Theoretical Foundations of Law and Economics

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whereas the distribution of the pie was a question of equity outside the scientific bailiwick of economics.

Instead of taking the Pareto definition of efficiency in terms of vector maximization as an opportunity to explore nonwelfarist approaches to normative economics (e.g., rights-based theory), the economics profession has largely ignored it at the “impracticality” of the definition. The rehabilitation of the Marshall–Pigou approach was inaugurated by the introduction of the Kaldor–Hicks (KH) principle6 for a potential Pareto improvement (the winners in a proposed change could compensate the losers but do not necessarily do so) and by the modern treatment7 of consumers’ surplus. Kaldor was quite explicit about laying the groundwork to justify the older Marshall–Pigou way of thinking:

This argument lends justification to the procedure, adopted by Professor Pigou in The Economics of Welfare, of dividing “welfare economics” into two parts: the first relating to production, and the second to distribution.8

The Marshall–Pigou tradition was thus modernized by Kaldor and Hicks, and the seemingly austere Pareto notion of efficiency9 was broadened in the “Kaldor–Hicks (welfare maximization . . .) concept of efficiency.10 Today any change that increases the “social wealth,” according to the KH criterion is routinely interpreted as an “increase in efficiency,” particularly in the law-and-economics literature, cost-benefit analysis, policy analysis, and other parts of applied welfare economics.11 In general, one could say that the closer economics is to being applied,
the closer it comes to using the Marshall–Pigou approach with the modern KH
refinements.
We will, however, show how the Marshall–Pigou–Kaldor–Hicks (MPK) rea-
soning – based on the construction of a "pie" with the efficiency-equity parsing of
changes in the pie's size and distribution – is fatally flawed.

1. NUMERAIRE ILLUSION AND SIMILAR SAME-YARDSTICK FALLACIES

Before considering the numeraire-illusion fallacy that vitiates the KH principle, it
should be useful to consider a range of similar but simpler fallacies. The general
fallacy involved here is the illusion that a statement is a substantive assertion when
in fact it is only a tautological consequence of an arbitrary choice of numeraire,
origin, or yardstick.

A "Proof" that Yardsticks Cannot Change
Suppose a yardstick is used to measure off a yard on a table. But is it really a
yard? Perhaps the yardstick has expanded or contracted? Suppose that to check it,
distance is remeasured using the same yardstick, and sure enough (aside from
negligible measurement error), the distance is indeed a yard. But this in fact gives
no new information and simply reasserts the fact that the distance was originally
measured by that same yardstick. Changes in a yardstick cannot be discovered by
measurements using the same yardstick, and any conclusion of "no changes" based
on such measurements would be illusory.

A "Proof" that Inflation Is Impossible
How much would a dollar buy in 1900? It would buy a dollar's worth of goods. How
much would a dollar buy in 2000? It would again buy a dollar's worth of goods.
Because a dollar buys the same "amount" of goods in 1900 and 2000, there has
been no inflation between those two times. Because those two times were arbitrary,
inflation is impossible.

What is wrong with this "proof"? Clearly the problem lies in using the same
dollar measurement for what a dollar will buy at the two times. The seemingly
substantive conclusion – "A dollar buys the same amount of goods at the two
times" – is only a tautological restatement of the fact that the "amount of goods"
is measured by what a dollar will buy.

A "Proof" that the Earth Does Not Move
Let \( E(t) \) and \( S(t) \) be respectively the coordinates of (the center of mass of) the
earth and sun at time \( t \) when measured in geocentric coordinates. Then we
can check to see how the earth and sun move over the course of time. The inves-
tigation finds that indeed the sun's coordinates do change with the passage of time
(in revolution around the earth) but that the earth's coordinates are constant.
Therefore we can conclude that the earth does not move, because the sun does

Indeed move in rotation around the earth. The Church is vindicated and Galileo
refuted.

What is wrong with this "proof"? Clearly the illusion lies in the attempt to
draw seemingly substantive conclusions about the movement of the earth from
the mere choice of geocentric coordinates. Instead of being an empirical statement,
"the earth does not move" is only a tautological consequence of choice of geocentric
coordinates.

A "Proof" that the Marginal Utility of Income Is Constant
The marginal utility of income is the marginal rate of change of utility with respect
to a change in the consumer's income. Let \( U(Q) \) be the utility level that results
from a consumer maximizing utility at given prices and income. Because any
monotonic transformation of a utility function is equally acceptable as a utility
function, we consider the money-metric utility function \( E(P,U(Q)) \), which is the
minimum expenditure necessary to reach the level of utility \( U(Q) \) at the given
prices and income. Then we consider the marginal change in the money-metric
utility \( E(P,U(Q)) \) with respect to a change in income. We find that the minimum
expenditure necessary to reach the level of utility \( U(Q) \) reached with, say, a dollar
increase in income is exactly a dollar, so we conclude that the marginal utility of
income is in fact constant (with value unity).

What is wrong with this "proof"? That the marginal utility of income is constant?
Instead of being an empirical statement about the marginal utility of income, it is
only a mathematical consequence of the use of the money-metric utility function
to measure the marginal utility of income:

Indeed, "a yardstick cannot change in terms of itself" is a good statement of the
general same-yardstick fallacy.

A "Proof" that an Apple Has the Same Value to Any Consumer
If John had an apple, what would be its value to John? In terms of apples as
numeraire, it would be worth one apple to John. If Mary had an apple, it would
also be worth one apple to Mary. Hence an apple has the same value to John or
Mary or to any consumer, so a transfer of apples between two people can never
increase or decrease value. The argument can be restated in terms of any commodity
(changing the numeraire accordingly), so any commodity has the same value to
any consumer. Hence all transfers of commodity cannot increase value and are
thus of no value.

11 Paul A. Samuelson, 1979, "Complementarity: An Essay on the 40th Anniversary of the Hicks–Allen
Revolution in Demand Theory" Journal of Economic Literature, 12, p. 1264.
What is wrong with this "proof"? Clearly the problem lies in measuring the value of an apple to a person and also using apples as the numeraire. The statement that the apple has the same value to John and to Mary is only a tautological consequence of the choice of apples as the numeraire. The "same value" statement was only a numeraire illusion.

A "Proof" that Commodity Transfers Do Not Change Social Wealth

Although the preceding apple argument may seem obvious, the main point of this chapter is that the basic KH reasoning that money compensation payments (to turn a potential Pareto improvement into an actual Pareto improvement) do not change total social wealth as measured in money is only the same sort of tautological restatement of the consequences of the choice of numeraire. If the total value, or pie, is measured in terms of the numeraire X (apples or money or any other commodity), then any transfers in X will only seem to be a redistribution of the same total pie and never as an increase or decrease in the size of the pie. Hence the paradox of the total Pareto improvement into the efficiency part that changes the size of the pie and the equity part that only redistributes some of the X without changing the X-measured size of the pie is only a consequence of the choice of the X numeraire. Change the numeraire to Y, and the same transfers of X will then (in general) change the size of the Y-measured pie, so the paradox is not numeraire-invariant.

Restrict attention to a Pareto improvement that exchanges an apple for some money (or dollars for nuts), and the paradox of the total exchange into the efficiency part and the equity part using one commodity as numeraire will reverse itself when the other commodity is used as numeraire. Hence the policy recommendations of the non-numeraire transfer on efficiency grounds (because the numeraire transfers in the potential exchange are only a question of equity) will reverse itself with reversed numeraires. Lacking any serious argument that the social pie as measured by dollars, gold, silver, BTUs, apples, or nuts is the "true" or "normatively significant" social pie, such policy recommendations based only on the use of one particular numeraire are groundless.  

II. NUMERAIRE ILLUSION AND OTHER CRITICUES OF THE KALDOR-HICKS PRINCIPLE

The key step in going from Pareto reasoning to the MPK(H) reasoning was the drawing of the total Pareto improvement into efficiency and equity parts using the criterion that the equity compensations (paid in the numeraire) did not change the size of the social pie (measured using the same numeraire). But this in turn only what we have called the numeraire illusion; changes in the size of a yardstick cannot be revealed by using that same yardstick. The illusion is that attributes of a description based on one numeraire (usually money) or, abstractly, "purchasing power" are misinterpreted as if they were numeraire-invariant attributes of the underlying situation being described.

It may be useful to differentiate explicitly this numeraire illusion critique of the MPK(H) tradition from some previous criticisms. For instance, Sciotosky pointed out certain problems in the KH criterion (e.g., the project and compensation might have such strong income effects that the KH criterion then recommended a return to the original state). This criticism shows that in certain theoretical cases, income effects can lead to anomalies that complicate the use of the KH criterion. To the purist, these anomalies may be seen as "nails in the coffin" of the KH principle. But in applied economics, the anomalies in very special cases did as little as slow the use of the KH principle as the major voting paradox did to slow the use of majority voting. In any case, the critique based on the numeraire illusion has nothing to do the Sciotosky-type anomalies, and the critique applies to all uses of the KH principle (i.e., to the underlying logic), not just to special cases.

Within the MPK(H) tradition, there is also some controversy about the relative importance of efficiency versus equity questions - as if the efficiency-equity parsings were a numeraire-invariant matter. Some applied economists, such as A.C. Harberger, have argued that efficiency questions should be firmly settled on one side so that professional interest can be focused solely on what are considered efficiency questions; "a dollar's a dollar for all that." Other welfare economists, such as Broadway and Bruce and Blackorby and Donaldson, do not accept the sharp separation of efficiency and equity questions (e.g., due to general-equilibrium effects); such questions are more intertwined and should be considered more jointly by economists. The criticism developed here shows the lack of invariance in the whole construction of the "social pie" and the parsings - intertwined or not - into efficiency and equity questions. It is independent of the question of how general-equilibrium considerations might intertwine the so-called efficiency and equity parts of the total change.

It should also be noted that the critique based on the numeraire illusion has nothing to do with the old idea of a dollar having a different social welfare impact.

12 There sometimes seems to be a type of money mysticism in the MPK(H) tradition that attributes some unspoken normative significance to using that good as numeraire. Monetized net benefits, as opposed to net benefits realized using a different numeraire, are treated as if they represented social welfare, a mistake that Pigou was careful to avoid. This money mysticism is absent in the Pareto exchange perspective, which views money as one of many goods, albeit a particularly useful one that may or may not be involved in mutually beneficial transactions. See John R. Hicks, 1975, "The Scope and Status of Welfare Economics," Oxford Economic Papers, 27, pp. 302-36; for an interesting juxtaposition of the caleciatics (exchange) approach in its Leontief and Austro-Austrian versions with the "production and distribution of the national product" approach of the Marshall-Pigou tradition.

13 For our purposes the numeraire is only the commodity used as the units in which benefits and costs are measured. The results do not depend on the numeraire having any of the other usual characteristics of money (e.g., store of value or medium of exchange).

14 Elber Schotzov, 1981, "A Note on Welfare Propositions in Economics," Review of Economic Studies, 5, pp. 77-88. Sciotosky's analysis generated a whole literature about such special cases, but it is not germane to our logical-methodological critique.

15 Hence it is not just another nail in the coffin, but the last nail and final demise, of the KH principle.


for the rich or poor, that is, the question of distributonal weights in a supposed social welfare function. No notion of social welfare is used in this whole analysis and critique.

A. A Simple Generic Example

The MPKH reasoning is the basis for the maximization of "net social benefit" in cost-benefit analysis, as well as for the "social wealth" maximization at the foundation of the orthodox economic approach to law (the Chicago school of law and economics). For instance, consider the following pure example of numeraire illusion in cost-benefit analysis: "It should be emphasized that pure transfers of purchasing power from one household or firm to another per se should be typically attributed no value." 19

In these contexts, it is not easy (though not impossible) to envisage a numeraire reversal, so the failure of numeraire invariance in hidden from normal view. But we are looking at the underlying economic logic of the MPKH tradition, and it can be applied to situations where numeraire inversions are trivial. Indeed, such examples are in law-and-economics textbooks themselves.

Consider the following simple but generic example from David Friedman's book *Law's Order*: Mary has an apple that she values at fifty cents, whereas John values an apple at one dollar. There might be a voluntary exchange where Mary sold the apple to John for, say, seventy-five cents. There are two changes in that Pareto improvement: the transfer of the apple from Mary to John, and the transfer of seventy-five cents from John to Mary (see Figure 6.1).

Let us apply social-wealth maximization reasoning to the transfer of the apple, using money as the numeraire. Because the apple was worth fifty cents to Mary and a dollar to John, social wealth would be increased by fifty cents by the apple

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21 Taking any commodity as numeraire, the MPKH logic similarly recommends on "efficiency" grounds the transfer of money from those who relatively like to those who relatively dislike the commodity.
“Change” dS gives $0.75 = 1.5 - 0.75 = \Delta\text{apples increase in social apple pie.} 
“Compensation” dA gives $0 - 1 = -1 = \text{no change in apple pie.} 

Figure 6.2. Same transfers with apples as numeraire. 

(and the underlying MPK logic) have changed completely between the two descriptions. The efficiency part and the equity part of the total change reversed themselves under the numeraire reversal. In contrast, it might be noted that the weaker catallactic conclusion that the two changes together constitute a mutually beneficial exchange (a Pareto improvement) is invariant under numeraire change (see Table 6.1). 

The argument that “a dollar is worth the same number of dollars to everyone: one” pinpoints the problem that we have called the numeraire illusion. Transfers in whatever is taken as the numeraire will always seem to not change the size of the pie and thus to be merely distributive. Changes in a yardstick will never be revealed by that yardstick; one needs to use a different yardstick. 

If the mutually beneficial exchange had been Mary’s apple in exchange for John’s three-fourths of a pound of nuts (instead of three-fourths of a dollar), then in terms of some third commodity such as dollars we could say symmetrically that John values the apple more than Mary and that Mary values the three-fourths of a pound of nuts more than John. But by computing in the metric of one of the goods involved in the potential exchange, we are misled to the asymmetric conclusion that one part of the exchange increases the social pie whereas the other is mere redistribution of the social pie – an illusion that is exposed by changing the numeraire. 

B. A Pollution Example 

Law and economics (specifically, wealth maximization) applies the same logic of David Friedman’s apple example to legal rules: “We now expand the analysis by applying Marshall’s approach not to a transaction (John buys Mary’s apple) but to a legal rule”23. Because so much of this approach to the economic analysis of law grew out of Ronald Coase’s analysis of pollution,24 such an example may be used to represent the methodology of law and economics. 

Take the first numeraire y to be money, and take x to be the number of pollution permits. Our points are independent of the question of polluter’s rights or polluter’s rights, one that has received much attention in the literature on Coase’s theorem. Hence we initially take a polluter’s rights perspective and then later take the opposite viewpoint. In our first example, person 1 is the polluter, initially endowed with much money and few pollution rights, whereas person 2 is the pollutee, with the opposite relative endowments. 

At the endowment point it might well be that there could some mutually voluntary exchanges of dy money for dx pollution permits between the polluter and pollutee. So far so good; it is a Pareto improvement due to voluntary exchanges in the market for pollution permits, with no need for the KH criterion or wealth-maximization reasoning. 

The problem comes when, say, a legal–economic analyst of the Chicago school (or “the planner”25 of cost–benefit analysis) uses the MPK logic to analyze the transfer in pollution rights dx as an increase in social wealth, whereas the payments dy are seen as a merely redistributive transfer with no effect on the size of social wealth (aside perhaps from minor income effects). Economists and economics-savvy lawyers can recommend the efficiency change, the increase in social wealth due to the dx transfer, because the dy redistribution (e.g., polluters paying for pollution permits) is left aside as a noneconomic question (all as if the efficiency–equity parsing were an invariant attribute of the underlying legal situation rather than just a consequence of the choice of numeraire). Moreover, the merely redistributive dy transfer might be plagued by deadweight transaction costs that would actually reduce social wealth. Hence the most efficient outcome would be to make the social-wealth-increasing transfer dx to the polluter – in effect, to switch that part of the endowment to the polluter – and avoid any of the social-wealth losses due to the costs of the dy transaction. This would “imic 

23 Friedman, Law’s Order, p. 20. 
25 See, for example, the SO2 permits analyzed by Denny Ellerman et al., 2000, Markets for Clean Air: The U.S. Acid Rain Program, New York: Cambridge University Press. 
26 Badeau and Beach, Welfare Economics, p. 9.
the market" in terms of increasing social wealth, while avoiding the deadweight transaction costs.

All of these arguments and conclusions – representative of the Chicago school27 – are vulnerable to the mere redescription of the situation by exchanging the numeraire. Gains and losses are now to be expressed in terms of the measuring rod of pollution rights (x), and the transfers can be analyzed from the viewpoint of the new social x pie. The money payment dy from the polluter to the pollutee increases social wealth (now measured in x), whereas the dx transfer of pollution rights merely redistributes x with no effect on total social wealth as measured in x.28 One pollution permit is worth the same number of pollution permits to everyone: one. Economists can recommend the social-wealth-increasing transfer of the money dy from polluter to pollutee, whereas the question of transferring the pollution rights dx is best left aside as a nomenclature problem. There might even be some deadweight costs in social wealth associated with the transfer of the pollution rights dx, so the most efficient outcome would be (as to resign the money dy from the polluter to the pollutee. That would also mimic the market in terms of increasing social wealth, while at the same time avoiding the deadweight transaction costs.

The flaws in the MPKH reasoning have nothing to do with the Coase theorem controversy. The numeraire inversion analysis applies as in the preceding example if we start with the polluter's rights principle. Now take person 1 to be the pollutee, relatively well endowed with money but few pollution rights – the latter being assigned to person 2, the polluter. Again we might expect at the endowment point that there could be some mutually beneficial voluntary exchange where the pollutee buys pollution rights dx from the polluter for the money dy. In the literature, this is sometimes viewed as the polluter "bribing" the pollutee to reduce pollution, or it could be seen as the purchase of amenity rights to the good of less pollution.

The problem comes in the MPKH reasoning: the transfer of dx amenity rights from the pollutee to the polluter as an increase in the social y pie while the payment dy had zero effect on that pie. If there are deadweight transactions costs involved in the transfer, then the most efficient outcome is the uncompensated transfer of the amenity rights dx from the polluter to the pollutee. But these "recommendations" are easily reversed simply by redescribing the same situation with reversed numeraire.

With the amenity rights x taken as the numeraire, the payment dy from the polluter to the pollutee increases the size of the social pie (now measured in amenity rights), whereas the transfer of rights dx from polluter to pollutee is a "wash" because one pollution permit has the same value in terms of pollution permits to each. And if there are all transaction costs associated with transfer in amenity rights dx, then the MPKH-Chicago reasoning would conclude that the most efficient outcome is for the pollutee to make the bribe dy to the polluter but for the polluter to keep the pollution rights dx.

III. NUMERAIRE ILLUSION WITH CONSUMER AND SUPPLIER SURPLUSES

A. Summing Up So Far

There has been a long and rather exhausting debate in the law-and-economics literature about the KH principle, where the principle is often presented in the form of the wealth-maximization principle or, even, as the "efficiency norm."29 In spite of the wide variety of arguments pro and con, the numeraire-illusion analysis seems to have escaped attention. Indeed, the numeraire-illusion analysis renders the debate rather moot. In an unpalatable example such as the apple-and-money one, the wealth-maximization principle gives opposite results, depending on whether apples or money is taken as the numeraire. If money is the numeraire, then the apple transfer is wealth-increasing and the money transfer is not, but if apples are the numeraire, then the money transfer is wealth-increasing and the apple transfer is not. When the policy recommendation of the wealth-maximization principle reverses itself under a trivial redescription of exactly the same transfers, then the principle itself is rather incoherent – and the debate over it rather pointless.

The variability of the MPKH reasoning to numeraire change is not as obvious in the usual context of law and economics or cost–benefit analysis, but the underlying logic is the same. In the law-and-economics literature, the "apple transfer" might be some proposed change in the law. In cost–benefit analysis, the "apple transfer" would be some complex project under consideration, and the numeraire illusion is the statement that "pure transfers of funds among households, firms and government should themselves reasoning that would analyze the project benefits and costs."30 When the "apple transfer" is a proposed legal change or a proposed project, the flaw in the MPKH reasoning is more hidden from view.31 Perhaps that is why such a simple methodological error has persisted for so long. The problem in the underlying MPKH reasoning is easily exposed in Friedman's simple apple-and-dollar example26 – and how could the reasoning suddenly become valid when

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27 Taking Chicago as the mother Church in law and economics, we here again a church eating a "do not move" statement (i.e., that social wealth "does not move" from transfers in the numeraire money or purchasing power) as a substantive assertion instead of a mere consequence of the choice of coordinate systems.

28 See the appendix for a proof.


30 Bawa, Economic Evaluation of Projects, p. 35.

31 At the end of the appendix, the general result is stated that for complex multimodality and multiplier transfers that together form a Pareto improvement, the MPKH reasoning will recommend all the transfers except the transfers in the numeraire, because the effects of the latter seem to vanish because of the numeraire illusion. Change the numeraire to one of the other commodities, and then the MPKH reasoning will recommend all the transfers (including those in the old numeraire) and the transfers in the new numeraire.

32 A more realistic example would be a land reform program with positive net monetized benefits of land transfers from, say, the rich to the poor. Revaluing the benefits and costs in terms of land as numeraire (which we might assume is of a uniform grade) yields the result that the compensation
apple transfers are replaced by more complex transactions in goods. Focusing on complex changes only fogs over the difficulties and does not resolve them. The "ostich defense"—not looking at cases where the numeraire can be easily reversed—does not change the underlying logic (or the lack thereof).

**B. The Standard Textbook Treatment**

The numeraire illusion is hardly confined to the literature on cost-benefit analysis or the economic analysis of law. We will show how it arises in the standard textbook rendition of Marshall's consumer and supplier surpluses. There is a downward-sloping demand curve; the quantity of x demanded, x_d, is a function x_d = d(p) of the price in dollars per unit x. And there is an upward-sloping supply curve; the quantity of x supplied is a function x_s = s(p) of the price. Equilibrium occurs at a price p^* at which the quantities demanded and supplied are equal: x_d = d(p^*) = s(p^*).

Leaving aside the fine-grained controversy about measuring the consumer and supplier surpluses as not germane to our analysis, the standard, or "naive," Marshallian definitions will be used. The total benefit to the consumer(s) in receiving x is measured in dollars by the area under the demand curve from 0 to x (see Figure 6.3). If px was paid out to receive x, then the net gain is the consumer's surplus. In a similar manner, the area under the supply curve from 0 to x represents the loss measured in dollars to the supplier(s) in giving up x. If px was received in return for x, then the net gain is the supplier's surplus.

For the transfer of x from the supplier to the consumer, the total gain to the consumer is represented by the area abox, whereas the total cost to the supplier is the area giox. The difference is the total social surplus, represented by the area abfg. If the consumer paid px (the area pbox) to receive x, then the difference is payments to the rich are also a project that increases social value but that the actual land transfers have no impact on social value (as measured in land).

We might also give MPKH their best case by assuming just one consumer and one supplier. Thus the apostrophe is before the x in consumer's and supplier's surpluses.

The most efficient amount of x to transfer is the one that maximizes the increase in the social $5 pie, which is the equilibrium value x^*. Many textbooks still use this MPKH reasoning to "explain" the efficiency of the competitive equilibrium (in this market, the exchange of x in return for p*x^* dollars). The Pareto explanation of efficiency (using up all the opportunities for mutually beneficial exchange) is usually also given as if the two accounts were equivalent.

But the difference between the two accounts of efficiency becomes clear as soon as we take the MPKH reasoning seriously enough to ask about the efficiency role of the p*x^* payment. From the Pareto viewpoint, it is necessary to make the exchange mutually beneficial, a Pareto improvement, so the x transfer without the p*x^* transfer does not pass Pareto muster. But from the KH efficiency point of view, the payment p*x^* is redistributive; it does not change the size of the social $5 pie. Thus numeraire illusion arises in this standard textbook account by picturing the x transfer as generating by itself the consumer and supplier surpluses, whereas the p*x^* transfer is only redistributive.

In spite of this reasoning being developed to facilitate economics giving "professional" or "scientific" advice to public policy, the reasoning in fact reverses itself after a mere redescription of exactly the same market with reversed numeraires.

**C. The Inverse Description**

We now give an inverse description of the same market, reversing the roles of the commodity x and the revenue R = px. The supply curve provides the functional relationship giving the amount of x that is supplied if the revenue R = s(p)x is paid for it. The seller of x goes to the market and demands money spent on x in exchange for x. Thus the x supplier is the R demander, and the reciprocal p = 1/R is the unit price of a dollar spent on x in terms of x (where we may assume 0 < p < ∞ and thus p is in the same range). Thus the revenue demanded as a function of p is R_x(p) = R(1/p) = s(1/p)/p. This is the revenue (money spent on x) demand function in the redescribed market interpreting x supply as R demand.

Revenue demand curve: R_x(p) = s(1/p)/p.

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24 This highlights that the "mimic the market" rhetoric in Chicago-style law and economics selectively ignores the fact that market transactions involve payments.

25 Intuitively, the commodity dollars spent on x could be thought of as money earmarked in a budget to be spent on x. The amount of this commodity supplied to or demanded from the market will depend on its price p = 1/R in terms of the numerator x. Like an earmarked budget item, R units of this commodity can only be exchanged for p R units of x.
the inverted way as the market for the supply and demand for money spent on $x$ with the payments made in $x$.

It should not be surprising that the equilibrium properties of the model were unchanged by the mere redistribution with reversed numeraire. However, the constraints of the MPKH reasoning change completely with the change in numeraire.

The area under the revenue demand curve (ABRO in the diagram) from 0 to $R$ gives the total gain to the $S$ demander (the $x$ supplier), expressed in the numeraire $x$, from receiving $R$. The area under the revenue supply curve from 0 to $R$ (AFGO) gives the total loss to the $R$ supplier (the $x$ demander) from giving up $R$. The difference gives the total social surplus, the increase in the social $x$ pie, from the $R$ transfer from the $S$ supplier to the $S$ demander. The transfer of the $x$ payment for $R$, namely, $p' = (1/p)x = x$, in the opposite direction is a mere redistribution of $x$ that does not change the size of the social $x$ pie.

The most efficient transfer of $R$ is the amount that maximizes the increase in the social $x$ pie – which is $R^*$. That transfer of $R^* = p^*x^*$ from the $S$ supplier ($x$ demander) to the $S$ demander ($x$ supplier) is the efficiency part of the transaction. The transfer of payment $p^*R^* = (1/p^*)p^*x^* = x^*$ from the $S$ demander to the $S$ supplier does not affect the size of the social $x$ pie, so it is the equity part of the total charge – all according to the MPKH reasoning.

Thus in the textbook supply-and-demand competitive model, we have the ordinary description of the model with money as the numeraire (given in the textbooks), and we also have the inverse description with the commodity $x$ as the numeraire (not given in textbooks). The underlying properties of the model (e.g., the equilibrium value of $x^*$, the equilibrium price ratio of $x$ per $p^*$, and the equilibrium amount of money $R^*$ transacted) are all the same under the redefinition. But the MPKH parsing of the efficiency part and the equity part of the total charge rewrites under the reversal. The $x^*$ that is the efficient increase in the social $x$ pie becomes a value-indifferent change in terms of the social $x$ pie (i.e., the numeraire-illusion reasoning that ‘one unit of $x$ has the same value in terms of $x$ to everyone: one’). The $R^* = p^*x^*$ transfer of money, which was the value-neutral change in terms of the social $x$ pie, becomes the efficient increase in the social $x$ pie (see Table 6.2).

The numeraire-illusion analysis of the MPKH logic is not based on some esoteric special cases with little everyday relevance; the analysis applies to the simplest and most general textbook model of market equilibrium. Because the analysis in
terms of efficiency (increased size of the social pie) reverses itself under the mere redescription of the same market with reversed numeraires, we see in the context of the standard textbook supply-and-demand model that recommendations based on MPKH efficiency reasoning are baseless. The MPKH shortcut to efficiency is a dead end.

What survives? The conclusion that is numeraire-invariant is that the mutual exchange of $x$ for $R^*$ is mutually voluntary, that is, that both transfers together are Pareto-superior change. But this conclusion is based entirely on Pareto reasoning, and the MPKH efficiency-equality parsing and the wealth-maximization principle play no role.

FINAL REMARKS

One might ask: Where is economic reasoning misled by the numeraire illusion into making noninvariant conclusions? Where else have the "high priests" of economics habitually chosen to use "geocentric coordinates" and then "scientifically" drawn the conclusion that "the sun moves but the earth does not"? There is a whole research program to conduct an intellectual audit across economics to see where the numeraire illusion might lead to error as it did in the MPKH tradition of welfare economics.

Our focus here has been on Chicago-style (wealth maximization) law and economics, cost-benefit analysis, and other areas of applied welfare economics based on the MPKH reasoning. The common pattern is that a potential overall Pareto improvement is parsed into two parts: the proposed project or change, and the compensation of the losers that would make the total project cum compensation into a Pareto-superior change. Then the MPKH reasoning is used to represent the project by itself as an increase in the social pie measured by the money metric, and thus as something that can be recommended by economists on efficiency grounds. The compensation is represented as a redistribution of the social pie, a question of equity, not efficiency.

The purpose of considering hypothetical redistributions is to try and separate the efficiency and equality aspects of the policy change under consideration. It is argued that whether or not the redistribution is actually carried out is an important but separate decision. The mere fact that it is possible to create potential Pareto improving redistribution possibilities is enough to rank one state above another on efficiency grounds.36

Richard Posner makes a similar point in the context of law and economics as well as cost-benefit analysis. He notes that KH efficiency leaves distributive considerations to one side:

But to the extent that distributive justice can be shown to be the proper business of some other branch of government or policy instrument . . . . it is possible to set distributive considerations to one side and use the Kaldor–Hicks approach with a good conscience. This assumes . . . that efficiency in the Kaldor–Hicks sense—

APPENDIX: THE ALGEBRA OF THE BASIC ARGUMENT

The controversies about measuring "consumers’ surplus" or "aggregate willingness to pay" by integrating under Marshallian demand curves or Hickian compensated demand curves are not germane to our point. Hence we will avoid those controversies by making the simple and basic point using differential changes (i.e., small changes at the margin) around a point prior to any integration over a path of finite changes.

There are two commodities $X$ and $Y$ involved in the changes. There are two value systems that give prices $P_1 > P_2 > 0$ of $X$ in terms of $Y$ that could be thought of as the marginal rates of substitution of $Y$ for $X$ of two different people, as the marginal rates of transformation of $X$ into $Y$ of two systems of production, or as resulting from any two different value systems in general. For example, the two prices might be the marginal rates of substitution of $Y$ for $X$ for persons 1 and 2:

$$P_i = \frac{MRS_{x,y}^i}{U_x^{i}} = \frac{MU_x^{i}}{MU_y^{i}} \quad \text{for } i = 1, 2$$

where $MRS_{x,y}^1 > MRS_{x,y}^2$. Let $P$ be any price between $P_1$ and $P_2$ that will function as a public rate of exchange between the two systems.
We will further assume that these prices were determined by some prices of X and Y in terms of a third commodity Z. Let $P_{1z}$ and $P_{2z}$ be the prices of X in terms of Z that are subjective or internal to the two systems, such that $P_{1z} > P_{2z}$, and let $P_z$ be an intermediate public price of X in terms of Z. Similarly, let $P_{1y}$ and $P_{2y}$ be the prices of Y in terms of Z in the two systems such that $P_{1y} > P_{2y}$, and let $P_y$ be an intermediate public price of Y in terms of Z. The previous prices of X in terms of Y are determined by the Z prices:

$$P_1 = P_{1z}/P_{1y} > P = P_{d}/P_y > P_2 = P_{2z}/P_{2y}.$$ 

The prices of Y in terms of X would be obtained by inverting the prices of X in terms of Y.

Thus we have three arrays of prices corresponding to the three different numeraires (X, Y, and Z). In the first description of dX and dY between systems, or persons, 1 and 2, Y is the numeraire. Then we describe the same transfers with X as the numeraire. Both these descriptions will involve the numeraire illusion, because the numeraire is one of the commodities involved in the transfers being evaluated. The MPKH reasoning will apply to each of these cases but give opposite results. Then we evaluate the dX and dY transfers using a noninvolved commodity X as the numeraire. Then no numeraire illusion arises, and the MPKH reasoning does not apply.

We start with the description using Y as the numeraire (see Figure 6.5).

If dX is transferred from where it has a lower value in 2 to where it has a higher value in 1, then the Y cost of taking dX out of 2 is $P_y dX$, whereas the gain from adding dX to 1 is $P_1 dX$. Thus the increase in Y from the dX transfer is

$$\Delta Y = (P_1 - P_2) dX > 0.$$ 

Now suppose that dY = $P_d dX$ units of Y are transferred from 1 to 2. The cost to 1 is $dY = P_d dX$ units of Y, and the gain to 2 is $dY$ units of Y, so the transfer of dY units of Y (or any other units of Y) yields no change in the size of the Y pie. The net change for 1 (or $P_1 - P_2$) dX < 0, and the net change for 2 is $(P_1 - P_2) dX > 0$, so both 1 and 2 are better off, and the two positive slices add up to the Y pie:

$$(P_1 - P_2) dX + (P_1 - P_2) dX = (P_1 - P_2) dX = \Delta Y.$$ 

The first term, $(P_1 - P) dX$, is the marginal version of X (consumer's surplus), and the second term, $(P_1 - P_2) dX$, is the marginal version of X (supplier's surplus).

The $dY = P_d dX$ transfers change the distribution of the Y pie between 1 and 2, but do not affect the size of the pie.

So far, this is just mathematics. Then the MPKH reasoning is misled by the numeraire illusion involved in measuring the effect of the dY transfer in terms of Y to conclude that the dY transfer added no value or wealth; it was only a redistribution. The value increase was all in the dX transfer, so it can be recommended on grounds of efficiency while the dY transfer can be treated separately as a question of equity.

But this asymmetric treatment of the dX and dY transfers is only a consequence of the asymmetric choice of one of the involved commodities as numeraire to evaluate the transfers. Reverse the choice of numeraires, and the conclusions will be reversed. Taking X as the numeraire, $P_1 = 1/P_1$ is the price of a unit of Y in units of X in system 1, and $P_2 = 1/P_2$ is the price of a unit of Y in terms of X in 2 (see Figure 6.6).

We now evaluate the results of the dY transfer from 1 to 2. The loss to 1 is $P_1 dY$, and the gain to 2 is $P_2 dY$, so, noting that $P_2 > P_1$, we have the increase in the X pie from the dY transfer as

$$\Delta X = (P_2 - P_1) dY > 0.$$ 

Now taking $P' = 1/P$, we find that $P' dX = P_d dX = dX$ is the same dX units of X transferred from 2 to 1. The cost to 2 is $dX$ units of X and the gain to 1 is $dX$ units of X, so the transfer in dX units of X (or any other units of X) yields no change in the size of the X pie (i.e., the self-measuring yardstick records no change). But there is a change in the distribution of the pie. The net changes for 2 and 1 are respectively

$$(P_2 - P') dY > 0 \quad \text{and} \quad (P' - P_1) dY > 0,$$

so both 1 and 2 are better off, and the two positive slices sum to the X pie:

$$(P_2 - P') dY + (P' - P_1) dY = (P_2 - P_1) dY = \Delta X.$$
Similarly the gain in system 2 from receiving \(dY\) and giving up \(dX\) is

\[
\Delta Z_2 = P_{13}dY - P_{23}dX = \left( P_{13} - P_{23} \right) dX + \left( P_{13} - P_{23} \right) dY > 0,
\]

and the two benefits sum to the total \(Z\) benefit:

\[
\Delta Z = \Delta Z_1 + \Delta Z_2 = \left( P_{14} - P_{24} \right) dX + \left( P_{14} - P_{24} \right) dY.
\]

where \(\left( P_{14} - P_{24} \right) dX > 0\) and \(\left( P_{14} - P_{24} \right) dY > 0\). Note that both transfers now contribute to the total benefit evaluated using a numeraire not involved in the transfers.

There is no simple multiplicative conversion of \(\Delta Z\) into \(\Delta X\) or \(\Delta Y\), because the \(Z\) must be converted into \(X\) or \(Y\) at the different rates internal to system 1 or system 2.\(^{39}\) For instance, \(P_{14}dX\) would be divided by \(P_{14}\) to get the equivalent values in \(Y\) in system 1, while \(P_{24}dX\) would be divided by \(P_{24}\) to get the equivalent \(Y\) value in system 2. Thus, to arrive at \(\Delta Y\), we would have to divide the different terms in the expression for \(\Delta Z\) by the appropriate \(Y\) prices for each system:

\[
\left( \frac{P_{14}}{P_{14}} \right) dX + \left( \frac{P_{14}}{P_{14}} \right) dY = \left( P_{14} - P_{24} \right) dX + \left( 1 - 1 \right) dY = \Delta Y.
\]

Note now the numeraire illusion appears in the mathematics as the zeroing out of the \(dY\) coefficient, that is, \(-1\) in the calculation of \(\Delta Y\) (the increase in the \(Y\) price from the transfers using \(Y\) as numeraire). In a similar manner we could convert \(\Delta Z\) into \(\Delta X\), and the numeraire illusion would appear in the zeroing out of the \(dX\) coefficient in \(\Delta X\). When the numeraire illusion is avoided by evaluating the \(dX\) and \(dY\) changes in terms of some other noninvolved commodity \(Z\), then we saw that both transfers added value.

With a noninvolved commodity as numeraire, the MPK reasoning gets no illusionary foothold to recommend either \(dX\) or \(dY\) by itself on efficiency grounds. At the cost of some complication, other commodities can be added to make the changes or project more complex. For instance, there might be other transfers \(dX\) from 1 to 2 and \(dY\) from 1 to 2 so all the transfers together were a Pareto improvement. Then with \(Y\) as the numeraire, the MPK reasoning would recommend the \(dX\), \(dX'\), and \(dY\) transfers on efficiency grounds. With \(X\) as the numeraire, the MPK reasoning would recommend the \(dX', dY\), and \(dY\) transfers on efficiency grounds.

The general result, which models a legal change or project as a set of multi-commodity and multiperson transfers (i.e., project cum compensation), is that when all the transfers together constitute a Pareto improvement, then the MPK reasoning will recommend all the transfers except the numeraire transfers on efficiency grounds. Change the numeraire to one of the other commodities, and then the MPK reasoning will recommend on efficiency grounds all the transfers including those in the old numeraire except the transfers in the new numeraire.

\(^{39}\) This emphasizes the point that "changing numeraires" does not mean the trivial conversion of net benefits in one numeraire to another at some fixed public price ratio, but resummation of the benefits and costs when converted at each person's internal rate of substitution to the new numeraire.
When only two goods are involved in the transfers (as before), then the general numeraire-illusion flaw in the MPKH reasoning is illustrated in the simplest and most dramatic way as a reversal in the efficiency recommendations arising from a mere change in numeraire. The KH argument that efficiency does not require the numeraire transfers is only numeraire illusion. Changes in a yardstick cannot be revealed by the same yardstick — but can be revealed by changing the yardstick.

7 Justice, Mercy, and Efficiency

SARAH HOLTMAN

If one proposes to consider mercy and efficiency under the same heading, the aim surely must be to draw a contrast. For we associate mercy not only with leniency but with a fine sensitivity to circumstances and both the ability and the disposition to sympathize. No matter what the context in which we contemplate it, efficiency carries none of these associations. It requires no well-trained sensitivities or dispositions. These arc time-consuming to develop and costly to employ. A mathematical formula, ready-to-hand and relatively simple to apply, much better suits efficiency’s focus on savings.

This general division between mercy and efficiency carries over to their more specialized application in legal contexts. Here mercy urges attention to facts and circumstances that we might ignore if we focused solely on what strict justice requires or permits. It is, we might say, a virtuous disposition to leniency marked by a compassionate attention to the circumstances at hand. Efficiency, in its relatively recent incarnation as the guiding principle of the law-and-economics approach to legal interpretation, is perhaps best understood as a means of wealth maximization. Depending on the context, we can use standards including Pareto superiority, the Kaldor–Hicks test, and the Coase theorem to determine what legal standards, or interpretations, will yield the most substantial gains. The chief concern of the economic approach is to achieve Pareto-optimal outcomes, those in which no distributional change could increase utility for one party without decreasing it for another. The measure of utility, of course, is individual preference, judged by parties’ willingness to exchange positions or bundles of goods.1

1. For a helpful overview of the features traditionally thought to characterize mercy, see Jeffrie Murphy’s discussion in Jeffrie Murphy and Ivan Hampton, 1988, Forgiveness and Mercy, New York: Cambridge University Press, p. 66.


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