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Comment Susanto Basu

In this chapter, Fixler takes on a very important and very challenging task—thinking hard about the measure of nominal financial sector output, and decomposing that output into a price index and a volume index. This is a long-standing problem in the economics of measurement, made more urgent

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by the growing share of the service sector in most industrialized countries and the importance of the financial sector specifically in the total factor productivity (TFP) acceleration in the United States since 1995.

No method of measuring financial sector prices (and hence real output) has yet commanded a consensus.[1] In fact, there is even disagreement about how to measure *nominal* output in one of the most important financial sectors, namely banking![2] Thus, it is not surprising that I shall propose different answers than Fixler to the questions that he raises. But more important than the specifics of any particular issue is a general contention: in economics, when a conceptual disagreement has lasted a long time with no resolution in sight, it is usually a sign that economic theory has not been applied sufficiently rigorously. The only way to make progress in this area is to start from detailed models of what financial institutions actually do, and the market environment in which they operate. Once that is done, the measurement implications are usually obvious in principle, although the implied measures may be exceedingly difficult to implement in practice.

Although I shall move to theory of this sort, I begin from the simple example of constructing a price index for bank deposit services to fix some ideas. Bank deposits are a good case because it is one where Fixler and I agree on the measure of nominal output. That is, we agree that consumers buy implicitly-priced services from banks in the amount of

$$(1) \qquad \frac{\rho - r^{\mathrm{D}}}{1 + \rho} D \equiv p^D D.$$

The notation in equation (1) follows that in the chapter. (Here I follow the chapter and ignore explicit fees; it reintroduces them in section 6.3.) Now if equation (1) defines nominal output, then the temptation is obviously to define p^D as the price and D as the real volume of output. But of course this leads to the uncomfortable realization that the "real" D is in fact nominal. The usual solution is to divide D by some general price index (and multiply p^D by the same price index). But what is the right price index? One might divide by the GDP deflator, on the grounds that it is the most comprehensive, or by the CPI, on the grounds that consumers use bank deposits to buy consumption goods. When issues of this importance are left ambiguous, it is usually a sign that more detailed theorizing is necessary.

Regardless of the deflator used, the upshot is that in the approach that Fixler advocates, real depositor output is taken to be linearly proportional to the stock of deflated balances that people hold in their bank accounts. Given an observed measure of nominal output, this is the only way to justify a p^D of the sort used to construct the price index in the chapter. That is, the

1. See, for example, the exchange between Bosworth, Triplett, and Fixler in Triplett and Bosworth (2004, chapters 5 and 6 and subsequent comment by Fixler).

2. See the contribution by Wang, Basu, and Fernald (chapter 7, this volume).

basic price measurement framework advocated in this chapter rests on the assumption that the *flow* of real financial services, which we can denote S_t, is linearly proportional to some measure of the *stock* of real deposit balances:

$$s_t = kD_t, \tag{2}$$

where k is a constant. Thus, even though the focus of Fixler's chapter is on measuring prices, my focus will be on the implied measure of real output. But given an agreed-upon measure of nominal output—mostly true, with a caveat that I discuss at the end of my comments—the two issues are isomorphic.

How realistic is the assumption in equation (2) that is central for the chapter? Before turning to theory, consider an example to build intuition.

Suppose two people keep the same amount of money in their banks. But Bank 1 pays a lower interest rate on deposits, because it offers access to a larger ATM network than does Bank 2. (For simplicity, let us suppose that ATM transactions are the only implicitly-priced depositor services that are provided.) The procedure advocated by Fixler would say unequivocally that Bank 1 charges a higher price than Bank 2. In fact, we see that the issue is one of quality difference in the services provided to depositors, so that the correct, quality-adjusted price charged by Bank 1 may be higher or lower than the price charged by Bank 2.

This sort of issue is clear to advocates of the method that Fixler proposes in this chapter. For example, Fixler and Zieschang (1999) propose ways "quality adjust" the outputs (or equivalently, the prices) of financial firms generally and banks particularly. That is, they propose a modification of the assumption maintained in the present chapter, and allow for a time-varying relationship between services and deposit stocks of the form

$$s_t = k(\mathbf{x}_t)D_t, \tag{3}$$

where k is no longer a constant but a function of a vector of characteristics $\mathbf{x}$. Note that adjustments of this sort, which are necessary to make measurement conform more closely to intuition, are rather ad hoc in terms of the formal theory underlying the measurement of depositor prices as p^D, which is Sidrauski's (1967) model of money in the utility function.

If one comes so far, then why not take one extra step, and dispense with the proportionality to D completely? That is, why not say that depositors at both banks are buying access to ATM networks, the flow of service output is the number of ATM transactions, but the quality of the service provided is different across the two banks, which complicates the proper computation of an average price? Conceptually, this would make banking and financial services the same as other personal and professional services, such as hair cuts and legal representation, with the same issues of quality adjustment. The only extra complication would be that consumers are paying implicitly for the services by accepting deposit rates lower than ρ rather than paying explicit fees. But one can figure out the amount of the payment from equation (1)—which continues to hold in the framework I have sketched—and figure out an implicit price deflator by knowing the quantities of nominal and real output. The real output would need to be adjusted for quality, just as haircuts and legal services need to be adjusted for quality, which may be difficult in practice, but is not problematic in principle. (This approach is developed further in Wang and Basu, 2009.)

Why then has the literature on financial output measurement foregone this straightforward approach, which treats financial services as a garden-variety service industry like many others, and hewed to the notion that real output must be proportional to real balances in some manner? The assumption that real financial services are linearly proportional to real financial balances is strong and not very realistic. With the assumption of a fixed k as in equation (2)—the approach adopted in Fixler's current chapter—it can lead to undesirable results where price changes are confounded with quality changes. The answer is that the literature has sought microeconomic foundations for its approach by putting its faith in money-in-the-utility-function models and has assumed that this formulation, which originated as a shortcut, is in fact a structural economic relationship.

The idea of using real balances as a quantity measure and foregone interest as price goes back at least to the classic paper of Sidrauski (1967). He proposed a shortcut to modeling financial services—putting real balances in the utility function:

$$U = U(C_t, M_t), \tag{4}$$

where C is real consumption and M represents real money balances. Normalizing the price of consumption goods to 1, the first-order conditions for optimization are:

$$U_c(C_t, M_t) = \lambda_t,$$

and

$$U_M(C_t, M_t) = \lambda_t(\rho_t - r_t^m).$$

Here λ is the marginal utility of wealth, ρ as before is the real interest rate, and r^m is the real return to holding "money"—equal to the negative of the inflation rate in the case of cash, and equal to r^D in the case of bank deposits. Thus, by analogy to consumption, it appears from this formulation that *if* the stock of real balances is the correct measure of real financial service consumption *then* the interest spread is its price. But of course Sidrauski did not prove the "if" part of the proposition—he simply (and rather apologetically) took it for granted.

It was left to Feenstra (1986) to provide a beautiful analysis of the microfoundations of Sidrauski's approach. Feenstra showed that the "money in the utility function" formulation can be justified as an *indirect* utility function if holding "money" helps to economize on the real transactions cost of purchasing consumption goods. He then demonstrated that a number of classic models of the transactions demand for money, including the Baumol-Tobin model, have such a property.

While Feenstra provided a classic analysis of the microfoundations of Sidrauski's approach, he did so in a setting where all transactions technologies are static. But this assumption, while a sensible shortcut for his purposes, does not accord with the evident reality of massive innovation in all aspects of finance. Basu and Wang (2006) investigate this issue. They analyze a growth model where bank deposits (the only form of "money") are used to make transactions. Consumers need to pay a fixed cost intermittently to cash part of their holdings of capital (which they hold in mutual funds) and transfer them to banks as deposits. Banks charge for the costs they incur in clearing transactions by paying a lower-than-market interest rate on bank deposits, exactly as assumed by Fixler. Mutual funds charge explicit fees for each transaction.

In this framework, Basu and Wang show, first, that if the technologies used by *both* banks and mutual funds are constant over time, then the quantity of real bank service output *is* proportional to the stock of real deposits (deflated by the CPI). Thus, there is indeed a set of conditions that validates Fixler's approach in the current chapter. Unfortunately, the necessary conditions are very restrictive. If there is technological progress *either* in banking *or* in the mutual fund industry, the result is broken—there is no longer a fixed proportionality between actual bank services (the number of transactions cleared) and the real deposit balances that consumers hold. This result implies, for example, that the real output measure for financial industries that is implicit in Fixler's approach cannot be used to estimate TFP in finance, since the measure is valid only if such TFP growth is zero. On the other hand, Basu and Wang show that the value of nominal bank services to depositors is still correctly measured as $p^D D$, even when the real output is not proportional to D deflated by some general price index.

Since deposit balances are not, in general, a valid index of real service output, Basu and Wang (2006) propose a method of constructing real output (and thus, given the observed $p^D D$, an implicit price deflator) that is robust to technological change. Conceptually it is very simple—just count the services provided by banks as one would count any traditional good or service output. In the context of their model, this just amounts to counting the number of transactions that banks clear. Inklaar and Wang (2007) show that there are practical difficulties when one tries to implement this approach in real data, but that these difficulties can be overcome. Basu, Inklaar, and Wang (2006) do the same for the measurement of nominal financial output.

As noted earlier, all of these issues of the appropriate measure of real quantities have direct implications for the measurement of prices, which is the subject of Fixler's current chapter.

Finally, this discussion so far has been couched in a nonstochastic framework, where there is no issue of risk. This is appropriate for analyzing bank deposits in the United States, where there is deposit insurance.[3] Wang (2003) and Wang, Basu, and Fernald (chapter 7, this volume) show that when risk is present—for example, in the case of bank loans—the "reference rate" used to construct p^D (the analogue of r^D) must be adjusted for risk. Together, these papers—all following from the original work of Wang (2003)—present an alternative to the approach that Fixler exposits in his current chapter. The alternative has firmer roots in theory, and can be implemented in practice. However, it is true that the Wang approach significantly complicates the measurement of nominal financial output, real output, and a financial services price deflator. Thus, I must confess that there are days when I yearn for the simplicity of measurement promised by the approach that Fixler advocates in his current chapter. But unfortunately there is no guarantee that better measures of prices and output in hard-to-measure service industries will also be easier to construct than the current measures.

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3. However, these issues arise even for bank deposits in countries without deposit insurance—for example, Switzerland. And even in the United States, deposits over $100,000 are not insured.