THE DISCOUNT -WINDOW

David L. Mengle

The discount window refers to lending by each of the twelve regional Federal Reserve Banks to depository institutions. Discount window loans generally fund only a small part of bank reserves: For example, at the end of 1985 discount window loans were less than three percent of total reserves. Nevertheless, the window is perceived as an important tool both for reserve adjustment and as part of current Federal Reserve monetary control procedures.

Mechanics of a Discount Window Transaction

Discount window lending takes place through the reserve accounts depository institutions are required to maintain at their Federal Reserve Banks. In other words, banks borrow reserves at the discount window. This is illustrated in balance sheet form in Figure 1. Suppose the funding officer at Ralph's Bank finds it has an unanticipated reserve deficiency of $1,000,000 and decides to go to the discount window for an overnight loan in order to cover it. Once the loan is approved, the Ralph's Bank reserve account is credited with $1,000,000. This shows up on the asset side of Ralph's balance sheet as an increase in "Reserves with Federal Reserve Bank," and on the liability side as an increase in "Borrowings from Federal Reserve Bank." The transaction also shows up on the Federal Reserve Bank's balance sheet as an increase in "Discounts and Advances" on the asset side and an increase in "Bank Reserve

Accounts" on the liability side. This set of balance sheet entries takes place in all the examples given in the Box.

The next day, Ralph's Bank could raise the funds to repay the loan by, for example, increasing deposits by $1,000,000 or by selling $1,000,000 of securities. In either case, the proceeds initially increase reserves. Actual repayment occurs when Ralph's Bank's reserve account is debited for $1,000,000, which erases the corresponding entries on Ralph's liability side and on the Reserve Bank's asset side.

Discount window loans, which are granted to institutions by their district Federal Reserve Banks, can be either advances or discounts. Virtually all loans today are advances, meaning they are simply loans secured by approved collateral and paid back with interest at maturity. When the Federal Reserve System was established in 1914, however, the only loans authorized at the window were discounts, also known as rediscounts. Discounts involve a borrower selling "eligible paper," such as a commercial or agricultural loan made by a bank to one of its customers, to its Federal Reserve Bank. In return, the borrower's reserve account is credited for the discounted value of the paper. Upon repayment, the borrower gets the paper back, while its reserve account is debited for the value of the paper. In the case of either advances or discounts, the price of borrowing is determined by the level of the discount rate prevailing at the time of the loan.

Although discount window borrowing was originally limited to Federal Reserve System member banks, the Monetary Control Act of 1980 opened the

Figure 1

BORROWING FROM THE DISCOUNT WINDOW

Ralph's Bank		Federal Reserve Bank	
Assets	**Liabilities**	**Assets**	**Liabilities**
Reserves with Federal Reserve	Borrowings from Federal Reserve Bank	Discounts and Advances	Bank Reserve Accounts
+ $1,000,000	+ $1,000,000	+ $1,000,000	+ $1,000,000

Examples of Discount Window Transactions

Example 1 - It is Wednesday afternoon at a regional bank, and the bank is required to have enough funds in its reserve account at its Federal Reserve Bank to meet its reserve requirement over the previous two weeks. The bank finds that it must borrow in order to make up its reserve deficiency, but the money center (that is, the major New York, Chicago, and California) banks have apparently been borrowing heavily in the federal funds market. As a result, the rate on fed funds on this particular Wednesday afternoon has soared far above its level earlier that day. As far as the funding officer of the regional bank is concerned, the market for funds at a price she considers acceptable has "dried up." She calls the Federal Reserve Bank for a discount window loan.

Example 2 - A West Coast regional bank, which generally avoids borrowing at the discount window, expects to receive a wire transfer of $300 million from a New York bank, but by late afternoon the money has not yet shown up. It turns out that the sending bank had due to an error accidentally sent only $3,000 instead of the $300 million. Although the New York bank is legally liable for the correct amount, it is closed by the time the error is discovered. In order to make up the deficiency in its reserve position, the West Coast bank calls the discount window for a loan.

Example 3 - It is Wednesday reserve account settlement at another bank, and the funding officer notes that the spread between the discount rate and fed funds rate has widened slightly. Since his bank is buying fed funds to make up a reserve deficiency, he decides to borrow part of the reserve deficiency from the discount window in order to take advantage of the spread. Over the next few months, this repeats itself until the bank receives an "informational" call from the discount officer at the Federal Reserve Bank, inquiring as to the reason for the apparent pattern in discount window borrowing. Taking the hint, the bank refrains from continuing the practice on subsequent Wednesday settlements.

Example 4 - A money center bank acts as a clearing agent for the government securities market. This means that the bank maintains book-entry securities accounts for market participants, and that it also maintains a reserve account and a book-entry securities account at its Federal Reserve Bank, so that securities transactions can be cleared through this system. One day, an internal computer problem arises that allows the bank to accept securities but not to process them for delivery to dealers, brokers, and other market participants. The bank's reserve account is debited for the amount of these securities, but it is unable to pass them on and collect payment for them, resulting in a growing overdraft in the reserve account. As close of business approaches, it becomes increasingly clear that the problem will not be fixed in time to collect the required payments from the securities buyers. In order to avoid a negative reserve balance at the end of the day, the bank estimates its anticipated reserve account deficiency and goes to the Federal Reserve Bank discount window for a loan for that amount. The computer problem is fixed and the loan is repaid the following day.

Example 5 - Due to mismanagement, a privately insured savings and loan association fails. Out of concern about the condition of other privately insured thrift institutions in the state, depositors begin to withdraw their deposits, leading to a run. Because they are not federally insured, some otherwise sound thrifts are not able to borrow from the Federal Home Loan Bank Board in order to meet the demands of the depositors. As a result, the regional Federal Reserve Bank is called upon to lend to these thrifts. After an extensive examination of the collateral the thrifts could offer, the Reserve Bank makes loans to them until they are able to get federal insurance and attract back enough deposits to pay back the discount window loans.

window to all depository institutions, except bankers' banks, that maintain transaction accounts (such as checking and NOW accounts) or nonpersonal time deposits. In addition, the Fed may lend to the United States branches and agencies of foreign banks if they hold deposits against which reserves must be kept.

Finally, subject to determination by the Board of Governors of the Federal Reserve System that "unusual and exigent circumstances" exist, discount window loans may be made to individuals, partnerships, and corporations that are not depository institutions. Such lending would only take place if the

Board and the Reserve Bank were to find that credit from other sources is not available and that failure to lend may have adverse effects on the economy. This last authority has not been used since the 1930s.

Discount window lending takes place under two main programs, adjustment credit and extended credit.[1] Under normal circumstances adjustment credit, which consists of short-term loans extended to cover temporary needs for funds, should account for the larger part of discount window credit. Loans to large banks under this program are generally overnight loans, while small banks may take as long as two weeks to repay. Extended credit provides funds to meet longer term requirements in one of three forms. First, seasonal credit can be extended to small institutions that depend on seasonal activities such as farming or tourism, and that also lack ready access to national money markets. Second, extended credit can be granted to an institution facing special difficulties if it is believed that the circumstances warrant such aid. Finally, extended credit can go to groups of institutions facing deposit outflows due to changes in the financial system, natural disasters, or other problems common to the group (see Box, Example 5). The second and third categories of extended credit may involve a higher rate than the basic discount rate as the term of borrowing grows longer.

In order to borrow from the discount window, the directors of a depository institution first must pass a borrowing resolution authorizing certain officers to borrow from their Federal Reserve Bank. Next, a lending agreement is drawn up between the institution and the Reserve Bank. These two preliminaries out of the way, the bank requests a discount window loan by calling the discount officer of the Reserve Bank and telling the amount desired, the reason for borrowing, and the collateral pledged against the loan. It is then up to the discount officer whether or not to approve it.

Collateral, which consists of securities which could be sold by the Reserve Bank if the borrower fails to pay back the loan, limits the Fed's (and therefore the taxpaying public's) risk exposure. Acceptable collateral includes, among other things, U. S. Treasury securities and government agency securities, municipal securities, mortgages on one-to-four family dwellings, and short-term commercial notes. Usually, collateral is kept at the Reserve Bank, although some Reserve Banks allow institutions with adequate internal controls to retain custody.

The discount rate is established by the Boards of Directors of the Federal Reserve Banks, subject to review and final determination by the Board of Governors. If the discount rate were always set well above the prevailing fed funds rate, there would be little incentive to borrow from the discount window except in emergencies or if the funds rate for a particular institution were well above that for the rest of the market. Since the 1960s, however, the discount rate has more often than not been set below the funds rate. Figure 2, which portrays both adjustment credit borrowing levels and the spread between the two rates from 1955 to 1985, shows how borrowing tends to rise when the rate spread rises.

The major nonprice tool for rationing discount window credit is the judgment of the Reserve Bank discount officer, whose job is to verify that lending is made only for "appropriate" reasons. Appropriate uses of discount window credit include meeting demands for funds due to unexpected withdrawals of deposits, avoiding overdrafts in reserve accounts, and providing liquidity in case of computer failures (see Box, Example 4), natural disasters, and other forces beyond an institution's control.[2]

An inappropriate use of the discount window would be borrowing to take advantage of a favorable spread between the fed funds rate and the discount rate (Example 3). Borrowing to fund a sudden, unexpected surge of demand for bank loans may be considered appropriate, but borrowing to fund a deliberate program of actively seeking to increase loan volume would not. Continuous borrowing at the window is inappropriate. Finally, an institution that is a net seller (lender) of federal funds should not at the same time borrow at the window, nor should one that is conducting reverse repurchase agreements (that is, buying securities) with the Fed for its own account.

The discount officer's judgment first comes into play when a borrower calls for a loan and states the reason. The monitoring does not end when (and if)

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[1] For more detailed information on discount window administration policies, see Board of Governors of the Federal Reserve System, **The Federal Reserve Discount Window** (Board of Governors, 1980). The federal regulation governing the discount window is Regulation A, 12 C.F.R. 201.

[2] In order to encourage depository institutions to take measures to reduce the probability of operating problems *causing* overdrafts, the Board of Governors announced in May 1986 that a surcharge would be added to the discount rate for large borrowings caused by operating problems unless the problems are "clearly beyond the reasonable control of the institution." See "Fed to Assess 2-Point Penalty on Loans for Computer Snafus," **American Banker, May 21, 1986.**

THE SPREAD BETWEEN THE FEDERAL FUNDS RATE AND DISCOUNT RATE COMPARED WITH DISCOUNT WINDOW BORROWINGS
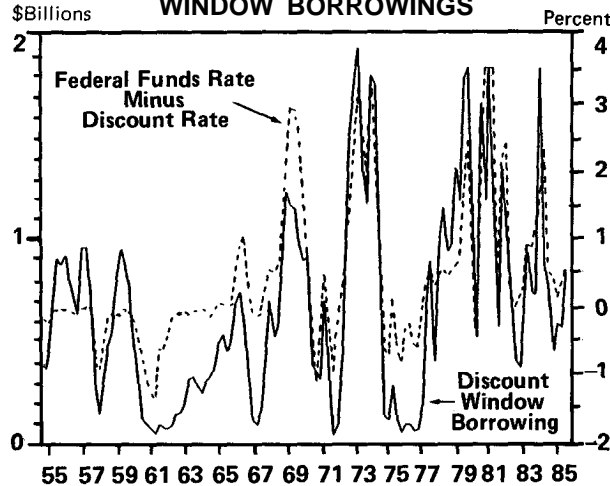
the loan is approved, however. The discount officer watches for patterns in borrowing and may look at such summary measures as discount window loans **as** a percentage of deposits and of reserves, and duration and frequency of past borrowing. In addition, special circumstances and efforts to obtain credit elsewhere receive attention. Finally, discount window borrowings are compared with fed funds market activity to make sure banks are not borrowing from the Fed simply to lend at a higher rate in the fed funds market.

If the discount officer suspects that borrowing by an institution has possibly gone beyond what is appropriate, he or she makes an "informational" call in order to find out the particular problems and circumstances of the case (Example 3), as well as how the institution plans to reduce its reliance on the discount window. If little or nothing changes, it may be time for counseling as well as a more direct effort to help the borrower find new sources of credit. It is conceivable that an institution's credit could be terminated if counseling were to fail, but this is rarely if ever necessary.

The Borrowing Decision

When deciding whether and how much to borrow from the discount window, a bank's funding officer can be expected to compare the benefit of using the discount window with the cost. The benefit of an additional dollar of discount window credit is the savings of the rate on federal funds, which is normally the next best alternative to the window. The marginal cost contains two elements. The first is the price of discount window credit, that is, the discount rate. The second is the cost imposed by nonprice measures used by the Fed to limit the amount of borrowing. An equilibrium level of borrowing would be reached when the marginal benefit of savings of the fed funds rate is balanced by the marginal cost including both the discount rate and the cost imposed by nonprice measures.[3]

Antecedents

In the United States in the late nineteenth and early twentieth centuries, establishment of a central bank was urged in order to provide an "elastic" currency. The central bank's task would be to expand discount window loans as production (and demand for money) expanded over the business cycle. The loans would then be repaid as goods finally went to market. Such a view of the central bank's role was based on the "real bills" or "commercial loan" school, which asserted that expansion of the money supply would not be inflationary so long as it was done to meet the "needs of trade." In other words, loans made by rediscounting commercial loans (which were considered to be made for "productive" purposes) would be self-liquidating since they would be paid back as the goods produced were sold on the market. The money supply increase would consequently be extinguished.[4] Reflecting the influence of the real bills doctrine, the Preamble to the Federal Reserve Act of 1913 included as a stated purpose "to furnish an elastic currency." Accordingly, the Act contained provisions for the rediscounting of bank loans "arising out of actual commercial transactions" and defining what paper was eligible for rediscount.

Although the real bills doctrine had the most practical influence on the development of central bank lending, some nineteenth century writers argued that the most important function of a central bank was to act as lender of last resort to the financial system. The first major writer to detail the role of a lender of last resort was Henry Thornton at the beginning of the nineteenth century.[5] In today's terms, Thornton described a lender acting as a "cir-

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[3] See Marvin Goodfriend (1983).

[4] For a demonstration of the fallaciousness of this doctrine, see Thomas M. Humphrey (1982).

[5] For a more detailed treatment of the material in this and the following paragraph, see Thomas M. Humphrey and Robert E. Keleher (1984).

cuit breaker," pumping liquidity into the market in order to prevent problems with particular institutions from spreading to the banking system as a whole. He emphasized that the lender of last resort's role in a panic is precisely opposite that of a private banker in that the former should expand lending in a panic while the latter contracts it. At the same time, Thornton did not advocate lending in order to rescue unsound banks, since that would send the wrong message to bankers, namely, that imprudent management would be rewarded with a bailout. Rather, he urged that loans be made only to banks experiencing liquidity problems due to the panic. In other words, the central bank has a responsibility to protect the banking system as a whole, but not to protect individual banks from their own mistakes.

The other important architect of the lender of last resort idea was Walter Bagehot, who detailed his beliefs in *Lombard Street* in 1873. Generally, Bagehot agreed with Thornton, but developed the lender's role in far greater detail. His contribution is best summed up in the venerable Bagehot Rule: Lend freely at a high rate. This implies three points. First, the public should be confident that lending will take place in a panic, so that there is no question as to the central bank's commitment. Second, lending should go to anyone, not just banks, who presents "good" collateral. In addition, collateral should be judged on what it would be worth in normal times, and not on the basis of its temporarily reduced value due to a panic. Finally, borrowers should be charged a rate higher than prevailing market rates. The justifications for a high rate are several, namely, ensuring that central bank credit goes to those who value it highest, encouraging borrowers to look first to other sources of credit, giving borrowers incentives to pay back such credit as early as possible, and compensating the lender for affording borrowers the insurance provided by a lender of last resort.

The ideas set forth by both Thornton and Bagehot emphasized emergency lending rather than adjustment credit. In actual practice, the Bank of England did act as lender of last resort several times during the late nineteenth century, but such lending was done in addition to its normal practice of providing adjustment credit at the "bank rate." In the United States, the real bills doctrine was more influential in shaping the central bank than were the ideas of Thornton or Bagehot.[6]

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[6] The lender of last resort idea did surface in the practice of some American clearinghouses acting as emergency lenders during panics. See Gary Gorton (1984).

Evolution of Discount Window Practices

The only type of lending allowed Federal Reserve Banks by the Federal Reserve Act of 1913 was discounting. In 1916 the Act was amended to add the authority for Federal Reserve Banks to make advances, secured by eligible paper or by Treasury securities, to member banks. Advances replaced discounts in practice during 1932 and 1933, when the volume of banks' eligible paper fell precipitously due to the general banking contraction taking place at the time. Emphasis on lending on the basis of "productive" loans gave way to concern with whether or not collateral offered to secure an advance, be it commercial or government securities, was sound enough to minimize risk to the Fed. Since then, advances have been the predominant form of discount window lending.

Nonprice rationing of Federal Reserve credit became firmly established as a matter of practice during the late 1920s. Use of the discount window to finance "speculative" investments was already discouraged due to the real bills doctrine's stress on "productive" uses of credit, but other reasons for lending also received the Board's disapproval. For example, in 1926 the Board adopted a policy of discouraging continuous borrowing from the discount window. In 1928, it specifically stated that banks should not borrow from the window for profit. Since then, the Federal Reserve has emphasized nonprice measures along with the discount rate to control borrowing.

Because market rates were well below the discount rate, banks used the discount window sparingly between 1933 and 1951. From 1934 to 1943, daily borrowings averaged $11.8 million, and only $253 million from 1944 to 1951. For the most part, banks held large amounts of excess reserves and were under little pressure to borrow. Even after the business recovery of the early 1940s, borrowing remained at low levels. Banks held large quantities of government securities, and the Federal Reserve's practice of pegging the prices of these securities, instituted in 1942, eliminated the market risk of adjusting reserve positions through sales of governments.

The pegged market for government securities ended in 1947, and the subsequent increased fluctuations of these securities' prices made buying and selling them a riskier way for banks to change reserves. As a result, the discount window began to look more attractive as a source of funds. By mid-1952, borrowings exceeded $1.5 billion, a level not seen since the early 1930s. Given the new importance

of the window, Regulation A, the Federal Reserve regulation governing discount window credit, was revised in 1955 to incorporate principles that had developed over the past thirty years. In particular, the General Principles at the beginning of Regulation A stated that borrowing at the discount window is a privilege of member banks, and for all practical purposes enshrined nonprice rationing and the discretion of the discount officer regarding the appropriateness of borrowing as primary elements of lending policy.

The new version of Regulation A notwithstanding, the discount rate was for the most part equal to or greater than the fed funds rate during the late 1950s and early 1960s. As a result, there was not much financial incentive to go to the window. By the mid-1960s however, the difference between the fed funds rate and the discount rate began to experience large swings, and the resulting fluctuations in incentives to borrow were reflected in discount window credit levels (see Figure 2).

In 1973, the range of permissible discount window lending was expanded by the creation of the seasonal credit program. More significantly, in 1974 the Fed advanced funds to Franklin National Bank, which had been experiencing deteriorating earnings and massive withdrawals. Such an advance was made to avoid potentially serious strains on the financial system if the bank were allowed to fail and to buy time to find a longer term solution. This particular situation was resolved by takeover of the bulk of the bank's assets and deposits by European American Bank, but the significant event here was the lending to a large, failing bank in order to avert what were perceived to be more serious consequences for the banking system. The action set a precedent for lending a decade later to Continental Illinois until a rescue package could be put together.

Reflecting a discount rate substantially below the fed funds rate from 1972 through most of 1974, discount window borrowings grew to levels that were high by historical standards. A recession in late 1974 and early 1975 drove loan demand down, and market rates tended to stay below the discount rate until mid-1977. During the late 1970s, the spread was positive again, and borrowing from the window increased. Borrowing then jumped abruptly upon the adoption of a new operating procedure for day-to-day conduct of monetary policy (described in the following section), which deemphasized direct fed funds rate pegging in favor of targeting certain reserve aggregates. Because this procedure generally requires a positive level of borrowing, the gap between

the fed funds rate and the discount rate has frequently remained relatively high during the first half of the 1980s.

The Monetary Control Act of 1980 extended to all banks, savings and loan associations, savings banks, and credit unions holding transactions accounts and nonpersonal time deposits the same borrowing privileges as Federal Reserve member banks. Among other things, the Act directed the Fed to take into consideration "the special needs of savings and other depository institutions for access to discount and borrowing facilities consistent with their long-term asset portfolios and the sensitivity of such institutions to trends in the national money markets." Although the Fed normally expects thrift institutions to first go to their own special industry lenders for help before coming to the window, private savings and loan insurance system failures in 1985 led to increased use of extended credit.

The Role of the Discount Window in Monetary Policy

As a tool of monetary policy, the discount window today is part of a more complex process than one in which discount rate changes automatically lead to increases or decreases in the money supply. In practice, the Federal Reserve's operating procedures for controlling the money supply involve the discount window and open market operations working together. In the procedures, there is an important distinction between borrowed reserves and nonborrowed reserves. Borrowed reserves come from the discount window, while nonborrowed reserves are supplied by Fed open market operations. While nonborrowed reserves can be directly controlled, borrowed reserves are related to the spread between the funds rate and the discount rate.

During the 1970s, the Fed followed a policy of targeting the federal funds rate at a level believed consistent with the level of money stock desired. Open market operations were conducted in order to keep the funds rate within a narrow range, which in turn was selected to realize the money growth objective set by the Federal Open Market Committee. Under this practice of in effect pegging the fed funds rate in the short run, changes in the discount rate only affected the spread between the two rates and therefore the division of total reserves between borrowed and nonborrowed reserves. In other words,

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[7] These are described in more detail by R. Alton Gilbert (1985) and Alfred Broaddus and Timothy Cook (1983).

if the discount rate were, say, increased while the fed funds rate remained above the discount rate, borrowing reserves from the Fed would become relatively less attractive than going into the fed funds market.[8] This would decrease quantity demanded of borrowed reserves, but would increase demand for their substitute, nonborrowed reserves, thereby tending to put upward pressure on the funds rate. Given the policy of pegging the funds rate, however, the Fed would increase the supply of nonborrowed reserves by purchasing securities through open market operations. The result would be the same fed funds rate as before, but more nonborrowed relative to borrowed reserves.[9]

After October 6, 1979, the Federal Reserve moved from federal funds rate targeting to an operating procedure that involved targeting nonborrowed reserves. Under this procedure, required reserves, since they were at the time determined on the basis of bank deposits held two weeks earlier, were taken as given. The result was that, once the Fed decided on a target for nonborrowed reserves, a level of borrowed reserves was also implied. Again assuming discount rates below the fed funds rate, raising the discount rate would decrease the fed funds-discount rate spread. Since this would decrease the incentive to borrow, demand would increase for nonborrowed reserves in the fed funds market. Under the new procedure the target for nonborrowed reserves was fixed, however, so the Fed would not inject new reserves into the market. Consequently, the demand shift would cause the funds rate to increase until the original spread between it and the discount rate returned. The upshot here is that, since discount rate changes generally affected the fed funds rate, the direct role of discount rate changes in the operating procedures increased after October 1979.

In October 1982, the Federal Reserve moved to a system of targeting borrowed reserves.[10] Under this procedure, when the Federal Open Market Committee issues its directives at its periodic meetings, it specifies a desired degree of "reserve restraint." More restraint generally means a higher level of borrowing, and vice versa. Open market operations are then conducted over the following period to provide the level of nonborrowed reserves consistent with desired borrowed reserves and demand for total reserves. A discount rate increase under this procedure would, as in nonborrowed reserves targeting, shrink the spread between the fed funds and discount rates, and shift demand toward nonborrowed reserves. In order to preserve the targeted borrowing level, the fed funds rate should change by about the same amount as the discount rate so that the original spread is retained. As a result, discount rate changes under borrowed reserves targeting affect the funds rate the same as under nonborrowed reserves targeting.

Discount Window Issues

As is the case with any instrument of public policy, the discount window is the subject of discussions as to its appropriate role. This section will briefly describe three current controversies regarding the discount window, namely, secured versus unsecured lending, lending to institutions outside the banking and thrift industries, and the appropriate relationship between the discount rate and market rates.

The risk faced by the Federal Reserve System when making discount window loans is reduced by requiring that all such loans be secured by collateral. William M. Isaac, who chaired the Federal Deposit Insurance Corporation from 1981 to 1985, has suggested that this aspect of discount window lending be changed to allow unsecured lending to depository institutions.[11] Mr. Isaac's main objection to secured lending is that, as uninsured depositors pull their money out of a troubled bank, secured discount window loans replace deposits on the liability side of the bank's balance sheet. When and if the bank is declared insolvent, the Fed will have a claim to collateral that otherwise may have been liquidated by the FDIC to reduce its losses on payouts to insured depositors. Sensing this possibility, more uninsured depositors have an incentive to leave before the bank is closed.

Mr. Isaac's proposed policy is best understood by considering how risks would shift under alternative policies. Under the current policy of secured lending

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[8] Broaddus and Cook (1983) analyze the effect of discount rate changes if the discount rate is kept above the fed funds rate.

[9] Although under this procedure discount rate changes did not directly affect the funds rate, many discount rate changes signaled subsequent funds rate changes.

[10] See Henry C. Wallich (1984). In addition, since February 1984 required reserves have been determined on an essentially contemporaneous basis.

[11] **Deposit Insurance Reform and Related Supervisory Issues,** Hearings before the Senate Committee on Banking, Housing, and Urban Affairs, 99th Cong. 1 Sess. (Government Printing Office, 1985), pp. 27-8, 40. As an alternative, Mr. Isaac has suggested that if the policy of making only secured loans at the window is continued, only institutions that have been certified solvent by their primary regulators should be eligible.

at the discount window, if the Fed lends to a bank that fails before the loan is paid back, the fact that the loan is secured makes it unlikely that the Fed will take a loss on the loan. Losses will be borne by the FDIC fund, which is financed by premiums paid by insured banks. Thus, risk in this case is assumed by the stockholders of FDIC-insured banks.[12] Under Mr. Isaac's alternative, the Fed would become a general rather than a fully secured creditor of the failed bank. As a result, losses would be borne by both the Fed and the FDIC fund, depending on the priority given the Fed as a claimant on the failed bank's assets. Since losses borne by the Fed reduce the net revenues available for transfer to the United States Treasury, the taxpaying public would likely end up bearing more of the risk than under current policy. The attractiveness of moving to a policy of unsecured discount window lending thus depends on the degree to which one feels risks should be shifted from bank stockholders to the general public.[13]

A second discount window issue involves the exercise of the Fed's authority to lend to individuals, partnerships, and corporations. Although such lending has not occurred for over half a century, major events such as the failure of Penn Central in the mid-1970s and the problems of farms and the manufacturing sector of the 1980s raise the question of whether or not this authority should be exercised. On the one hand, one might argue that banking is an industry like any other, and that lending to nonfinancial firms threatened by international competition makes just as much sense as lending to forestall or avoid a bank failure. On the other hand, the Federal Reserve's primary responsibility is to the financial system, and decisions regarding lending to assist troubled industries are better left to Congress than to the Board of Governors.[14]

A final issue regarding the discount window is whether to set the discount rate above or below the prevailing fed funds rate.[15] Figure 2 shows that both policies have been followed at different times during the last thirty years. One could make several arguments in favor of a policy of setting the discount rate above the funds rate. First, as mentioned earlier, placing a higher price on discount window credit would ensure that only those placing a high value on a discount window loan would use the credit. Since funds could normally be gotten more cheaply in the fed funds market, institutions would only use the window in emergencies. Second, it would remove the incentive to profit from the spread between the discount rate and the fed funds rate. As a result, the process of allocating discount window credit would be simplified and many of the rules regarding appropriate uses of credit would be unnecessary. Finally, it might simplify the mechanism for controlling the money supply, since borrowed reserves would not likely be a significant element of total reserves. Indeed, setting targets for borrowed or nonborrowed reserves would probably not be feasible under a penalty rate. Targeting total reserves, however, would be possible, and open market operations would be sufficient to keep reserve growth at desired levels.[16]

Despite the possible advantages of keeping the discount rate above the fed funds rate, it is not clear what would be an effective mechanism for setting a discount rate. Should the discount rate be set on the basis of the previous day's funds rate and remain fixed all day or should it change with the funds rate? Letting it stay the same all day would make it easier for banks to keep track of, but incentives to profit from borrowing could result if the funds rate suddenly rose above the discount rate. Further, what is an appropriate markup above the fed funds rate? Too high a markup over the funds rate might discourage borrowing even in emergencies, thus defeating the purpose of a lender of last resort.[17] Finally, some banks that are perceived as risky by the markets can only borrow at a premium over market rates. Even if the discount rate were marked up to a penalty rate over prevailing market rates,

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[12] Since Congress has pledged the full faith and credit of the United States government to the fund, it is also possible that the public may bear some of the losses.

[13] Fed Chairman Paul Volcker has characterized the proposal as changing the Fed from a provider of liquidity to a provider of capital to depository institutions. Ibid., pp. 1287-8.

[14] Ibid., pp. 1315-6. For a discussion of the possibility of discount window lending to the Farm Credit System, see The Problems of Farm Credit, Hearings before the Subcommittee on Economic Stabilization of the House Committee on Banking, Finance, and Urban Affairs, 99th Cong. 1 Sess. (GPO, 1985), pp. 449-55, 501-4.

[15] For a more complete summary of arguments regarding the appropriate use of the discount rate, see Board of Governors (1971), vol. 2, pp. 25-76.

[16] For further arguments in favor of total reserves targeting, see Goodfriend (1984). For arguments against, see David E. Lindsey et al. (1984).

[17] Lloyd Mints (1945), p. 249, argues that a higher price for discount window credit would discourage borrowing precisely at the time when the central bank should be generous in providing liquidity.

such banks might attempt to borrow at the discount window to finance more risky investments. In such a case, certain administrative measures might be necessary to ensure that, as under present policy, discount window credit is not used to support loan or investment portfolio expansion.

Choosing between policies of keeping the discount rate either consistently above or consistently below the fed funds rate involves a decision not only on how best to manage reserves but also on the relative merits of using prices or administrative means to allocate credit. Administrative limits on borrowing may help to brake depository institutions' incentives to profit from rate differentials, but will not remove them. Pricing would take away such incentives, but there are difficulties with setting an optimal price. As in most policy matters, the choice comes down to two imperfect alternatives.

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THE NATIONAL INCOME AND PRODUCT ACCOUNTS

Roy H. Webb

This article is the first of a series that will be published by this Bank under the title Macroeconomic Data: A User's Guide. *That book will contain introductions to important series of macroeconomic data, including prices, employment, production, and money. It will replace "Keys to Business Forecasting," which has been distributed since 1964. Although there are many sources that describe data concepts, surprisingly few deal with practical problems that may confront users. A characteristic of* Macroeconomic Data *will be that its articles discuss the seemingly small points that can make the difference between successful and unsuccessful attempts to use data.*

It would be hard to overstate the value of the national income and product accounts to economists. They summarize the millions of economic transactions that occur in the nation each day and present the data in a readily comprehensible form. Their important role can be observed by noting that discussions of current economic conditions usually focus on real gross national product (GNP) and its components. In addition, macroeconomic research critically depends on the hundreds of interrelated items in the accounts.

This article is an introduction to the national income and product accounts. It briefly describes the history of the accounts, explains basic concepts, details the main structure of the accounts, and reviews the movement of key elements over time. Throughout the article there are cautions for users who might expect more than the accounts can deliver. And finally, it provides suggestions for additional reading for readers who would like to learn more than is provided in this brief introduction to the accounts.

Introduction

History National income and product accounts are a fairly recent invention. Prior to World War I they were prepared for only a few countries by individual investigators who wished to study particular questions, such as understanding the effects of government budgetary actions.

During the interwar period governments became increasingly involved in the preparation of national economic accounts. In part this was because governments had relatively inexpensive access to data such as tax returns and other documents that individuals and firms were required to file. Also, a growing interest in using government fiscal actions to influence national economic performance increased the demand for detailed information on the current state of the economy.

In the United States, the Commerce Department first prepared national income estimates in the early 1930s; national product estimates followed in the early forties. These estimates played an important role in economic planning in the United States during World War II.

The widespread intellectual acceptance of John Maynard Keynes's *The General Theory of Employment, Interest,* and Money did much to stimulate interest in the accounts. Keynes emphasized macroeconomic relationships-that is, relationships stated at a highly aggregated level, such as the relation between national investment and national product. Keynes also strongly advocated the use of national fiscal policy to moderate fluctuations of national output and to stimulate long-term growth. The major uses of income and product accounts-appraisal of current conditions, the analysis of fiscal policy, forecasting economic activity, and research concerning the relations of macroeconomic aggregates-all fit comfortably within a Keynesian framework. Many users today, however, would not label themselves as Keynesians. Use of the accounts has grown far beyond any single group.

Preparation The national income and product accounts are now prepared by the Bureau of Economic Analysis (BEA), an agency of the United States Commerce Department. The BEA has prepared estimates for most items going back to 1929. Most of the data used by the BEA are first collected by other branches of the government for purposes other than constructing national income accounts. One important source of data is the tax returns of firms and individuals. Another is the large and varied group of surveys that are conducted at regular intervals. Important examples include Census Bureau surveys of retailers and manufacturers, and Labor Department surveys of prices.

Although some data series like personal income are published monthly, most items are only available at quarterly or annual intervals. Estimates for a particular quarter are first released during the third week after the end of that quarter. At that time, the BEA has data for about two-thirds of GNP; it therefore estimates the remaining items. As the BEA continues to receive data, the preliminary estimates are revised twice at monthly intervals. Then in July of each year, further revisions are published along with estimates for series that are published annually. Finally, new information, conceptual changes, and statistical changes are incorporated by benchmark revisions, which occur about every five years.

Gross National Product Defined

GNP is the most widely followed statistic in the income and product accounts. It can be succinctly defined as the market value of current, final, national production during a specific interval of time. That succinct definition, however, requires a bit of explanation,

Value Market value means that, when possible, goods and services are valued at prices actually paid in market transactions. In some cases, such as national defense and other services provided by the government, there are no market prices available. An alternative estimate of the value of those products, such as the cost of production for goods and services provided by government agencies, is therefore substituted for market value. For another important item, owner-occupied housing, an estimated rental value is included in GNP.[1] And some transactions

that occur outside the marketplace are excluded from GNP. Examples include production within households and illegal activities.

By focusing on market values, it is indeed possible to add apples and oranges. The focus on market values is a key insight that has powerfully aided economic analysts. It allows one to combine production from vastly different activities into a meaningful aggregate.

Current Current production simply means that GNP for a year only includes production that occurred during that year,

Final The concept of final product is less obvious; its necessity can best be illustrated with an example. Suppose that one farmer grows a bushel of wheat, mills the wheat, bakes bread, and sells the bread in front of the farmhouse. Another farmer grows a bushel of wheat but sells it to a miller, who sells flour to a baker, who then sells bread. In each case the contribution to GNP is the value of the bread, the final product. Yet if the dollar value of all sales in the market were simply added up, the second example would have a higher sum than the first. In other words, simply adding all sales would overstate GNP ; that error is often referred to as double counting. To avoid that error, one can focus on the value added in each step of production. In the second example, the contribution to GNP of the baker is the difference between the revenues from selling bread and the cost of the flour. The values added by the baker, miller, and farmer in the second example would sum to the value of the bread and would therefore equal the value added by the farmer-miller-baker in the first case.

National National product refers to the output of productive factors of a particular nation. Production from the labor of a nation's residents and the capital of its residents' corporations is therefore included in gross national product. Many countries prefer to focus on gross domestic product (GDP), the output of productive factors located within a particular nation. The distinction between national and domestic product is most important for locating the value added by multinational firms. The value added by overseas branches of American firms is included in United States GNP, but not United States GDP.

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[1] In effect, the homeowner is treated as a business that rents the home to itself. This has several effects for the accounts, including: (1) spending for new homes is part of business investment; (2) the estimated rental value

of owner-occupied housing is part of consumer spending; and (3) the rental value minus expenses, such as interest, taxes, and depreciation, is part of personal income.

For the United States, the quantitative difference between the two is not large; in 1985, GNP was only one percent larger than GDP.

Gross The word "gross" refers to the fact that depreciation of structures and equipment is not subtracted from the value of output. Conceptually, it might seem preferable to recognize that some part of production just replaces the capital consumed in the production process, and in fact the BEA does estimate national product net of capital consumption, net national product. There are usually no direct measures of capital consumption, however. Capital consumption is therefore indirectly estimated for each type of capital good by government statisticians who use an accounting formula. Since many analysts question the accuracy of any such formula, they prefer to focus on gross national product, because its calculation does not require a probably inaccurate estimate for depreciation.

Real The concept of market value allows different products to be meaningfully added at a particular time. But since market value is expressed in dollars, another problem arises when comparing production at different times. Changes in the purchasing power of a dollar (which are reflected in statistics of inflation or deflation) will distort the meaning and relevance of comparative dollar magnitudes.

The concept of real GNP is an attempt to allow production in different years to be meaningfully compared. It is an estimate of GNP in dollars of constant purchasing power. (Estimates of real GNP are thus often referred to as "constant dollar" values.) In most cases, the dollar value of each particular good or service is divided by a relevant price index, yielding the constant dollar value. The constant dollar values for all items are then summed to yield real GNP. The ratio of current dollar GNP (often called nominal GNP) to real GNP is the GNP implicit price deflator. It will be discussed in a forthcoming article on aggregate price data.

Components of GNP

It is often useful to think of total spending rather than total production. That is facilitated in national product accounts by the way components of GNP are defined. Anything produced is either sold to its final purchaser or else held as inventory by some business, whether producer, wholesaler, or retailer. The sum of spending for final products plus changes in businesses' inventories is therefore equal to the market value of production.

GNP is traditionally divided into spending in four categories, or sectors : consumer, business (including inventory change), government, and foreign. Each sector is described in this section, and numerical values for 1985 are presented in the table.

Consumer The consumer sector is the largest, accounting for 65 percent of GNP in 1985.[2] Spending by consumers is divided into spending for durable goods such as autos, nondurables such as food and services. Services consist of a wide variety of components such as utilities, medical care, transportation, and the estimated rental value of owner-occupied housing.

Business Spending by the business sector, also labeled investment,[3] is composed of three major categories. The most obvious is business spending for plant and equipment. Also included are changes in business inventories, including raw materials, work in progress, and completed products awaiting resale to their final purchaser. The third category is spending on residential construction, which includes both residential structures owned by business enterprises and owner-occupied housing.

Government Government spending is divided between federal spending and spending by state and local governments. In the national income and product accounts government spending refers solely to spending for goods and services-transfer payments, such as pensions, welfare, and interest, do not add to GNP.

Foreign The foreign sector's effect on GNP is given by net exports, the difference between exports and imports. Net exports include both physical commodities and services, such as insurance, transportation, tourism, and corporate earnings from foreign operations.

Income

In the previous section the equality of production and spending was mentioned. There is another basic

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[2] The consumer sector also includes certain nonprofit institutions, personal trusts, and private pension funds. For most analysis it is probably appropriate to neglect this qualification; in the discussion below, however, it should be remembered that the words "consumer" and "person" often refer both to individuals and these institutions.

[3] The word "investment" in the income and product accounts only refers to spending for physical capital, or for the value of inventory change. It is therefore different from ordinary usage, in which "investment" can also refer to the purchase of financial assets.

NATIONAL INCOME AND PRODUCT, 1985

Billions of Dollars

Product		Income	
Personal Consumption Expenditure	**2582.1**	**Compensation of Employees**	**2372.4**
Durables	361.1	Wages and salaries	1960.2
Nondurables	912.3	Supplements	412.2
Services	1308.8	**Proprietors' Income**	**242.3**
		Farm	21.3
Gross Private Domestic Investment	**668.6**	Nonfarm	220.9
Business fixed investment	475.8	**Rental Income of Persons**	**14.0**
Residential investment	185.6	**Corporate Profits**	**296.2**
Inventory change	7.2	After-tax profits	139.5
		Profits-tax liability	85.5
Net Exports	**-76.9**	Adjustments	71.2
Exports	370.2	**Net Interest**	**287.2**
Imports	447.0	**Other Charges Against GNP**	**776.4**
		Capital consumption	438.5
Government Purchases	**815.3**	Indirect business taxes	328.5
Federal	355.0	Other items, net	9.4
State and local	460.3	**Statistical Discrepancy**	**0.7**
Gross National Product	**3989.1**	**Gross National Product**	**3989.1**

Source: Survey of Current Business, February 1986, Tables 1.1, 1.9, and 1.14.

equality in the accounts, that of spending and income. Revenues from the sales of goods and services are collected by businesses. Payments by businesses for wages, rent, and the like are income for individuals. By definition, profits represent the difference between a firm's payments for inputs and its revenue from the sales of products. Adding up for all firms, their profits are therefore equal to the difference between aggregate revenues (spending) and costs (incomes to others); consequently, national income and national spending are equal by definition.

If all components of income and product were measured precisely, the value of production would equal the sum of incomes received. It is therefore possible to construct a national balance sheet such as the table with production on one side and income on the other. Since data collected by the government are necessarily less than perfect, errors in estimating the components of income and product are inevitable. One result is that the income and product sides of a national balance sheet are not exactly equal. The difference is referred to as the statistical dis-

crepancy. Other items on the income side are described below.

Employee compensation Compensation of employees is the largest category of income. It includes not only wages and salaries, but also fringe benefits paid by employers such as funding for pension plans and medical insurance. Also included are employer payments for social security and unemployment insurance taxes.

Corporate profits The estimated value of corporate profits is primarily derived from corporate income tax returns, but for many reasons does not precisely equal taxable profits of private corporations. One important reason is that the effect on profits from holding inventories when prices change is removed with an inventory valuation adjustment. Also, the difference between depreciation allowed by the tax code and the BEA's estimate of depreciation of corporate assets is removed with a capital consumption adjustment. In addition, Federal Reserve Banks are treated as part of the corporate sector.

Their interest receipts are treated as income ; their payments of most of their income to the U. S. Treasury are included in the BEA's measure of corporate tax payments.

Other income Proprietors' income includes earnings of individuals and partnerships from unincorporated businesses, such as physicians' practices, farms, and law firms. Rental income of persons includes items such as rental receipts and royalties. It also includes the estimated rental value of owner-occupied housing minus housing expenses. Net interest is a fairly complicated item. In broad terms, it represents individuals' receipts of interest income from businesses and from foreign sources minus individuals' interest payments.[4]

Non-income items Other charges against GNP are non-income items, most importantly capital consumption allowances and indirect business taxes. The latter includes federal excise taxes and state and local sales and property taxes.

Definitions of income There are several definitions of income that are published in the income and product accounts. National income, the total income from current production, is the sum of employee compensation, proprietors' and rental income, corporate profits, and net interest. More attention is paid to personal income, which includes wages, salaries and other labor income ; proprietors' and rental income; and personal receipts of interest, dividends, and transfer payments. A closely related measure, disposable personal income, is personal income minus personal tax payments and other payments to government agencies.

Movements over Time

Countless books and articles containing studies of long-term growth, cyclical change, and shifting patterns of economic life have been based on data from the national income and product accounts. Only a few broad features will be mentioned in this section.

A striking feature is the amount of economic growth that is revealed. Chart 1 illustrates the movement of real GNP from 1929 to 1985. Despite the Great Depression and other fluctuations, real GNP increased fivefold during that interval-a 2.9 percent compound annual rate of growth. Chart 1 also il-

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[4] Some arcane adjustments for households' dealings with financial institutions are also included. Those adjustments also affect estimates of consumer spending for financial services.

Chart 1

**REAL GNP**

Billions of 1982 Dollars
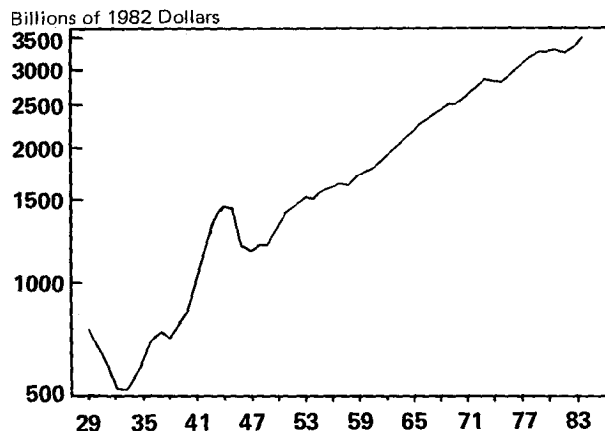
lustrates the massive decline of real GNP during the Great Depression, the equally massive expansion during World War II, and the smaller fluctuations of output in the postwar period. Chart 2 reveals similar growth, but less fluctuation, in real consumer spending and disposable income.

The accounts also reveal some important changes in the structure of the economy. The expanded role of government is illustrated by its spending for goods and services, which has risen from less than 9 percent of GNP in 1929 to more than 20 percent in 1985. Foreign trade also plays a more important role in the economy than it has in the past, with exports rising from about 5 percent of GNP in the 1930s to 11 percent in the 1980s.

Chart 2

CONSUMER SPENDING & INCOME

Billions of 1982 Dollars
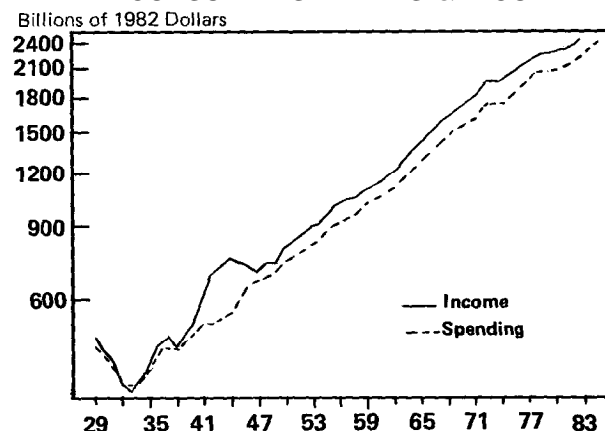
Cautions

Considering the amount of data consistently measured over time and the complex interrelations revealed among disparate items, the national income and product accounts are a remarkable achievement. In part because the accounts do so much so well, users can be tempted to expect more of the accounts than they can deliver. A few potential problems have already been mentioned; in this section other potential pitfalls are discussed.

First, it should be emphasized that the national income and product accounts only measure production, spending and income. They were not designed to measure economic welfare-that is, how highly individuals evaluate the economic rewards they receive minus the cost of obtaining them. Despite the limited focus of the accounts, it is still common for some observers to see differences in national product between nations as evidence of different standards of living. Such comparisons should be discounted for many reasons, a few of which follow:

(1) Some items included in GNP do not directly raise individual welfare. For example, military spending is like intermediate product-it can provide necessary protection that allows other economic activity to proceed, but is not valued for its own sake. Citizens of a nation that is able to obtain adequate defense for 1 percent of GNP can consume and invest more, thus having a higher standard of living, than citizens of a nation with the same GNP who had to spend 10 percent of GNP for defense.

(2) Some items are not included in GNP that do make people better off. For example, unpaid household work may be highly productive but is not included in the national income and product accounts.

(3) There may be unmeasured external effects that result from productive activity. For example, the production of electric power may involve an unmeasured damage of pollution from burning coal. Two countries could have the same GNP but differ in the cleanliness of air and water.

(4) Other countries may use different data sources or even different concepts to produce income and product estimates. Socialist countries, for example, will lack many market prices used in the U. S. accounts, Also different governments may not have access to similar quantities or qualities of data.

A second caution is that it is possible that the definition of an item in the accounts may not be the best definition for a particular study.

For example, many economists have studied the relationship between consumer saving at one time and consumer spending during later time periods. The definition of saving in the accounts is probably not appropriate for that question, however, since capital gains and losses are excluded from personal income and saving (because they do not result from current production). Their potential importance is illustrated by rising stock and bond markets in 1985, which added hundreds of billions of dollars to consumer wealth but were not income or saving as defined in the income and product accounts.

Third, the construction of the national accounts requires choosing among alternatives that each has drawbacks. One example is converting nominal expenditures to real magnitudes. The decision to estimate constant dollar values has greatly enhanced the utility of the accounts. There are side effects, however.

The BEA's approach is to define one year as a base year and to compare conditions in other years with the base year. That is, "real" magnitudes in other years are hypothetical values, such as quantities exchanged in 1960 valued at prices paid in transactions in 1982. Constructing those hypothetical values allows the tracking of changes in volumes of particular items over time, but can also distort relationships in the accounts. For example, from 1958 to 1973 net exports in current dollars were positive each year, averaging over $7 billion. When measured in 1982 dollars, however, net exports were negative in 15 of the 16 years, averaging -$18 billion. The actuality of a trade surplus was therefore converted into a "real" deficit by using 1982 as a base period.

Fourth, the data that the BEA receives from other government agencies may not be accurate.

For example, to the extent that individuals or firms file inaccurate tax returns in order to reduce their tax liabilities, the tax collectors will give the BEA inaccurate data. Moreover, if someone has given false information to one government agency, the likelihood of that person giving false reports to other agencies is increased. Census surveys, therefore, could also be affected by tax-induced misreporting of income and expenditure. Although

the BEA does attempt to estimate tax-induced misreporting, there is no way to determine the accuracy of those estimates.

These cautions should not prevent one from using the accounts. Rather, the cautions should prompt the user to think about the problem and the data before simply assuming that the data are appropriate. The limitations of the accounts are real, but should be kept in perspective. The accounts provide consistently estimated data for more than fifty years for hundreds of items. They provide an unsurpassed picture of economic performance. As the longtime head of the BEA George Jaszi put it, the income and product accounts "are eminently useful in macroeconomic analysis if they are not regarded as a precision instrument and . . . may be lethal if they are."

Suggestions for Additional Reading

There is a large literature on the subject of national income and product accounts. Rather than attempting to survey the whole field, a few sources are mentioned which should be especially helpful to readers who wish to pursue the subject.

The *Survey of Current Business* (SCB), published monthly by the Commerce Department, contains recent estimates of items in the income and product accounts and articles on selected topics related to national income accounting. One of the most useful publications on the subject is the *National Income* supplement to SCB, 1954 edition, parts II-IV. It contains 132 large format pages of detailed definitions and discussion of the methodology for estimating components of the accounts. More recent discussions are contained in "The National Income and Product Accounts of the United States: An Overview," SCB February 1981, and "An Introduction to National Economic Accounting," SCB March 1985.

For many readers, less technical summaries of the accounts may be useful. Introductory economics textbooks usually contain descriptions of the accounts ; a particularly good presentation is contained in Paul Samuelson's *Economics*. Also, *The U.S. Economy Demystified* by Albert T. Sommers has a clear, user-oriented description and discussion of the accounts.

Building on the framework of the BEA's accounts, Robert Eisner has constructed a set of statistics that attempt to narrow the gap between national product accounts and statistics that more directly attempt to estimate economic welfare. "The Total Incomes Systems of Accounts," SCB January 1985, contains a discussion of his approach and detailed tables of data for selected years.

Finally, it may be of interest to study the history of national income accounts. A prime source is John W. Kendrick, "The Historical Development of National Income Accounts," *History of Political Economy,* Fall 1970. A more narrow focus on U. S. accounts is given by Carol S. Carson, "The History of the United States National Income and Product Accounts," *Review of Income and Wealth,* June 1975. Further insight into the design of the U. S. accounts can be found in George Jaszi's "An Economic Accountant's Audit," *American Economic Review,* May 1986.

CUMULATIVE PROCESS MODELS FROM THORNTON TO WICKSELL

Thomas M. Humphrey

The celebrated Wicksellian theory of the cumulative process is a landmark in the history of monetary thought. It gave economists a dynamic, three-market (money, credit, goods) macromodel capable of showing what happens when banks, commercial or central, hold interest rates too low or too high. With it one could trace the sequence of events through which money, interest rates, borrowing, spending, and prices interact and evolve during inflations or deflations. The prototype of modern interest-pegging models of inflation, it influences thinking even today. It also confirms the adage, well known to historians of science, that no scientific discovery is named for its original discoverer [19, p. 147]. For, as documented below, it was not Knut Wicksell but rather two British economists writing long before him in the first third of the nineteenth century who first presented the theory.

The cumulative process analysis itself attributes monetary and price level changes to discrepancies between two interest rates. One, the market or money rate, is the rate that banks charge on loans. The other is the natural or equilibrium rate that equates real saving with investment at full employment and that also corresponds to the marginal productivity of capital. When the loan rate falls below the natural rate, investors demand more funds from the banking system than are deposited there by savers. Assuming banks accommodate these extra loan demands by issuing more notes and creating more demand deposits, a monetary expansion occurs. This expansion, by underwriting the excess demand for goods generated by the gap between investment and saving, leads to a persistent and cumulative rise in prices for as long as the interest differential lasts. As stressed by Wicksell, the differential vanishes once banks raise their loan rates to protect their gold reserves from depletion by cash drains into hand-to-hand circulation. Given the volume of real transactions paid in gold coin, these drains arise from the

price increases that necessitate additional coin for such payments. The differential also vanishes when a loan rate set *above* the natural rate produces falling prices and a reversal of the cash drain. In this case, the resulting excess reserves induce banks to lower their rates toward equilibrium in an effort to stimulate borrowing. These adjustments, however, may occur too late to prevent substantial changes in prices.

From this analysis it follows that the monetary authority must strive to keep the money rate in line with the natural rate if it wishes to maintain price stability. To do this, it must raise or lower its own lending rate as soon as prices show the slightest tendency to rise or fall and maintain that rate steady when prices exhibit no tendency to move in either direction. By following this rule, it eradicates the two-rate disparity that generates inflation or deflation.

The foregoing model and its policy implications are well known. Not so well known, however, is that the model was already more than 70 years old when Wicksell presented it in his *Interest and Prices* in 1898. Long before then, Henry Thornton (1802, 1811) and Thomas Joplin (1823, 1828, 1832) had already constructed versions of the model and had employed it in their policy analysis. The model's two-rate, saving-investment, loanable-funds framework was as much their invention as Wicksell's. The same is true of their demonstration that inflation stems from usury ceilings and bankers' attempts to peg loan rates at levels other than those that clear the market for real capital investment. Even the model's famous equilibrium conditions-two-rate equality, saving-investment equality, loan-saving equality, aggregate demand-supply equality, monetary and price stability-were recognized by them. All they lacked was an automatic stabilizing mechanism that brings the cumulative process to a halt by the convergence of the loan rate on the natural rate.

And this was provided by Wicksell in the form of the feedback effect of price changes on the loan rate. In an attempt to correct some misconceptions about the theory's origins and to give these pioneers their due, the paragraphs below outline the model and its components to show what the three contributors had to say about each.

The Model and Its Components

To identify the specific contributions of Wicksell and his predecessors, it is useful to have some idea of the model they helped create. As presented here, that full-employment model consists of seven equations linking the variables investment I, saving S (both planned or ex ante magnitudes), loan rate i, natural rate r, excess aggregate demand E, money-stock change dM/dt, and price-level change dP/dt.[1] Of these, saving and investment are taken to be increasing and decreasing linear functions of the loan rate, the presumption being that higher rates encourage thrift but discourage capital formation.

The first equation states that investment I exceeds saving S when the loan rate of interest i falls below its natural equilibrium level r (the level that equilibrates saving and investment),

$$(1) \quad I - S = a(r - i),$$

where a is a coefficient relating the investment-saving gap to the rate differential that creates it. The second equation states that the excess of investment over saving equals the extra money dM/dt created to finance it,

$$(2) \quad I - S = dM/dt.$$

That is, assuming banks create money by way of loan, monetary expansion occurs when they lend more to investors than they receive in deposit from savers, To see this, denote the (investment) demand for loans L_D as $L_D = I(i)$, where I(i) is the schedule relating desired investment spending to the loan rate. Similarly, denote loan supply Ls as the sum of saving S(i)-all of which is assumed to be deposited with banks-plus new money dM/dt created by banks in accommodating loan demands ; in short, Ls = S(i) + dM/dt. Equating loan demand and supply (L_D = Ls) yields equation (2) above.

The model's third equation says that an excess of investment over saving at full employment generates an equivalent excess demand E for goods,

$$(3) \quad I - S = E,$$

as aggregate real expenditure outruns real supply. The fourth equation says that this excess demand bids up prices, which rise by an amount dP/dt proportionate to the excess demand,

$$(4) \quad dP/dt = kE.$$

Substituting equations (1) and (3) into (4), and equation (1) into (2), yields

$$(5) \quad dP/dt = ka(r - i) \text{ and}$$

$$(6) \quad dM/dt = a(r - i),$$

which together state that price inflation and the money growth that underlies it both stem from the discrepancy between the natural and loan rates of interest. This, of course, is the model's most famous prediction.

Finally, the seventh equation closes the model by linking loan rate changes di/dt to price changes dP/dt. It states that bankers adjust their rates upward in proportion to the price rises so as to protect their gold reserves from being exhausted by inflation-induced cash drains into hand-to-hand circulation. That is, assuming the public makes a certain proportion of its real payments in the form of coin, rising prices increase the quantity of coin required for that purpose. To arrest the resulting drain of coin reserves into hand-to-hand circulation, bankers raise their loan rates by an amount di/dt proportionate to price changes dP/dt,

$$(7) \quad di/dt = b \, dP/dt.$$

This equation ensures that the loan rate eventually converges to its natural equilibrium level, as can be seen by substituting equation (5) into equation (7) and solving the resulting differential equation for the time-path of the loan rate.[2] At this point, saving

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[1] For similar models, see Eagly [2] and Laidler [10, pp. 104-5, 117].

[2] Solving the differential equation di/dt = bka(r-i) obtained by substituting equation (5) into equation (7) yields the expression for the time-path of the loan rate i,

$$i(t) = (i_0 - r) \, e^{-bkat} + r$$

where t is time, e is the base of the natural logarithm system, i_0 is the initial disequilibrium level of the loan rate, and r is the (constant) natural rate. This expression states that the loan rate will converge on the natural rate with the passage of time if the coefficients b, k, and a are each positive, as is assumed in the model in the text.

equals investment, excess demand vanishes, money and prices are stable, and bank lending equals saving -these results obtaining when one sets the two rates equal to each other in the model. These of course are the famous Wicksellian conditions of monetary equilibrium. Given the model and its components, one can identify what Wicksell and his precursors contributed to it.

Henry Thornton

The origins of the cumulative process model are to be found in Chapter 10 of Henry Thornton's classic *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain* (1802) and in the first of his two parliamentary speeches of 1811 on the Bullion Report. In those works he contributed four ideas that together constitute the central analytical core of the model. He also demonstrated the model's power as a tool of policy analysis.[3]

First, he noted that the quantity of loans demanded depends upon a comparison of the loan rate of interest with the expected rate of profit on the use of the borrowed funds. He says, "In order to ascertain how far the desire of obtaining loans at the bank may be expected at any time to be carried, we must enquire into the subject of the quantum of profit likely to be derived from borrowing there under the existing circumstances. This is to be judged of by considering two points: the amount, first of interest to be paid on the sum borrowed; and, secondly, of the mercantile or other gain to be obtained by the employment of the borrowed capital. . . . We may, therefore, consider this question as turning principally on a comparison of the rate of interest taken at the bank with the current rate of mercantile profit" [20, pp. 253-4]. He continues : "The borrowers, in consequence of that artificial state of things which is produced by the law against usury, obtain their loans too cheap. That which they obtain too cheap they demand in too great quantity" [20, p. 255]. Thus a loan rate equal to the profit rate limits loan demands to noninflationary levels. But a loan rate below the profit rate induces additional-and inflationary-loan demands.

Second, he explained how the rate differential, through its effect on loan demands, translates into money and price level changes. As noted above, the rate differential induces an expansion of loan demands. Assuming that bankers accommodate these loan demands by increasing their note issue-an assumption that implies a willingness to let reserve to note and deposit ratios fall-the money stock expands. The resulting money-induced rise in aggregate expenditure puts upward pressure on prices. It also, because of an assumed sluggish adjustment of wages and other costs to rising prices, stimulates output and employment. Given that the economy normally operates close to its full-capacity ceiling, however, the price effect predominates. It follows that price inflation as well as the money growth that underlies it stems from the differential between the loan and profit rates as indicated by the expressions $dP/dt = ka(r-i)$ and $dM/dt = a(r-i)$. Here is the first model to show that inflation occurs when bank rates are pegged at inappropriate levels.

Third, he stressed that the rate differential, if maintained indefinitely, produces cumulative (continuing) rather than one-time changes in money and prices. This is so, he said, because as long as the loan rate remains below the equilibrium rate, borrowing will continue to be profitable ("the temptation to borrow will be the same as before") even at successively higher price levels. The result will be more borrowing, more lending, more monetary expansion, still higher prices and so on without limit in a cumulative inflationary spiral. Under these conditions, "even the most liberal extension of bank loans" will fail to have the slightest "tendency to produce a permanent diminution of the applications to the bank for discount" [20, p. 256]. On the contrary, loan demands will be insatiable while the rate differential lasts.

Fourth, from the foregoing considerations Thornton derived his fundamental equilibrium theorem, namely that monetary and price level stability obtain when the loan rate equals the profit rate. Such two-rate equality, he said, would allow the banking system to "sufficiently limit its paper" to noninflationary levels "by means of the price [i.e., rate] at which it lends" [20, p. 254]. For with the two rates equal, their differential would vanish and with it the inducement to borrow and lend that produces inflationary money growth. Money and prices would stop rising and stabilize at a constant level. Having described the two-rate equilibrium, however, he did not explain what forces would drive banks to attain it. His model lacked the automatic equilibrating mechanism through which inflation induces banks to raise their loan rates to equilibrium in order to protect their reserves from cash drains into hand-to-hand circulation.

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[3] On Thornton, see Hayek [4, pp. 12-14; 20, pp. 49-50] and Schumpeter [18, pp. 720-4].

Thornton's Policy Conclusions

Thornton's fifth contribution was his demonstration of the model's usefulness as a tool of policy analysis. He used his model to determine the cause of the paper pound's depreciation on the foreign exchanges during the Napoleonic wars when Britain had suspended the convertibility of her currency into gold at a fixed price upon demand. He attributed the depreciation to note overissue caused by the Bank of England's discount rate being too low. Usury ceilings, he noted, constrained the Bank's rate to a 5 percent maximum at a time when, owing to the boom conditions of the war, the expected rate of profit was well in excess of 5 percent. The result of this differential was a loss of Bank control over the volume of its loans and its note issue, both of which had expanded to produce inflation. To give the Bank a firm grip on the money supply, he urged removing the usury ceiling and requiring the Bank to set its discount rate equal to the profit rate. As a second-best alternative, he endorsed the Bank's policy of rationing loans. Apart from such direct credit rationing, however, he saw no end to inflation as long as the differential persisted. In this connection, he noted that no amount of monetary expansion could lower the profit rate to the level of the discount rate. The profit rate, he said, is a real variable determined by the demand for and supply of real capital. As such, it is invariant with respect to changes in nominal variables like the money stock. Somewhat inconsistently, he admitted that money growth could stimulate capital formation through *forced saving*-the inflation-induced redistribution of purchasing power from fixed-income receivers to capitalist investors. But he thought such effects to be quantitatively unimportant. For that reason, he made no mention of the resulting capital accumulation's impact on the profit rate.

He also employed his model to refute the real bills doctrine according to which inflationary overissue is impossible as long as banks lend only on sound commercial paper arising out of real transactions in goods and services. He contended that the real bills test provided no check to overissue when the loan rate is below the profit rate. For the resulting price rise emanating from the differential would, by raising the nominal value of real transactions, in&ease the nominal volume of eligible bills coming forward for discount. Since these bills would pass the real bills test (i.e., they are backed by an equivalent value of goods) they would be discounted and the money stock would expand. This monetary expansion would validate a further rise in prices thereby resulting in more bills being presented for discount leading to further monetary expansion and still higher prices and so on ad infinitum in a never-ending inflationary spiral. These examples show that for Thornton the cumulative process model was not a theoretical toy but a key component of his policy analysis.

Thornton's Contemporaries

Thornton's two-rate analysis was accepted by at least four of his contemporaries. Thus J. R. McCulloch, in his refutation of the real bills doctrine, argued that loan demands depend primarily on "the rate of interest for which those sums can be obtained, compared with the ordinary rate of profit that may be made by their employment" [13, p. 235]. Similarly, Lord King warned that such loan demands "may be carried to any assignable extent" if the rate differential persists [9, p. 22]. John Foster put the point even more forcefully. He said that if the directors of the Bank of England were to expand the note issue in an effort to accommodate all loan demands arising at the disequilibrium rate, they "might at length reduce the value of their notes to that of the paper on which they are engraved" [3, p. 113]. But perhaps the clearest and most succinct statement came from David Ricardo who wrote that "The applications to the Bank for money, then, depend on the comparison between the rate of profits that may be made by the employment of it, and the rate at which they are willing to lend it. If they charge less than the market [i.e., natural] rate of interest, there is no amount of money which they might not lend,-if they charge more than that rate, none but spendthrifts and prodigals would be found to borrow of them. We accordingly find, that when the market rate of interest exceeds the rate of 5 per cent at which the Bank uniformly lend, the discount office is besieged with applicants for money; and, on the contrary, when the market rate is even temporarily under 5 per cent, the clerks of that office have no employment" [17, p. 364].

Missing from the analysis of Thornton and his contemporaries was any mention of the model's real saving and investment schedules. These components were largely overlooked before the appearance of Thomas Joplin's *Outlines of a System of Political Economy* (1823), Views on the Currency (1828), and *An Analysis and History of the Currency Question* (1832).

Thomas Joplin

Joplin incorporated saving and investment schedules into Thornton's model and defined the natural rate as the rate that equilibrates the two.[4] He then argued that an increase in the demand for capital, by raising the natural rate above the loan rate, will open a saving-investment gap and a corresponding excess demand for goods that bids up prices progressively as long as the rate differential lasts. He likewise noted that money growth would accompany and validate the price increases as bankers (who have no way of knowing what the natural rate is and so charge their customary rate) honor all credit demands at the going loan rate. These considerations led him to conclude with Thornton that monetary and price level changes stem from disparities between the two rates. He also concluded that monetary equilibrium and its attendant balance conditions-saving-investment equality, loan-saving equality, aggregate demand-supply equality, monetary and price level stability-obtain only when the two rates are equal.

Joplin's observations are so Wicksellian that they must be read to be believed. On the relation I-S=dM/dt between the investment-saving gap and the monetary change that finances it, he wrote, "When the supply of capital exceeds the demand, it has the effect of compressing it [the circulation]; when the demand is greater than the supply, it has the effect of expanding it again" [8, p. 101]. On the expression dM/dt=a(r-i) connecting money-stock changes with the natural rate-loan rate disparity, he remarked that since bankers "never can know what the true [natural] rate of interest is" they "charge a fixed [loan] rate," with the consequence that the currency "expands and contracts, instead of the interest of money rising and falling" [8, pp. 109, 111].

Likewise, on the mechanism through which deviations of the loan rate from the natural rate produce inflation, he observed, "Money comes into the market . . . from the banks . . . in consequence not of a demand for currency, but of a demand for capital, determined by the interest which the banks charge proportioned to the market [i.e., natural] rate. And in all cases the influx of money into the market . . . is not the effect, but the cause of high prices" [6,

pp. 258-9]. Here is an explicit recognition of (1) the two-rate disparity, (2) the investment demand for loans, (3) a loan-determined money stock, and (4) the money-price relationship-all key ingredients of Wicksell's analysis. Finally, on pegging the loan rate above the natural rate so that saving exceeds investment and loans, money, and prices all fall, he said, "If it [fall of prices] proceeded from the interest charged by the banks, being too high, the economy [i.e., saving] of the country, instead of reducing the interest . . . would find vent in discharging the debts due to the banks, at the high rate of interest they imposed; and the value of money and profits of trade would thus be kept up to that level which rendered the general economy [saving] greater than the general expenditure [investment]" [6, pp. 209-10]. Here is perhaps the first application of the cumulative process model to the deflationary case in which a loan rate above the natural rate spells an excess of saving over investment, a deficiency of aggregate demand, a contraction of borrowing and the money stock, and a consequent fall of prices. In other words, Joplin recognized that interest-rate pegging can lead to deflation as well as inflation.

Like Thornton, he saw forced saving as one effect of the price inflation produced by banks' willingness to lend more than the savings voluntarily deposited with them. "If the issues of the bank are not increased by any loan it makes at interest, an equal amount of money must have been previously saved out of income, and paid into the bank, in which case, the party borrows the income previously saved ; but if not, and the issues of the bank are increased by the loan, prices rise, and the party who has borrowed the money obtains value for it by depriving the holders of the money in previous circulation, of a proportionate power of purchasing commodities. An economy is thus created, though a forced economy, but it answers all the purpose of a volutary one" [7, p. 146]. He opposed forced saving on the grounds that it involved a fraud and an injustice on the preexisting money holders.

From his analysis he concluded that interest-rate pegging is an important cause of price-level fluctuations. "One effect, no doubt, would be produced by the bank regulating its issues by the demand for [loans] at a particular rate of interest, namely, that the rate of interest would be kept steady. Instead of the savings of income rising above four per cent [following, say, an upward shift in the loan demand schedule], the enlargement of issues would create an additional quantity sufficient to supply, at four per

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[4] On Joplin, see Corry [1, pp. 54-6, 60-1, 110], Hayek [4, pp. 15-7], Link [12, pp. 73-102], Schumpeter [18, p. 723], Viner [22, pp. 190-2], and Warburton [23, pp. 125, 290].

cent, the increased demand. On the other hand, when the savings of income were not in such request, and the demand at four per cent fell off, the notes of the bank would be withdrawn, and the supply of such savings, to a corresponding extent, would be cancelled, by which the rate of interest would be kept up [above its natural level]. The alteration in the [loan] demand for capital would not affect its value. The supply of it by means of the enlargement and contraction of the currency, would be created and cancelled as it was required. Prices would fluctuate instead of the interest of money" [7, pp. 152-3].

He contended that these price fluctuations occur because banks possess the power of creating and destroying paper money at will by varying their reserve ratios. Take away this power, he said, and banks would become pure intermediaries, lending only the savings entrusted to them. In this case, saving would equal investment, loan rates would equal the natural rate, excess demand would be zero, and price stability would prevail. To make these equilibrium conditions a reality he proposed a policy of 100 percent required gold reserves behind note issues.

To summarize, Joplin gave the model its most complete formulation up to Knut Wicksell. His inclusion of saving and investment schedules allowed him to show how gaps between the two produced by deviations from the natural rate translate into money-stock changes and excess demand that bids up prices. In short, he recognized all the model's components except the price-induced interest-adjustment mechanism that ensures the stability of monetary equilibrium.

Knut Wicksell

When Wicksell presented his cumulative process model in 1898, he thought he was the first to do so.[5] At that time he was totally unaware of the earlier work of Thornton and Joplin. Not until 1916 did he discover from his colleague David Davidson that Thornton had foreshadowed him by almost 100 years. But he apparently never learned about Joplin, whose saving-investment version of the model was virtually identical to his.

One finds in his model all the elements developed by Thornton and Joplin. The two-rate disparity is there, as are the saving-investment gap, the excess demand for goods that bids up prices cumulatively,

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[5] On Wicksell, see Jonung [5], Laidler [10], Leijonhufvud [11, pp. 151-61], Patinkin [15, pp. 587-97; 16] and Uhr [21, pp. 198-254].

and the accompanying money growth resulting from banks' willingness to accommodate all credit demands at the going loan rate. His conclusion-that monetary and price-level changes stem from the two-rate disparity-is the same as theirs. So too is his list of monetary equilibrium conditions, including two-rate equality, saving-investment equality, loan-saving equality, aggregate demand-supply equality, and monetary and price-level stability. True, he differed from Joplin on how these conditions should be achieved. He preferred a policy of promptly moving the discount rate in the same direction as prices are changing, stopping only when price movements cease. By contrast, Joplin preferred a policy of 100 percent required gold reserves. But both believed that there existed a workable policy rule to keep money rates in line with the natural rate. Like his predecessors, he even used his model as a tool to explain British price movements in the nineteenth century, although he focused on secular rather than cyclical changes.

He differed from Thornton and Joplin chiefly in his inclusion of the stabilizing feedback effect of price-level changes on the loan rate. By adding this element to the model he was able to show that the cumulative process is self-limiting provided banks maintain some desired level of gold reserves and provided the public transacts a certain proportion of its real payments in gold coin. Since inflation increases and deflation decreases the need for coin in circulation to effectuate these given real payments, banks, he argued, will find their reserves being depleted in the former case and augmented in the latter. To arrest these price-induced reserve drains or accumulations they will adjust their rates upward or downward. In this way those price changes bring their own cessation as the loan rate converges on the natural rate.

He also demonstrated that the cumulative process is *not* self correcting in hypothetical "cashless" or pure credit economies using no metallic money, all payments being made by bookkeeping entries, Since specie drains are not a threat in such economies, banks need hold no reserves and are free to maintain indefinitely any money rate they choose. As a result, there exists no reserve constraint in the cashless society to limit the cumulative process. Thus any spontaneous disturbance that upsets the initial equality between the two rates will set in motion an inflation or deflation that can continue indefinitely. He further argued that the same may be true even in pure cash societies if technological innovations,

wars, and other real shocks cause the natural rate to change before the loan rate can ever catch up with it. In this case, the loan rate's lag behind the moving natural rate spells incomplete adjustment, persistent disequilibrium, and ceaseless price changes.

This last insight, which combined the notions of an active or leading natural rate and a passive or trailing loan rate, enabled him to resolve what Keynes was later to call the Gibson paradox. This paradox, which neither Thornton nor Joplin addressed, holds that prices and interest rates historically move together in the' same direction when, according to standard monetary theory, they should move inversely as excess issues of money temporarily depress interest rates while raising prices. In resolving the paradox, Wicksell agreed that prices and loan rates would move inversely if those rates fell below a given natural rate. For example, if loan rates fell to 4 percent when the natural rate was 5 percent, prices would rise. On the other hand, prices and loan rates would tend to move together if the natural rate itself moves and the loan rate lags behind (i.e., adjusts incompletely to the changing natural rate). In this case, loan rates, though rising or falling, would still be too low or too high relative to the natural rate to prevent a cumulative rise or fall in prices. Indeed, this was precisely Wicksell's explanation of long-term price changes in nineteenth century Britain. These changes he saw as emanating from movements of the active natural rate about the lagging loan rate. Except for these applications, Wicksell's use of the model was the same as Thornton's and Joplin's.

Concluding Comments

That Wicksell at best only rediscovered or reinvented the model now universally associated with his name is hardly surprising. It merely confirms the validity of Stigler's Law of Eponymy according to which no scientific discovery is named for its original discoverer. Still this finding, though completely unexceptional, is nevertheless at odds with some recent interpretations of the model's history. Certainly it is not true, as suggested in Axel Leijonhufvud's recent essay on the "Wicksell Connection," that the model derives solely from Wicksell. Nor is it true, as Leijonhufvud contends, that Wicksell originated the saving-investment approach to macroeconomics [11, pp. 132-3]. For, as documented above, the cumulative process model together with its implied conditions of monetary equilibrium originated not with Wicksell but rather with Thornton and Joplin. Of these two pioneers, Joplin deserves at least some

credit for initiating the saving-investment approach since it was he who first introduced saving and investment schedules into the model.

These findings also cast doubt on Robert Nobay's and Harry Johnson's recent attempt to distinguish between classical and Wicksellian phases in the evolution of monetary thought [14, pp. 471-3]. The classicals, according to this distinction, concentrated on establishing the proposition of the long-run neutrality of money. Wicksellians, by contrast, focused on the dynamic implications of monetary responses and disturbances as well as on the conditions of monetary equilibrium. What is overlooked is that at least two classical monetary theorists, namely Thornton and Joplin, were Wicksellians as far as their monetary analysis was concerned. True, they accepted the neutrality proposition. But their main concern was investigating the dynamics of money's response to deviations of the loan rate from the natural rate. They also sought to eliminate those deviations so that prices could be stabilized. To that end they spelled out the conditions of monetary equilibrium and prescribed policies to achieve them. In these ways they strongly resembled Wicksell.

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THE INDUSTRIAL MIX OF EMPLOYMENT
IN THE FIFTH DISTRICT, 1950-1985

Christine Chmura*

The industrial distribution of employment in the United States has undergone significant changes over the years.   Once predominantly agricultural, the nation's workforce first shifted from farming to mining and manufacturing, and then from producing goods to producing services. The concentration of employment also has changed substantially within major industrial classifications, such as from smoke-stack to high-tech manufacturing.

Regions within the United States generally display the same major industrial shifts in employment that have occurred in the nation as a whole. But regional economies do exhibit significant differences in employment growth by industry and industry subgroups. A regional analysis of the industrial distribution of employment can therefore provide important insights into the development and current character of an area's economy.   Such information may be of use to state and local officials and to other citizens in their efforts to attract industry and promote growth. It is also of interest to citizens wishing to know why, how, and how much the employment mix in a region has changed.

This article describes and analyzes the principal changes in nonagricultural employment in the Fifth Federal Reserve District during the past 35 years, with emphasis on more recent years.   The main finding is that the employment trends in the Fifth District are similar to those of the nation, except that the percent of manufacturing employment has not declined as rapidly in the District as in the nation. The first section reviews developments in the United States as well as in the District and points out where differences are significant. The second section analyzes changes in the industrial employment mix. The third section focuses on employment changes in industry subgroups within the manufacturing and service sectors, again using national trends as a basis

for evaluating Fifth District developments.   The fourth and final section summarizes the findings and discusses some implications for the District.

I.
POSTWAR INDUSTRIAL EMPLOYMENT GROWTH

Since the end of World War II, total nonagricultural employment in the United States has increased greatly. Over that same period, dramatic shifts have occurred in the percentages of workers employed in specific sectors or industries and in the regional concentration of employment by industry. While the Fifth District's postwar changes in employment broadly reflect those of the nation as a whole, there are important differences.

The analysis focuses on changes from 1946 to the present.[1]   However, since trends are the topic of interest here, the years used for comparative purposes are chosen to minimize the effects of the business cycle. Thus, most of the comparisons are based on employment data for 1950, 1972, 1978, and 1985-- all years of economic expansion that occur within three years after a business cycle trough.

Total Employment

The pronounced increase in nonagricultural employment in the United States during the past 35 years is shown in Figure 1. The doubling in jobs over this period translates to an average annual growth rate of 2.2 percent.

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[1]This analysis is based primarily on annual data from the U. S. Department of Labor. The data, known as the "payroll series," provide detail on employment by industry and state. The labor force data are obtained from "establishment surveys."   That is, a firm operating in more than one location must submit a report for each establishment. In addition, firms engaged in distinctly different lines of activity are required to submit separate reports, if possible. For definitions of terms, area samples used, historical comparability of the data, comparability with other series, etc., see Department of Labor, Bureau of Labor Statistics, "Employment, Hours, and Earnings."

Figure 1

U.S. NONAGRICULTURAL EMPLOYMENT
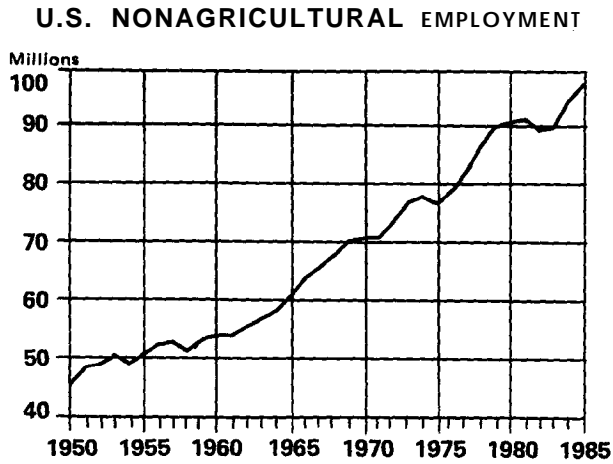
NOTE: District employment growth reflects the growth
pattern in the United States.

Employment in the Fifth District also more than doubled between 1950 and 1985. Jobs in the Fifth District grew at an average annual rate of 2.6 percent, with Virginia posting the strongest gain, followed in order by North Carolina, South Carolina, Maryland, the District of Columbia, and West Virginia. (See Table I.) To be sure, over the more recent period from 1972 to 1985 employment growth slowed in both the nation and the Fifth District. But the District rate remained above that of the nation, although not by as great a margin as was recorded from 1950 to 1972.

Growth differences among geographical regions occur for various reasons. Since World War II, the Fifth District labor supply has increased faster than that of the nation because of a higher District birth rate in the 1950s and a migratory movement toward the South in the 1960s and 1970s.[2] Other factors contributing to growth differences among geographical areas will be considered later.

From Goods to Services

A major trend in the employment mix over the last century has been a shift from goods-producing to service-producing industries.[3] As shown in Figure 2, employment in service-producing industries has grown significantly relative to employment in goods-producing industries in the United States. The same trend has occurred in the District. The change in employment reflects different rates of growth in productivity and demand which will be explained further in Section II.

[2] For more explanation of the labor force composition, see Lynn E. Brown, "Regional Unemployment Rates-Why Are They So Different?" New England Economic Review, July/August 1978, pp. 9-11.

[3] The mining, construction, and manufacturing sectors are often referred to as goods-producing because their products are tangible while the remaining sectors are collectively termed service-producing.

Table I

GROWTH IN EMPLOYMENT

Average annual rates

	1950-72	1972-85*	1950-85*
United States	2.25	2.19	2.22
Fifth District	2.67	2.36	2.55
District of Columbia	0.64	0.73	0.67
Maryland	3.14	2.23	2.80
North Carolina	3.34	2.53	3.04
South Carolina	3.19	2.69	3.00
Virginia	3.33	3.05	3.23
West Virginia	0.14	0.76	0.37

* 1985 is a preliminary figure.

Figure 2

EMPLOYMENT DISTRIBUTION OF GOODS AND SERVICES IN THE UNITED STATES

--- Goods-producing   --- Service-producing
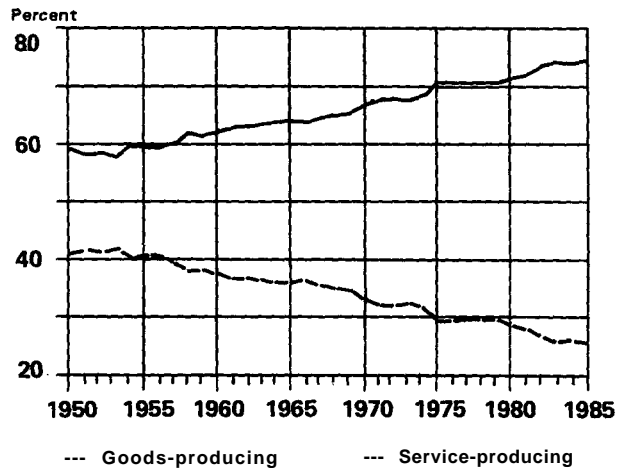
NOTE: The change in employment distribution of goods
and services in the District reflects that of the
United States.

The United States and the District have been service economies in terms of employment since the early 1900s when over 50 percent of the work force became employed in service-producing industries. The trend toward services, however, has become more rapid since the 1950s. In fact, the U. S. service-producing sectors have as a group grown at an annual average rate of 2.9 percent between 1950 and 1985, while the goods-producing sectors have grown 0.9 percent per year. Within these two classifications, employment growth rates by individual sector vary considerably.

Sector by Sector

Figure 3 displays changes in the relative distribution of employment in the United States and the Fifth District by major industrial sector. (See Box.) Clearly evident is the great increase in the relative number of service sector employees.[4] The service sector has become the second largest employer in the

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[4] The service sector is defined more narrowly here than in the previous section.

Figure 3

EMPLOYMENT SHARE BY MAJOR SECTOR

*Finance, Insurance & Real Estate
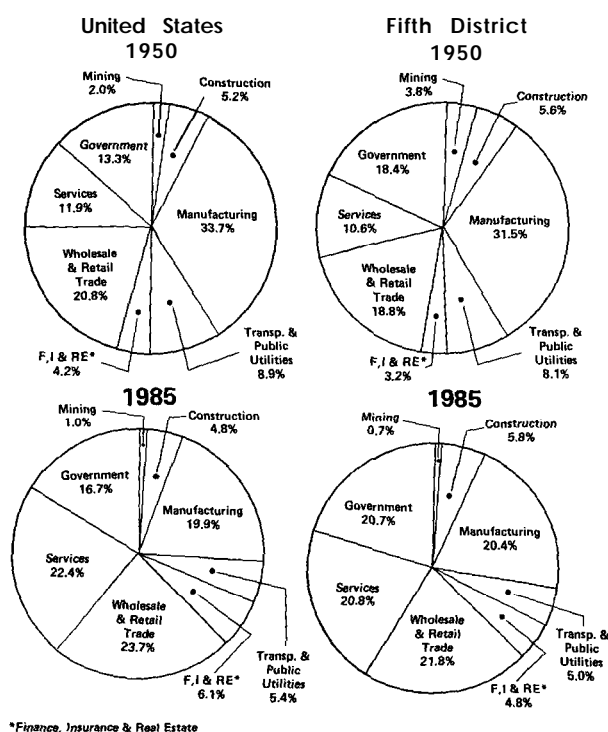
nation and the District, growing between 1950 and 1985 at an annual average rate of 4.1 and 4.5 percent, respectively.

In contrast, the relative share of the manufacuring sector has declined considerably. In 1950, U. S. manufacturing jobs comprised 33.7 percent of non-agricultural employment, but they declined to about 19.8 percent in 1985. By comparison, the District had 31.5 percent of its employees in the manufacturing sector in 1950 compared with only 20.4 percent in 1985. Despite the gradual decline in the manufacturing sector share of total employment, there has been an increase in the number of *workers* employed. Between 1950 and 1985, U. S. manufacturing employment rose 27 percent while the Fifth District gain was nearly 57 percent.

A comparison of industry sector growth in the Fifth District with that of the United States between 1950 and 1972 reveals that the District gained employment more rapidly than the United States in all industries except mining and government. Both the nation and the Fifth District experienced trends in industry employment over the last 13 years that differed from their counterparts between 1950 and 1972. As shown in Table II, the growth rate of nonagricultural employment, national as well as District, slowed between 1972 and 1985. Among the various sectors, employment in mining, transportation and public utilities, wholesale and retail trade, and service grew faster in the last 13 years while employment in construction, manufacturing, and government, grew considerably more slowly. When the District's industry sectors are examined relative to the nation's from 1972 through 1985, slower growth rates are found in the District's mining and finance, insurance, and real estate sectors.

II.

ANALYSIS OF CHANGES IN
INDUSTRIAL EMPLOYMENT MIX

The growth of employment in various sectors and regions differs dramatically. This section offers some explanations for the different rates of employment growth in the nation's manufacturing and service sectors and for the interregional disparities in these rates of growth.

Explanations of Manufacturing and Service Sector Shifts

The industrial composition of U. S. jobs depends primarily on two factors : the type and mix of goods

Industrial Classifications

The Standard Industrial Classification (SIC) system defines sectors on the basis of such factors as end-product similarity, types of resources used, and types of customers. The eight major SIC manual sectors are:

Mining - Businesses extracting minerals occurring naturally such as coal, ores, crude petroleum, and natural gas. Also included are operations necessary to make minerals marketable.

Construction - Builders and other fabricators producing new work, additions, alterations, and repairs including special trade contractors, such as plumbing, painting, and electrical work.

Manufacturing - Firms performing mechanical or chemical transformations of materials or substances into new products.

Transportation and Public Utilities - Establishments providing passenger and freight transportation, communication services, electricity, gas, steam, water or sanitary services, and the U. S. Postal Service.

Wholesale and Retail - Places of business primarily engaged in selling merchandise for personal, household, industrial, commercial, institutional, farm, or professional business consumption, as well as firms engaged in the sale of goods to other wholesalers.

Finance, Insurance, and Real Estate - Establishments providing specialized activities in either the finance, insurance, or real estate field.

Service - Establishments providing a wide variety of services for individuals, business and government establishments, and other organizations.

Government - Organizations performing the legislative, judicial, administrative, and regulatory activities of federal, state, local, and international government.

Table II

EMPLOYMENT GROWTH BY SECTOR

Average annual rates

	United States		Fifth District	
	1950-72	1972-85*	1950-72	1972-85*
Total Nonagriculture	2.25	2.19	2.67	2.36
Mining	-1.63	3.07	-3.06	-0.56
Construction	2.29	1.45	3.30	1.53
Manufacturing	1.04	0.07	1.94	0.20
Transp. and Public Utilities	0.54	1.11	0.92	1.49
Finance, Ins., and Real Estate	3.36	3.29	4.17	3.06
Wholesale and Retail Trade	2.44	2.89	2.78	3.34
Service	3.84	4.58	4.24	5.04
Government	3.68	1.61	3.40	2.08

* 1985 is a preliminary figure.

and services desired by consumers, businesses, governments, and foreigners, and the differentials in labor productivity by industry. By explaining the change in the mix demanded and the changes in labor productivity one can indirectly account for the causes of the change in the industrial mix of employment.

One reason for the shift from goods to services production is that people tend to demand more service goods relative to manufactured goods as income rises.[5] There has been an increase in the proportion of the service sector contribution to the gross national product (GNP) between 1950 and 1984. The real service sector GNP increased from 11.1 percent of total GNP in 1950 to 14.6 percent in 1984.[6]

The relative decline in manufacturing employment also reflects the much faster increase in output per worker in the manufacturing sector than in the service sector.[7] Labor productivity indices show that productivity growth in the manufacturing sector has exceeded the average rate of productivity growth in the United States since 1960. In other words, the amount of labor required per unit of output fell more rapidly in the manufacturing sector than in other sectors. Consequently, the relatively smaller amount of labor required to produce a unit of output contributes to a relative decline in manufacturing employment.

In support of the productivity argument, Victor Fuchs many years ago argued that the relatively higher cost of manufacturing labor to service labor caused a greater substitution of capital for labor in the manufacturing sector.[8] In this view, industries react to the cost differential by substituting the lower priced input for the higher priced input, where possible. If manufacturers find it more profitable to substitute capital for labor, then the manufacturing share of employment will decline while employment in other sectors, such as services, will increase. In fact, the average hourly earnings for U. S. manufacturing production workers was $9.18 in 1984

while service sector nonsupervisory workers earned only $7.64 per hour. The high percent of unionization in the manufacturing sector has contributed to its relatively high wages. Within the manufacturing sector, union wages increased 11 percent faster than nonunion wages between 1970 and 1984.[9] Because of the relatively high cost of labor in manufacturing, a greater incentive to substitute capital for labor existed ; hence a shift of the employment shares to the service sector may have resulted.

Explanations of Shifts in Regional Employment

Two determinants influence shifts in the industry mix of a region's labor force. First, there is the "industry factor," defined as the base period industry mix of employment. The historical industry mix affects future changes in employment because some regions possess a larger proportion of the nation's rapidly growing industries. Second, a region's employment changes are explained by the "regional factor," defined as the competitive advantage one particular region has over other regions due, for example, to low-cost inputs for specific industries and access to important markets.

Competitive advantage, via its effect on plant profitability at different sites, influences plant location and thereby regional employment. Numerous studies, which are heavily oriented toward manufacturing, have been conducted to determine the relationship between plant location and regional characteristics. Among the variables reported to have a positive impact on interregional and interstate manufacturing location choice are lower wages, business taxes, personal income taxes, unionization, and higher primary and secondary education spending.[10] Thus employment in regions with attractive characteristics grows relatively faster than regions with unattractive characteristics.

In mining, more so than in other sectors, location and, therefore, employment shifts are dependent upon

[5] Everett E. Hagen, The Economics of Development, Fourth Edition. (Homewood, Illinois: Irwin, 1986), pp. 114-7.

[6] In the category of goods production manufacturing has held its own, increasing from 21.4 percent to 21.8 percent of GNP over the same period.

[7] See Victor R. Fuchs, The Growing Importance of the Service Industries (New York: Columbia University Press, 1965), pp. 13, 14, and Edward F. Denison, "The Shift to Services and the Rate of Productivity Changes," Survey of Current Business 53 (October 1973), pp. 20-35.

[8] Fuchs, pp. 13, 14.

[9] Colin Lawrence and Robert L. Lawrence, "Manufacturing Wage Dispersion: An End Game Interpretation," Brookings Papers on Economic Activity (1985:1), p. 48.

[10] For a study on wage differentials, see William E. Cullison, "Equalizing Regional Differences in Wages: A Study of Wages and Migration in the South and Other Regions," Economic Review, Federal Reserve Bank of Richmond 70 (May/June 1984), pp. 20-33. For an in-depth review of studies on business location decision, see Michael Wasylenko, "Business Climate, Industry and Employment Growth: A Review of the Evidence," Metropolitan Studies Program, Syracuse University, Occasional Paper No. 98, October 1985.

the resource site. The District's relative employment decline in mining, however, is primarily due to the decrease in West Virginia mining at an average rate of 2.9 percent annually between 1950 and 1985. There has been a significant increase in coal production in the past decade, but the rapid rise in coal mining productivity has created a decline in employment. In 1944, for example, over 393,000 bituminous and lignite miners produced an average 5½ tons per miner per day for a total production of 619 million tons. In 1980, only 225,000 miners produced over 16 tons per miner per day for a total output of 800 million tons. The relative decline in Fifth District mining employment is also partly attributable to the large increase in surface mining in the western states of the United States.

III.
FIFTH DISTRICT MANUFACTURING AND SERVICE EMPLOYMENT SHIFTS

The most significant employment shifts within the District and the nation have taken place in the manufacturing and service sectors. The remainder of this paper concentrates exclusively on these sectors.

The economic performance of the Fifth District is evaluated by comparing percentage changes in employment of the United States with comparable figures for the Fifth District. The period 1972 through 1985 is chosen for the manufacturing comparison because the 13-year period 1972-1985 is long enough for significant changes to have occurred. Furthermore, both end-point years occur within three years after a business cycle trough. For the service sector comparison, however, the years 1978 and 1984 are the end points because comparable data are not available prior to 1978 or later than 1984.[11]

The percent change in the District and each of its states is compared to that of the nation. The net employment gain or loss of an area relative to the United States reflects faster or slower growth compared to the nation as a whole. Moreover, the change in composition of each state's manufacturing or service sector indicates which industry subgroups had the greatest impact on the state's total manufacturing or service growth.

[11] Tables giving manufacturing employment (1972 and 1985) and service employment (1978 and 1984) by states in the Fifth District and for the District by SIC codes are available upon request from the author.

Fifth District vs. United States Manufacturing Employment

At the national level, manufacturing employment gains primarily occurred in high-tech jobs. On the other hand, employment losses were experienced by manufacturers depending most on natural resources. The instruments and related products group-a high-tech manufacturing classification-grew faster than any manufacturing group in the nation with a 40.2 percent employment increase between 1972 and 1985. Large employment increases also occurred in electric and electronic equipment, machinery (except electrical), and printing and publishing. On the other hand, primary metals experienced a 30.7 percent decline in employment followed by textile mill products (18.8 percent), and apparel (18.6 percent).

Figure 4 shows that manufacturing groups within the Fifth District have undergone changes quite different from those of the nation. Employment in the Fifth District grew faster or declined more slowly than in the nation in all but three of eighteen manufacturing industry groups. For example, Fifth District apparel employment declined by 8.8 percent between 1972 and 1985 while apparel employment in the United States declined 18.6 percent. This differential indicates that employment in the national apparel industry though declining overall is tending to be more heavily located in the Fifth District.

Figure 4

MANUFACTURING EMPLOYMENT CHANGES 1972 - 1985
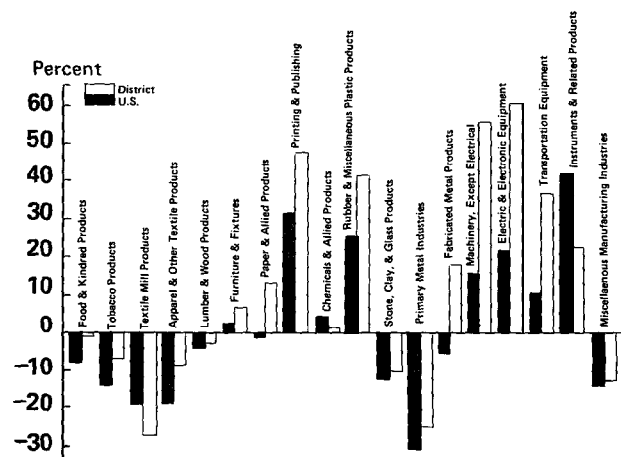
Explanations of Interstate Changes in Manufacturing Employment

Fifth District changes in manufacturing employment seem to be reasonably well explained by business location studies. (See Table III.) Between 1972 and 1985, the largest manufacturing employment increases in the District occurred in North Carolina, Virginia, and South Carolina, where wages, unionization, and corporate taxes are relatively low. Declines in employment have occurred along with correspondingly higher wages, unionization, and corporate tax rates in West Virginia and Maryland. In fact, North Carolina, with the lowest wage and second lowest unionization rate in the District, has become, the nation's most industrialized state, with 31.3 percent of its employees being in the manufacturing sector in 1985. South Carolina was second, with 28.1 percent.

North Carolina experienced the largest increase (9.3 percent) in Fifth District manufacturing employment between 1972 and 1985. To be sure, North Carolina suffered a substantial loss in textile mill employment. However, increases in other manufacturing industries led by transportation equipment and machinery, more than offset that loss. Virginia, a principal supplier to the federal government, enjoyed a 9.2 percent manufacturing employment increase,

helped by large gains in defense and research-related groups, as well as printing and publishing. South Carolina, on the other hand, experienced more balanced growth of 3.1 percent, with gains in all but three of its manufacturing groups.

Manufacturing employment declines in Maryland, the District of Columbia, and West Virginia between 1972 and 1985 appear to be the result of a long-term trend and are greater than the declines currently experienced by the nation. Maryland recorded a decline of 12.7 percent even though large proportions of electric and electronic equipment industries benefited from a strong national market and an increase in defense spending. The District of Columbia witnessed an employment decline of 16.3 percent, and West Virginia suffered a 27.3 percent loss of manufacturing employment with declines in every industry group except machinery (not including electrical machinery) and printing and publishing.

Fifth District vs. United States Service Employment

The U. S. service sector grew 30.7 percent between 1978 and 1984. By far the fastest growing service industry was the private household group, growing over 130 percent during this period. The private

Table III

1985 BUSINESS CONDITIONS FOR MANUFACTURING SECTOR

	Average Hourly Wages	Percent Workforce Unionized	State Corporate Tax**	Annual Average Percent Employment Change 1972-85
United States	9.15	.27		0.07
Fifth District	8.03*	.11*	.062*	0.21
Maryland	9.70	.32	.070	- 1.13
North Carolina	7.30	.05	.060	0.75
South Carolina	7.60	.04	.060	0.25
Virginia	8.50	.12	.060	0.73
West Virginia	10.20	.37	.070	- 2.63

Note: District of Columbia is excluded because data is not available in all categories.

* Weighted average based on the proportion of employment in each state.

** When a two-tier tax system is used, the higher of the two rates is reported.

Sources: The Seventh Annual Study of General Manufacturing Climates, Grant Thornton, June 1986; State Tax Handbook (Chicago: Commerce Clearing House, 1985); and U. S. Department of labor, Bureau of Labor Statistics, Employment and Earnings, various editions and unpublished data.

household group, which includes such services as housekeeping and babysitting, received its stimulus from the increasing number of two-wage earner households that have created a demand for these services. Other groups outstripping the annual average rate for the service sector are business services (54.8 percent), legal services (48.3 percent), social services (36.1 percent), and miscellaneous services (32.6 percent).

The slowest growing service group is membership organizations which increased 5.6 percent between 1978 and 1984 and includes categories such as labor organizations and civic and social associations. The slower growth for this service group reflects a decline in labor organizations.

In general, the District service sector experienced growth patterns similar to the nation but with greater strength. (See Figure 5.) Of the 15 service industry groups, 11 experienced faster growth in the District than in the nation.

Fifth District States

Virginia experienced the largest service employment increase in the Fifth District. A review of Virginia's service sector composition reveals benefits from its proximity to Washington, D. C. Over 25 percent of Virginia's 1984 service employment is in the business service group which provides outputs such as computer and data processing and research and development laboratories.

Maryland experienced the most even distribution of service growth in the District. Growth faster than the national rate occurred in all of Maryland's service groups with the exception of educational services. That state has also benefited from federal government purchases from local firms. Some of the major categories Maryland supplies are engineering services and medical and aerospace research-development. Similar to other District states, both Virginia and Maryland found much of their 1984 service employment in health services (26.9 percent and 28.2 percent, respectively).

West Virginia experienced the slowest service employment growth in the Region. Only three service groups showed growth rates faster than the nations. In fact, two service groups showed declines of over 15 percent each. Because the state has suffered large manufacturing and mining sector losses, West Virginia's economy is weak. Consequently, service sector growth remains well below the nation as a whole.

The service sector in the District of Columbia reflects a strong presence of the federal government. Service groups such as legal services, business services, membership organizations, and miscellaneous services each comprises over 10 percent of total service employment.

Both North and South Carolina show service sector increases greater than those of the nation. The largest proportion of service employment in both states is found in health services followed by business services. Large service employment increases in South Carolina and North Carolina are found in the amusement and recreation service group and the private household service group.

Figure 5

SERVICE EMPLOYMENT CHANGES
1978 - 1984
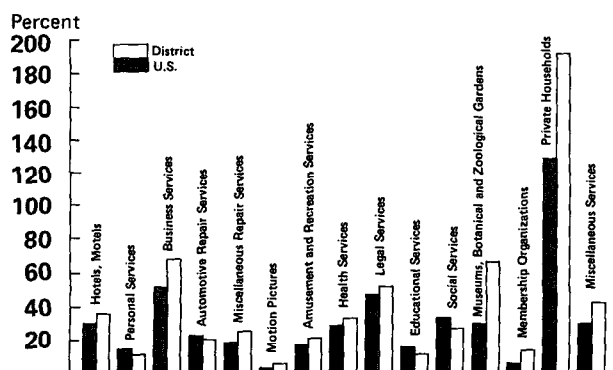
IV.
SUMMARY AND CONCLUDING NOTE

The Fifth District has enjoyed rapid employment growth since World War II, as has the nation as a whole. Employment in the District, however, has grown even more rapidly than that in the nation. During the last decade employment growth has slowed in both the Fifth District and the nation, but the Fifth District has grown slightly faster than the nation in the last twelve years. Within the Fifth District, North 'Carolina, South Carolina, and Virginia have grown faster than Maryland, West Virginia, and the District of Columbia. There is some

evidence that the difference in growth may be attributable to a more favorable business environment in North Carolina, South Carolina, and Virginia, although a complete analysis of the reasons for such employment differentials was beyond the scope of this article.

Changes in the structure of employment differ among industry groups within a particular sector and within particular states because of varying regional characteristics. In the manufacturing sector, industries depending most on natural resources are declining while those depending more on high technology are increasing. Relative to other states in the nation, the District states of North Carolina, South Carolina, and Virginia are experiencing greater increases in manufacturing employment. The District service sector, on the other hand, more closely reflects the trends of the nation, but has shown larger increases in employment.

Employment in the United States and District economy is likely to continue to become more service oriented. According to Bureau of Labor Statistics employment projections for 1984 through 1995, there will be a further expansion of employment in the service sector and a contraction of the goods-producing sector. Although the service sector will continue to generate most of the new jobs in the economy, the rate of employment growth in the next decade is not expected to be as fast as the period 1973 through 1984.