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In This Issue . . .

There is considerable concern that the substantial U.S. trade deficits incurred in recent years are a symptom or, even worse, a cause of general weakness in the U.S. economy. In the first article in this *Review*, K. Alec Chrystal and Geoffrey E. Wood answer the question, "Are Trade Deficits A Problem?" They first demonstrate the relationship between trade deficits and capital surpluses using the U.S. balance of payments account. They then distinguish between circumstances in which trade deficits are problematic — for example, those produced by inflationary domestic monetary policy — and circumstances in which they are not — for example, those produced by high private investment relative to the domestic savings available to fund them. They conclude by noting that the present trade deficits appear to have resulted from a combination of large federal deficits and investment spending. Insofar as the federal deficit and private savings behavior are taken as given, the choices that the United States faces are continued high levels of private investment demand and trade deficits or balanced trade and slow real growth. In the current case, reducing the trade deficit might well produce the greater problem.

* * *

Protectionist pressures have been mounting worldwide during the 1980s. In the second article in this *Review*, Cletus C. Coughlin, K. Alec Chrystal and Geoffrey E. Wood survey the theory, evidence and rationale concerning protectionist trade policies. The authors illustrate the gains from free trade using the concept of comparative advantage and review recent developments concerning the consequences of international trade in imperfectly competitive markets. They argue that, while protectionist trade policies occasionally may offset foreign monopoly power or advantageously use domestic monopoly power, trade restrictions generally reduce both the competition faced by domestic producers and the consumption possibilities of domestic consumers.

The empirical evidence is clear-cut. The costs of protectionist trade policies borne by consumers far exceed the gains of domestic producers and government. Moreover, the adverse consumer effects are not short-lived. Protectionist trade policies generate lower economic growth rates than free trade policies. Consequently, national interests will be served by the reduction of trade barriers.

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In the third article, entitled "The Borrowed Reserves Operating Procedure: Theory and Evidence," Daniel L. Thornton analyzes the Federal Reserve's operating procedure as a method for controlling the money stock or the federal funds rate. Thornton demonstrates that the borrowed reserves operating procedure is not an effective method for controlling the money stock. Indeed, he shows that an interest rate targeting procedure would be more effective in controlling money. Furthermore, he shows that the borrowed reserves operating procedure is an effective method of controlling interest rates in the short run only when the variation in borrowing is due solely to shifts in the demand for total reserves; in the long run, it is an effective method of controlling interest rates only when the borrowings function is stable.

Thornton also investigates the use of the borrowing functions since October 1982. His evidence suggests that the borrowings operating procedure has been used to offset the effect of permanent shifts in borrowings on the federal funds rate.

In This Issue . . .

The farm sector of the United States experienced a severe downturn in the 1980s despite over $95 billion in government support. Many analysts believe that such government supports and other traditional U.S. farm policies have done little to alleviate agriculture's problem and may have actually contributed to the farm crisis. As a result, some have proposed mandatory controls on crop production as an alternative to the current policy of voluntary acreage reduction and direct government payments.

Such mandatory controls have been used in the United States to support the price of tobacco since the 1930s. In the final article in this *Review*, "Farm Policy and Mandatory Supply Controls — The Case of Tobacco," Kenneth C. Carraro examines U.S. tobacco policy to analyze the likely consequences of extending mandatory supply controls to other major U.S. crops. Carraro shows that the United States was able to use mandatory supply controls successfully for many years only because both world supply and world demand were inelastic. As the world elasticity of both supply and demand increased over time, however, the effectiveness of U.S. tobacco policy eroded. The author concludes that mandatory supply controls for other crops would not be successful because the conditions of elasticity that worked well previously for tobacco are not present for other major crops.

Are Trade Deficits a Problem?

K. Alec Chrystal and Geoffrey E. Wood

IN 1986, the U.S. trade deficit exceeded $140 billion. Such substantial trade deficits often are considered a sign of weakness in the economy. While this situation is something of a novelty for the United States, many other countries have had trade deficits off and on throughout the postwar period.[1]

The purpose of this article is to explain what is meant by trade deficits within the context of the balance of payments, to outline the circumstances under which the state of the balance of payments may be symptomatic of a problem, and to consider what this analysis implies currently for the United States. With regard to the last, we will suggest that concern about the U.S. trade deficit has been overstated. Indeed, a trade deficit can be indicative of a healthy and strongly growing economy.

THE BALANCE OF PAYMENTS ACCOUNTS

The balance of payments accounts are a record of transactions between domestic residents and the rest of the world over a specific period of time. Like any double entry bookkeeping system, the balance of payments accounts must balance.[2] There is nothing mysterious about this, nor does it involve any statement about how the world works.

The simplest form in which the balance of payments accounts can be expressed is as follows:

$$(1)\quad CA + K + F \equiv 0,$$

where CA is the current account balance, K is net nonofficial capital flows and F is official reserve financing. These items are defined in such a way that they must sum to zero. Let us consider each of them in turn.

Current Account

The current account has two major components. These are the trade balance and the services or "invisibles" balance. The former, which generally gets the most attention, is the difference between the value of goods exported and the value of goods imported. These exports and imports are of physical objects which, in principle, could be observed crossing the border. In contrast, "invisibles" are services for which international payments are made but that do not

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[1]The United States did run deficits in the 19th century, but not quite as big relative to GNP as are current U.S. trade deficits. See Mudd and Wood (1978).

[2]Because of measurement errors, the actual accounts add in a "statistical discrepancy" which when included in (1) ensures balance. The reason we say that they *must* balance, however, is not a statement about the accuracy of the statistics. The current and capital account (including official balance) are defined to be equal and opposite. Think of the current account as the excess of income over spending. The capital account is then merely net saving, which is equal to income minus spending. If you measure saving as negative and the excess of income over spending as positive, they will obviously add up to zero.

involve the direct transfer of a physical product. For example, if a New York shipping company were to insure a cargo with Lloyds of London, the purchase of that insurance contract would represent an invisible import for the United States and an invisible export for the United Kingdom.

Invisibles take many different forms. Two examples are worth mentioning in addition to such financial services as insurance and banking. First, if a nation has either assets or liabilities overseas, the net payment of interest or dividends is measured as an invisible import or export. A positive net return on foreign assets is counted as an invisible export, because it generates an inflow of payments into the economy just as an export of goods does. Second, international tourism is counted as part of the invisible component of the current account. If U.S. citizens spend more on overseas trips than foreigners spend on U.S. vacations, it is measured as an invisible net import in the U.S. balance of payments.

Non-Official Capital Account

The capital account of the balance of payments measures the change in net indebtedness between the domestic economy and the rest of the world. It is important to get this clear, as there is sometimes confusion about what the capital account contains. It does not involve imports and exports of capital goods, such as machine tools and computers. These are all physical goods, and their import and export are therefore counted in the trade account. The capital account involves the transfer of financial claims of various kinds. These claims are referred to as "capital" because they represent claims to interest or dividend payments and, in the case of company shares, do involve ownership of underlying real assets.

The terminology commonly used to describe the capital account is rather confusing when it is related to the way in which capital account items are measured. In the current account of the balance of payments, goods leaving the country is measured as a plus item. In the capital account, however, what is generally called a capital "outflow" is measured as negative. Only the terminology here is confusing, however; accounts are quite logical. What we mean by a capital outflow is that domestic residents are buying foreign assets. In other words, they are "importing" foreign shares, titles or securities. Thus, all purchases of foreign goods, securities (stocks, bonds, bills) or any other asset are measured as negative (imports), and all sales to foreigners are measured as positive (exports) irrespective of whether they are goods sales or asset sales.

In principle, the capital account of the balance of payments measures the change in the net asset/liability position between the home economy and the rest of the world. We say "in principle" because there is one respect in which this is not correct. The capital account measures the value of the net flow of financial instruments (stocks, bonds, bills, etc.) that passes between domestic and overseas residents. But the external indebtedness of an economy changes not just as assets change hands. It also changes as a result of changes in values of assets that have not changed hands. For example, U.S. residents may own shares in Rolls Royce which rise in value. This capital gain (or loss) element of the external asset/liability position is not measured as part of the balance of payments accounts until it is realized by an asset sale. Only the flow of financial claims is included.[3]

Official Balance

The final item in the balance of payments accounts is the balance for official financing. This comprises changes in the official foreign exchange reserves of the domestic economy. These reserves are mainly claims against foreign governments (or central banks), for example, Fed holdings of Deutsche marks. For most countries, reserves are held as a means of intervening in foreign exchange markets to support the value of the domestic currency.[4] This item is a special official sector component of the capital account. It is treated separately for historical reasons associated with the fixed exchange rate system which operated almost worldwide from World War II until 1973.[5] Under a freely floating exchange rate regime, the official financing balance is always zero. If F in equation 1 is zero, clearly, CA and K must be equal and of opposite sign.

U.S. Balance of Payments

Table 1 shows the U.S. balance of payments for 1986. It shows a current account deficit of a little over $141 billion. The current account is made up of items 1 and 2. The capital account surplus of $117 billion is shown in lines 3 and 4. Changes in U.S. official reserves are shown in line 5. There was a very small fall of $0.312 billion in 1986 (a plus sign indicates a decline in holdings of foreign assets). This indicates that the U.S. authorities intervened little during 1986 as a whole.

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[3]Some have claimed that the United States has become a net debtor vis-a-vis the rest of the world. This claim ignores the capital gains on U.S.-owned foreign assets; in reality, the United States is likely still to have positive net external assets.

[4]See Balbach (1978).

[5]See Batten and Ott (1983).

Table 1

U.S. Balance of Payments: 1986 (millions of dollars)

1) Merchandise trade	$-144,339	
2) Invisibles net	+2,987	
Balance on current account (1 plus 2)		$-141,352
3) Change in U.S. assets abroad (increase −)	−96,294	
4) Change in foreign assets in U.S. (increase +)	+213,387	
Balance on capital account (3 plus 4)		+117,093
5) Change in U.S. official reserves (increase −)		+312
Statistical discrepancy (1+2+3+4+5)		$23,947

NOTE: The merchandise trade balance is exports minus imports. The invisibles balance is the sum of: net military transactions; net investment income; other service transactions; net remittances, pensions and other transfers; and U.S. government grants (non-military).

SOURCE: U.S. Department of Commerce.

Thus, the dominant picture is one of U.S. residents buying more goods and services overseas than foreign residents are buying from the United States and of foreigners increasing their net holding of claims against the United States.

Notice, however, that there is a fairly large statistical discrepancy. The presence of this discrepancy indicates that the data do not include some trade and/or capital flows. While it is impossible to say where the inaccuracies arise, it is often presumed that the greatest errors are likely to be in the capital account, primarily because asset transfers are more difficult to keep records on. If the data had no omissions, then the current and capital accounts (including official flows) would add to zero.

It is not obvious at first glance why the current and capital accounts must offset each other exactly. What would happen if they did not? Suppose for example, that at current exchange rates a country is running a current account deficit but its *planned* net capital flows are zero. This means that the country is trying to spend more on imports than foreigners are willing to spend on its exports. This will produce an imbalance in its foreign exchange market.[6] Attempted sales of domestic currency (for foreign currency) will exceed attempted purchases. The market value of the currency will fall until the quantity of the currency demanded is equal to that supplied. At this point, either the current account has adjusted so that it is no longer in deficit, or the net export of assets (induced as assets in the country became cheaper, through domestic currency devaluation, and thus more attractive to foreigners, and prices of foreign assets became higher and hence less attractive to U.S. citizens) is just equal to the current account deficit. Thus, the exchange rate will adjust to ensure that the current and capital accounts are exactly offsetting.

There is nothing magical about this outcome. The end result is the same for any individual. If you spend more than your income, you must borrow or sell the equivalent value of your assets to cover the difference; if you spend less than your income, you must inevitably acquire increased claims on someone else. Similarly, a nation that runs a current account deficit must either borrow from abroad or sell off some of its assets, whether these assets are domestic or foreign. Likewise, a current account surplus must be associated with either an increase of claims on foreigners or a reduction of previous borrowings.

Another implication of the definition of balance of payments is the following identity:

(2) $CA \equiv GNP - GDE.$

The current account surplus (or minus the current account deficit) is equal to gross national product minus gross domestic expenditure. This identity shows that the current account of the balance of payments is the difference between the value of what the nation produces and what it spends. The former (GNP) can also be thought of as the value of the nation's gross income. Identity (2) is useful because it makes clear that any nation that spends more than it produces will have a trade deficit. The interesting question, of course, is whether such an imbalance is good or bad.

WHAT MAKES THE CURRENT ACCOUNT BALANCE A PROBLEM?

The nature of what is usually termed a balance of payments problem varies considerably, depending

[6]See Chrystal (1984).

upon whether the country in question has a fixed or a floating exchange rate regime. The problem produced by a deficit on the current account can be most acute if the nation is maintaining a fixed exchange rate regime.[7] In this case, "the problem" is felt directly by the central bank.

Maintaining a fixed exchange rate vis-a-vis one or more countries requires the pegging nation's central bank to hold foreign exchange reserves with which to intervene in the foreign exchange market. This intervention can be necessary to stop the exchange rate from moving in either direction. Suppose, for example, that the country has a current account deficit and no desired net private capital flows. In order to maintain the existing exchange rate, the central bank must sell foreign exchange for its domestic currency. Whether the origin or source of the net supply of domestic currency in foreign exchange markets is from the current or capital account side of the balance of payments is irrelevant. The domestic currency value of reserves sold in a particular period is the official financing balance, F, in equation 1. Because it involves the sale to foreigners of a domestically held asset, a net loss of reserves is measured as positive in the balance of payments accounts.

Under a fixed exchange rate regime, exchange rate pressure poses a problem if the central bank in question starts to run out of foreign exchange reserves. This possibility makes the problem worse because holders of the domestic currency, fearing a devaluation, will try to buy foreign currency. Speculative sales of the domestic currency in foreign exchange markets force the central bank to sell even more foreign exchange reserves. Inevitably, the nation must either devalue its currency or introduce measures to cut domestic spending (including spending on foreign goods). This action is unavoidable; otherwise, the central bank will run out of foreign exchange reserves.

This describes the nature of most balance of payments crises experienced by countries attempting to maintain fixed exchange rates in the 1950s and 1960s. It is worth noting, however, that the United States under the postwar "Bretton Woods" regime was not the same as other countries.[8] All other countries in the system pegged their currencies to the dollar and held dollar reserves for this purpose. The United States, therefore, did not need to support its own exchange rate and, in fact, did not hold significant reserves of foreign currency during this period.[9]

Since the spring of 1973, when all the major industrial countries moved to a floating exchange rate regime (the United Kingdom had floated in June 1972), the nature of balance of payments problems has changed.[10] Under a floating exchange rate system, a central bank does not have to use its foreign exchange reserves to finance a deficit in the non-official part of the balance of payments; in fact, there will be none.[11] In equation 1 above, the term F becomes zero. Instead of central bank intervention, the exchange rate moves to assure that the current account and the capital account sum to zero on their own.

WHY WORRY ABOUT THE TRADE BALANCE?

Concern about the state of the trade balance has a long history. It is useful to put this concern in historical context, as it leads naturally to the analysis of when such concern is justified.

In the following discussion, we take it as given that trade itself is beneficial, a point not clearly established until Ricardo's famous demonstration published in 1817. There was, however, some connection historically between the case against trade *deficits* and the understanding of why trade in general was a good thing. Only when the gains from trade were properly understood could people begin to make sensible assessments of the cause and effect of trade deficits.

The context in which the early debates took place was an international economy in which payments for external trade were largely made in precious metals, especially gold. The effect of running a trade surplus was that a nation would accumulate gold. In many

[7]The exception to this is when a currency is depreciating at a fast rate. This is a symptom of acute internal problems normally associated with hyperinflation.

[8]The system was named after the place in New Hampshire where the final negotiations setting it up were held in July 1944.

[9]The U.S. authorities agreed to convert dollars into gold at $35 per ounce. This commitment was abandoned for all but official holders in March 1968 and for official holders in August 1971. See Batten and Ott (1983) for evidence on exchange market intervention.

[10]Note that even today the majority of small countries peg their exchange rates to either a major currency or a weighted basket of currencies. Reserve shortages still may cause acute problems for them.

[11]In fact, none of the major currencies are floating freely. All the major central banks have intervened from time to time to influence exchange rates. Intervention to support the dollar has been especially heavy since the "Plaza Accord" of September 1985.

people's minds, the accumulation of gold itself became the object of trade: trade surpluses were "good" and trade deficits "bad." Trading in order to build up gold holdings became known as mercantilism.

Mercantilism was criticized by several eminent writers, including David Hume (1752), who showed that a continuing trade surplus was unattainable. An existing trade surplus, he noted, produces an inflow of gold. Because gold is a form of money, the quantity of money in the country rises. This, in turn, produces a rise in prices, which continues as long as more gold flows in. As the country's goods become more expensive relative to those produced overseas, however, fewer will be bought, eventually eliminating the trade surplus.[12]

Some years later, David Ricardo (1817) used this demonstration to show why trade deficits occurred. His answer to this question brings us directly to our central point: trade deficits can result from a variety of sources, not all of which are "bad."

RICARDO, THORNTON AND TRADE DEFICITS[13]

Ricardo argued that a trade deficit was the inevitable consequence of prices in the deficit country being "too high." These prices, in turn, were produced by excessive prior monetary expansion from domestic sources that were unrelated to prior trade surpluses.[14] He argued, in other words, that excessive monetary expansion was not only a sufficient condition for a trade deficit to occur, it was also a necessary condition and vice versa for trade surpluses.

This describes what happened in many countries during the Bretton Woods regime. While this sequence of events portrays a common cause of trade deficits, however, it is not the only cause. In the 65-year period between 1830 and 1895, the United States had a current account deficit in almost every year; there were only 13 years in which a surplus was recorded. Yet this was not a period of sustained inflation.[15] Indeed, it was a period of rapid and prolonged economic growth. There is thus at least one counterexample — and a major one — to Ricardo's generalization. How can this be explained?

At the time Ricardo was writing, his claim was disputed, most notably, by Henry Thornton. Thornton argued that, although prior excessive money expansion was indeed sufficient to produce a trade deficit, it was not a necessary condition for a trade deficit.

Thornton distinguished between trade deficits arising from real causes and those arising from excessive money creation. The former can occur because individuals in a country want to spend more than their current income, that is, they wish to reduce their net financial wealth or increase their net indebtedness.[16] In terms of equation 2 above, anything that causes domestic spending to exceed output will produce a trade deficit.

Of course, the balance of payments deficit from this cause can not persist forever. It will disappear when individuals have reached their new lower desired wealth level; in the same manner, a trade deficit produced by excess money creation will end when the excess money has been dispersed overseas (or deflated by higher prices).[17]

In summary, a trade deficit can be produced not just by excess monetary expansion, but by dissaving.[18] Both of these will produce deficits that are temporary; however, these deficits will be eliminated eventually by different mechanisms. Dissaving and the associated decline in financial wealth can be produced by several factors; examining some major ones helps to understand the current U.S. situation.

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[12]Hume, although dealing explicitly with the mercantilist argument, dealt implicitly with the notion that an export surplus is necessary for growth. Since a perpetual export surplus is impossible, if an export surplus were essential for growth, growth would have stopped. It did not, however, and to date has not.

[13]An extensive discussion of the ground covered in this section can be found in Perlman (1986).

[14]The issue of domestic bank notes partially backed by gold was a topic of controversy between the "currency" and "banking" schools through the 19th century in Britain.

[15]For more details on this, see Mudd and Wood (1978) and Friedman and Schwartz (1963).

[16]This highlights the fact that a trade deficit can be a symptom of a problem, but is not itself a problem. Alternatively, it may be a symptom of something that is not a problem at all.

[17]Note that, when we talk about a "lower desired wealth level," we are referring only to financial wealth. If financial assets are being converted into physical capital, the composition rather than the level of wealth is changing. If the physical capital offers a greater rate of return than financial assets, this change actually will increase people's wealth. This distinction is central to the argument that a trade deficit associated with high levels of domestic real investment could lead to faster real growth, increased wealth and higher output in the future.

[18]Monetary expansion need not always lead to a trade deficit. In a classic paper, Robert Mundell (1963) showed that, with perfect capital mobility, floating exchange rates and sticky goods prices, monetary expansion causes capital outflows (purchases of foreign assets). This causes the currency to depreciate and results in a current account *surplus*. Similar results are found in the modern "overshooting" literature.

WHY SHOULD THERE BE DISSAVING?

In order to discuss the possible sources of dissaving in the domestic economy, it is convenient to set out another identity:[19]

(3) $CA \equiv (S - I) + (T - G)$.

This shows that the current account surplus must be equal to the excess of private saving over private investment $(S - I)$, plus the government budget surplus $(T - G)$. In other words, the surplus for the economy as a whole can be broken down into the private sector surplus plus the public sector surplus. This classification suggests possible directions in which to look for causes of the trade deficit: a fall in private saving, a rise in private investment or an increase in the government budget deficit.

A fall in private saving must be associated with an increase in consumption relative to income. This could happen if there were a temporary fall in income due, for example, to a crop failure or a natural disaster. It is well established that, at times when income is abnormally low, people attempt to maintain their consumption patterns by dissaving. If the nation as a whole does this, it will necessarily involve a trade deficit. It should be emphasized that, while crop failures or other natural disasters are unfortunate, the ability to adjust to these events by dissaving and thus importing goods from abroad is preferable to reducing domestic consumption. In extreme cases, the choice may be between running a trade deficit and starvation. While natural disasters can explain some trade deficits, it is unlikely to explain the U.S. deficits in the 1980s. After all, this has been a period of fairly steady income growth.

The second alternative suggested by identity (3) is a rise in private investment, caused by an expected rise in the productivity of domestic capital (relative to that overseas). This alternative is an extremely healthy sign for the domestic economy. It indicates that the expected profitability of investment was such that firms were prepared to borrow in order to finance the higher investment. If private investment exceeds private saving (for a balanced government budget), the private sector must borrow from overseas. We have seen already that net borrowing from overseas implies a current account deficit in the balance of payments.

[19]This can be derived as follows: $GNP = C + I + G + CA$ from the expenditure accounts. It is also true that $GNP = C + S + T$ from the income accounts. So $I + G + CA = S + T$ and $CA = (S - I) + (T - G)$.

If overseas-financed growth in private investment lies behind the trade deficit, we have to be careful in interpreting the statement that the trade deficit is associated with dissaving or a reduction in wealth. It is true that the private sector will be increasing its net financial liabilities (or reducing net financial assets). At the same time, however, it is converting those liabilities into real capital. The return on that real capital is expected to be greater than the cost of the borrowing. Hence, this provides the basis for income and wealth growth in the future and, presumably, explains why the United States had sustained trade deficits throughout the second half of the 19th century. Rapidly growing countries that attract capital from overseas typically will have trade deficits.

The final possibility is that the current account deficit reflects the government budget deficit. Obviously, if private saving and investment were equal, the budget deficit and the current account deficit would be equal. We shall not pursue the question of whether the budget deficit is "good" or "bad" for the economy. Assuming that the budget deficit represents the deliberate choice of policymakers, however, it follows that the associated trade deficit must be preferred to the alternatives.

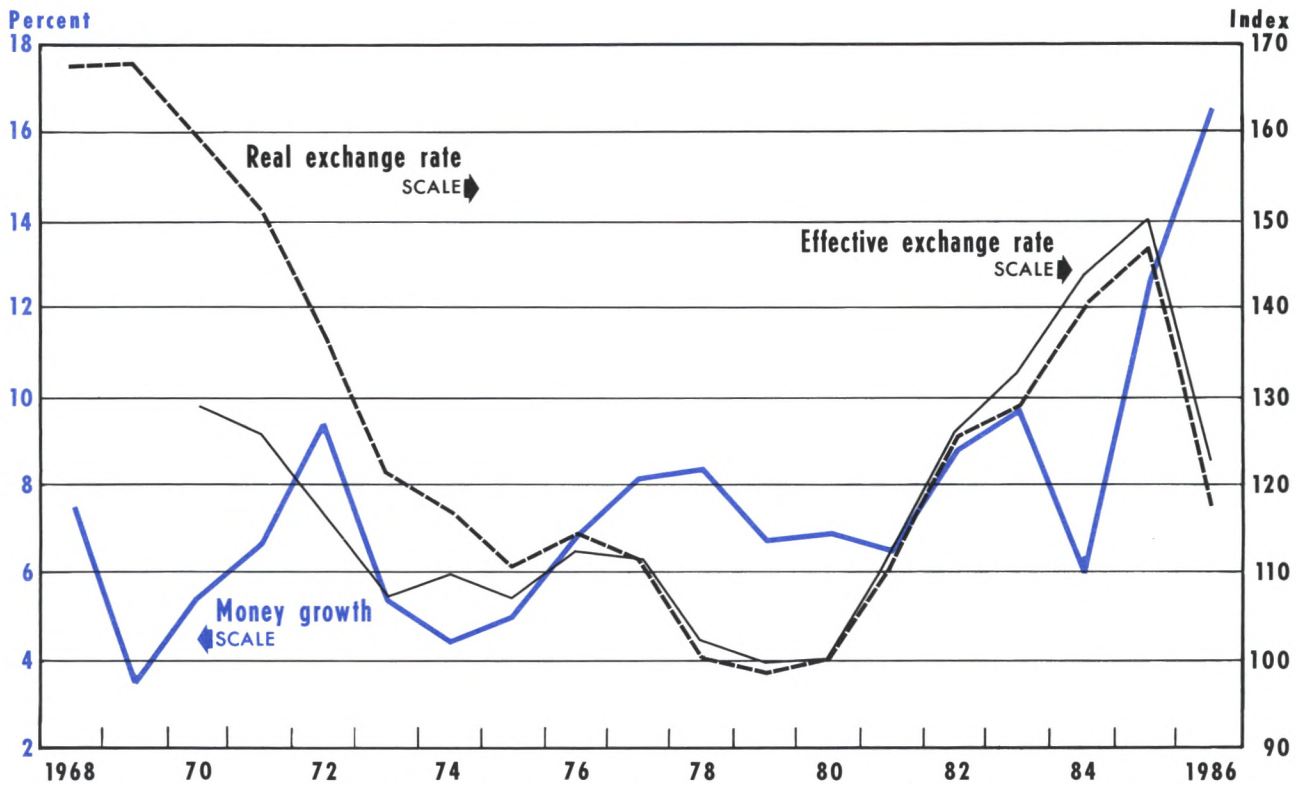
Thus, we have seen that a rising current account deficit must be associated with either a rise in investment relative to saving (or fall in saving relative to investment) or a rise in the budget deficit of the government. We already had seen that current account deficits could result from excessive monetary expansion, a case that is consistent with identity (3): the attempt to spend the excess money will result in either a fall in $S - I$ (higher consumption, lower saving or higher investment) or a fall in $T - G$ (more government spending relative to taxes).

The Evidence for the United States

We now look at the possible causes of the U.S. current account deficit. First, we consider the argument, favored by Ricardo, of fast monetary growth associated with high domestic inflation. At first sight, this appears a likely possibility. Monetary growth accelerated after 1982 (chart 1) at the same time as the current account plunged into deficit (chart 2). However, U.S. inflation fell (chart 3) and remained consistently below the OECD average during this period. Also, both the real and effective exchange rates appreciated strongly until 1985. The inflation and exchange rate behavior are signs of monetary tightness, not mone-

Chart 1

U.S. Money Growth, Effective and Real Exchange Rates



NOTE: The effective exchange rate is the Federal Reserve Board of Governors' trade-weighted exchange rate, a weighted index (1973=100) of the dollar's value in terms of 10 industrial country currencies. The real effective exchange rate is obtained by dividing the nominal effective exchange rate by the ratio of consumer price indexes (CPI) of the 10 industrial countries, (trade-weighted, the same as the exchange rates) to the CPI of the United States; all CPIs are indexed to 1973, 1973=100.

tary ease.[20] Only the high U.S. money growth in 1986 looks consistent with Ricardo's explanation: both the real and nominal exchange rates fell during 1986. The increase in the trade deficit in 1986, however, was small. Hence, little weight can be attached to the monetary explanation of the trade deficit. Indeed, why the rapid money growth of 1982–86 did not create inflation is still something of a mystery. There was, over this period, a significant decline in the velocity of circulation, which means that the extra money balances were willingly held rather than spent domestically.[21]

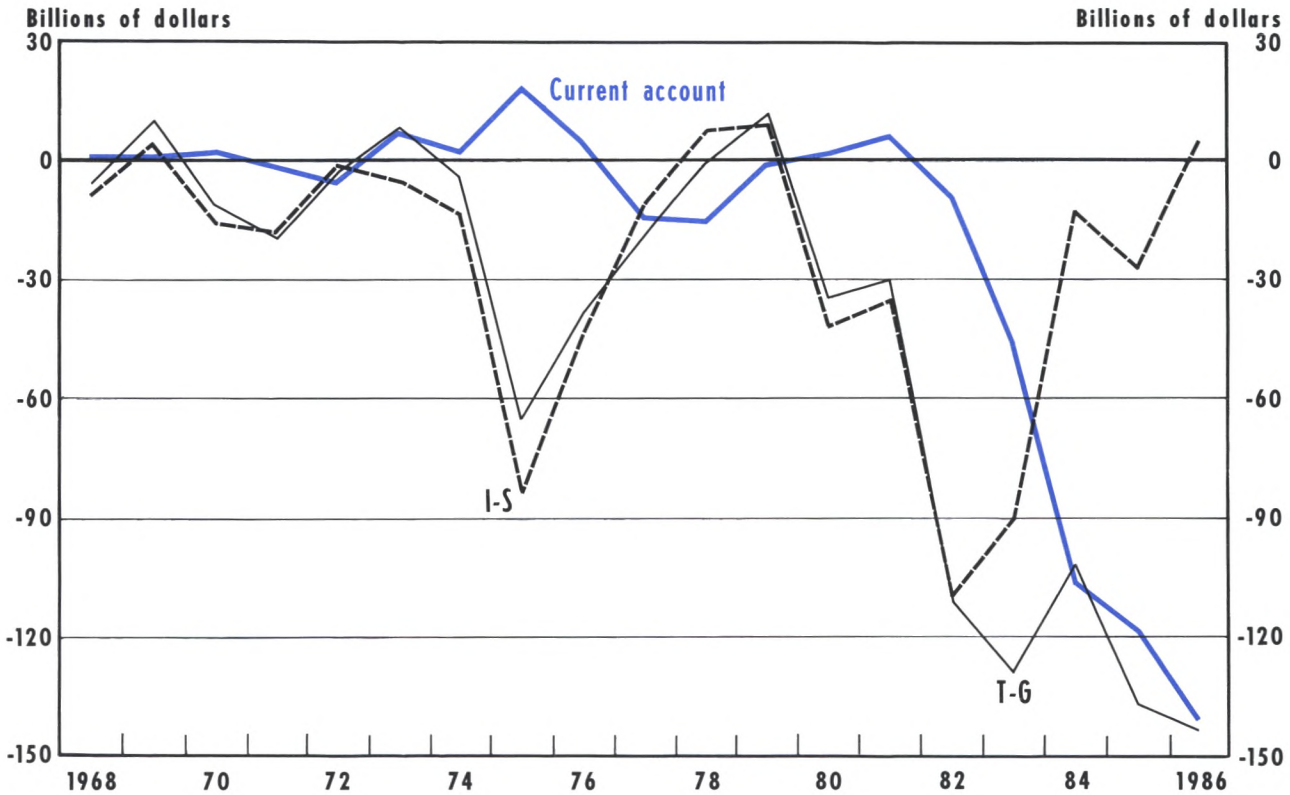
A much more plausible story emerges from a plot of the private and public sector surpluses (chart 2). Notice that we show here I − S rather than S − I, because it is easier to see its correspondence with T − G. Before 1982, the relationship between the public sector deficit and the private sector surplus was remarkably close. As a result, current account deficits and surpluses generally were small. After 1982, however, the

[20]It is possible that the Mundell model referred to above is relevant here. This predicts that monetary tightness causes capital inflows, a currency appreciation and a current account deficit. We think this unlikely to be relevant here. There is no clear evidence of sufficient monetary tightening over the entire 1981–86 period to explain what happened. More importantly *the same outcome* is predicted from the Mundell analysis as resulting from fiscal expansion. Hence monetary neutrality combined with fiscal expansion would be sufficient. It is the latter which seems to us to dominate in this case.

[21]See Stone and Thornton (1987).

Chart 2

Relationships Between Public and Private Sector Deficits and the Current Account



public sector deficit stayed high while private investment rose relative to private saving. By 1986, the private sector invested in excess of its saving. Hence, the continued public sector deficit is necessarily matched by a current account deficit of equivalent size. Insofar as the government budget deficit is taken as given, the choices that the U.S. faces are high levels of private investment and a trade deficit or balanced trade and slow real growth.

CONCLUSION

A trade deficit arises when a country buys more from overseas than foreigners buy from it. The counterpart of a trade deficit in the balance of payments accounts is an increase in borrowings (or reduction in net lending) from the rest of the world. Trade deficits could result from inflationary domestic monetary policies; there is no evidence, however, that such policies are the cause of the current U.S. trade deficit. In general, a trade deficit must be associated with some combination of private and public sector deficits. Until 1982, the budget deficit was approximately financed by private sector surpluses. The present situation, however, is the inevitable result of the combination of a budget deficit and high investment relative to private saving.

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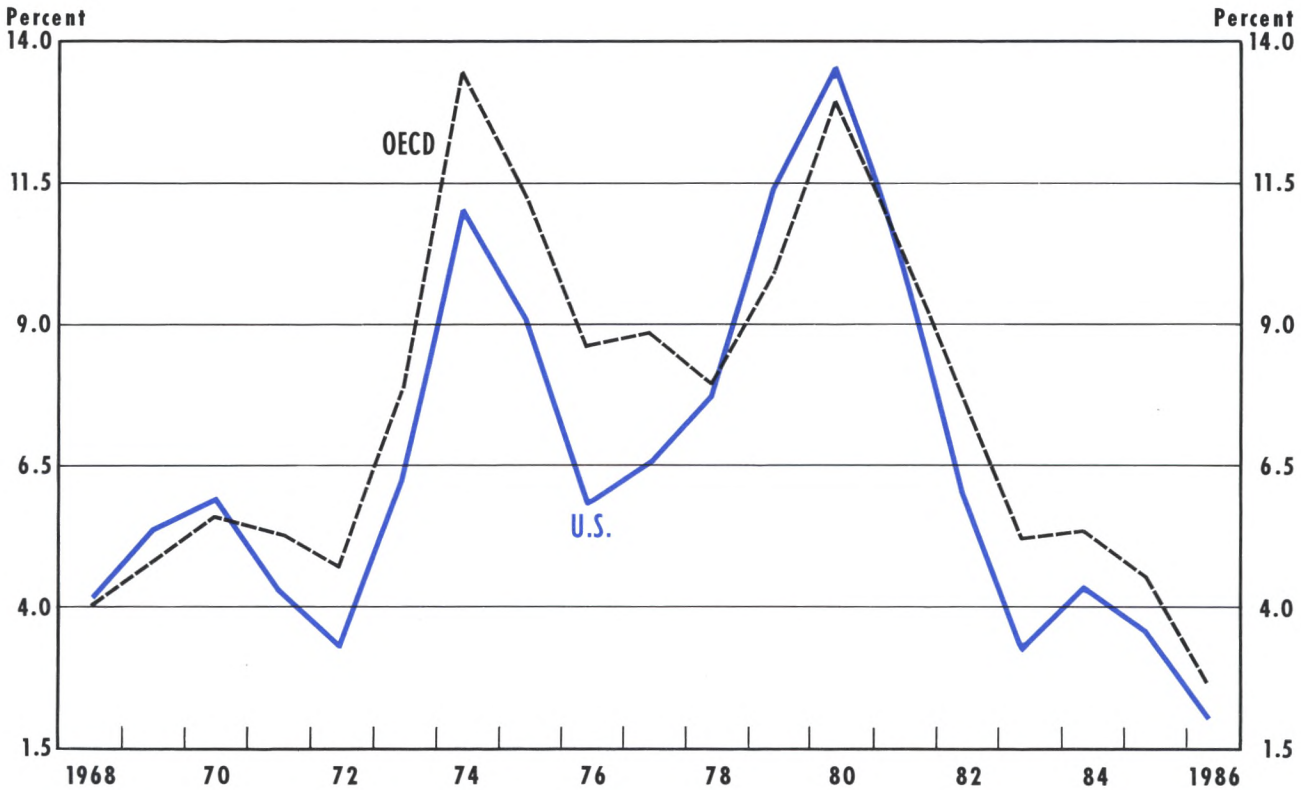
Chart 3

U.S. and OECD Inflation



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Protectionist Trade Policies: A Survey of Theory, Evidence and Rationale

Cletus C. Coughlin, K. Alec Chrystal and Geoffrey E. Wood

PROTECTIONIST pressures have been mounting worldwide during the 1980s. These pressures are due to various economic problems including the large and persistent balance of trade deficits in the United States; the hard times experienced by several industries; and the slow growth of many foreign countries.[1] Proponents of protectionist trade policies argue that international trade has contributed substantially to these problems and that protectionist trade policies will lead to improved results. Professional economists in the United States, however, generally agree that trade restrictions such as tariffs and quotas substantially reduce a nation's economic well-being.[2]

This article surveys the theory, evidence and rationale concerning protectionist trade policies. The first section illustrates the gains from free trade using the concept of comparative advantage. Recent developments in international trade theory that emphasize other reasons for gains from trade are also reviewed. The theoretical discussion is followed by an examination of recent empirical studies that demonstrate the large costs of protectionist trade policies. Then, the rationale for restricting trade is presented. The concluding section summarizes the paper's main arguments.

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[1] See Page (1987) for a detailed examination of trade protectionism since 1974.

[2] This consensus was found in a survey published in the late 1970s (Kearl et al., 1979). Recent developments in international trade theory, which can be used to justify governmental intervention in trade policy, have not altered the consensus (Krugman, 1987).

THE GAINS FROM FREE TRADE

The most famous demonstration of the gains from trade appeared in 1817 in David Ricardo's *Principles of Political Economy and Taxation*. We use his example involving trade between England and Portugal to demonstrate how both countries can gain from trade. The two countries produce the same two goods, wine and cloth, and the only production costs are labor costs. The figures below list the amount of labor (e.g., worker-days) required in each country to produce one bottle of wine or one bolt of cloth.

	Wine	Cloth
England	3	7
Portugal	1	5

Since both goods are more costly to produce in England than in Portugal, England is absolutely less efficient at producing both goods than its prospective trading partner. Portugal has an absolute advantage in both wine and cloth. At first glance, this appears to rule out mutual gains from trade; however, as we demonstrate below, absolute advantage is irrelevant in discerning whether trade can benefit both countries.

The ratio of the production costs for the two goods is different in the two countries. In England, a bottle of wine will exchange for 3/7 of a bolt of cloth because the labor content of the wine is 3/7 of that for cloth. In Portugal, a bottle of wine will exchange for 1/5 of a bolt of cloth. Thus, wine is relatively cheaper in Portugal than in England and, conversely, cloth is relatively cheaper in England than in Portugal. The example indicates that Portugal has a comparative advantage in wine production and England has a comparative advantage in cloth production.

The different relative prices provide the basis for

both countries to gain from international trade. The gains arise from both exchange and specialization.

The gains from *exchange* can be highlighted in the following manner. If a Portuguese wine producer sells five bottles of wine at home, he receives one bolt of cloth. If he trades in England, he receives more than two bolts of cloth. Hence, he can gain by exporting his wine to England. English cloth-producers are willing to trade in Portugal; for every 3/7 of a bolt of cloth they sell there, they get just over two bottles of wine. The English gain from exporting cloth to (and importing wine from) Portugal, and the Portuguese gain from exporting wine to (and importing cloth from) England. Each country gains by exporting the good in which it has a comparative advantage and by importing the good in which it has a comparative disadvantage.

Gains from *specialization* can be demonstrated in the following manner. Initially, each country is producing some of both goods. Suppose that, as a result of trade, 21 units of labor are shifted from wine to cloth production in England, while, in Portugal, 10 units of labor are shifted from cloth to wine production. This reallocation of labor does not alter the total amount of labor used in the two countries; however, it causes the production changes listed below.

	Bottles of Wine	Bolts of Cloth
England	− 7	+ 3
Portugal	+10	− 2
Net	+ 3	+ 1

The shift of 21 units of labor to the English cloth industry raises cloth production by three bolts, while reducing wine production by seven bottles. In Portugal, the shift of 10 units of labor from cloth to wine raises wine production by 10 bottles, while reducing cloth production by two bolts. This reallocation of labor increases the total production of both goods: wine by three bottles and cloth by one bolt. This increased output will be shared by the two countries. Thus, the consumption of both goods and the wealth of both countries are increased by the specialization brought about by trade based on comparative advantage.

TRADE THEORY SINCE RICARDO

Since 1817, numerous analyses have generated insights concerning the gains from trade. They chiefly examine the consequences of relaxing the assumptions used in the preceding example. For example, labor was the only resource used to produce the two goods in the example above; yet, labor is really only one of many resources used to produce goods. The example also assumed that the costs of producing additional units of the goods are constant. For example, in England, three units of labor are used to produce one bottle of wine regardless of the level of wine production. In reality, unit production costs could either increase or decrease as more is produced. A third assumption was that the goods are produced in perfectly competitive markets. In other words, an individual firm has no effect on the price of the good that it produces. Some industries, however, are dominated by a small number of firms, each of which can affect the market price of the good by altering its production decision. Some of these extensions are discussed in the appendix.

These theoretical developments generally have strengthened the case for an open trading system. They suggest three sources of gains from trade. First, as the market potentially served by firms expands from a national to a world market, there are gains associated with declining per unit production costs. A second source of gains results from the reduction in the monopoly power of domestic firms. Domestic firms, facing more pressure from foreign competitors, are forced to produce the output demanded by consumers at the lowest possible cost.[3] Third is the gain to consumers from increased product variety and lower prices. Generally speaking, the gains from trade result from the increase in competitive pressures as the domestic economy becomes less insulated from the world economy.

The gains from free trade can also be illustrated graphically. The shaded insert on pages 14 and 15 examines the gains from trade in perfectly competitive markets using supply and demand analysis. The insert also analyzes the effects of trade restrictions, a topic that we discuss below.

COSTS OF TRADE PROTECTIONISM

Protectionist trade policies can take numerous forms, some of which are discussed in the shaded insert on pages 16 and 17. All forms of protection are

[3] A profit-maximizing firm produces its output at minimum cost. When firms are insulated from competition, costs are not necessarily being minimized. This situation, which is called X-efficiency, has been stressed by Leibenstein (1980). The increase in competitive pressures due to international trade reduces the probability that costs are not minimized.

A Supply and Demand Analysis of the Gains from Free Trade and the Effects of a Tariff

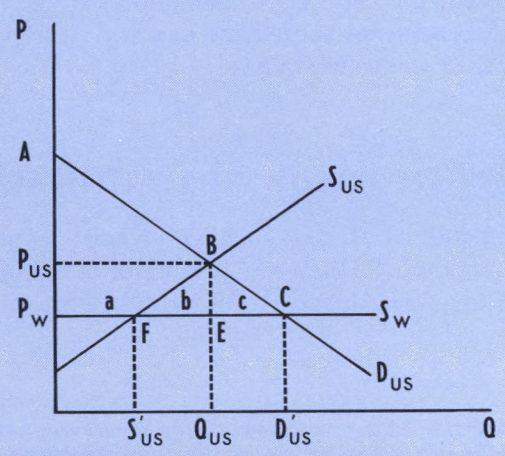
A standard illustration of the gains from free trade and the effects of a tariff is presented below. The analysis assumes perfectly competitive markets throughout.

Gains From Free Trade

In figure 1 the lines S_{us} and D_{us} are the U.S. supply and demand curves for a hypothetical good. Their intersection at B results in the equilibrium values for price and quantity of P_{us} and Q_{us}. Assuming the United States has a comparative disadvantage in the production of this good, the price will be lower abroad than in the United States. Let this lower world price be P_w, and assume that U.S. purchases do not affect this world price. Graphically, this is represented by the horizontal world supply curve S_w. If one allows for free trade, this lower world price has two effects. First, U.S. consumers will increase their consumption to D'_{us}. Second, U.S. producers will contract their production to S'_{us}. The excess of U.S. consumption over production is U.S. purchases from foreign producers (that is, imports).

The lower price simultaneously benefits U.S. consumers and harms U.S. producers, a fact that underlies the recent controversial discussions of U.S. trade policy. The magnitude of these gains and losses using the concepts of consumer and producer surplus can be seen in figure 1. Consumers gain in two ways. Initially, consumers purchased Q_{us} at a price per unit of P_{us}. With free trade, they purchase Q_{us} at the lower price per unit of P_w. This gain is represented by the rectangle P_{us} BE P_w. In addition, the lower price induces consumers to increase their purchases from Q_{us} to D'_{us}. This gain is represented by the triangle BCE. The total gain to consumers is P_{us} BC P_w or, using the lower case letters to represent areas, a + b + c. Analogously, producers lose due to the lower price they receive for their output, S'_{us}, and due to their contraction of production from Q_{us} to S'_{us}. The total loss to producers is P_{us} BF P_w or a.

Figure 1



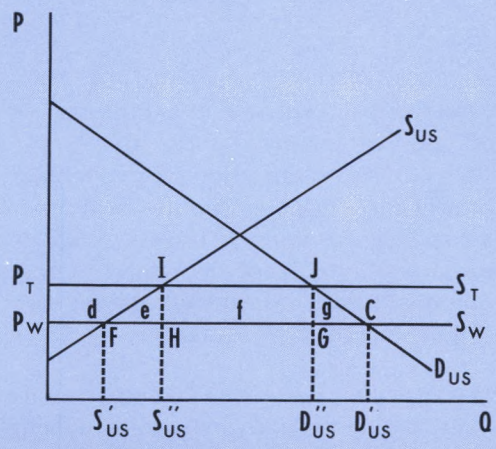
The nation as a whole gains because the consumer gains of a + b + c exceed the producer losses of a by b + c. This analysis can also be viewed using a good that the United States exports. In other words, the United States will have a comparative advantage in the production of a good. For the export good, the change to free trade will cause producer gains that exceed consumer losses.

The Effects of a Tariff

To make the analysis of protectionist trade policy as straightforward as possible, the impact of a tariff is analyzed. (One can view any protectionist trade policy, however, in an analogous manner.) For convenience, the free trade results in figure 1 are duplicated in figure 2. Given the free trade world price of P_w, U.S. consumption, production and imports are D'_{us}, S'_{us}, and S'_{us} D'_{us}. Assume a tariff is imposed, causing the price in the United States to increase to P_T. The price in the United States now exceeds price in the world by the amount of the tariff, P_wP_T.

The higher U.S. price causes consumer purchases to decrease from D'_{us} to D''_{us}, domestic production to increase from S'_{us} to S''_{us}, and imports to decrease from $S'_{us}D'_{us}$ to $S''_{us}D''_{us}$. By imposing the tariff, consumers lose the area P_TJCP_w or d + e + f + g and producers gain the area P_TIFP_w or d. Do-

Figure 2



mestic producers are protected at the expense of domestic consumers.

One complication stems from tariff revenue. Tariff revenue, which can be viewed as a gain for the government, equals the tariff, P_wP_T, times the quantity of imports, $S''_{us}D''_{us}$. This revenue is equal to area IJGH or f.

Overall, the nation loses because the consumers' losses of d + e + f + g exceed the producers' gains of d and the government gains of f by e + g. Area e is called a "deadweight production loss" and can be viewed as a loss resulting from inefficient (excess) domestic production, while area g is called a "deadweight consumption loss" and can be viewed as a loss resulting from inefficient (too little) consumption.

intended to improve the position of domestic relative to foreign producers. This can be done through policies that increase the home market price of the foreign product, decrease the production costs of domestic firms, or somehow restrict the access of foreign producers to the domestic market.

The specific goal of protectionist trade policies is to expand domestic production in the protected industries, benefiting the owners, workers and suppliers of resources to the protected industry. The government imposing protectionist trade policies may also benefit, for example, in the form of tariff revenue.

The expansion of domestic production in protected industries is not costless; it requires additional resources from other industries. Consequently, output in other domestic industries is reduced. These industries also might be made less competitive because of higher prices for imported inputs. Since protectionist trade policies frequently increase the price of the protected good, domestic consumers are harmed. They lose in two ways. First, their consumption of the protected good is reduced because of the associated rise in its price. Second, they consume less of other goods, as their output declines and prices rise.

The preceding discussion highlights the domestic winners and losers due to protectionist trade policies. Domestic producers of the protected good and the government (if tariffs are imposed) gain; domestic consumers and other domestic producers lose. Foreign interests are also affected by trade restrictions. The protection of domestic producers will harm some foreign producers; oddly enough, other foreign producers may benefit. For example, if quotas are placed on imports, some foreign producers may receive higher prices for their exports to the protected market.

There have been numerous studies of the costs of protectionism. We begin by examining three recent studies of protectionism in the United States, then proceed to studies examining developed and, finally, developing countries.

Costs of Protectionism in the United States

Recent studies by Tarr and Morkre (1984), Hickok (1985) and Hufbauer et al. (1986) estimated the costs of protectionism in the United States. These studies use different estimation procedures, examine different protectionist policies and cover different time periods. Nonetheless, they provide consistent results.

Tarr and Morkre (1984) estimate annual costs to the U.S. economy of $12.7 billion (1983 dollars) from all tariffs and from quotas on automobiles, textiles, steel and sugar. Their cost estimate is a net measure in which the losses of consumers are offset partially by the gains of domestic producers and the U.S. government.

Estimates by Hickok (1985) indicate that trade restrictions on only three goods — clothing, sugar, and automobiles — caused increased consumer expenditures of $14 billion in 1984. Hickok also shows that low-income families are affected more than high-income families. The import restraints on clothing, sugar and automobiles are calculated to be equivalent to a 23 percent income tax surcharge (that is, an additional

Forms Of Protectionism

Protection may be implemented in numerous ways. All forms of protection are intended to improve the position of a domestic relative to foreign producer. This can be done by policies that increase the home market price of the foreign product, decrease the costs of domestic producers or restrict the access of foreign producers to the home market in some other way.

Tariffs

Tariffs, which are simply taxes imposed on goods entering a country from abroad, result in higher prices and have been the most common form of protection for domestic producers. Tariffs have been popular with governments because it appears that the tax is being paid by the foreigner who wishes to sell his goods in the home economy and because the tariff revenue can be used to finance government services or reduce other taxes.

In the 20th century, U.S. tariff rates peaked as a result of the Smoot-Hawley Tariff of 1930. For example, in 1932, tariff revenue as a percentage of total imports was 19.6 percent. An identical calculation for 1985 yields a figure of 3.8 percent. The decline was due primarily to two reasons. First, since many of the tariffs under Smoot-Hawley were set as specific dollar amounts, the rising price level in the United States eroded the effective tariff rate. Second, since World War II, numerous tariff reductions have been negotiated under the General Agreement on Tariffs and Trade.

On the other hand, various other forms of protection, frequently termed non-tariff barriers, have become increasingly important. A few of the more frequently used devices are discussed below.

Quotas

A quota seems like a sensible alternative to a tariff when the intention is to restrict foreign producers' access to the domestic market. Importers typically are limited to a maximum number of products that they can sell in the home market over specific periods. A quota, similar to a tariff, cause prices to increase in the home market. This induces domestic producers to increase production and consumers to reduce consumption. One difference between a tariff and a quota is that the tariff generates revenue for the government, while the quota generates a revenue gain to the owner of import licenses. Consequently, foreign producers might capture some of this revenue.

In recent years, a slightly different version of quotas, called either orderly marketing agreements or voluntary export restraints, has been used. In an orderly marketing agreement, the domestic government asks the foreign government to restrict the quantity of exports of a good to the domestic country. The request can be viewed as a demand, like the U.S.-Japan automobile agreement in the 1980s, because the domestic country makes it clear that more restrictive actions are likely unless the foreign government "voluntarily" complies. In effect, the orderly marketing agreement is a mutually agreed-upon quota.

Regulatory Barriers

There are many other ways of restricting foreigners' access to domestic markets. Munger (1983) has noted that the tariff code itself tends to limit trade. The 1983 *Tariff Schedules of the United States Annotated* consists of 792 pages, plus a 78-page appendix. Over 200 tariff rates pertain to watches and clocks. Simply ascertaining the appropriate tariff classification, which requires legal assistance and can be subject to differences of opinion, is a deterrent.

Product standards are another common regulatory barrier. These standards appear in various forms and are used for many purposes. The standards can be used to serve the public interest by ensuring that imported food products are processed according to acceptable sanitary standards and that drugs have been screened before their introduction in the United States. In other cases, the standards, sometimes intentionally, protect domestic producers. An example of unintended re-

strictions may be the imposition of safety or pollution standards that were not previously being met by foreign cars.

Subsidies

An alternative to restricting the terms under which foreigners can compete in the home market is to subsidize domestic producers. Subsidies may be focused upon an industry in general or upon the export activities of the industry. An example of the former, discussed by Morici and Megna (1983), is the combination of credit programs, special tax incentives and direct subsidy payments that benefit the U.S. shipbuilding industry. An example of the latter is the financial assistance to increase exports provided by the U.S. Export-Import Bank through direct loans, loan guarantees and insurance, and discount loans. In either case, production will expand.

An important difference between subsidies and tariffs involves the revenue implications for government. The former involves the government in paying out money, whereas tariffs generate income for the government. The effect on domestic production and welfare, however, can be the same under subsidies as under tariffs and quotas. In all cases, the protected industry is being subsidized by the rest of the economy.

Exchange Controls

All of the above relate directly to the flow of goods. A final class of restrictions works by restricting access to the foreign money required to buy foreign goods. For example, a government that wished to protect its exporting and import-competing industries may try to hold its exchange rate artificially low. As a result, foreign goods would appear expensive in the home market while home goods would be cheap overseas. Home producers implicitly are subsidized and home consumers implicitly are taxed. This policy is normally hard to sustain. The central bank, in holding the exchange rate down has to buy foreign exchange with domestic currency. This newly issued domestic currency increases the domestic money stock and eventually causes inflation. Inflationary policies are not normally regarded as a sensible way of protecting domestic industry.

There is another aspect to exchange controls. The justification is that preventing home residents from investing overseas benefits domestic growth as it leads to greater domestic real investment. In reality, it could do exactly the opposite. Restricting access to foreign assets may raise the variance and lower the return to owners of domestic wealth. In the short run, it also may appreciate the domestic exchange rate and, thereby, make domestic producers less competitive.

tax added to the normal income tax) for families with incomes less than $10,000 in 1984 and a 3 percent income tax surcharge for families with incomes exceeding $60,000.

Hufbauer et al. (1986) examined 31 cases in which trade volumes exceeded $100 million and the United States imposed protectionist trade restrictions.[4] They generated estimates of the welfare consequences for each major group affected (see table 1). The figures in the table indicate that annual consumer losses exceed $100 million in all but six of the cases. The largest losses, $27 billion per year, come from protecting the textiles and apparel industry. There also are large consumer losses associated with protection in carbon steel ($6.8 billion), automobiles ($5.8 billion) and dairy products ($5.5 billion).

The purpose of protectionism is to protect jobs in specific industries. A useful approach to gain some perspective on consumer losses is to express these losses on a per-job-saved basis. In 18 of the 31 cases, the cost per-job-saved is $100,000 or more per year; the consumer losses per-job-saved in benzenoid chemicals, carbon steel (two separate periods), specialty steel, and bolts, nuts and screws exceeded $500,000 per year.

Table 1 also reveals that domestic producers were the primary beneficiaries of protectionist policies; however, there are some noteworthy cases where foreign producers realized relatively large gains. For the U.S.-Japanese voluntary export agreement in automobiles, foreign producers gained 38 percent of what domestic consumers lost, while a similar computation

[4]While there were cases in which the industry adjusted to its new competitive position and the protection was terminated, these cases were more the exception than the rule. In far more cases, protectionist policies were maintained indefinitely or removed because of favorable demand changes.

Table 1

Distribution of Costs and Benefits from Special Protection

Case	Consumer Losses		Producer Gains	Welfare Costs of Restraints		
	Totals (million dollars)	Per job saved[1] (dollars)	Totals (million dollars)	Gain to foreigners (million dollars)	Tariff revenue (million dollars)	Efficiency loss (million dollars)
Manufacturing						
Book manufacturing	$ 500	$ 100,000	$ 305	neg.	$ 0	$ 29
Benzenoid chemicals	2,650	over 1 million	2,250	neg.	252	14
Glassware	200	200,000	130	neg.	54	13
Rubber footwear	230	30,000	90	neg.	139	33
Ceramic articles	95	47,500	25	neg.	69	6
Ceramic tiles	116	135,000	62	neg.	55	11
Orange juice	525	240,000	390	neg.	128	130
Canned tuna	91	76,000	74	$ 7	10	4
Textiles and apparel: Phase I	9,400	22,000	8,700	neg.	1,158	1,100
Textiles and apparel: Phase II	20,000	37,000	18,000	350	2,143	3,100
Textiles and apparel: Phase III	27,000	42,000	22,000	1,800	2,535	4,850
Carbon steel: Phase I	1,970	240,000	1,330	330	290	50
Carbon steel: Phase II	4,350	620,000	2,770	930	556	120
Carbon steel: Phase III	6,800	750,000	3,800	2,000	560	330
Ball bearings	45	90,000	21	neg.	18	neg.
Specialty steel	520	1,000,000	420	50	32	30
Nonrubber footwear	700	55,000	250	220	262	16
Color televisions	420	420,000	190	140	77	7
CB radios	55	93,000	14	neg.	32	5
Bolts, nuts, large screws	110	550,000	60	neg.	16	1
Prepared mushrooms	35	117,000	13	neg.	25	0.8
Automobiles	5,800	105,000	2,600	2,200	790	200
Motorcycles	104	150,000	67	neg.	21	17
Services						
Maritime industries	3,000	270,000	2,000	neg.	10[2]	1,000
Agriculture and fisheries						
Sugar	930	60,000	550	410	5	130
Dairy products	5,500	690/acre 220,000 1,800/cow	5,000	250	34	1,370
Peanuts	170	1,000/acre	170	neg.	9	14
Meat	1,800	160,000 225/head	1,600	135	44	145
Fish	560	21,000	200	170	177	15
Mining						
Petroleum	6,900	160,000	4,800	2,000[3]	70	3,000
Lead and zinc	67	30,000	46	4	11	5

Neg. = negligible.

[1]Unless otherwise specified, figures are per worker.

[2]Estimated duties collected on ship repairs performed abroad.

[3]In this case, because of the way the quotas were allocated, the gains to importers accrued to domestic refiners rather than foreign exporters.

SOURCE: Trade Protection in the United States: 31 Case Studies.

for the latest phase of protection for carbon steel was 29 percent.

Finally, table 1 indicates that the efficiency losses are small in comparison to the total losses borne by consumers. These efficiency losses, which are defined precisely and illustrated in the first shaded insert, result from the excess domestic production and the reduction in consumption caused by protectionist trade policies. In large cases such as textiles and apparel, petroleum, dairy products and the maritime industries, these losses equal or exceed $1 billion. It is likely that these estimates understate the actual costs because they do not capture the secondary effects that occur as production and consumption changes in one industry affect other industries.[5] In addition, restrictive trade policies generate additional costs because of bureaucratic enforcement costs and efforts by the private sector to influence these policies for their own gain as well as simply comply with administrative regulations.

Costs of Protectionism Throughout the World

In 1982, the Organization for Economic Cooperation and Development (OECD) began a project to analyze the costs and benefits of protectionist policies in manufacturing in OECD countries. The OECD (1985) highlighted a number of ways that protectionist policies have generated costs far in excess of benefits. Since protectionist policies increase prices, the report concludes that the attainment of sustained noninflationary growth is hindered by such price-increasing effects. Moreover, economic growth is potentially reduced if the uncertainty created by varying trade policies depresses investment.

Wood and Mudd (1978), and many others, have shown that imports do not cause higher unemployment. Conversely, the OECD study stresses the fact that a reduction in imports via trade restrictions does not cause greater employment. A reduction in the value of imports results in a similar reduction in the value of exports. One rationale for this finding is that a reduction in the purchases of foreign goods reduces foreign incomes and, in turn, causes reduced foreign purchases of domestic goods.

While the reduction in imports increases employment in industries that produce products similar to the previously imported goods, the reduction in exports decreases employment in the export industries. In other words, while some jobs are saved, others are lost; however, this economic reality may not be obvious to businessmen, labor union leaders, politicians and others. Luttrell (1978) has stressed that the jobs saved by protectionist legislation are more readily observed than the jobs lost due to protectionist legislation. In other words, the jobs that are protected in, say, the textiles industry by U.S. import restrictions on foreign textiles are more readily apparent (and publicized) than the jobs in agriculture and high technology industries that do not materialize because of the import restrictions. These employment effects will net to approximately zero.[6]

The OECD study also stresses that developing countries need exports to offset their debts. Thus, protectionist trade policies by developed countries affect not only the economic activity of the developing countries, but the stability of the international financial system as debtor nations find it increasingly difficult to service their debts.

Not only does a free trade policy by developed countries benefit developing countries, but a free trade policy by developing countries benefits developing countries. A recent World Bank study (1987) of 41 developing countries compared the performance of countries following a free trade policy with countries following a restricted trade policy.[7] Table 2 lists the

[5]Recent estimates of the costs of protectionist policies using general equilibrium models suggest that the secondary effects, to the limited extent they are measurable, are substantial. For example, Grais, de Melo and Urata (1986) estimate that the elimination of quotas in Turkey in 1978 would have caused a 5.4 percent rise in gross domestic product, while Clarete and Whalley (1985) estimate that the elimination of tariffs, quotas and export taxes in the Philippines in 1978 would have caused a 5.2 percent rise in gross national product.

[6]Recent evidence shows that protectionist legislation actually may reduce employment. Denzau (1987) estimated that 35,600 manufacturing jobs were lost as a result of the September 1984 voluntary export restraints that limited the level of U.S. steel imports. Despite an increased employment for producers of steel (14,000) and producers of inputs for steel producers (2,800), these increases were more than offset by the 52,400 job losses by steel-using firms. These losses are due to the higher steel prices that cause steel-using firms to be less competitive in export markets and subject them to more foreign competition in the U.S. market.

[7]The World Bank study divides trade strategies into two groups: outward oriented and inward oriented. An outward-oriented strategy, which we call a free trade policy, is one in which trade and industrial policies do not discriminate between production for the domestic market and exports, nor between purchases of domestic and foreign goods. An inward-oriented strategy, which we call a restricted trade policy, is one in which trade and industrial policies are biased toward production for the domestic market relative to the export market.

Table 2

Annual Average Growth of Per Capita Real Gross National Product

	Free Trade				Restricted Trade			
Period	Strongly		Moderately		Moderately		Strongly	
1963–73	Singapore	9.0%	Brazil	5.5%	Yugoslavia	4.9%	Turkey	3.5%
	South Korea	7.1	Israel	5.4	Mexico	4.3	Dominican Republic	3.4
	Hong Kong	6.0	Thailand	4.9	Nigeria	4.2	Burundi	3.2
			Indonesia	4.6	Tunisia	4.0	Argentina	3.1
			Costa Rica	3.9	Kenya	3.9	Pakistan	3.1
			Malaysia	3.8	Philippines	2.2	Tanzania	2.7
			Ivory Coast	3.5	Bolivia	2.0	Sri Lanka	2.3
			Colombia	3.3	Honduras	1.9	Ethiopia	1.9
			Guatemala	2.7	El Salvador	1.4	Chile	1.7
			Cameroon	−0.1	Madagascar	1.1	Peru	1.5
					Nicaragua	1.1	Uruguay	1.5
					Senegal	−0.6	Zambia	1.2
							India	1.1
							Ghana	0.4
							Bangladesh	−1.4
							Sudan	−1.9
1973–85	Singapore	6.5	Malaysia	4.1	Cameroon	5.6	Bangladesh	2.0
	Hong Kong	6.3	Thailand	3.8	Indonesia	4.0	India	2.0
	South Korea	5.4	Tunisia	2.9	Sri Lanka	3.3	Burundi	1.2
			Brazil	1.5	Pakistan	3.1	Dominican Republic	0.5
			Turkey	1.4	Yugoslavia	2.7	Ethiopia	−0.4
			Israel	0.4	Colombia	1.8	Sudan	−0.4
			Uruguay	0.4	Mexico	1.3	Peru	−1.1
			Chile	0.1	Philippines	1.1	Tanzania	−1.6
					Kenya	0.3	Argentina	−2.0
					Honduras	−0.1	Zambia	−2.3
					Senegal	−0.8	Nigeria	−2.5
					Costa Rica	−1.0	Bolivia	−3.1
					Guatemala	−1.0	Ghana	−3.2
					Ivory Coast	−1.2	Madagascar	−3.4
					El Salvador	−3.5		
					Nicaragua	−3.9		

SOURCE: World Development Report 1987 and *The Economist* (1987).

annual average growth in real per capita gross national product for each of the 41 countries for 1963–73 and 1973–85. Those countries that did not bias industrial production toward the domestic market by trade restrictions grew at faster rates than those that did. For example, the average annual growth rate in real per capita income for 1963–73 was 6.9 percent in the economies strongly oriented to free trade and 1.6 percent in the economies strongly oriented to restricted trade. For 1973–85 these growth rates were 5.9 percent and −0.1 percent, respectively.

The study proceeds to identify the macroeconomic reason for the general finding. A given amount of new investment generated more additional output in countries following a free trade policy than a restricted trade policy. The reason is that a free trade environment allows capital to flow to its most highly valued uses, while a restricted trade environment distorts economic incentives.

ARGUMENTS FOR RESTRICTING TRADE

If protectionism is so costly, why is protectionism so pervasive? This section reviews the major arguments

for restricting trade and provides explanations for the existence of protectionist trade policies.

National Defense

The national defense argument says that import barriers are necessary to ensure the capacity to produce crucial goods in a national emergency. While this argument is especially appealing for weapons during a war, there will likely be demands from other industries that deem themselves essential. For example, the footwear industry will demand protection because military personnel need combat boots.[8]

The national defense argument ignores the possibility of purchases from friendly countries during the emergency. The possibilities of storage and depletion raise additional doubts about the general applicability of the argument. If crucial goods can be stored, for example, the least costly way to prepare for an emergency might be to buy the goods from foreigners at the low world price before an emergency and store them. If the crucial goods are depletable mineral resources, such as oil, then the restriction of oil imports before an emergency will cause a more rapid depletion of domestic reserves. Once again, stockpiling might be a far less costly alternative.

Income Redistribution

Since protectionist trade policies affect the distribution of income, a trade restriction might be defended on the grounds that it favors some disadvantaged group. It is unlikely, however, that trade policy is the best tool for dealing with the perceived evils of income inequality, because of its bluntness and adverse effects on the efficient allocation of resources. Attempting to equalize incomes directly by tax and transfer payments is likely less costly than using trade policy. In addition, as Hickok's (1985) study indicates, trade restrictions on many items increase rather than decrease income inequality.

Optimum Tariff Argument

The optimum tariff argument applies to situations in which a country has the economic power to alter world prices. This power exists because the country (or a group of countries acting in consort like the Organization of Petroleum Exporting Countries) is such a large producer or consumer of a good that a change in its production or consumption patterns influences world prices. For example, by imposing a tariff, the country can make foreign goods cheaper. Since a tariff reduces the demand for foreign goods, if the tariff-imposing country has some market power, the world price for the good will fall.[9] The tariff-imposing country will gain because the price per unit of its imports will have decreased.

There are a number of obstacles that preclude the widespread application of this argument. Few countries possess the necessary market power and, when they do, only a small number of goods is covered. Secondly, in a world of shifting supply and demand, calculating the optimum tariff and adjusting the rate to changing situations is difficult. Finally, the possibility of foreign retaliation to an act of economic warfare is likely. Such retaliation could leave both countries worse off than they would have been in a free trade environment.

Balancing the Balance of Trade

Many countries enact protectionist trade policies in the hope of eliminating a balance of trade deficit or increasing a balance of trade surplus. The desire to increase a balance of trade surplus follows from the mercantilist view that larger trade surpluses are beneficial from a national perspective.

This argument is suspect on a number of grounds. First, there is nothing inherently undesirable about a trade deficit or desirable about a surplus.[10] For example, faster economic growth in the United States than in the rest of the world would tend to cause a trade deficit. In this case, the trade deficit is a sign of a healthy economy. Second, protectionist policies that reduce imports will cause exports to decrease by a comparable amount. Hence, an attempt to increase exports permanently relative to imports will fail. It is doubtful that the trade deficit will be reduced even temporarily because import quantities do not decline quickly in response to the higher import prices and the revenues of foreign producers might rise.

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[8]See Pine (1984).

[9]If a country such as the United States has no market power, the world price is fixed. Consequently, the price faced by U.S. consumers and producers rises by the full amount of the tariff. In the optimum tariff case, the price faced by U.S. consumers and producers rises, but not by the full amount of the tariff. This must be the case because the world price falls and the amount of the tariff is the difference between the world price and the U.S. price.

[10]See Chrystal and Wood (1988) earlier in this issue.

Protection of Jobs — Public Choice

The protection of jobs argument is closely related to the balance of trade argument. Since a reduction in imports via trade restrictions will result in a similar reduction in exports, the overall employment effects, as found in the OECD (1985) study and many others, are negligible. While the *overall* effects are negligible, workers (and resource owners) in specific industries are affected differently.

A domestic industry faced with increased imports from its foreign competition is under pressure to reduce production and lower costs. Productive resources must move from this industry to other domestic industries. Workers must change jobs and, in some cases, relocate to other cities. Since this change is forced upon these workers, these workers bear real costs that they are likely to resist. A similar statement can be made about the owners of capital in the affected industry.

Workers and other resource owners will likely resist these changes by lobbying for trade restrictions. The previously cited studies on the costs of protectionism demonstrated that trade restrictions entail substantial real costs as well. These costs likely exceed the adjustment costs because the adjustment costs are one-time costs, while the costs of protectionism continue as long as trade restrictions are maintained.

An obvious question is why politicians supply the protectionist legislation demanded by workers and other resource owners. A branch of economics called public choice, which focuses on the interplay between individual preferences and political outcomes, provides an answer. The public choice literature views the politician as an individual who offers voters a bundle of governmentally supplied goods in order to win elections.[11] Many argue that politicians gain by providing protectionist legislation. Even though the national economic costs exceed the benefits, the politician faces different costs and benefits.

Those harmed by a protectionist trade policy for a domestic industry, especially household consumers, will incur a small individual cost that is difficult to identify. For example, a consumer is unlikely to ponder how much extra a shirt costs because of protectionist legislation for the textiles and apparel industry. Even though the aggregate effect is large, the harm to each consumer may be small. This small cost, of which an individual may not even be aware, and the costs of organizing consumers deter the formation of a lobby against the legislation.

On the other hand, workers and other resource owners are very concerned about protectionist legislation for their industry. Their benefits tend to be large individually and easy to identify. Their voting and campaign contributions assist politicians who support their positions and penalize those who do not. Thus, politicians are likely to respond to their demands for protectionist legislation.[12]

Infant Industries

The preceding argument is couched in terms of protecting a domestic industry. A slightly different argument, the so-called infant industry case, is couched in terms of *promoting* a domestic industry. Suppose an industry, already established in other countries, is being established in a specific country. The country might not be able to realize its comparative advantage in this industry because of the existing cost and other advantages of foreign firms. Initially, owners of the fledgling firm must be willing to suffer losses until the firm develops its market and lowers its production costs to the level of its foreign rivals. In order to assist this entrant, tariff protection can be used to shield the firm from some foreign competition.

After this temporary period of protection, free trade should be restored; however, the removal of tariff protection frequently is resisted. As the industry develops, its political power to thwart opposing legislation also increases.

Another problem with the infant industry argument is that a tariff is not the best way to intervene. A production subsidy is superior to a tariff if the goal is to expand production. A subsidy will do this directly, while a tariff has the undesirable side effect of reducing consumption.

In many cases, intervention might not be appropriate at all. If the infant industry is a good candidate for being competitive internationally, borrowing from the

[11]The role of pressure groups, acting in their economic self-interest, has been stressed by Stigler (1971) and Peltzman (1976). For references, as well as an example of an international trade study focused on the interaction of politicians and interest groups, see Coughlin (1985).

[12]Special interests benefiting from trade will likely resist the forces for protectionist legislation. Destler and Odell (1987) identify exporters, industrial import users, retailers of imported products, businesses providing trade-related services, foreign exporters, and foreign governments as interest groups capable of exerting some anti-protection pressure. Decisions about protectionist legislation result from the interaction of both pro-protection and anti-protection forces.

private capital markets can finance the expansion. Investors are willing to absorb losses *temporarily* if the prospects for future profits are sufficiently good.

Spillover Effects

The justification for protecting an industry, infant or otherwise, frequently entails a suggestion that the industry generates spillover benefits for other industries or individuals for which the industry is not compensated. Despite patent laws, one common suggestion is that certain industries are not fully compensated for their research and development expenditures. This argument is frequently directed toward technologically progressive industries where some firms can capture the results of other firms' research and development simply by dismantling a product to see how it works.

The application of this argument, however, engenders a number of problems. Spillovers of knowledge are difficult to measure. Since spillovers are not market transactions, they do not leave an obvious trail to identify their beneficiaries. The lack of market transactions also complicates an assessment of the value of these spillovers. To determine the appropriate subsidy, one must be able to place a dollar value on the spillovers generated by a given research and development expenditure. Actually, the calculation requires much more than the already difficult task of reconstructing the past. It requires complex estimates of the spillovers' future worth as well. Since resources are moved from other industries to the targeted industry, the government must understand the functioning of the entire economy.

Finally, there are political problems. An aggressive application of this argument might lead to retaliation and a mutually destructive trade war. In addition, as interest groups compete for the governmental assistance, there is no guarantee that the right groups will be assisted or that they will use the assistance efficiently.

Strategic Trade Policy

Recent theoretical developments have identified cases in which so-called strategic trade policy is superior to free trade. As we discussed earlier, decreasing unit production costs and market structures that contain monopoly elements are common in industries involved in international trade. Market imperfections immediately suggest the potential benefits of governmental intervention. In the strategic trade policy argument, government policy can alter the terms of competition to favor domestic over foreign firms and shift the excess returns in monopolistic markets from foreign to domestic firms.

Krugman (1987) illustrates an example of the argument. Assume that there is only one firm in the United States, Boeing, and one multinational firm in Europe, Airbus, capable of producing a 150-seat passenger aircraft. Assume also that the aircraft is produced only for export, so that the returns to the firm can be identified with the national interest. This export market is profitable for either firm if it is the only producer; however, it is unprofitable for both firms to produce the plane. Finally, assume the following payoffs are associated with the four combinations of production: 1) if both Boeing and Airbus produce the aircraft, each firm loses $5 million; 2) if neither Boeing nor Airbus produces the aircraft, profits are zero; 3) if Boeing produces the aircraft and Airbus does not, Boeing profits by $100 million and Airbus has zero profits; and 4) if Airbus produces the aircraft and Boeing does not, Airbus profits by $100 million and Boeing has zero profits.

Which firm(s) will produce the aircraft? The example does not yield a unique outcome. A unique outcome can be generated if one firm, say Boeing, has a head start and begins production before Airbus. In this case, Boeing will reap profits of $100 million and will have deterred Airbus from entering the market because Airbus will lose $5 million if it enters after Boeing.

Strategic trade policy, however, suggests that judicious governmental intervention can alter the outcome. If the European governments agree to subsidize Airbus' production with $10 million no matter what Boeing does, then Airbus will produce the plane. Production by Airbus will yield more profits than not producing, no matter what Boeing does. At the same time, Boeing will be deterred from producing because it would lose money. Thus, Airbus will capture the entire market and reap profits of $110 million, $100 million of which can be viewed as a transfer of profits from the United States.

The criticisms of a strategic trade policy are similar to the criticisms against protecting a technologically progressive industry that generates spillover benefits.[13] There are major informational problems in applying a

[13]A recent volume edited by Paul Krugman (1986) examines the policy implications of the new trade literature. See Grossman's article in that volume for a discussion of the information requirements.

strategic trade policy. The government must estimate the potential payoff of each course of action. Economic knowledge about the behavior of industries that have monopoly elements is limited. Firms may behave competitively or cooperatively and may compete by setting prices or output. The behavior of rival governments also must be anticipated. Foreign retaliation must be viewed as likely where substantial profits are at stake. In addition, many interest groups will compete for the governmental assistance. Though only a small number of sectors can be considered potentially strategic, many industries will make a case for assistance.

Reciprocity and the "Level Playing Field"

Bhagwati and Irwin (1987) note that U.S. trade policy discussions in recent years have frequently stressed the importance of "fair trade." The concept of fair trade, which is technically referred to as reciprocity, means different things to different people.

Under the General Agreement on Tariffs and Trade, negotiations to reduce trade barriers focus upon matching concessions. This form of reciprocity, known as first-difference reciprocity, attempts to reduce trade barriers by requiring a country to provide a tariff reduction of value comparable to one provided by the other country. In this case, reciprocity is defined in terms of matching changes.

Recent U.S. demands, exemplified by the Gephardt amendment to the current trade legislation, reveal an approach that is called full reciprocity. This approach seeks reciprocity in terms of the level of protection bilaterally and over a specific range of goods. Reciprocity requires equal access and this access can be determined by bilateral trade balances. A trade deficit with a trading partner is claimed to be *prima facie* evidence of unequal access. Examples abound. For example, U.S. construction firms have not had a major contract in Japan since 1965, while Japanese construction firms did $1.8 billion worth of business in the United States in 1985 alone. Recent legislation bars Japanese participation in U.S. public works projects until the Japanese offer reciprocal privileges.

As the name suggests, the fundamental argument for fair trade is one of equity. Domestic producers in a free trade country argue that foreign trade barriers are unfair because it places them at a competitive disadvantage. In an extreme version, it is asserted that this unfair competition will virtually eliminate U.S. manufacturing, leaving only jobs that consist primarily of flipping hamburgers at fast food restaurants or, as Bhagwati and Irwin have said, rolling rice cakes at Japanese-owned sushi bars. While domestic producers *are* relatively disadvantaged, the wisdom of a protectionist response is doubtful. Again, the costs of protectionism exceed substantially the benefits from a national perspective.

In an attempt to reinforce the argument for fair trade, proponents also argue that retaliatory threats, combined with changes in tariffs and non-tariff barriers, allow for the simultaneous protection of domestic industries against unequal competition and induce more open foreign markets. This more flexible approach is viewed as superior to a "one-sided" free trade policy. The suggestion that a fair trade policy produces a trading environment with fewer trade restrictions allows proponents to assert that such a policy serves to promote both equity and efficiency. In other words, not only will domestic and foreign producers in the same industry be treated equally, but the gains associated with a freer trading environment will be realized.

On the other hand, critics of a fair trade policy argue that such a policy is simply disguised protectionism — it simply achieves the goals of specific interest groups at the expense of the nation at large. In many cases, fair traders focus on a specific practice that can be portrayed as protectionist while ignoring the entire package of policies that are affecting a nation's competitive position. In these cases, the foreign country is more likely either not to respond or retaliate by increasing rather than reducing their trade barriers. In the latter case, the escalation of trade barriers causes losses for both nations, which is exactly opposite to the alleged effects of an activist fair trade policy.

Critics of fair trade proposals are especially bothered by the use of bilateral trade deficits as evidence of unfair trade. In a world of many trading countries, the trade between two countries need not be balanced for the trade of each to be in global balance. Differing demands and productive capabilities across countries will cause a specific country to have trade deficits with some countries and surpluses with other countries. These bilateral imbalances are a normal result of countries trading on the basis of comparative advantage.[14] Thus, the focus on the bilateral trade deficit can produce inappropriate conclusions about fairness and, more importantly, policies attempting to eliminate bilateral trade deficits are likely to be very costly because they eliminate the gains from a multilateral trading system.

[14]Bergsten and Cline (1985) estimate an equilibrium U.S.-Japanese bilateral trade deficit of $20–$25 billion annually.

CONCLUSION

The proliferation of protectionist trade policies in recent years provides an impetus to reconsider their worth. In the world of traditional trade theory, characterized by perfect competition, a definitive recommendation in favor of free trade can be made. The gains from international trade result from a reallocation of productive resources toward goods that can be produced less costly at home than abroad and the exchange of some of these goods for goods that can be produced at less cost abroad than at home.

Recent developments in international trade theory have examined the consequences of international trade in markets where there are market imperfections, such as monopoly and technological spillovers. Do these imperfections justify protectionist trade policies? The answer continues to be no. While protectionist trade policies may offset monopoly power overseas or advantageously use domestic monopoly power, trade restrictions tend to reduce the competition faced by domestic producers, protecting domestic producers at the expense of domestic consumers.

The empirical evidence is clear-cut. The costs of protectionist trade policies far exceed the benefits. The losses suffered by consumers exceed the gains reaped by domestic producers and government. Low-income consumers are relatively more adversely affected than high-income consumers. Not only are there inefficiencies associated with excessive domestic production and restricted consumption, but there are costs associated with the enforcement of the protectionist legislation and attempts to influence trade policy.

The primary reason for these costly protectionist policies relies on a public choice argument. The desire to influence trade policy arises from the fact that trade policy changes benefit some groups, while harming others. Consumers are harmed by protectionist legislation; however, ignorance, small individual costs, and the high costs of organizing consumers prevent the consumers from being an effective force. On the other hand, workers and other resource owners in an industry are more likely to be effective politically because of their relative ease of organizing and their individually large and easy-to-identify benefits. Politicians interested in re-election will most likely respond to the demands for protectionist legislation of such an interest group.

The empirical evidence also suggests that the adverse consumer effects of protectionist trade policies are not short-lived. These policies generate lower economic growth rates than the rates associated with free trade policies. In turn, slow growth contributes to additional protectionist pressures.

Interest group pressures from industries experiencing difficulty and the general appeal of a "level playing field" combine to make the reduction of trade barriers especially difficult at the present time in the United States. Nonetheless, national interests will be served best by such an admittedly difficult political course. In light of the current Uruguay Round negotiations under the General Agreement on Tariffs and Trade, as well as numerous bilateral discussions, this fact is especially timely.

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Appendix
Developments in International Trade Theory and the Gains from Trade

Since 1817, numerous developments have taken place in international trade theory. The consequences of more than one factor of production, increasing and decreasing unit production costs, and imperfectly competitive markets are examined in this appendix. Special attention is focused on developments in international trade theory in the last decade.

Increasing the Number of Factors of Production

Assume that, in the United States, two resources, labor and capital (e.g., machines), are used in the production of two goods, automobiles and airplanes. The prices of these resources will be affected differently by trade. As trade develops, demand for the exported good (that is, the good in which the United States has a comparative advantage) will increase and demand for U.S. production of the imported good will fall. This demand shift causes the price of the exported good to rise relative to the price of the imported good. Similarly, the shift may also produce changes in the prices of resources; however, these price changes are not always obvious.

Initially, assume that the resources cannot be transferred across industries. For example, the labor and capital used to produce automobiles, the good imported into the United States, cannot be used to produce airplanes, the exported good. Consequently, as the price of airplanes rises in the United States, the compensation for labor and capital in the airplane industry will rise; meanwhile, the decline in automobile prices causes a decline in compensation for labor and capital in the industry. It would not be surprising if labor and owners of capital in the industry would resist such changes by asking for trade protection.

While resources may not be easily transferred across industries in the short run, workers can change jobs and capital can be moved as time passes. If resources are mobile, then the longer-run consequences for labor and owners of capital are different from those described above. Even if labor and capital are perfectly mobile, however, one set of resource owners may benefit while another group is harmed by trade.[1]

The real world is more complicated than this discussion has allowed. There are more than two factors of production and varying degrees of mobility for these factors. For example, the U.S. labor force contains scientists and engineers as well as short-order cooks. Nonetheless, the underlying analysis does suggest some generalizations. When trade occurs, owners of the resources that are more specialized in the production of export goods will tend to become weal-

[1]Who wins and who loses? It depends on the U.S. endowment of capital to labor relative to other countries. If the United States has relatively larger amounts of capital to labor relative to other countries, then owners of capital would benefit, while labor would be harmed. This result follows from the Stolper-Samuelson Theorem (Stolper and Samuelson, 1941). In the example, the United States is defined to be capital-abundant. The example also implicitly assumes that airplanes are produced by capital-intensive methods and automobiles by labor-intensive methods. Thus, the production of airplanes requires the use of more capital relative to labor than automobiles. Since the United States is relatively well-endowed with capital and the production of airplanes is capital intensive, the United States will have a comparative advantage in the production of airplanes. With the elimination of trade barriers, the relative price of airplanes to automobiles will increase. The Stolper-Samuelson Theorem shows that an increase in the relative price of the capital intensive good will increase the return to capital relative to the prices of both goods and reduce the return to labor relative to the prices of both goods.

thier; those who own resources more specialized in the production of import-competing goods will tend to lose wealth. People also gain or lose, however, depending on what happens to the prices of the goods they buy. Individuals who chiefly consume imported goods will benefit, while those who prefer consuming the exported goods will lose. Thus, the net effect on any individual depends on both the gains or losses associated with the price changes on the goods that he consumes and the effect of trade on his wealth (or income).

Increasing Unit Production Costs

A second assumption underlying the Ricardian example of the gains from trade is that unit production costs are constant. If unit production costs rise as more is produced, however, the general conclusions about the gains from trade remain essentially unchanged. The major difference is that rising unit production costs limit the extent to which specialization occurs.

Decreasing Unit Production Costs and Imperfect Competition

On the other hand, if unit production costs decrease as production increases, the extent to which actual trade patterns can be explained by comparative advantage becomes unclear. It also forces trade theory to deal with numerous characteristics of international trade in the real world. The market structure of industries engaged in trade is frequently highly concentrated. In other words, the individual firms in an industry, contrary to those in a perfectly competitive industry, can affect the market price of their good by their production and advertising decisions. In addition, trade statistics show that intra-industry trade (i.e., the simultaneous export and import of the output of the same industry) accounts for increasingly larger shares of world trade.

In the last decade, trade theorists have developed numerous models to deal with these facts. An exhaustive review of this rapidly expanding literature is beyond the scope of this appendix; however, a few illustrative articles are discussed in order to establish some key points. Brander (1981) and Brander and Krugman (1983) developed models using a homogeneous good to highlight how imperfect competition can cause intra-industry trade and how intra-industry trade can arise in the absence of cost differences.

Assume two countries with one firm in each country. The firms are producing a homogeneous good under identical cost situations and there are no transportation costs. Each firm operates under what is termed a "Cournot conjecture," meaning that each firm assumes its production decision will not affect its rival's production decision. Before international trade, each firm has a monopoly position in its home market. Allowing for free trade induces each firm to enter the other firm's market, because price exceeds marginal cost in each country. Thus, the same good will flow to and from each country.

Kierzkowski (1987) has noted that the bulk of intra-industry trade involves differentiated rather than homogeneous goods. Two approaches, Lancaster's (1979) characteristics approach and Dixit and Stiglitz's (1977) "love of variety" approach, have provided the foundation for trade models involving differentiated goods.

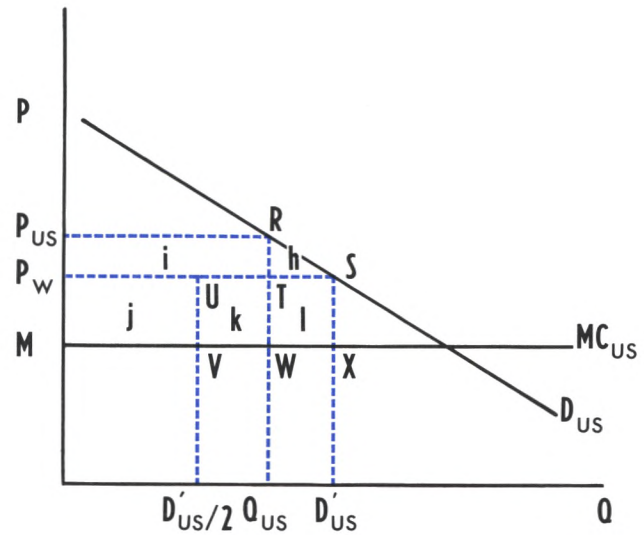
In the characteristics approach, individuals have preferences for the characteristics of goods rather than for collections of the goods themselves. A group of goods is defined as goods possessing the same characteristics but in different proportions. A diversity in consumer preferences causes different consumers to prefer different products (i.e., varieties) of a group of goods.

Helpman (1981) and Lancaster (1980) used the characteristics approach to show how intra-industry trade results from combining the demand for variety with economies of scale. The change from autarchy to free trade enlarges the market and causes output of the existing varieties to increase and the production of new varieties to begin. Consumers gain from the production of more varieties and lower prices as economies of scale are realized.

The sources of gains from trade are identical using the love-of-variety and characteristics approaches. In the love-of-variety approach, which is used by Dixit and Norman (1980), consumers have identical tastes and prefer to consume as many types of the differentiated product as possible.

The introduction of imperfect competition and declining unit production costs suggest three sources of gain from free trade. As the market potentially served by firms expands from a national to a world market, there will be gains due to declining unit production costs. The second is the reduction in monopoly power of firms faced with foreign competitors. The third is the gain to consumers from lower prices and increased product variety. Generally speaking, gains from trade result from the increase in competitive pressures as the domestic economy becomes less insulated from the world economy. Nonetheless, the numerous market structures and firm behaviors possible under imperfect competition preclude a definitive statement about the optimality of free trade.

Figure 3



Sometimes the benefits of expanded consumption resulting from free trade are less than the costs associated with distorted production. Venables and Smith (1986) provide a graphical illustration, duplicated in figure 3, of the preceding point using the Brander-Krugman duopoly model. Assume the U.S. market and the market in the rest of the world for a specific good are monopolies, the good is produced at a constant marginal cost, and there are no transportation costs. The demand curve is D_{us} and the marginal cost curve is MC_{us}. (The marginal revenue curve associated with D_{us} is omitted.) The monopoly price and output are P_{us} and Q_{us}.

The change from autarchy to free trade transforms the national monopolies into a world duopoly. Assuming the firms follow a Cournot strategy, price declines from P_{us} to P_w, sales in the United States increase from Q_{us} to D'_{us}, and consumers gain area P_{us} RS P_w or h + i. Profits (ignoring fixed costs) in the United States decline from area P_{us} RWM or i + j + k to area P_w SXM or j + k + l. The domestic firm has one-half of the domestic market, so its profits are j with k + l going to the foreign firm. The domestic firm's exports allow it to capture one-half of the foreign market. If the foreign market is identical to the domestic market, the firm's profits on foreign sales will equal k + l. Therefore, the net reduction in the domestic firm's profits is i − l and the overall welfare gain to the economy is h + l.

If the assumption of identically sized domestic and foreign markets is dropped, then a different conclusion is possible. If the foreign market is smaller than the domestic, the profits of the domestic firm in the foreign market will be less than k + 1. Assuming zero exports, the domestic gains from trade are h − k, and the domestic economy could lose from free trade. In this case, consumer gains can be more than offset by the shifting of profits from the domestic to the foreign economy. This shifting reflects the contraction of an activity that is already too little to an even smaller level.

The Borrowed-Reserves Operating Procedure: Theory and Evidence

Daniel L. Thornton

IN LATE 1982, the Federal Reserve switched from a nonborrowed-reserves to a borrowed-reserves operating procedure.[1] Analysts generally believe that the adoption of this procedure, which involves the use of a "borrowings assumption" specified by the Federal Open Market Committee (FOMC), represents a policy reversal toward the setting of the federal funds rate and away from direct money stock control.

This paper discusses the merits of the borrowed-reserves operating procedure as a method for money stock or interest rate control, analyzes the relationships between the borrowings assumption, the federal funds rate and the discount rate, and provides some evidence on how the new procedure has been used since late 1982.

THE NEW OPERATING PROCEDURE

The cornerstone of the borrowed-reserves operating procedure is the borrowings function, which reflects the basic economic factors that induce depository institutions to borrow from the Federal Reserve. It is usually argued that the level of borrowings (Borr) from the Federal Reserve is influenced primarily by the spread between the federal funds rate (FFR) and the Federal Reserve's discount rate (DR). Accordingly, the borrowings function is

$$(1)\quad Borr_t = b_0 + b_1(FFR_t - DR_t) + v_t,$$

where b_0 and b_1 are constants ($b_1 > 0$). The random error term, v_t, captures the effect of all other factors that determine depository institutions' borrowings. It can be thought to represent "transitory" shocks to the borrowings function, while changes in b_0 represent "permanent" shifts in the function. This distinction will be useful later.

The equilibrium FFR, given DR, is determined by the demand for and the supply of total reserves. The supply of total reserves is composed of nonborrowed reserves (NBR) and reserves supplied through the discount window. The demand for total reserves is composed of the demand for required plus excess reserves. Theory suggests that the demand for reserves is inversely related to the federal funds rate. Equating the demand for and the supply of total reserves results in an equilibrium equation for the federal funds rate of the general form

$$(2)\quad FFR_t = \mu_0 - \mu_1 NBR_t, \quad \mu_0, \mu_1 > 0.$$

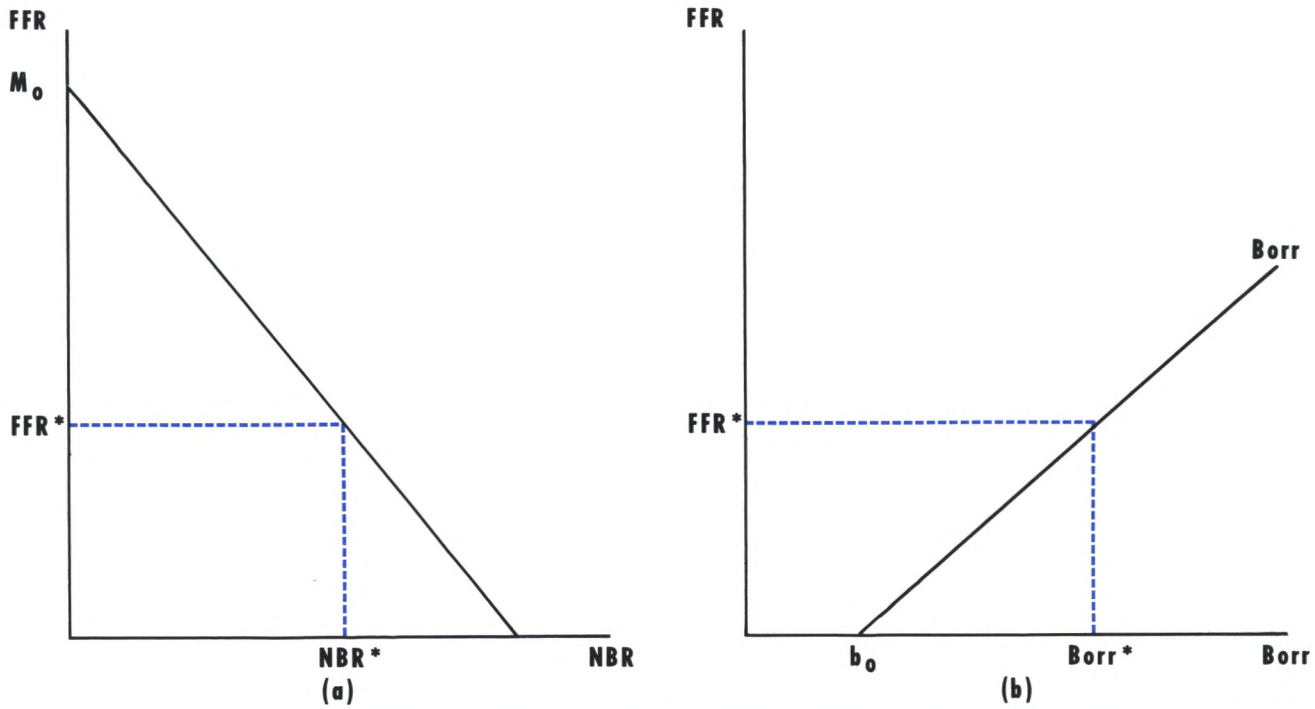
This equation shows all possible combinations of nonborrowed reserves and federal funds rates for which the supply of and the demand for total reserves are equal. Equation 1, presented in figure 1b, and equation 2, presented in figure 1a, can be used to illustrate how the borrowings procedure operates and to show similarities and differences between a borrowings operating procedure and a federal funds rate targeting procedure. Suppose the borrowings assumption is set at Borr*, shown in figure 1b. The borrowings assumption represents the amount of reserves that the Fed wishes to induce depository institutions to borrow from the discount window. This implies FFR must equal FFR*. Given the demand and supply functions, the Fed can hit its borrowings target by supplying nonborrowed reserves equal to NBR*. This establishes an equilibrium FFR at FFR* consistent with the borrowings objective.

While figure 1 clarifies the relationship between the borrowings objective, the funds rate and nonborrowed reserves, it may be unfamiliar to many readers. Consequently, from this point on, the analysis will be illustrated in terms of the more familiar figure 2. (See appendix A for a discussion in terms of figure 1 and the details concerning the variances of the federal funds rate and borrowings stated in the text.) In figure

Daniel L. Thornton is a research officer at the Federal Reserve Bank of St. Louis. Rosemarie V. Mueller provided research assistance.

[1]For a discussion of this change, see Roley (1986), Wallich (1984) Federal Reserve Bank of New York (1986) and Gilbert (1985).

Figure 1
Equilibrium in the Reserve Market under a Borrowings Procedure

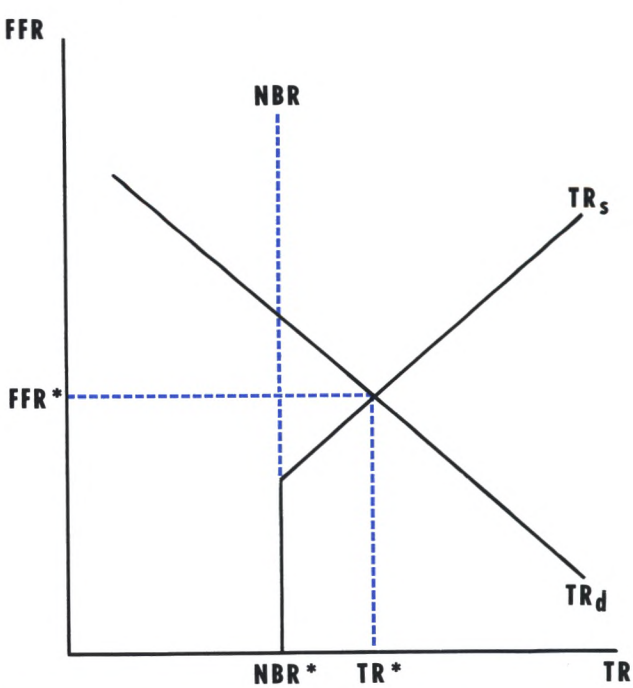


2, the supply of total reserves is obtained by adding borrowed reserves (from equation 1) to the desired level of nonborrowed reserves, NBR*, on the assumption that $b_0 > 0$ (see the shaded insert). The equilibrium federal funds rate, FFR*, is determined by the intersection of the supply and demand curves in figure 2. As before, the target level of borrowings is achieved by providing the appropriate amount of nonborrowed reserves.

How the Fed Should Respond to Shocks under a Borrowings Operating Procedure

To understand properly the efficacy of the borrowings procedure as a method of money stock or interest rate control, it is important to see how the Fed reacts to shocks when using it. First, consider its response to an increase in the demand for total reserves, illustrated in figure 3a. Other things constant, an increase in the demand for total reserves causes the equilibrium funds rate to rise from FFR* to FFR*′ and borrowings to rise from the desired level (TR* − NBR*) to (TR*′ − NBR*). To bring borrowings back to its desired level, the supply of *nonborrowed* reserves must be increased via an open market purchase of government securities. This reduces the federal funds rate and

Figure 2
Equilibrium in the Reserve Market under a Borrowings Procedure



The Borrowings Function: A Supply or Demand Curve?

The Fed does not set quantitative restrictions on the level of aggregate borrowings. Consequently, it is unclear whether the quantity of reserves injected through the discount window properly reflects "supply" or "demand" considerations. In other words, does the borrowings portion of the TR_s curve in figure 2 represent a supply curve, as is commonly assumed, or a demand curve? Though the answer to this question has no bearing on the analysis presented in the text, the issue is interesting in its own right.

It is important to note that discount window borrowing is a privilege for depository institutions, not a right. Nevertheless, until the mid-1960s, the discount window was considered "open" in the sense that those who wanted to borrow were more or less automatically granted a loan. Only if a bank had been deemed to have made too frequent or inappropriate use of the privilege would it be "discouraged" from further borrowing.

Furthermore, for various reasons, some banks may be "reluctant to borrow" from the Fed. Many economists believe that the reluctance to borrow is induced by the Fed's administration of the discount window under which the amount of borrowed reserves available is determined by a complicated system of price and non-price rationing. According to this view, in the absence of administrative restrictions, depository institutions would borrow from the Fed whenever the discount rate is below the federal funds rate, and obtain funds in the federal funds market whenever the federal funds rate is below the discount rate.[1] Thus, in the absence of any administration of the discount window, the discount rate should establish an effective ceiling for the federal funds rate.

If true, the supply of reserves should be perfectly interest-elastic at or below the current discount rate. Since discount borrowings are small (usually between $1 billion and $2 billion) and the federal funds rate is generally *above* the discount rate, it is often assumed that there is non-price rationing at the discount window. Presumably, the marginal, non-pecuniary rationing cost is the amount by which the federal funds rate exceeds the discount rate. This spread is the marginal premium depository institutions willingly pay to obtain funds from sources other than the Fed. Consequently, according to this view, the borrowings function is essentially a supply curve that changes as the Fed changes its non-pecuniary price of funds obtained at the discount window.

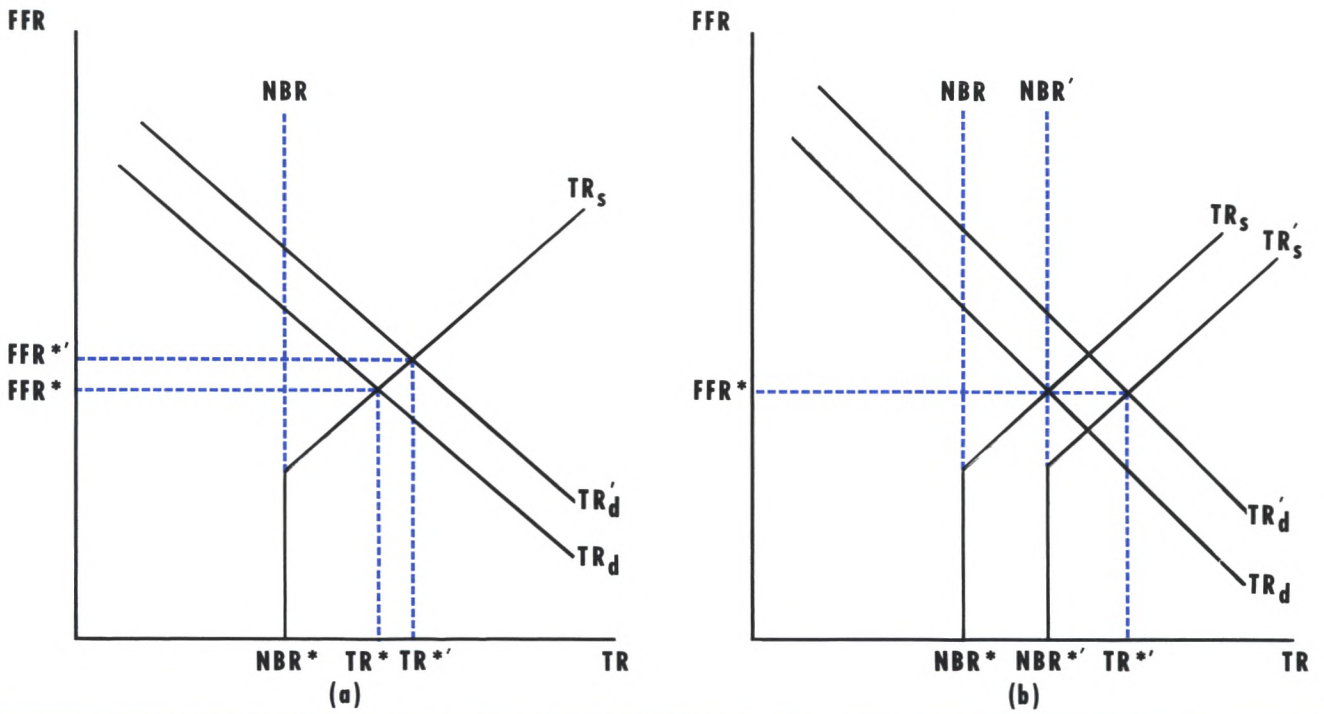
This view has certain deficiencies. First, it implies that borrowings should be zero whenever the discount rate is at or above the federal funds rate — that is, the intercept term in equation 1, b_0, should be zero. Estimates of equation 1, however, typically yield a significant positive intercept term. Apparently, depository institutions borrow at the discount window even when it is the more costly source of marginal funds. For some depository institutions at least, borrowings appear to be determined by factors other than the relative cost of funds, at least as measured by the federal funds rate/discount rate spread.

Riefler (1930) argued that the positive intercept is due to a "need" that cannot be satisfied in the market. At one level, Riefler's needs theory could result from a lack of financial sophistication. For example, some banks may seldom, if ever, borrow or lend in the federal funds market. When these institutions experience a reserve deficiency, for whatever reason, they may go to the Fed rather than the unfamiliar federal funds market, even if the discount rate is above the federal funds rate. Viewed from this perspective, the borrowing function is a demand curve, at least to the extent that changes in demand-related factors cause the curve to shift. Today, this explanation lacks the credibility it might have had at Riefler's time. The increased sophistication of depository institutions and the widespread use of correspondent banking have weakened the validity of this argument.

A different explanation for the positive constant term in the borrowings function is that the *average* federal funds rate does not represent the relevant opportunity cost for all depository institutions. Some institutions, for example, may be able to borrow in the federal funds market only at a very high federal funds rate, if at all. For these institutions, discount window borrowings may be attractive, even when the average level of the federal funds rate is well below the discount rate. In this case too, however, shifts in the borrowings function reflect changes in demand rather than supply.

[1] See Goodfriend (1983).

Figure 3
The Effect of an Increase in the Demand for Total Reserves under a Borrowings Procedure



brings borrowings back to Borr*; that is, (TR* − NBR*) equals (TR*′ − NBR*′), as shown in figure 3b. Consequently, neither borrowings nor the federal funds rate is changed; instead, the demand for total reserves is satisfied by an increase in NBR.

Alternatively, the borrowings function could shift to the right, illustrated by the rightward shift in the TR_s function in figure 4a. Other things the same, borrowings will increase and the equilibrium federal funds rate will decline from FFR* to FFR*′. If the borrowings assumption is maintained at Borr*, the supply of nonborrowed reserves must be increased. This will put further downward pressure on the federal funds rate until it reaches FFR*″ (see figure 4b), inducing borrowings back to Borr*. In this instance, borrowings are unchanged and the funds rate falls.

The Borrowings Procedure: An Ineffective Tool for Money Stock Control

The above analysis suggests that strict adherence to the borrowings procedure will not provide effective money stock control. If borrowings are kept at the assumed level, changes in the demand for money and, hence, reserves will be accommodated by compensatory changes in the supply of reserves. This is illustrated by the usual money supply/money demand paradigm shown in figure 5a. Here, the money supply is positively related to the FFR and is drawn holding the discount rate and the level of nonborrowed reserves unchanged.[2] As usual, the demand for money is negatively related to the interest rate. If the borrowings procedure is used to control the money stock, a money target, M*, must be established. Given the demand for money and the discount rate, this requires achieving a specific interest rate, FFR*. Given the borrowings function, this implies a target level of borrowings (Borr*) and target setting for nonborrowed reserves (NBR*).

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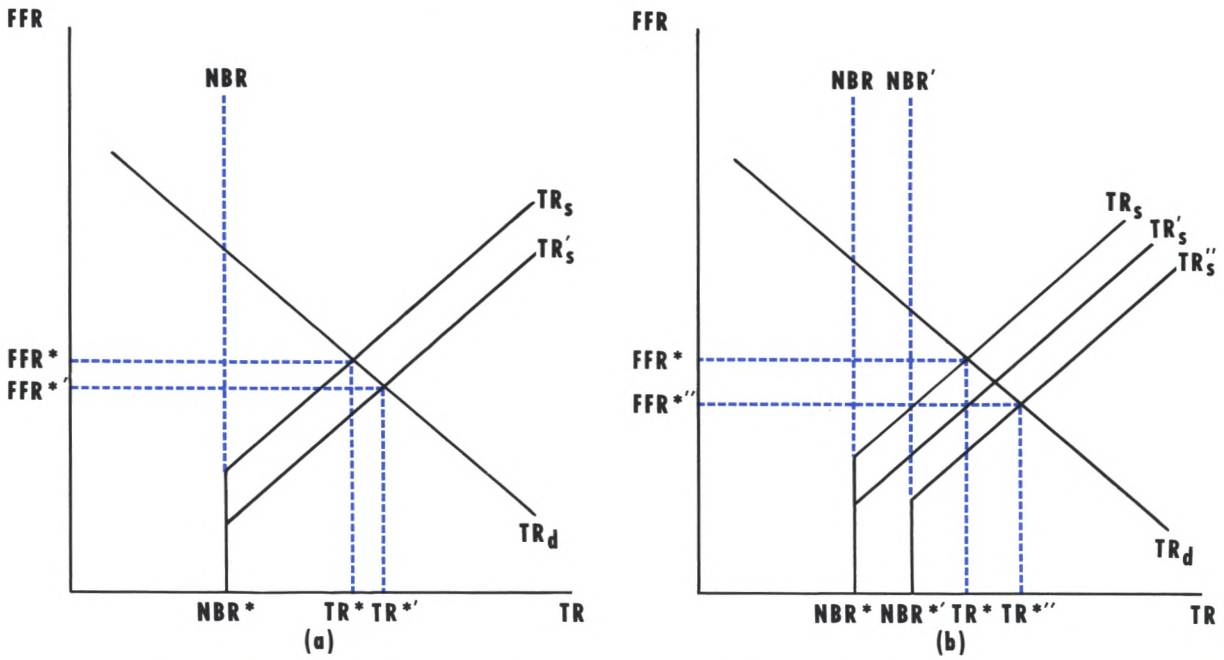
[2]The supply of money is positively sloped on the assumption that borrowings are positively related to the funds rate and that the demand for other reservable components of the monetary base is negatively related to the funds rate. See Thornton (1982b) for a model that incorporates these assumptions.

The federal funds rate is not used commonly as the representative interest rate for money demand. But it is used commonly in money supply models as well as those that incorporate both money supply and money demand functions. This may not be desirable, especially if the relationship between the funds rate and the true representative rate in the money demand equation is either highly variable or affected by changes in policy or policy-related variables. It is adequate, however, if there is a fixed proportionate relationship between these rates.

Figure 4
The Effect of an Increase in the Borrowings Function under a Borrowings Procedure



Suppose the demand for money increases from M_d to M'_d.[3] Other things the same, the resulting rise in the funds rate would increase borrowings. In order to reduce borrowings back to Borr*, the supply of nonborrowed reserves must increase from NBR* to NBR*′, shifting the money supply schedule to the right as shown in figure 5a. Because borrowings depend only on the level of the federal funds rate (given the discount rate and assuming the function is otherwise stable), the desired level of borrowings can be achieved by supplying the requisite quantity of nonborrowed reserves. Hence, all shifts in the demand for money are accommodated by corresponding shifts in the money supply if Borr* remains unchanged. In this case, no difference between money stock control under a borrowings procedure and a federal funds rate targeting procedure exists.

Now, suppose the borrowings function temporarily increases, that is, $v_t > 0$. This produces a temporary rightward shift in the money supply from M_s to M'_s, as illustrated in figure 5b.[4] Other things the same, the federal funds rate falls and borrowings increase. To bring borrowings back to Borr*, nonborrowed reserves must be increased, shifting the money supply schedule still further to the right from M'_s to M''_s. As a result, the money stock is further away from its targeted level, M*. Strictly enforced, the borrowings operating procedure yields less short-term control over the money stock than a straight forward federal funds rate targeting procedure as long as the borrowings function is subject to some variability and the Fed makes no allowance for the shift.[5]

The Borrowings Procedure as a Federal Funds Rate Target

The borrowings procedure produces results that are identical to those using a federal funds rate targeting procedure if all shocks emanate from the demands for money or reserves. The two procedures yield dif-

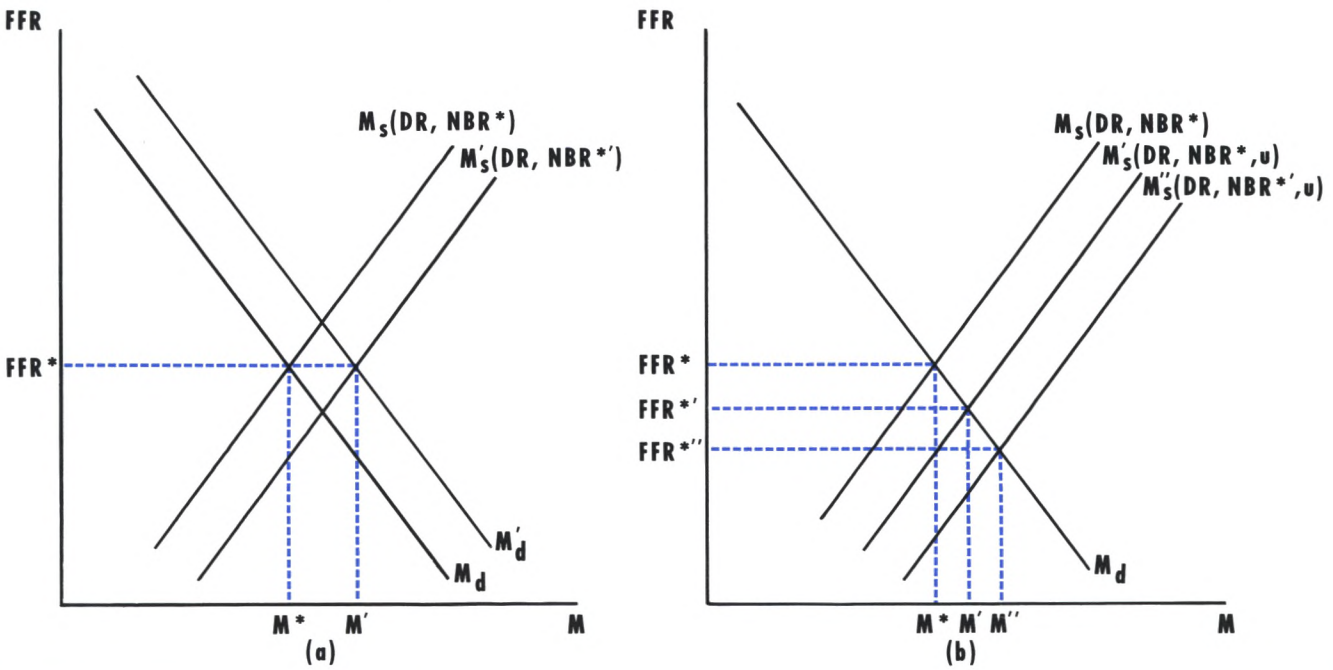
[3]Total reserves demand is composed of the demand for required and excess reserves. The demand for required reserves can be thought of as a derived demand, derived from the demand for money via the relationship between checkable deposits and required reserves. Because the demand for money generally is estimated to be interest-inelastic, the demand for required reserves should also be interest-inelastic. Of course, during the lagged reserve accounting (LRR) period prior to February 1984, the demand for required reserves should be perfectly interest-inelastic. (See Thornton (1983) for a discussion of the differences between lagged and contemporaneous reserve accounting.) The demand for excess reserves usually is found to be relatively interest-insensitive as well.

[4]The assumption here is that the discount window is assumed "open," given a set of unchanged administrative constraints.

[5]This point has also been made by VanHoose (1988).

Figure 5

The Effect of an Increase in the Demand for Money and the Borrowings Function on the Money Supply under a Borrowings Procedure



ferent results, however, when there are shifts in the borrowings function. The borrowings procedure exacerbates the effect of short-run fluctuations in the borrowings function on the funds rate.[6] If any part of such shifts is offset by changes in NBR, the borrowings procedure will produce greater variability in the federal funds rate and less variability in borrowings than a direct funds rate targeting procedure. Indeed, under a borrowings procedure, the variability of borrowings will be less than the variability of the funds rate under fairly general conditions.[7] Nevertheless, if the borrowings function is stable (in the sense that all fluctuations are transitory), fluctuations in the federal funds rate will net out over time [$E(v_t) = 0$]; therefore, the borrowings operating procedure can be used to achieve a federal funds rate target over a somewhat longer-term horizon.[8]

Of course, the borrowings function also could exhibit permanent shifts associated with changes in b_0 in equation 1. In this instance, the assumed level of borrowings would be achieved only with a substantial change in the federal funds rate.[9] For example, if borrowings are maintained at a predetermined level despite a permanent decrease in the borrowings function, nonborrowed reserves must be reduced until the federal funds rate rises enough to return borrowings to their former level. On the other hand, if the federal funds rate is kept at its former level, the borrowings assumption must be lowered.

[6]Roley (1986) argues that, while the Fed moves quickly to offset changes in the demand for total reserves, it does not do so for changes in the borrowings function. Thus, he argues that the federal funds rate will vary *more* in the short run under a borrowed-reserves procedure than under a federal-funds-rate targeting procedure. Roley's assertion implies the Fed can distinguish between shifts in these two functions.

[7]The relative variability of borrowings will be less if the slope of the total reserves supply function in figure 2 is flatter than that of the demand for total reserves — a condition that is likely to hold — or if the Fed is reasonably successful in offsetting the effect of shifts in the borrowings function. See appendix A for details.

[8]The two procedures are equivalent if the shocks to both the demand for total reserves and borrowings exhibit no persistence and if no attempt is made to offset such temporary shocks. See appendix A for details.

[9]Wallich (1984), p. 26, notes that the borrowings function is unstable. Therefore, he contends the borrowings procedure cannot be regarded as a form of "rate-pegging," because the ". . . chosen level of borrowing is consistent with any range of values of the funds rate."

In summary, the borrowings operating procedure is a useful surrogate for a short-run federal funds rate targeting procedure *only* if all changes in aggregate borrowings are produced by shifts in the demand for total reserves. It is a useful surrogate for a longer-run federal funds rate targeting procedure only if the borrowings function is stable, that is, subject only to temporary, random shifts. It is unsuited for a federal funds rate target whenever there are permanent shifts in the borrowings function, unless the borrowings assumption is changed sufficiently.

The Policy Implications of a Change in the Borrowings Assumption

Usually, monetary aggregates or interest rates are chosen as intermediate policy targets. Why is the borrowings procedure used when the money stock or the funds rate could be more directly controlled by other procedures? What are the policy implications of a change in the borrowings assumption? Without precise information about the intermediate policy target, it is difficult to answer these questions definitively; nevertheless, some generalizations can be made.

If the borrowings function is stable, an increase in the borrowings assumption can be interpreted as a move toward restraint in that it reduces the supply of reserves relative to demand. Conversely, a decrease is a movement toward ease. If the borrowings function is unstable, in the sense that permanent shifts occur, however, changes in the borrowings assumption may reflect the Fed's awareness of these shifts and its desire to mitigate their effect on the funds rate. A failure to change the borrowings assumption, on the other hand, could be interpreted as a movement toward ease or restraint, depending on the direction of the shift of the borrowings function.

The Relationship Between Changes in the Borrowings Assumption and Changes in the Discount Rate

Changes in the borrowings assumption and the discount rate can be viewed as substitutes. Because it depends on the discount rate, the TR_s curve shifts with a change in the discount rate. For example, a discount rate increase shifts the sloped portion of the TR_s curve to the left at all levels of the funds rate. If the borrowings assumption is unchanged, the quantity of nonborrowed reserves must be reduced until the funds rate rises enough to restore borrowings to their desired level. On average, the federal funds rate will change point-for-point with a change in the discount rate under a strictly enforced borrowings procedure.

The same change in the equilibrium federal funds rate could be obtained by changing the borrowings assumption instead. Consequently, changes in the borrowings assumption and changes in the discount rate are substitutes in their effect on the federal funds rate under a strictly enforced borrowings procedure.[10]

Table 1 reports changes in the discount rate and the borrowings assumption from October 1982 through December 1986. Technical discount rate changes, reportedly made *solely* to keep the discount rate in line with market interest rates, are denoted by a T; those made for other, policy-related, reasons are denoted by a P.[11] As the table shows, changes in the borrowings assumption and the discount rate generally occurred around the same time: five of the 11 changes in the discount rate came within about one week of a change in the borrowings assumption, while two were within two weeks. Moreover, all changes that occurred close together were in the same direction, indicating consistent movements in both the borrowings assumption and the discount rate.

The table also shows alternating periods of ease and restraint. From October 1982 through the end of the year, the borrowings assumption and the discount rate were reduced. While changes in the borrowings assumption were modest (even cumulatively) and one discount rate change was technical, policy eased moderately during this period.

From spring 1983 to spring 1984, policy moved toward restraint. The borrowings assumption was raised by $600 million from March through August 1983, lowered in October 1983 by $150, then increased by $350 million in March 1984. The last increase was followed closely by a 50 basis-point technical increase in the discount rate.

Policy was easier during the fall of 1984. The borrowings assumption was reduced by $700 million from early October to late December and two policy-related cuts in the discount rate reduced it by a full percentage point. There were no large, consistent movements in the borrowings assumption during 1985 and none after early February 1986, despite four cuts in the discount rate (three of which were policy-related).

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[10]Because a one percentage-point change in the discount rate is associated with about a $420 million change in borrowings over this period, a $420 million change in the assumed level of borrowings should have an effect on the funds rate equal to a one percentage-point change in the discount rate. See Thornton (1986).

[11]See Thornton (1986, 1982a) for a discussion of the classification of discount rate changes into technical and non-technical changes.

Table 1

Changes in the Discount Rate and the Borrowings Assumption

	Change in the discount rate (in basis points)	Change in the borrowings assumption (in millions of dollars)
October 6, 1982		$ −50
October 12, 1982	−50 T	
November 17, 1982		−50
November 22, 1982	−50 P	
December 14, 1982	−50 P	
December 22, 1982		−50
March 30, 1983		50
May 25, 1983		100
June 24, 1983		100
July 14, 1983		250
August 24, 1983		100
October 5, 1983		−150
March 28, 1984		350
April 9, 1984	50 T	
October 3, 1984		−250
November 8, 1984		−175
November 23, 1984	−50 P	
December 19, 1984		−275
December 24, 1984	−50 P	
February 14, 1985		50
March 27, 1985		50
May 20, 1985	−50 P	
May 22, 1985		−50
August 21, 1985		75
October 2, 1985		75
November 6, 1985		−50
December 18, 1985		−100
February 13, 1986		−50
March 7, 1986	−50 P	
April 21, 1986	−50 T	
July 11, 1986	−50 P	
August 21, 1986	−50 P	

T Indicates changes made solely to keep the discount rate in line with market interest rates
P Indicates changes made for other, policy-related, reasons.

EMPIRICAL EVIDENCE ON THE USE OF THE BORROWINGS PROCEDURE

An important factor in determining the impact of the borrowings procedure on the funds rate and the money stock is the stability of the borrowings function. Historically, the borrowings function has been subject to considerable random variation: by itself, the spread between the federal funds rate and the discount rate explains less than 50 percent of the variation in borrowings about its mean level.[12] For the borrowings procedure to be used effectively as a federal funds rate target over the longer run, the borrowings function must be stable. It is important, therefore, to determine whether there have been permanent shifts in the borrowings function. If so, the key issue is how the borrowings assumption was changed in response to these shifts.

To examine this issue, equation 1 was estimated using random coefficient regression, where both the constant term, b_0, and the slope coefficient, b_1, are allowed to vary through time.[13] Chart 1 presents random-coefficient-regression estimates of the constant term and a band representing plus or minus one standard error. The vertical lines show the dates on which the borrowings assumption was raised or lowered, as indicated.

The intercept shows considerable variability. With but three significant exceptions, the borrowings assumption was changed in the direction consistent with mitigating the effect of shifts in the borrowings function on the federal funds rate.[14] The three exceptions occurred in October 1984, August 1985 and October 1985. In October 1984, when the borrowings function shifted upward, the borrowings assumption was reduced from $1 billion to $750 million. In both August and October 1985, the borrowings assumption was raised, despite the downward shift in the borrowings function. Both increases were relatively small ($75 million each), however, and both were completely offset by the mid-December decrease.

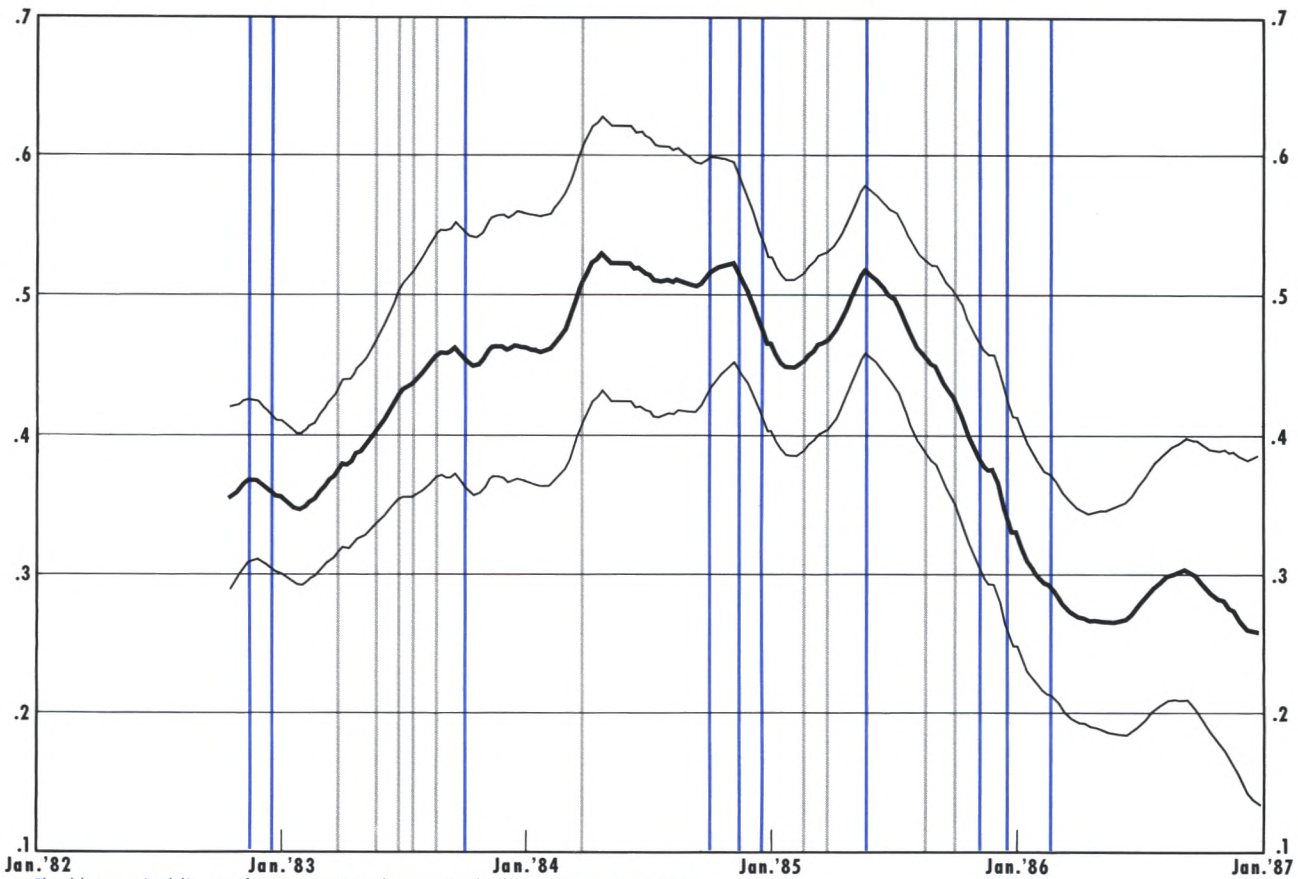
These results are consistent with movements in borrowings, the borrowings assumption and the federal funds rate presented in chart 2. The October 1984 change in the borrowings assumption preceded movements in borrowings; however, this action followed a 100 basis-point drop in the funds rate from its

[12]This is for the period from October 1982 through June 11, 1986. See Thornton (1986). This same function estimated for the 222 weeks prior to October 6, 1979, has an $\bar{R}^2$ of about .70.

[13]The procedure used here is suggested by Garbade (1977). The equation was first estimated allowing only the constant term to vary. It was then reestimated allowing both the constant and slope coefficients to vary; this was done to determine whether variation in the slope coefficient was being inappropriately attributed to the constant term. The results presented in chart 1 are from the latter estimation. The qualitative interpretation of the relationship between changes in the borrowings assumption and shifts in the borrowings function was not affected by the different estimation procedures.

[14]There were two other exceptions: they occurred on October 6, 1982, and May 22, 1985. In both instances, however, these changes predate the shift by only one week. Including these in subsequent statistical tests does not affect the results.

Chart 1
Varying Parameter Intercept



The blue vertical lines refer to negative changes in the borrowings assumption.
The grey vertical lines refer to positive changes in the borrowings assumption.

cyclical peak for the week ending August 22.[15] Nearly all other changes in the borrowings assumption were preceded by movements in borrowings and the federal funds rate in the same direction.

A Comparison of the Variability of Borrowings and the Federal Funds Rate

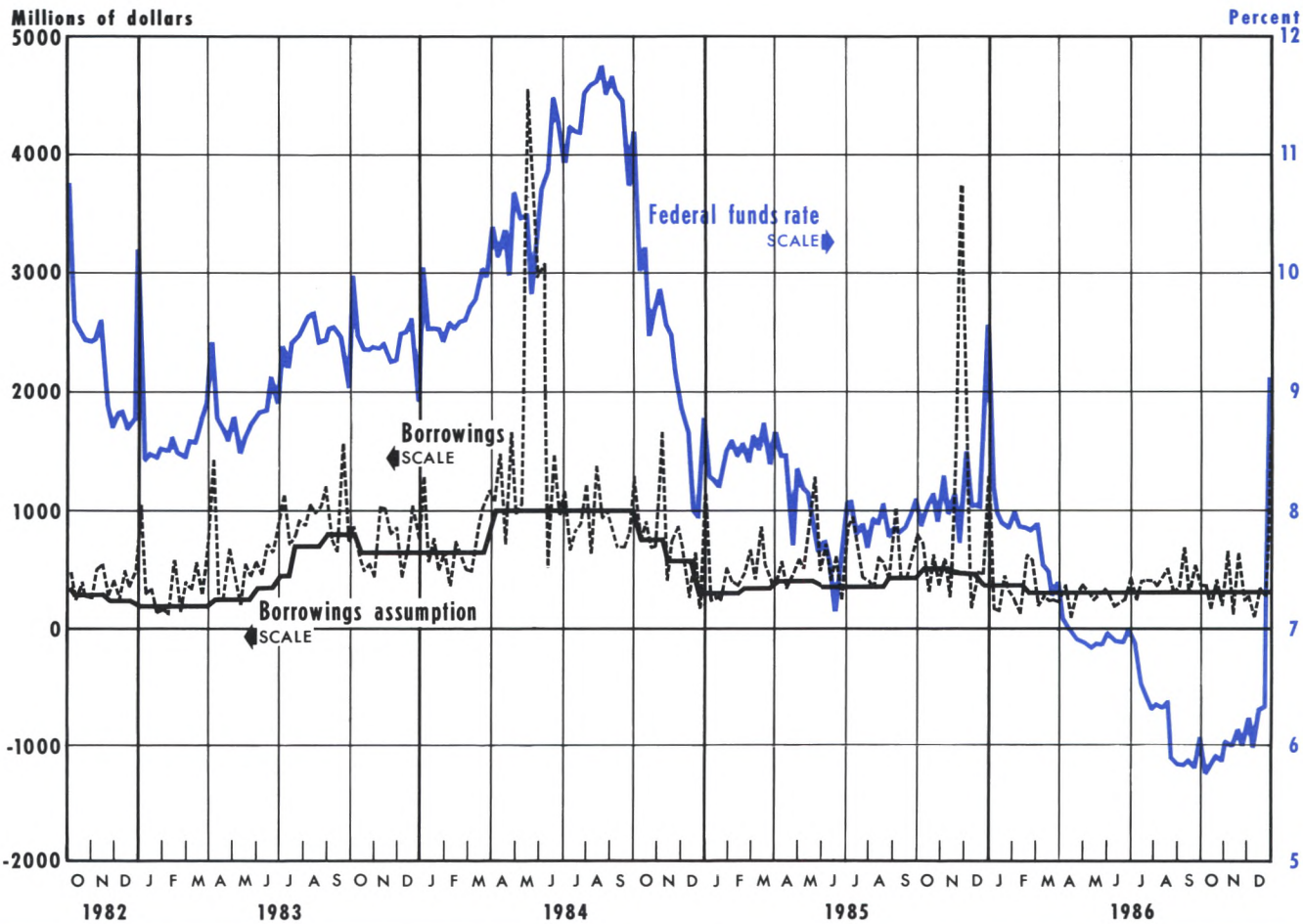
Further evidence on the effects of using the borrowings procedure can be obtained by analyzing scatter plots of borrowings and the federal funds rate during periods in which both the borrowings assumption and the discount rate were unchanged.[16] The previous results suggest that there are considerable temporary shifts in the demand for borrowed reserves. If most of the effect of short-run variation in the borrowings function on the federal funds rate were offset quickly, there would be little variation in the federal funds rate but considerable variation in borrowed reserves. In the extreme, if the effect of all such shifts on the funds rate were quickly and completely offset, all observations would lie along a vertical line representing the average of the federal funds rate in a scatter plot of borrowings and the federal funds rate. On the other hand, if borrowings were kept close to the assumed

[15]The FOMC meeting was held on October 2, 1984. The federal funds rate had fallen to 9.84 percent on September 26, though it averaged 10.73 percent for the week ending Wednesday, September 26. The weekly peak was 11.77 percent for the week ending Wednesday, August 22; the daily peak occurred on August 1, when the federal funds rate was 12.04 percent.

[16]This procedure was suggested to me by R. Alton Gilbert. It is interesting to note that the variability of borrowings could be reduced by simply "tying" the discount rate to the federal funds rate. This point was made by Thornton (1982b) and more recently by VanHoose (1987).

Chart 2

Borrowings, Borrowings Assumption, and Federal Funds Rate



level, the funds rate should vary relatively more than borrowings. In this case, the observations should be clustered about a horizontal line at the assumed level for borrowings.[17]

During the post-October 1982 period, there were six periods with 10 or more weeks in which both the borrowings assumption and the discount rate were unchanged.[18] Scatter plots of borrowings and the federal funds rate for these periods are presented in charts 3a through 3f.[19] The data used in these charts have been normalized. The actual level of borrowings was normalized by dividing it by the level of the borrowings assumption for the respective period. The federal funds rate was normalized by dividing it by its average rate for the period.[20] All charts have identical scales for both variables to make it easy to compare the relative variability. The solid horizontal and vertical lines denote where the normalized variables are equal

[17]The variability of borrowings and the funds rate depend on the slopes of the TR_s and TR_d curves and the extent to which random shocks are offset. If more than 50 percent of such shocks are offset during the period, however, there will be more variability in the funds rate than in borrowings regardless of the slopes of these curves.

[18]Plots for the omitted periods show no pattern. They consist, however, of very few observations.

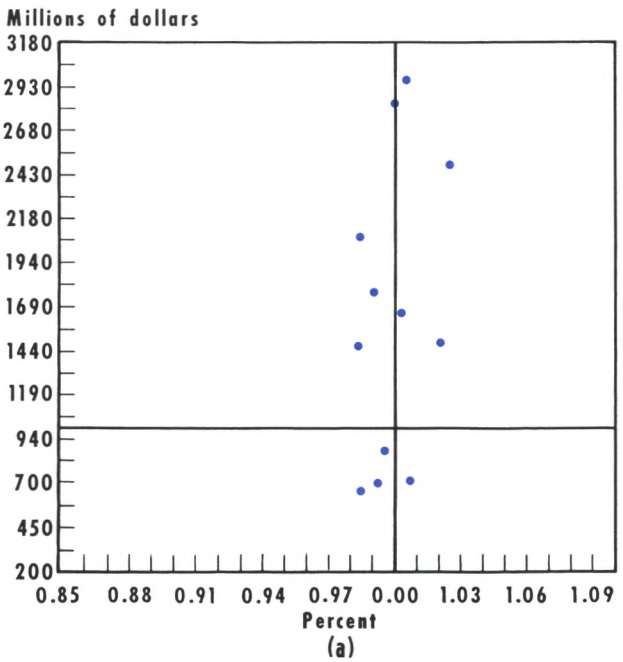
[19]These data exclude outliers such as the "window-dressing" borrowings during the final reserve period of the year and the unusually large borrowings associated with Continental Bank of Illinois. See Thornton (1986) for a discussion of the latter episode.

[20]Because the mean of the normalized rate spread equals one, the rate spreads will be scattered symmetrically about the vertical line. In contrast, the data points will be scattered asymmetrically above (below) the vertical line depending on whether the borrowings assumption is below (above) the average level of borrowings for the period.

Chart 3

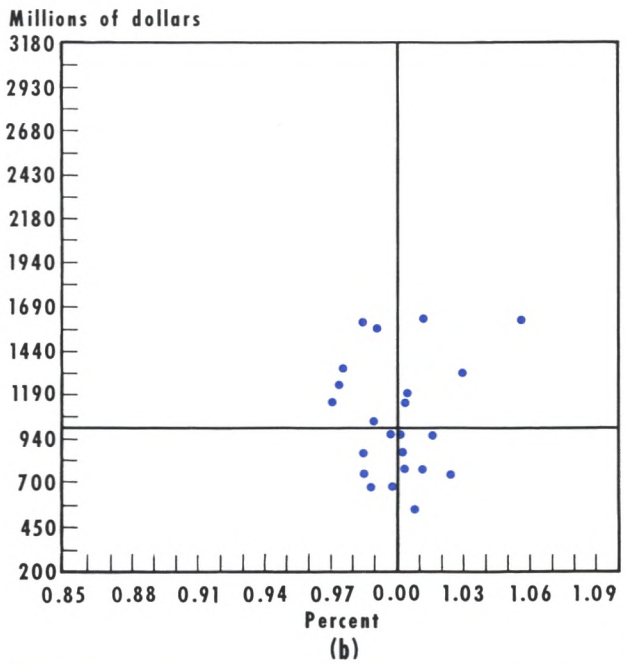
Selected Scatter Plots of Normalized Borrowings

December 29, 1982 – March 23, 1983
(N=12)



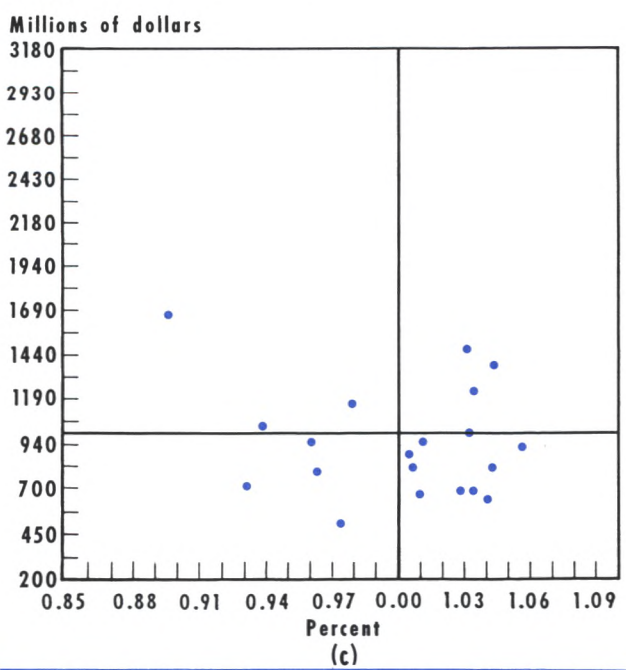
(a)

October 12, 1983 – March 21, 1984
(N=23)



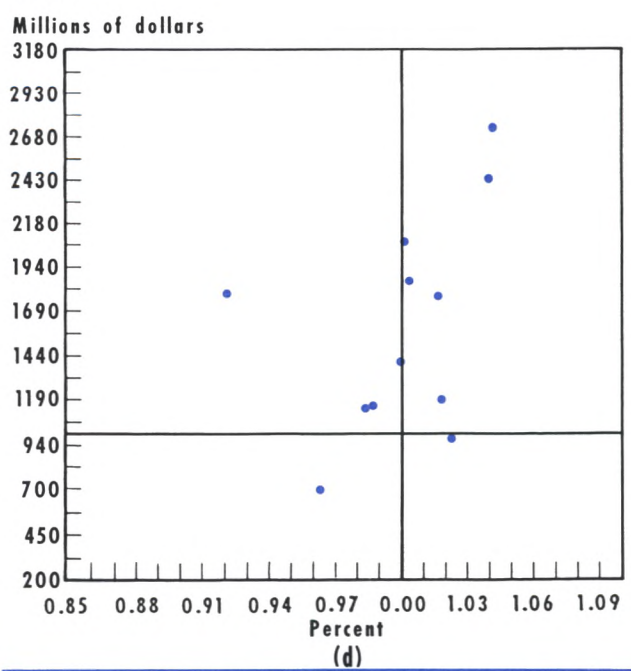
(b)

April 18, 1984 – September 26, 1984
(N=20)



(c)

May 29, 1985 – August 14, 1985
(N=12)

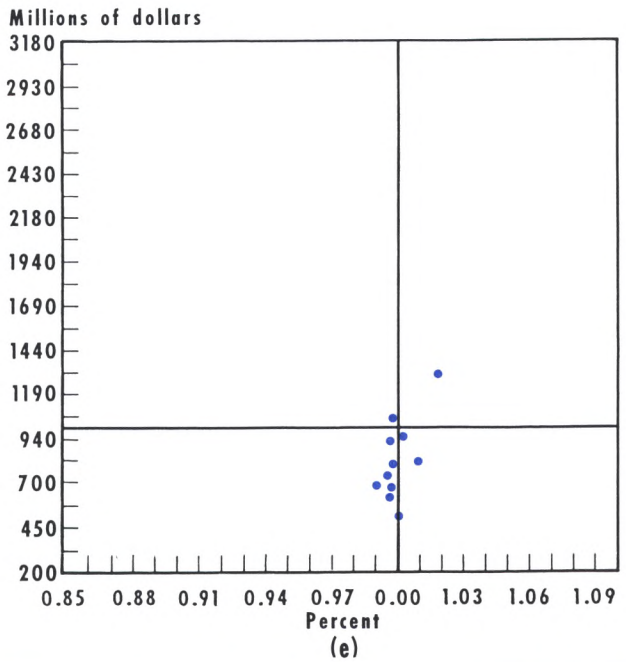


(d)

The vertical reference lines refer to the normalized mean of the federal funds rate; the horizontal reference lines refer to the normalized mean of borrowings.

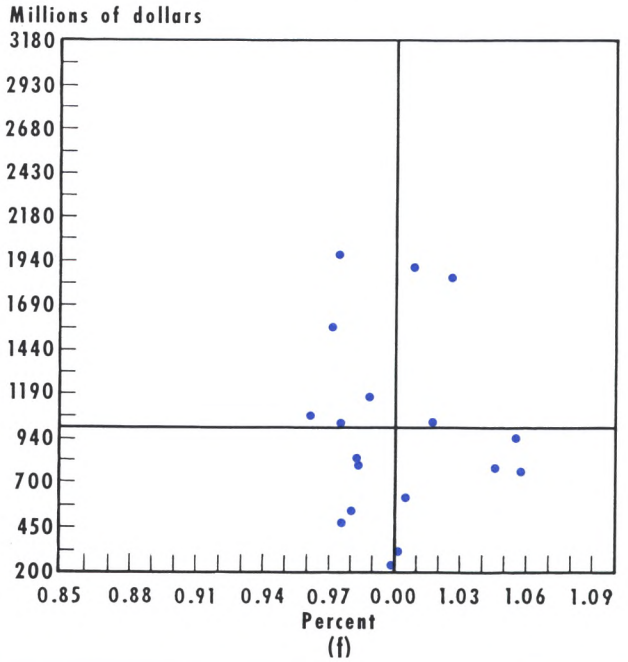
and the Normalized Federal Funds Rate

April 30, 1986 - July 9, 1986
(N=11)



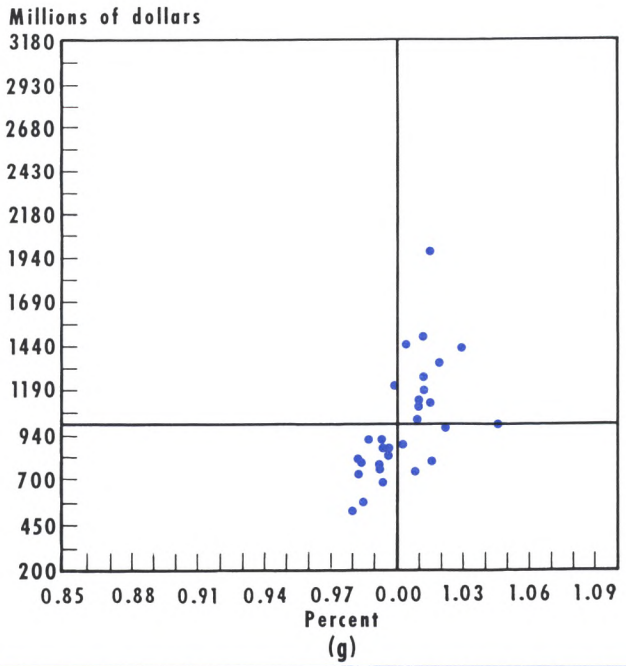
(e)

August 27, 1986 - December 24, 1986
(N=18)



(f)

December 27, 1978 - July 18, 1979
(N=30)



(g)

to one. Some descriptive statistics for the raw data are presented in table 2.

Finally, chart 3g is a scatter plot from late December 1978 to late July 1979, when it is generally acknowledged that the Fed was targeting the federal funds rate. During this period, a 75 basis-point target range for the federal funds rate was specified.[21]

With the exception perhaps of chart 3c, no period suggests a rapid adjustment to maintain borrowings at the assumed level. In contrast, two periods (charts 3a and 3e) show relatively little variability in the federal funds rate. Indeed, a comparison of these charts with chart 3g shows that the funds rate fluctuated less around its mean during these periods than it did around the midpoint of the Fed's narrow range for the federal funds rate in early 1979.

There should be less variability in borrowings and more variability in the federal funds rate under a

[21]This was the only extended period in which the federal funds rate band was both narrow and unchanged.

Table 2

Descriptive Statistics for Borrowings and the Federal Funds Rate

Period	Borrowings			Federal funds rate		
	Mean[1]	SD[2]	CV	Mean	SD	CV
Dec. 27, 1978– July 25, 1979	$1,190.47	$367.0	.3083	10.16%	.1549	.0153
Dec. 29, 1982– March 23, 1983[2]	326.3	165.9	.5084	8.56	.1176	.0137
Oct. 12, 1983– March 21, 1984	688.0	214.9	.3124	9.51	.1863	.0196
April 18, 1984– Sept. 26, 1984[3]	951.3	301.8	.3173	11.15	.4935	.0443
May 29, 1985– Aug. 14, 1985	559.0	213.6	.3821	7.74	.2618	.0338
April 30, 1986– July 9, 1986	284.9	79.6	.2794	6.89	.0525	.0076
Aug. 27, 1986– Dec. 24, 1986	343.8	184.7	.5372	5.98	.1742	.0291

NOTE: SD denotes the standard deviation. CV denotes the coefficient of variation, i.e., SD/Mean.

[1]In millions of dollars.

[2]Excludes the "window-dressing" borrowings for the week ending January 5, 1983.

[3]Excludes the four weeks of unusually large borrowings (May 16–June 6) associated with the problems of Continental Bank of Illinois.

borrowings target than under an interest rate target. Table 3 presents the mean, standard deviation (SD) and a measure of relative variability, the coefficient of variation (CV), for weekly data during the period of the borrowings operating procedure and during an equal number of weeks under an interest-rate-targeting regime. The results are generally consistent with those discussed above. The variability of borrowings differs little in either absolute or relative terms between the two periods. The variability of the federal funds rate, however, fell considerably; its SD declined nearly 30 percent, while its CV declined nearly 50 percent.[22]

The Impact of Changes in the Borrowings Assumption on the Federal Funds Rate

If changes in the borrowings assumption were made primarily to offset shifts in the borrowings function, there should be no significant relationship between changes in the borrowings assumption and movements in the federal funds rate. If changes in the borrowings assumption are made for other reasons, they should produce a significant effect on the federal funds rate.[23]

[22]This result is only marginally affected by the switch from a one-week to a two-week reserve accounting period. If only reserve period data are used for the CRR period, the standard deviation of the funds rate is 1.60 percent and the coefficient of variation is .19.

[23]This is true only if a discount rate change shows significant direct effect on the federal funds rate; Thornton (1986) argues such an effect should be small and insignificant. Indeed, this may provide an expectations-effect-free method of assessing the direct effect of a discount rate change on market interest rates. See Thornton (1986) for discussion of three potential effects of a change in the discount rate on the federal funds rate.

Because the Federal Reserve makes a public statement when it changes the discount rate, it is difficult to separate the direct and announcement effects. In contrast, the levels of the borrowings assumption for the previous calendar year are made public in the Spring issue of the Federal Reserve Bank of New York *Quarterly Review*. Because appropriately scaled changes in the discount rate and the borrowings assumption have equivalent announcement-free effects on the supply of credit in the market, the direct effect of discount rate changes can be gauged by investigating the effect of changes in the borrowings assumption if the Federal Reserve moves quickly to stabilize the level of borrowings at the new assumed level. If changes in the borrowings assumption are made to offset the effect of shifts in the borrowings function on the federal funds rate, they will not produce a significant effect on the federal funds rate and will not provide an announcement-effect-free test of the direct effect of a discount rate change.

To investigate this, the following equation was estimated:

$$(3)\quad \Delta FFR_t = \alpha_0 + \sum_{i=1}^{L} \alpha_i \Delta FFR_{t-i} + \beta_0 \Delta DRT_t + \beta_1 \Delta DRNT_t + \sum_{i=0}^{K} \mu_i \Delta BA_{t-i} + \varepsilon_t.$$

Here, ΔFFR denotes the change in the federal funds rate, ΔDRT and ΔDRNT denote "technical" and "nontechnical" changes in the discount rate, ΔBA denotes the changes in the borrowings assumption and ε denotes a random error term. A change in the borrowings assumption was assumed to be effective the day after the decision was made.[24] This equation was estimated using ordinary least squares (OLS) for the period from October 1, 1982, through December 31, 1986; however, the equation was estimated separately for the period of lagged reserve requirements, LRR (up to February 1, 1984) and contemporaneous reserve requirements, CRR.[25] The equation was estimated using daily, weekly and reserve-period data (one week before February 1, 1984, and two weeks thereafter).

Because it is not known how quickly changes in the borrowings assumption are implemented or how rapidly the federal funds rate might respond, lags of ΔBA were included; however, the F-statistic for including lagged values of the ΔBA, $F_{\Delta BALAGS}$, shows that the relationship between the ΔFFR and ΔBA is contemporaneous regardless of whether daily, weekly or reserve-period data are used.[26]

The results are reported in table 4. They indicate a statistically significant *positive* relationship between changes in the funds rate and changes in the borrowings assumption only for weekly data during the CRR period. A further investigation of this relationship, however, shows it to be quite fragile (see appendix B for details). Hence, there is no strong, statistically significant relationship between changes in the borrowings assumption and changes in the funds rate. These results are consistent with the previous ones that changes in the borrowings assumption were made primarily to accommodate shifts in the borrowings function.[27]

Table 3

Descriptive Statistics on Borrowings and the Funds Rate under Interest Rate and Borrowings Operating Procedures

Statistic	Borrowings	Federal funds rate
	July 9, 1975 – October 3, 1979	
Mean	$567	6.88%
SD	533	2.09
CV	.94	.30
	October 6, 1982 – December 31, 1986	
Mean	$660	8.60%
SD	571	1.42
CV	.87	.17

NOTE: SD denotes the standard deviation. CV denotes the coefficient of variation, i.e., SD/Mean.

SUMMARY AND CONCLUSIONS

This paper assesses the usefulness of the borrowings operating procedure in controlling the money stock or the interest rates. The borrowings procedure is a poor method for achieving money stock control. In fact, a federal funds rate targeting procedure is superior for both money stock and interest rate control.

The borrowings procedure is an effective means of targeting the federal funds rate in the short run only when the variation in borrowings is due solely to shifts in the demand for total reserves. It is an effective means of targeting the federal funds rate over longer periods only when the borrowings function is stable. If there are permanent shifts in the borrowings function,

[24] All changes in the borrowings assumption but one were made at regularly scheduled meetings of the FOMC.

[25] The equation was estimated for separate periods for several reasons. First, it would be inappropriate to estimate the equation using reserve-period data for the entire sample period with OLS because the error terms of one-week and two-week average data will be different and OLS would not reflect the heteroskedasticity induced by the change in the reserve accounting period. Second, the coefficients do not appear to be stable over the entire period as the results of table 4 suggest. Third, there is a pronounced quarterly seasonal spike during the LRR period (as is readily evident in chart 2) that is not statistically identifiable during the CRR period. Finally, there is low-order autocorrelation in the error term during the CRR period which is not evident during the LRR period.

[26] The exception was for daily data during the CRR period; however, the sum of the coefficients was not significantly different from zero.

[27] Alternatively, these results could be interpreted as evidence that the announcement-free, "direct effect" of a discount rate change on the federal funds rate is nil.

Table 4

Estimates of Equation 3

	October 1, 1982–February 1, 1984		February 2, 1984–December 31, 1986		
	Daily	Reserve period[1]	Daily	Weekly	Reserve period
Constant	−0.01	0.04	0.01	0.01	0.03
	(0.46)	(1.02)	(0.44)	(0.26)	(0.63)
ΔDRT_t	1.32*	0.49	0.13	0.23	−0.05
	(2.08)	(0.55)	(0.19)	(0.30)	(0.08)
$\Delta DRNT_t$	0.85*	1.59*	0.72	0.69	0.80*
	(2.09)	(2.65)	(1.82)	(1.78)	(1.96)
ΔBA_t	0.0004	0.0005	−0.0018*	0.0019*	0.0004
	(0.50)	(0.50)	(2.12)	(2.38)	(0.58)
$F_{\Delta FFRLAGS}$[2]	8.44*	15.36*	9.82*	7.01*	0.34
$F_{\Delta BALAGS}$[3]	1.27	1.80	2.56*	1.53	1.91
$\bar{R}^2$	0.1854	0.5302	0.1188	0.1640	0.0397
SEE	0.2860	0.2942	0.4709	0.3815	0.3247

*Indicates statistical significance at the 5 percent level; two-tailed test.

[1]During the LRR period, the reserve period was one week.

[2]F-statistic for the lagged values of ΔFFR. A quarterly seasonal was included for weekly data for the LRR period.

[3]F-statistic for lagged values of ΔBA. The reported results are for an equation that did *not* include lagged values of ΔBA if they were not significant.

the federal funds rate will vary with shifts in the borrowings function, and the borrowings procedure can be used to target the federal funds rate only if compensatory changes in the borrowings assumption are made.

Evidence indicates that the borrowings function is unstable. Also, it suggests that generally the borrowings assumption has been changed in the direction that offsets the effect of permanent shifts in the borrowings function on the federal funds rate.

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Appendix A
Complete Results for a Simple Model of the Reserves Market

This appendix develops the results stated in the text in terms of a simple model of the money stock. The model consists of the following equations:

(A1) $TR_d = a_0 - a_1FFR + u$

(A2) $Borr = b_0 + b_1(FFR - DR) + v$

(A3) $TR_s = NBR + Borr,$

and

(A4) $TR_d = TR_s,$

where TR denotes total reserves and the subscripts "d" and "s" denote "demand" and "supply."[1] Borr denotes the amount of borrowings and NBR the supply of nonborrowed reserves, which is assumed to be controlled by the Fed. FFR and DR denote the federal funds and discount rates, respectively, and u and v are random errors such that $E(u) = E(v) = E(uv) = 0$. Equations A1 – A4 can be combined to yield the expression for the equilibrium federal funds rate

(A5) $FFR = -\lambda^{-1}[NBR + (b_0 - a_0) - b_1DR + (v - u)],$

where $\lambda = (a_1 + b_1)$. Figure A1-a shows the expected value of this equilibrium equation.[2] Given the discount rate and the structural parameters, it shows all possible combinations of FFR and NBR such that the reserve market is in equilibrium. Figure A1-b reflects the expected value of the borrowings function, equation A2.

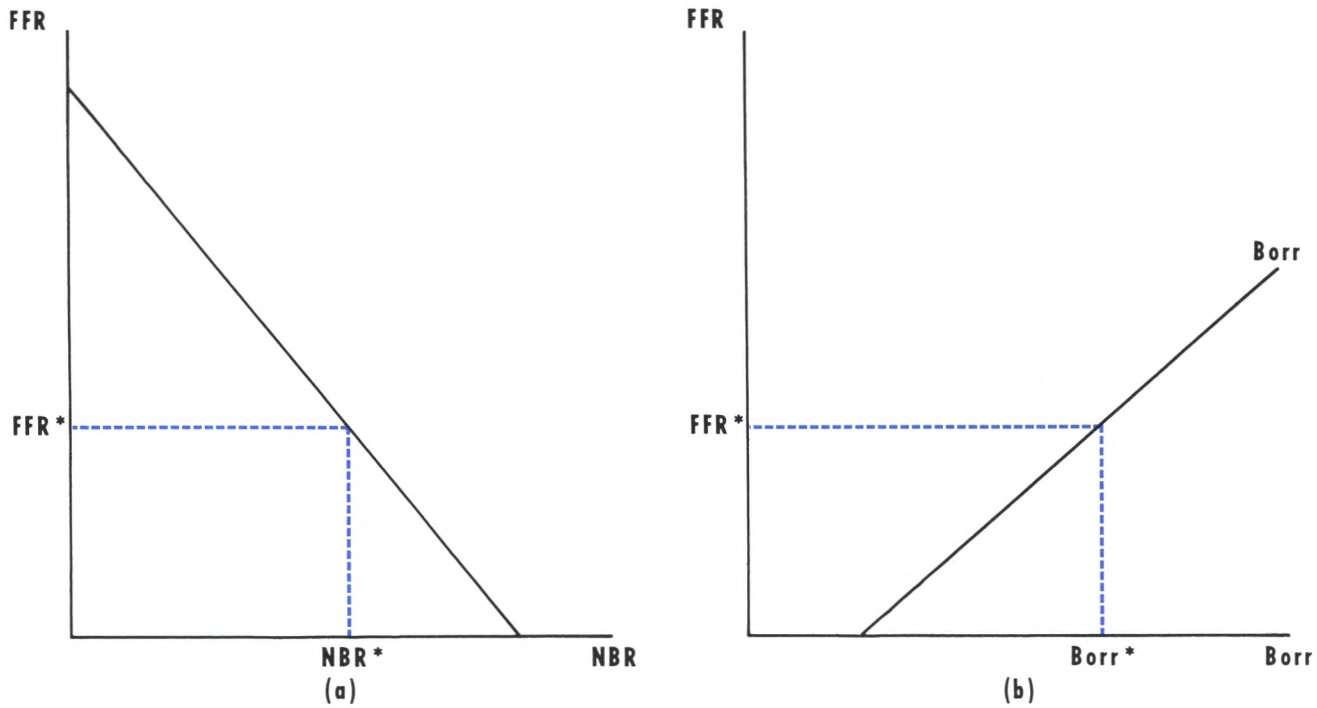
If the Fed establishes a borrowings objective, Borr*, the federal funds rate must equal FFR*, given the discount rate. The equilibrium trade-off curve indicates that the target level of borrowings can be hit by providing nonborrowed reserves equal to NBR*. This illustrates the relationship between a borrowings operating procedure and a federal funds rate targeting procedure. If the Fed does not respond to stochastic shocks, the variance of borrowings will be identical under either procedure, as will the variance of the federal funds rate.

Differences between the two procedures emerge when the Fed acts to offset disturbances in borrowings, v. The results depend on the time period over which the disturbances are operative and the assumption made about the distributions of u and v. For example, if shocks occur each day and if v and u are white noise, such shifts essentially will be impossible to offset. Furthermore, because $\sum_{i=1}^{n} u_i/n$ and $\sum_{i=1}^{n} v_i/n$ approach zero as n gets large, there is no need to offset these shifts if the planning horizon is fairly long. Over shorter periods such as a reserve period (one week before February 1984 and two weeks thereafter), these errors will seldom "average out;" therefore, it may be desirable to offset part of these shocks. Also, these shocks may exhibit persistence, e.g., $u_t = \varphi_1 u_{t-1} + \varepsilon_t$ and $v_t = \varphi_2 v_{t-1} + \eta_t$, when ε_t and η_t are white noise. In this case, the Fed may also find it advantageous to offset some shifts during the reserve period (or, for that matter, over a somewhat shorter or longer period) depending on the magnitude of φ_1 and φ_2.

[1]The "time" subscript, t, is dropped for convenience.

[2]The curve slopes downward on the assumption that the interest rate intercept is positive. A sufficient condition for this is that $a_0 > b_0$.

Figure A1
Equilibrium in the Reserve Market under a Borrowings Procedure



The Model with Complete Adjustment to Shocks

The borrowings operating procedure can be differentiated from an interest rate targeting procedure by comparing the appropriate response to shocks in either borrowings or the federal funds rate under each procedure. Initially, this is done under the assumption that the Fed completely offsets all shocks.

Under the borrowings procedure, the appropriate response to shocks is to change nonborrowed reserves in accordance with the rule:

(A6) $dNBR = u + (a_1/b_1)v$.[3]

Thus, nonborrowed reserves should change dollar for dollar with a shock to the demand for total reserves and by a larger or smaller amount (depending on the relative magnitudes of a_1 and b_1) for a shock to borrowings. These cases are illustrated in figures A2 and A3. In figure A2, a fully anticipated increase in the demand for total reserves shifts the market equilibrium curve by u; the borrowings function remains unaffected by this shock. Consequently, the target level of the federal funds rate is unchanged, but NBR is increased by u.

In figure A3, a positive value of v shifts the borrowings function to the right by v and the market equilibrium curve to the left by v. As a result, the level of the funds rate that is consistent with the borrowings objective is lower and nonborrowed reserves must be expanded by (a_1/b_1) to bring the funds rate down enough to maintain borrowings at the target level. If the Fed fully offsets shifts in the demand for total reserves, neither borrowings nor the funds rate will change. If the borrowings function shifts, however, borrowings would remain at their target level but the federal funds rate will change.

Under a federal funds rate targeting procedure, the appropriate rule for adjusting nonborrowed reserves would be

(A7) $dNBR = u - v$.

Note that the response to a shock in total reserves demand is the same as under the borrowings operat-

[3]This rule is obtained by substituting A5 into A2, totally differentiating the result and setting it equal to zero. Technically, the result is $dNBR = du + (a_1/b_1)dv$; however, since the results are presented about the expected value, du and dv have been replaced with u and v.

Figure A2

The Effect of a Rise in v under a Borrowings Operating Procedure

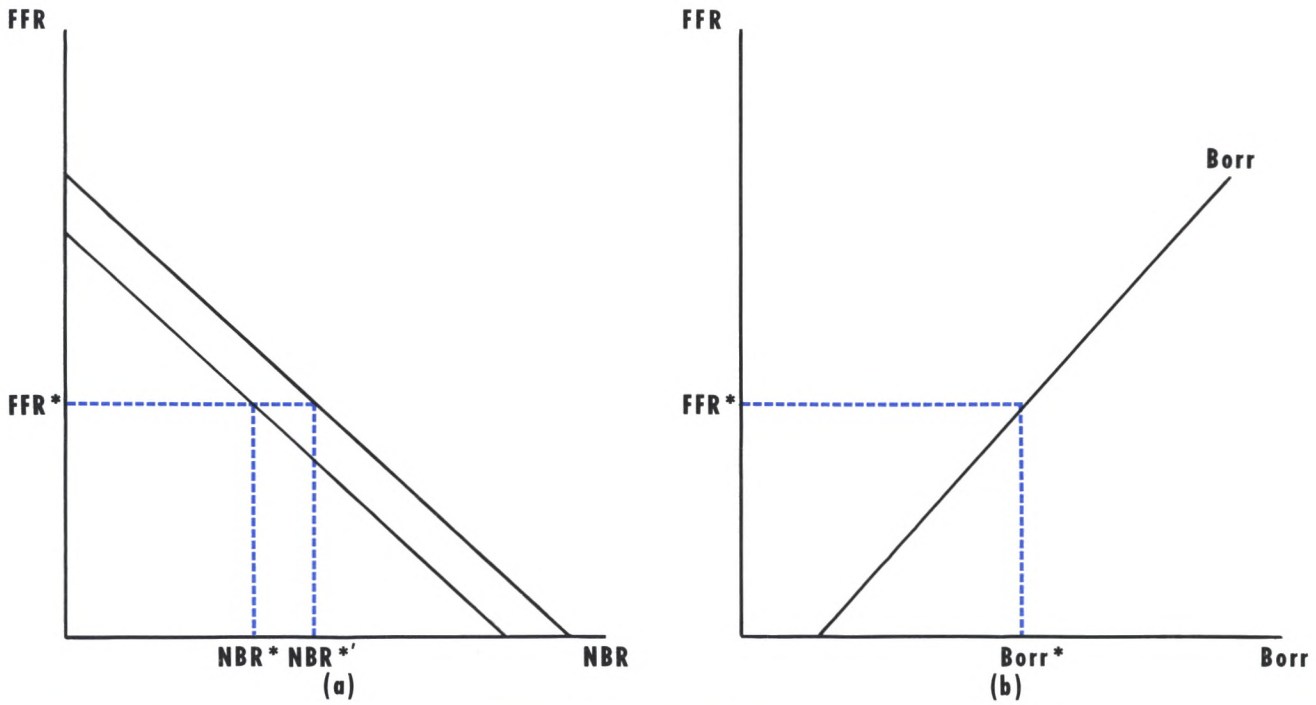


Figure A3

The Effect of a Rise in v under a Borrowings Procedure

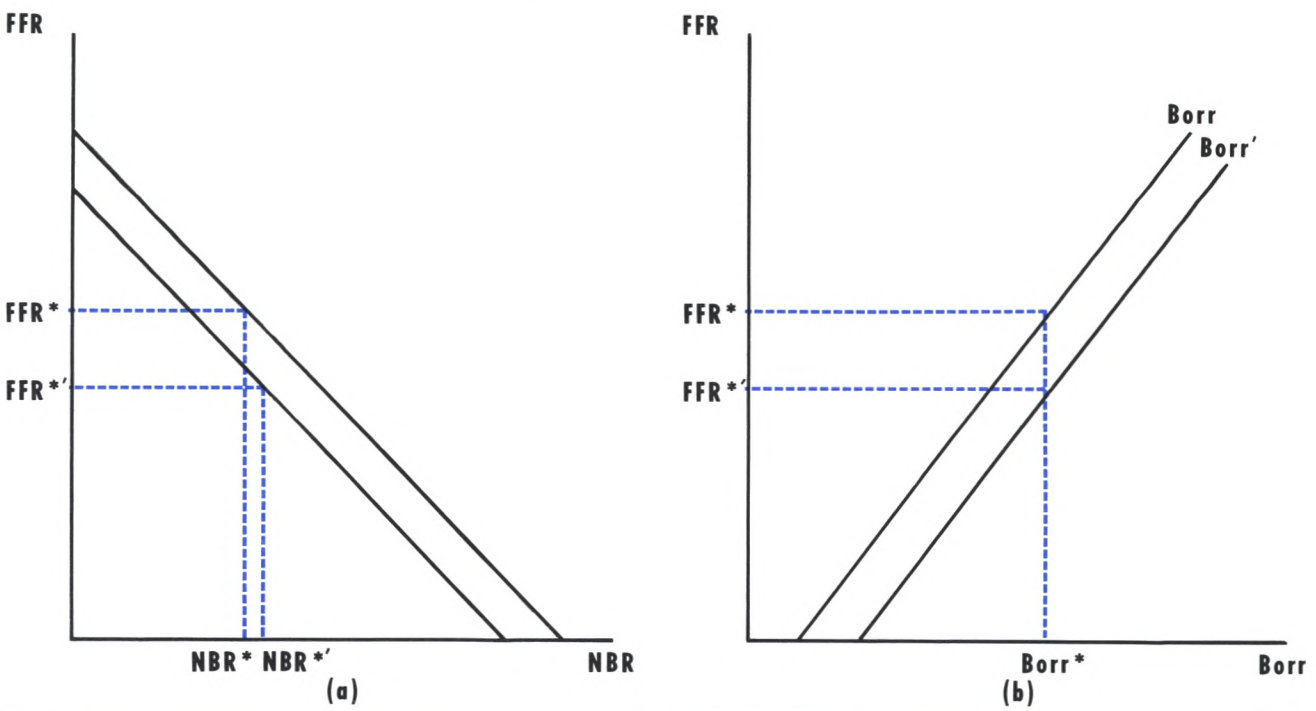
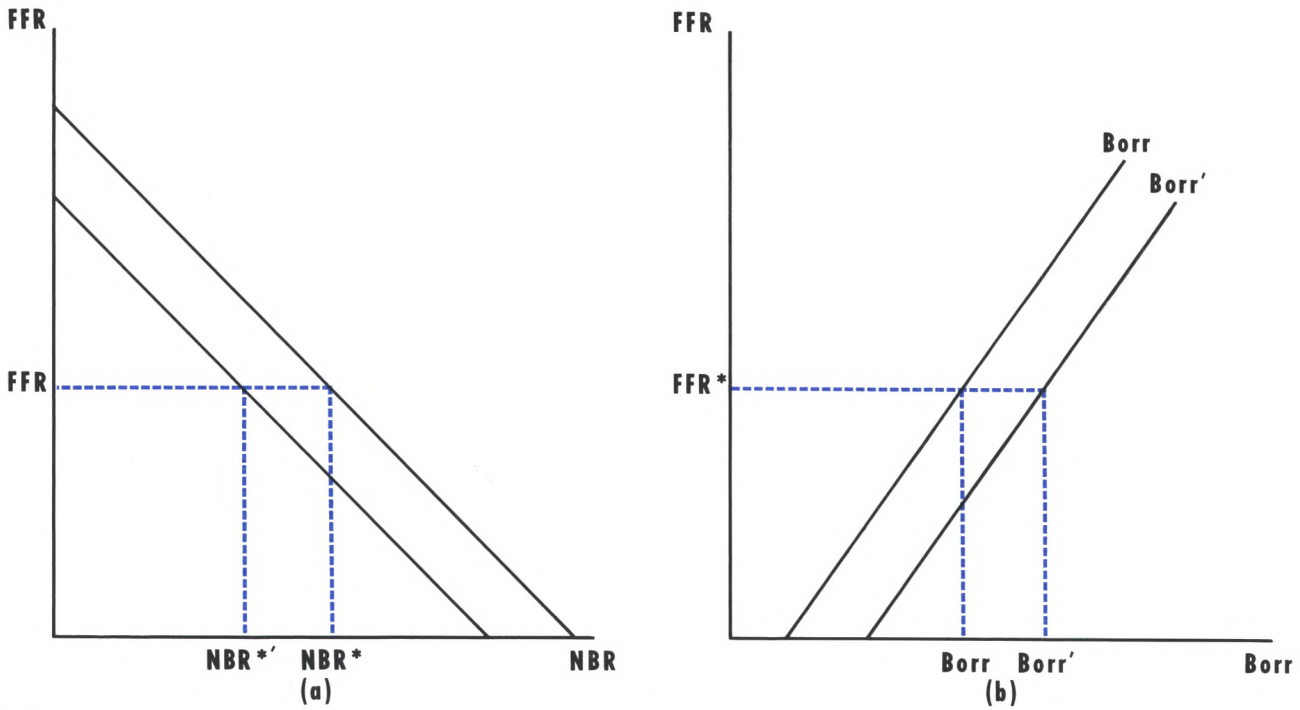


Figure A4
The Effect of a Rise in v under a Federal Rate Targeting Procedure



ing procedure, equation A6. The difference in the two procedures comes in the response to shifts in the borrowings function. In the case of an interest rate target, the Fed offsets the effect of an increase in the borrowings function by *reducing* nonborrowed reserves by v (illustrated in figure A4), while under a borrowings operating procedure, the Fed increases nonborrowed reserves by (a_1/b_1) of the shock.

Under an interest rate target, if the Fed offsets all shifts in the demand for total reserves, neither borrowings nor the funds rate will deviate from their target levels (as under the borrowings procedure). If the Fed offsets shifts in the borrowings function, the funds rate will not vary; however, there will be variability in borrowings.

The Model with Incomplete Adjustment to Shocks

The above analysis is based on the assumption that the Fed has perfect foresight and completely offsets shocks to total reserves or borrowings. Now assume that the Fed only offsets part of the shocks. That is, equation A6 can be rewritten as

$$(A8)\quad dNBR_t = \delta u + \delta(a_1/b_1)v,$$

where δ represents the proportion of shocks which the Fed offsets over a given planning horizon, $0 \leq \delta \leq 1$. $\delta = 1$ is the complete adjustment model, $\delta = 0$ represents a model in which the Fed makes no attempt to offset shocks. δ would likely increase with the length of the planning horizon.

The variance of borrowings and the funds rate under a borrowings operating procedure can be expressed as

$$(A9)\quad \mathrm{Var}(\mathrm{Borr} \mid \mathrm{Borr}^*) = b_1^2(1-\delta)^2 \lambda^{-2} \sigma_u^2 + [1 - b_1 \lambda^{-1}(1 + \delta a_1/b_1)]^2 \sigma_v^2$$

and

$$(A10)\quad \mathrm{Var}(\mathrm{FFR} \mid \mathrm{Borr}^*) = (1-\delta)^2 \lambda^{-2} \sigma_u^2 + \lambda^{-2}(1 + \delta\, a_1/b_1)^2 \sigma_v^2,$$

respectively.[4] Note that $\mathrm{Var}(\mathrm{Borr} \mid \mathrm{Borr}^*)$ equals zero if $\delta = 1$, and $\lambda^{-2}(b_1^2\sigma_u^2 + a_1^2\sigma_v^2)$ if $\delta = 0$. Also, $\mathrm{Var}(\mathrm{FFR} \mid \mathrm{Borr}^*)$ equals (σ_v^2/b_1^2) if $\delta = 1$, and $\lambda^{-2}(\sigma_u^2 + \sigma_v^2)$ if $\delta = 0$.

The variance of borrowings and the funds rate under a funds rate target can be expressed as

[4]These expressions are obtained by applying the definition of the variance, e.g., $E[\mathrm{Borr} - E(\mathrm{Borr})]^2$, and replacing NBR − E(NBR) with equation A8.

$$(A11)\quad \mathrm{Var}(\mathrm{Borr}\,|\,\mathrm{FFR}^*) = b_1^2(1-\delta)^2\lambda^{-2}\sigma_u^2 + [1-b_1\lambda^{-1}(1-\delta)]^2\sigma_v^2$$

and

$$(A12)\quad \mathrm{Var}(\mathrm{FFR}\,|\,\mathrm{FFR}^*) = \lambda^{-2}(1-\delta)^2(\sigma_u^2+\sigma_v^2),$$

respectively. The $\mathrm{Var}(\mathrm{Borr}\,|\,\mathrm{FFR}^*)$ equals σ_v^2 if $\delta = 1$ and $\lambda^{-2}(b_1^2\sigma_u^2 + a_1\sigma_v^2)$ if $\delta = 0$, while the $\mathrm{Var}(\mathrm{FFR}\,|\,\mathrm{FFR}^*)$ equals zero if $\delta = 1$ and $\lambda^{-2}(\sigma_u^2+\sigma_v^2)$ if $\delta = 0$.

A comparison of equations A9 and A11 shows that the variance of borrowings will be *smaller* under a borrowings procedure than under an interest rate targeting procedure for $\delta > 0$ and equal for $\delta = 0$. The variance of the funds rate will be *larger* under a borrowings procedure than under an interest rate targeting procedure for $\delta > 0$ and equal for $\delta = 0$.

Also, it is possible to establish conditions under which the variance of borrowings will be small relative to the variance of the federal funds rate under a borrowings target. Solving equation A10 for $(1-\delta)^2\lambda^{-2}\sigma_u^2$ and substituting the result into A9, yields

$$(A13)\quad \mathrm{Var}(\mathrm{Borr}\,|\,\mathrm{Borr}^*) = b_1^2\,\mathrm{Var}(\mathrm{FFR}\,|\,\mathrm{Borr}^*) + [1-b_1\lambda^{-1}(1+\delta a_1/b_1)]^2\sigma_v^2 - b_1^2\lambda^{-2}(1+\delta a_1/b_1)^2\sigma_v^2.$$

Since the term $b_1^2\,\mathrm{Var}(\mathrm{FFR}\,|\,\mathrm{Borr}^*)$ is merely the variance of the interest rate expressed in units comparable to $\mathrm{Var}(\mathrm{Borr}\,|\,\mathrm{Borr}^*)$, after some simplification, the variance of borrowings relative to the federal funds rate under a borrowings operating procedure can be written as

$$(A14)\quad \mathrm{Var}(\mathrm{Borr}\,|\,\mathrm{Borr}^*) - b_1^2\,\mathrm{Var}(\mathrm{FFR}\,|\,\mathrm{Borr}^*) = (1-\theta)^2\sigma_v^2 - \theta^2\sigma_v^2,$$

where $\theta = b_1\lambda^{-1}(1+\delta a_1/b_1)$. θ is a monotonic increasing function of δ. The right-hand side of A13 is negative if $\theta > 1/2$. This condition will hold if $b_1 > a_1$ or if $\delta \geq 1/2$. Hence, under some fairly general conditions, the variance of borrowings will be less than the variance of the federal funds rate under a borrowings operating procedure.

Likewise, equation A12 can be solved for $\lambda^{-2}(1-\delta)^2\sigma_u^2$ and the result substituted into equation A11. This yields

$$(A15)\quad \mathrm{Var}(\mathrm{Borr}\,|\,\mathrm{FFR}^*) - b_1^2\,\mathrm{Var}(\mathrm{FFR}\,|\,\mathrm{FFR}^*) = (1-\psi)^2\sigma_v^2 - \psi^2\sigma_v^2,$$

where $\psi = b_1\lambda^{-1}(1-\delta)$. ψ is a monotonic decreasing function of δ. The right-hand side of equation A15 will be negative if $\psi > 1/2$. This will be satisfied if $b_1 > a_1$ or if $\delta > 1/2$. Consequently, if the Fed is able to offset more than half of the shocks over its planning horizon, the variance of borrowings will be larger than the variance of the funds rate under an interest rate targeting procedure.

While it may seem odd that the expressions for the relative variance do not depend on σ_u^2, this result is quite intuitive. Variation in the demand for total reserves affects the variance of borrowings only through its effect on the variation of the federal funds rate, not directly through the borrowings function. Consequently, variability in the demand for total reserves only produces variability in the market interest rate; given the borrowings function, this translates into an equal amount of appropriately scaled variability in borrowings. This result is illustrated in figure A5 under the assumption that $\delta = 0$.

This also explains why control errors, i.e., $\mathrm{NBR} = \mathrm{NBR}^* + \omega$, where ω represents a random control error, increase the variability of both borrowings and the federal funds rate, but do not affect the variability of borrowings relative to the funds rate. This is illustrated in figure A5 alternatively as NBR above (NBR′) or below (NBR″) the target level (NBR*).

What If u and v Are Correlated?

One possibility that deserves consideration is the case where u and v are correlated, that is, shocks to the demand for total reserves, u, produce a change in the demand for borrowed reserves, v. To see how this affects the results, consider first the special case in which the shocks are perfectly correlated, e.g., $v = \xi u$. Assume that ξ is positive, although this assumption is not critical to the results. Given these assumptions, equation A5 can be rewritten as

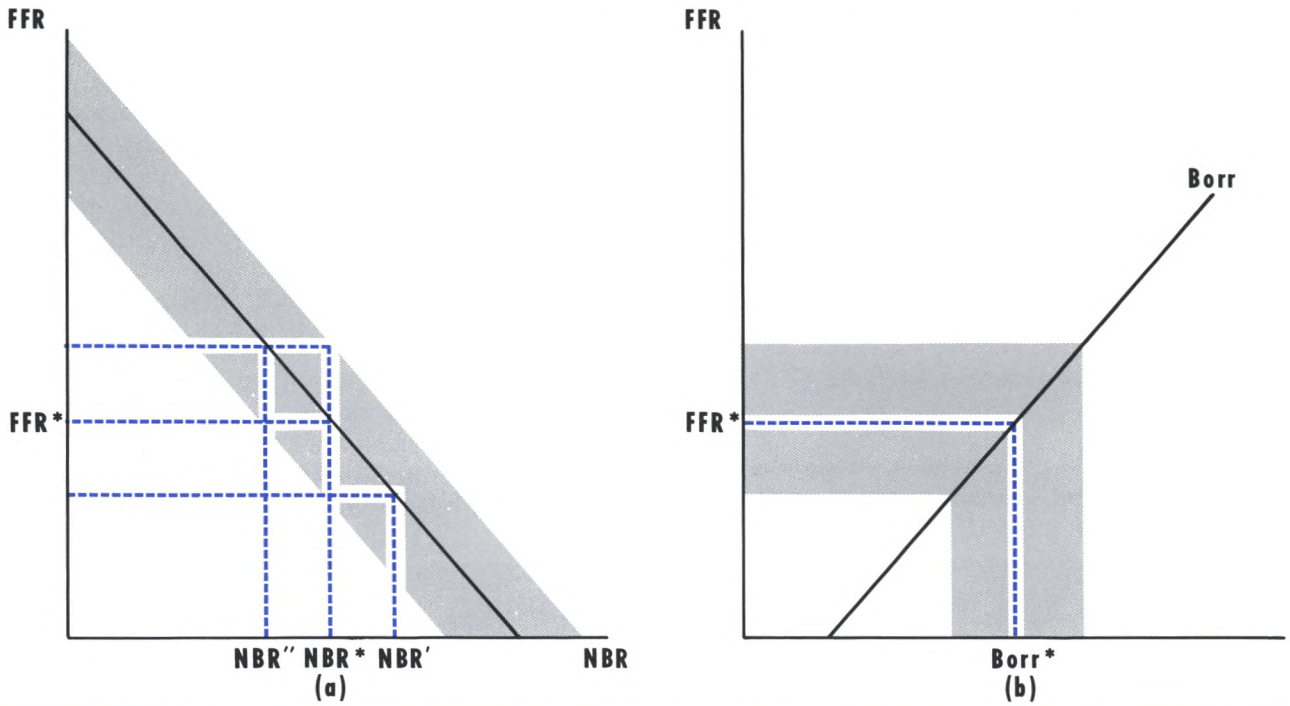
$$(A16)\quad \mathrm{FFR} = -\lambda^{-1}[\mathrm{NBR} + (b_0 - a_0) - b_1\mathrm{DR} - (1-\xi)u].$$

Note that $(1-\xi)$ is positive if $0 \leq \xi < 1$, zero if $\xi = 1$ and negative if $\xi > 1$. Given this assumption, no shifts in the borrowings function are independent of shifts in the demand for total reserves. Hence, the difference that the correlation between the error terms makes can be seen by comparing the effect of a change in u under both assumptions. In the model that assumed independence, the equilibrium interest rate curve shifted to the right by u while the borrowings function did not shift, as in figure A2. Under perfect positive correlation, the market equilibrium curve shifts by $(1-\xi)u$, while the borrowings function shifts by ξu. These shifts determine the extent to which open market operations must be undertaken to stabilize borrowings at the target level.[5] It also can be shown that the assump-

[5] If $\xi < 0$ and equal to $-b_1/a_1$, nonborrowed reserves will not have to change to stabilize borrowings at the target level. In this case, the leftward shift in the borrowings function just cancels the effect of the rightward shift in the equilibrium curve on nonborrowed reserves.

Figure A5

An Illustration of Why the Variance of Borrowings Relative to the Federal Funds Rate is Unaffected by σ_u^2.



tion of perfect correlation has no effect on conclusions about the variability of borrowings and/or the federal funds rate under the alternative operating procedure.

What if the stochastic disturbances are not perfectly correlated? For example, assume that $v = \xi u + \eta$, where η is identically and independently distributed with a mean zero and a variance σ_η^2. Given this assumption, the error term of equation A5 is simply $-\lambda^{-1}[\eta + (1-\xi)u]$; the same as that of A5 except that u is replaced by $(1-\xi)u$ and η replaces v. Consequently, all of the previously stated results hold.[6]

[6]The intuition for this is straightforward. The variability of borrowings under a borrowings operating procedure relative to that under a federal funds rate operating procedure depends only on the variability of the borrowings function. Since variability of the borrowings function is the same under any of these assumptions, i.e., $v = \xi u$ or even $v = \xi u + \eta$, for both the borrowings and federal funds rate targets, the assumption made does not affect the general conclusion about the variability under these procedures. This is also the reason the general conclusions about the variance of borrowings relative to the federal funds rate under the borrowings operating procedure are unaffected by this assumption.

Appendix B
A More Detailed Analysis of the Effect of a Change in the Borrowings Assumption on the Federal Funds Rate

The purpose of this appendix is to present detailed results on the effect of a change in the borrowings assumption on the federal funds rate. One way to calibrate such effects is to estimate a reduced form equation for the *level* of the federal funds rate (FFR):

$$(B1)\quad FFR_t = \alpha + \beta DR_t + \mu BA_t + \varepsilon_t,$$

where DR and BA denote the level of the discount rate and borrowings assumption. Under a strict borrowed-reserves operating procedure, β should be positive and equal one. OLS estimates of equation B1 are reported in the top half of table B1 for the LRR and CRR periods. Three significant aspects of these results deserve particular attention. First, the hypothesis that $\beta = 1$ is rejected at the 5 percent level during both periods. Second, the Q statistic does not indicate low-order serial correlation during the LRR period, but does indicate it during the CRR period. Nevertheless, the residuals show a pronounced quarterly seasonal spike during the LRR period (clearly evident from chart 2 of the text). Third, the standard error of the equation increases dramatically during the CRR period, indicating increased variability of the FFR under CRR. (This is true whether weekly or reserve period data are used.)

Because of the seasonal spike during the LRR period and serial correlation of the residuals during the CRR period, the equations were reestimated including lagged dependent variables. The results are reported on the bottom half of table B1. (Four lags of FFR are included during the CRR period; in addition, FFR_{t-13} is included during the LRR period.) During the LRR period, the coefficient on BA increased somewhat, although its t-ratio declined. Also, the estimate of β declined substantially and the hypothesis that $\beta = 1$ is rejected at very low significance levels. For the CRR period, the estimated coefficient on BA declined by nearly two-thirds and the t-ratio declined dramatically.

There are several reasons for questioning the estimates from the level equations. The first reason relates to the time-series properties of the individual series themselves. BA is highly autocorrelated, as table B2 indicates. The fact that the levels of BA and FFR are highly autocorrelated affects the relationship between them. This is evident in the simple correlation coefficients given in table B3. The simple correlation of FFR and BA is higher than that of FFR and actual adjustment plus seasonal borrowing, Borr, during the LRR period; however, the correlation coefficient of first

Table B1

Estimates of Equation B1

Period	Constant	DR	BA	DL	Q[3]	SEE
October 1, 1982– February 1, 1984	2.23* (2.37)	.72* (6.78)	.0017* (9.60)	—	4.69	.3041
February 2, 1984– December 31, 1986	0.81* (2.22)	.80* (13.4)	.0029* (10.95)	—	38.05*	.3763
October 1, 1982– February 1, 1984	5.39* (5.23)	.42* (2.02)	.0022* (6.64)	5.71*[1]	5.95	.2616
February 2, 1984– December 31, 1986	0.53 (1.76)	.28* (2.29)	.0011* (2.90)	10.13*[2]	0.78	.3072

*Indicates statistical significance at the 5 percent level.
[1]Test that $FFR_{t-1} - FFR_{t-4}$ and FFR_{t-13} are jointly zero.
[2]Test that $FFR_{t-1} - FFR_{t-4}$ are jointly zero.
[3]Test for white noise residuals, distributed $\chi^2(6)$.

Table B2

Autocorrelations of Time-Series Variables for Reserve-Period Data

Variable	Lag 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
							October 1, 1982 – February 1, 1984								
FFR	.55	.53	.48	.46	.37	.36	.32	.23	.23	.17	.17	.12	.34	.00	.01
BA	.98	.95	.92	.88	.85	.81	.76	.71	.66	.60	.55	.49	.44	.39	.34
Borr	.37	.37	.39	.25	.27	.31	.36	.27	.09	.17	.16	.14	.42	.15	.16
							February 2, 1984 – December 31, 1986								
FFR	.97	.94	.89	.84	.78	.72	.66	.60	.54	.48	.43	.38	.33	.28	.23
BA	.97	.93	.89	.83	.76	.69	.61	.54	.47	.40	.33	.26	.20	.14	.09
Borr	.50	.32	.25	.27	.19	.17	.09	.07	.10	.12	.10	.09	.04	.07	.00

Table B3

Simple Correlations of Time-Series Variables for Reserve-Period Data

Variables	BA	Borr	ΔBA	ΔBorr
	October 1, 1982 – February 1, 1984			
FFR	.605*	.540*	—	—
ΔFFR	—	—	.166	.533*
	February 2, 1984 – December 31, 1986			
FFR	.903*	.492*	—	—
ΔFFR	—	—	.175	−.024

* indicates statistical significance at the 5 percent level.

differences of FFR and BA is dramatically different from that of their levels. This is not true, however, of the correlation between Borr and FFR and ΔBorr and ΔFFR. For the CRR period, when their autocorrelations match closely, the correlation between FFR and BA is high. Yet in first-difference form, the correlation is essentially the same as during the LRR period and is not statistically significant.

A second reason to be cautious of the level equation results has to do with the long-run stability of the borrowings function itself. The borrowings assumption does not represent an exogenous supply of borrowings; more precisely, it is an exogenous target level that the Fed attempts to induce depository institutions to hold by altering the supply of nonborrowed reserves. Consequently, actual borrowings can, and do, deviate from the desired level. Nevertheless, over a longer time period, the *average* level of borrowings can be close to the desired level. This is especially likely if adjustments are made to nonborrowed reserves or if the borrowings assumption itself is changed to keep it in line with actual borrowings levels.

Therefore, when the *level* of the funds rate is regressed on the *level* of the borrowings assumption, there is a tendency to retrieve this long-run relationship to a greater or smaller degree, depending on how closely the borrowings assumption mimics actual borrowings.[1]

In order to more closely capture the effect of an exogenous *change* in the borrowings assumption on the funds rate, first differences of the funds rate are regressed on first differences of the borrowings assumption. This should yield consistent estimates of the immediate response of the federal funds rate to an exogenous change in the borrowings assumption, even if the level specification is correct.[2] Moreover, it

[1]Augmented Dickey-Fuller tests for stationarity applied to borrowings and the funds rate indicate that both series are integrated of order one, i.e., I(1) for the LRR period. When the test is applied to the residuals from OLS estimates of equation 1, however, the results indicate that borrowings and the funds rate are cointegrated in the Engle-Granger (1987) sense. The augmented Dickey-Fuller test indicates that BA and FFR are I(2) over the CRR period. Yet the test indicates that the residuals from equation 1 estimated over this period are stationary.

The OLS estimate of b_1, of equation 1 from the text for the LRR period is 471. This yields an implied coefficient estimate of β of equation B1 equal to .0021 (1/471). The implied estimate of β for the CRR period using reserve-period data is .0038 (1/260).

[2]See Plosser, Schwert and White (1982).

Table B4

t-ratios for ΔBA_j from equation B1

	October 1, 1982–February 1, 1984	February 2, 1984–December 31, 1986	
	Reserve-Period[1]	Weekly	Reserve-Period
μ_1	−2.78 AN	0.03	0.64
μ_2	1.23 A	1.00	0.66
μ_3	−1.98 AN	−0.37	1.80 A
μ_4	−1.66 AN	2.69 A	2.51 A
μ_5	−2.14 AN	1.13	0.75
μ_6	−0.48	2.12 A	1.57 A
μ_7	0.42	0.22	−0.87
μ_8	−0.56	0.31	−0.15
μ_9	0.56	−0.64	−0.20
μ_{10}	0.34	0.27	−0.20
μ_{11}	−0.81	−0.34	0.43
μ_{12}	0.52	0.83	−0.21
μ_{13}	0.96	0.26	−0.17
μ_{14}	−1.17 AN	−0.38	−0.39
μ_{15}	−0.35	0.37	0.06
μ_{16}	−1.76 AN	−0.54	0.19
μ_{17}	0.89	−1.00	0.06
μ_{18}		0.65	0.33
μ_{19}		0.53	0.35
μ_{20}		−0.35	−2.09 AN
μ_{21}		0.13	0.35

NOTE: A denotes those that are positive and significant at a 25 percent level. AN denotes those that are negative and significant at a 25 percent level.

[1]During the LRR period, the reserve period was one week.

Table B5

Estimation of the Funds Rate Equations with ΔBA Partitioned as in Table B1

	October 1, 1982–February 1, 1984	February 2, 1984–December 31, 1986	
	Reserve-Period[1]	Weekly	Reserve-Period
Constant	0.04	0.015	0.033
	(0.98)	(0.47)	(0.87)
ΔDRT	0.20	0.247	0.082
	(0.22)	(0.33)	(0.15)
ΔDRNT	2.280*	0.755*	0.891*
	(3.60)	(1.99)	(2.36)
ΔBA-A	0.0087	0.0055*	0.0058*
	(1.16)	(3.10)	(3.21)
ΔBA-B	0.0007	0.0011	0.0002
	(0.77)	(1.25)	(0.26)
ΔBA-AN	−0.0160*	—	−0.0076*
	(2.53)		(2.37)
$\bar{R}^2$	0.5737	0.1875	0.2046
SEE	0.2803	0.3761	0.2951
$F_{\Delta FFRLAGS}$	15.81*	6.57*	0.65

*indicates statistical significance at the 5 percent level.

[1]During the LRR period, the reserve period was one week.

should avoid spurious correlation often experienced when the levels of nonstationary series are used.

Finally, because the borrowings assumption is changed infrequently, changes in the borrowings assumption can be partitioned into those that do have a significant effect on the federal funds rate and those that do not. This is done by estimating the equation:

$$(B2)\quad \Delta FFR_t = \alpha_0 + \sum_{i=1}^{K} \alpha_i \Delta FFR_{t-i} + \beta_0 \Delta DRT_t + \beta_1 \Delta DRNT_t + \sum_{j=1}^{L} \mu_j \Delta BA_{j,t} + \varepsilon_t,$$

where $\Delta BA_{t,j}$ takes on the value of the jth change in the borrowings assumption during the period and is zero otherwise. L denotes the number of changes in the borrowings assumption over the sample period.[3] The estimated standard error from this equation, σ_ε^2, measures the conditional variance of ΔFFR for periods when $\Delta BA = 0$. Hence, the t-ratio for the jth ΔBA indicates how much the federal funds rate moved during this period relative to periods when the borrowings assumption was unchanged.

The t-ratios for each ΔBA are reported in table B4. The results indicate that, of the 17 changes in the borrowings assumption during the LRR period, 10 were *inversely* related to changes in the federal funds rate. During the CRR period, either seven or eight of the 21 ΔBAs were inversely related to the funds rate, depending on whether weekly or reserve-period data are used. The results in table B4 can be used to partition ΔBA into those that have a positive signifi-

[3]If daily data were used, L is equal to the number of changes on the borrowings assumption over the sample period. When weekly or reserve-period data are used, the data are averaged on a pro-rata basis. Consequently, L denotes the number of weeks or reserve periods that are affected. This is usually larger than the number of changes in the borrowings assumption itself.

cant effect on the funds rate, ΔBA-A, those that have a significant negative effect, ΔBA-AN, and all others, ΔBA-B. This was done by including in the A or AN groups all ΔBAs that are significant at the 0.25 percent level using standard analysis. Those changes in BA that are in the A or AN groups are designated correspondingly in table B4.

Estimates of the same basic equation with the partitioned data are presented in table B5. In all cases, except the single observation in the A group during the LRR period, the coefficients on the A and AN partitions are significant at the 5 percent level. More importantly, the coefficients on the changes in the borrowings assumption in the B partition, which account for the vast majority of changes in the borrowings assumption, were uniformly insignificant at the 5 percent level. This evidence indicates that the link between changes in the borrowings assumption and the federal funds rate is, at best, weak.

Farm Policy and Mandatory Supply Controls — The Case of Tobacco

Kenneth C. Carraro

FROM 1980 through 1986, the United States spent $43.9 billion in direct payments to farmers and $52.3 billion on other price support programs.[1] Despite such expenditures, the U.S. farm sector has experienced a severe downturn. Falling exports, declining farmland values, high rates of farm loan delinquencies and increasing dependence on government support payments were visible symptoms of the farm sector's difficulties.

Because of the great expense and the apparent failure of farm programs, some policymakers have called for the use of mandatory supply controls to limit crop production and raise prices.[2] Advocates assert that such controls could guarantee farmers a "fair" price and improve their incomes, while drastically cutting the cost of farm programs and eliminating farm commodity surpluses.

This article examines the effects of mandatory supply controls. The analysis begins with a theoretical discussion of the effects of mandatory supply controls on economies that are closed to international trade and those that engage in international trade. Next, the experience of the U.S. tobacco industry and its mandatory supply controls is examined.[3] Finally, the key points from the theoretical discussion and the U.S. tobacco industry's experience are combined with specific facts about U.S. crops to suggest the likely consequences of the supply legislation currently under consideration.

THE ECONOMICS OF SUPPLY CONTROLS IN A CLOSED ECONOMY

Supply control programs are designed to increase the price of a good above its free market price by restricting the quantity of the good that reaches the market. The supply restrictions typically are established by a government agency or a consortium of producers. The Organization of Petroleum Exporting Countries (OPEC) is one example of a group of producers who agree (usually) to restrict production as a means of securing a higher price for crude oil.

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[1] U.S. Department of Agriculture, *History of Budgetary Expenditures of the Commodity Credit Corporation, Book 2,* and *Agricultural Outlook* (December 1987), p. 53, table 32.

[2] The Harkin-Gephardt "Save the Family Farm Act" is the most prominent domestic example of mandatory supply control legislation currently being debated in Congress. In 1986, Congress allocated $10 million for the study of mandatory controls and the polling of farmers. Mandatory supply controls have recently been proposed in the European Economic Community to limit milk production.

[3] U.S. tobacco policy has used mandatory supply controls since the 1930s.

Figure 1
Supply Controls in a Closed Economy

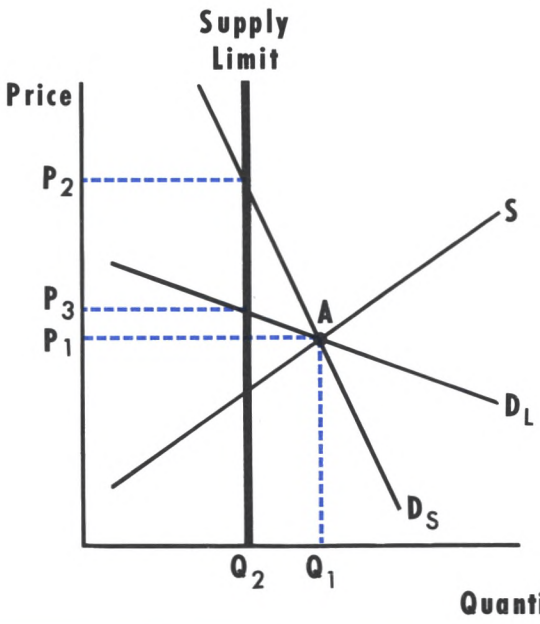


Figure 1 demonstrates how prices are determined in an economy that is closed to international trade and how supply controls can increase the price of a good above its free market level. The supply curve, labeled S, rises upward and to the right, indicating that producers will supply larger quantities of a good as its price is increased. The short-run demand curve, labeled D_S, slopes downward to show that consumers will buy smaller quantities of a good as its price rises. In a free market, the intersection of the supply and demand curves at point A determines that the price would be P_1 while the quantity supplied would equal the quantity demanded, at Q_1. Since the quantity of the good supplied to the market at that price exactly satisfies consumer demand, neither producers nor consumers have an incentive to change their production or consumption patterns.

By imposing a supply limit at Q_2, the price can be increased from P_1 to P_2. This would benefit producers, however, only if it increased their profits. Since production declines, the total costs incurred by producers will decline also. As long as total revenue is not reduced by an amount larger than the reduction of total costs, profits will rise.

The change in total revenue resulting from a price change depends upon the price elasticity of demand. The price elasticity of demand measures the responsiveness of the quantity demanded to a change in price. If the quantity of a product demanded changes proportionately less (in absolute value) than the change in price, the demand is referred to as inelastic.

Since a 1 percent increase in price causes less than a 1 percent decrease in quantity demanded when demand is inelastic, the price increase causes total revenue to increase. Conversely, a price decrease causes total revenue to decrease when demand is inelastic. The effects on total revenue of price changes are reversed when demand is elastic. Elastic demand exists when the quantity of a product demanded changes proportionately more (in absolute value) than the change in price. Since a 1 percent increase in price causes a more than 1 percent decrease in quantity demanded when demand is elastic, the price increase causes total revenue to decrease. Conversely, a price decrease causes total revenue to increase when demand is elastic. A final possibility, known as unitary elasticity, is that a 1 percent change in price leads to a 1 percent change in quantity demanded, which has no effect on total revenue.

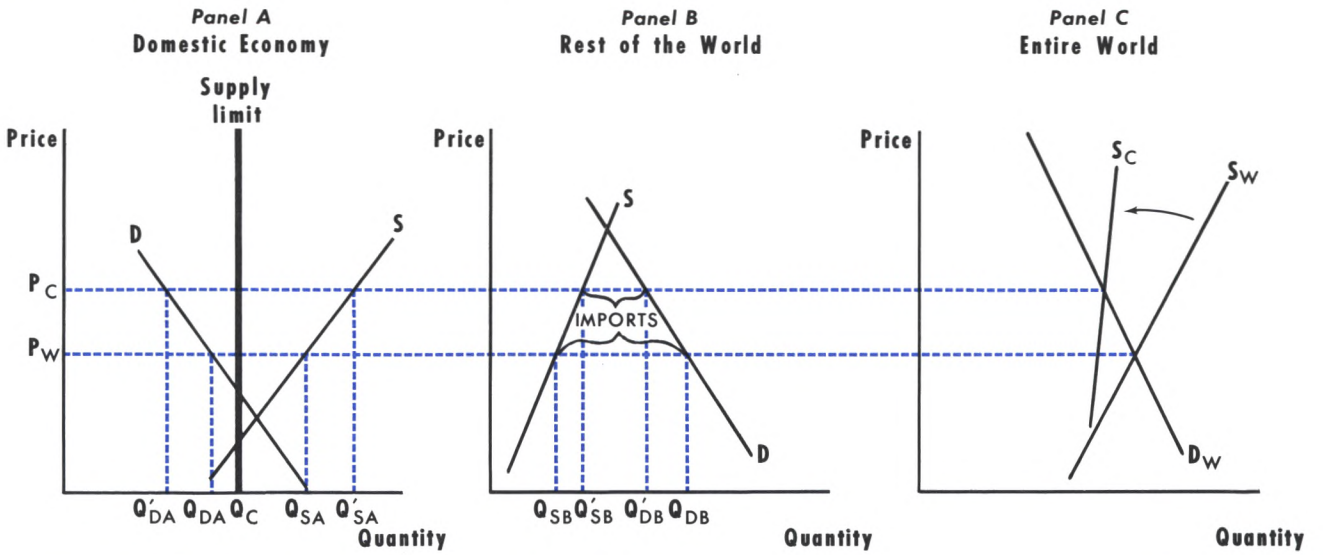
In figure 1, the supply control, which reduced the quantity supplied from Q_1 to Q_2, appears to have caused the price approximately to double from P_1 to P_2. The quantity demanded, however, appears to have decreased much less. In other words, the demand is considered to be inelastic in that price range. When the demand for a product is inelastic, a supply control program increases the total revenue of producers. Since total costs will have fallen also, profits must increase.

When the demand for a product is elastic, a supply control program would reduce the quantity demanded proportionately more than the price increase. The reduction in total revenue makes it possible that the supply control program could lead to reduced profits. In general, a supply control program is beneficial to producers facing an inelastic demand.

A variety of factors influence the elasticity of demand for a product. One of the most important of these is the availability of substitutes for the product. A product's demand is more likely to be elastic if acceptable substitutes for that product exist. For example, the price elasticity of beef likely exceeds that of gasoline because there are numerous substitutes for beef while there are few substitutes for gasoline.

Another extremely important influence on demand elasticity is time. In the short run, a product's demand is generally less elastic than over the long run because consumers find substitutes or learn to conserve on the consumption of the product over time. Demand becomes more elastic the longer the time period as

Figure 2
Supply Controls in a World Economy With Trade



consumers readjust their consumption patterns.[4]

Figure 1 portrays the effect of changes in demand elasticity over time. The curve D_L portrays the long-run demand curve for the product and is much flatter than the short-run demand curve D_S. This reflects the greater elasticity that is common over the long run. The supply control that resulted in the doubling of prices from P_1 to P_2 in the short run is markedly less beneficial to producers over the long run. In this case, the imposition of the supply restraint has a relatively small effect on the price, raising it only to P_3. Furthermore, it appears that the total revenue has declined through the use of the controls. The short-run strategy that appeared to increase profits may lead to lower future profits if the long-run demand becomes elastic.

THE ECONOMICS OF SUPPLY CONTROLS IN AN OPEN ECONOMY

So far, we have focused on a simple economy without international trade to illustrate fundamental points about supply control programs. This section expands that analysis to include supply controls in a world economy with trade. The addition of trade to the analysis implies: 1) that a product may be produced in countries outside of the country (or group of countries) attempting to increase returns through a supply control policy, and 2) that the controlled good can be traded between countries. In a closed economy, a product's price is determined solely by domestic supply and demand. With the addition of trade, price determination occurs in the world rather than domestic market.

Figure 2 portrays price determination in the world market. Panel A represents the domestic market for a good. Panel B represents the supply and demand of the product for all other countries in the world. Finally, panel C is the world economy, which is derived by horizontally combining the supply and demand curves of the domestic and rest-of-the-world economies.

Ignoring transportation costs, the equilibrium price for both the domestic economy and the rest of the world is P_W. In this case, the equilibrium price is above what the domestic price would have been in a closed economy. According to panel A, at the world price, domestic producers supply a larger quantity (Q_{SA}) than domestic consumers are willing to purchase (Q_{DA}). The difference between these two is exported to the rest of the world where, at P_W, consumers demand a larger quantity (Q_{DB}) than producers in the rest of the world are willing to supply (Q_{SB}) as shown in panel B.

The domestic economy in figure 2 is portrayed as the dominant world supplier of a product for which the demand is inelastic. The imposition of a supply

[4]For example, Houthakker and Taylor (1966) estimated the long-run price elasticity for gasoline at −.7, while the short-run elasticity was estimated to be much more inelastic at −.2.

control in the domestic economy at the quantity Q_C changes the world supply from S_W to S_C. This shift, in turn, causes the world price to jump from P_W to P_C. Because of supply controls in the domestic economy, the quantity supplied falls from Q_{SA} to Q_C. At the higher price of P_C, foreign production increases from Q_{SB} to Q'_{SB}; while foreign consumption falls from Q_{DB} to Q'_{DB}. As a result of these changes, the level of exports from the domestic economy to the rest of the world declines. The shares of world trade and world production held by the domestic economy also decline.

The loss of shares of world production and trade is a predictable outcome of a supply control measure. While an exporting country might prefer not to lose its shares of world production and trade, it is more likely to accept these losses if the supply controls result in higher returns to producers. In figure 2, it appears that returns would be increased in the short run because the inelastic world demand curve and the inelastic foreign supply curve result in higher total revenue for domestic producers.[5]

These short-run returns will erode, however, because the price elasticities of both demand and supply increase over time. A given domestic supply control results in a smaller price increase in the long run than in the short run. This effect is even more pronounced with international trade because the elasticity of foreign, as well as domestic, supply generally increases over time. In the short run, producers are unable to respond fully to a price increase because the capital base used for production is fixed. Over a longer period, producers can increase output by adding production capacity, improving technology and adopting new technology. This long-run foreign supply response contributes to the decline in the share of world production and trade of the domestic country by increasing foreign production and, in the process, reducing the demand for the domestic country's exports. The foreign supply response becomes increasingly more important because of the growing foreign share of world production.

In summary, the introduction of international trade makes the decision to use supply control measures dependent on the elasticity of world demand and world supply. It is important to note that, while the elasticity of foreign (rest-of-the-world) supply is important, it is the entire world's elasticity of supply that determines if a domestic supply control program will be effective. For example, foreign supply may be very elastic over a small range; but if foreign production represents only a small share of total world production, the domestic supply control program may still be very profitable. This is true because the foreign supply response, while very elastic, may have only a small effect on the total quantity supplied in the world if domestic production dwarfs foreign production. A natural consequence of domestic supply controls and foreign supply elasticity, however, is an increase in the foreign share of world production and a resulting increase in the world supply elasticity.

THE ORIGINAL TOBACCO PROGRAM

The current tobacco program has its roots in the farm legislation of the 1930s known as the Agricultural Adjustment Act (AAA). This legislation used production controls on most agricultural products as a means of increasing prices. Of the numerous supply control programs proposed in the original AAA legislation, only the tobacco and peanut programs have maintained direct production controls.

The tobacco program functioned, and continues to function, by first establishing a support price.[6] Initially, farmers were assigned allotments that indicated the number of acres of tobacco each farmer could cultivate. In the 1960s and 1970s, the acreage allotments were supplemented with marketing quotas that limited the number of pounds of tobacco each farmer could sell. These quotas were based on estimates of the quantity that could be sold at the support price.

The price support mechanism has changed only slightly over time. Initially, if a farmer did not receive an offer greater than the support price, the government purchased the farmer's tobacco and held it until it could be sold at the support price. In the 1940s, a system of growers' cooperatives was organized to purchase and hold the surplus tobacco. The cooperatives received, and continue to receive, government financing.

[5]The example of OPEC is instructive at this point. When OPEC reduced production as a means of increasing the price of crude oil, it was logical to expect that its share of both oil exports and production would fall. While its share fell, it was able to greatly increase its returns because of the elasticities of world demand and supply. With a lack of acceptable energy sources as substitutes, the world demand for crude oil was extremely inelastic. The world supply of oil also was extremely inelastic because of the small share of world production held by non-OPEC countries and the difficulty, expense and time required to find and tap new oil reserves. If non-OPEC countries had been able to expand production easily and quickly in response to higher prices, the price increases would not have been as great.

[6]From its inception in the 1930s until 1985, the tobacco support price was based on a "parity index" which measures the ratio of prices received by farmers to prices paid by farmers. The parity ratio is typically criticized for having no relationship to market prices.

For a long period, the tobacco program was considered extremely successful. The price of U.S. tobacco continued to rise, and the program was run at little cost to the government. In addition, the quota rights to grow and sell tobacco were marketable; in fact, they generated as much as $800 million per year in income for quota owners.[7] It is, in part, because of the apparent success of the tobacco program that interest in supply controls has resurfaced for other crops.

The tobacco program's ability to endure while generating substantial wealth through the sale and leasing of quotas was attributable to the inelastic nature of both world demand and supply of tobacco. The major reason for the inelastic supply response was that the United States held a large share of the world's production and sales of particular varieties of tobacco.[8] As recently as the 1950s, the United States produced more than 80 percent of the world's burley tobacco.

It is important to note that the U.S. dominance in tobacco production and the inelasticity of world supply were even greater when one considers the important distinction of tobacco quality. Owing to special soil and climatic conditions and growing experience, U.S. tobacco generally was regarded to be of unmatched quality.[9] This further differentiated it from tobacco grown in other countries. If other countries were unable to grow superior quality tobacco even as its price increased, the supply of that tobacco would be considered perfectly inelastic. Perfectly inelastic supply means that the quantity supplied would not change when the price changed.

The demand for tobacco, in general, was also inelastic. One source estimated the intermediate-run demand elasticity of tobacco at $-.1$ and the long-run elasticity at $-.5$.[10] The major reason for the inelastic nature of tobacco demand is the lack of substitutes. The addictive nature of tobacco further reduces sensitivity to price changes. Furthermore, tobacco purchases generally represent only a small share of a consumer's budget, a fact that usually reduces the elasticity of demand. While tobacco users can switch from U.S. to foreign tobacco (or cigarettes), there are few substitutes for tobacco in general.

By using supply controls, U.S. tobacco producers initially earned higher incomes. While the quantity of tobacco marketed fell, the resulting price increase was large enough to cause the total revenue received by quota owners and tobacco growers to increase. Because of the higher price, U.S. exports fell as foreign consumers reduced the amount of tobacco purchased at the higher price. Foreign suppliers responded to the higher price by producing larger quantities of tobacco.

SOME LONG-TERM TRENDS

The supply and demand analysis suggested that the adoption of a supply control policy would lead to both a reduction in U.S. production and a smaller U.S. share of world trade and world production. An examination of tobacco production and quota trends documents the long-term process of reducing the domestic tobacco industry as a means of maintaining the price support mechanism. Chart 1 tracks the production of tobacco in the United States against the production of tobacco in the rest of the world over the past 30 years. It shows that domestic production, though variable, has been trending downward while foreign tobacco production has grown steadily. Since 1966, domestic tobacco production has fallen by 38.8 percent, while foreign production has grown by 56.5 percent.

A longer-term perspective on the impact of the tobacco program restrictions can be gained by examining acreage data. The tobacco program initially attempted to control production solely by restricting the number of acres that farmers could grow. Chart 2 shows the long-term trend of falling acreage allotments.[11]

As yields increased, acreage limitations became less effective in controlling production and were augmented by marketing quotas that limited the number of pounds of tobacco farmers could market. Chart 3 shows the trend of falling marketing quotas for flue-cured and burley tobaccos, the two varieties that account for 90 percent of all domestic tobacco produc-

[7]Sumner and Alston (1985), p. 13. The U.S. General Accounting Office study found that, although farmers were the intended beneficiaries of the tobacco program, 68 percent of quota owners were not active farmers. U.S. General Accounting Office (1982), p. 18.

[8]There are numerous varieties of tobacco. Two varieties, flue-cured and burley, account for more than 90 percent of the tobacco grown in the United States. There are other varieties used in the blending of cigarettes that are not grown in this country, such as Oriental tobacco.

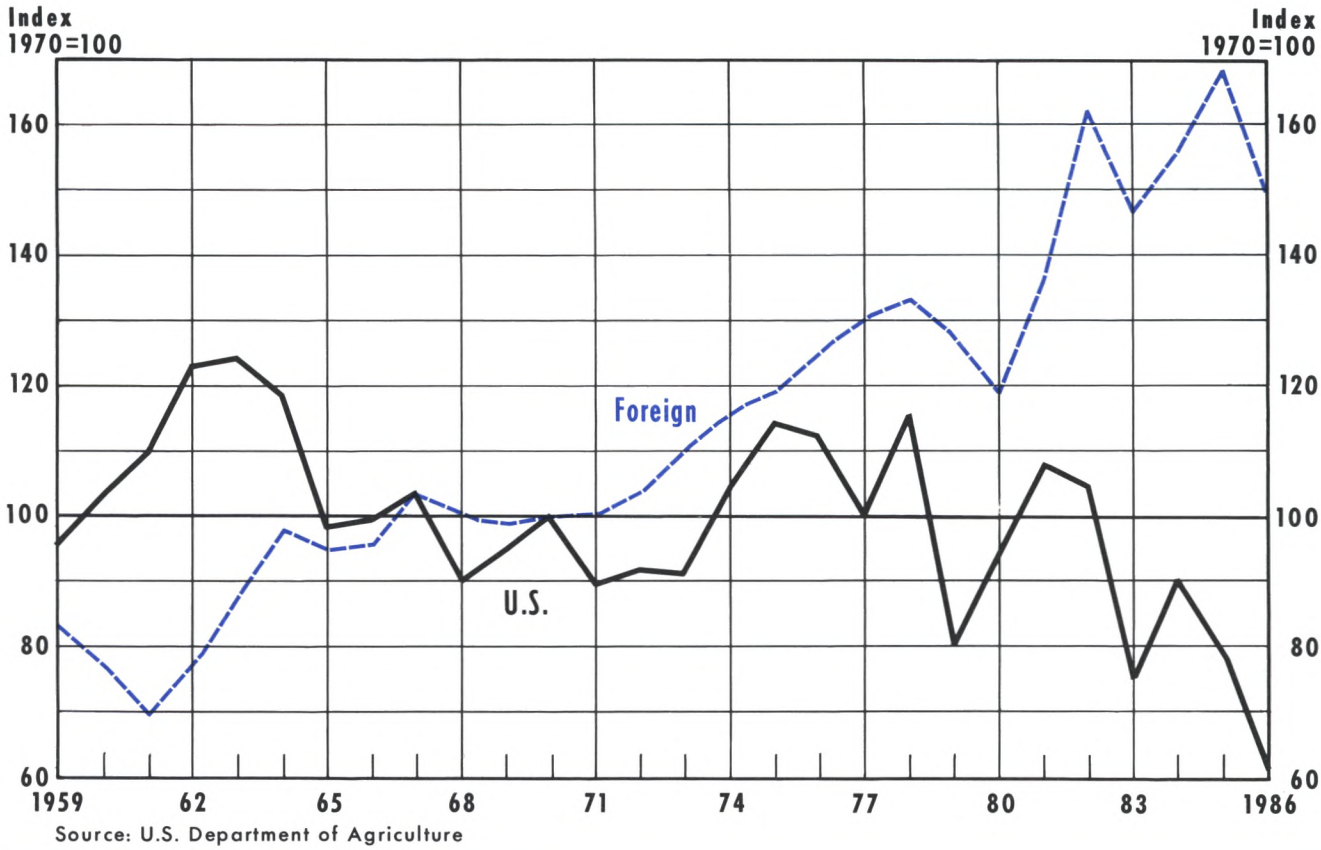
[9]Starkey (1985), p. 50 and U.S. General Accounting Office (1982), p. 18.

[10]Tweeten (1970), p. 201. These measures of demand elasticity are interpreted to mean that a 1 percent increase in price would lead to only a .1 percent decrease in quantity demanded in the intermediate run and to a .5 percent decrease in the long run.

[11]Although not shown in the graph, tobacco acreage in 1986 was at its lowest point since 1874 as a result of the supply control program.

Chart 1

U.S. and Foreign Tobacco Production



Source: U.S. Department of Agriculture

tion. The chart shows that, after initially rising, poundage quotas for these two tobaccos generally have been decreasing in the 1980s.

As indicated earlier, a reduction in the U.S. shares of world tobacco production and total exports is an expected result of the supply restriction. Table 1 documents these share losses. For example, in the 1955–59 period, the United States accounted for more than 80 percent of the world's production of burley tobacco. By 1985, the U.S. share of burley production had fallen to 38 percent. Similar trends are evident for flue-cured tobacco and for the category labeled "all tobacco."

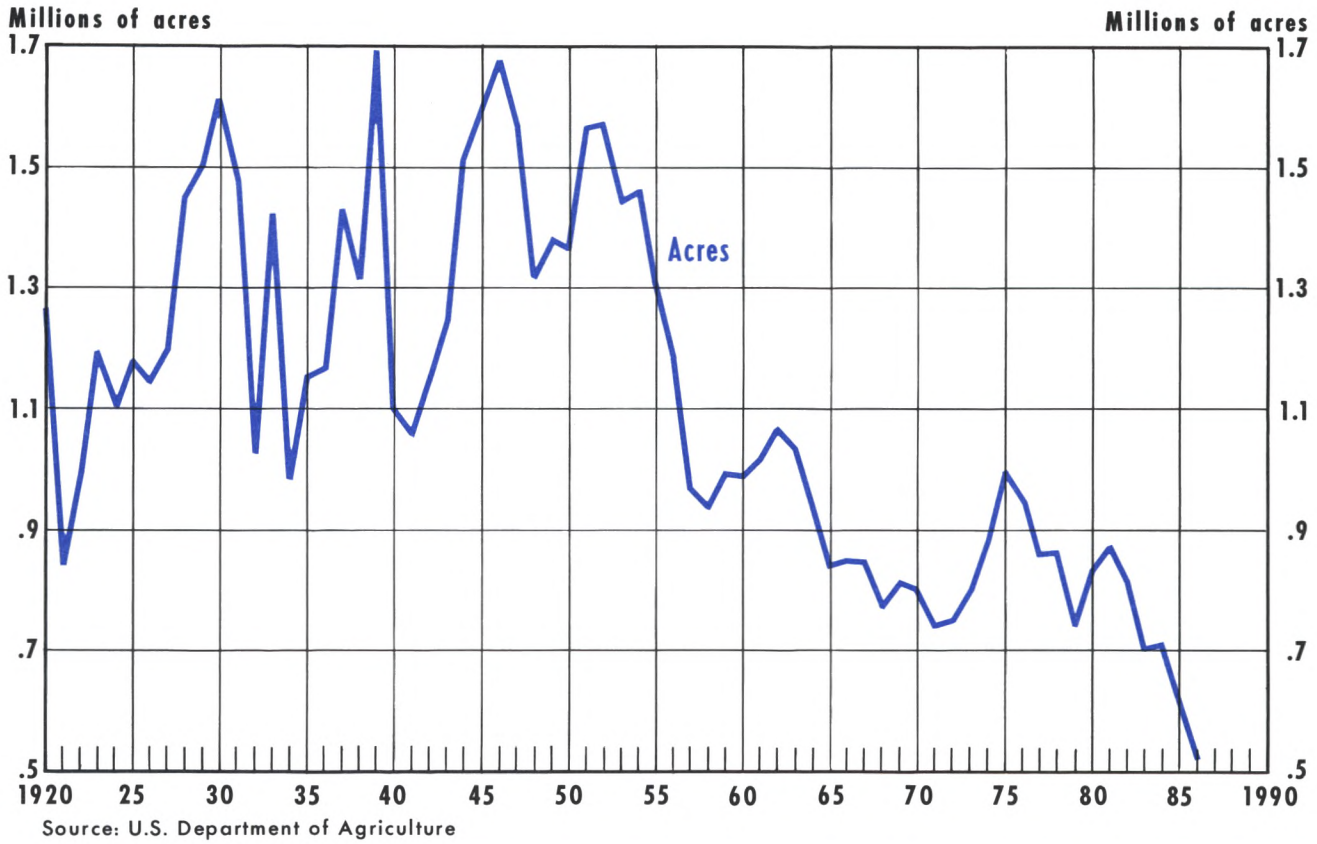
Not only have the U.S. shares of world production and trade fallen, but the use of imported tobacco has risen substantially (see table 2). Until the 1970s, the use of imported burley and flue-cured tobacco was negligible. In 1969, less than 1 percent of all burley tobacco used in the United States was imported. By 1985, imports accounted for more than 24 percent of all burley use. Other varieties not produced in this country, such as Oriental tobacco, continually have been imported for blending purposes.

Another important trend is the reduction of the quality advantage that U.S. tobacco holds over foreign tobacco. Numerous sources assert that the quality gap between foreign and domestic tobacco is narrowing.[12] This reflects the fact that attempts to increase the price of high-quality tobacco have provided foreign producers with an incentive to improve the quality of their tobacco. The result of a smaller quality advantage and rising prices has led, predictably, to the loss of both domestic and foreign markets for U.S. tobacco.

Over time, the demand for U.S.-produced tobacco has become more elastic as other sources of supply from the rest of the world have appeared. The elastic-

[12]Starkey (1985), p. 50 and U.S. General Accounting Office (1982), p. 18.

Chart 2
Harvested Acreage of Burley and Flue-Cured Tobacco



Source: U.S. Department of Agriculture

ity of supply also has increased. In the short run, foreign tobacco producers were limited in their response to higher prices by their land base and other factors such as the knowledge and technology needed to produce higher-quality tobacco. With time, however, foreign producers have acquired these additional inputs. The result has been a dramatic increase in the quantity of tobacco supplied by the rest of the world. As a consequence, the impact of U.S. tobacco policy on world tobacco markets has declined.

Although the long-run benefits of supply control policies may be in question for U.S. tobacco farmers, benefits for foreign producers are obvious. These benefits are conferred in two ways. First, by restricting the supply of U.S. tobacco initially through quotas and later through the maintenance of the loan stocks by the growers' cooperatives, a higher world price is maintained. Second, the program creates a strong incentive for foreign producers to improve the quality of their tobacco by maintaining a higher price in the market for high-quality tobacco than would otherwise result.

None of these long-term trends of decreasing production, falling quotas or falling U.S. shares, however, were cause for concern. The purpose of supply controls was to raise the commodity's price and, more importantly, to raise the net revenue of farmers. For many years, the tobacco program was successful in this respect.

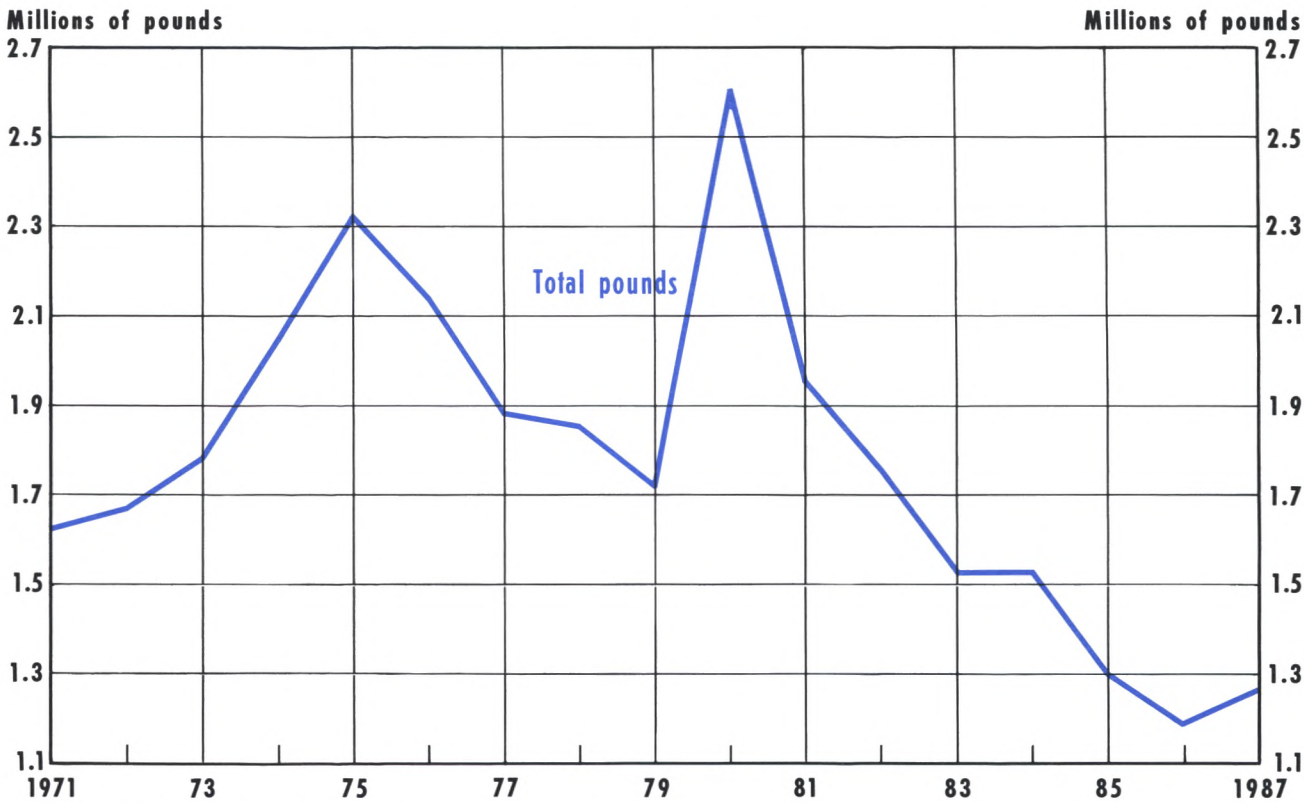
Over a recent period, however, the program led to lower revenues for tobacco growers. From 1982 to 1985, the poundage allotments for burley tobacco fell by 30.4 percent. Over this same period, however, the average price paid to growers for burley fell by 11.9 percent. The combination of lower output and lower price translated into a 38.7 percent decline in tobacco receipts for burley farmers.

RECENT PROGRAM DEVELOPMENTS AND CHANGES

In the 1980s, the tobacco price support mechanism led to major problems. The tobacco price support was,

Chart 3

Poundage Allotments for Burley and Flue-Cured Tobacco



Source: U.S. Department of Agriculture

Table 1

U.S. Percentage of World Tobacco Production and Exports

	Burley		Flue-Cured		All tobacco	
Year	Production	Exports	Production	Exports	Production	Exports
1955–59	82%	60%	41%	60%	23%	35%
1960–64	80	57	40	52	25	30
1970	62	33	30	46	19	28
1975	52	27	28	33	18	20
1980	44	27	20	29	16	20
1981	51	21	18	26	16	18
1982	49	30	13	23	13	18
1983	33	22	13	22	11	17
1984	42	18	12	24	12	17
1985	38	26	10	22	10	18

SOURCE: U.S. Department of Agriculture, *Tobacco Outlook and Situation Report* (December 1986), p. 42.

Table 2

Percentage of Imported Flue-Cured and Burley Tobacco Used Domestically

Year beginning July 1	Flue-Cured	Burley
1969	0.9%	0.6%
1970	1.6	0.6
1971	1.7	0.9
1972	1.9	1.6
1973	2.8	5.4
1974	3.4	8.4
1975	3.5	8.4
1976	4.6	7.2
1977	8.3	14.7
1978	9.3	15.1
1979	13.1	18.6
1980	11.7	22.3
1981	11.5	19.1
1982	17.7	24.1
1983	17.6	25.8
1984	20.9	28.9
1985	24.1	24.5

SOURCE: U.S. Department of Agriculture, *Tobacco Outlook and Situation Report* (April 1987), p. 14.

and still is, administered by growers' cooperatives, which purchased surplus tobacco and held it until it could be sold at a price above the support level. Any losses on the surplus stocks were absorbed by the Commodity Credit Corporation (CCC), while gains were redistributed to the cooperative's members. As the stocks held by cooperatives continued to grow but prospects for selling these stocks at a gain seemed remote, the potential cost to the government increased greatly.

In response, the No Net Cost Tobacco Program Act of 1982 was passed. This act stipulated that the tobacco program be run at no net cost to the government other than administrative costs. Under this law, assessments were levied on growers and buyers to support losses incurred by the program. In 1985, both buyers and producers of flue-cured tobacco were required to pay assessments of 7 cents per pound to cover program costs. This amount was roughly equivalent to $140 per acre for farmers.

U.S. tobacco surpluses grew as the gap between the support price and the world price widened and imports gained a larger share of U.S. tobacco markets. With less domestic tobacco being sold on the market, the cooperatives purchased more surplus tobacco. As a result, the growers' potential liability for losses on the stored tobacco increased. The assessments for 1986 were estimated at 30 cents per pound or $600 per acre.

Legislation in 1985, however, relieved growers of the potential liability for losses on the stored tobacco. The CCC took title to the surplus stocks and sold them at discounts of up to 90 percent, resulting in a net loss of approximately $373 million. This loss will not be recovered through the No Net Cost Act.

In exchange for the government's rescue, tobacco farmers accepted lower support prices. Because of the lower prices, the assessments fell to only 2 cents per pound. The United States Department of Agriculture (USDA) also was given increased freedom to reduce tobacco prices further if needed and was permitted to use a more market-oriented method of calculating support prices and setting quotas.[13]

The new tobacco program has resulted in substantially lower prices. The average tobacco price paid to growers fell from $1.80 per pound in 1985 to $1.45 per pound in 1986. As a result, tobacco exports rose in 1987. Imports also fell and now represent a smaller share of the tobacco used in the United States. Marketing quotas also have been increased in anticipation of growing sales.

CAN SUPPLY CONTROLS BE USED EFFECTIVELY ON OTHER CROPS?

The initial success of the tobacco program's use of supply controls can be attributed to supply and demand characteristics that are not present for other major crops. The tobacco program benefited from the fact that the demand for U.S. tobacco was inelastic because of a lack of a good substitute. Additionally, the world supply was inelastic because the United States held a dominant share of the world's production.

[13]The support price formerly had been determined by a combination of the parity index and limits set by the Secretary of Agriculture. Tobacco support prices currently are determined by a formula using five-year moving averages of tobacco prices and year-to-year changes in costs of production. This approach is substantially more "market-oriented" than the previous method, which was driven by costs of numerous products unrelated to the open market for tobacco.

The USDA determines tobacco quotas based on three factors. The first factor is the intended purchases of tobacco by cigarette manufacturers based on the support price. Cigarette manufacturers must provide these estimates and purchase a minimum of 90 percent of their stated intentions or face a penalty. The remaining two factors are the average tobacco exports of the past three years and an estimate of the quantity of tobacco needed to maintain tobacco stocks at desired levels.

Most, if not all, other major crops do not enjoy these characteristics.

For example, if the United States were successful in restricting the production of corn and raising its market price, consumers would most likely switch to any of the numerous coarse grains such as barley, sorghum, millet or oats, which are acceptable substitutes for many of the feed uses of corn. On an international level, the U.S. share of the world's coarse grains is small. If it were to impose supply controls on corn, it would be necessary to restrict greatly the importation of foreign grain that would occur in response to higher U.S. prices. Such trade restrictions might negatively affect the ability to export other U.S. commodities.

In some crops, the United States *does* have a large share of the world's production. Because of the availability of substitutes, however, supply restriction would be ineffective. The United States, for example, produces more than half of the world's soybeans. Unfortunately for advocates of supply controls, other crops like corn, coconut and cotton seed can be substituted for soybeans as inputs for edible oil production.

An additional factor restricting the potential use of supply controls for other crops is the world elasticity of supply of these crops. Most crops for which supply controls have been considered in the United States can be produced throughout the world. Wheat, for example, is produced in more than 100 countries. If the United States were successful in raising wheat prices by reducing production, other wheat-producing countries would be able to respond quickly by increasing production while the non-wheat-producing countries would have incentives to begin to produce wheat.

SUMMARY

Controlling the supply of agricultural products has received attention recently as a possible solution to the problem of falling farm prices and growing commodity surpluses. The original tobacco program provides an insight into the likely effects of such farm policy changes. The tobacco program enjoyed initial success because of unique characteristics of the supply of and demand for tobacco. The market power of the United States in the world tobacco market, however, has decreased over time as supply and demand elasticities and the foreign share of world production have increased. To a large extent, the decline in market power can be attributed to U.S. policy actions. In response to this decline, the supply control program has been altered to be more market-oriented in setting support prices. The other major crops for which supply control legislation has been proposed do not have the necessary supply and demand characteristics needed to successfully impose a supply control program, even in the short term.

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