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A MICRO VIEW OF THE
TRANSACTIONS MONEY MARKET

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Abstract

This paper provides a micro-oriented, price-theoretic perspective on the transactions money market. Such a perspective is useful for three reasons. First, it emphasizes that the supply of transactions money will depend on, among other things, the state of technology in the transactions-money-producing industry, the price of transactions money, the cost of factors of production utilized to manufacture transactions money, and the prices of substitutes for and complements of transactions money--types of determinants that are commonly taken into account in the specification of a supply curve of commodities other than transactions money but have been given either little attention or ignored in the case of transactions money. Second, a micro perspective can also deal with the fact that transactions money is not a homogeneous good--provided that the costs of transforming/transporting the different money forms to a homogeneous state are specifiable (the divisia approach to monetary aggregation notably takes a percentage transformation/transportation cost approach). Third, a micro perspective affords a framework for comparative statics--i.e., for estimating the allocative and distributive consequences of such aspects of the market as reserve requirements (a percentage tax on regulated transactions money producers), interest-rate ceilings (transactions money price floors), and improvements in technology or innovations (outward shifts of the transactions money supply curve--contrary to the currently popular approach, which models such innovations as inward shifts of the demand curve for transactions money).

I. INTRODUCTION

In reviewing the literature on the concept of transactions money and on the nature of the transactions money market, it is surprising to note the tendency with which economists rely on a "macro" perspective. In analyzing and predicting the level of and changes in transactions money variables, economists favor (with the possible exception of Pesek 1976) rule-of-thumb and broad causal arguments at the expense of a more fundamental "micro"-oriented (price-theoretic) approach. To determine the supply of transactions money, for example, a money multiplier is standard fare (with assumptions being made about the currency-deposits ratio desired by the public and the reserves-deposits ratio maintained by the banks). Little attention is given to the state of technology in the transactions-money-producing industry, the cost of factors of production utilized to manufacture transactions money, the price of transactions money, and the prices of substitutes for and complements to transactions money; yet, these types of determinants typically are taken into account in the specification of a supply curve of commodities other than transactions money.

The prevalence of macro perspectives probably derives from the tilt toward macro-analysis in the training of economists studying transactions money. It may also, although less likely, stem from a perception that micro-analysis is either unfruitful in or inapplicable to the case of transactions money. This paper attempts to erode such a perception and to point to how macro-trained economists may benefit from occasionally wearing micro eyeglasses.

Notwithstanding the "back-of-the-envelope" methodology employed below, a micro perspective appears to be both tractable and useful. Its usefulness is two-fold. First, it provides a convenient way of characterizing the transactions money market. Why not treat transactions money as a good produced and consumed by participants in a market (albeit a good with distinctive attributes and a market with peculiar features)? Second, a micro-oriented approach affords a framework for comparative statics. Once the transactions money market is modeled, "tried-and-tested" micro-analytic techniques exist for estimating the allocative and distributive impacts of such aspects of the market as reserve requirements, transactions money price floors, and changes in technology (innovations).

While future work will hopefully put some empirical meat on the theoretical bones assembled here, this paper outlines a method for depicting the market and for undertaking comparative static analyses. It is a skeleton at best--open to criticism and elaboration. Nevertheless, it is intended to show how a micro perspective on the transactions money market may be developed. Benefits from such a perspective will perhaps accrue to academics as well as to "real world" policymakers who regulate transactions money.

II. MODELS OF THE TRANSACTIONS MONEY MARKET

A. Beginner's Version

In its simplest form, the transactions money market may be characterized by two equations:

$$\begin{aligned}
 [1] \quad S &= S(P_{tm}, \overset{+}{TEC}, \overset{+}{G}, \overset{?}{P_{fop}}, \overset{-}{\bar{P}_S}, \overset{+}{P_C}, \dots); \\
 [2] \quad D &= D(P_{tm}, \overset{-}{TA}, \overset{+}{Y}, \overset{+}{POP}, \overset{+}{DIST}, \overset{?}{P_S}, \overset{+}{P_C}, \dots).
 \end{aligned}$$

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The aggregate supply of transactions money will be (ceteris paribus):

1. An increasing function of the price of transactions money, P_{tm} . Holding everything else constant, that is, a rise in the price of transactions money will result in an increase in the quantity of transactions money supplied.
2. An increasing function of the level of technology, TEC, available to firms manufacturing transactions money. Innovations such as EFT and ATM, for example, will shift the supply of transactions money outward.
3. An uncertain function of the goals, G, of transactions-money-producing firms--depending on whether these firms are sales-maximizers, satisficers, or profit-maximizers.
4. A decreasing function of the price of the factors of production, P_{fop} , utilized in the manufacture of transactions money--labor (e.g., tellers), capital (e.g., computers), energy (e.g., lighting or heating expenditures), and high-powered money. A rise, for instance, in the cost of high-powered money--via an increase in the discount rate or open market purchases of securities by the Federal Reserve--will shift the supply of transactions money inward (other things equal).
5. A decreasing function of the price of substitutes, P_S (e.g., barter).
6. An increasing function of the price of complements, P_C (e.g., marketplaces).

The aggregate demand for transactions money will be (ceteris paribus):

1. A decreasing function of the price of transactions money.
2. An increasing function of the intensity of preferences or tastes, TA, for transactions money. The demand for transactions money can be expected to shift outward, for example, **if** the members of an economy renounce their beliefs in communism and decide to live according to the tenets of libertarianism.
3. An increasing function of an economy's per capita income level, Y (provided that transactions money is a normal good).
4. An increasing function of an economy's population, POP.
5. An uncertain function of the distribution of income in an economy, DIST.
6. An increasing function of the price of substitutes.
- , A decreasing function of the price of complements.

The interaction of the above-outlined supply and demand equations will determine, according to standard economic analysis, the prevailing price and quantity of transactions money in the economy.

Leaving aside for now the issue of a precise definition of transactions money, demanders (i .e., consumers) of transactions money are assumed to include both firms and individuals. Suppliers of transactions money are presumed to consist of all firms manufacturing a product capable of being used for making payments. Transactions money producers, therefore, will include not only banks but also money market mutual funds, credit card companies, and any other establishments that supply a good having the ability to serve as a payments mechanism.

B. A Toy for Intermediates

The beginner's version of the transactions money market fails to account for two significant features of the market: 1) the presence of a complex regulatory matrix; and 2) the fact that transactions money is not a homogeneous good. While the former characteristic may be readily incorporated into a micro-analytic model, the latter makes such a model problematic if not intractable.

B.1. A Homogeneous Good, but Regulatory Distinctions

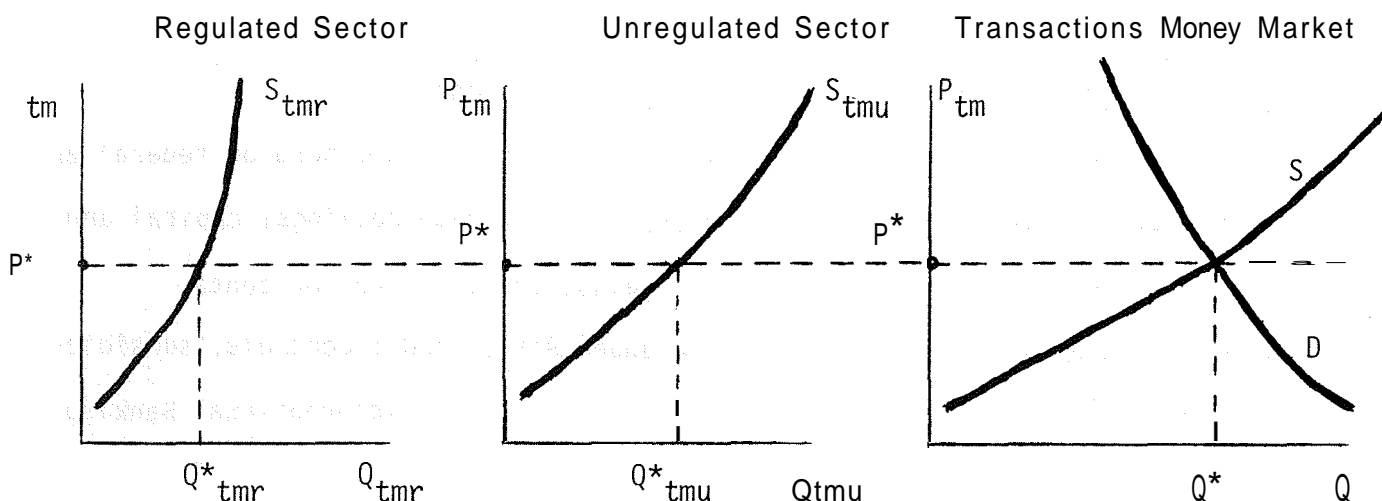
The transactions money market is subject to a plethora of federal and state regulations--reserve requirements, interest-rate ceilings, capital and insurance requirements, proscriptions against vertical and horizontal integration by suppliers (e.g., the McFadden Act), credit controls, subsidized check-clearing services, and entry restrictions (e.g., International Banking

Act of 1978). While the presence and extent of these regulations have varied, they do not, *per se*, render a micro approach to the transactions money market meaningless. In fact, provided that all forms of transactions money are perfect substitutes (e.g., currency, demand deposits, money market mutual funds), micro-analysis of the effect of these regulations may prove quite fruitful.

To start with the simplest case, assume that only federal regulations exist (via the Federal Reserve System) and that only one of two sectors of the domestic transactions-money-producing industry falls under the auspices of the Fed; the other sector is completely unregulated. As long as the good (i.e., transactions money) produced by the two sectors is homogeneous, the transactions money market may be depicted by Figure 1, where S_{tmr} represents the supply of transactions money regulated by the Fed, S_{tmu} represents the supply of unregulated transactions money, and S is the aggregate supply of transactions money in the economy.

Several points are in order about a Figure 1 conception of the transactions money market. First, both S_{tmr} and S_{tmu} are functions of the

Figure 1



same factors as S (see equation 1 above). Second, the relative slope and magnitude of $S_{t_{mr}}$ and $S_{t_{mu}}$ need not be identical (their relative slope and magnitude in Figure 1 are intended for exposition and not for accurate representation). All that matters is that regulated and unregulated transactions money are perfect substitutes (i.e., that they sell at the same price, P^*). Third, the aggregate supply of transactions money is determined by the horizontal sum of $S_{t_{mr}}$ and $S_{t_{mu}}$. At the prevailing price P^* , for example, $Q^*_{t_{mr}} + Q^*_{t_{mu}} = Q^*$ (this will be the case at any price level, not just P^*). Fourth, the price of transactions money is still determined by the interaction of the aggregate supply, S , and demand, D , for transactions money--as was the case in the beginner's version. Finally, the supply of transactions money can be broken down into not only two but into any number of Sectors--depending on the "segmentation effects" of existing federal and state regulations and the extent to which such regulations are deemed to be of relevance to an objective examination of the transactions money market. Theoretically, at least, there could be n sectors as long as the goods being produced by all of the different sectors were homogeneous.

8.2. A Nonhomogeneous Good

If the products manufactured by transactions money suppliers are not all perfect substitutes, a Figure 1 depiction of the transactions money market does not apply. Some version of such a conception might be redeemed, however, if the nonhomogeneous goods could be transformed/transported to the "perfect substitutes state" at either constant, fixed, or percentage cost.

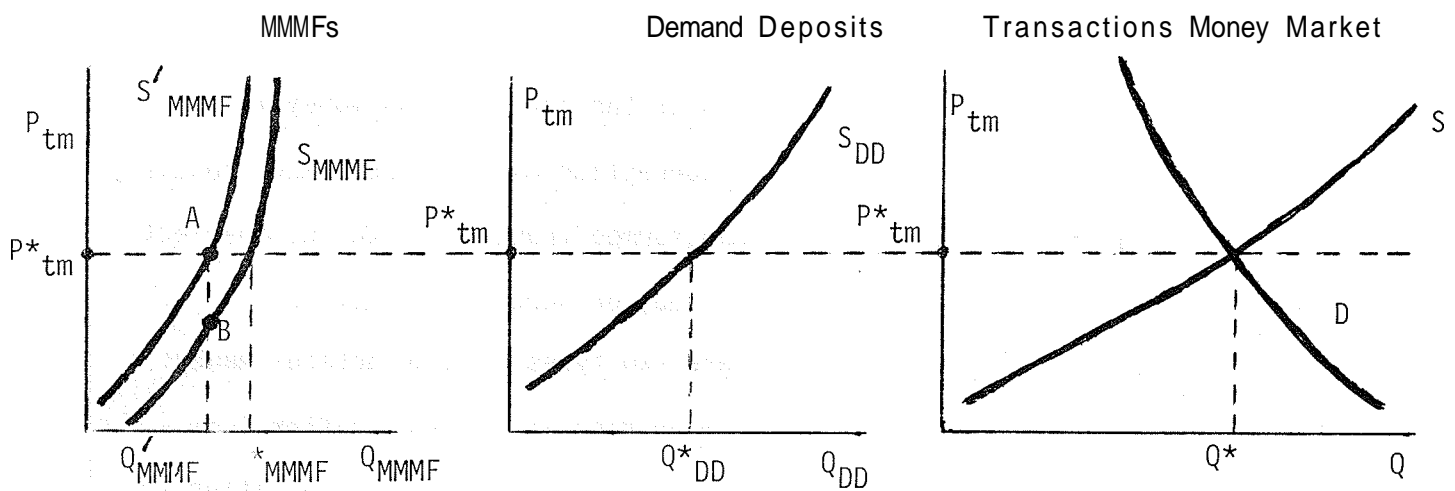
Suppose, for example, that there are two types of transactions money: money market mutual funds (MMMFs) and demand deposits. MMMFs differ from demand deposits in that the former serve as a store of value, in addition to

being used as a medium of exchange. Suppose also that MMMFs are transformable/transportable into demand deposits at constant cost--it takes \$0.05 to ship \$1.00 of MMMFs to a demand-deposit account. This situation is represented in Figure 2, where S_{MMMf} is the supply of MMMFs, S_{DD} is the supply of demand deposits, and S'_{MMMf} is the supply of pure transactions money inherent in S_{MMMf} (S_{MMMf} is transformable/transportable into demand deposits at a constant cost of $AB = \$0.05$).

Figure 2 differs from Figure 1 only in that the aggregate supply of transactions money in the economy, S , is determined by the horizontal sum of S'_{MMMf} and S_{DD} (not S_{MMMf} and S_{DD}). At the prevailing price P^*_{tm} , that is, $Q^* = Q^*_{DD} + Q'_{MMMf}$ (not $Q^* = Q^*_{DD} + Q^*_{MMMf}$). Analogous to Figure 1, Figure 2 may be generalized to the n-sector case--with the supply emanating from each sector being transformable/transportable into "pure" transactions money at a constant cost (note that transformation/transportation costs may vary across sectors).

As a further generalization, the transformation/transportation cost need not be constant. The cost may be a fixed or percentage cost. It is

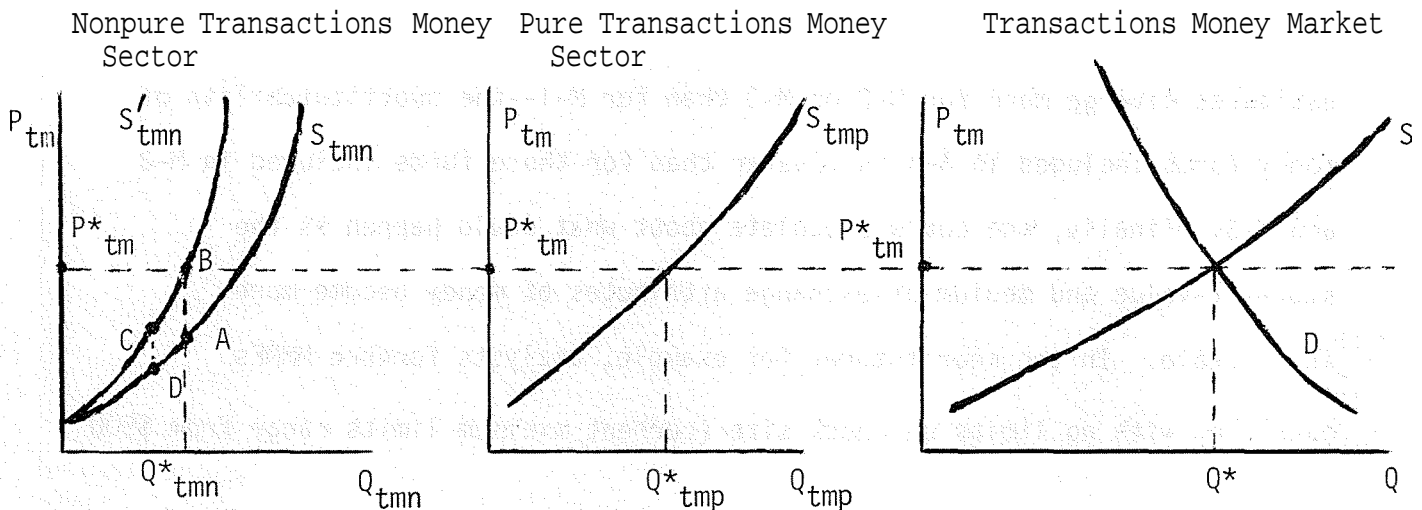
Figure 2



interesting to note that a divisia measure of the quantity of transactions money (see, for example, Barnett and Spindt 1982) opts for essentially a percentage transformation/transportation cost approach. An economist relying on a divisia measure attempts to ascertain the percentage of each particular form of transactions money that is "pure." A weight ranging from zero on up is assigned to each form of transactions money--the greater magnitude of the weight, the purer the transactions money form. Weights are determined by the user cost of each form of transactions money--by the extent to which the return on a particular form of transactions money to the consumer is less than the return on an asset valued primarily for its attribute of serving as a store of value. A divisia measure is thus a weighted average of various forms of transactions money--not a simple sum as are M-1, M-2, M-3, and L.

In the two-sector case (pure and nonpure), a divisia approach to deriving an estimate of the aggregate supply of transactions money may be depicted in Figure 3, where S_{tmp} represents the supply of pure transactions money, S_{tmn} represents the supply of nonpure transactions money, and S'_{tmn} represents the supply of pure transactions money inherent in the supply of nonpure transactions money.

Figure 3



The situation depicted in Figure 3 differs from Figure 2 only in the fact that the transformation/transportation cost is not constant--it is a percentage cost ($AB \neq CD$). The vertical distance between S_{tmn} and S'_{tmn} is a constant percentage. The extent to which S'_{tmn} is an inward pivot of S_{tmn} depends (monotonically) on the "pure moneyness" weight (ranging from 0 to 1) assigned to the nonpure form of transactions money (via calculation of user cost as described above). The lower the weight, the further inward is the pivot.

A divisia measure of transactions money admittedly might be fraught with difficulties. It would be an inappropriate technique, for example, if nonpure transactions money could not be rarefied via application of the above-described transformation/transportation cost method--if this were the case, however, simple aggregation of all imperfectly substitutable forms of transactions money would also be incorrect. The divisia approach would also prove troublesome if the assigned "pure moneyness" weights were inaccurate; i.e., if user costs were not a reliable indicator of the pureness of various forms of transactions money.

At first glance, however, a divisia approach seems to hold potential for being a superior method for ascertaining the supply of transactions money in an economy. The broader the monetary aggregate under examination, the more accurate will be the divisia approach; note that divisia and simple-sum estimates diverge more for M-2 or M-3 than for M-1--the substitutability of money forms included in M-1 is greater than for those forms included in M-2 and M-3. Finally, one could speculate about what would happen as the store-of-value and medium-of-exchange attributes of money become more inseparable. In the near future, for example, analysts foresee MMMFs operating with no limits on check size (current minimum limits range from \$500

to \$1,000) and relatively smaller initial deposit requirements (currently around \$1,000). **I**f technological advances permit MMMFs to offer such accounts, one would expect the amount of pure transactions money in an economy (measured along divisia lines) to decline drastically. Furthermore, as the stock (store-of-value) and flow (medium-of-exchange) attributes of money become further intertwined ("bundled together"), **i**t would foreseeably become more difficult for policymakers to effect monetary policy via control of basic monetary aggregates.

C. Puzzles for Experts (to Hand Wave or Not to Hand Wave?)

If the perfect substitutes case does not apply and **i**f the transformation/transportation cost remedy is inapplicable, micro-analysis of the transactions money market becomes quite difficult. In this "puzzle for experts" case, two approaches are available. First, one can fall back on broad causal arguments. **I**f, for instance, nonpure and pure transactions monies exist and are imperfect substitutes, the following line of reasoning might be adopted when the demand for nonpure transactions money shifts outward: 1) the price and quantity of nonpure transactions money will rise; 2) the demand for pure transactions money (a substitute for nonpure transactions money) will shift outward; 3) the supply of pure transactions money will shift inward; and 4) while the price of pure transactions money will rise, the quantity of pure transactions money will either increase or decrease (depending on the relative slopes and the extent of shifts of the pure transactions money supply and demand curves).

A second, and more quantitative, approach would be to estimate simultaneous systems for both the pure and nonpure transactions money markets--thereby obtaining measures of elasticities of substitution between

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the alternative transactions money forms. Such estimation, however, would probably be subject to severe multicollinearity problems. Specifically, a properly specified system of equations would have to include the prices of substitute goods--prices that, depending on the number of transactions money forms that are deemed to be substitutes, tend to be extremely collinear.

III. WORKING WITH THE MODELS: COMPARATIVE STATICS

It is possible to analyze the effects of various regulatory and institutional aspects of the transactions money market. This section will focus on the allocative and distributive consequences of three such aspects: reserve requirements, transactions money price floors, and innovations. The comparative statics of these three aspects will be examined in the context of the intermediate model--i.e., under the assumption that the supply of transactions money may come from either a regulated or an unregulated sector and that the good produced by both of these sectors is homogeneous. This approach is adopted for the sake of simplicity in exposition. Whenever possible, however, modifications of the intermediate model will be noted--modifications necessitated by either the perfect-substitutes-with transformation/transportation or the imperfect substitutes cases.

A. Reserve Requirements

Reserve requirements (RR) force producers of regulated transactions money to hold a fixed percentage of reserves (either vault cash or deposits with the Fed) against the amount of demand deposits (transactions money) they supply.

RR can thus be viewed as a percentage tax--for every dollar of output produced by regulated suppliers, a proscribed fraction of that output must be held in the form of sterile reserves (no interest accrues to banks from vault cash or deposits at the Fed).

A.1. First Cut

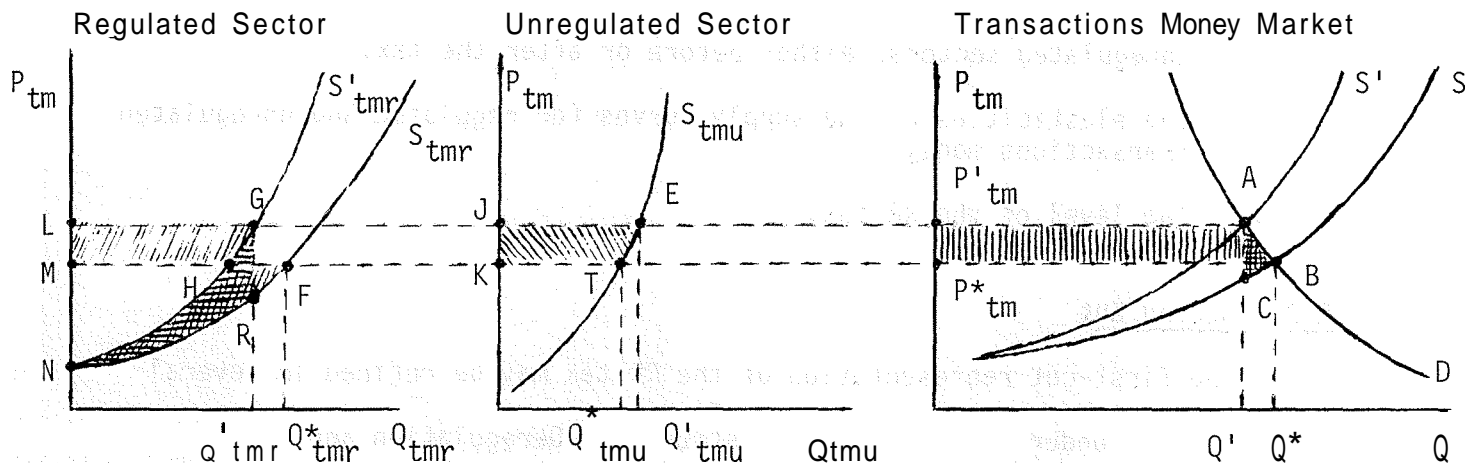
Characterizing RR as a percentage tax on producers of transactions money regulated by the Fed, the effects of such a tax are depicted in Figure 4, where S'_{tmr} is the supply of transactions money from the regulated sector after the imposition of the RR tax, S' is the total supply of transactions money following the imposition of the RR tax, and all other symbols are as before.

The allocative effects of the RR tax (ceteris paribus) include:

1. An increase in the price of transactions money from P^*_{tm} to P'_{tm} .
2. A decrease in the total quantity of transactions money supplied from Q^* to Q' .

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Figure 4



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3. An increase in the quantity of unregulated transactions money from Q^*_{tmu} to Q'_{tmu} .
4. A decrease in the quantity of regulated transactions money from Q^*_{tmr} to Q'_{tmr} .
5. A deadweight loss to the economy represented by area ABC.

The distributive effects of the RR tax (ceteris paribus) include:

1. A loss to consumers of transactions money equal to area $P^*_{tm}P'_{tm}AB$.
2. A gain to producers of unregulated transactions money represented by area JKTE.
3. A gain/loss to producers of regulated transactions money--depending on whether the beneficial effect of an increase in the price of transactions money (area LMHG) outweighs/is outweighed by the deleterious effect of the RR tax (area NHF).
4. A gain to the RR tax collector (i.e., the Fed) equal to area NGR.

The net value of the distributive effects of the RR tax will be negative and equal to area ABC--the deadweight loss from the tax to the economy as a whole.

To quantify the above-outlined allocative and distributive effects (aka the triangles-and-rectangles-approach to economics), one would need to know:

1. The own-price elasticity of the demand for transactions money.
2. The quantity of transactions money produced by both the regulated and unregulated sectors, either before or after the tax.
3. The elasticities of the supply curves for regulated and unregulated transactions money.
4. The level of the RR tax.

A.2. Second Cut

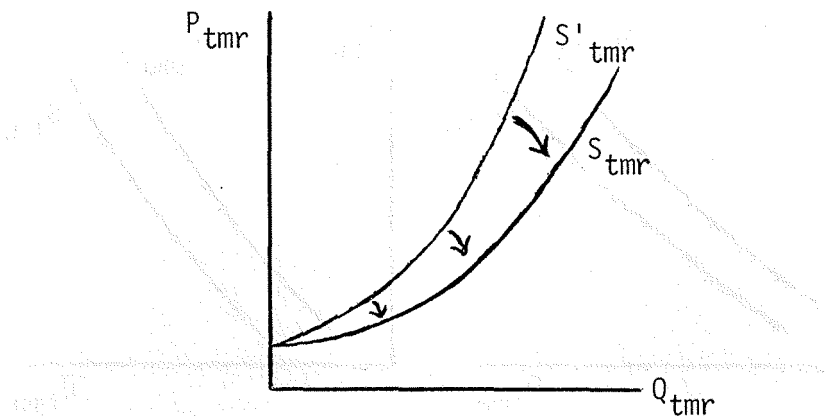
The first-cut representation of the RR tax may be refined in several ways. First, under the Depository Institutions Deregulation and Monetary

Control Act of 1980, RR are scheduled to be phased in by September 3, 1987, for all depository institutions, including commercial banks, mutual savings banks, savings and loan associations, credit unions, agencies and branches of foreign banks, and Edge corporations; previously only member banks were subject to the RR tax. In addition, reserve requirements are scheduled to be 3 percent for net transaction accounts up to \$26 million and 12 percent for any amount of net transaction accounts over \$26 million. The phase-in of the new RR tax schedules may be represented by the outward pivoting of the $S'_{t\text{mr}}$ curve in Figure 5 toward the $S_{t\text{mr}}$ curve (the RR tax was higher for regulated firms prior to the passage of the Monetary Control Act).

The imposition of a RR tax on previously unregulated producers can be characterized by either subdividing the unregulated sector in Figure 4 into "newly" regulated and unregulated sectors (e.g., MMMFs are still not subject to the RR tax) or else by transferring the "newly" regulated portion of the unregulated supply curve into the regulated sector. The latter approach is shown in Figure 6, where $S'_{t\text{mr}}$ is the supply of regulated transactions money

Figure 5

Regulated Sector of the Transactions Money Market



after implementation of the Monetary Control Act, S'_{tmu} is the supply of unregulated transactions money after implementation of the Monetary Control Act, and all other symbols are as before. Note that

$$S_{tmr} + S_{tmu} = S'_{tmr} + S'_{tmu} = S.$$

Whether the deadweight loss of the RR tax will increase with the implementation of the Monetary Control Act will depend on the relative impacts of: 1) the decreased tax on previously regulated producers and 2) the imposition of a RR tax on a portion of the previously unregulated sector.

The fact that net transactions accounts exceeding \$26 million are taxed at a 12 percent rate rather than at a 3 percent rate may be considered by distilling from the regulated sector those firms with net accounts greater than \$26 million and representing the supply curves of such firms as shown in Figure 7; where S_{26} is the supply curve for a representative firm with net transactions accounts greater than \$26 million and S'_{26} is the supply curve for such a firm after imposition of the RR tax (Monetary Control Act

Figure 6

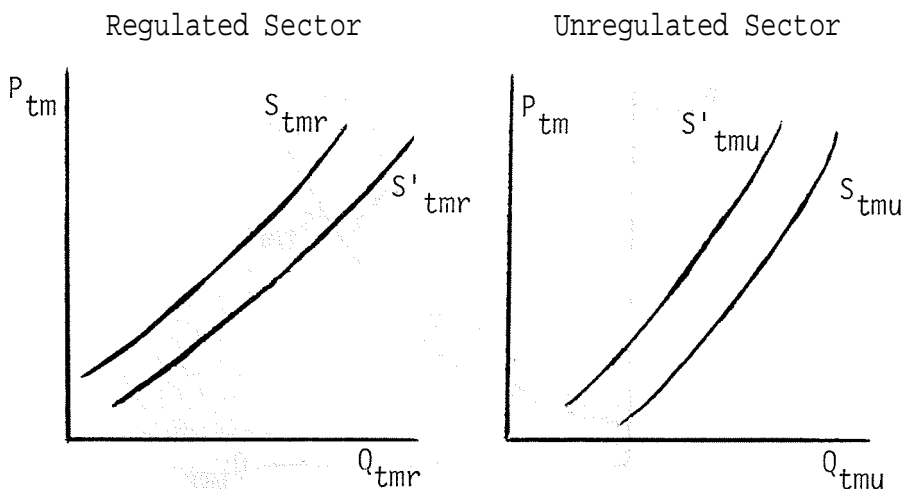
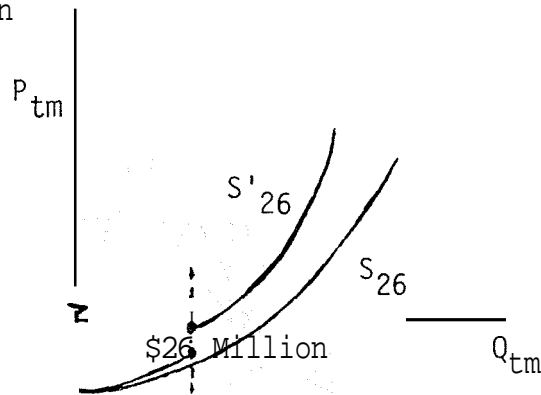


Figure 7

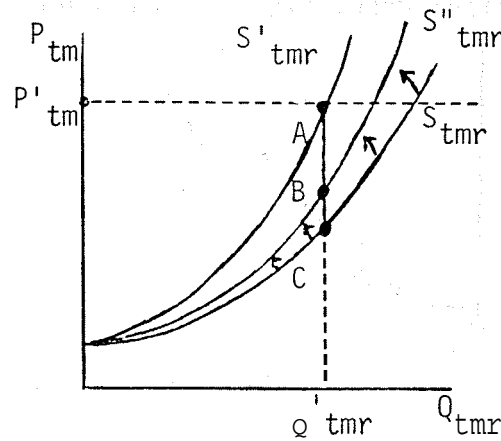
Regulated Transactions Money Producers with Net Transactions Accounts
 \geq \$26 Million



version). Note that the new supply curve is discontinuous at the quantity of \$26 million--representing the fact that the marginal tax rate jumps from 3 percent to 12 percent at this point.

Second, the first-cut depiction of the RR tax does not account for the fact that suppliers of transactions money might hold reserves even in the absence of the RR tax. Cagan (1979) conjectures that, without RR, transactions money producers would hold 1 percent reserves. Estimates of the reserves that would be held in the nonregulated case could also be derived by observing presently unregulated producers (e. g., state-chartered banks). The mere fact that transactions money producers would hold reserves in the absence of RR, however, does not pose a serious analytic problem. It simply implies that the original supply of regulated transactions money, S_{tmr} , should have been pivoted inward by the amount of reserves desired without RR, S''_{tmr} , as shown in Figure 8. Note that at Q'_{tmr} (or at any output level) imposition of a RR tax is relatively less onerous ($AB < AC$) and

Figure 8

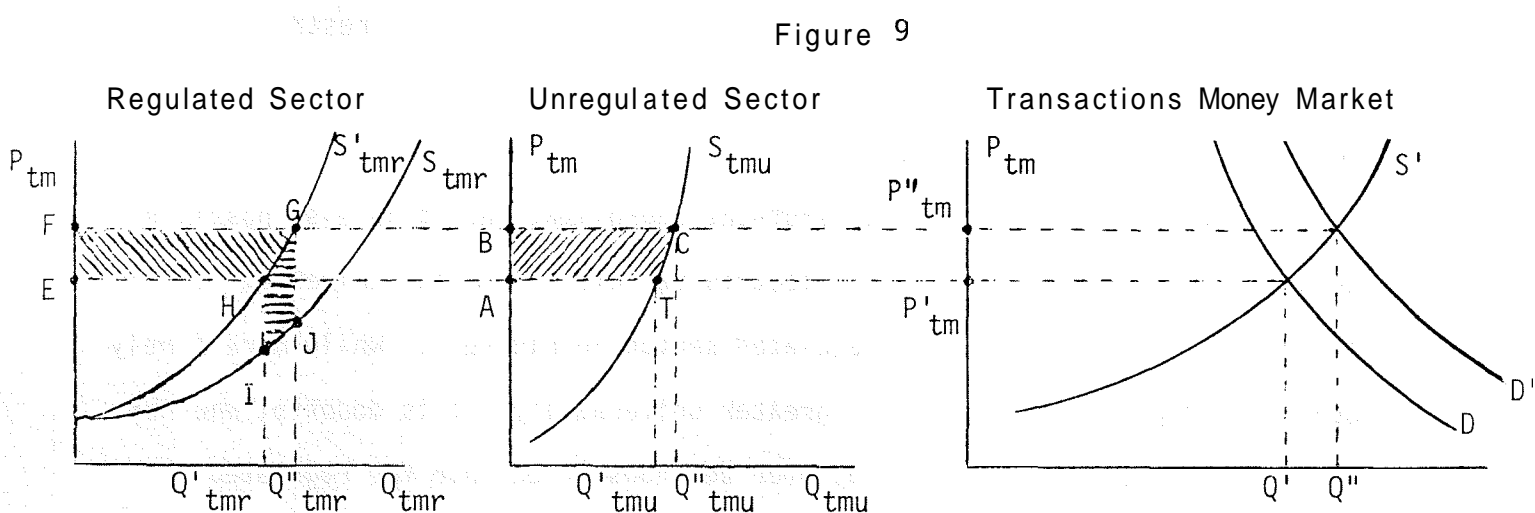


involves relatively less significant allocative and distributive impacts for the transactions money market.

Third, the first-cut characterization of the RR tax may easily be adapted to the perfect-substitutes-with-transformation/transportation case. One would simply apply the same analysis after filtering out the "nonpure" portions of the regulated and nonregulated transactions money supply curves (under the divisia approach, for example, one might take only a percentage of the unregulated transactions money supply curve). In the case of imperfect substitutes, however, a study of the effects of the RR tax would be more difficult. Nevertheless, one might still, after econometric estimation of simultaneous systems for both the regulated and unregulated transactions money markets, be able to estimate partially the consequences of a RR tax; partially only, since the RR-tax-induced increase in the price of regulated transactions money would shift both the demand for and supply of unregulated transactions money--limiting analysis of the effects of the RR tax on the unregulated sector.

Fourth, the first-cut depiction of the RR tax can provide at least a partial explanation of why unregulated transactions money has increased so rapidly in the U.S. economy. If, for instance, the demand for money shifts outward (ceteris paribus)--either because of the government (from the deficit) or individuals and businesses (from short-term financial strains)--then it can be expected that both the burden of the RR tax on regulated producers will rise and the supply of unregulated transactions money will increase, as shown in Figure 9.

With an increase in the demand for transactions money, the quantity of unregulated transactions money increases from Q'_{tmu} to Q''_{tmu} and the quantity of regulated transactions money rises from Q'_{tmr} to Q''_{tmr} . While unregulated producers benefit by an amount equal to area ABCT, regulated producers gain/lose--depending on whether area EFGH outweighs/is outweighed by area HIJG (the burden of the RR tax rises by area HIJG with the demand-induced increase in the price of transactions money). The tax collector (i.e., the Fed) gains additional revenue equal to area HIJG.



Fifth, the first-cut characterization of the RR tax assumes everything else remains constant. This assumption ignores the benefits the Fed derives from relying on RR in effecting monetary policy. Specifically, through RR, the Fed is capable of: 1) directly controlling the money supply; 2) preventing possible externalities attendant to bank failures resulting from insufficient reserves; and 3) minimizing the relative impact of variability in excess reserves on the variability in the quantity of transactions money (and thus on the income and price levels in the economy). While changes in RR have very rarely been used for the first reason and while Cagan (1979) argues that the second reason is obviated by deposit insurance, an active federal funds market, and the Federal Reserve as a lender of last resort, the third reason does appear to be a possible justification for RR. As Cagan points out, RR make excess reserves "a smaller or more constant fraction of total reserves." It is conceivable that the benefits of RR *vis-à-vis* excess reserves might be measured by: 1) estimating the level of excess reserves that would prevail in a non-RR world; 2) predicting the heightened variability in total reserves that would result from the relatively higher level of excess reserves in the non-RR world; 3) estimating the increased variability in national income and prices that would result from the greater variability of total reserves; and 4) comparing the costs of this variability with the allocative cost (i.e., deadweight loss) of a RR tax.

Finally, working from the first-cut approximation, it is also possible to speculate about the effect of attempts to make the RR tax universal--to meld the unregulated with the regulated sector in Figure 4. While more finely specified regulations may afford greater universality, it is doubtful whether all of the unregulated sector may ever be transferred into the regulated sector. Furthermore, if the RR tax is a burdensome one, transactions money

producers may be expected to vote with both their physical and mental feet (they will devise ways of circumventing existing regulations and getting back into the unregulated sector--e.g., RPs). New firms will also be given the incentive to enter the unregulated sector--firms that may be less susceptible to the Fed (e.g., foreign banks) and that may create a product that is a much more difficult form of transactions money to monitor and control (e.g., Merrill Lynch's parking-lot money).

8. Transactions Money Price Floors

Regulations of the payment of interest on various forms of transactions money are commonplace. There is, for example, a legal prohibition against banks paying any interest on demand deposits. NOW accounts may only pay 5.25 percent.

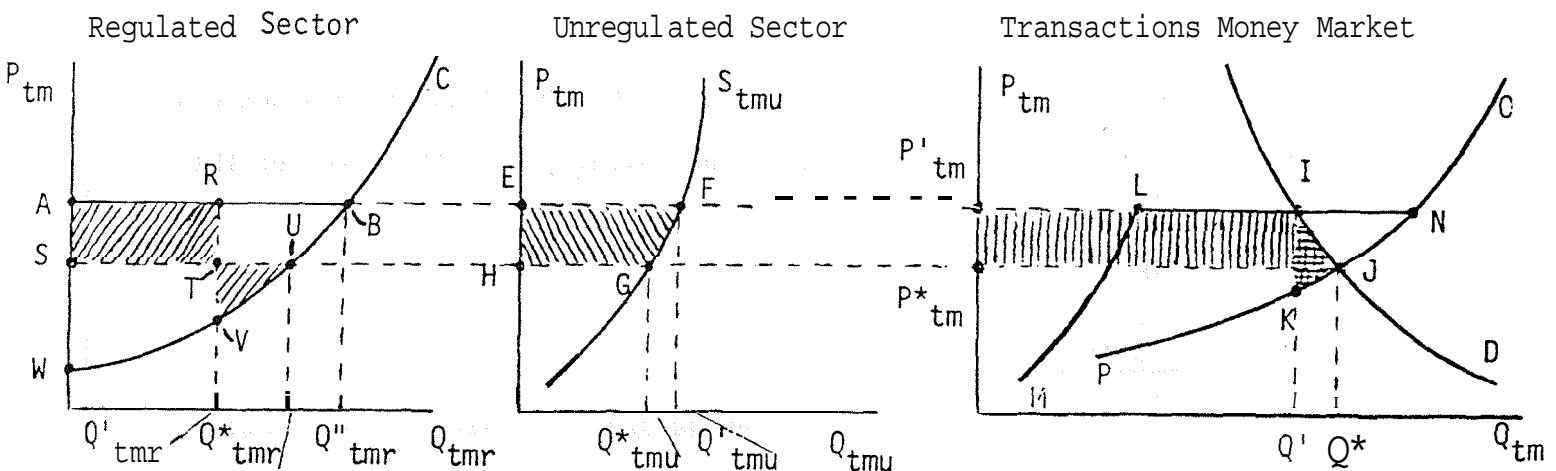
Why are such interest rate ceilings actually price floors? The reason for this apparent anomaly is rather simple. By limiting the amount of interest that producers of transactions money may pay on certain forms of transactions accounts, such regulations effectively dictate a user cost (i.e., a transactions money price) to consumers of such transactions accounts. The level of this user cost will vary positively and monotonically with the market rate of interest; i.e., the greater the interest rate, the higher will be the user cost of the regulated transactions money (other things equal and provided that the interest-rate ceiling is effective). The user cost of transactions money likewise will vary negatively and monotonically with the level of the governmentally proscribed interest-rate ceiling.

B.1. The Intermediate Model

Assuming that both regulated and unregulated suppliers of transactions money produce a homogeneous good (and thus that consumers/demanders of

transactions money cannot be differentiated along regulated market/unregulated market lines), the imposition of a nonuniversal interest-rate ceiling on the transactions money market may be depicted by Figure 10, where WBC represents the supply of regulated transactions money before the imposition of the interest-rate ceiling, ABC represents the supply of regulated transactions money after the imposition of the interest-rate ceiling, PKJNO is the aggregate supply of transactions money before the interest-rate ceiling regulation, MLINO is the aggregate supply of transactions money after the imposition of the interest-rate ceiling, and all other symbols are as before. Note that the supply of regulated transactions money becomes horizontal at the level of the user cost floor (this level will vary with the market rate of interest and the interest-rate ceiling). Up to quantity Q''_{tmr} , regulated transactions money producers would be willing to supply their product at a lower price than P'_{tm} to consumers, since the cost to the producers of supplying their product falls below the user cost to consumers (i.e., the price consumers will pay for the product). Interest-rate ceilings prevent suppliers from doing so (exceptions to this are noted below), however, and force consumers of such regulated goods onto the price floor AB.

Figure 10



After imposition of the interest-rate ceiling, the aggregate supply of transactions money will be the horizontal sum of S_{tmu} and ABC. The aggregate supply of transactions money will thus be equal to S_{tmu} below the price of P'_{tm} , have a horizontal segment at P'_{tm} , and be equal to the sum of S_{tmu} and ABC above the price of P'_{tm} .

The allocative consequences of an effective interest-rate ceiling (ceteris paribus) include:

1. An increase in the price of transactions money from P^*_{tm} to P'_{tm} .
2. A decrease in the aggregate quantity of transactions money from Q^* to Q' .
3. An increase in the quantity of unregulated transactions money from Q^*_{tmu} to Q'_{tmu} .
4. A decrease in the quantity of regulated transactions money from Q^*_{tmr} to Q'_{tmr} . Note that $Q'_{tmr} = Q' - Q'_{tmu}$. The quantity Q'_{tmr} will fall somewhere to the left of Q^*_{tmr} --its exact location will be determined by the elasticity of S_{tmu} . The more elastic S_{tmu} , the more will the quantity of regulated transactions money decline following the imposition of an interest-rate ceiling.
5. A deadweight loss for the economy as a whole--represented by area IKJ.

The distributive consequences of an effective interest-rate ceiling (ceteris paribus) include:

1. A loss to consumers of transactions money equal to area $P^*_{tm}P'_{tm}IJ$.
2. A gain to producers of nonregulated transactions money equal to area EFGH.
3. A gain/loss to producers of regulated transactions money--depending on whether area ARTS is greater/smaller than area TUV.

Analogous to the RR tax, the net wealth effect of an interest-rate ceiling will be negative and will be equal in magnitude to area IJK--the deadweight loss to the economy as a whole from an interest-rate ceiling.

An intermediate level approach allows several important observations and hypotheses to be made about an interest-rate ceiling. First, such a price floor toward consumers of transactions money provides another potential, if only partial, explanation for the recent increase in unregulated transactions money in the U.S. economy. The quantity of unregulated transactions money may be expected to increase with a rising price floor--caused, for example, by a rising market rate of interest.

Second, if the price floor becomes high enough (if segment AB moves up sufficiently), regulated transactions money may be squeezed completely out of the market--provided that the aggregate demand for transactions money, D , intersects the aggregate supply at a quantity below the horizontal segment of the aggregate supply curve.

Third, the higher the price floor for regulated transactions money, the less control the Fed will have over transactions money; the more the quantity of unregulated transactions money will increase and the more the quantity of regulated transactions money will decrease. Thus, as market rates of interest rise, one would anticipate that the Fed would have progressively less control over transactions money (ceteris paribus). The greater the elasticity of the supply of unregulated transactions money and the smaller the elasticity of the supply of regulated transactions money (other things equal), the more quickly the Fed's control over transactions money would erode.

Fourth, given that the cost of producing regulated transactions money is less than the legally proscribed price for such money (below the quantity Q_{tmr}), one would anticipate efforts on the part of regulated transactions money producers to lower the user cost (i.e., price) of their product to potential consumers. This argument might explain the payment of implicit interest on certain types of regulated transactions money--implicit interest

in the form of free toasters, personalized checks. Payment of such implicit interest may be viewed as an attempt to compete away the rents (area ARTS) that regulated producers derive from interest-rate ceilings. Payment of implicit interest may also be characterized as an effort to "convexify" the horizontal segment of the supply curve ABC--in the limit, an effort to get back onto the supply curve WBC.

Fifth, while the RR tax may afford the Fed the benefit of minimizing the effect of variable excess reserves, no similar potentially redeeming virtue suggests itself in the case of interest rate ceilings. If anything, transactions money price floors provide a "stable^N and predictable source of income for regulated suppliers that remain in the market. This stability is eroded, however, both by the presence of unregulated producers and by the payment of implicit interest by regulated producers. The higher the market rate of interest (ceteris paribus), the greater the erosion. A stable source of income for surviving regulated suppliers is also obtained at the expense of both nonsurvivors and the Fed (the Fed's ability to control transactions money is eroded).

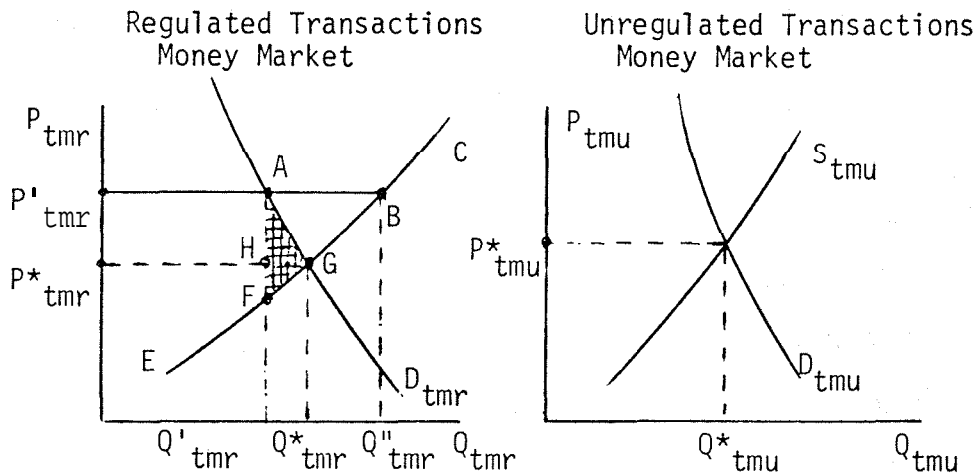
Sixth, the regulated and unregulated sectors in the preceding analysis of transactions money price floors need not correspond to the regulated and unregulated sectors in the case of the RR tax.

Finally, the Intermediate Model approach to transactions money price floors may easily incorporate a transformation/transportation cost element (see Section II.B.2. above).

B.2. The Imperfect Substitutes Model

If regulated and unregulated transactions money are imperfect substitutes (and non-transformable/non-transportable to the perfect

Figure 11



substitutes case), a different analytic approach is necessary. Such an approach will perhaps more clearly portray interest-rate ceilings as transactions money price floors.

Suppose, for example, that there are two separate markets--one for regulated transactions money and one for unregulated transactions money--as shown in Figure 11, where $D_{t\text{mr}}$ is the demand for regulated transactions money, $D_{t\text{mu}}$ is the demand for unregulated transactions money, EC is the supply of regulated transactions money prior to the imposition of an interest-rate ceiling, and all other symbols are as before.

Suppose that with the imposition of an interest-rate ceiling, consumers of regulated transactions money are forced to pay a price (i.e., to bear a user cost) of $P'_{t\text{mr}}$. Other things equal, the allocative effects of such a price floor will include:

1. A change in the effective supply curve of regulated transactions money to $P'_{t\text{mr}}ABC$.
2. A decrease in the quantity of regulated transactions money from $Q^*_{t\text{mr}}$ to $Q'_{t\text{mr}}$. Although the value of the marginal unit of transactions money at quantity $Q'_{t\text{mr}}$ exceeds the cost that must be

incurred to produce it, the price floor of $P'_{t_{mr}}$ precludes a further expansion of regulated transactions money (since the effective user cost exceeds the price consumers are willing to pay).

3. An excess supply of regulated transactions money at the price $P'_{t_{mr}}$ of $AB = Q''_{t_{mr}} - Q'_{t_{mu}}$. This excess supply or the fact that the cost of producing the marginal unit of transactions money exceeds the price consumers are willing to pay for that unit at $Q'_{t_{mr}}$ will foster attempts on the part of regulated transactions money producers to pay implicit interest--to stretch the effective supply curve $P'_{t_{mr}}ABC$ toward the original supply curve EC .
4. An outward shift in the demand for unregulated transactions money due to the increase in price of a substitute good (regulated transactions money).
5. An inward shift in the supply of unregulated transactions money.
6. An increase in the price and an uncertain effect on the quantity of unregulated transactions money (due to the simultaneous shift in the supply of and demand for unregulated transactions money).
7. A deadweight loss in the regulated transactions money market equal to area AFG .

While the distributive consequences of a price floor cannot be outlined for the unregulated market, they may easily be delineated for the regulated market:

1. A loss to regulated transactions money consumers equal to area $P^*_{t_{mr}}P'_{t_{mr}}AG$.
2. A gain/loss to regulated producers--depending on whether area $P^*_{t_{mr}}P'_{t_{mr}}AH$ is greater/smaller than area HGF .
3. A negative net wealth effect equal to area AFH (a deadweight loss).

C. Innovations

Although innovations have occurred in both the regulated and unregulated sectors of the transactions money market, the following examination will focus on innovations in the unregulated sector. This approach is adopted for three reasons. First, it appears that innovations in the transactions money market have occurred predominantly in the unregulated sector (e.g., money market

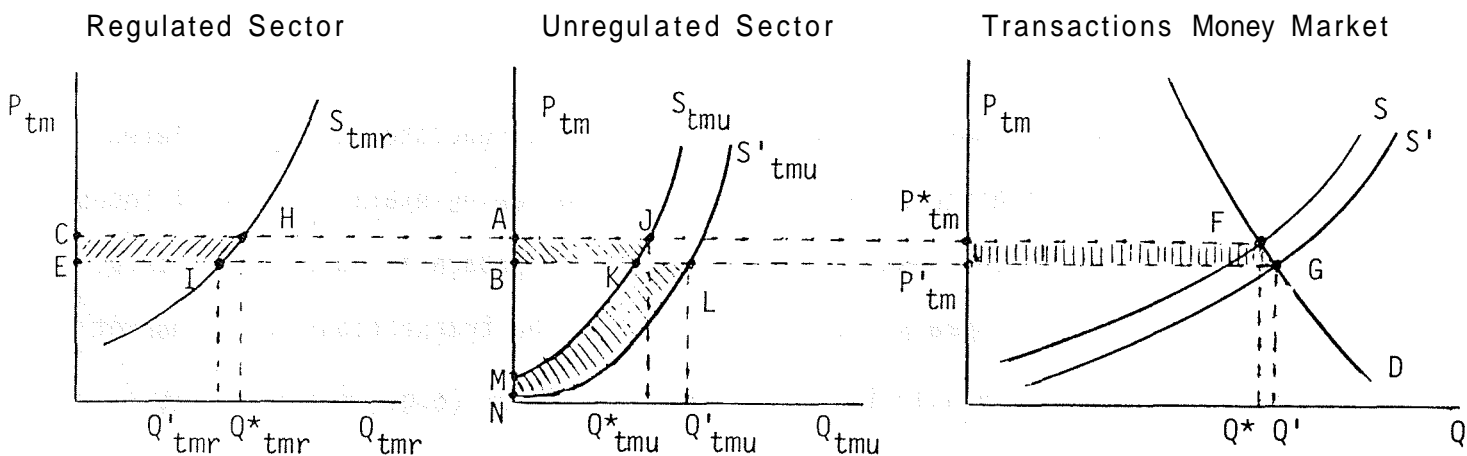
mutual funds). Second, innovations in the unregulated sector pose a greater threat to the Fed's ability to monitor and control transactions money. Third, future innovations will most likely occur in the unregulated sector--via the introduction of forms of money that bundle together medium-of-exchange and store-of-value attributes.

Innovations are taken to be a form of technological change and are represented below as outward shifts of the supply curve of unregulated transactions money. An outward shift in the supply of unregulated transactions money must be distinguished from an increase in the quantity supplied of unregulated transactions money--the latter results from the imposition of either a RR tax or a transactions money price floor. While this distinction is straightforward theoretically, it may be quite difficult to make empirically.

Innovations are assumed to include one-bank holding companies, advances in communications and electronics, RPs, MMMFs, Eurodollars, and other new forms of unregulated transactions money. Innovations, therefore, involve both actual technological changes and entry by new producers into the unregulated sector (e.g., Sears).

An innovation in the unregulated sector may be depicted as in Figure 12, where S'_{tmu} is the supply of unregulated transactions money following an

Figure 12



innovation, S' is the aggregate supply of transactions money following an innovation, and all other symbols are as before.

The allocative effects of an innovation include:

1. A decrease in the price of transactions money from P^*_{tm} to P'_{tm} .
2. An increase in the aggregate quantity of transactions money from Q^* to Q' .
3. A decrease in the quantity of regulated transactions money from Q^*_{tmr} to Q'_{tmr} .
4. An increase in the quantity of unregulated transactions money from Q^*_{tmu} to Q'_{tmu} . (The expansionary effect of the innovation must outweigh the contractionary influence of a lower price--given that the aggregate quantity increases, while the quantity of regulated transactions money declines.)
5. No deadweight loss.

The distributive effects of an innovation include:

1. A gain to consumers represented by area $P^*_{tm}P'_{tm}GF$.
2. A loss to producers of regulated transactions money equal to area $CEIH$.
3. A **gain/loss** to producers of unregulated transactions money--depending on whether area $MNLK$ **exceeds/is exceeded** by area $ABKJ$.

Note that innovations provide another possible explanation both for the recent rapid increase in unregulated transactions money and for the simultaneous decline in the Fed's ability to monitor and control transactions money.

Figure 12 also allows one to hypothesize that if an innovation is extensive enough (if the supply curve of unregulated transactions money shifts out far enough), regulated transactions money could be squeezed out of the market altogether. This might happen, for example, if an innovation allowed the bundling of money's store-of-value and medium-of-exchange attributes at minimal cost. The squeezing out of regulated transactions money, however, would occur only if the Fed had no ability to "capture" (e.g., via legislation) new forms of unregulated transactions money.

IV. CONCLUSION

While other aspects of the transactions money market (e.g., subsidized check-clearing processes, deposit insurance, and capital requirements) are capable of being analyzed from a micro perspective, the preceding section has focused on the comparative statics associated with only three central **aspects:** reserve requirements, transactions money price floors (interest-rate ceilings), and innovations. The analysis highlights the fact that a micro approach may afford a better conceptual grasp of the transactions money market than a macro approach. While much more empirical and theoretical work will be required, the above-outlined models are intended to generate interest in and discussion about a perspective on the transactions money market that is "less traveled by." Such a micro perspective, at least as far as regulatory decision making goes, might end up making **"all the difference."**

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