Federal Reserve Bank of St. Louis

Review

November 1982
Vol. 64, No. 9

The Review *is published 10 times per year by the Research and Public Information Department of the Federal Reserve Bank of St. Louis. Single-copy subscriptions are available to the public free of charge. Mail requests for subscriptions, back issues, or address changes to: Research and Public Information Department, Federal Reserve Bank of St. Louis, P.O. Box 442, St. Louis, Missouri 63166.*

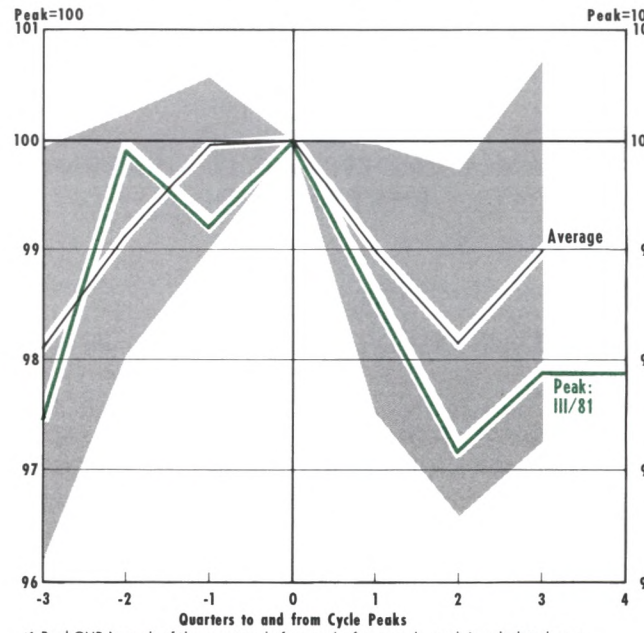
The Puzzling Behavior of Business Loans in the Current Recession

R. ALTON GILBERT

DURING the current recession, the drop in U.S. economic activity has exceeded the average decline in prior postwar recessions (charts 1 and 2). Despite this sizable drop in real output, large commercial banks have increased substantially their loans to domestic business firms. Business loans at large commercial banks rose at an 18.6 percent annual rate from July 1981 through June 1982. There has been little net change in those loans since June 1982.[1] In contrast, business loans rose no more than about 3 percent above the peak month level during the other recessions shown in chart 3.[2]

Some analysts claim that the rapid growth of business loans during this recession reflects an increase in the total funds raised by businesses to alleviate their financial distress and, therefore, provides further evidence of the severity of the current recession. Other explanations for the rapid growth of business loans by commercial banks also suggest a rapid expansion of total funds raised by firms in the nonfinancial business sector, prompted by various other causes. This article investigates whether these explanations are accurate;

Chart 1
Real GNP Before and During Postwar Recessions [1]

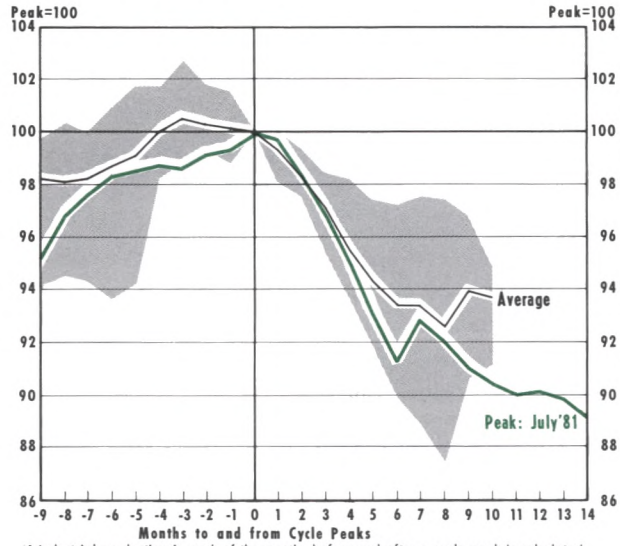


[1] Real GNP in each of the quarters before and after a cycle peak is calculated as a percentage of real GNP in the peak quarter. The average line is the average of those percentages around the following peak quarters: IV/1948, III/1953, III/1957, II/1960, IV/1969, and I/1980. The shaded area is the range of those percentages.

[1]Authorization for U.S. banks to begin operation of international banking facilities (IBFs) in December 1981 complicates analysis of growth in business loans at commercial banks in recent months. Some of the loans to non-U.S. addressees that had been reported as assets of U.S. domestic offices of commercial banks have been shifted to their IBFs, thus reducing the amount of loans included in the series on business loans by U.S. offices of commercial banks. Such a bias is eliminated from the business loan data used in this article by subtracting from total business loans by large, weekly reporting banks their loans to non-U.S. addressees. The breakdown in the data between loans to U.S. addressees and non-U.S. addressees of weekly reporting banks begins in 1979. Data on business loans before 1979 used in this article are total business loans of weekly reporting banks.

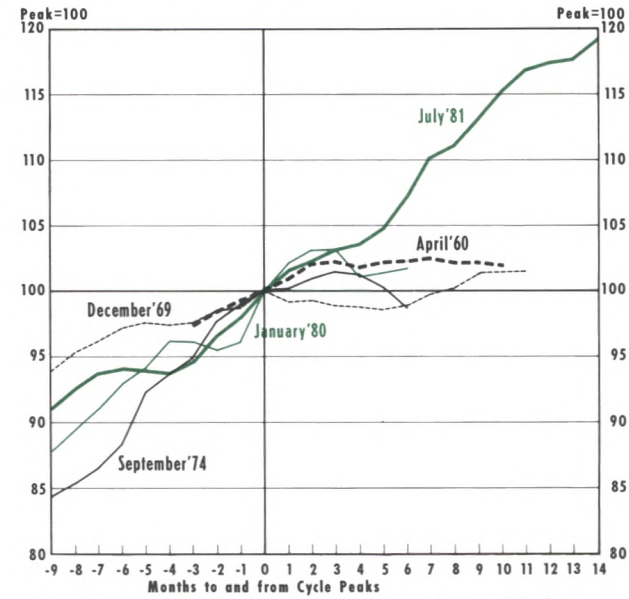
[2]With one exception, recession periods are those specified by the National Bureau of Economic Research. The National Bureau indicates that one recession began after November 1973 and ended in March 1975. The decline in economic activity from late 1973 through early 1975 had two distinct phases. In the first phase from late 1973 through about September 1974, the decline in economic activity reflected primarily the effects of a reduction in the supply of oil. Beginning in the fall of 1974, economic indicators reflected the more usual symptoms of a decline in economic activity due to a slowing in growth of aggregate demand. Since the objective of comparisons across recession periods is to determine the usual patterns of various series when there is a slowing in growth of aggregate demand, September 1974 is considered the peak month of that recession, with March 1975 the trough month. For an analysis of this recession, see Norman N. Bowsher, "Two Stages to the Current Recession," this *Review* (June 1975), pp. 2–8.

Chart 2
Industrial Production Before and During Postwar Recessions [1]



[1] Industrial production in each of the months before and after a cycle peak is calculated as a percentage of industrial production in the peak month. The average line is the average of those percentages around the following peak months: November 1948, July 1953, August 1957, April 1960, December 1969 and January 1980. The shaded area is the range of those percentages.

Chart 3
Business Loans at Large Commercial Banks [1]



[1] Data on business loans at large, weekly reporting commercial banks excludes loans to non-U.S. addressees beginning in January 1979. Date on each line indicates peak month.

that is, whether the *total* funds raised by nonfinancial business firms, in fact, have increased at an unusually rapid rate during this recession. The evidence presented here does not support these explanations for the growth in bank loans to business firms. The aspect of business finance that is unusual in the current recession is not the amount of total funds raised, but the relatively large share of funds raised from short-term sources, including bank loans, and the small share from long-term sources.

BUSINESS CREDIT: HAS IT GROWN UNUSUALLY FAST IN THIS RECESSION?

Distressed Borrowing

Several analysts have attributed the unusually rapid growth of business loans at commercial banks to the financial distress of business firms. They claim that nonfinancial firms have been borrowing heavily to offset the effects of declining profits.[3] Evidence of financial distress does exist in that before-tax profits of firms in the nonfinancial corporate sector have fallen more rapidly during the current recession period than during comparable periods in most other postwar recessions (table 1).

There is a problem with such evidence, however. Increases in depreciation charges against taxable income allowed under the Economic Recovery Act of 1981 have reduced pre-tax profits, but have increased the firms' cash flow. A more relevant measure of funds generated by businesses from their operations is U.S. internal funds, which equal profits after taxes, less dividends, plus depreciation charges. The percentage decline in internally generated funds during the current recession is about average for postwar recession periods (table 2). Therefore, the data do not support the contention that firms have increased their borrowing to offset declines in internally generated funds.

Reductions in Unpaid Business Income Taxes

Another explanation that has been offered for the rapid growth of business loans involves the response of businesses to an increase in the penalty interest rate on unpaid tax liabilities. Effective in early 1982, the penalty interest rate on delinquent income taxes of business firms was increased from 12 percent to 20 percent per year. Businesses with tax liabilities subject to the 20 percent penalty rate could reduce their costs by borrowing at any interest rate below 20 percent to reduce their delinquent income taxes.[4]

[3] "What Has Fired Up the Paper Market," *Business Week* (June 21, 1982), p. 112.

[4] John D. Paulus, "Role of Corporate Tax Payments in Recent Short-Term Business Borrowing," Goldman Sachs' *Economic Research* (June 7, 1982).

Table 1

Rate of Change in Profits Before Taxes During Recession Periods—Nonfinancial Corporate Sector

Peak quarter	Rate of change from peak quarter to:[1] One quarter later	Two quarters later	Three quarters later
III/1953	−69.5%	−35.5%	−21.6%
III/1957	−34.3	−44.9	−30.7
II/1960	−18.1	−20.7	−18.0
IV/1969	−37.1	−22.1	−14.2
III/1974	−32.4	−44.2	−21.5
I/1980	−62.9	−19.2	−6.6
Average of above	−42.4	−31.1	−18.8
III/1981	−37.3	−50.4	−39.5

[1]Compounded annual rates, seasonally adjusted.

Table 2

Rate of Change in U.S. Internal Funds During Recession Periods—Nonfinancial Corporate Sector

Peak quarter	Rate of change from peak quarter to:[1] One quarter later	Two quarters later	Three quarters later
III/1953	−52.9%	−14.2%	−0.7%
III/1957	−17.5	−27.6	−18.6
II/1960	−9.5	−9.3	−6.9
IV/1969	−8.8	−4.2	−0.5
III/1974	−11.6	−23.1	−8.3
I/1980	−33.6	−5.2	2.2
Average of above	−22.3	−13.9	−5.5
III/1981	−7.7	−14.0	−7.6

[1]Compounded annual rates, seasonally adjusted.

Table 3

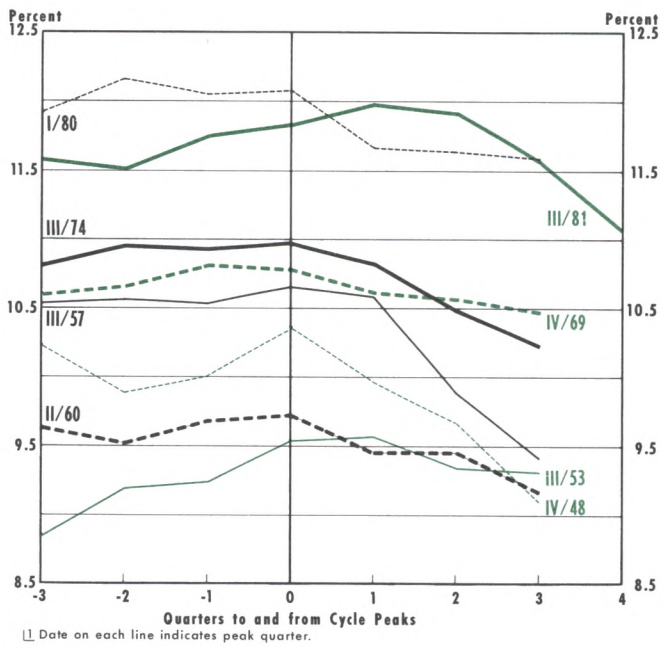
Profit Tax Payments Less Profit Tax Accruals—Nonfinancial Corporate Sector (billions of dollars)[1]

	As of May 1982	As of September 1982
1977/I	$ 3.7	$ 4.0
II	4.1	3.7
III	−4.6	−5.4
IV	−1.2	−1.0
1978/I	5.6	5.8
II	−2.3	−3.1
III	−3.0	−4.1
IV	−7.1	−6.3
1979/I	0.6	−2.4
II	4.9	3.4
III	−0.8	0.8
IV	1.6	5.1
1980/I	−4.5	0.9
II	22.1	20.5
III	10.0	8.0
IV	2.1	0.4
1981/I	−0.4	−4.5
II	7.6	10.4
III	7.3	4.3
IV	17.2	16.2
1982/I	51.5	24.7
II	—	2.7

[1]Seasonally adjusted annual rates.

According to the flow of funds data released in May 1982, the difference between income tax payments by firms in the nonfinancial corporate sector and their accrued tax liabilities (at seasonally adjusted annual rates) was unusually large in I/1982 (table 3). This measure indicates the amount by which current tax payments exceed (or fall below) the tax liabilities incurred on current income. Revised data indicate that the difference between income tax payments and tax accruals was substantially smaller in I/1982 than indicated earlier, and that the amount by which tax payments exceeded accruals was relatively small in II/1982. Tax payments exceeded accrued income taxes by

Chart 4
Nonresidential Fixed Investment as a Percent of Nominal GNP [1]



[1] Date on each line indicates peak quarter.

$5.8 billion in III/1982, a difference that is not large relative to other quarters. Business income tax payments, therefore, do not appear to be an important factor in explaining business demand for credit.

Growth of Business Fixed Investment During the Current Recession

Business fixed investment as a proportion of total spending generally falls sharply throughout recession periods. This cyclical pattern was delayed in the current recession until the second and third quarters of this year (chart 4). Nonresidential fixed investment as a percentage of nominal GNP was *higher* during the first two quarters of the current recession than at the cycle peak, whereas that ratio was below that of the peak quarter by the second quarters of other postwar recession periods.

The relatively large proportion of business fixed investment to total spending through the first quarter of this year appears to reflect a response to new incentives for investment in the Economic Recovery Act of 1981.[5] Besides increasing tax incentives for investment, that act also provides investment incentives for firms with no taxable income through leasing arrangements with other firms that earn taxable income. Under such an arrangement, a profitable firm purchases the plant or equipment, charges the tax credits against its federal income tax, and leases the plant or equipment to a firm that currently has no taxable income. This tax-leasing provision may have altered the cyclical response of business investment to tax incentives.

Table 4
Rate of Change in Fixed Investment plus Inventory Investment—Nonfinancial Corporate Sector[1]

Peak quarter	Rate of change from peak quarter to:[2] One quarter later	Two quarters later	Three quarters later
III/1953	−65.4%	−35.6%	−22.0%
III/1957	−52.6	−54.4	−43.9
II/1960	−15.6	−35.1	−13.0
IV/1969	−24.0	−3.2	2.4
III/1974	65.3	−36.0	−27.8
I/1980	−24.5	−17.6	−3.5
III/1981	−24.3	−27.8	−16.5

[1] Also includes the purchase of mineral rights from the U.S. government.
[2] Compounded annual rates, seasonally adjusted.

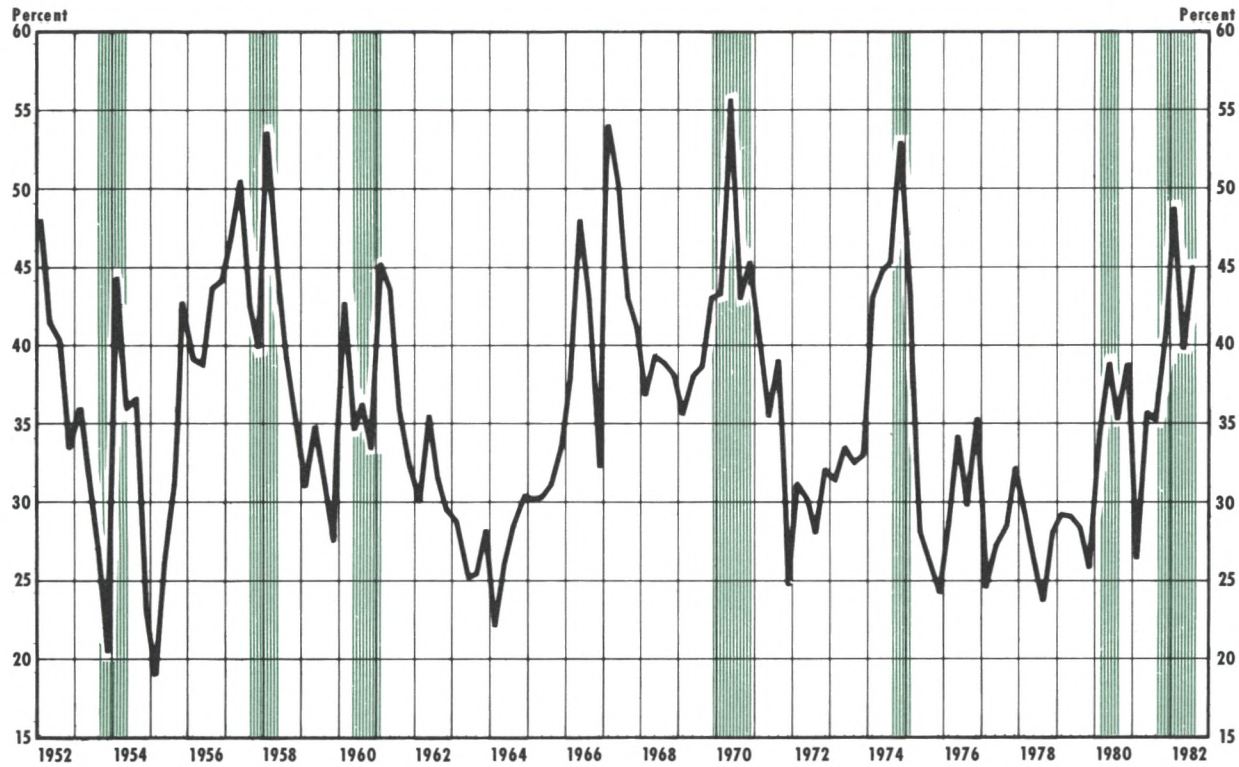
Several studies have found positive effects of tax incentives on business investment. The response is especially large if the tax incentives are considered temporary.[6] The debate in Congress concerning options to reduce the federal budget deficit may have made the tax incentives for business investment appear to be only temporary.

The unusual strength of business fixed investment during the current recession does not explain the rapid growth of borrowing by business firms from commercial banks. Business fixed investment *plus* inventory investment actually declined during the current reces-

[5] Jane G. Gravelle, "Effects of the 1981 Depreciation Revisions on the Taxation of Income from Business Capital," *National Tax Journal* (March 1982), pp. 1–20.

[6] Martin Feldstein, "Inflation, Tax Rules and Investment: Some Econometric Evidence," *Econometrica* (July 1982), pp. 825–62; and Lawrence H. Summers, "Tax Policy and Corporate Investment," in Laurence H. Meyer, ed., *The Supply-Side Effects of Economic Policy*, conference cosponsored by the Federal Reserve Bank of St. Louis and the Center for the Study of American Business, Washington University, October 24–25, 1980, pp. 115–48.

Chart 5
Funds Raised in Financial Markets by Nonfinancial Firms as a Percentage of Funds Raised by the Private Sector



Shaded areas represent periods of business recessions.
Latest data plotted: 3rd quarter

sion at rates comparable to the declines in prior recessions (table 4). Thus, the sharp decline in business inventory investment more than offset the growth of fixed investment.

Share of Funds Raised by Business Firms

The issue of whether business firms have been raising funds at rates that are typical for a recession period can be investigated directly by examining the total funds raised by the nonfinancial corporate sector relative to the funds raised by the entire private sector. The share of funds raised by nonfinancial firms tends to rise during recession periods (chart 5). Thus, the increase in the share of funds raised by business firms during the current recession is typical of the pattern in previous recession periods.

THE COMPOSITION OF BUSINESS CREDIT

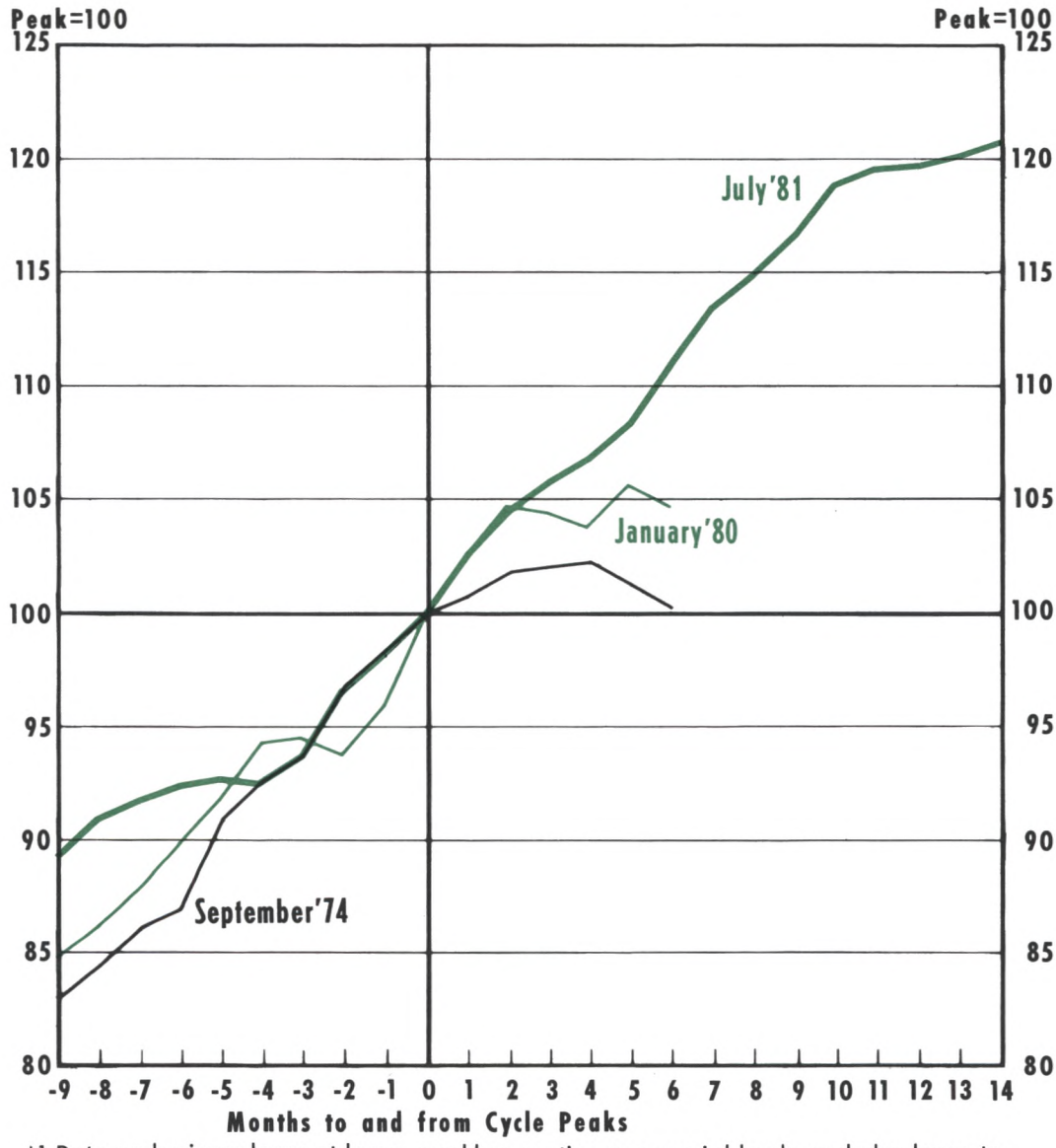
The rapid growth of business loans at commercial banks during the current recession is unusual. The possible explanations cited above all suggest that the growth of total funds raised by business firms should be rapid, yet this is not the case. The share of funds business firms raised by borrowing from commercial banks, therefore, must have been unusually large during the current recession, with relatively small shares of funds raised from other sources.

The growth of business loans at commercial banks has *not* been accompanied by a decline in commercial paper outstanding. Business loans at large commercial banks plus commercial paper outstanding issued by nonfinancial firms have risen more rapidly during the current recession than in the two previous recessions (chart 6).

The share of funds raised by nonfinancial firms *from long-term sources* has been unusually low during the current recession. Businesses raised funds during previous recessions primarily by issuing equities, bonds and mortgages, and actually reduced short-term debt in some periods (indicated by the ratio in chart 7 above unity). The share of funds raised from these long-term sources has increased in each quarter of the current

Chart 6

Business Loans at Large Commercial Banks plus Nonfinancial Commercial Paper [1]



[1] Data on business loans at large, weekly reporting commercial banks excludes loans to non-U.S. addressees beginning in January 1979. Date on each line indicates peak month.

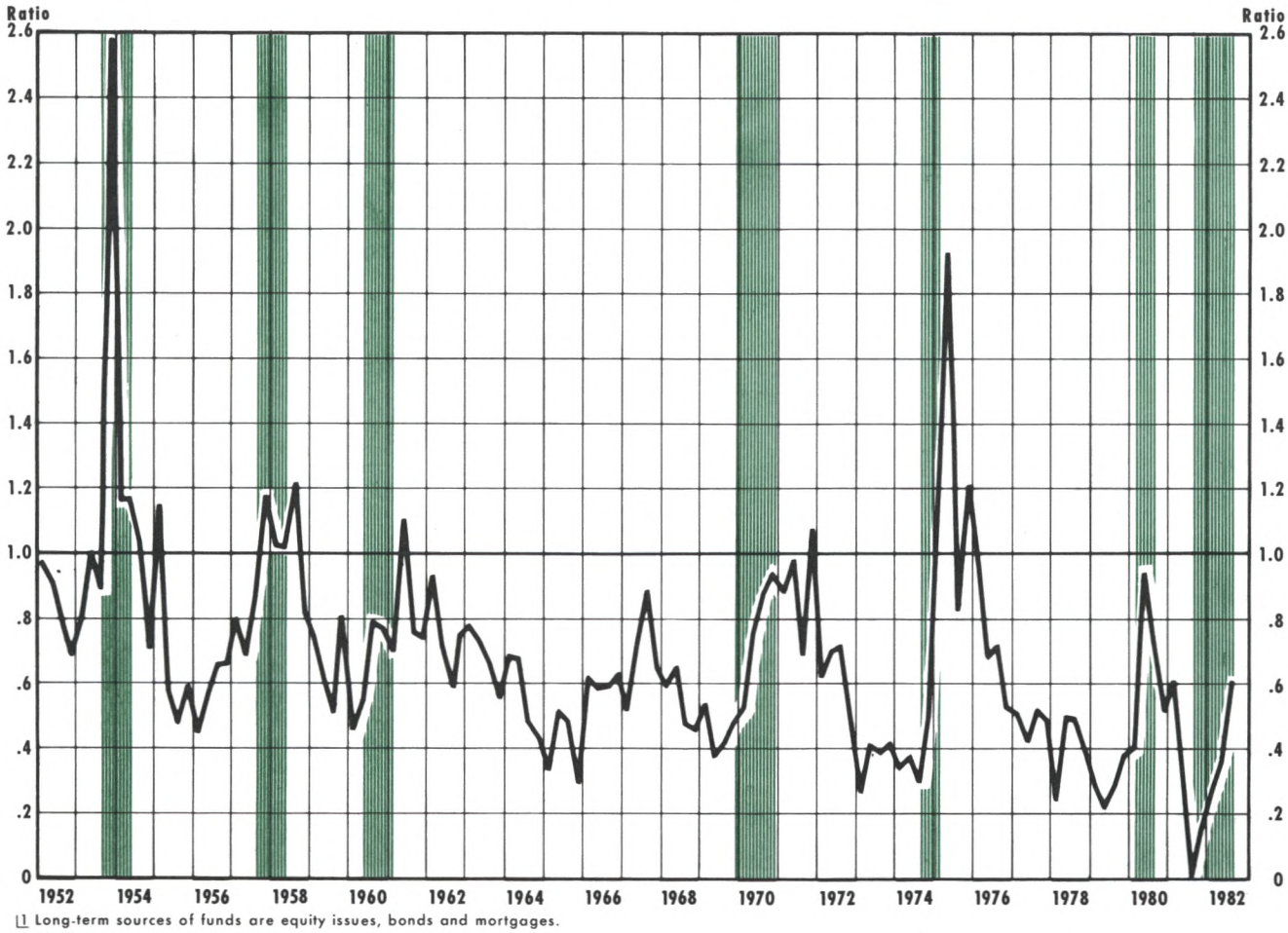
recession from just above zero in III/1981. As of II/1982, that share was only about 35 percent, substantially below the proportion of funds businesses raised from long-term sources during comparable periods after prior cycle peaks.[7] In III/1982, however, the share of funds raised from long-term sources increased to

[7]The dollar magnitude of funds raised from short-term sources by nonfinancial corporate business during the three quarters ending II/1982 is comparable to the dollar magnitude of the rise in business loans by large commercial banks plus nonfinancial commercial paper over the same period. Nonfinancial corporate business raised about $75.2 billion in the financial markets during those three quarters, with $18.8 billion from long-term sources, leaving a difference of $56.4 billion. Business loans at large commercial banks plus nonfinancial commercial paper (nonseasonally adjusted) rose by $36 billion from III/1981 to II/1982. The difference between the $56.4 billion and $36 billion is accounted for by business loans from other banks and other sources of short-term credit for nonfinancial business firms.

Chart 7

Ratio of Funds Raised from Long-Term Sources to Total Net Funds Raised in Financial Markets [1]

Nonfinancial Corporate Sector



[1] Long-term sources of funds are equity issues, bonds and mortgages.
Shaded areas represent periods of business recessions.
Latest data plotted: 3rd quarter

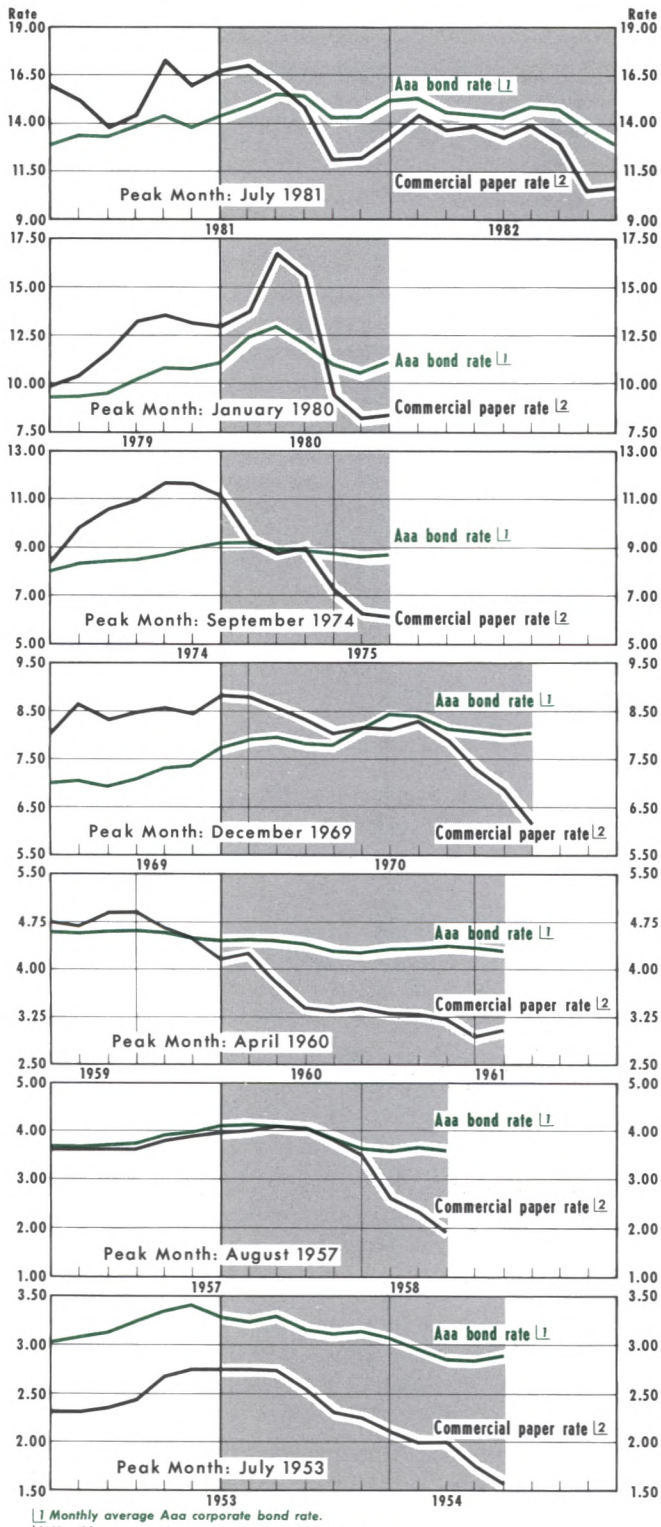
about 60 percent, and the growth of business loans by large commercial banks slowed sharply. Thus, the maturity distribution of funds raised by firms in the nonfinancial corporate sector in III/1982 was more typical of prior recessions than of the current recession.

This article does not provide an explanation for the relatively limited amount of long-term financing by nonfinancial firms during most of the current recession. None of the reasons cited at the start of this article is adequate for this purpose. Similarly, a comparison of the patterns of long-term and short-term interest rates over the current and past recession periods does not indicate why the share of funds raised from long-term sources should be different during the current recession. During prior recessions, the yield on corporate Aaa rated bonds was stable relative to the wider movements in the yield on four-to-six-month prime commercial paper, and this short-term rate declined relative to the long-term rate during the recession periods (chart 8).

Thus, businesses increased the share of funds they raised from long-term sources during the past recessions, *despite* the decline in short-term interest rates relative to long-term rates. The pattern of short-term and long-term interest rates during the current recession has been similar to that of previous recessions, but during the current recession prior to III/1982, businesses did not shift to long-term sources of finance as they did during earlier recession periods.

Chart 8

Pattern of Long-Term and Short-Term Interest Rates During Recession Periods



[1] Monthly average Aaa corporate bond rate.
[2] Monthly average 4-6 month commercial paper rate.
Shaded areas represent periods of business recessions

CONCLUSIONS

Loans to domestic business firms by large commercial banks have risen rapidly during the current recession. Some analysts have claimed that business credit demand has been unusually strong as a consequence of the unusually weak economy. Total funds raised by business firms, however, have not increased at an unusually rapid rate during the current recession. The unusual aspect of business finance during the current recession has been a relatively low proportion of funds raised from long-term sources, including bonds, equities and mortgages. This relatively low share of funds raised from long-term sources has been accompanied by rapid growth of short-term business credit, including loans from large commercial banks.

Good Intentions, Cheap Food and Counterpart Funds

CLIFTON B. LUTTRELL

IN the not-so-distant past, the United States' agricultural price-support programs provided an incentive for the production of bountiful harvests and huge amounts of surplus foods. In response, the U.S. government developed a variety of programs to reduce these surpluses by selling them abroad at sharply reduced prices to less developed countries. The sales of "cheap" food for nonconvertible currencies and the ways in which the receipts were used in the various countries have generated considerable discussion and controversy among economists.

Although the sales of food for these currencies were initiated in the early 1950s and had been phased out by the early 1970s, a brief review of the impact of this program is timely for at least two reasons: (1) payments generated by it, called counterpart funds, still exist and have had important consequences long after the program itself has been phased out; and (2) it appears that the United States, once again, is facing ever-increasing farm surpluses. Before decisions are made to "reduce" these surpluses, it would be useful to assess the impact of the prior programs on both the United States and the beneficiaries. This article does not attempt an exhaustive survey of the prior programs. Instead, it focuses on the arguments used to establish the counterpart funds program and its impacts.

Surplus Food and Counterpart Funds

The Agricultural Trade Development and Assistance Act of 1954 (P.L. 480), designed to increase exports of U.S. "surplus" farm products to less developed countries (LDCs), led to the creation of counterpart funds. These funds are nonconvertible currencies of foreign nations credited to the United States in payment for shipments of the surplus agricultural commodities. The uses that can be made of the accounts are highly restricted — largely limited to U.S. embassy expenses, market development, common defense and economic development in the respective LDCs.

Source of the Accounts

Under P.L. 480, the United States sells surplus farm commodities to friendly LDCs in exchange for foreign currencies. In these negotiations authorized under the act, the President is required to ensure, insofar as practicable, that such sales do not replace the normal sales of the same products by the United States or other friendly nations.[1] This requirement, in effect, limited P.L. 480 shipments to nations that had relatively small amounts of foreign exchange (gold or convertible currency).

With minor exceptions, foreign currencies obtained from the export of these farm commodity surpluses initially were deposited in U.S. accounts in the central banks of the importing countries and could, with few exceptions, be spent only in these countries. As the currencies were used, they were withdrawn from the central bank accounts. The Commodity Credit Corporation (CCC), an agency of the U.S. Department of Agriculture, is responsible for financing the sale and export of the commodities. Any U.S. agency that funds its foreign activities by drawing on this account must reimburse the CCC.

The Food for Peace Act of 1966 altered the arrangements under P.L. 480 by requiring that most food shipments would be sold for dollars, instead of foreign currencies, with the transition to be completed by the end of 1971.[2] As a result of this policy change, sales of farm products for foreign currencies, which reached a peak of $1.7 billion in 1963, were phased out in the early 1970s.[3] Because a sizable portion of the $18 bil-

The author wishes to acknowledge the helpful comments received on this paper from T. W. Schultz, of the University of Chicago.

[1]"Agricultural Trade Development and Assistance Act of 1954," *U.S. Code Congressional and Administrative News*, Vol. 1, (West Publishing Co., and Edward Thompson Co., 1954) pp. 506–12.

[2]"Food for Peace Act of 1966," *U.S. Code Congressional and Administrative News*, Vol. I (West Publishing Co., 1966) pp. 1761–76.

[3]U.S. Department of Agriculture, *Food for Peace:* 1980 Annual Report on Public Law 480, (U.S. Government Printing Office, 1981) table 6.

Table 1

Uses of Foreign Currency Provided in Title I, P.L. 480 Shipments, July 1, 1954, through September 30, 1980 (amounts in millions of dollars)

	All Countries		India[1]	
	Amount	Percent distribution	Amount	Percent distribution
Common defense	$ 2,187	14%	$ 0	0%
Loans to private enterprise	413	3	254	6
Grants for economic development	1,838	11	696	17
Loans to foreign governments	5,157	32	2,494	61
Population growth programs	64	0	32	1
Control of rodents, insects, etc.	2	0	2	0
Loans and grants	2,204	14		
U.S. uses	4,103	26	599	15
TOTAL	$15,968	100%	$4,077	100%

[1]1954 to 1973 only.

SOURCES: U.S. Department of Agriculture, *Food for Peace: 1980 Annual Report on Public Law 480,* table 14; and *1973 Annual Report on Public Law 480,* table 13.

lion in counterpart funds obtained during the 1955–74 period was not spent directly, but loaned to both government and private enterprises in the food-importing nations, it continued to be made available through principal and interest payments on these loans. The counterpart fund balances held by the U.S. Treasury and other executive agencies of the government totaled $1.1 billion on September 30, 1980.[4]

Uses of the Funds

The uses of the foreign currencies provided by the P.L. 480 agreements since 1954 are shown in table 1. Grants for economic development and loans to foreign governments, also largely for economic development, accounted for 44 percent of the total. Common defense and loans and grants to others accounted for 14 percent each, and U.S. uses accounted for 26 percent.

Authorized U.S. uses for the funds included developing new markets for U.S. farm commodities, scientific, cultural and educational programs, sales of such currencies to U.S. organizations and citizens, and paying U.S. obligations abroad (table 2). The National Park Service has used the currencies to develop and manage programs for the conservation of endangered or threatened species. The Environmental Protection Agency uses the funds to support research in a number of countries ostensibly for developing standards and regulations applicable to the United States.[5]

U.S. officials concede that many of these overseas programs exist solely because the foreign currencies are available. For example, the U.S. Department of Labor uses some of the Indian currency for yearly meetings of government officials and labor attachés from various embassies. Robert Greenberger of the *Wall Street Journal* quoted one official who attended the 1982 meeting in New Delhi as saying, "The annual gatherings are important because things are moving fast in the international labor world." Despite this hectic pace, the U.S. Department of Labor issued no written report "because we didn't think it was needed . . . besides if we had [written one] it would have been classified." Furthermore, because inflation in the various countries reduces the value of the funds each succeeding year, there is additional incentive to accelerate the rate of spending of these funds, regardless of the use derived.[6]

[4]*Annual Report of the Secretary of the Treasury on the State of the Finances*, Statistical Appendix, (GPO, 1981), Fiscal Year 1980, p. 431.

[5]U.S. Department of Agriculture, *Food for Peace:* 1980 Annual Report on Public Law 480.

[6]Robert S. Greenberger, "It May Surprise You But Uncle Sam Has Too Much Money," *The Wall Street Journal*, July 21, 1982.

Table 2

U.S. Uses of Title I, P.L. 480 Foreign Currencies Through September 30, 1979 (amounts in millions of dollars)

Agency and Purpose	Amount	Percent distribution
Agency for International Development:		
Acquisitions of sites, buildings and grounds	$ 2.6	0.0%
Emergency relief	11.6	0.2
Purchases of goods and services for other friendly countries	176.5	4.3
Agriculture:		
Trade fairs, market development and scientific activities	331.6	8.1
Commerce:		
Trade fairs, market development and scientific activities	19.8	0.5
Defense:		
Military family housing	92.3	2.3
Other programs	40.5	1.0
Energy	0.3	0.0
Environmental protection	26.5	0.6
Health, Education and Welfare:		
International educational, cultural exchange and scientific activities	188.5	4.6
Interior:		
Scientific activities	5.4	0.1
International Communication Agency:		
Translation of books, periodicals, American sponsored schools, trade fairs, audiovisual materials, educational and exchange activities, preservation of Nubian monuments and emergency relief grants	417.3	10.2
Labor:		
International labor meetings	0.2	0.0
Library of Congress:		
Evaluating foreign publications	36.8	0.9
National Science Foundation:		
Scientific activities	48.1	1.2
Smithsonian Institution:		
Scientific activities	39.7	1.0
State:		
Acquisition and maintenance of buildings for U.S. government purposes	114.0	2.8
Treasury:		
Payments of U.S. obligations	2,493.6	60.8
Sales for dollars to U.S. citizens, etc.	56.6	1.4
Transportation:		
Scientific activities	0.7	0.0
TOTAL	$4,102.6	100.0%

SOURCE: U.S. Department of Agriculture, *Food for Peace: 1979 Report on Public Law 480,* table 14.

Some Evaluations of the Fund Uses

The real value of the payments (goods or services received) to the United States for the food exports and the real cost of food (goods or services paid) to the importing nations has been the subject of an intense debate among economists for over two decades. The discussions largely have been centered around the balance-of-payments effects of the transactions, the value of the funds for economic development, and the value of the food to the recipient nations.

Theodore Schultz, in a classic critique of the program in 1960, estimated that actual payments to the United States for shipments under this program would be between 10-15 cents per dollar of CCC costs.[7] A more optimistic view was presented by McGehee Spears and Dale Vining of the USDA Foreign Agricultural Service, who found the program a net generator of foreign exchange, noting: "Programs which generate needed foreign exchange without dollar purchase of such exchange, take on added, and positive, importance;" this implies that the currencies are valuable assets to the United States.[8] Without making specific judgments about the value of the funds to the United States, Spears later concluded: (1) " . . . foreign currencies acquired through the sale of surplus agricultural commodities are utilized advantageously in financing part of U.S. government military and economic assistance operations abroad;" and (2) the substitution by the United States of foreign currencies for dollar expenditures abroad prevented the overall balance-of-payments deficit from rising higher — that is, constituted real payments to the United States.[9]

A number of writers have pointed to the opportunities for using counterpart funds to finance economic development programs in the food importing nations. S. R. Sen, in reply to Schultz's criticism of the program, found that in India "the use that has been made of the counterpart funds in building up the infrastructure of the economy, in constructing irrigation and power facilities, improving transport and communications and promoting research and extension is certainly noteworthy."[10] R. O. Olson reported " . . . the benefit (from use of the funds) depends on the extent to which the recipient country takes advantage of the presence of these goods [food shipments] to step up the pace of development. It can do this with created money. . . ."[11] In support of the program, Deena Khatkhate reported that the food shipments provided an important source of funds for investment in the public sector of India.[12]

Earl Heady and John Timmons in 1967, after pointing out the long-run impact of food aid on the population/food production ratio of P.L. 480 importing nations, reported individual elements of the program — for example, some uses of counterpart funds — to be positive. They pointed to the program's impact in Israel as an example of the gains that can be achieved from the investment of such funds. Two methods were enumerated by which these funds assist capital investment: "First, funds which would go into food purchases abroad at unfavorable rates of exchange become available for investment within the country. Second, under Title I of Public Law 480, local currencies become available for internal developmental investment."[13]

The debate on the value of the funds to the United States subsided somewhat with the phase-out of farm product exports for such currencies in the early 1970s. Their use, however, continues to attract the attention of the daily press.[14] Furthermore, in its annual report, *Food for Peace*, the USDA lists the uses made of the funds under a number of headings: export market development; market and utilization research; scientific, medical, cultural and educational activities; and buildings for the U.S. government.[15]

Value of the Funds to the United States

Some of the confusion about the value of the payments to the United States for the food can be eliminated by comparing the real value of the funds to the United States to the resources given up by food-importing nations that receive the food. The value of the funds to the United States is approximately the real saving to the U.S. government resulting from their expenditure. The actual expenditure of the funds for U.S. uses is shown in table 2. The real saving to the

[7]Theodore W. Schultz, "Value of U.S. Farm Surpluses to Underdeveloped Countries," *Journal of Farm Economics* (December 1960), pp. 1019–30.

[8]McGehee H. Spears and Dale K. Vining, *Importance of U.S. Farm Exports to Balance of Payments*, United States Department of Agriculture, Economic Reporting Service and Foreign Agricultural Service, Foreign Agriculture Economic Report No. 7, October 1962.

[9]McGehee H. Spears, "Recording P.L. 480 Transactions in the U.S. Balance of Payments," *Southern Economic Journal* (April 1963), pp. 340–45.

[10]S. R. Sen, "Impact and Implications of Foreign Surplus Disposal on Underdeveloped Economies–The Indian Perspective," *Journal of Farm Economics* (December 1960), pp. 1031–42.

[11]R. O. Olson, "Discussion: Impact and Implications of Foreign Surplus Disposal on Underdeveloped Economies," *Journal of Farm Economics* (December 1960), pp. 1042–45.

[12]Deena R. Khatkhate, "Some Notes on the Real Effects of Foreign Surplus Disposal in Underdeveloped Economies," *Quarterly Journal of Economics* (May 1962), pp. 186–96.

[13]Earl O. Heady and John F. Timmons, "Objectives, Achievements, and Hazards of the U.S. Food Aid and Agricultural Development Programs in Relation to Domestic Policy," *Alternatives for Balancing World Food Production and Needs* (Iowa State University Press, 1967) pp. 186–214.

[14]Greenberger, "It May Surprise You."

[15]U.S. Department of Agriculture, *Food for Peace*, 1979.

United States resulting from their usage, however, is well below the indicated dollar expenditure figure. U.S. expenditures in the P.L. 480 food importing countries would have been much less had there been no foreign currency holdings; indeed, many of the expenditures would have never been made had outlays of dollars been necessary.[16]

A number of programs, such as trade fairs; agricultural market developments; health, education and welfare; cultural exchange activities; and American-sponsored schools, studies and conferences are associated closely with the P.L. 480 Act. As indicated in table 2, about one-third of the U.S. counterpart fund expenditures in all the participating nations through September 1979 was of this type. Without the funds, these programs would have been carried out on a greatly reduced scale, if indeed at all. Consequently, the real value to the United States of using foreign currency was well below the 26 percent of the total disbursed for U.S. uses. Since the counterpart funds credited to the United States covered only about 90 percent of the CCC outlays for the farm products exported, the actual recovery of CCC investment in the food was probably on the low side of the Schultz 10–15 percent estimate.

Food Shipments Largely a Gift

Since the food-importing nations reimbursed the United States for only about 10 percent of the original CCC investment in food, about 90 percent of the shipments were essentially a gift by the United States to the recipient nations. A gift of goods from one nation to another, however, is not neutral with respect to economic activity in either country. In this case, the policies that led to the gift caused increases in taxes, in the price of grain to producers, and in the price of food in the donor nation. The higher price of grain, in turn, provided incentive for farmers to purchase more resources and increase production, further increasing supplies in future years.

Moreover, the gift exacerbates the long-run food production problem in the recipient nations.[17] While consumers may pay less for food as the supply increases, domestic farmers are subjected to further food price declines. The lower price reduces food production, thereby leading to less domestic food output in future years. Hence, these gifts contribute to further rural poverty in the recipient nations.[18]

The cost of the grain to the importing nations, although relatively small, has some impact on their balance-of-payments. It reduces their foreign exchange earnings to the extent that they would have received dollar exchange for the U.S. embassy expense, thereby reducing their ability to purchase other goods and services from abroad. Moreover, U.S. expenditures of funds that would not have been made in the absence of the accounts also are real costs to the importing countries. Resources used in these countries by the United States for trade fairs, agricultural market developments, education, etc., are costs in terms of scarce goods and services. The use of these goods and services, while often looked upon as costless from the viewpoint of the U.S. users, are a real expense to the food importing nations. Hence, they will consider such expenses an important factor in negotiating P.L. 480 agreements and currency use projects.

Funds not used directly by the United States but credited to its account were disbursed for projects designed to benefit these less-developed nations. Funds, grants and loans were released for these purposes through agreements with their governments. Such grants and loans through 1980 totaled about $13 billion or 75 percent of all foreign currencies credited to the United States in payment for Title I food shipments (table 1). This amount, plus the excess of CCC outlays for the shipments not credited to the United States, plus a portion of the U.S. uses of the funds represents the cost of this program to U.S. taxpayers that is not reimbursed by foreign governments.

The approximate real values exchanged in the P.L. 480, Title I, transactions may be summarized as follows:

United States		*Recipient nations*	
Market value of grain shipped	100%	Market value of grain received	100%
Value of payment received	10%	Cost of grain	26%
Net loss to United States	90%	Net gain to recipients	74%

The value of the grain to the United States and the receiving nations is assumed to be 100 percent of the

[16]Greenberger, "It May Surprise You;" and Jimmye S. Hillman and Murray R. Benedict, "A Further Look at P.L. 480 and the Balance of Payments," *Journal of Farm Economics* (August 1966), pp. 728–37.

[17]The analysis here is intended to describe the effects of programs designed to reduce farm "surpluses." It does not necessarily describe the effects of humanitarian distributions of food and other aid intended to alleviate the short-run impacts of crop failures and other natural disasters.

[18]For further discussion, see Dale W. Adams and Donald W. Larson, "What Cheap Food Does to Poor Countries," *The Wall Street Journal*, November 19, 1982.

world market value for grain. Because the real value of the payment received by the United States is about 10 percent of the value of the grain shipments, the net loss to the United States totaled approximately 90 percent of the market value of the exports. The real cost of the grain to the recipient nations, however, totaled about 26 percent of the value of the shipments, and the net gain (value of the gift) to the recipients totaled 74 percent of the market value of the grain. The transactions resulted in a "welfare loss" of about 16 percent of the combined value of the shipments; in other words, real payments to the United States were about 16 percent of the market value of the grain below the real costs to the recipients. A case study of the portion of the P.L. 480 program that generated the funds in India indicates the real economic impacts of the transactions.

INDIA: A CASE STUDY

For two reasons, India is used to demonstrate the real impact of the P.L. 480 transactions that generated the counterpart funds. First, India has signed more agreements for Title I, P.L. 480 shipments than any other nation — $6.1 billion, or about 40 percent of the total at the close of 1980. Second, although there is a paucity of data for all the recipient nations, more data are available for India that for other nations.

Creation of Counterpart Funds — In Part a Government Debt Monetization Process

As indicated in figure 1, the government of India obtained funds for P.L. 480 shipments by selling securities to the Reserve Bank of India.[19] Proceeds from the security sales were then credited by the bank to the Indian government (stage A, figure 1). Upon arrival of the food shipments, the funds were credited to the U.S. Treasury (stage B). These accounts were left on deposit with the reserve bank until disbursements were made in the form of loans and grants to India or for other uses as previously outlined. As the funds were disbursed, ownership was transferred to the private sector, and they eventually were credited to member bank accounts at the reserve bank, thereby increasing commercial bank reserves and the stock of money (stage C). If the process stopped at this point, all counterpart funds would be monetized following disbursement. The Indian government, however, recovered part of the funds from the public through grain sales at less than cost, partially offsetting the rise in bank reserves. Consequently, only the subsidized portion of the sales remained on the central bank's books.

Reserves for monetary expansion, thus, were increased only to the extent of the subsidy. Because the entire cost of P.L. 480 food imports was financed initially by government borrowings from the reserve bank, the excess of costs over proceeds from food sales remained in the banking system as an addition to reserves at the central bank after the counterpart funds has been disbursed (stage E, last entry). With an estimated 50 percent of counterpart funds resulting from the central bank's financing of government deficits, the impact of such expenditures on bank reserves (high-powered money) was quite large. For example, by 1980, agreements had been made for the use of more than $4 billion in counterpart funds in India.[20] On the basis of the estimated rate of subsidy on the food sales, this added more than $2 billion (rupee equivalent) to bank reserves.

India has a relatively high ratio of currency to deposit money and the impact of increased reserves on the stock of money (currency plus demand deposits) in recent years has been relatively low — about one to one. Nevertheless, the addition of an estimated $200 million in reserves in 1967 as a result of P.L. 480 operations caused a rise of about 3 percent in the money stock, which was about one-third the average rate of annual money growth from 1965 to 1970. On this basis, the expenditure of counterpart funds accounted for about one-third of the 6.4 percent rate of inflation during the half decade. The addition of $2 billion over a 25-year period, thus, was a sizable factor contributing to the rise in the money stock and the relatively high inflation rate.[21]

Creation of Counterpart Funds — In Part, a Fiscal Operation

Partial recovery of the funds occurred when the government sold the imported food to the public and

[19]Deena R. Khatkhate, "Money Supply Impact of National Currency Counterpart of Foreign Aid: An Indian Case," *The Review of Economics and Statistics* (February 1963), pp. 78–83.

[20]U.S. Department of Agriculture, *Food for Peace*, 1980, table 13.

[21]During the three years from 1964–65 to 1966–67, inclusive, the net Reserve Bank of India credit to the government and private sectors rose Rs. 1,401 crores, while the stock of money rose Rs. 1,201 crores.

Typical of less-developed nations, currency in India is a more desirable form of money than demand deposits. When currency is withdrawn from the banking system, it reduces bank reserves at a one-to-one ratio. In contrast, in the absence of large currency withdrawals, demand deposits can be expanded at some multiple of new reserves, depending on legal reserve requirements.

Figure 1

How Counterpart Funds Increase the Stock of Money in India (amounts in millions of dollars)

Stage A

Government sells bonds to central bank to obtain $500 million to pay United States for grain:

Central Bank Balance Sheet

Assets	Liabilities
Government bonds +$500	Government deposits +$500

Stage B

Government pays United States for grain:

Central Bank Balance Sheet

Assets	Liabilities
No change	Government deposits −$500 U.S. deposits +$500

Stage C

United States spends deposits in India for development purposes:

Central Bank Balance Sheet

Assets	Liabilities
No change	U.S. deposits −$500 Commercial bank deposits +$500

Commercial Bank Balance Sheet

Assets	Liabilities
Legal reserves +$500	Demand deposits +$500 (money)

Stage D

Government sells grain to public at 50 percent of cost and reduces debt to central bank with proceeds:

Central Bank Balance Sheet

Assets	Liabilities
No change	Commercial bank deposits −$250 Government deposits +$250

Commercial Bank Balance Sheet

Assets	Liabilities
Legal reserves −$250	Demand deposits −$250

Stage E

Government reduces bonded debt to central bank:

Central Bank Balance Sheet

Assets	Liabilities
Government bonds −$250	Government deposits −$250

Central Bank (FINAL) Balance Sheet

Assets	Liabilities
Government bonds +$250	Commercial bank deposits +$250

paid off a portion of its debt to the reserve bank (stages D and E, figure 1). If the deposits were made simultaneously with the disbursements and if the deposits were equal to the disbursements, the funds would have had no impact on the stock of money. The proceeds from sales of P.L. 480 food to the Indian public, however, did not equal the rupee credits to the United States. The extent of the shortage is not available, but rough estimates indicate that no more than 50 percent of P.L. 480 wheat cost was recovered in some years (stage E).[22] For example, the Reserve Bank of India reported that the issue price of imported wheat was raised from 50 to 55 rupees per quintal on November 15, 1966, " . . . in accordance with the decision taken by the Government to reduce gradually the element of subsidy. . . ."[23]

The portion of counterpart funds that was offset by sales of food to the public (funds available for reduction of government debt to the Reserve Bank of India) had no impact on the level of bank reserves or the stock of money. This portion was essentially a fiscal operation. Food, largely donated by the United States to the Indian government, was used as a means of transferring resources from the private to the public sector. As indicated by Gary Seevers, proceeds from these sales may be viewed as an indirect tax on Indian farmers and a subsidy to consumers, because the producing sector suffered from lower prices and the consumer sector benefited from lower cost food.[24]

[22]This estimate is based on the issue price of 40 Rs. per quintal (about $1.80 per bushel) and $1.73 per bushel average cost at American ports. Ocean freight is estimated at $0.45 per bushel and shipping and distribution cost in India at $0.40 per bushel. The prevailing exchange rate of 13.3 cents per rupee was used in the calculations.

[23]Reserve Bank of India, *Report on Currency and Finance for the Year 1966–67*, Bombay, 1967.

[24]Gary L. Seevers, "An Evaluation of the Disincentive Effect Caused by P.L. 480 Shipments," *American Journal of Agricultural Economics* (August 1968), pp. 630–42.

Counterpart Funds: Detrimental to Food Importing Nations?

Whether counterpart funds contribute to economic development in the food recipient nations as alleged is not a crucial question concerning the creation and use of the funds. Similar investments readily can be made without the creation of counterpart funds. The fund expenditures did not add to the nation's stock of resources. For example, if all counterpart fund accounts were erased from the books of the Reserve Bank of India and the U.S. Treasury, the purchases for which the funds are used could be made by the Indian government through either the monetization of government debt, the levying of taxes or both. These actions could achieve the same results at no additional social cost.

Since rupee expenditures for development purposes or U.S. Department of Labor conferences could as readily be made without the counterpart fund accounts, the fund-creating feature of the program is not a requisite. Consequently, the creation and spending of counterpart funds does not appear to be a productive function. Such funds (new money or taxes) could have been raised as readily without the currency credits to the United States. Benefits from U.S. participation in the programs would occur only if U.S. participants possess superior knowledge about development techniques and of the special conditions involved, neither of which is likely. Moreover, as indicated earlier, many expenditures would not have been made in the absence of counterpart funds, another indication of their wasteful use.

Counterpart fund accounts appear to represent idle resources abroad which, if not spent, would be wasted. Yet, their expenditure represents the utilization of real resources in the issuing nations. Further, it appears that the value obtained from their use to the United States frequently is less than the value of their use foregone by the other countries involved.

CONCLUSION

This article examines the results of crediting foreign currencies to the United States in payment for P.L. 480 food shipments abroad. The greater portion of the food shipments that led to the creation of these accounts was a gift of consumer goods by the United States to these nations.

The shipments provided additional net food resources to the recipient countries and made some contribution to their welfare in the short run. In the longer run, however, such gifts have an unfavorable impact on food production in the recipient nations. They affect producers in the United States and in the food recipient nations in opposite directions. Here, the government purchases cause an increase in the price of grain to producers and the price of food to consumers. U.S. farmers are provided incentive to further increase production. In contrast, the gift leads to lower prices for farmers in the recipient nations and reduces their incentive to produce. As a result, the recipient nations become even more dependent on the donor nations.

The use of counterpart funds in the program was predicated in part, on the belief that foreign currency credits are a vital factor in economic development in the food-importing nations; this belief is an illusion. The counterpart fund accounts currently on the central bank books represent one way of initiating money creation; however, governments always can create or destroy money at their convenience. The use of counterpart funds leads to an increase in the stock of money in these nations, not to an increase in resources or production. Because the quantity and use of real resources are important for development, resource use is likely to be more efficiently achieved under a simpler accounting system.

One solution would be simply to write off counterpart funds entirely and charge the expenditure instead to foreign aid. With the exception of the small amount of expenditure for embassy expense, etc., the funds are not payments to the United States and have no impact on the balance of payments. Both U.S. expenses and money creation in the LDCs would be under better control by writing off such accounts and negotiating the proportion of U.S. expenses offset by food shipments.

The importance of assessing the impact of counterpart funds in the context of the current problem of rising food surpluses is that it provides a reminder that even ostensibly charitable actions have hidden and unexpected impacts. Moreover, these unforeseen consequences often are detrimental to the presumed purposes of the program. The use of counterpart funds in the context of reducing the U.S. food surplus by shipping food to LDCs is such an example.

A Perspective on the Economics of Natural Gas Decontrol

MACK OTT and JOHN A. TATOM

A FUNDAMENTAL lesson that economic policymakers learned over the past decade is that microeconomic energy policies can have a significant effect on the nation's macroeconomic performance. Early in the decade, price regulation in domestic energy markets led to growing imports of energy and rendered the United States—the world's largest energy producer—impotent to the challenge of the OPEC cartel in determining the prices of the world's energy resources. Subsequent policy efforts to smooth the difficult transition to a world of higher-cost energy by preventing any abrupt rise in domestic energy prices reduced the incentive to conserve energy, discouraged domestic energy production, subsidized petroleum imports and increased inefficiencies in the use of domestic energy supplies.

These policies increased the demand for OPEC petroleum so that the ability of the OPEC cartel to raise its prices (and thereby reduce world output and raise the dollar prices of goods and services) was substantially enhanced.[1] Moreover, attempts to smooth the disruptive effects of OPEC actions could not keep pace with the changing realities in world energy markets. The energy prices assumed to prevail at the end of each transition continually fell short of the market price, contrary to federal energy policy intentions.

The elaborate regulatory scheme for oil was finally abandoned in February 1981. In the case of natural gas, the recognition that regulations were leading to increased shortages of gas and a consequent increased reliance on imported oil led to the passage of the Natural Gas Policy Act of 1978 (NGPA). Akin to the earlier efforts to prevent abrupt energy price increases in the transition to a free market for oil, NGPA provided for phased decontrol of the nation's natural gas market. Changing world energy market conditions, however, rendered this plan obsolete as the pace of allowable price increases and decontrol became inadequate to accomplish a smooth transition. In addition, there emerged a growing recognition that phased policy changes create perverse economic incentives that thwart the achievement of the policy objectives.[2] As a result, pressure has been growing to decontrol natural gas markets more rapidly than scheduled under NGPA.

A major obstacle to the decontrol of the U.S. natural gas market has been the potential effect on the price of natural gas paid by residential users (voters). Analysts also have argued that natural gas decontrol will have adverse macroeconomic effects similar to those experienced following OPEC energy price increases.

This article provides an alternative perspective, which indicates that the adverse economic effects of decontrol are substantially overstated. These negative impacts are largely reversed when the effect of natural gas decontrol on the *world* oil market is taken into account.[3]

---

[1]See John A. Tatom, "Energy and Its Impact on Economic Growth: A Supply-Side Miracle for the Eighties," Federal Reserve Bank of St. Louis, Working Paper 82-005, 1982. Also Claudio Loderer, "Theory and Evidence about the Structure of the International Oil Market: 1974–1979," Graduate School of Management, University of Rochester, Working Paper GPB 82-5, 1982, provides evidence that OPEC has operated successfully as a cartel but that this alone has not accounted for higher energy prices. He emphasizes that energy policies worldwide have contributed to higher prices in the manner detailed below.

[2]Knowing that future prices will be higher than current prices, gas producers are induced to postpone production of some known or suspected deposits until after decontrol. This reduces the predecontrol supply of gas and increases scarcity. Thus, the phased decontrol of prices, instead of smoothing the transition, actually worsens the domestic gas shortage.

[3]This article draws heavily upon the more detailed analysis in Mack Ott and John A. Tatom, "Are There Adverse Inflation Effects Associated with Natural Gas Decontrol?" *Contemporary Policy Issues*, a supplement to *Economic Inquiry* (October 1982), pp. 27–46.

Table 1

U.S. Consumption of All Forms of Energy and of Natural Gas (quads[1])

	1950	1955	1960	1965	1970	1975	1980
Total energy	33.62	39.18	44.08	52.99	66.83	70.71	72.27
Natural gas	5.97	9.00	12.39	15.77	21.79	19.95	20.44
Natural gas as a percent of total energy	17.8%	23.0%	28.1%	29.8%	32.6%	28.2%	26.8%
SHARE OF NATURAL GAS USE BY SECTOR[2]							
Residential	20.8%	24.3%	25.9%	25.5%	22.9%	25.2%	24.0%
Commercial	6.7	7.2	8.6	9.4	11.3	12.8	13.5
Industrial	59.4	52.2	48.2	46.5	43.8	42.8	41.1
Electric utility	10.9	13.2	14.4	15.2	18.6	16.2	18.4
Transportation (pipeline)	2.2	2.9	2.9	3.3	3.4	3.0	2.9
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

[1]A quad is one quadrillion British thermal units.

[2]Totals may not add to 100 due to rounding.

SOURCE: Energy Information Administration, U.S. Department of Energy, *1980 Annual Report to Congress*, volume 2, and *Monthly Energy Review*.

THE U.S. NATURAL GAS MARKET

From 1950 to 1970, the domestic consumption of all types of energy grew at an average annual rate of 3.5 percent, with natural gas consumption growing at a 6.7 percent rate. The growth of both total energy and natural gas consumption was particularly rapid during the 1960s, before slowing dramatically in the past decade. As table 1 shows, consumption of natural gas as a fraction of total energy rose from about one-sixth in 1950 to about one-third in 1970, then declined to slightly over one-fourth in 1980.

In large part, the decline in the growth of natural gas consumption was the result of governmental control of the pricing and distribution of natural gas.[4] Control of wellhead natural gas prices from the early 1960s led to declining reserves of natural gas relative to its production and, since 1968, absolutely declining reserves. In addition, the number of new gas wells drilled declined from 1962 to 1968. Production growth actually did not begin to decline until after 1973 when the excess inventories (reserves) caused by regulatory changes in the early 1960s had been eliminated. In the early 1970s, natural gas prices began to respond to the growing shortage. Nevertheless, production continued to decline until the passage of NGPA and the related Powerplant and Industrial Fuel Use Act of 1978 (FUA).

These laws lessened restrictions on the pricing of natural gas, decontrolled the price of new gas from deep wells and other high-cost gas, but extended restrictions on the industrial and utility use of natural gas and on the construction of new gas-fired boilers. The phase-out of wellhead price controls, to be completed by the end of 1984, presumed that gas would then sell at the equivalent of a relatively low 1984 price of crude oil. The limitations on industrial and utility gas demand, in practice, allow such uses residually; that is, they allow exceptions to the restrictions only to the extent that other uses of gas do not exhaust total natural gas production.

Table 1 shows that the total use of natural gas was lower in 1975 than in 1970. Natural gas use rose following the enactment of NGPA, although the share of gas

[4]See Jai-Hoon Yang, "The Nature and Origins of the U.S. Energy Crisis," this *Review* (July 1977), pp. 2–12; and Paul W. MacAvoy and Robert S. Pindyck, *The Economics of the Natural Gas Shortage (1960–1980)* (North-Holland Publishing Company, 1975), especially chapter 1, pp. 1–28.

Table 2

The Real Price of Natural Gas[1]—Delivered to Final Users and at the Wellhead $/1000 (cubic ft)

	1950	1955	1960	1965	1970	1975	1980	1981
Residential	1.288	1.460	1.505	1.409	1.192	1.360	2.076	2.214
Commercial	0.888	1.031	1.128	1.039	0.841	1.075	1.913	2.065
Industrial[2]	[0.355	0.485	0.582	0.514]	0.374	0.702	1.689	1.546
Electric utilities[2]					0.319	0.616	1.256	1.494
Transportation[3] (pipeline)	NA	NA	NA	NA	0.230	0.314	1.041	1.235
Wellhead	0.121	0.171	0.204	0.210	0.187	0.354	0.904	1.030

[1]The ratio of the indicated price to the implicit price deflator for GNP, 1972 prices.

[2]Industrial and electric utility prices are not available separately prior to 1967; the prices for 1950–65 are average prices for industrial and utility customers.

[3]Pipeline fuel price is not available prior to 1967.

SOURCES: Energy Information Administration, U.S. Department of Energy, *Annual Report to Congress,* 1977 and 1980; *Monthly Energy Review* (August 1982).

in total energy still declined slightly. The tilt toward residential use of natural gas and away from industrial use (especially electric utility use) before NGPA also can be seen by comparing the pattern of use in 1975 with that in earlier years. Despite the rise in the residential share from 1970 to 1975, total residential use was virtually unchanged. Residential use declined only after NGPA, while electric utility use recovered sharply. Since utility use is restricted to the residual after residential demands, increased use by utilities would not have been possible without the combined effects of increased total gas production and reduced demand by other, primarily residential, users.

The decline in the growth of natural gas consumption also is due to a rise in the delivered price of gas, primarily since the OPEC embargo of 1973–74. As table 2 reveals, the real price of natural gas rose significantly from 1950 to 1960 for all users, then declined to a level in 1970 roughly equal to its 1950 value. From 1970 to 1980, however, the real price of delivered natural gas rose dramatically, almost doubling for residential users and rising by even larger multiples for the commercial, industrial, utility and pipeline sectors.

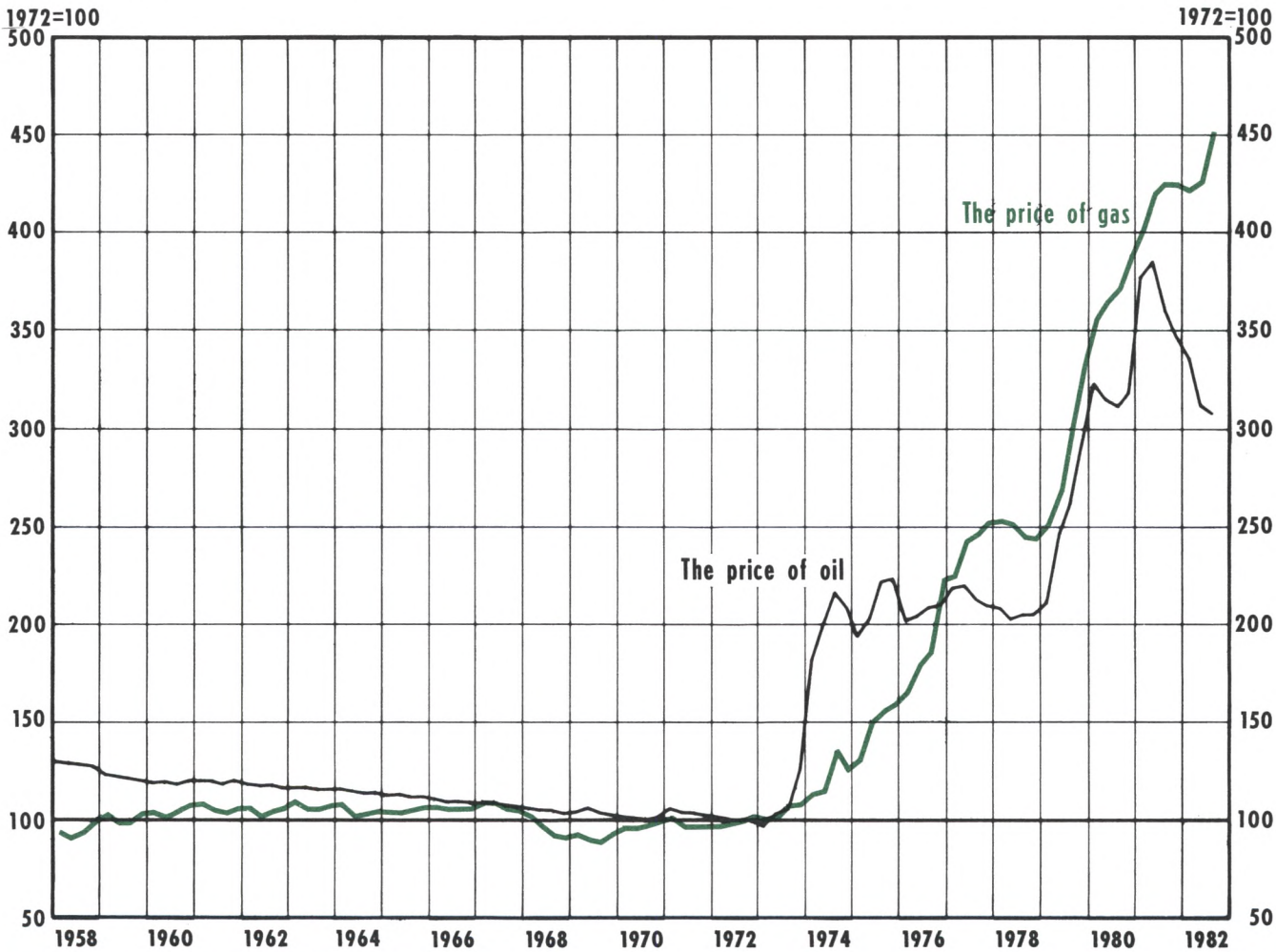
During the 1950–70 period, the real wellhead price of gas rose at only a 2.2 percent rate, but then surged at a 15.8 percent rate from 1970 to 1980, or, even more revealing, an 18.8 percent rate from 1975 to 1980. The percentage movements in the industrial and electric utility prices conformed closely to the growth rate of the wellhead price during the 1950–70, 1970–80 and 1975–80 subperiods. In contrast, residential prices grew much more slowly than the wellhead or delivered industrial prices.

The diversity of delivered natural gas prices reflects different delivery and administrative costs. Decontrol of the wellhead price of natural gas will not raise the price for each of the various users of natural gas to the same extent because of these differences. In the industrial and utility sectors, the share of the wellhead cost of gas in the delivered price is very high, so that percentage changes in the wellhead price result in similar percentage changes in delivered price. The share of the wellhead cost of gas in the delivered price to residential customers is much smaller, as can be seen from the difference in relative prices; a given percentage change in the wellhead price leads to a much smaller percentage change in the residential price.

The effect of controls on natural gas prices appears to have been quite extensive, especially since 1973, yet gas fuel prices have risen more rapidly than crude oil over the last 12 years. Chart 1 shows an index of the real price of gas, found by deflating the producer price index (PPI) of gas fuels by the implicit price deflator for private business sector output, and an index of the real price of crude petroluem, the PPI for crude petroleum, adjusted for the crude oil control program, de-

Chart 1

Index of the Relative Prices of Gas and Oil



flated by the same price index.[5] In 1981, the index for the price of gas was somewhat above that of crude oil. The delayed response of gas prices to the 1973–74 run-up in the real price of crude in the United States can be observed in chart 1. In 1977–78, however, when real oil prices flattened out, the price of gas changed little, despite the considerable leeway exhibited earlier for regulated real gas prices to rise. From mid-1981 to mid-1982, when real crude prices fell, the rise in natural gas prices slowed sharply. Such casual evidence raises doubts about the usefulness of extrapolating "controlled" natural gas prices upward based upon regulatory allowances.

The Effect of Price Decontrol on the U.S. Natural Gas Market

In some essential respects (i.e., at the margin), natural gas was decontrolled in November 1979 when the wellhead prices of new (discovered since February 19, 1977), deep (15,000 feet or more), and other high-cost gas were totally decontrolled by NGPA.[6] On the other

[5]The crude oil price is adjusted to reflect the actual cost of oil to refiners rather than domestic selling prices. The difference arises from the entitlement system. The entitlement adjustment simply adds the differential between the logarithm of the composite refiner acquistion cost of crude oil and the domestic refiner acquisition cost to the logarithm of the PPI for crude oil.

[6]See Energy Information Administration, U.S. Department of Energy, *Annual Report to Congress* (1981b), pp. 2–3, for a schedule of ceiling prices under NGPA. Of course, imports of natural gas, especially from Canada and Mexico, are free of U.S. wellhead price controls and tend to be priced according to the world price of oil. Such imports generally have been less than 5 percent of consumption.

hand, some categories of natural gas remain subject to wellhead price ceilings that will likely be effective well beyond this decade.[7] For the purposes of the analysis in this article, decontrol refers to the complete abandonment of wellhead price regulation and the repeal of FUA. The hypotheses developed below already apply to post-1977 developments under phased decontrol.

There are two shortage-creating effects of any price control program that holds a price below its market-clearing level. The first effect is that less of that good will be produced than would be at the higher price. Removing the controls increases the quantities supplied. In the case of natural gas, this potential increment to supply comes from three sources: (1) known gas deposits recoverable at higher cost but not profitable to produce at the current controlled price—or more profitable to produce later when prices are expected to be higher; (2) suspected gas deposits whose anticipated development and production cost could not be covered at current prices; (3) a shift in production techniques so that currently producing oil wells would produce, at a higher price of gas relative to that of crude oil, less oil and more gas.

The second effect of a price control program is that a larger quantity of that good will be demanded than at the higher market-clearing price so that, to be effective, the price control program must involve an allocation or rationing scheme. Evidence of this rationing is apparent in the different prices in the *intra*state and the *inter*state markets.

During the 1960–78 period, the intrastate natural gas markets were free of controls so that purchasers could avoid rationing by paying a market clearing price—limited only by the cost of competing fuels—and suppliers could respond to these higher prices.[8] Of course, the diversion of supplies to this market intensified the shortage in the regulated interstate market. The intrastate market, primarily in Texas, Oklahoma and Louisiana, had gas prices during this period substantially in excess of the interstate market.

Table 3

Natural Gas Price Paid by Electric Utilities in Interstate and Intrastate Markets (dollars per 1000 cubic feet) and Residual Fuel Oil Price

	1970–72	1973–74	1975–76	1977–78[1]
Interstate gas[2]	0.32	0.44	0.88	1.40
Intrastate gas[2]	0.66	1.09	1.91	1.63
Residual fuel oil[3]	0.63	1.38	2.04	2.23

[1]NGPA was enacted in 1978 bringing the intrastate natural gas price under federal control.

[2]Taken from Richard P. O'Neil, "The Interstate and Intrastate Natural Gas Markets," *Monthly Energy Review* (January 1982), table 3, p. vii. Prices given there (per million BTU) were converted by estimated BTU per 1000 cubic feet.

[3]The price of residual fuel oil to steam electric utility plants (cents per million BTU) converted to dollars per 1000 cubic feet. The 1970–72 data are estimated using the producer price index for residual fuel oil.

SOURCE: *Monthly Energy Review.*

As shown in table 3, electric utilities willingly paid a much higher price for natural gas in the intrastate market than they paid in the interstate market. Note that the average price of gas in the intrastate market was close to the BTU-equivalent cost of fuel oil. When NGPA brought the intrastate market under federal price control, the difference between the intra- and interstate prices effectively was nullified. The implication of the earlier, sharply higher, uncontrolled intrastate gas prices and the recent discrepancy between the price of fuel oil and the prices of gas is that gas has been inefficiently allocated to lower-valued uses.[9]

The Conventional Analysis of Decontrol

Most analyses of natural gas deregulation have assumed that, measured on a BTU basis, the price of natural gas and fuel oil at the burner-tip would be equated *and* that the price of natural gas would rise to equality with an unchanged fuel oil price. The underlying presumption has been that natural gas and petroleum fuels are highly substitutable for gas; thus, it is argued that deregulation would cause natural gas wellhead prices to rise until delivered gas prices, especially

[7]See Paul Bennett and Debra Kuenstner, "Natural Gas Controls and Decontrol," Federal Reserve Bank of New York *Quarterly Review* (Winter 1981–82), pp. 50–60. They cite studies indicating that by 1990, 28 to 38 percent of natural gas would remain controlled under NGPA.

[8]Furthermore, the availability of gas at a market clearing price in these intrastate markets probably induced some firms to relocate. The lower likelihood of interrupted natural gas simplifies production decisions and long-range planning by reducing energy uncertainty. This is part of the favorable impact of natural gas deregulation on the Northeast region predicted by Joseph Kalt, Henry Lee and Robert A. Leone, *Natural Gas Decontrol: A Northeast Industrial Perspective* (Energy and Environmental Policy Center, Harvard University, July 1982).

[9]See Energy Information Administration, U.S. Department of Energy, *Analysis of Economic Effects of Accelerated Deregulation of Natural Gas Prices* (August 1981), p. 28.

Table 4

A Conventional Analysis of Natural Gas Decontrol—Constant Oil Prices (IV/1981)

		IV/1981	Decontrol	Percent change
Price of residual fuel oil delivered to steam electric utility plants	$/barrel	$32.00[1]	$32.00[1]	0
	$/mBTU	5.13	5.13	
Price of natural gas, steam electric utility plants	$/mcf	3.07[1]	5.30[1]	72.6%
	$/mBTU	2.97	5.13	
Wellhead price of natural gas	$/mcf	2.15	4.38	103.7
	$/mBTU	2.10[1]	4.26[1]	
Price of natural gas, average residential heating	$/mcf	4.85	7.08	46.0
	$/mBTU	4.73[1]	6.90[1]	

[1]Conversion factors:
Residual fuel oil, 6.244 thousand BTU/barrel
Natural gas-electric utilities, 1,034 BTU/cubic foot
Natural gas-production, 1,026 BTU/cubic foot
Natural gas-residential, 1,026 BTU/cubic foot

SOURCE: *Monthly Energy Review* (September 1982).

for utilities and industrial users, are equivalent to the price of fuel oil.

As shown in table 1, electric utilities use a significant share of U.S. natural gas. In addition, natural gas is an important source of fuel for the generation of electricity. Natural gas, which constituted 18.7 percent of the energy input used by electric utilities in 1973, declined to 14.0 percent in 1978 before NGPA loosened quantitative restraints on gas use and allowed this proportion to rise back to 15 percent by 1981. In 1973, petroleum was slightly less important in electric utility production, remained so until 1975, briefly became relatively larger than gas use in 1976–78, then declined sharply to 1981 as a share of electric utility energy consumption. Thus, utilities will have a strong impact on natural gas pricing with decontrol.

In table 4, an analysis of natural gas decontrol is constructed using the set of energy prices prevailing at the end of 1981; this can be referred to as the conventional analysis because it assumes that oil prices will be unaffected by decontrol. In the table, the price of natural gas for electric utilities is assumed to rise to that of residual fuel oil on a BTU-equivalent basis. The resulting rise in the price of natural gas limits the increase in wellhead prices under decontrol to $2.22 per thousand cubic feet (mcf), a doubling of such prices. At the residential level, such a wellhead price increase would raise the delivered price from $4.85/mcf to $7.07/mcf, about a 46 percent increase.

A recent estimate of the price effects of continued phased decontrol (NGPA continuing after 1984) indicates an addition to overall nominal and relative energy prices of 1.2 percent per year, adding less than 0.1 percent to the rate of increase in the GNP deflator from 1982 through 1986. With complete decontrol in early 1983, but with energy prices the same as at the end of 1981, the price level would rise 0.4 percent within about one year, so that the inflation rate temporarily would be 0.4 percentage points higher.[10]

This price level effect arises because higher real energy costs reduce productivity or potential output through reduced energy usage and increased obsolescence of domestic capital and labor resources. The extent of these effects is trivial in comparison to the effects of the two OPEC energy shocks in 1973–74 and 1979–80.

More important, however, this analytic approach is itself woefully incomplete, because it ignores the efficiency gains in the use of existing natural gas and the effects of decontrol on the world energy market. In particular, potential users of natural gas value it far more highly than indicated by the controlled price, and decontrol provides incentives to make it available.

[10]Immediate decontrol also removes the relatively trivial upward adjustment in the prices of goods and services that otherwise would have continued under the control solution of phased decontrol. See Ott and Tatom, "Are There Adverse Inflation Effects?"

As a result, total energy is more abundant and should become cheaper relative to all other goods and services. Yet, in the conventional analysis, the reverse occurs.

NATURAL GAS DECONTROL WILL LOWER OIL PRICES

Industrial users and electric utilities currently are restricted in their purchases of natural gas. As a result, they are forced to use fuels like oil or coal that are more costly. In many industrial processes and in electric generation, fuel substitution possibilities are technically unlimited, but additional gas cannot be obtained due to direct legal restrictions. The contribution of energy to the value of output is correctly measured by the price of oil that firms pay, and this is the relevant measure of fuel cost that enters into the determination of prices of output including electricity. Such firms could profitably pay up to the current price of fuel oil for the energy equivalent in natural gas; for each unit of gas substituted, oil use and oil imports would decline by the amount of oil that is not purchased.

Currently, some residential users are not allowed access to natural gas. As a result, they too are forced to rely on higher-cost fuel alternatives. Like industrial or utility users, they would be willing and able to pay much more for gas than the current price, and, if such a switch were allowed, they would reduce their purchases of higher-cost alternative fuels such as electricity, fuel oil or coal.[11]

With no change in natural gas production, decontrol would lead to gains in efficiency and aggregate output, and lower prices of final goods and services. Higher prices of natural gas would tend to reduce gas use by those who currently are able to obtain all the gas they wish to use. This gas would be diverted to users who value natural gas more highly, but can only buy gas if residential and commercial customers do not. Overall energy prices clearly will fall for purchasers who currently cannot buy gas or are limited in their ability to purchase it, and they will reduce their reliance on higher-cost alternative fuels.

These substitutions reduce the demand for OPEC oil. Given the pattern of use of natural gas, differences in the responsiveness of demand by residential and other users of natural gas, and prices that prevailed at the end of 1981, for each 1 percent rise in the delivered price of natural gas for industrial and electric utility purchasers, the demand for OPEC oil would decline by 0.4 percent.[12]

Decontrol allows gas prices to rise, providing an incentive to boost domestic gas production and displace some of the U.S. and world oil demand with U.S. gas, further reducing the demand for OPEC oil. Decontrol also increases the responsiveness of U.S. gas and energy supplies to changes in the world price of oil. A domestic price ceiling on domestic natural gas results in a completely unresponsive or inelastic supply of gas. Producers market only the amount that is profitable to produce at the fixed price. Increases or decreases in the world price of oil or energy result in no direct changes in the incentive to produce domestic gas. When the price ceiling is lifted, the responsiveness of demand facing other producers of energy, especially OPEC, rises, putting downward pressure on their prices.

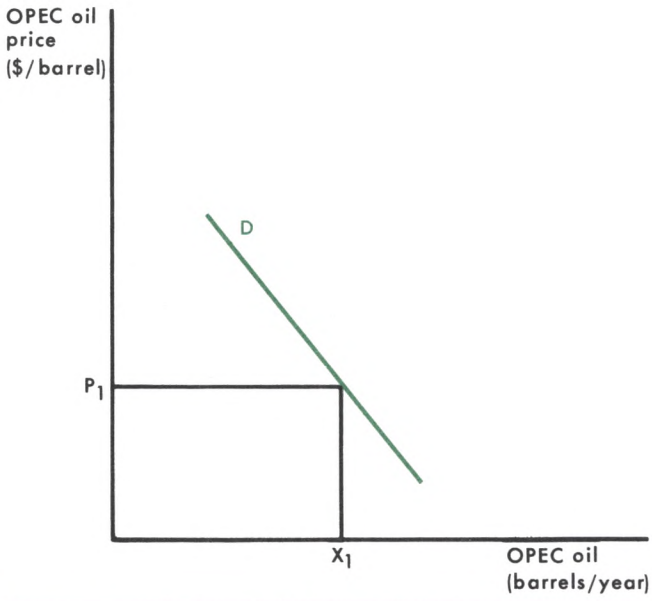
A price leader, dominant firm in an industry, or a cartel is limited in its incentive to raise prices by the supply response of other producers and by the demand response of purchasers, since higher prices reduce the quantities demanded and increase the quantities supplied by competitors.[13] The OPEC cartel has benefited

[11]Bennett and Kuenstner, "Natural Gas Controls" show that the number of annual new residential gas customers declined sharply after 1970, from about 800,000 per year from 1960–69 to under 400,000 per year from 1975–77. Following phased decontrol and its attendant supply increases, hook-ups rose by more than 200,000 per year from 1978–80. Conversions to residential gas heating also were rationed under controls, declining from about 400,000 per year from 1960–69 to under 100,000 in 1977. Subsequently, these conversions surged to almost 600,000 per year by 1980.

[12]This estimate is derived in Ott and Tatom, "Are There Adverse Inflation Effects?" based on econometric evidence in Robert S. Pindyck, *The Structure of World Energy Demand* (Massachusetts Institute of Technology Press, 1979).

[13]The relevant theory of pricing applied here for the OPEC cartel is often referred to as the theory of the dominant firm. This is the theoretical basis for the results in Ott and Tatom, "Are There Adverse Inflation Effects?". For a more detailed discussion, see George J. Stigler, *The Organization of Industry* (Richard D. Irwin, Inc., 1968) or his *The Theory of Price*, 3rd ed. (Macmillan, 1966), especially chapter 13, appendix B and mathematical note 7. This theory has been used for OPEC in the studies cited in footnote 1 above, and in John A. Tatom, "Energy Prices and Capital Formation, 1972–1977," this *Review* (May 1979), pp. 8–9; Steven E. Plaut, "OPEC Is Not a Cartel," *Challenge* (November–December 1981), pp. 18–24; and Rodney T. Smith, "In Search of the 'Just' U.S. Oil Policy: A Review of Arrow and Kalt and More, *Journal of Business* (January 1981), pp. 87–116. Other discussions of OPEC pricing behavior include those in William D. Nordhaus, "Oil and Economic Performance in Industrial Countries," *Brookings Papers on Economic Activity* (2: 1980), pp. 341–99; Robert S. Pindyck, "Some Long-Term Problems in OPEC Oil Pricing," *Journal of Energy and Development* (Spring 1979), pp. 259–72; E. Hnyilicza and R. S. Pindyck, "Pricing Policies for a two-part exhaustible resource cartel: The case of OPEC," *European Economic Review* (August 1976), pp. 139–54; and Philip K. Verleger, "The Determinants of Official OPEC Crude Prices," *The Review of Economics and Statistics* (May 1982), pp. 177–83.

Figure 1
The Demand for OPEC Oil



from U.S. natural gas price controls because its price increases are not automatically matched by increased U.S. natural gas prices that would evoke larger gas supplies, and because the demand for OPEC oil is larger under U.S. natural gas price controls. As a result, OPEC has found it attractive to raise prices more than they would have if U.S. energy producers could compete with OPEC.[14]

Three factors, then, lower the world price of oil under U.S. natural gas decontrol: interfuel substitution, increased domestic energy production, and an increased responsiveness of U.S. energy production to changes in the world price of oil. These factors reduce the demand for OPEC oil and raise the responsiveness of the demand for OPEC oil to OPEC price changes.

The effects on the demand for OPEC oil and its price arise from some simple considerations of economic theory. World energy prices have been determined largely by OPEC oil prices since 1973; OPEC faces competition, however, from competing producers of oil, as well as from producers of close substitutes such as natural gas, coal and nuclear power. In this environment, a cartel acts as a "dominant firm," realizing that other producers will produce and sell as much of their products as they desire given the economic environment, including the OPEC oil price. Thus, OPEC faces a derived demand that, at each price of oil, is the difference between world demand for oil and the energy supply of other producers.

Given factors other than price that influence the demand for OPEC oil, a demand curve such as that shown in figure 1 can be derived. At higher prices, OPEC demand is smaller, because some competing producers of oil produce more and purchasers of world oil buy less. The latter reaction arises for two reasons: some users restrict activities in which they use oil, and other users switch to a more abundant supply from competing non-oil energy producers. OPEC, a dominant firm, sets its price for oil, taking these interactions into account as well as its cost of producing oil so as to maximize wealth (essentially the present value of its oil reserves). At such an optimal price, P_1 in figure 1, OPEC producers sell all the oil demanded of them.

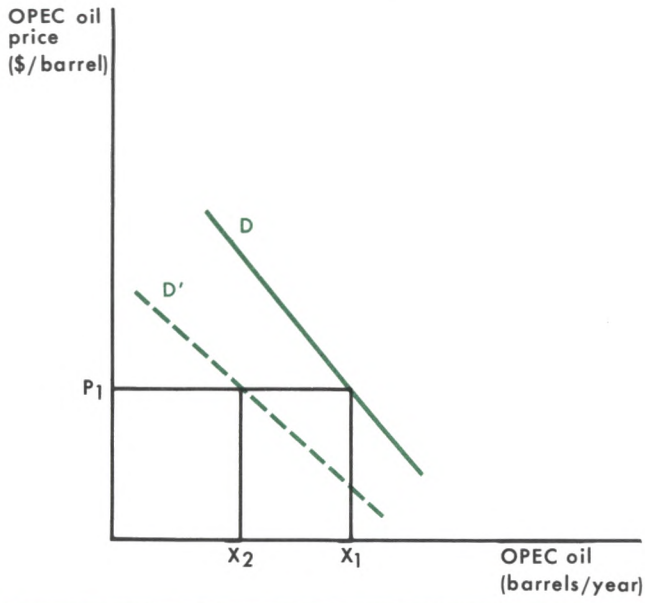
As a result of an effective ceiling price of natural gas, the supply of U.S. natural gas is smaller, and the U.S. and world demand for oil is larger than it otherwise would be. In addition, the responsiveness of world oil demand to changes in the OPEC price is reduced. The OPEC demand is larger (the curve is further to the right) and steeper under price controls. When the OPEC price rises above P_1, world oil demand and the residual portion facing OPEC cannot fall as much because there can be no increase in U.S. natural gas to compete with OPEC oil at higher energy prices.

Decontrol would reduce the component of U.S., world and OPEC oil demand created by controlled natural gas prices. The demand would shift from D to D′ in figure 2. Moreover, the responsiveness of OPEC demand would be increased so that the demand at price P_1 would become more responsive to OPEC price changes than under price controls. At any price, OPEC would find that their total receipts were more responsive to price changes. If the OPEC price is raised from P_1 along D′, U.S. natural gas prices would respond to individuals' attempts to use more gas and less oil, and U.S. natural gas producers would respond by producing more. If the OPEC price were lowered, sales of OPEC oil would expand more because some energy users would switch from U.S. natural gas to oil, natural gas prices would fall in line with oil, and U.S. natural gas producers would cut back production.

Both types of changes in the demand for OPEC oil would induce a lower price. Reductions in the market share of a dominant firm cause a bigger wealth loss if

[14]The analysis here assumes that OPEC acts as a dominant firm, but is unaffected if only some members of OPEC are the residual suppliers and price-setters while others are "price-takers," that is, producing all they desire at the OPEC price, like non-OPEC producers of oil.

Figure 2
U.S. Natural Gas Decontrol and Demand for OPEC Oil



prices are kept the same than if some of its market share is recouped by lowering the oil price somewhat and passing the revenue loss on to competing producers of oil and energy. In effect, OPEC would replace the output of their competitors as well as filling any increase in energy demand due to the lower energy prices with enlarged OPEC production. In addition, the revenue increase from any OPEC price cut would be enhanced, because OPEC could displace high-cost U.S. natural gas through their pricing actions.

An Earlier Example: U.S. Crude Oil Decontrol

The decontrol of the U.S. market for crude oil in February 1981 provides a useful test of these hypotheses.[15] In that instance, the analysis is simpler and the effects are smaller than would be the case with natural gas decontrol. Prior to decontrol, domestic crude oil prices were determined through an entitlement system so that oil sold for the same weighted average price for almost all purchasers, regardless of the source. Thus, the allocation of controlled oil was more efficient than is currently the case with natural gas; each purchaser paid the same price for crude oil. This meant there was no artificially induced demand for crude oil created by restricting the availability of the controlled crude to some purchasers. At a price above the controlled price received by sellers of domestic crude but below the import price, any purchaser could buy as much or as little crude oil as desired.

In other respects, however, the analysis is virtually the same: decontrol allowed domestic production and prices to be responsive to world prices. As a result, the demand for OPEC oil fell, given the OPEC price, as U.S. oil purchasers reduced quantities demanded and U.S. producers expanded the quantities supplied. More important, the effective responsiveness of U.S. oil producers to changes in OPEC prices was increased. Thus, the demand for OPEC oil shifted as described in figure 2, leftward and flatter. Both changes reduced the OPEC price.

The sequence of oil price movements in the United States following decontrol was dramatic. In February 1981, the cost of imported crude oil to refineries was $39.00 per barrel, while the cost of domestic oil in January, the month prior to decontrol, was $32.71 per barrel. At the time of decontrol, there was concern that domestic prices of oil would rise to eliminate the discrepancy between domestic and imported oil. The domestic oil cost did rise, but peaked at $36.97 per barrel in March. The world price, however, fell steadily, as did the domestic price after March. Within five months, the average cost of crude oil had fallen below its level in the month before decontrol. In June 1982, the average refiner acquisition cost was below the controlled domestic price in January 1981; that is, the free-market U.S. price and the world price were *lower* than the controlled U.S. price had been in the month before decontrol. From the first quarter of 1981, when decontrol occurred, to the third quarter of 1982, the refiner acquisition cost of imported oil fell 14.4 percent, despite a rise in the U.S. price level of 9.7 percent; that is, the real price of imported or world oil has fallen 22 percent since decontrol.

Some observers attribute the recent decline in real oil and energy costs to the worldwide recession rather than the decontrol of the U.S. crude oil market. Such a view is inconsistent with the historical evidence. Before 1974, the producer price index for crude oil and for fuels, related products and power (deflated by the implicit price deflator for business sector output) exhibited no cyclical tendencies, at least in terms of a significant statistical relationship to measures of slack such as the Federal Reserve Board index of capacity utilization or the unemployment rate.

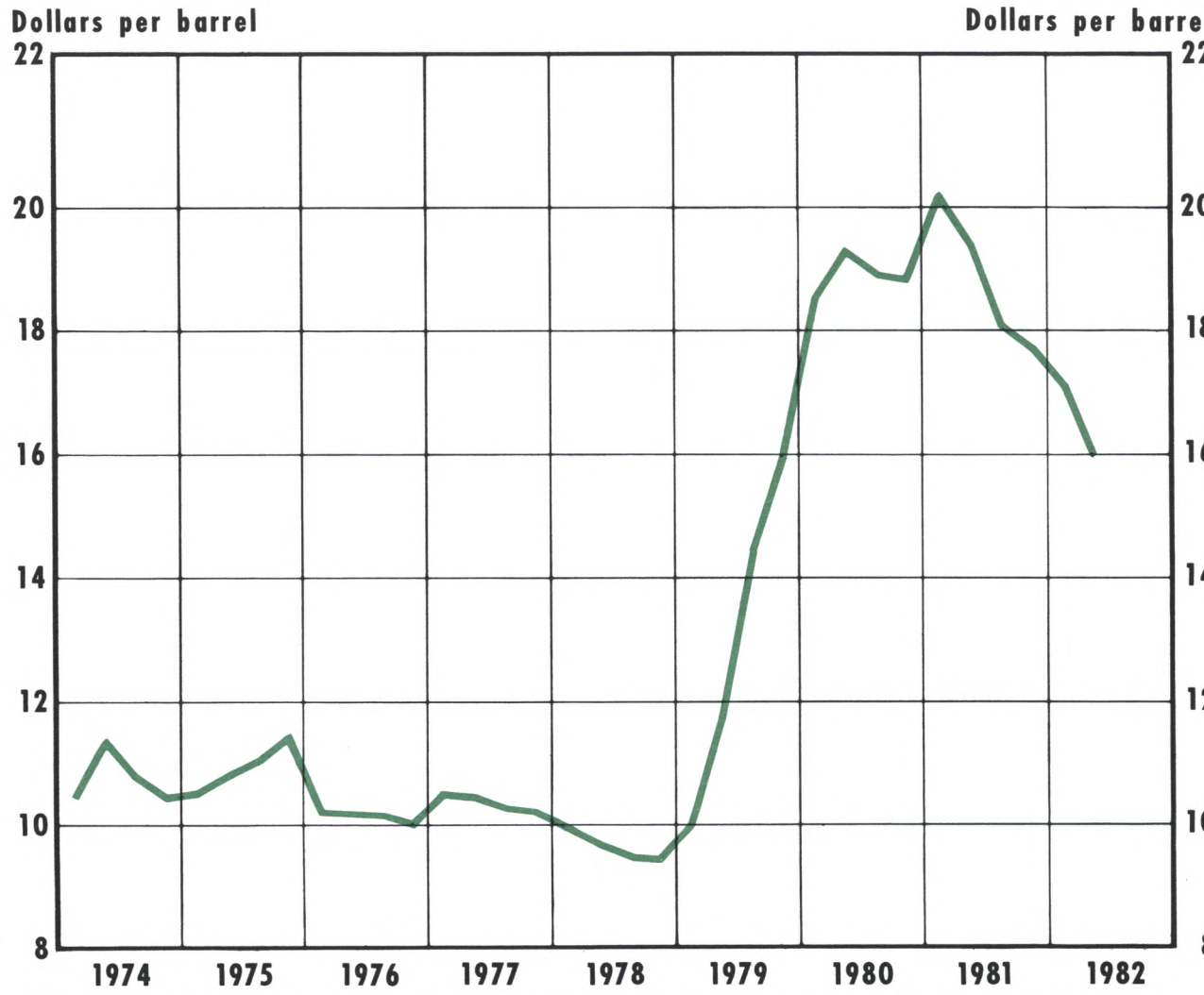
Chart 2 shows the U.S. refiner acquisition cost of imported oil deflated by the business sector deflator

[15]See also Tatom, "Energy and Its Impact on Economic Growth."

Chart 2

Real Oil Prices [1]

(1972 dollars)



[1] Refiner acquisition cost of imported crude oil deflated by the implicit price deflator for private business.

from 1974 to the second quarter of 1982. The real price of oil during the period of OPEC control has not been cyclical, contrary to the recent cyclical explanation of falling OPEC prices. For example, a cyclical view would have required a falling price in the 1974–75 recession and rising prices during the cyclical expansion from 1976 to 1980. Contrary to this view, chart 2 shows a slight downtrend in prices from 1974 to the end of 1978, a sharp rise in 1979 and early 1980 and again in early 1981. Until the first quarter of 1981, the pattern is easily explained by a moderate erosion of the dominant firm's market share in the oil and energy markets due to competition and then, when the output of Iran and Iraq declined sharply after 1978, by a major rise in demand faced by other OPEC members.[16]

[16]Cyclical movements in world oil prices, however, are not inconsistent with the underlying economic theory. Given prices, a cyclical decline in world oil demand falls principally on the OPEC market share. Because the responsiveness of demand for OPEC oil is raised by such a change, a cyclically lower world price would be optimal. The point above, however, is that the possibility for such cyclical movements has been dominated by other developments.

Table 5
Energy Price Effects of Natural Gas Decontrol

	Alternative Assumptions of the Own-Price Elasticity of Natural Gas Supply, ε_G			
	0.0	0.2	1.0	2.0
U.S. price of natural gas				
Electric utilities	37.0%	31.7%	9.7%	−12.7%
Residential heating	20.8	17.9	5.7	−7.8
World price of crude oil	−22.5	−25.5	−37.9	−49.4
U.S. price of energy (fuel, related products and power)	−9.2	−11.8	−22.4	−41.6

NATURAL GAS DECONTROL: INCLUDING THE INDIRECT EFFECTS

The extent of the decline in the world price of oil due to decontrol depends on the responsiveness of OPEC oil demand to changes in the OPEC price, the responsiveness of U.S. natural gas supply to changes in the U.S. price of natural gas, and the effect of decontrol on the former. The OPEC oil demand is more responsive (elastic) to changes in the OPEC price, the larger the responses of world demand for oil or competitors' energy supplies to changes in the OPEC price, or the smaller the market share of the price-setter in the world oil market.

Many behavioral parameters are required to estimate the pattern of oil and gas price changes that occur when decontrol closes the gap between oil and gas prices. Depending on the magnitude of these parameters, the gap will be closed by relatively more downward pressure on oil prices, and less upward pressure on gas prices. Indeed, if the responsiveness of U.S. natural gas supply is large enough, the gap will be closed, with oil prices declining to equal a *lower* price of U.S. natural gas.

For a broad range of parameter estimates, the price of natural gas rises substantially less than a conventional estimate like that in table 4. More important, under no plausible conditions does the overall index of energy prices rise due to decontrol; the depressing effect of decontrol on the world oil price and, hence, on the prices of all petroleum products and other competing energy sources outweighs any upward effect of decontrol on the price of U.S. natural gas.[17]

For example, table 5 reports the percentage changes in the U.S. relative price of natural gas, the world relative price of crude oil, the U.S. relative price of energy, and the price of gas for residential heating with some standard assumptions about the relevant responses.[18] The effect of the size of responses of U.S. natural gas supply to changes in its price, the own-price elasticity of U.S. natural gas supply (ε_G), is shown by considering four values ranging from no response whatsoever (ε_G is 0), to a fairly sizable response (ε_G is 2).[19] The first column of table 5 shows that, for a completely unresponsive natural gas supply, the gap between gas and oil prices is closed by fairly similar

[17]The downward pressure on oil prices dominates any upward pressure on gas prices because, while U.S. production of oil and gas are similar on a BTU basis, oil consumption is much larger, especially in production of marketed output. The hypothesized decline in overall energy prices due to decontrol is quite robust and virtually independent of parameter assumptions. In the appendix to Ott and Tatom, "Are There Adverse Inflation Effects?" equation 1.6, sufficient (not necessary) conditions for a fall in energy prices are that the U.S. elasticity of supply of natural gas exceed that for oil and that the elasticity of demand for OPEC oil is less than 2. Of the many unresolved debates on the size of energy market parameters, these two are perhaps the most readily agreed upon.

[18]These assumptions include an elasticity of world oil demand of 0.5, an elasticity of supply for competitors of 0.2, and a market share for OPEC set at the relatively low level in IV/1981 of 39 percent. The latter assumption reduces the magnitude of the oil price response substantially. Alternative parameter values are discussed in the appendix to Ott and Tatom, "Are There Adverse Inflation Effects?".

[19]The percentage change in the supply of U.S. natural gas is a function of the percentage point rise in its price, so that a 10 percent rise in the U.S. natural gas price is assumed to increase supply by 0 percent, 2 percent, 10 percent or 20 percent, if ε_G is 0, 0.2, 1.0 or 2.0, respectively. Paul A. MacAvoy and Robert S. Pindyck, "Alternative Regulatory Policies for Dealing with the Natural Gas Shortage," *The Bell Journal of Economics and Management Science* (Autumn 1973), pp. 454–98, and MacAvoy and Pindyck, *The Economics of the Natural Gas Shortage*, present evidence that shows this elasticity is unity under a phased decontrol experiment. Under immediate decontrol, it would be larger for reasons given in footnote 2.

increases in the price of natural gas for electric utilities and decreases in world oil prices. Even without a response by U.S. natural gas producers to decontrol, energy prices decline.

At the other extreme in which natural gas supply is quite responsive, all prices are shown to decline substantially; the decline in energy prices is about the same magnitude as the increases associated with each of the two OPEC price shocks since 1973. There exists an intermediate supply elasticity, an ε_C of 1.6, at which the natural gas price would be the same after decontrol as its controlled level.[20] Focusing on the middle elasticities, most of the effect of decontrol is to lower oil prices rather than raise gas prices, with energy prices declining by between one-eighth and one-quarter.

The macroeconomic effects of decontrol are considerably smaller and less sensitive to the parameter assumptions. Natural gas decontrol, based on prices prevailing at the end of 1981, would lower the relative price of energy. The principal macroeconomic effects would be to lower the general level of prices and to raise potential output. For the middle two cases in table 5, the price level quickly declines 1.1 to 2.2 percent, so that a like reduction temporarily occurs in the inflation rate in the year following decontrol. Capacity output and productivity are raised by similar amounts equally quickly. Due to a rise in the profitability of plant and equipment associated with lower energy prices, investment also would be raised temporarily, further increasing capacity output and productivity. The long-run effect of natural gas decontrol is to raise capacity output and productivity by 1.5 to 3 percent.

SUMMARY AND CONCLUSION

Natural gas decontrol cannot raise the price level. To raise prices of goods and services, decontrol would have to raise the relative price of energy resources and, thereby, reduce real output. The relative price of energy is determined in world markets and is based on the scarcity of energy resources. Since decontrol cannot reduce the energy supply, it cannot raise energy prices or the price level.

We have examined the conventional analysis of decontrol that assumes real oil prices are unaffected by U.S. energy policy. Under this worst-case scenario, wellhead prices would double, and delivered prices of natural gas would rise under immediate decontrol by up to 50 percent, raising the general level of prices by about 0.4 percent within one year, temporarily adding a like amount to measured inflation. When the effect of increased competition in world energy markets is taken into account, however, such a conclusion is reversed. Decontrol reduces the demand for OPEC oil, lowering the world price of oil and energy prices in the United States, even if natural gas prices are higher. Increases in natural gas prices are not even inevitable. Plausible values of the elasticity of U.S. natural gas supply could lead to a substantial increase in competition in the world energy market and lower the optimal price for world oil by more than the existing discrepancy between gas and oil prices.

The confusion over the price effects of natural gas decontrol arises from an incorrect analogy to the two surges in the real price of OPEC oil over the past decade. Decontrol of gas reduces the scarcity of energy resources rather than increasing it, so the correct analogy is the experience with decontrol of the U.S. crude petroleum market in 1981, which lowered world energy prices.

Relative gas prices may fall under decontrol but the more likely scenario is that they will rise 9.3 percent to 27.5 percent in relation to the prices of goods and services generally, while overall relative energy prices, as a result, will decline by about 12 percent to 25 percent. The analysis of energy effects on the macroeconomy leads to the conclusion that potential output will be raised as a result of decontrol by 1.5 percent to 3 percent, and the general level of prices would tend to be 1.1 percent to 2.2 percent lower than otherwise within about one year of full decontrol.

We have not been concerned here with the distributional implications of natural gas decontrol, but the general pattern of adjustments includes switching from gas to other forms of energy in many areas of production (and in residential uses), while users of gas that currently are constrained, especially industrial users and electric utilities, will tend to switch toward gas. The distributional effects of decontrol that arise from this broader analysis indicate that the issue is *not* consumers versus energy producers.[21]

[20] Intriguingly, an estimated elasticity of supply of new gas of 1.6 for the Oklahoma intrastate market was obtained by Chong Liew and Donald Murry, "An Econometric Model of The Intrastate Gas Market in Oklahoma," in Paul R. Lowry and Shirley Stanphill, *Regional Supply and Demand of Coal and Petroleum for Energy Production* (Bureau of Business and Economic Research, Memphis State University, 1979).

[21] For a discussion of distribution effects of natural gas decontrol under the conventional assumption that oil prices are unaffected, see J. A. Stockfisch, "The Income Distribution Effects of a Natural Gas Price Increase," *Contemporary Policy Issues*, a supplement to *Economic Inquiry* (October 1982), pp. 9–25. For interregional distribution effects, see Kalt, Lee and Leone, "Natural Gas Decontrol: A Northeast Industrial Perspective."

Some consumers (those who use relatively more gas and relatively less electricity, coal, oil and oil products both directly and in the goods and services they purchase) are likely to be affected adversely by natural gas decontrol. *Other* consumers (for example, users of relatively more gasoline and electricity both directly and in the goods and services they purchase) will benefit from decontrol.

Among energy producers, it is important to distinguish owners of wells from processors. Processors, such as gas pipeline companies and gas distribution companies, will likely face reduced profit margins temporarily and smaller markets, while gas well owners could gain by decontrol. In the oil sector, the refiners' market would tend to expand, improving profit margins temporarily, while owners of oil wells (including OPEC wells) will tend to be affected adversely by the removal of the component of their demand created by the regulatory constraint on competitors.