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**NOTES ON TRANSACTIONS COSTS AND THE ANALYSIS
OF MICROECONOMIC MONETARY THEORY**

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by

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A feast is made for laughter, and wine
maketh merry: but money answereth all
things. Ecclesiastes 10:19

A fundamental understanding of the microeconomic aspects of money still eludes economic theory. Professor Tobin noted more than a decade ago:

The intellectual gulf between economists' theory of the values of goods and services and their theories of the value of money is well known and periodically deplored. Twenty-five years after Hicks's eloquent call for a marginal revolution in monetary theory our students still detect that their mastery of the presumed fundamental theoretical apparatus of economics is put to very little test in their studies of monetary economics and aggregative models. As Hicks complained anything seems to go in a subject where propositions do not have to be grounded in someone's optimizing behavior and where shrewd but casual empiricisms and analogies to mechanics or thermodynamics take the place of inferences from utility or profit maximization. [13]

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Many people with whom I have had conversations on this subject will see their contribution here. I would like particularly to acknowledge K. J. Arrow, D. Foley, F. Hahn, W. P. Heller, J. Ostroy, M. Rothschild, and J. Tobin. They bear no responsibility for errors.

The difficulty pointed out here derives I think from the very structure of non-monetary microeconomic theory. In microeconomics we find it convenient to abstract from costs of transaction and search. But one of the fundamental uses of money is the reduction of these costs. In traditional microeconomics we find it convenient to assume that there is no uncertainty, or -- what is almost indistinguishable -- to assume that all uncertain events are fully insurable. But one of the major roles of money and financial assets payable in money is that they are held because of uncertainty in a world in which other forms of assurance are excessively costly or nonexistent. The equilibrium of which microeconomists are so fond depends on all goods being divisible. Curious then that classical discussions of money should insist that the monetary commodity be "divisible." Behind this insistence is the realization that most goods are not divisible but that the difficulties such indivisibilities pose may be at least partly overcome by assuring that at least one generally held commodity be divisible. The microeconomic function of money is the facilitation of trade and efficient allocation. The framework in which our theory of trade and allocation is expounded is one in which these functions take place without impediment. Microeconomic monetary theory is in an awkward position as the theory of a commodity that facilitates a process having no need of facilitation.

The cornerstone of modern microeconomic theory is the concept of optimization. Firms maximize profits. Households behave so as to achieve least upper bounds of their budget constraint sets as evaluated by their preference pre-orderings. A good microeconomic monetary theory will be a conclusion of a theory of agents' maximizing behavior. Thus Hicks writes

It was marginal utility that really made sense of the theory of value; and to come to a branch of economics which does without marginal utility altogether! ... What is wanted is 'marginal revolution'.

That is my suggestion. But I know that it will meet with apparently crushing objections. I shall be told that the suggestion has been tried out before... The suggestion has a history, and its history is not encouraging.

This would be enough to frighten one off, were it not for two things. Both in the theory of value and in the theory of money there have been developments in the [past] twenty or thirty years... And these developments have considerably reduced the barriers... [7]

Since these remarks were made (1934) there have again been developments in the theories of money (eg. [9, 14, 15]) and value [1, 3] which may sufficiently reduce the barriers to a general microeconomic theory of money.

Transactions Costs

Transactions costs enter fundamentally in the attempt to make the structure and means of exchange the result of optimizing decision. Choices are made so as to minimize cost or to maximize satisfaction or profits subject to cost. The process of exchange may be chosen to be more or less costly, more or less effective. Transactions costs determine whether monetary exchange dominates barter, when bilateral exchange is preferable to multilateral exchange, and under what conditions money rather than futures contracts will be used as stores of value over time. To the extent that the origins of transactions costs are in the informational requirements of exchange [10, 11], analysis leads to a fundamental unexplored area of microeconomics.

The initial effect of transactions costs is to discourage trade, and more interestingly, to channel trade in less costly directions. Trading partners will be chosen on the basis of how costly they are to trade with; media of exchange are chosen with a view to the costs they impose on transactions of which they are a part. The classic microeconomic properties of money and exchange can presumably be restated meaningfully in the more general -- though perhaps less revealing -- context of statements about transaction cost. If proposed media of exchange are not cognizable portable or divisible this reflects high costs of identifying, transporting, or dividing the media. If monetary exchange dominates barter exchange because the latter requires a double coincidence of wants then the requirement of double coincidence and the superiority of money reflect lower search, coordination and transactions costs.

The intention, then, is to analyze and (one hopes) to explain the structure of markets and exchange in terms of optimizing behavior involving avoidance of transactions costs. If two institutional arrangements seem capable of achieving virtually the same outcomes and one has substantially lower transactions costs the presumption is that the latter is likely to be the one that persists.

It is a commonplace that transactions costs are likely to exhibit diminishing marginal costs, to be non-convex. Non-convexity will not revolutionize the analysis. Non-convex transactions costs give an incentive to avoid transactions and to perform transactions in low cost fashion. The added incentive will be to take advantage of the diminishing marginal transaction cost by making transactions larger and more concentrated (in time,

geography, variety of trading partners, or purchases). Non-convexities are also likely to cause discontinuities in the behavior of agents as a function of other economic variables.

Market Activity and Structure

An immediate consequence of transactions costs sufficiently high is to make it no longer worthwhile for some markets to operate. This is particularly true of markets that can in part be replaced by other markets less costly to operate or where many markets can partly be replaced by a single market with a correspondingly smaller number of transactions. This is the argument of [4, 6] for the inactivity (speaking loosely but descriptively one would say nonexistence) of futures markets especially those where delivery is contingent on an uncertain event. Such markets can of course be replaced by spot markets. It is further argued that the link between present and future that is provided by futures markets can be almost as well furnished by a single intertemporal commodity of certain future value and low transaction cost. This commodity is thought of as "money", fulfilling the traditional "store of value" function. My own feeling is that it begs at least part of the question to define money as the low transactions cost low uncertainty commodity. It would be preferable to show that a commodity having other defining characteristics of money, in particular, medium of exchange, is likely to have these as well.

Transactions costs may vary with who is doing the trading, of what, and with whom. Traders will seek to arrange their trades so as to conduct most of their dealings in the least costly fashion. Though it is physically

possible to buy shoes from friends, relatives, strangers, or a shoe factory, most agents purchase their shoes from agents that have contrived to minimize the transactions cost associated with buying shoes from them, shoe stores. The whole structure of merchandising activity, retailers, wholesalers, brokers, could presumably be analyzed and derived as the result of a structure of transactions costs. Such an approach is likely to involve a good deal of hand waving and ad hocery in the absence of some analysis of the origin of transactions costs deriving them from more fundamental considerations or at least describing the transactions technology from which transactions costs are derived in more detail. Similarly, such micro economic aspects of money as the Fisherine payment period and the nonsynchronization of receipts and disbursements should be the result of optimizing behavior in the presence of transactions costs.

Scale Economies in Production

There is a hoary tradition in economic analysis that transactions costs, and their reduction through the use of low cost means of exchange, have something to do with the exploitation of economies of scale. The greater the exploitation of economies of scale the more specialized is individual output. The more specialized the output, the greater is the need to exchange.

Adam Smith writes:

But when the division of labour first began to take place, this power of exchanging must frequently have been very much clogged and embarrassed in its operations. One man, we shall suppose, has more of a certain commodity than he himself has occasion for, while another has less. The former consequently would be glad to dispose of, and the latter to purchase, a part

of this superfluity. But if this latter should chance to have nothing that the former stands in need of, no exchange can be made between them. The butcher has more meat in his shop than he himself can consume, and the brewer and the baker would each of them be willing to purchase a part of it. But they have nothing to offer in exchange, except the different productions of their respective trades, and the butcher is already provided with all the bread and beer which he has immediate occasion for. No exchange can, in this case, be made between them. He cannot be their merchant, nor they his customers; and they are all of them thus mutually less serviceable to one another. In order to avoid the inconveniency of such situations, every prudent man in every period of society, after the first establishment of the division of labour, must naturally have endeavoured to manage his affairs in such a manner, as to have at all times by him, besides the peculiar produce of his own industry, a certain quantity of some one commodity or other, such as he imagined few people would be likely to refuse in exchange for the produce of their industry. [12, bk. I, ch. 4]

Money, or some other device for reducing the difficulties (transactions costs), of exchange is essential to the full exploitation of division of labor and the attendant scale economies. The more fundamental determinant of the extent to which scale economies can be exploited is demand within a market whose compass is limited by transactions costs. "As it is the power of exchanging that gives occasion to the division of labour, so the extent of this division must always be limited by the extent of that power, or in other words, by the extent of the market." What are we to make of this concept of the "extent of the power of exchanging," "extent of the market"? The measure of the extent of an agent's power of exchanging is the ease or difficulty of performing exchange. Thus, we should be able to construct a full and rigorous analysis of markets with economies of scale in production relying on transactions costs to avoid those indeterminances which scale economies imply in their absence.

Suppose transactions costs are not uniform across trading partners. For any agent, there may now be some low cost trading partners, some intermediate cost, some high cost. One way to think of this is merely to suppose that transactions costs vary with the distance between trading partners. Some are nearby with low cost, others are farther away. The extent of the market is now partly an economic decision. Depending on the presence of competitors with lower transactions costs for some of the agents we may discover that the extent of the market for the agent in question is merely his low cost trading partners or low and medium or somewhere between these, the cut-off point being the result of individual decisions based on (potentially) lower prices due to the exploitation of scale economies traded off with higher transactions costs incurred in expanding the list of active trading partners. I expect analysis in this direction to result in a general equilibrium model with economies of scale in production along essentially Smithian lines. If achieved, this will be substantial progress since the inability to incorporate economies of scale in production into a general equilibrium model has long frustrated general equilibrium theorists.

Nonconvex Transactions Costs

It is often argued in a casual way that transactions costs are likely to exhibit diminishing marginal costs. The effort to write a \$1000 check is substantially less than 1000 times that required for a \$1 check. Though the observation is accurate, it is also a bit superficial. It would be good to see a deeper analysis. There is a range of phenomena in monetary economies that lend themselves to explanation in terms of nonconvex transactions costs.

The immediate implication of diminishing marginal transactions cost is that there are savings to be achieved by bunching purchases together. Which purchases to bunch depends on the specification of the cost function. The simplest function is the traditional set-up cost function. Such a function specifies that there is a transactions cost of zero in purchasing zero units of a good. Purchase of any positive quantity implies fixed positive constant transactions cost plus some cost varying as a convex (increasing marginal) or linear function of quantity. In such a case there is an incentive to acquire and hold inventories of the good in order to hold down the number of fixed cost elements incurred. This is why consumers hold nonzero inventories of consumer goods. Further it is the explanation of the transactions demand for the holding of idle demand deposits when the same purchasing power might more profitably be held as time deposits.

The traditional problem in dealing with non-convexities in consumer behavior in general equilibrium analysis is that non-convexities generally imply discontinuities in demand functions rendering fixed point theorems inapplicable. By the argument above, after all, if a consumer is going to make a purchase, it will be a sizable one, and there is likely to be some price at which he is just indifferent between purchasing and not doing so. Hence, in the neighborhood of that price his demand function makes a jump, the discontinuity. It seems reasonable to suppose that a near-equilibrium concept could be developed which could handle the small unsatisfied excess demands implicit in these discontinuities and give us a meaningful equilibrium with set-up transactions costs and inventories.

In the presence of diminishing marginal transactions costs, traders might well find it advantageous to buy at one shot their lifetime needs of all commodities. Indeed, they would do so in the absence of liquidity constraints, perishability, and (more generally) carrying costs. A meaningful analysis of equilibrium with inventories and set up costs on individual transactions will include the carrying costs of inventory as well. A similar argument will explain why transactions and payments for goods naturally continuous in time (labor, services of rented durables) take place in substantial discrete units rather than continuously or in very small units.

The holding of inventories of means of payment, idle balances, is sometimes attributed to uncertainty, the precautionary motive. Though uncertainty as to when he will want to make a transaction can explain a desire on the economic agent's part to have means of payment available, addition of transactions costs is necessary to turn this desire into a demand for idle balances. In the absence of transactions costs the agent will hold his wealth in assets of positive yield. When an unforeseen need for means of payment arises he will costlessly convert the necessary portion of his wealth into means of payment and perform the transaction. He will hold means of payment only instantaneously, during the process of the transaction. Thus transactions costs are an essential element of inventory holding of media of exchange, even in the presence of uncertainty. Whether the transactions costs need to be nonconvex as well depends on whether the media of exchange are time dated or durable. This point is discussed further below.

Related Transactions

So far the only "bunching" analyzed has been consolidation of purchases making them larger and less frequent. It also arises that merely by virtue of trading with one agent, there is a family of other agents with whom transactions costs are reduced relative to what they would otherwise be. This is the reason for the agglomeration of commercial districts and shopping centers. Having purchased a nonzero quantity of a commodity from an agent, incremental cost of further units of the same commodity or other commodities from the same agent may be reduced. Again, this may suggest something about the structure of commerce.

Another form of bunching is that several trades distinct in principle (and sometimes in practice) may be made at once rather than separately and appear as a single trade. Thus, a long term loan is merely several short term loans strung together at once; similarly for a long term lease. This last form of bunching raises a technically tricky modelling problem in the case of durable goods. It is often convenient to treat as distinct commodities otherwise identical goods available at different dates. Indeed, it is a production process to transform a good at one date into the same commodity at a succeeding date. Thus, acquisition of durable good, in what appears to be only one act of purchase, is for purposes of these models the purchase of a whole family of distinct commodities, the good at each date of the good's lifetime. One way to model this situation is to treat the acquisition of a durable good as a bunched purchase of the separate dated goods of which the durable is composed. Such an approach changes the standard model nearly

as little as possible though it seems unnecessarily complicated. Indeed, the simpler approach is merely to present buying, selling, or scrapping the commodity at various dates. The difficulty arises when we wish to represent in the same model both purchase and rental of the durable. Specification must then be made of feasible and infeasible portfolios of dated and undated durables.

Economy-Wide One-Shot Set Up Costs

The nonconvex transactions costs so far investigated are those involving a single transaction or closely related family of transactions. Another possibility is that a market arrangement may involve a once and for all set up cost for the economy as a whole [7]. If we suppose that establishment of markets using a given medium of exchange involves a set up cost for the economy, such a model might describe why monetary economies are characterized by a single or very small collection of closely related media of exchange. A very large portion of the obligations held in an advanced monetary economy are expressed as contracts to deliver a certain quantity of the single medium of exchange. In a world where the holding of media of exchange is neither satisfying nor productive in itself we would expect obligations denominated in a wide range of goods (perhaps at a discount reflecting the transactions cost of disposing of them). The concentration of obligations in a small range of goods closely related to and including the medium of exchange is a bunching effect.

The near identity of the medium of exchange, store of value, and unit of account may be another bunching effect reflecting the results of set-up

and transactions costs. Once the economy has a medium of exchange there is a saving in the volume of arithmetic performed if the unit of account can be made to exchange one for one with the medium of exchange. In an economy where most transactions use the single medium of exchange, a store of value payable in something other than the single medium of exchange will require that payees exchange the payout for the medium, thereby incurring transactions cost. It will be more convenient if the store is payable in the medium of exchange.

Prospects for the Analysis.

When the full implications of the general equilibrium analysis of monetary economies with transactions costs are developed, economic theory will have moved substantially closer to the integration of the theory of money and the theory of value. This has long represented an important family of unsolved problems. But the area of economics that microeconomic analysis has found most difficult to penetrate is not so much the theory of money as that theory's next of kin, macroeconomics, in particular the analysis of macroeconomic disequilibrium. A more adequate microeconomic theory of money will move us several steps closer to macroeconomics [2, 5]. Will microeconomics' roots in static equilibrium theory limit the progress along this line?

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