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September 25, 1992

MEMORANDUM TO: Participants, Voorburg Group
Williamsburg Conference

FROM: Jack E. Triplett JET
Chief Economist

SUBJECT: Paper for the Conference

The attached paper consists of uncorrected page proofs for an article on banking output, prepared for the forthcoming New Palgrave Dictionary of Money and Finance (MacMillan Press). As the references suggest, the New Palgrave entry is condensed from a longer paper: "Measuring the Output of Banks: What Do Banks Do?" I have chosen to circulate the shorter paper largely because conference participants already have an abundant quantity of reading, and a condensed paper can sometimes get the essential ideas across efficiently. A subsidiary reason is that I hope soon to have a revision of the full paper.

I will bring copies of the longer paper to Williamsburg as background material. Additionally, for anyone who would like to review the longer paper before the conference, a copy will be air mailed or FAXED. Please contact Peggy Burcham (202) 523-0842, FAX (202) 523-7538.

Attachment

uncorrected page proofs: 2/91

Wearside Tradespools *Macmillan*
The New Palgrave Dictionary of Money and Finance
K/s 19,712 BANKINGO.01 Article 0704

(1)

banking output. Analysis of the economic activity of any sector can scarcely proceed very far without a measure of that sector's output. For most of the service industries, measuring output is generally deemed to be difficult, for both conceptual and empirical reasons (Fuchs 1969). In the case of banking, however, researchers have yet to forge a consensus on the definition of output itself.

THE TRADITIONAL NATIONAL ACCOUNTS APPROACH. The oldest measure of banking output is the one contained in the national accounts of most countries. In the national accounts, banking output is derived largely as a consequence of the treatment of interest flows: production originating in a firm (value added) is defined to include net interest payments (interest paid minus interest received). Following this rule, the value added of financial firms' borrowing and lending activities is:

$$VA = \Sigma i_j D_j - \Sigma r_i L_i, \qquad (1)$$

where the first term records the firm's deposits (or other financial liabilities) and interest rates paid, and the second loans (or other financial assets) and interest rates received. The result is, obviously, normally negative.

This treatment of interest excludes the major source of bank revenue (income from lending activity) from the measure of banking output. Gorman (1969) colourfully remarks that the national accounts treatment of interest flows – unless adjusted – leaves the 'commercial bank . . . portrayed as a leech on the income stream'.

To avoid a clearly nonsensical output measure, banks are assumed in national accounts to provide unpriced or 'free' services to depositors (such as chequing accounts for which no explicit charges are made) that are equal in value to *the entire net proceeds from banks' lending operations.* In some formulations, borrowers are also deemed to receive free services (bookkeeping, credit ratings and the like). In either case, an imputation for banking output takes the form

$$\Sigma f_s S_s = -(\Sigma i_j D_j - \Sigma r_i L_i), \qquad (2)$$

where f_s and S_s are the implicit fee and (unobserved) quantity of unpriced service s, and the other symbols are defined as in equation (1). The total output of the banking industry includes the imputed value of unpriced services, as defined in equation (2), plus the value of services for which an explicit charge is levied (not only certified cheques and so forth – a very small part of bank revenue – but also in principle the panoply of financial and fiduciary services that characterize a modern bank). In the United Nations (but not the United States) implementation, an additional step assures that most of banking output is excluded from GDP and from international transactions. The national accounts approach to banking was first introduced by Yntema (1947); see also United Nations (1968).

Criticisms of the national accounts approach to banking output are quite old. Equation (2) implies that banks act as agents for their depositors (or perhaps for both depositors and borrowers); there is little evidence confirming such a model of bank behaviour, nor the idea that banks convert their entire earnings into unpriced services. Warburton (1958) asserted that a bank's sources of revenue (its loans) are as good an indicator of what banks produce and sell as are the revenues of a coal mine or a laundry, and proposed

an alternative 'services' approach that would recognize lending activity as the primary bank output. The services approach has been advocated more recently by Sunga (1984), Ruggles (1983) and others. The exclusion of banks' provision of finance to borrowers from the national accounts measure of banking output is a serious defect for any analytic purpose.

(2)

APPROACHES VIA BANKS' PRODUCTION FUNCTIONS. Explicit measures of bank output have also been developed in the literature on bank regulation. To determine if substantial economies of scale or economies of scope exist in banking, researchers have estimated explicit multi-output production or cost functions, where various bank financial outputs and inputs and the usual capital, labour and materials inputs are specified. Hancock (1991) provides comprehensive references to these studies.

Though obtaining a valid measure of output is crucial for modelling bank production and costs, a variety of approaches have been followed, and a consensus on conceptual questions has not yet emerged. One approach – inexplicably known as the 'production', or sometimes the 'value added', approach (but better termed the 'activity approach') – takes any bank activity that absorbs real resources as a bank output. Benston, Hanweck and Humphrey (1982) remark that 'Output should be measured in terms of what banks do that cause operating expenses to be incurred.' US measures of banking labour productivity (Dean and Kunze, forthcoming) also use an output concept that is essentially the activity approach, including in their measure of bank output counts of loan and deposit activities (such as loan applications processed and cheques cleared).

Critics of the activity approach note that a gadget factory incurs costs in unloading and processing incoming rolls of steel, but that does not make the activity 'unloading steel' an output of the gadget factory. The cost criterion followed in the activity approach does not serve to distinguish financial inputs from financial outputs.

In a second approach, the researcher distinguishes *a priori* between those banking activities that are properly considered the outputs of a bank and others that are deemed financial inputs. For example, Mester (1987) assumes, of savings and loan institutions, that 'output is best measured by the dollar value of earning assets of the firm, with inputs being labor, capital, and deposits', and specifies three outputs (two types of loans, plus other assets) and three deposit inputs (passbook, NOW accounts, and certificates). Because only bank assets, and not bank liabilities, are specified as outputs, this approach is usually termed the 'asset' approach to defining bank output (though sometimes it is also referred to as the 'intermediation' approach). Bank deposits are regarded as financial inputs to banks, a necessary source of finance that permits them to sell finance to others.

The asset approach implies that banks buy funds and sell funds, in much the same way as any other specialized merchant. It is equivalent to the services approach in the national accounts literature (see above). A criticism of the assets approach is that its grouping of inputs and outputs is arbitrary – the choices made by some researchers are disputed by others, and the approach admits no mechanisms for resolving such debates.

A third approach resolves the issues empirically. Appealing to Barnett's (1980) notion of the 'user cost of money', Hancock (1991) permits any particular banking activity to be an input or an output according to the sign of its derivative in a bank profit function, which she estimates empirically. In Hancock's empirical results (and in those of other researchers who follow the same approach), loans are bank outputs (which is consistent with both activity and asset approaches – and, of course, inconsistent with the national accounts approach); time deposits are inputs, but demand deposits are outputs.

A major advantage of the user cost approach is that it permits statistical tests of the hypotheses maintained in other approaches. One problem with the results so far arises from the fact that – though time deposits are typically paid for in strictly monetary terms – demand depositors receive a large portion of their return in unpriced services. Banks' user costs of demand deposits are accordingly understated by the omission of these bartered services, which biases the estimated sign of demand deposits in the profit function. Adding an imputation for the value of unpriced depositor services to the nominal cost of demand deposits would correct the bias, and, one expects, move the estimates in the direction of making demand deposits financial inputs to the bank, as are time deposits.

Irrespective of their approach to banking output, banking production function studies frequently consider whether bank output activity is best specified by the count of the numbers of loans (or deposits) of different types, or by their respective monetary volumes; often, both number and monetary volume measures are used, on the grounds that both contain information. The issue arises, of course, because loans are not a homogeneous commodity: they differ in size and also in other characteristics (riskiness, for example, or compensating balance requirements). Heterogeneity of inputs or outputs is addressed elsewhere in economic measurement as the 'quality problem', but the empirical methods followed in the quality change literature (see Griliches 1971) have so far not been applied to banking.

THE VIEW FROM THE FINANCE LITERATURE. The national accounts and the bank production literatures both view banks from the perspective of the theory of production. That is, they both look for analogies in the banking business that fit models that are typically applied to manufacturing or other nonfinancial business.

A much older tradition, however, is the approach to banking contained in money and banking, and in finance: '... The concern with banks in macroeconomics centers on their role as portfolio managers, whereby they purchase securities from individuals and firms (and a loan is, after all, just a purchase of securities) which they then offer as portfolio holdings (deposits) to other individuals and firms' (Fama 1980). 'The product of intermediation is the indirect financial asset [e.g. a bank deposit] coined from the underlying primary security [e.g. a bank loan] ...' (Gurley and Shaw 1960).

Bank deposits are of course part of the money supply. Modelling the banking firm as seller of deposits (Pesek 1970; Saving 1977; Towey 1974) is equivalent to depicting it as a supplier of money, which conforms to the major interests of money and banking and of macroeconomics. Towey considers and rejects the idea that loans (or 'credit') might be considered a bank output, and Pesek denounces it.

Obviously, the words 'selling finance' and 'buying securities' as applied to bank lending are merely alternative descriptions of the same transaction. The issue is not language itself but the appropriateness for particular purposes of the paradigm that underlies the language.

The finance-macro approach, because it concentrates on portfolio management by bank customers, neglects the real side of the economy. Baltensperger (1980), in an insightful review, noted that in a complete theory of the financial firm, costs and the banks' use of real resources must be included:

> ... somehow the nature of the services produced by the firm [must make] an appearance in the model ... This is not the case in models which restrict themselves to a direct application of traditional portfolio theory to the financial firm, and it is hard to achieve in such a framework. Of course, it is true in a formal sense that a financial firm is nothing but a collection of assets and liabilities. But so is General Motors.

Niehans and Hewson (1976) also remark that the traditional focus on money creation and liquidity leads to ignoring 'an important function of financial intermediaries which the dominant model tends to suppress, namely, the function of efficient distributors of funds'.

To model banks as distributors of funds, it is necessary to think of them as purchasing funds from depositors and offering interest and bartered depositor services as payment for the use of depositors' funds, and not, as the traditional money and banking paradigm has it, of selling liquid securities to depositors. Models of banking based on the theory of production are accordingly the appropriate ones for studying the real side of the economy.

CONCLUSIONS AND RESEARCH DIRECTIONS. National accounts aside, the fundamental ambiguity in measuring banking activity arises in the treatment of demand deposits. When deposits are treated as bank output (activity and user cost approaches), the logic *must* be that a count of the volume of deposits serves as a proxy for unpriced services produced by the bank and provided to depositors as compensation for use of their funds. But by thus obtaining an imperfect proxy for the unobserved portion of bank output, the researcher understates a major part of the bank's cost of funds (though not necessarily understating total costs), and distorts cost of funds comparisons between banks that use purchased funds, compared with those that obtain funds from traditional deposits. When deposits are treated solely as financial inputs, on the other hand (the asset approach), the bank output measure is understated by omission of unpriced services produced by the bank, and the cost of financial inputs is likewise understated by the portion of depositor compensation that takes the form of unpriced services.

One solution is to recognize explicitly the barter nature of banks' transactions with depositors. The value of free cheques, automatic teller machine usage and so forth must be added to banks' output, and simultaneously added to the cost of banks' purchased financial inputs. From the depositor's perspective, the value of unpriced services is simultaneously income and outlay on banking services. In another way of putting it, recognizing the nature of the barter transaction separates depositor services (the bank output) conceptually from the deposits themselves, which function as purchased financial inputs to the bank.

Obtaining values for unpriced depositor services is a formidable problem. It seems natural to view the compensation of depositors as consisting of a bundle of interest and unpriced services, much as labour compensation is made up of direct wages plus benefits. If alternative mixes of interest and services are observed on various accounts, a hedonic function (Griliches 1971) might be used to estimate the unpriced components of depositor compensation (Triplett 1991). This approach would be particularly attractive if one can assume that banks adjust interest payments and 'free' service schedules so as to equalize at the margin the cost to the bank of funds from different sources, which is of course merely a condition for cost minimization. Data for implementing a hedonic approach have yet to be assembled.

Beyond this, the heterogeneity of bank loans has not been addressed satisfactorily in empirical estimates. Compensating balance requirements, for example, imply that the nominal quantity of loans overstates, and the nominal interest rate understates, the true magnitudes of the loan transaction. Moreover, because banks have extended their financial activities beyond the traditional deposit-taking and lending roles, banking output measures must incorporate these non-traditional activities; some of them (brokerage, selling insurance, executing hedging arrangements) are also areas where defining or measuring the output of the activity,

or its price, pose conceptual problems comparable in difficulty to the ones confronted in traditional banking. And a perhaps more fundamental question also remains: when banks sell finance (or rent loanable funds) to borrowers, what is the nature of the services that finance provides? The ultimate test for the empirical validity of a measure of bank output is to find some effect on, say, the production process and productivity of business borrowers, for whom banking output is an intermediate input.

JACK E. TRIPLETT

See also ACCOUNTING AND FINANCIAL FLOWS; BANKING FIRM; DEFINING MONEY; SOCIAL ACCOUNTING; SOCIAL ACCOUNTS OF THE FINANCIAL SECTOR.

BIBLIOGRAPHY

Baltensperger, E. 1980. Alternative approaches to the theory of the banking firm. *Journal of Monetary Economics* 6: 1–37.

Barnett, W.A. 1980. Economic monetary aggregates: an application of index number and aggregation theory. *Journal of Econometrics* 14, September ~~and *Annals of Applied Econometrics 1980–3: A Supplement to the Journal of Econometrics*~~: 11–59.

Benston, G.J., Hanweck, G.A. and Humphrey, D.B. 1982. Scale economies in banking: a restructuring and reassessment. *Journal of Money, Credit, and Banking* 14, November: 435–50.

Dean, E.R. and Kunze, K., forthcoming. Productivity measurement in service industries. In *Output Measurement in the Service Sector*, ed. Z. Griliches, Chicago: University of Chicago Press for the National Bureau of Economic Research.

Fama, E.F. 1980. Banking in the theory of finance. *Journal of Monetary Economics* 6: 39–57.

Fuchs, V.R. ed. 1969. ~~Conference on Research in Income and Wealth~~ (Studies in Income and Wealth.) *Production and Productivity in the Service Industries* vol. 34, New York: National Bureau of Economic Research.

Gorman, J.A. 1969. Alternative measures of the real output and productivity of commercial banks. In Fuchs (1969).

Griliches, Z. ed. 1971. *Price Indexes and Quality Change: Studies in New Methods of Measurement*. Cambridge, Mass.: Harvard University Press.

Gurley, J.G. and Shaw, E.S. 1960. *Money in a Theory of Finance*. Washington DC: Brookings Institution.

Hancock, D. 1991. *A Theory of Production for the Financial Firm*. Boston: Kluwer Academic Publishers.

Mester, L.J. 1987. A multiproduct cost study of savings and loans. *Journal of Finance* 42, June: 423–45.

Niehans, J. and Hewson, J. 1976. The eurodollar market and monetary theory. *Journal of Money, Credit, and Banking* 8, February: 1–27.

Patek, B.P. 1970. Bank's supply function and the equilibrium quantity of money. *Canadian Journal of Economics* 3, August: 357–85.

Ruggles, R. 1983. The United States National Income Accounts, 1947–1977: their conceptual basis and evolution. In *The United States National Income Accounts: Selected Topics*. Studies in Income and Wealth, vol. 47, ed. M.F. Foss, Chicago: University of Chicago Press for the National Bureau of Economic Research.

Saving, T.R. 1977. A theory of the money supply with competitive banking. *Journal of Monetary Economics* 3: 289–303.

Sunga, P.S. 1984. An alternative to the current treatment of interest as transfer in the United Nations and Canadian systems of National Accounts. *Review of Income and Wealth* 30: 385–402.

Towey, R.E. 1974. Money creation and the theory of the banking firm. *Journal of Finance* 29, March: 57–72.

Triplett, J.E. 1991. Measuring the output of banks: what do banks do? Bureau of Economic Analysis Discussion Paper no. 53, Washington DC: US Department of Commerce.

United Nations. 1968. *A System of National Accounts*. Studies in Methods, Series F no. 2, New York: United Nations.

Warburton, C. 1958. Financial intermediaries. In *A Critique of United States Income and Product Accounts*, Conference on Research in Income and Wealth, vol. 22, Princeton: Princeton University Press.

Yntema, D.B. 1947. National income originating in financial intermediaries. In Conference on Research in Income and Wealth, Studies in Income and Wealth, vol. 10, New York: National Bureau of Economic Research.