)6

Clarity in analysis occurs when different things are given different names. Since a new term is needed, the sensible course is to retain opportunity cost as the name of the referent of the correct definition, and to find a new phrase for the referent of the incorrect definition. My proposal is ‘trade-off cost’. Using trade-off as the adjective has two advantages – it refers
directly to the situation that underpins the sacrifice, and it deploys an existing idea which minimises the adjustment tasks for everyone (authors, teachers, publishers, practitioners, students, commentators etc). The required re-learning can be relatively painless.

Two simple examples may clarify the roles of these two concepts in decision-making and their different properties. Consider, on the demand side, an agent choosing to spend $125 on two non-divisible goods (books and shirts) all priced at $25 each, and desiring that at least one book and one shirt be purchased. Four alternative (book, shirt) combinations constitute the choice set – (4, 1), (3, 2), (2, 3) and (1, 4). The agent then ranks these in order of their decreasing utility to herself – say (3, 2), (2, 3), (4, 1) and (1, 4). The optimal decision is clearly (3, 2), with the three distinct trade-off costs of this decision being the rejected alternatives of (2, 3), (4, 1) and (1, 4). The (correct) opportunity cost of the decision is the utility of 2 books and 3 shirts, the value of the foregone alternative with highest value to the agent. However, the incorrect definition provides three ‘opportunity costs’ – each of the foregone alternatives, (2, 3), (4, 1) and (1, 4) – and provides no means of distinguishing between them because of the omission of the valuation ranking criterion. The agent thus can never know the true cost of her decision. Now consider, on the supply side, an agent endowed only with time and skill who is deciding whether to establish a business and for whom values are measured in dollars. From annual revenue of $240,000, he deducts explicit costs of $170,000 for the hire or purchase of inputs, leaving an accounting profit of $70,000. The annual wage income from all possible alternative employments of his time and skill are, say, $50,000 (manager), $60,000 (programmer) and $40,000 (teacher). The best decision is clearly to establish the business, with the correct opportunity cost of this decision being $60,000 (the highest-valued rejected alternative or highest trade-off cost), so leaving an economic profit of $10,000. The incorrect definition, however, generates three ‘opportunity costs’ – the trade-off costs of $60,000 (foregone programming), $50,000 (foregone managing) and $40,000 (foregone teaching) and hence three ‘economic profits’ – $10,000, $20,000 and $30,000 – with no way of discriminating between them because of the exclusion of the valuation ranking criterion. In both examples, trade-off costs are known before the optimal decision is made, but the opportunity cost is only known afterwards.

Opportunity cost is a more developed concept than trade-off cost. An arguably correct but ambiguous sentence from Taylor (2007: 19) that ‘Scarcity leads to choice, and choice leads to opportunity costs’, can be expanded to describe the relationships more accurately: Scarcity leads to choice, which leads to trade-off costs, which lead to opportunity cost. Merely giving up an opportunity does not generate an opportunity cost. It generates a trade-off cost, which then only become the opportunity cost if it possesses the highest value among all the trade-off costs. In short, in a given choice situation, every opportunity has a trade-off cost, but every opportunity does not have an opportunity cost.

However, trade-off costs are the actual foundation of much theorising inappropriately presented in terms of opportunity cost, so that all discussion previously based on the incorrect concept can proceed as before provided the idea of opportunity cost is replaced by that of trade-off cost. The different name simply makes explicit a concept which has always underpinned the theory, even if not recognized in this form. This point is further illustrated below.8

5. Why Does it Matter? Coherence versus Incoherence

The situation matters because the correct concept leads to clear discourse, analytical coherence and determinacy, while the incorrect one leads to confused conversation, incoherent analysis and indeterminacy. Note that the argument is not about ‘word quibbles’ or ‘mere definitions’, but about concepts, the use and misuse of which have serious consequences. A sceptic might
say it doesn’t matter which definition or idea is adopted so long as consistency is maintained, but such an argument is completely misdirected here for three reasons.

The first is conceptual clarity. Clear discourse and rigorous theory require meaning-invariance of concepts, that is, single (not multiple) meanings for fundamental terms. In current usage, the term opportunity cost refers interchangeably to two different things without the difference being recognized. This leads to cognitive dissonance in thinking, writing and speaking. Clarity requires awareness of different meanings, different terms for different things, and the removal of conflation.

The second is meaningful usage. Statements about opportunity cost should be coherent and significant when the words ‘opportunity cost’ are replaced by their correct definition. If the expanded statement turns out to be meaningless or irrelevant, then an incorrect concept of opportunity cost is being used, and the statement is about trade-off cost or something else. A simple test for distinguishing meaningful from non-meaningful statements is to translate the words opportunity cost using the correct definition and inspect the resulting statement for coherence or significance. Should the statement fail, replace the words opportunity cost with trade-off cost and again inspect. This often discloses that the concept in question is trade-off cost rather than opportunity cost.

The third is analytical coherence. Standard supply and demand theory remains intact only if decision-making generates single opportunity costs; incoherence results if it generates multiple opportunity costs. Because decisions typically have multiple trade-offs between alternatives, the incorrect concept results in multiple opportunity costs between which it is impossible to choose. Analytical determinacy now vanishes. A firm has multiple cost schedules and values for economic profit, and is unable to make decisions on how much to produce or whether to enter/exit an industry. Household supply decisions are similarly undermined. There are now many supply curves, all of which are legitimate, and it becomes impossible to determine a unique market price, or even a few such prices. The incorrect concept thus leads to incoherence and indeterminacy. The correct concept, with only a single value for opportunity cost, restores determinacy and allows normal analysis to proceed without such impediments.

The difference between the two concepts is apparently small, but this is deceptive because nothing less than the rigour and coherence of standard supply and demand analysis is at stake. The following sections illustrate problems arising from the current confusion and the relevance of the above meaningfulness test.

6. Poorly Constructed Examples

Almost all illustrations in texts use \( n = 2 \). Such cases have the advantage of simplicity and are useful for illustrating trade-offs, but they are inadequate and misleading vehicles for illustrating opportunity cost. Four reasons may be given. The first is clarity of understanding. Good illustrations of opportunity cost need to provide clear illustrations of the operation of the valuation ranking criterion, the key defining attribute that differentiates it from trade-off costs. The structure of examples must thus be sufficiently rich for this work to be done in full view. To identify the alternative with the next highest value, one needs \( n \geq 3 \) to be able to show unambiguously that its value is less than that of the best alternative and greater than that of other rejected alternatives (or equal to them if all have the same value). At a minimum, clarity requires a chosen alternative, a second best alternative and a third alternative. Of course, one can say in defence of \( n = 2 \) that the rejected alternative necessarily has the next-highest value but this is a weak argument for three reasons. It follows solely from the structure of the example and not from the explicit operation of the valuation ranking criterion; it is not true in general (see below); and it is quite unnecessary when superior three-option demonstrations are
The second reason concerns generality. To cover all cases, the correct definition of opportunity cost imposes logical requirements on the number and valuation of alternatives. These are that \( n \geq 3 \), and that the first two alternatives in the value ordering have \( \text{positive} \) values. This ensures that the second alternative is always an opportunity which a rational agent would choose were the first to become unavailable for some reason.\(^{10}\) Now opportunity cost is determinable in all cases, for one knows that the agent would definitely fall back on the second best alternative and that its rejection constitutes a \( \text{cost} \). In situations of \( n = 2 \), however, unambiguous determination is no longer available in \( \text{all} \) cases, for it is possible for differences to emerge between the \( \text{stated} \) forgone alternative and the \( \text{best} \) forgone alternative. Suppose the choice is between a good thing and a bad thing. The rational agent chooses the former, but this does not mean the latter is \( \text{valued} \) as the next best alternative, so that if the good thing disappeared, the agent would then prefer the bad thing. The rational agent would eschew it as the best option in such reduced circumstances, for the preferred alternative would be \( \text{not to choose} \) the bad thing. This indicates that there is always a potential third alternative when \( n = 2 \), namely, not to accept the rejected alternative as an option that would actually be chosen. Put another way, for the rejected alternative to become a cost, it must have positive value to the agent; if it has negative value, its rejection generates a \( \text{benefit} \) and it cannot be an opportunity cost. In general, an alternative that is the only alternative is not guaranteed to be the next-best alternative.

The third reason concerns slippery slopes, for \( n = 2 \) examples subtly act as a bridge between the correct and incorrect concepts. Such cases clearly exemplify trade-offs but not an idea based on valuation rankings that need \( n = 3 \) at a minimum. If the illustrations used to demonstrate opportunity cost actually only illustrate trade-off costs, a misleading link is created between the correct and incorrect ideas such that mental sliding between them is regarded as acceptable.

The fourth is realism. Virtually all real choice situations involve \( n \geq 3 \), for choice is rarely restricted to only two options. In standard examples (such as study versus exercise) there are always additional options (music, meditating etc). In sum, the best procedure is always to use clarifying examples based on \( n \geq 3 \), not \( n = 2 \).(\(^{11}\)

### 7. Production Possibility Frontiers and the ‘Law of Increasing Opportunity Cost’

Opportunity cost is often illustrated using PPFs. If, in moving from frontier point A to frontier point B to acquire one more unit of \( x \), it is necessary to give up \( \alpha \) units of \( y \), \( \alpha \) is typically called the opportunity cost. This is incorrect for it is actually a trade-off cost.

Two points are relevant here. First, it is impossible to determine opportunity cost using PPFs alone. As their name implies, they are purely technical constructs derived from quantities of resources and their productiveness on given technological knowledge. They are entirely independent of agents’ valuation rankings, which makes them independent of opportunity cost. The absence of the valuation ranking criterion means that we are not dealing with opportunity cost but with trade-offs and the simple foregoing of one thing to gain another.

Second, the alternatives confronting the choosing agent must be correctly specified. The alternatives are the bundles represented by points \( \text{on} \) the frontier, and not changes in these bundles represented by marginal increments gained and lost by movements \( \text{along} \) the frontier. The ultimate choice set facing the agent contains only all the frontier points. Suppose the agent chooses bundle \( (x', y', z') \) represented by point A, and that the second highest valued bundle is \( (x'', y'', z'') \) or point B. Then the opportunity cost of choosing the bundle at A is \( \text{the value of the} \)
bundle at B. It is only when the incorrect trade-off definition is used that it could be the value foregone in moving from A to B. Thus while opportunity costs have nothing to do with marginal changes within alternatives, trade-off costs do.

Trade-offs, and their technically determined sacrifices or costs, are the foundation of PPFs, underpinning the derivation of the curves and their shapes. There is thus no such thing as a ‘law of increasing opportunity costs’. There is, however, a ‘law of increasing trade-off costs’ or, more precisely, a ‘law of increasing trade-off costs under scarcity’.

8. Comparative Advantage

According to standard theory, rational agents specialise in the activity for which they have the lowest opportunity cost and then trade. This theory is based on the incorrect definition of opportunity cost for two reasons. The first is that given above for PPFs which, by themselves, cannot indicate opportunity costs because they are independent of valuation rankings.

The second is that the theory becomes meaningless when the correct definition of opportunity cost is employed. Consider the phrase ‘lowest opportunity cost’. Using the correct definition, this is equivalent to the phrase ‘the lowest second highest value’ among the alternatives. This cannot have any meaning to the agent (or economist) because it is contradictory. There can only ever be one second highest value, for one cannot, in this context, create a set of second highest values out of which the lowest is to be chosen. The semantic quagmire deepens when we examine the idea that A has a comparative advantage over B because the value of A’s second best alternative is lower than the value of B’s second best alternative. What economic significance could this have?

However, coherence is restored when the theory of comparative advantage is re-cast in terms of trade-off costs. Agents possess a comparative advantage in an activity when they have the lowest trade-off cost for that activity. Relative trade-off costs, not relative opportunity costs, are the foundation.

9. Economic Costs and Profit

The two contrary definitions lead to conflicting treatments of the relationship between opportunity cost and economic cost – where the firm’s economic cost is the sum of explicit costs and implicit costs, explicit costs refer to (money) payments for the use of other agents’ resources, and implicit costs refer to the costs of using the agent’s own resources.

The correct approach is that only implicit costs are opportunity costs, with economic profit being total revenue minus explicit costs and opportunity costs. The incorrect approach, consistent with the incorrect definition, is that all economic costs, both explicit and implicit, are opportunity costs, so that economic profit is simply total revenue minus total opportunity cost. This view is conveyed by many of the surveyed texts.

Strictly speaking, your opportunity cost of engaging in an activity is the value of everything you must sacrifice to engage in it. Under this definition, all costs – both implicit and explicit – are opportunity costs. (Frank and Bernanke, 2009: 7)

[I]n the end, all costs are opportunity costs. …[O]pportunity cost…may include implicit as well as explicit costs. (Krugman and Wells, 2006: 7, 164; also 10, 17, 143,G4)

…it is important to include all the opportunity costs of production. Some of the opportunity costs, such as the wages a firm pays its workers, are explicit. Other
opportunity costs, such as the wages the firm owner gives up by working in the firm rather than taking another job, are implicit. (Mankiw 2009: 283; also 269-70)

For economists, a firm’s economic costs are the opportunity costs of the resources used, whether those resources are owned by others or by the firm. (McConnell, Brue and Flynn 2009: 155; also 156)

Whether hired in resource markets or owned by the firm, all resources have an opportunity cost. (McEachern 2010: 150)

Economists use the full opportunity cost of all resources (including both explicit and implicit costs) as the figure to subtract from revenues to obtain a definition of profit. (Miller 2010: 565)

A firm’s opportunity cost of production is the sum of the cost of ● bought in the market ● owned by the firm ● supplied by the firm’s owner. …The $230,000 spent on these items [labor, materials, leased equipment] could have been spent on something else, so it is an opportunity cost... (Parkin 2010: 228; also 229)

**economic profits** total revenue minus total costs, where total costs include opportunity costs, whether implicit or explicit (Taylor 2007: 239, G2).

The problem with the incorrect approach arises with explicit costs, not implicit costs which are always opportunity costs. Although explicit expenditure can be always be viewed as having *trade-off costs* since money spent on the chosen bundle of inputs means that other input bundles are foregone, there is no sense in regarding it as an opportunity cost with a value equal to the *next-best* alternative.

But supposing explicit cost were an opportunity cost, what would its value be? The firm’s chosen alternative is a specific bundle of inputs, and the set of rejected alternatives comprises other bundles of inputs with the opportunity cost being the highest value of these. How is the valuation to be carried out? Given that the same amount of money is spent, all bundles will have the same monetary value but this merely follows from the requirement of identical expenditure. However, all bundles certainly do not have the same value to the firm. In terms of their profit-generating capacity, rejected bundles will result in lower profits since the chosen bundle is the profit-maximising bundle. What is then being given up in choosing the optimal bundle are lower profit levels. The greatest of these lower profit levels would be the opportunity cost, but it does not make sense to view this as the value of the explicit cost. It is thus difficult, if not impossible, to reconcile the notion of explicit cost with the correct definition of opportunity cost. The explicit cost, the money cost actually incurred by the firm, is what is sensibly deducted from revenue, rather than any other cost such as that of the highest value among rejected alternatives. And it is unnecessary because the correct approach (that explicit cost is not an opportunity cost) provides straightforward and coherent analysis.

10. Some Mistakes Flowing from the Incorrect Definition

Single errors can spawn many offspring, but these derived errors can be corrected once the original error is identified. While the statements outlined below are mistaken in relation to opportunity cost, most are correct when re-expressed in terms of trade-off costs.

1. **Opportunity Cost Includes All Foregone Opportunities**

As noted, this is an implication of the incorrect definition, for the idea that opportunity cost is
what you give up to get what you want is non-specific about what exactly is given up. All the alternatives is certainly one possibility. Even highly regarded authors can unwittingly convey this notion by infelicitous expression.

Recall that the *opportunity cost* of an item refers to all those things that must be foregone to acquire that item. (Mankiw, 2008: 268)

The opportunity cost of an activity, once again, is the value of all that must be foregone in order to engage in that activity. (Frank and Bernanke, 2009: 10)

The opportunity costs of a decision include all its consequences, whether these reflect monetary transactions or not. (Samuelson and Nordhaus, 2010: 139)

…the true cost of any good is not just the amount of money it costs to buy, but everything else in addition to money that must be given up in order to get that good – the *opportunity cost*. (Krugman and Wells, 2006: 24)

The use of ‘all’ or the plural suggests the sum of all the rejected alternatives (aggregated by value in some way), whereas opportunity cost involves only one value, the highest among the rejected opportunities.

2. **Opportunity Cost is a Marginal Concept**

Although previously discussed, this mistake deserves additional emphasis. In developing ‘the economic way of thinking’, texts often seek to demonstrate the relatedness of fundamental concepts and are tempted to tie the concept of opportunity cost to marginalism. This is common in the discussion of PPFs, where the incorrect concept leads to propositions such as: ‘The opportunity cost of producing an additional pizza is the cola we must forgo’, or ‘The *marginal cost* of a good is the opportunity cost of producing one more unit of it’ (Parkin, 2010: 33, 35). However, marginal analysis represents a *process* by which alternatives can be assessed and ranked. Trade-off costs, the actual referent of the incorrect definition, are involved in this process but not opportunity cost.

3. **Opportunity Cost is a Ratio, Slope, Relative Price or Marginal Rate of Transformation**

These corollaries of the incorrect definition are commonly encountered.

The slope of the production possibilities curve is the opportunity cost… (Taylor, 2007: 467)

Opportunity cost is a ratio. It is the decrease in the quantity produced of one good divided by the increase in the quantity produced of another good as we move along the production possibilities frontier. (Parkin 2010: 33; also 34)

Case, Fair and Oster (2009: 34-5), Frank and Bernanke (2009: 43), McEachern (2009: 421) and Varian (2010: 23) also state or imply that opportunity cost is related to the slope of the PPF (or the marginal rate of transformation), while Colander (2010: 26, 36) and Taylor (2007: 464) link the slope of linear PPFs to the relative price of the two commodities. However, it is evident from its correct definition that opportunity cost is not a ratio of any kind, but that trade-off costs can have this property.

4. **This Decision has a High Opportunity Cost**

This statement, versions of which occur in McEachern (2010: 29), Frank and Bernanke (2009:
This text begins with the correct conception in its opening chapter.

**Opportunity Cost** The most highly valued opportunity or alternative forfeited when a choice is made. (5; also 17, 541)
But shortly afterwards, it switches to the incorrect concept which then subsequently dominates the discussion. The slide begins in chapter 1, with the incorrect definition taking centre-stage from chapter 2 on, primarily in discussing PPFs (33-8) and comparative advantage (45, 48, 50-1, 429-33).

Bowed-outward PPF = Increasing opportunity costs. (35)

Opportunity cost is illustrated as we move from one point to another on the PPF. (37)

**Comparative Advantage** The situation where someone can produce a good at lower opportunity cost than someone else can. (45)

Conflation of the two definitions is evident from the presence, in the same chapter, of the incorrect opportunity cost treatment of PPFs and the correct treatment that ‘the PPF tells us there are trade-offs in life’ (49).

2. Case, Fair and Oster (2009), *Principles of Economics*

This work, concordant with its view that opportunity cost is one of the three core concepts in the economic way of thinking, carefully presents the correct concept of opportunity cost at its first appearance.

The best alternative that we forgo, or give up, when we make a choice or decision is called the opportunity cost of that decision. (2; also 27, 743)

It does not, however, maintain this stance and soon slips over to the incorrect concept which dominates the remaining discussion. The start of the slide is detectable in some of the examples used to illustrate the correct definition (eg. a hockey player must decide between playing on the team or doing more study). In all subsequent applications, the dominating presence of the incorrect trade-off definition is evident – comparative advantage (29-30, 667-71), PPFs and the law of increasing opportunity cost (29-31, 34-6), consumer theory (113-4, 121-2), the theory of the firm (137-8) and investment decisions (230-2).

…in country C, a bushel of wheat has an opportunity cost of 2 bushels of corn. That is, to produce an additional bushel of wheat, C must give up 2 bushels of corn. (667)


This text also begins with the correct definition.

**Opportunity cost** is the benefit you might have gained from choosing the next-best alternative. …[It] is the value of that next-best alternative. (9; also 20, 330, G-9)

However, it very soon moves across to the incorrect definition which then dominates ensuing discussion. The initial movement is evident within several of the examples used to illustrate the correct concept (9), with some subsequent examples also reflecting the incorrect concept (308, 432).

The discussion of PPFs (25-9, 42) and comparative advantage (32-6, 42, 203, 207) are grounded on the incorrect concept. The ‘law of increasing opportunity cost’ is renamed the
‘principle of increasing marginal opportunity cost’ (27-8, 42), this form doubly emphasising the presence of the incorrect definition through the words ‘increasing’ and ‘marginal’. On some occasions, the substitution of opportunity cost for trade-off cost is explicit.

[The downward slope of the PPF] means that there is an inverse relationship (a trade-off)… That downward slope represents the opportunity cost concept: you get more of one benefit only if you get less of another benefit. (26)

The discussion of labour supply is based on the incorrect definition (431-2) and, while economic cost is treated correctly overall, the discussion of implicit cost wavers between the incorrect and correct concepts (278, 307-8, 330).

4. Frank and Bernanke (2009), Principles of Economics

Discussion in this text is almost entirely based on the incorrect concept.

The opportunity cost of an activity is the value of what must be forgone in order to undertake the activity. (7; also 10, G-6)

The conflation of opportunity cost and trade-off cost is also evident in the treatment of their ‘scarcity principle’. This initially links scarcity to trade-offs (4), but subsequently ties it to opportunity cost – ‘The Scarcity Principle…reminds us that the opportunity cost of spending more time on any one activity is having less time available to spend on others’ (36). The incorrect concept also underlies the discussion of PPFs and increasing opportunity costs (41-9), comparative advantage (35-9), and supply curves (ch 6).

However, in the context of two examples, it is indicated that opportunity cost refers to the value of the next-best alternative (7, 14), but this essential point is not included in the initial definition and plays a minor role in discussing opportunity cost.

5. Krugman and Wells (2006), Economics

With one small exception, this book consistently works with the incorrect definition from start to finish.

The real cost of an item is its **opportunity cost**: what you must give up in order to get it. (7; also 10, 11, 17, 24, 26, 38, 143, 161, 237, 408, 412, 414, 743-4)

The foundations of this definition in trade-offs is evident – ‘the opportunity cost of those 10 extra fish is the 5 coconuts not gathered’ (24), this carrying over to PPFs and comparative advantage. The exception is a minor intrusion of the correct definition into one topic, the opportunity cost of owner-supplied capital.

…the opportunity cost of the capital used by a business…reflects the income that could have been realized if the capital had been used in its next best alternative way. (163)

However, there is then an immediate return to the incorrect definition. At the end, the glossary does not reproduce the definition in the text but a confused variant.

**opportunity cost**: the real cost of an item, *including* what must be given up to obtain it. (G-10, second emphasis added)

The more advanced text by Krugman and Obstfeld (2006: 25, 27) also employs the incorrect
concept and again reveals its foundation in trade-offs.

Economists use the term **opportunity cost** to describe such trade-offs: The opportunity cost of roses in terms of computers is the number of computers that could have been produced with the resources used to produce a given number of roses.

6. Mankiw (2009), *Principles of Economics*

From start to finish, this text consistently uses the incorrect concept, with the correct concept entirely absent.

The opportunity cost of an item is what you give up to get that item. (5; also 17, 27-8, 54-8, 268-70, 853)

It also makes manifest the foundation of this concept solely in trade-offs.

This trade-off [along the PPF] helps us understand [that the] cost of something is what you give up to get it. This is called the opportunity cost. (27)

The opportunity cost measures the trade-off between the two goods that each producer faces. (54)

The incorrect definition is then deployed in all the standard applications – PPFs, comparative advantage and the cost of capital. Given Mankiw’s consistency, some corollaries of the incorrect definition are also present – that opportunity cost is a slope (27), that it could conceivably embrace all foregone opportunities (268), and that all costs are opportunity costs (269-70, 283).


This text starts with the correct concept in chapter 1.

[Opportunity cost is] the value of the next best thing foregone. (5; also 4, 7,155)

But error soon arrives in that chapter and subsequently when opportunity costs are conflated with trade-off costs in discussing the budget constraint, PPFs, and comparative advantage.

**Trade-Offs and Opportunity Costs** …[T]o obtain the first DVD, you trade off 2 books. So the opportunity cost of the first DVD is 2 books. (9; also 20)

The number of units of industrial robots that must be given up to obtain another unit of pizzas, *of course*, is the opportunity cost of the unit of pizzas. (12, emphasis added; also 19, 21, 746-7)

The same identification of opportunity cost with trade-off cost is evident in the glossary which confusingly advances a marginal version of the incorrect definition instead of the correct one in chapter 1.

**opportunity cost** The amount of other products that must be foregone or sacrificed to produce a unit of product. (G-20)

This text commences with a strong emphasis on the correct definition, subsequently repeated at several points.

The opportunity cost of the chosen item or activity is *the value of the best alternative that is foregone*. (28; also 30, 45, 150-2.257, 260, 494)

However, within the same chapter, it slips across to the incorrect definition, implicitly in some of the examples and explicitly in relation to comparative advantage (31-2, 45) and PPFs (36-7, 41, 45). Sometimes the two conceptions of opportunity cost occur side by side (45). The international trade chapter also relies on the incorrect definition (418, 420-3), as does the discussion of economic costs: ‘Like explicit costs, implicit costs are opportunity costs’ (150).

9. Miller (2010), *Economics Today*

This book starts excellently with the correct definition, an emphasis on valuation and clear exposition.

The value of the next-best alternative is called **opportunity cost**. The opportunity cost of any action is the value of what is given up – the next-highest-ranked alternative – because a choice was made. (31; also 47, G-9)

…no-one else can tell you the answer because only you can put a value on the alternatives foregone. Only you can determine the value of the next-best alternative. (31)

Consistency is not maintained unfortunately, and the discussion soon slides over to the incorrect definition in examples which commence the process of moving from thinking in terms of valuation rankings to thinking only in terms of trade-offs. This becomes transparent in the discussion of trade-offs and PPFs.

Whenever you engage in any activity using any resource, …you are trading off the use of that resource for one or more alternative uses. The extent of the trade-off is represented by the opportunity cost. (32)

[The production possibilities curve] graphically shows the trade-off that occurs when more of one output is obtained at the sacrifice of another. This curve is a graphical representation of… opportunity cost. (34; also 47)

The incorrect definition also underpins the discussion of comparative advantage (41, 44, 842) and investment demand (296).

10. Parkin (2010), *Economics*

This text provides the correct definition in chapter 1, and helpfully repeats it subsequently at various points.

The highest value alternative foregone is the opportunity cost of what is chosen. (13; also 9, 33, 228, G-9)

Unfortunately, the incorrect definition is also used, and the discussion often moves from the correct to the incorrect, or vice versa, without missing a beat. The ambiguity occurs at the student’s first encounter with the idea.

What we give up is the cost of what we get. Economists call this cost the **opportunity**
Within a quarter of a page, the reader is given both concepts – the incorrect one, two statements of the correct one, followed by a return to the incorrect one.

The same juxtaposition of correct and incorrect recurs in applications. In the discussion of PPFs and ‘increasing opportunity cost’, the correct definition is first given but the following discussion is replete with incorrect ideas – that the incorrect (trade-off) definition can make the correct idea ‘precise’, that in a two-good world, opportunity cost is the same as the cost of any trade-off, and that opportunity cost is ‘a ratio’ (32-4, 48). The discussion of comparative advantage is likewise presented in terms of opportunity cost (40-3, 48, 154), and all economic costs are regarded as opportunity costs (228).

11. Samuelson and Nordhaus (2010), Economics

This book indiscriminately scrambles the correct and incorrect concepts at the first encounter and subsequently. In chapter 1, the correct definition is given, the incorrect definition informs the two illustrative examples used, and the incorrect definition concludes the brief section.

The next-best good that is foregone represents the opportunity cost of a decision.

The concept of opportunity cost can be illustrated using the PPF. On the most fundamental level, the opportunity cost of moving from D to C is the butter that must be given up to produce the extra guns. …Or consider…the cost of opening a gold mine near Yellowstone National Park. …While the dollar cost [to Yellowstone] might be small, the opportunity cost in lost wilderness values might be large indeed. …In a world of scarcity, choosing one thing means giving up on something else. The opportunity cost of a decision is the value of the good or service foregone. (13)

The chapter summary then repeats the incorrect definition (15), while the glossary returns to a poorly expressed version of the correct definition (669).

The correct approach is used for economic costs, but examples involving the costs of the firm, the Iraq War (see below), and externalities are based on the incorrect approach (139-41, 295). Notably, comparative advantage is correctly discussed without reference to opportunity cost (341-9).


Here the treatment of opportunity cost is mixed and inconsistent. The correct concept is given at several points.

[Opportunity cost is] the next best alternative use of any resource. (38, 166, 168)

The glossary and several instances in the text are also aligned with this idea. However, the shift to trade-off cost occurs in the examples given to clarify opportunity cost (38, 40, 140) and in the discussion of PPFs and comparative advantage which wrongly deploy opportunity cost in standard fashion.
[Trade patterns] are based on a comparison of the opportunity cost in each country of producing the two goods. In North, the opportunity cost of producing 100 shirts is 5 computers… In contrast, the opportunity cost of producing 110 shirts in South is only 2 computers… (41; also 42, Table 2.4)

The movement between the two concepts is evident in the treatment of owner-supplied inputs to a firm where the first sentence below reflects the correct concept and the second the incorrect one.

The opportunity cost of his time is the best available wage to him if he worked…at an alternate job. The opportunity cost of his capital is the return that the $100,000 invested in this enterprise would produce in another investment. (166-7)

Finally, in macroeconomics, lost or foregone output is not the opportunity cost of higher unemployment (504), but the trade-off cost.


This book commences by presenting, side by side, versions of the correct and incorrect concepts.

**opportunity cost**: the value of the next-best foregone alternative that was not chosen because something else was chosen. (5; also 461, G5)

The opportunity cost of a choice is the value of the foregone alternative that was not chosen. (5; also 7, 12)

It is noted that ‘In general, when there are more than two items, the opportunity cost is the value of the next-best alternative’, but this key point is never developed because the remaining discussion is dominated by $n=2$ scenarios and the incorrect definition, as in the discussion of PPFs and comparative advantage. The role of the $n=2$ case as a bridge between the two concepts, thus apparently legitimating their equivalence, is clear.

The points on the [PPF] curve show a **tradeoff** between one good and another. …The opportunity cost of producing more of one item is the reduced production of another item. (10, 12)

In general, *country A has a comparative advantage over country B*…*if the opportunity cost of producing the good in country A is less than in country B*, or, alternatively but equivalently stated, *if country A can produce the good relatively more efficiently...compared to country B*. (461)

One could argue that introductory texts are merely trying to get unfamiliar ideas across in simplified ways so that some conceptual slippage in presentation is excusable. Although this is an unconvincing argument (for reasons given below), it does raise the question of whether intermediate or advanced texts amend, perpetuate or ignore the inadequacies of the introductory texts. Five intermediate texts, four advanced texts and one research work are now considered.

1. Varian (2010), *Intermediate Microeconomics*
In this intermediate text, the treatment of opportunity cost is light and imprecise. The concept is not given any separate analysis and is discussed only in applications. It is also never explicitly stated that opportunity cost refers to the best rejected alternative. This allows the incorrect definition to dominate, as in the discussion of consumer budget constraints and labour supply.

Economists sometimes say the slope of the budget line measures the opportunity cost of consuming good 1. …Giving up the opportunity to consume good 2 is the true economic cost of more good 1 consumption; and that cost is measured by the slope of the budget line. (23)

...if your wage rate is $10 an hour and you decide to consume an extra hour’s leisure, how much does it cost you? The answer is that it costs you $10 in foregone income... Economists sometimes say the wage rate is the opportunity cost of leisure. (174)

Whether Varian himself endorses the incorrect concept is not clear from the phrase ‘Economists sometimes say’, and from a later application in which incorrect and arguably correct ideas are placed side by side.

The interest rate measures the opportunity cost of funds – the value of alternative uses of your money. So every stream of payments should be compared to your best alternative that has similar characteristics in terms of tax treatment, risk and liquidity. (202)

The first sentence connects opportunity cost to trade-offs, whereas the second leans in the direction of the correct concept. Overall, the correct concept never receives the emphasis it requires and deserves.


The discussion of opportunity cost in this intermediate text deploys both the incorrect and correct definitions. On its first introduction, three versions of the concept are presented in one short paragraph, with two incorrect and one arguably correct.

If doing activity $x$ means not being able to do activity $y$, then the value to you of doing $y$…is an opportunity cost of doing $x$. …

opportunity cost of activity the value of all that must be sacrificed to do the activity. …

Should I do $x$ or $y$? In [this] question, $y$ is simply the most highly valued alternative to doing $x$. (7)

The examples used at selected points are variably based on the incorrect concept (8-9, 19, 242, 334-5) and the correct concept (7-8, 335).

3. Mansfield and Yohe (2004), *Microeconomics, Theory/Applications*

Opportunity cost receives little mention, despite a focus on ‘the few fundamental economic concepts’ underpinning microeconomics (xxi). The concept is first introduced in chapter 7 dealing with firms’ costs where the lead-in relies on the incorrect concept but is followed by the correct concept.

To an economist, the cost of producing a certain product is the value of other products
that could have been produced if the resources had been allocated differently. … So, the cost of employing a particular input is the value of that input if it were employed in its most valuable alternative use. …[This] is to adopt what has been termed the alternative cost or opportunity cost doctrine. (242)

However, the incorrect concept then takes over completely and informs the treatments of implicit costs (245), investment demand (549), and comparative advantage (607), with the correct concept playing no role at all.


This text starts with the incorrect definition and largely persists with it to the end.

Opportunity cost The cost of a good as measured by the alternative uses that are foregone by producing it. (5; also 19, 237, 482-3, 643)

The incorrect concept is then illustrated using PPFs, increasing opportunity costs and labour supply (5-6, 9, 482-3). The only deviation occurs in the chapter on costs where the idea underpinning the correct definition enters the discussion of economic cost in an indirect and unexplained manner.

Economic cost (which draws, in obvious ways, on the idea of opportunity cost)…is defined as the payment required to keep an input in its present employment, or (what amounts to the same thing) the remuneration that the resource would receive in its next best alternative use. (238; also 239)

This statement, appropriate for perfectly competitive equilibria, is not true in general. Two other aspects are also noteworthy. First, an equivalence is made with social cost – ‘For economists, the most general [concept of cost] is opportunity cost (sometimes called social cost)’ (237), and second, although not explicitly stated, the implication of the discussion is that all economic costs are opportunity costs (241, 238-9, 273, 311, 640).

5. Perloff (2009), Microeconomics

At a conceptual level, the correct idea is regularly presented across this intermediate text.

opportunity cost is the value of the best alternative use of a resource. (183; also 184, 219, 228-9, 260, 552, A43, A45)

However, in several applications it slides over to the incorrect definition and its corollaries. While the general discussion of PPFs is conducted in the context of trade-offs and not opportunity cost (217-8), the application of PPFs to comparative advantage is based on the incorrect definition.

comparative advantage: the ability to produce a good at a lower opportunity cost than someone else (326; also A42)

The incorrect view of economic cost is also repeatedly used.

The economic or opportunity cost includes both explicit and implicit costs. (183; also 184, 219, 228, 552, 557)

Finally, in several places the valuation criterion is not mentioned which, if not supplied by the reader, leaves the concept ambiguously poised between the correct and incorrect concepts
(183-5, 229, 260, 262, 557).


In this graduate text of 550 pages, no mention is made of opportunity cost in the index, opening chapters or rest of the text.

7. Kreps D. (1990), *A Course in Microeconomic Theory*

No reference to opportunity cost in the index, opening chapters or discussions of cost and profit occurs in this graduate text. Skim reading of its 850 pages suggests that the concept is never mentioned.


This graduate text also contains no index or contents entry for opportunity cost and, as far as is determinable by skim reading, does not define or discuss it in its 1,000 pages.


Opportunity cost is not explicitly mentioned in either edition of this graduate text. The only reference to it in each is an implicit and incomplete one in relation to economic profit that leans more toward the incorrect concept than the correct one.

   It is important to understand that all costs must be included in the calculation of profit. If a small businessman owns a grocery store and he also works in the grocery, his salary as an employee should be counted as a cost. (1978: 1; 1992: 23)

10. Stiglitz and Bilmes (2008), *The Three Trillion Dollar War, The True Cost of the Iraq Conflict*

The true cost of the Iraq war (to the US) is estimated as the sum of two components – budgetary outlays, and economic and social costs with the latter linked to opportunity costs. However, the concept of opportunity cost informing the analysis is not the correct one but the incorrect trade-off cost version, this being evident from the analysis and its explanations of opportunity cost.

   …the opportunity costs – what the economy would have looked like had we spent the money in another way. (30)

   Earlier, we noted that there was an opportunity cost to having our National Guard over in Iraq: they were not at home to help in emergencies like Katrina. (110; also 111)

   …the opportunity costs – the diversion of funds that could have been used in so many other and better ways. (163)

   …it is appropriate to calculate the opportunity costs, what would have happened to the economy had we not gone to war and financed it by increased deficits. (271-2 n32)

This work provides a good illustration of why applied studies of this kind are *necessarily* limited to trade-off costs and cannot calculate opportunity costs.

The above survey yields the following observations. *None* of the texts work solely with the
correct concept; a majority work with *both* concepts simultaneously, treating them as identical; and a few are based (almost) *entirely* on the incorrect concept. It is common for a text to start with one concept (correct or incorrect) and then unconsciously slide across to the other, implicitly suggesting that such conflation is analytically unproblematic and pedagogically acceptable. Compounding matters, none of the higher level works either provide correctives for mistaken ideas derived from prior instruction, or deepen understanding of the concept; in fact, several entrench the misunderstandings of introductory texts. There is thus a very high probability that most, if not all, texts at any level are performing badly, and from here it is but a small step to the conclusion that the entire profession has been, and continues to be, mis-educated in this area.

12. **Can Current Practice be Defended?**

In defence of present practice, it might be argued that authors of introductory texts are necessarily involved in pedagogical trade-offs of their own. Since simplifications of difficult issues are needed to provide initial understandings for beginning students, accuracy in presentation needs to be sacrificed to develop understanding. Foregoing degrees of precision to gain degrees of insight is acceptable.

This apparently reasonable argument does not withstand closer inspection, however. Even if accepted as true, it is evident that current texts have gone too far in this direction regarding opportunity cost. For the simplification of treating two related, but *different*, conceptions as identical has introduced confusion and problems which remain uncorrected in subsequent instruction. But closer examination of the trade-off argument reveals deeper weaknesses. The first is whether such trade-offs are genuine or illegitimate. Can accuracy be traded off against understanding *in the case of concepts*? Foregoing accuracy by omitting an *essential* characteristic of a concept or object (here the valuation ranking criterion) can only damage understanding, not instil it. Simplification then becomes antithetical to understanding, for accuracy and understanding are inextricably linked and not independent. Simplifying complex *theories* to develop initial understanding may be appropriate, but this practice does not extend to omitting essential components of concepts (especially concepts regarded as foundational). Simplifying the concept of a cow by defining it as an animal with four legs and two ears embraces too many non-cows and only generates fundamental misunderstanding of what is required to be a cow. A second issue is the underlying assumption of the trade-off argument that opportunity cost is a difficult concept whose mastery by first year students requires simplified treatment. But the idea of a trade-off is straightforward, as is the idea of a value ranking, so a simple combination of these two ideas generates a more developed, but still straightforward, idea. The correct concept of opportunity cost is one well within the reach of tertiary students, and does not need simplification via misleading replacements.19

13. **Recommendations**

These apply to all books that expound, use or discuss opportunity cost regardless of their subject matter.20

1. Present the correct definition and adhere consistently to it throughout (noting, whenever appropriate, differences from the incorrect idea).
2. Introduce the term trade-off costs to refer to all items in the set of rejected alternatives or foregone opportunities. The referent of the incorrect definition of opportunity cost becomes trade-off cost, with only the highest-valued trade-off cost being the opportunity cost.
3. Provide examples based on *n ≥ 3* so that the operation of the valuation ranking criterion is fully visible and clearly demonstrated.
4. Ensure that alternatives are properly specified.
5. Substitute trade-off cost for opportunity cost in all subsequent theorising as appropriate, including PPFs, the principle of increasing trade-off costs, comparative advantage and budget constraints.
6. In relation to the firm’s economic costs, restrict the term opportunity cost to implicit costs.
7. Avoid loose expressions that state or imply mistaken ideas about opportunity cost.
8. Avoid misleading simplifications and connections between fundamental ideas.

**14. Conclusion**

It would appear that the economics profession as a whole – academics, graduates, students and practitioners – is in a state of serious and deeply ingrained confusion about opportunity cost. Of the texts surveyed here, none advanced the correct concept and adhered to it consistently throughout its discussion. The majority presented both the correct and incorrect concepts, moved between them without awareness of inconsistency, and typically spent more time deploying the incorrect concept. A minority even based their discussion entirely on the incorrect concept. Higher level works did not correct the confusion, but reinforced it by either commission or omission.

The main source of this deep-seated confusion is the conflation of opportunity cost with trade-off costs, this being occasioned by neglect of the valuation ranking criterion essential to opportunity cost. In choice situations, multiple trade-off costs exist, but only one opportunity cost, and it is not the case that every foregone opportunity creates an opportunity cost. This conceptual muddle, accompanied by poorly constructed examples, then permeates applications and subsequent theorising. The outcomes are confused ways of thinking and incoherent analysis. Only the correct concept provides foundations for standard supply and demand theory, with the incorrect concept leading to its disintegration. That which is apparently near enough can never be good enough when essential parts of ideas are simplified away.

This is an unhappy report card. The surveyed texts are by some of the most eminent economists and experienced economics educators in the world, including several Swedish Bank Prize winners. Given that the writings of these authors display such deep-seated inadequacies, and that the standard model has been adopted as best practice by numerous other authors, the education of millions of economics students and graduates around the globe has been deficient for as long as the confusion has existed. It also reflects poorly on economics in the academy, including the general lowering of intellectual standards, institutional and market incentives that lead to herding behaviour, and a failure in practice to model the logical and critical thinking that students are told is vitally important. If opportunity cost is fundamental to ‘the economic way of thinking’, the trade-off cost of what has been lost, and continues to be lost, is extremely large.

**REFERENCES**


ENDNOTES

1 This is a revised version of a paper to the 2010 Australasian Teaching Economics Conference, University of Waikato; see O’Donnell (2010). I would like to thank David Colander, Alan Duhs, Bruce Littleboy, Peter Kennedy, Adrian Pagan and Gordon Menzies for helpful discussion and comment.
2 The *logical* arguments of this paper, however, are independent of Ferraro and Taylor’s *empirical* findings; any criticisms of the latter do not affect the former.
3 The last definition, apart from the addition of ‘net’, is from Buchanan (1998/2008).
4 Going to the movies instead of lectures has benefits but also costs (such as the ticket). The importance of the ‘net’ term is also underlined by the Ferraro and Taylor (2005) question.
5 These properties are not necessarily exhaustive for either definition but are sufficient for present purposes.
6 All emphases in quotations are in the original unless otherwise noted.
George Orwell’s remark is apposite: ‘What is above all needed is to let the meaning choose the word, and not the other way about’ (cited in Krugman and Wells, 2006: ix).

Some similarities exist with Buchanan’s perceptive analysis (1969; 1998/2008), but the arguments are quite different regarding the central issue of this paper. While Buchanan’s treatment emphasises the direct link between cost and choice, the necessary presence of choosing and valuing agents, and a distinction between choice-influencing (ex ante) and choice-influenced (ex post) costs, it does not broach the central issue of this paper and consequently also confuses opportunity cost with trade-off cost.

For example, 4 hours can be allocated between 2 activities (jogging and studying) with three options in the choice set – (1, 3), (2, 2) and (3, 1) hours. Given the agent’s valuation ranking, the value of the second best alternative (the opportunity cost) emerges clearly.

As Arnold (2010: 5) put it, ‘Whatever you would have chosen to do had you decided not to [do x] is the opportunity cost of [doing x].’

This is an instance of the importance of the ‘beyond necessity’ qualification in Ockham’s razor.

Frank and Bernanke (2009: 7) note that some economists use opportunity cost ‘to refer only to the implicit value of opportunities foregone’. However, the impression is given that this difference is just a matter of word usage without adverse consequences. Unusually, their earlier ‘strict definition’ does not figure in the discussion of economic profit (204-5).

Provided the highest value rejected alternative is chosen, which does not always occur in the texts.

Despite their loose language in this sentence, Frank and Bernanke (2009: 7) are distinctive in warning against this idea: ‘opportunity cost is not the combined value of all possible activities you could have pursued, but only the value of your best alternative’.

See also the ‘principle of increasing marginal opportunity cost’ (Colander 2010: 27-8, 42).

Similar remarks to those below also apply to the extensive ancillary packages (sometimes up to twelve components) associated with many texts.

In the following paragraphs, the numbers in brackets refer to page numbers in the text under discussion, and all emphases in quotations are in the original unless otherwise noted.

Interestingly, Miller refers to the ‘law of increasing relative cost’, but relative cost just turns out to be a re-naming of opportunity cost in the incorrect sense (37).

This discussion echoes some of the problems in the standard treatment of opportunity cost, namely, the need to specify alternatives correctly and the inappropriate generalisation of marginalism.

The recommendations relate only to issues discussed in this paper, not other issues concerning the nature and pedagogy of opportunity cost.