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The Quarterly Review is published by the Research and Statistics Function of the Federal Reserve Bank of New York. Among the members of the staff who contributed to this issue are SUSAN HICKOK *(on the consumer cost of U.S. trade restraints, page 1);* LEON KOROBOW *and* GEORGE BUDZEIKA *(on financial limits on interstate bank expansion, page 13);* DOUGLAS M. WOODHAM *(on the economic growth of Europe, page 28); and* CARL J. PALASH *and* LAWRENCE J. RADECKI *(on using monetary and financial variables to predict cyclical downturns, page 36).*

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The Consumer Cost of U.S. Trade Restraints

Record U.S. trade deficits and the four-year rise in the value of the dollar have led to strong pressures for changes in U.S. trade policy. Trade protection has now become a major political issue affecting both exports and imports. At the recent Bonn Economic Summit, for example, the United States pressed for a new round of multilateral trade liberalization, which would greatly help the U.S. agricultural and services export industries as well as world trade in general. In Congress, both the House and the Senate passed resolutions calling for Japanese action to increase access to its markets.

At the same time, however, U.S. industries ranging from costume jewelry to tuna have been requesting protection from international competition. Thus, for example, the U.S. steel industry recently obtained a major increase in restraints on imports of steel products while U.S. clothing producers are asking for much tighter import limits to be set under the 1986 renewal of the international apparel trade agreement (negotiations begin this summer). In Congress, legislation has been introduced for an across-the-board import surcharge to be levied on all imports.

Against this background, existing U.S. trade restraints call for careful examination. It is especially critical to understand the cost U.S. consumers are currently paying for protectionist measures if they are going to be asked to pay for further import restraint. The fact that the United States is asking for freer trade elsewhere only intensifies the need for a careful analysis of current U.S. import protectionist measures.

The consumer cost of U.S. import trade restrictions must be compared with the benefits of those restrictions in order to evaluate the restrictions' overall impact. Benefits include such considerations as jobs saved, producers' income gained, and tariff revenue earned. The consumer cost of trade protection, however, is not easily determined and requires complicated analysis in and of itself. Although there is an established theoretical framework for calculating this consumer cost, in practice many individual factors need to be considered and evaluated. In fact, estimates for the cost of earlier protectionist measures differ significantly and there are no estimates for recent protectionist actions.[1]

This article concentrates on the consumer cost of trade restraints rather than on their total effect. It makes consistent, up-to-date estimates of this cost for present major U.S. protectionist measures on clothing, sugar, and steel, as well as for recently ended automobile restrictions. The clothing, sugar, and automobile cost calculations estimate how much U.S. consumers paid for trade protection in 1984. For the steel restraints, which were enacted at the end of last year, the steel cost calculation provides an estimate of how much this protectionist measure will cost consumers in 1985.

[1]There are several reasons why consumer cost estimates for trade restrictions differ among analysts. Since supply and demand factors change over time, consumer cost estimates made using the same methodology but calculated at different times are apt to vary significantly. Moreover, the methodologies of the estimates are often markedly different themselves. Some analysts have compared U.S. import prices for protected goods with the prices these goods sell for in their own domestic markets. However, the more countries whose U.S. sales are constrained and the greater the differences in taxes and other selling costs between these markets and the United States, the more difficult this method of analysis is to perform. Other analysts have calculated the consumer cost of trade restrictions using tariff equivalents. Factors that can cause differences among estimates which are all based on this methodology are discussed in the box.

Surprising results emerge from this examination of protection's consumer costs. Although it is well known that consumers pay something for protection, the price turns out to be strikingly high. Conservatively estimated, trade restrictions on clothing, sugar, and automobiles alone forced U.S. consumers to spend $14 billion more on these products in 1984, albeit with some product quality-upgrading in return. The new steel restrictions will cost consumers $2 billion. Even more surprising than this high overall cost, however, is the regressive income distribution effect caused by the restrictions. Clothing, sugar, and automobile restraints are conservatively calculated here as equivalent to a 23 percent "income tax surcharge" for low income families last year as opposed to a 3 percent "income tax surcharge" for high income families.[2]

U.S. import restraints

The United States is not generally perceived to have high import restrictions. Its average tariff rate is only 4.4 percent for all industrial products. This is comparable to the average rates of other industrialized countries. The relatively low average rates are the result of a series of multilateral tariff reductions since the 1950s, conducted under the auspices of the General Agreement on Tariffs and Trade.

But despite its low average tariff level, the United States still has costly import restrictions due to exceptionally high tariffs on some goods and, more significantly, quantitative controls applied to a small but very important list of products. Other industrialized countries also provide strong protection to selected products and, again, the degree of U.S. protection is not high in international comparison. Moreover, some countries have a much stronger cultural bias against buying foreign products than does the United States. These countries have barriers to trade which are higher and much more difficult to penetrate than is suggested by their explicit protectionist measures alone.

Even though the United States has this generally low level of trade restraints, U.S. protection must still be judged as fairly onerous to consumers in terms of the percentage of total domestic consumption expenditures it affects. The costliest U.S. import controls are placed on apparel, sugar, and steel, and have just recently been removed from automobiles. These products alone account for about 10 percent of total U.S. consumption purchases.

The United States also has significant quantity and/or considerable tariff restrictions on dairy and meat products, mushrooms, tobacco, fruit juices, some fresh vegetables, clothespins, motorcycles, books and magazines, gasohol, and some cookware items. These restrictions currently have much less of an effect on the U.S. economy than do the clothing, sugar, and steel restraints. Cheese quotas were enlarged in 1979 and only in 1982 and 1983 did growing cheese imports reach quota levels. Meat imports have also not always met quota levels, although in some years voluntary export restraints have been negotiated to prevent this. Other products which do face significant import restrictions represent only a relatively small part of total U.S. consumption expenditure.

In recent years, however, there has been growing pressure to both deepen and widen restraints. The footwear, machine-tool, copper, shipbuilding, wine, costume jewelry, shrimp, and tuna industries, among others, have all requested additional protection. There are also proposals for a domestic content requirement for U.S. automobile sales and an across-the-board 20 percent import surcharge on imports of all goods. Taken together with the products listed above, a growing net of protection is suggested, touching many areas of U.S. consumption, either directly or through intermediate products.

Estimates of the consumer cost of major U.S. trade protection

The consumer cost of major U.S. trade protection can be measured by calculating the effect trade restrictions have had on the average consumer price of the protected goods. The consumer cost of protection can then be calculated as equal to the extra amount consumers pay for goods because of this protection-induced price rise.

There are three aspects to the change in a protected good's average consumer price. The first is the rise in import prices that accompanies trade restrictions. The second is the price differential some consumers pay when restraints cause them to shift from buying imports to buying higher-priced domestically-produced goods.[3] The third aspect is any rise in the price of domestically-produced goods which occurs because of reduced import competition.

[2]Low income families are defined as families whose income level is less than $10,000 a year. High income families are families with an income greater than $60,000 a year.

[3]This analysis assumes that trade protection does not change the total volume of purchases but only its distribution between domestically-produced goods and imports. Given the broad commodity aggregates to which U.S. protection is applied, this is not an unreasonable assumption. (If, instead, the total volume of purchases were altered by trade restraints, it would be necessary to undertake a detailed general equilibrium analysis of the lost consumer surplus due to protection.) This analysis also assumes that consumers do not value their switched purchases to domestically-produced goods differently from their original import purchases. If domestically-produced goods were generally valued more, the switchover cost of protection should be reduced by the amount of this extra value received by consumers. If imports were generally valued more, then the switchover cost should be increased by this extra value cost.

Tariffs versus Quotas and Calculation Specifics

Tariffs versus quotas

The consumer cost calculations described in the text apply to both tariffs and quotas, despite the fact that the two forms of trade protection have different effects on prices and, more obviously, on the cost of protection to society as a whole. The most striking difference between tariffs and quotas for society as a whole, although not affecting consumer costs, is the tariff revenue the protecting country could collect. This revenue offsets some of the consumer cost of tariffs. When quotas are used, this revenue goes to foreign producers instead.

The amount of tariff revenue lost last year because the United States employed quotas instead of tariffs was significant. The tariff equivalent of the quotas may be calculated to show the sum involved. Conservatively estimated tariff equivalents* suggest that in 1984 the United States relinquished potential tariff revenue of $1.8 billion to foreign apparel producers, over $250 million to foreign sugar suppliers, and $1 billion to Japanese automobile companies because quotas were used instead of increased tariffs.† With increased tariffs, this $3 billion could have been collected by the U.S. Government, offsetting 30 percent of the consumer cost of the quantitative restraints.

With more liberally estimated tariff equivalents for clothing and sugar, the tariff revenue lost becomes much larger. The liberal estimates suggest the total foregone tariff revenue reached over $7 billion last year. This would have offset 40 percent of the more liberally estimated consumer cost of the quantitative restraints.

Aside from this lost tariff revenue, tariffs and quotas also have different effects on prices because of their differing impact on market structure.‡ Under tariffs, foreign producers have an incentive to cut costs as much as possible in order to compete. Under quotas, foreign competition is muted by a limit to new entrants to the market. Quotas also tighten automatically as demand grows over time. For both reasons prices react differently to quotas than to tariffs. Nevertheless, these price differences should already be incorporated into the observed price increases used to calculate protection's consumer costs.

Quality-upgrading

One difference between tariffs and quotas which affects the consumer cost calculations is quality-upgrading. Quality-upgrading often occurs when quotas are introduced. This is because the producers of quota-restricted goods raise the price of these goods in proportion to the price elasticity of demand, allowing the producers to capture the goods' increased scarcity-value. Assuming that the price-elasticity of demand is constant, there will be a higher absolute price rise for more expensive, better-quality products. Producers, consequently, will earn a higher profit on these better goods and will ship more of them. Stated slightly differently, profit margins generally tend to be higher on more expensive goods. With supply limited by quotas, producers will sell more of these higher-priced items.

It is argued in the text that any quality-upgrading price rise should be included in the consumer cost of protection if consumers have no choice but to purchase that quality-upgrading. This is because, while marginal consumers may be willing to pay the added cost for improved quality, strictly low-price buyers are forced to pay it. Where goods of a lower quality are still available to consumers, the extra cost for quality-upgraded imports should not be considered an unavoidable cost of protection (even though some consumers may pay for some added quality they would have preferred not to purchase). The distinction in the latter case is that no one is forced to pay the higher price. To remove the quality-upgrading component of the observed rise in import price in this case, tariff equivalents can be calculated.

Tariff equivalents

Tariff equivalents of quantitative restrictions show the tariff rate that would be needed in order to cut import demand to the restricted supply level if no quantity restrictions were set. The tariff equivalent reflects the pure scarcity-value price rise that the quota-restricted producers are able to demand. The difference between the tariff-equivalent price rise and the actually observed price rise under a quota can, then, be attributed to quality-upgrading.

There are several considerations that should be noted

*The tariff equivalents of the sugar and automobile restraints are given in the text. The conservative clothing tariff equivalent, based on a 17 percent fall in imports and an import price elasticity of demand of -1, as discussed in footnote 5, is 20 percent. The more liberal clothing tariff equivalent, based on a 40 percent import fall, is 50 percent.

†These figures are calculated by multiplying the value of imports (excluding the extra cost due to protection) by the tariff equivalents of each product. The tariff equivalent for sugar equals the total estimated price increase due to quotas.

‡Quotas also make international trade, which is normally a countercyclical buffer to the domestic business cycle, procyclical. This is because quantitatively restricted imports do not rise during an upturn. With supply limited, price rises. This contrasts sharply to the classic textbook example of free trade which has imports service residual demand and domestic production totally immune to the business cycle. These extra consumer costs of quotas vary over time and, consequently, may not be incorporated into the observed price changes used to calculate the costs of protection at any given point in time.

Actual computation of the change in average consumer prices due to trade restrictions is complicated by the fact that the individual price rises and amount of purchases shifted from imports to domestically-produced goods are not directly observable. For instance, to measure the current cost of shifting purchases, the

Tariffs versus Quotas and Calculation Specifics *(continued)*

concerning the tariff equivalent approach to estimating the cost of restrictions. The tariff equivalent is calculated by dividing the protectionist-reduction of the quantity of imports purchased (multiplied by any tariff rate) by the import price elasticity of demand. It, consequently, depends very heavily on both the import price elasticity used and the assumption of how much the restriction has cut imports from what they otherwise would have been. Different studies have used different figures for each of these values, particularly when analyzing clothing restrictions. Their calculated tariff equivalents have, therefore, been very different.

Another consideration of import price elasticity estimates is that, even if correct, they are generally calculated from import regressions based on marginal changes. Since marginal purchasers usually have higher price elasticities of demand, such calculations may overestimate the elasticities relevant to large price and quantity changes. The resulting tariff equivalents will, consequently, be underestimated. Again, this is a particularly important problem for clothing tariff equivalent calculations.

The average price formula

The three price factors affected by protection—the change in import price, the switchover cost of some purchases from imports to domestically-produced goods selling for a different price, and the rise in the price of domestically-produced goods—can all be incorporated into an average consumer price formula. This formula shows the impact of each of these factors on the average price consumers pay for the good in question. The average price formula is:

$$\%P_{aver} = \frac{M\Delta P_m + P_m\Delta M + \Delta P_m\Delta M + D\Delta P_D + P_D\Delta D + \Delta P_D\Delta D}{P_mM + P_DD}$$

$$= \Theta(\%P_m) + \Theta(\%M) + \Theta(\%P_m)(\%M) + (1-\Theta)(\%P_D) + (1-\Theta)(-\%M)\frac{M}{D} + (1-\Theta)(-\%M)(\%P_D)\frac{M}{D}$$

with
- $\%P_{aver}$ = percentage change in average consumption price
- M = import volume
- ΔM = change in M due to restrictions
- $\%M$ = percentage change in M
- P_m = import price
- ΔP_m = change in P_m due to restrictions
- $\%P_m$ = percentage change in P_m
- D = domestic production volume
- ΔD = change in D due to restrictions
- P_D = domestic production price
- ΔP_D = change in P_D due to restrictions
- $\%P_D$ = percentage change in P_D
- Θ = import value share of total consumption

In this formula the total volume of purchases is assumed unaffected by trade restrictions. Consequently $\Delta M = -\Delta D$ (explaining the substitutions in the second equation above).

If information is available for the current levels of Θ and $\frac{M}{D}$ (after protection has been put in place) then the average price formula can be used to calculate the average price fall that would occur if restrictions were ended. This price fall can then be converted forward to give the implicit price rise which is attributable to the restrictions. This is generally the procedure that was followed in the text.§

In accordance with this procedure, the average price formula can be separated into its price components. The term $\Theta(\%P_m)$ shows the impact on average price of a change in import price. The terms involving a change in import demand,

$$\Theta(\%M) + \Theta(\%P_m)(\%M) + (1-\Theta)(-\%M)\frac{M}{D} + (1-\Theta)(-\%M)(\%P_D)\frac{M}{D}$$

show the impact of the switchover cost.

(They equal $\frac{(P_m + \Delta P_m - P_D - \Delta P_D)(\Delta M)}{P_mM + P_DD}$.)

The term $(1-\Theta)(\%P_D)$ shows the impact of the change in domestic price.

§Using the current levels of Θ and $\frac{M}{D}$ and working backward avoids the necessity of estimating what levels these ratios would have reached under free trade. Since the changes in price and quantities reported in the study are large, all percentages calculations are calculated from the midpoint between old and new levels, *i.e.*,

$$\%A = \frac{A_1 - A_0}{(A_1 + A_0)/2}$$

with
- $\%A$ = percentage change in A
- A_1 = new A value
- A_0 = old A value

Standard percentage changes from the original base level, rather than these midpoint calculated percentage changes, are reported in the text. This has been done by rebasing percentage changes derived from midpoint calculations to the original base level.

amount of demand presently being switched from imports to domestically-produced goods must be estimated. This amount will vary over time. Its current estimate must be based on the difference between current actual import demand and the level that demand would have reached under free trade (rather than the level of imports that occurred when restrictions were first put in place). An assumption, consequently, has to be made as to how much imports would have increased under free trade in order to calculate this aspect of the trade restrictions' cost.

A further complication in estimating trade protection's consumer cost is that changes in import price may reflect both increased scarcity-value due to restrictions as well as increased value due to an improvement in import quality. Import quality-upgrading sometimes occurs when quotas are placed on import sales. This quality-upgrading cannot automatically be assumed as a cost of protection because the consumer does receive a better product in return for the added expense. However, it is not clear whether the consumer would freely choose to pay for this extra quality or that he feels totally compensated for it.

This article assumes that the extra price consumers have to pay for increased quality is part of the cost of protection if consumers have no choice but to accept the added quality because cheaper, lower-quality products are not available. When cheaper products are available, the price rise due to quality-upgrading will not be considered a part of protection's consumer cost. For these latter goods, the tariff equivalents of the quotas will be calculated (box). They will provide an estimate of the price rise which is due solely to a protection-induced increase in scarcity-value.

Following are consumer cost estimates for the major U.S. protectionist measures affecting clothing, sugar, and steel and for the recently lifted measures on Japanese automobiles. These estimates are based on the methodology just described. In each case the effect of protection on the average consumer price of each product is first calculated, incorporating the three price factors listed above. An average price formula, described in the box, is used to do the calculations. It should be noted that this price formula requires information on the difference between the market volume and value shares of imports and domestically-produced goods, rather than their explicit price differential figure, to calculate the switchover cost. Therefore, volume and value shares, rather than their derived price differential figures, are given for the four protected commodities discussed in this article.

After the effect of protection on the average consumer price of each good is calculated according to the average price formula, the associated consumer cost due to this price rise is discussed. The consumer cost in each case depends directly on both the extent of the protection-induced price increase and on the total amount consumers spend on the protected good.

Clothing

U.S. clothing trade is conducted within the framework of the International Multi-Fiber Agreement (MFA). This agreement sets the guidelines for bilateral negotiations on import quotas. During the 1970s the United States negotiated MFA quotas with all of the world's major apparel producers, limiting the annual volume growth rates of most U.S. clothing imports. Up until 1983, growth rates were set at around 6 percent, but tighter limits, averaging 2 percent and under, were set in 1983 for the very large exporters—Hong Kong, Singapore, South Korea, and Taiwan. The clothing industry in the United States is currently pressing for even tighter restraints. On top of these quota agreements, the United States also imposes an average clothing tariff rate of 26 percent.[4]

The most obvious effect of clothing trade restrictions has been on import prices. Our estimates suggest current restrictions have led to a more than 108 percent increase in import prices above the level that would occur if the United States allowed the free entry of apparel. This 108 percent figure is based on a 65 percent rise in price due to quotas, with the remainder due to the clothing tariff. The 65 percent rise is calculated by taking the price increase in U.S. clothing imports from 1971, the year trade restraints were broadly put in place, until 1984 and then adjusting to leave out the effects of average U.S. clothing price inflation (as measured by the U.S. textile and apparel wholesale price index).[5] The resulting 65 percent import price increase is on top of the average U.S. clothing price inflation over 1971-84, and may be attributed directly to our import quotas.[6]

[4]This average clothing tariff rate is calculated by the U.S. International Trade Commission, as reported in Murray L. Weidenbaum, *Toward a More Open Trade Policy* (January 1983).

[5]It is assumed that exchange rate movements compensated for inflation rate differentials between the United States and its clothing trade parthers. This is likely since U.S. imported manufactured goods prices in U.S. dollar terms in general rose about the same as U.S. domestic manufactured goods prices during this time period. Deflating by the U.S. apparel wholesale price index should understate the relative clothing import price rise to the extent that import prices are themselves incorporated in this index.

[6]Tariffs do not affect this 65 percent figure as they were set prior to 1971. Import value data is from *Highlights of U.S. Export and Import Trade*, FT990, United States Department of Commerce. Import volume growth is from information supplied by the United States Department of Commerce. The U.S. textile and apparel wholesale price index is from the *Survey of Current Business*. Imported and domestic manufactured goods prices are from *International Economic Indicators*, United States Department of Commerce.

The 65 percent quota price rise incorporates both the rise due to increased import scarcity-value as well as the rise due to quality-upgrading. In the case of clothing, both price increases should be included in the consumer cost of protection. This is because imports have remained the least expensive apparel available to U.S. consumers even after the imposition of trade restrictions. Consumers who buy the strictly lowest-price goods available have, consequently, had no choice but to accept paying for upgraded quality.[7]

The 108 percent tariff and quota import price rise alone has been responsible for a large increase in average U.S. clothing prices. Using the average price formula discussed in the box, the clothing import price rise alone accounts for a 12 percent increase in average U.S. clothing costs.

The second aspect of protection's effect on clothing prices is the switched purchase cost because some consumers now buy higher-priced domestic goods in place of imports. This cost can be calculated from the difference between the volume and value ratios of imports to domestically-produced clothes. The difference between the two ratios shows the implied price differential between the two competing clothing supplies. Clothing imports equal about 25 percent of domestically-produced clothes in value terms versus about 45 percent in volume terms. This suggests a large price differential between imports and domestically-produced apparel.

An estimate of the total amount of purchases switched is required, along with these ratios, to calculate the switchover cost of protection. Since the volume of clothing purchases is assumed unaffected, this switchover amount is directly equal to the amount of the import reduction due to trade restrictions. A conservative estimate of this import reduction figure may be made by assuming that during the period from 1971 to 1984, real clothing imports would have grown at the same rate as real total manufactured goods imports if there were no clothing trade restrictions. Clothing imports actually grew 17 percent less, suggesting restrictions cut imports by at least 17 percent.

Table 1

The Effect of Clothing Restrictions

Restrictions	26 percent tariff plus a quantitatively-restricted growth rate
Impact on import price	108 percent increase
Volume ratio of imports to domestic production	45 percent
Value ratio of imports to domestic production	25 percent
Implied price ratio of imports to domestic production	55 percent
Impact on domestic production price	None
Low average price rise estimate	17 percent
Low consumer cost estimate	$8½ billion
High average price rise estimate	25 percent
High consumer cost estimate	$12 billion

A more liberal but equally reasonable assumption about likely clothing import growth would be that clothing imports would have increased their U.S. market share to the same extent as did non-rubber shoe imports, or two and one-half times, in the absence of trade restrictions.[8] This assumption implies clothing imports have been cut almost 40 percent, with a much higher associated switchover cost of protection.

Using the conservative assumption about likely import growth with the 45 percent volume and 25 percent value ratios in the average price formula suggests that the switchover cost alone has led to a 5 percent rise in average U.S. clothing prices. The more liberal assumption about likely import growth with the same value and volume ratios translates into a 13 percent average price increase due to protection's switchover cost.

The final price factor that must be considered is protection's impact on domestically-produced clothing prices. A conservative assumption would be that sharp domestic competition has kept domestic prices in line with production costs despite trade restraints. Consequently, no domestic price rise will be attributed to the trade restrictions.

Using the average price formula to calculate protection's overall effect, the 108 percent tariff and quota

[7]The 65 percent price rise may be divided into its scarcity-value and quality-upgrading components by calculating the tariff equivalent of the quotas. For this tariff equivalent calculation an import price elasticity of -1, as estimated by Kreinen, is used. (Mordechai E. Kreinin, "Disaggregated Import Demand Functions—Further Results", *Southern Economic Journal*, Volume 40 [July 1973], pages 19-25.) Using a conservative assumption about the likely reduction of imports due to trade restraints, as is discussed later, quantity restrictions are assumed to have cut imports by 17 percent. The tariff equivalent resulting from this assumption is over 20 percent, implying a scarcity-induced price rise of this amount. Quality-upgrading, then, becomes responsible for the remaining 35 percent (equal to 1.65 divided by 1.20) of the price increase in imported clothes. A more liberal assumption about the likely reduction of imports is that they fell almost 40 percent. This changes the tariff equivalent scarcity-price increase to about 50 percent. Quality-upgrading is, then, responsible for only about 10 percent of the total price rise.

[8]Clothing and footwear both require about the same amount of capital and skilled labor to produce. Both also face similar demand conditions.

import price rise coupled with the conservative assumption about protection's switchover cost has resulted in a 17 percent rise in average U.S. clothing prices. Using the more liberal assumption about the switchover cost raises this figure to 25 percent.[9]

U.S. consumers spent about $60 billion on clothing in 1984. Consequently, the consumer cost associated with the protection-induced increase in average clothing prices was very high last year. Under the conservative growth assumption, consumers paid 17 percent or $8½ billion—calculated as ($60 billion / 1.17) × .17—more than they would have to if the United States had allowed the free entry of clothing imports. With the more liberal switchover cost assumption, this consumer cost goes up to 25 percent or $12 billion (Table 1).

Sugar

Sugar sales to the United States are controlled by a U.S. sugar quota imposed in 1982.[10] As a result of this quota the domestic U.S. sugar price rose to over 20¢ a pound last year while the world sugar price averaged a depressed 5¢. Since sugar is a fairly homogenous commodity, selling at a uniform price regardless of whether it is imported or domestically-produced, computing the price effect of the sugar quota is very straightforward. There is no need to calculate switched purchase costs, quality-upgrading effects, or different import and domestic price changes. Trade restraints simply raised the U.S. (import and domestic) sugar price by 400 percent.[11]

This 400 percent price effect may be somewhat misleading from a longer-term perspective, however. Wide cyclical price swings are normal in the international sugar market. The current international sugar price is very low. If this price follows past cyclical behavior it is likely to rise in the future. Although many factors will influence future supply and demand conditions as well as price, a conservative long-term price effect estimate of sugar protection may be made by using a base year price which appears relatively normal compared to sugar's high and low price extremes. The most appropriate year for this purpose is 1977.[12] Using the 1977 base world price for sugar and allowing for inflation since then, a reasonable estimate of a cyclically-adjusted international sugar price would currently be around 15¢ a pound.

If 15¢ a pound is taken as a conservative normal "long-run" world sugar price, then U.S. import quotas have raised U.S. sugar prices over 30 percent. Since U.S. consumers spent over $4 billion on sugar in 1984, restrictions cost them about $1 billion last year—calculated as ($4 billion/1.30) × 0.30. If the same calculation is done using the actual rather than the cyclically-adjusted world price level, trade restrictions would be held accountable for $3 billion in added consumer cost.

Steel

In the case of steel, the United States signed a quota agreement with the European Community in October 1982. This limited European steel imports to roughly 5½ percent of the U.S. market (down from 7.3 percent). At the same time, Japan initiated a system of voluntary steel export restraint in order to avoid more direct American trade action. It, too, aimed at a U.S. market share around 5 percent (down from 6.8 percent).

While these measures substantially reduced European and Japanese steel sales to the United States, steel sales by developing countries soared in their place. The latter sales elicited charges by U.S. steel producers of dumping and other unfair trade practices. In September 1984, the United States announced its intention to negotiate voluntary export restraint agreements with its other steel suppliers to limit imported steel to the United States to 18.5 percent of the U.S. market.[13] During 1984 steel imports averaged 25 percent of the market.

Since these negotiations are still going on, the price effect of steel restraint has not yet been estimated from observed price changes. Nevertheless, tariff equivalent calculations may be used to gain an idea as to what the effect on import price is likely to be. The tariff equivalent

[9]Earlier studies, employing different methodologies, give estimates of the import price rise due to clothing protection during the 1970s. By comparing U.S. clothing import prices with the prices of clothes in several Asian domestic markets, Mintz estimated that protection raised U.S. import prices about 5 percent in 1972 and Turner estimated the rise at between 6 and 43 percent from 1970-77, depending on the year. Based on tariff equivalents, the Council on Wage and Price Stability estimated imported clothing prices rose about 3 percent during the first year of restraint while Morici and Megna estimated they rose 15 percent by 1978.

Ilse Mintz, *U.S. Import Quotas: Costs and Consequences*, American Enterprise Institute for Public Policy Research (1973); Charlie G. Turner, "Voluntary Export Restraints on Trade Going to the United States", *Southern Economic Journal*, Volume 49, No. 3 (January 1983); Council on Wage and Price Stability, *A Study of the Textile and Apparel Industries* (1978); Peter Morici and Laura L. Megna, *U.S. Economic Policies Affecting Industrial Trade*, National Planning Association Committee on Changing International Realities (1983).

[10]Prior to 1982, U.S. domestic sugar producers were aided by government price supports.

[11]This assumes that the end of U.S. trade restrictions would not raise world sugar prices. Given the current world surplus of sugar, this is not an unreasonable assumption. It should be noted that the production costs of U.S. domestic sugar producers are much higher than 5¢ a pound.

[12]Morris E. Morkre and David G. Tarr suggest 1977 as an equilibrium year in *Staff Report on Effects of Restrictions on United States Imports*, Federal Trade Commission (1980).

[13]This does not include unfinished steel slabs. Including these slabs, imports are allowed a 20.5 percent market share.

Table 2

The Effect of Steel Restrictions

Restrictions	Imports quantitatively restricted to an 18.5 percent market share
Impact on import price	5 percent increase
Impact on domestic production price	4 percent increase
Average price rise estimate	5 percent
Consumer cost estimate	$2 billion

Table 3

The Effect of Automobile Restrictions

Restrictions	Quantitative limit of 1.85 million Japanese car imports allowed a year
Impact on import price	10 percent increase
Impact on domestic production price	4 percent increase
Average price rise estimate	5 percent
Consumer cost estimate	$4½ billion

will show only the import price rise due to increased scarcity-value. No estimate will be made for a possible quality-upgrading price increase. The estimated import price rise, consequently, may be lower than the actual rise that will occur.

To compute the tariff equivalent of the steel restraint, the likely level of steel imports in the absence of restrictions must be estimated. It will conservatively be assumed to be that level which would maintain imported steel's 1984 U.S. market share of 25 percent. This is a conservative estimate because imported steel has been rapidly gaining sales as steel plants come on line in many developing countries. The tariff equivalent of the steel restraint, based on this volume assumption and a $-4\frac{1}{2}$ percent import price elasticity of demand as estimated by Crandall, is approximately 5 percent.[14] Steel restrictions will raise imported steel's price about 5 percent. Using the average price formula, the average consumer price rise due to this factor alone is 1 percent.

Sufficient data is not yet available to calculate the purchase switchover cost of the new steel restrictions.[15] Consequently, this cost will not be estimated. The overall consumer cost of steel protection will be understated to this extent.

The third price factor to consider is a rise in the price of U.S. domestically-produced steel. Donald Trautlein, the chairman of Bethlehem Steel, has stated that an $18\frac{1}{2}$ percent quota would probably result in a 5 percent increase in total (domestic and imported) U.S. steel prices due to a sharp rise in the price of domestically-produced steel.[16] This suggests a domestically-produced steel price rise of about 4 percent.

U.S. steel purchasers currently spend about $40 billion a year for steel. An overall average steel price rise of 5 percent would be a heavy consumer cost for these purchasers to pay. It would add $2 billion annually to their steel bill (Table 2).

Automobiles

U.S. import restrictions on Japanese automobiles expired at the end of March. These restrictions, in the form of a voluntary export restraint agreement the United States negotiated with Japan, had been in place since April 1981. The agreement limited Japanese sales to the United States to 1.85 million cars a year. This was down about 10 percent from the number sold during the year before the agreement, and down much more from what would have been the likely sales level in the resuscitated U.S. automobile market in 1984. Japanese car sales last year accounted for about 17 percent of the total volume of U.S. car purchases.

Japanese car export prices increased substantially due to the quota. These prices were about $2,200 or 53 percent greater in 1984 than in 1980. During that same time the dollar price of other Japanese manufactured goods exports actually fell about 3 percent. Consequently, the quota may be held responsible for all of the increase in Japanese automobile prices.

The 53 percent price rise for Japanese cars reflects both increased prices due to higher scarcity-value and quality-upgrading. However, since higher-quality Japanese cars are no longer the lowest-priced cars available in the United States, their quality-upgrading price rise cannot simply be assumed to have been forced upon consumers who buy the strictly lowest-priced units possible. That part of the Japanese car price rise which

[14]Robert W. Crandall, *The U.S. Steel Industry in Recurrent Crisis*, The Brookings Institution (1981).

[15]The Department of the Census has not yet published 1984 data on the value of U.S. domestically-produced steel shipments. The 1983 numbers on domestic and foreign shipments are an inappropriate base for calculations because of significant price changes last year. Data for 1983 does suggest the switchover cost at that time would have raised average steel prices in the United States by 1 percent.

[16]*The New York Times* (October 9, 1984), Section D, page 1.

was due to quality-upgrading should, therefore, be subtracted out in order to conservatively estimate the consumer cost of the trade restrictions.[17]

Again, the tariff equivalent may be calculated to estimate the increased scarcity-value component of the total rise in import price. For this calculation an import volume reduction figure of 30 percent will be used. This 30 percent reduction is based on the assumption that Japanese automobile sales would have grown at the same rate as total (domestic and foreign) U.S. automobile purchases in the absence of trade restraint. Their actual level was 30 percent less. Combining this 30 percent import fall with an import price elasticity of demand of −2.53, as reported by Cline, Kawanabe, Kronsjo, and Williams, results in a tariff equivalent of 10 percent.[18] Increased scarcity-value, then, accounts for 10 percent of the total rise in Japanese automobile prices. Quality-upgrading is responsible for the remaining 40 percent.[19]

The purchase switchover cost of the automobile trade restriction will not be calculated because a valid comparison cannot be made between the price of imported Japanese cars and the average price of U.S. domestically-produced cars. Size differences are too great. Imported Japanese cars are generally small whereas the average U.S. domestically-produced car price will be based on cars of all sizes, including some very large vehicles. Without specific information on the price differential between Japanese cars and the actual domestically-produced small cars that consumers view as their substitute, no legitimate switchover cost estimate can be made.

A significant estimate, however, can be given for the quota-inspired rise in the price of U.S. domestically-produced cars. The oligopolistic nature of the U.S. automobile industry allowed this domestic price rise to occur. Robert Crandall estimated that U.S. domestically-produced automobile prices rose over 3 percent by 1983 due to import restrictions.[20] Following his methodology of comparing relative changes in U.S. car prices with relative changes in the U.S. Consumer Price Index, by 1984 the car quota raised U.S. domestically-produced car prices by 4 percent.

Combining both the 10 percent import and the 4 percent domestically-produced car price rises in the average price formula suggests that trade restrictions increased average U.S. car prices by 5 percent last year (with the import price rise alone responsible for a 1 percent average price increase). U.S. consumers spent about $100 billion in 1984 on automobiles. If prices were 5 percent higher due to restrictions, then $4½ billion of this amount was the consumer cost of automobile trade restraint (Table 3).

Summary of consumer cost calculations

The above calculations suggest that the total consumer cost of U.S. trade restrictions is very high. Conservatively estimated, it summed to $14 billion in 1984 for clothing, sugar, and automobile restraints alone (Table 4). More liberal estimates raise this figure to almost $20 billion. This year the consumer cost of clothing and sugar protection will likely increase even further as growing demand tightens the impact of the quota restraints. The 1985 cost of automobile protection is unclear, depending on both the level of exports Japan may set and the growth of U.S. automobile demand.[21] But, consumers will begin paying an additional $2 billion a year in 1985 for increased steel protection. If the

[17]Removing the quality-upgrading price rise will underestimate the true consumer cost to the extent that lower-priced domestically-produced cars are perceived to be of lower quality than the pre-restriction Japanese imports.

[18]William R. Cline, Noburu Kawanabe, T.O.M. Kronsjo, and Thomas Williams, *Trade Negotiations in the Tokyo Round*, The Brookings Institution, Washington, D.C. (1978).

[19]Feenstra provides a detailed examination of automobile quality changes following the introduction of restraints using data showing car weights, type of transmission, presence of air-conditioning, etc. Robert C. Feenstra, "Voluntary Export Restraints in U.S. Autos, 1980-81: Quality, Employment, and Welfare Effects", National Bureau of Economic Research Conference on the Structure and Evolution of U.S. Trade Policy (December 1982). He concludes that these changed characteristics accounted for about two-thirds of the rise in Japanese automobile prices above that of U.S. domestically-produced car prices during the first year of quotas.

[20]Crandall provides a thorough discussion of the impact of the car import restrictions on the U.S. domestic automobile industry through 1983. Robert Crandall, "Import Quotas and the Automobile Industry: The Costs of Protectionism", *The Brookings Review* (Summer 1984).

[21]Since this export ceiling level is set by the Japanese government, it does not violate U.S. anti-trust regulations.

Table 4

The Consumer Cost of Trade Restrictions

Commodity protected	Total consumer purchases	Assumptions	Effect on average consumer prices of the restrictions	Consumer cost of the restrictions
Clothing	$60 billion	low	17%	$8½ billion
		high	25%	$12 billion
Sugar	$4 billion	low	30%	$1 billion
		high	400%	$3 billion
Steel	$40 billion	*	5%	$2 billion
Automobiles	$100 billion	*	5%	$4½ billion

*Not applicable.

consumer cost of other U.S. trade restraints not discussed here is added, the overall consumer cost of trade restraints goes even higher. Clearly, U.S. trade protection is very expensive.

The consumer cost of trade protection and income distribution

The consumer cost of U.S. trade protection is more than just expensive, however. Its income distribution effect must also be considered. Import restraints are sales taxes on the products protected and, as is the usual case with sales taxes, they are regressive. Their regressiveness can be measured by examining the "income tax surcharge" equivalents of the consumer costs to various income groups.

The "income tax surcharge" equivalents are calculated by weighting the price increases of the protected goods by the average share each item commands in the average income of various income groups.[22] The weighted figures show the cost of protection as a per-

[22]The latest detailed breakdown of consumer expenditure by commodity is the *Consumer Expenditure Survey of 1972-73*. It is assumed here that expenditure patterns have not changed since then. Steel is not included because the table refers to 1984 trade protection and also because a consumer breakdown of steel purchases, in the form of automobiles and appliances, etc., is not available. Table 5 provides the income ranges listed in the *Survey* and their approximate 1984 equivalents. The latter are derived from inflating 1973 levels by the CPI. Incomes below $7,000 are not considered because non-monetary receipts, such as charity donations, distort the calculations.

Table 5

Tax Effect on Major U.S. Import Restrictions in 1984 Under Conservative Assumptions

Income group	Income range in 1972-73 consumer expenditure survey†	Cost of protection as a percent of income*			
		Clothing‡	Sugar	Automobiles	Total
1	$3,000-$3,999	1.06	0.20	0.30	1.56
2	$4,000-$4,999	0.94	0.17	0.33	1.44
3	$5,000-$5,999	0.94	0.16	0.29	1.39
4	$6,000-$6,999	0.88	0.14	0.36	1.38
5	$7,000-$7,999	0.90	0.12	0.34	1.36
6	$8,000-$9,999	0.86	0.11	0.33	1.30
7	$10,000-$11,999	0.84	0.10	0.36	1.30
8	$12,000-$14,999	0.78	0.10	0.32	1.20
9	$15,000-$19,999	0.78	0.08	0.30	1.16
10	$20,000-$24,999	0.76	0.07	0.28	1.11
11	$25,000 and over	0.64	0.04	0.20	0.88

Income group	Approximate 1984 equivalent income range based on consumer price inflation§	Applicable federal income tax rate‖	Income tax surcharge equivalent to cost of protection¶
1	$7,000-$9,350	6.90	23%
2	$9,350-$11,700	8.48	17%
3	$11,700-$14,050	9.64	14%
4	$14,050-$16,400	10.62	13%
5	$16,400-$18,700	11.49	12%
6	$18,700-$23,400	12.73	10%
7	$23,400-$28,050	14.56	9%
8	$28,050-$35,100	16.66	7%
9	$35,100-$46,800	19.93	6%
10	$46,800-$58,500	23.50	5%
11	$58,500 and over	30.70	3%

*The percent increases in prices due to protection multiplied by percentage of income spent on each product as calculated from the *Consumer Expenditure Survey*, multiplied by 100.

†*Consumer Expenditure Survey: Integrated Diary and Interview Survey Data, 1972-1973*, U.S. Department of Labor, Bulletin 1992 (1978).

‡The *Consumer Expenditure Survey* includes footwear with clothing. However, the United States has a 12 percent tariff on imported footwear which accounts for over 70 percent of total U.S. sales. Consequently the inclusion of footwear here does not seriously affect the results.

§See text footnote.

‖Married persons tax rate, filing jointly, calculated for the 1984 equivalent of the average income in each income group as listed in the *Consumer Expenditure Survey*; calculation based on IRS 1040 tax tables, assuming only standard deductions; married persons tax rate is used because the average family size in the *Survey* is three people.

¶Cost of protection as a percent of income divided by applicable federal income tax rate.

centage of income for each group. These protection "sales" tax rates are then expressed as a percentage of the federal income tax applicable to each income level to yield the "income tax surcharge" equivalent of protection.[23] Details are provided in Table 5.

The "income tax surcharge" calculations show that under the conservative price estimates discussed above—a 17 percent rise in clothing costs, a 30 percent rise in sugar costs, and a 5 percent rise in automobile costs—clothing restrictions, the sugar quota, and automobile restraint alone were equivalent to a 23 percent income tax surcharge on the lowest income group (incomes under $10,000 a year) in the United States last year versus a 3 percent income tax surcharge on the highest income group (incomes over $60,000 a year). This is a highly regressive result.[24]

[23]Three other studies have looked at the regressiveness of U.S. trade restraints. Norman Fieleke found U.S. tariff rates in 1967 and 1972 to be slightly regressive in "The Incidence of the U.S. Tariff Structure on Consumption", *Public Policy* (1971). He did not look at quantitative restrictions. David Richardson looked at the income distribution effect of tariff cutting proposals made during the Tokyo Round in *The Impact of Multilateral Trade Liberalization on U.S. Labor* written for the Committee on Finance, United States Senate (May 1977). Given the relatively low tariff rates at that time, he, not surprisingly, found the income distribution effect to be quite small. Don Clark looked at the distribution effects of both tariffs and quantity restrictions in "How Regressive are United States Distortions of International Trade?", *National Tax Journal* (June 1982). He found these restraints to be fairly regressive. However, he used a 1971 tariff and quantity restraint schedule. The major restrictions on sugar and clothing have either been put in place or significantly tightened since then.

[24]Since the estimated clothing price rise due to protection includes the effect of quality-upgrading, the "income tax surcharges" may be overstated by the value consumers place on extra quality. However, because low-income consumers are apt to value this quality less, the regressiveness of the restrictions is likely to be understated.

Using other reasonable assumptions about the price effect of protection leads to an even more highly inequitable income distribution effect. As shown in Table 6, import restrictions may have amounted to as much as a 66 percent surcharge on low income families while representing only a 5 percent income tax surcharge on higher-income individuals. These calculations are based on a 25 percent rise in clothing costs, the actual (rather than calculated cyclically-adjusted) 400 percent rise in sugar prices, and the same 5 percent rise in automobile costs. The actual sugar price rise gives a truer picture of the current inequitable tax burden being borne by lower income families.

Some final observations

The cost U.S. consumers are paying for trade protection on clothing, sugar, and automobiles has been shown to be both very high and very regressive. Conservatively estimated at $14 billion in 1984, it amounted to over 8 percent of total consumer spending on those goods. As an income tax surcharge, the consumer cost of protection was seven times as large for low-income consumers as it was for those with high incomes.

Trade protection, of course, cannot be evaluated only on the basis of the high costs to consumers. A detailed comparison must be made between these costs and any benefits in order to judge the overall impact of protectionist measures. As with costs, this requires a detailed and careful analysis of benefits on a case-by-case basis, which is beyond the scope of this article. However, a few observations may be helpful in considering benefits.

The two points usually made in favor of protection are that it is necessary to ensure fair competition in the face

Table 6

Tax Effect of Major U.S. Import Restrictions in 1984 Under Alternative Assumptions

Income group	1984 income range	Cost of protection as a percent of income				Income tax surcharge equivalent to cost of protection
		Clothing	Sugar	Automobiles	Total	
1	$7,000-$9,350	1.56	2.67	0.30	4.53	66%
2	$9,350-$11,700	1.38	2.27	0.33	3.98	47%
3	$11,700-$14,050	1.38	2.13	0.29	3.80	39%
4	$14,050-$16,400	1.30	1.87	0.36	3.53	33%
5	$16,400-$18,700	1.32	1.60	0.34	3.26	28%
6	$18,700-$23,400	1.26	1.47	0.33	3.06	24%
7	$23,400-$28,050	1.23	1.33	0.36	2.92	20%
8	$28,050-$35,100	1.14	1.33	0.32	2.79	17%
9	$35,100-$46,800	1.15	1.07	0.30	2.52	13%
10	$46,800-$58,500	1.12	0.93	0.28	2.33	10%
11	$58,500 and over	0.95	0.53	0.20	1.68	5%

of foreign subsidies and that it saves jobs. The notion of fair competition is vague since it is virtually impossible to determine what is fair. Different countries use different tax systems and provide various degrees of public services. The question of unfair subsidies is really a question of where to draw the line between these different policies.

The complexity of this issue is shown in the case of subsidized intermediate products used in manufactured goods exports. One such input, energy derived from local natural resources, is often sold at non-market prices to meet various domestic objectives. Such energy sales generally do not lead to trade partner complaints. But the provision of other subsidized intermediate products, such as domestically mined metals and other minerals, frequently raises strong protectionist objections.

As for the generally more widespread argument that trade protection saves jobs, several caveats are worth mentioning. The first is that protection does not guarantee that protected industries will not sacrifice the jobs of specific employees by moving to lower wage areas or by replacing these employees with machines.[25] The second is that foreign retaliation may decrease employment in U.S. export industries while protection is preserving jobs in import-competing industries. Finally, since protection raises prices, tighter macroeconomic policy aimed at reducing inflation may lead to a fall in employment for the economy as a whole even if some protected-industry jobs are saved.[26]

These observations suggest that the total economic benefits of trade protection may be less than frequently assumed, and perhaps not sufficiently large to offset the very high consumer cost. However, given the complex nature of the issues involved and the limited available evidence, it is difficult to reach firm conclusions on benefits associated with trade protection. Indeed, there is considerable room for more analysis in this area.

[25]Clothing protection did not have the benefit of saving many specific clothing jobs in the 1970s because much of the U.S. apparel

Footnote 25, continued

industry moved from New England to the southern states during that time. This finding is reported in Anne O. Krueger, "Protectionist Pressures, Imports and Employment in the United States", *Scandinavian Journal of Economics* (1980).

[26]Econometric studies by both Cable and Aislable suggest this negative overall impact of protection on employment. Their results are given in V. Cable, *Protectionism and Industrial Decline*, London (1983), and E. J. Aislable, "The Australian Tariff as a Selective Employment Policy Instrument: An Empirical Study", *Australian Economic Papers* (June 1984).

Financial Limits on Interstate Bank Expansion

The nation's banking system may be on the threshold of a major reduction of barriers to interstate banking. Regional agreements have been reached by many states to permit interstate acquisitions on a regional basis and the Supreme Court has upheld the constitutionality of an agreement which limits bank acquisitions to specific states. It would be a logical step for those agreements to be opened to outside banks and, eventually, for the nation to move to nationwide banking.

Despite the fact that the removal of legal barriers to bank expansion could be expected to have benefits, there are many reservations about interstate banking. Some observers have expressed concern that interstate banking would develop rapidly and result in the absorption of many regional and medium-sized banks that could otherwise be the nucleus of independent expansion and competition. It is feared that a small number of giant banking organizations would operate nationwide, each of them wielding great market power.

There has been considerable discussion of various legal and regulatory safeguards that could be put in place to protect against such developments. The safeguards include limits on the concentration of banking assets at both the state and national level. These types of safeguards remain relevant since even modest acquisition programs by major banking organizations could involve a concentration of ownership in individual states.

This article considers, from a strictly financial perspective, whether large banks would be able to bear the likely costs of absorbing a substantially increased share of the nation's banking assets if nationwide interstate banking were introduced. The analysis of several hypothetical merger scenarios suggests that a number of acquisitions which may seem large by today's standards could occur if interstate banking were allowed, but expansion by the major banks would, because of the costs involved, tend to be self-limiting. In contrast, it is also evident that the nation's large regional bank holding companies, because of strong earnings, capital, and share prices, are in a relatively favorable position to expand.

For example, our analysis indicates that while a modest expansion, say 5 percent, by one of the nation's top ten banking organizations may not involve severe financial constraints, larger bank acquisition programs would likely be much more difficult to carry out. As acquisition programs increase from the 5 percent level, specific types of financial constraints become increasingly important:

- There is a substantial potential for a dilution of stockholder interests in mergers through an exchange of shares if the buying bank's common stock is selling at a level below book value.

- Coverage of interest and/or dividends could decline sharply when large amounts of additional capital

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must be raised to finance the purchase at a substantial premium.

- The major banks may not be able to obtain low-cost capital on the strength of expected future growth.
- When the volume of new funds needed to finance an acquisition program looms large, it is likely to have increasingly adverse effects on costs through downward pressure on share prices as well as increased dividend or interest costs.
- A prospective combined organization, therefore, faces the task of having to increase its rate of return by a sizable amount after a merger to restore per-share and retained earnings to former levels.
- The capital/assets ratio of the combined organization would have to be maintained at levels which comply with bank and bank holding company regulatory guidelines.

High-performance regional banks may tend to be especially attractive targets (because high capital ratios and high rates of return would ease the acquisition costs). But, the larger the target and the larger the purchase premium over book value, which those same high performance companies typically command, the more quickly the attractiveness diminishes. Financial constraints become severe once a prospective acquisition (or series of acquisitions) by a major bank amounts to 20 percent of the acquiring bank's size and the purchase premium reaches 50 percent.

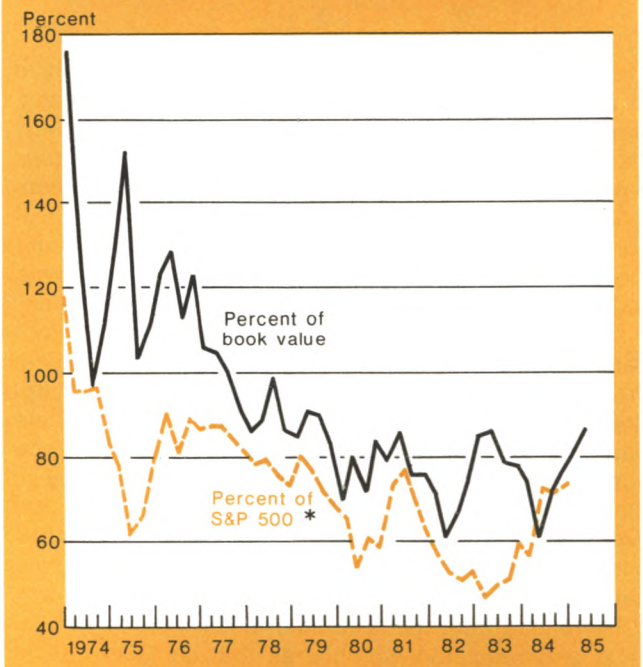
These types of constraints are not necessarily insurmountable. Dynamic factors such as a high rate of return at the target bank coupled with strong prospects for economies after the merger and favorable capital costs might be significant offsets. However, we estimate that efficiencies from such large-scale mergers would have to raise the rate of growth of net income at the combined organization by close to fifteen percentage points in the first year after the merger to restore retained income, eliminate earnings dilution, and provide funds for the gradual amortization of the purchase premium. If earnings growth does not accelerate rapidly, the acquiring bank may face an adverse reaction in the debt and equity markets. Further, the constraints were estimated for an "average" major banking organization; the market-wide effects would become stronger if the number of major banking organizations seeking to expand was to increase.

Average or low-performing targets might also be attractive if the purchase price was appropriately low and there was a significant potential for earnings improvement of the target. If these low-performing banks could be purchased at close to current market levels and financing costs were low, the adverse financial effects on the acquiring bank would be small. However, the constraints quickly become more binding if one assumes purchase prices only moderately above book value. In general, it seems reasonable to expect that active bidding for target organizations could boost share prices even further above book values than they are at present. Consequently, many would-be purchasers could find the prospective acquisitions no longer attractive.

Some observers argue that the opening of interstate banking may enhance the market's valuation of the equity of the nation's major banking organizations and that, over a long period of time, there would be a

Chart 1

Stock Price Valuations of Top Ten Bank Holding Companies, 1974-85



* Average price/earnings multiples of ten large banking organizations in percent of average price/earning multiples of Standard and Poor's 500 companies.

Sources: Average stock price valuations for the top ten bank holding companies were calculated from individual company data published in Bank Stock Quarterly, M.A. Shapiro & Co., Inc., various issues from 1974 to 1985; Comparative Market Valuation Statistics for 35 Banks by Quarter, 1971-1983, Salomon Brothers Inc., May 2, 1984; A Review of Bank Performance: 1985 Edition, Salomon Brothers Inc., April 1985; and American Banker, June 17, 1985.

tendency for these organizations to gradually absorb an increased share of the nation's banking assets. This article suggests that such a persisting tendency would require a corresponding upward shift in profitability to levels not in evidence in recent years. Further, competitive pressures and the strains encountered in the recent past in lending at home and abroad may also influence the market's perception of the overall opportunities interstate expansion may afford the nation's major banking organizations. Hence, there is some question whether the leading bank holding companies will be able to increase their earnings so rapidly that the market prices of their common stock will advance to, and remain at, levels that would facilitate large-scale acquisitions.

More recently, the share prices of the nation's top bank holding companies have staged a recovery. However, the advance in the first half of 1985 was closely matched by the rise in the share prices of target regional companies. As a result, the ability of the nation's large organizations to acquire attractive institutions on a large scale was not improved substantially. It appears likely, therefore, that the major banks would be selective in their approach to interstate acquisitions. And it may well turn out that the least costly method of banking expansion across state lines for major organizations would be the conversion of existing offices of nonbank subsidiaries to full commercial banks (when permitted) rather than the purchase of other banks.

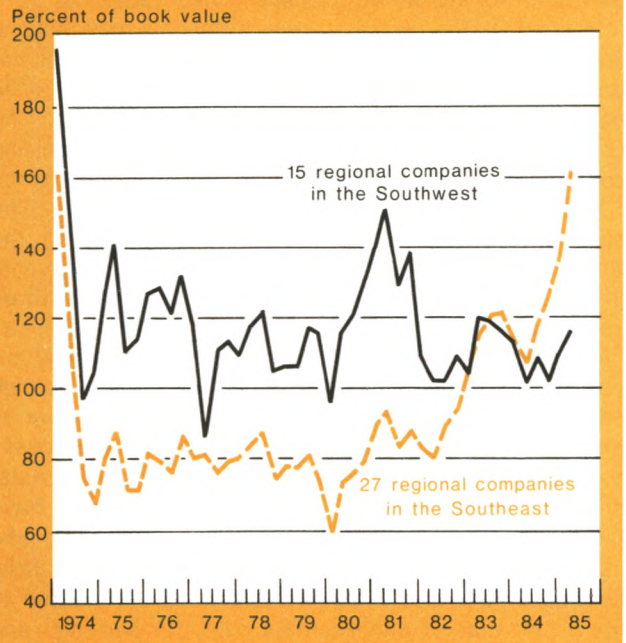
There is also concern that even a modest initial expansion by major banks, if repeated, would eventually lead to sizable concentrations. For example, a 5 percent expansion program by the nation's largest bank holding company could in the aggregate involve nearly $8 billion of acquired assets. In perspective, that aggregate would represent less than 4 percent of the total assets of some 42 largely high-performance bank holding companies headquartered in the most rapidly growing parts of the United States, and less than 2 percent of the aggregate assets of the five largest domestically-owned banks in 44 states and the District of Columbia. (The latter consists of 225 banks in total, excluding California, Illinois, Massachusetts, New York, Pennsylvania, and Texas.) However, even that relatively moderate level of expansion could be inhibited by cost factors and could not easily be repeated without the required increase in profitability.

It is noteworthy that financial factors place many of the large regional banks in a favorable position to expand through acquisitions because of their strong capital base and high rates of return. Earnings dilution at acquiring large regional companies would be only one-half as large as that sustained by shareholders of the nation's major banking organizations for a comparable expansion. The average decline in retained income after a regional merger would be approximately 15 percent of the decline projected for a major banking organization. As a result, the need for accelerated earnings growth would be far less at large regional companies than at the top banking organizations. Moreover, because the regional banks are relatively small, the market effects of expansion could be expected to be mild and not impose significant additional constraints on expansion by a number of regional companies.

Finally, the market environment likely to accompany a relaxation of the present barriers to interstate banking suggests significant leverage for a regulatory policy which sets high capital standards and requires strong financial conditions to be maintained in merger transactions, including standards for tangible capital and earnings growth. Given appropriate statutory powers, the bank regulatory authorities would be in a position to guide interstate acquisitions in ways which promote sound and competitive banking.

Chart 2

Average Ratio of Market to Book Value of Equity of Regional Bank Holding Companies, 1974-85



Sources: Bank Stock Quarterly, M.A. Shapiro & Co., Inc., various issues from 1974 to 1985, and American Banker, June 17, 1985.

Table 1

Assets, Equity, and Earnings of Selected Bank Holding Companies as of 1984

Key financial characteristics	Average major holding company	Hypothetical target companies: Group (1) 10%	Group (2) 20%	Group (3) 50%
Total assets				
$ million	69,839	6,984	13,968	34,920
Average ratio of market to book value of equity	0.84	1.30	1.39	1.30
Total primary capital				
$ million	4,030	446	927	2,361
% of assets	5.8	6.4	6.6	6.8
Income before taxes				
$ million	543	72	157	359
Net income after taxes				
$ million	383	60	128	304
% of assets	0.55	0.86	0.92	0.87
% of primary capital	9.50	13.45	13.81	12.88
Dividends				
$ million	182	23	45	107

Data on assets and capital are averages of figures for December 31, 1983 and December 31, 1984. Income and dividends are for full-year 1984. The ratios of the market to book value of equity are weighted averages of quotations for March 29, 1985 and June 14, 1985 of bank holding company stock prices relative to their book values. The weights were derived from the December 31, 1984 distribution of assets of companies included in the respective samples.

Sources: *Reports of Condition* and sources shown in Chart 1.

Table 2

Hypothetical Ratio of Primary Capital to Assets After Acquisitions by a Major Bank Holding Company as of March 31, 1985

In percent

Method of acquisition and size of premium	Capital ratio after expansion of: 10%	20%	50%
Starting ratio: 6.3%			
Ratio after cash purchase from own resources or new debt at:			
Book value	5.8	5.3	4.3
50% premium over book*	5.5	4.8	3.2
100% premium over book*	5.2	4.3	2.1

The projected capital ratios were calculated from figures shown in Table 1 and adjusted upward to reflect the growth in the capital of the major banking organizations through early 1985.

*Primary capital ratio if "Goodwill" is deducted from total assets in the calculation of primary capital. At present, such a deduction is not required in the definition of bank holding company primary capital, but is required in the calculation of bank primary capital. Where intangible assets are allowed, the capital ratio is that shown under "book value".

The background market conditions

The ability of a company to expand via mergers or acquisitions is affected importantly by the market's appraisal of the companies in question. Consequently, the price performance of the equity shares of major U.S. bank holding companies is relevant to this issue. To shed light on this factor, we examined two key groups of banks: the ten largest banking organizations headquartered in the major money market centers and the large regional bank holding companies.

As can be seen in Chart 1, during the mid-1970s the average market value of the equity of the major bank holding companies frequently exceeded book value. Stock prices weakened in the late 1970s and the decline carried the market value of equity to a low of nearly 40 percent below book value by mid-1982. The recovery from that decline has been slow, but by mid-1985 the average market price reached 85 to 90 percent of book value.

While part of the price weakness reflected the more general slippage of equities over the past ten years, the market's valuation of the equities of large bank holding companies has been more pessimistic than for other industries. To illustrate, the average price-earnings multiple accorded the large bank holding companies in March 1985 was 75 percent of the price/earnings ratio for Standard and Poor's 500 companies. This measure had been as low as 48 percent in mid-1983.

In contrast, the market values of regional bank holding companies have remained strong, particularly for companies in the southeast and southwest regions of the country where growth has been high (Chart 2). The common stock prices of about 27 regional bank holding companies in the Southeast have risen sharply since 1980 and have remained well above book value. The stock prices of about 15 regional companies in the Southwest generally have remained above book value in spite of a decline in energy prices in the past three years, which has had some adverse effect on earnings.

A number of factors may account for the relatively low valuation of the equity prices of large bank holding companies. During the past ten years, a number of major banking organizations have sustained large losses as a result of overextensions of credit in real estate, shipbuilding, and energy development. They also have had to deal with heavy strains in foreign lending and increased competitive pressures from nonbank financial service firms. All of these factors have contributed to increased market uncertainties over the earnings and dividend potential of the major banking organizations. The relatively strong market valuation of regional banks can be explained by favorable earnings and demographic and business growth factors.

The purchase price of acquisition

A major cost in any acquisition is the price the acquiring institution has to pay to the stockholders of the firm to be acquired. Stockholders of the selling firm typically expect to be paid the value of their equity holdings plus a premium to compensate for future growth potential, especially when the firm being sought occupies a strong market position.

A premium as high as 100 percent of book value has been common in many bank acquisitions. In 1973 and 1974, the premium over book value, weighted by the size of the acquired bank, averaged 117 percent in bank mergers and 106 percent in bank holding company acquisitions. Between 1975 and 1984, the weighted average premium was 58 percent in bank mergers and 48 percent in bank holding company acquisitions.[1]

It would be reasonable to expect that the removal of interstate barriers would stimulate brisk (but ultimately self-limiting) bidding for many regional organizations. On balance, there would be a decided tendency for the share prices of these companies to rise significantly.

What are the financial consequences of acquisitions by large bank holding companies?

A substantial acquisition usually holds important financial consequences for an acquiring firm. These consequences can vary with the method of financing the acquisition, its size, the purchase price, and the financial characteristics and market valuations of both the acquiring and target banks. The initial cost of an acquisition may result in a dilution of the earnings flow to the stockholders of the acquiring institution, a decline in retained income after the merger, and a decline in the acquiring bank's primary capital ratio. When the short-run effects of an acquisition are adverse to the acquiring institution, the soundness of the transaction must rest on expectations of a substantial rise in the earnings of the combined institution. The financial effects of major acquisitions are analyzed below through hypothetical mergers among selected samples of banks and bank holding companies in the United States.

Selecting the samples

There are, of course, many possible combinations of mergers and acquisitions involving banks of varying size. To make this analysis manageable and still provide meaningful insights into the financial impact that would be involved, we chose to focus on the differences in expansion potential of two separate and distinct samples of banking organizations. The first sample consists of the very large banking organizations which have been in the forefront of the bank holding company movement and could be expected to seek expansion in interstate banking nationally and regionally. The second sample includes a group of large regional holding companies which could be targets for acquisition by very large companies or be expected to expand in their own geographical regions and into major metropolitan areas throughout the country.

The sample of the very large banking institutions was chosen to include the ten largest bank holding companies in the United States. This sample of ten organizations accounts for about 27 percent of the nation's banking assets booked in both U.S. and foreign branch offices. The assets of the selected ten bank holding companies totaled $728 billion as of March 31, 1985 (including both bank and nonbank activities). The largest was Citicorp with $155 billion in total assets; the smallest was First Chicago Corporation with $41 billion.[2]

The simulation method

To conduct the study, we chose an approach which would highlight the financial circumstances that would be likely to confront any of the ten bank holding companies seeking to undertake a large-scale expansion program. We constructed data to represent an "average" institution among the top ten banking organizations. The average major company was developed by taking a simple average of the aggregate assets, capital, and earnings of the top ten companies. Three levels of hypothetical acquisitions by this average company were studied. The first involved a 10 percent increase in the size of the acquiring organization, the second 20 percent, and the third 50 percent. These alternative levels of expansion are treated as singular acquisitions or the accumulation of a series of acquisitions concluded over a short period of time.

The target banks to be acquired were selected from bank holding companies and independent banks having assets less than $10 billion and shares traded in the securities markets. These banking organizations were arrayed in descending order of asset size and three hypothetical target groups were selected. These groups were obtained by starting with the largest regional on the list and proceeding down the list until aggregate totals of banking assets were accumulated to provide totals equivalent to 10 percent, 20 percent, and 50 percent of the average assets of the ten largest bank holding companies.[3]

[1]This information was tabulated from premium data compiled by Golembe Associates in the *Banking Expansion Reporter*, Volume 1, No. 11 (June 21, 1982) and Volume 4, No. 14 (July 15, 1985).

[2]This sample of the top ten banking companies includes companies with varying interests in wholesale and retail banking activities.

[3]This procedure could not be followed exactly in the construction of aggregates of the desired size. Hence, some smaller institutions were added out of their order of size.

Table 3

Acceleration of Earnings Growth to Eliminate Dilution

Acceleration in the annual growth rate of earnings, in percentage points	Bank holding company expansion by: 10%		20%		50%	
	Purchase premium					
	50%	100%	50%	100%	50%	100%
	Years to eliminate dilution					
One	4.7	11.2	9.5	21.5	28.0	52.6
Three	1.6	3.8	3.2	7.2	9.4	17.7
Five	1.0	2.3	1.9	4.4	5.7	10.7
Seven	0.7	1.6	1.4	3.2	4.1	7.7
Ten	0.5	1.2	1.0	2.2	2.9	5.5
Initial earnings dilution, in percent	−4	−10	−8	−18	−22	−38

The data in this table are based on the banking data shown in Table 1. The acceleration of earnings growth required for the elimination of dilution was calculated on the assumption that earnings of the acquiring bank would have grown in the absence of merger at an annual rate of 10 percent. No provision was made for amortization of the purchase premium.

Key financial characteristics were then calculated for the average major bank holding company and for each of the three groupings of target banking organizations. These characteristics include the return on assets and on primary capital, the ratio of primary capital to assets, and the average ratio of market to book value of equity (Table 1).

As shown in Table 1, the average major company was less profitable and had a lower primary capital ratio than the target regional companies. Net income of the average major company was equal to 9.5 percent of its primary capital and 0.55 percent of its total assets in 1984, substantially below the figures for the regional companies. The ratio of primary capital to total assets of the acquiring major bank holding company averaged 5.8 percent during 1984, compared with an average of 6.8 percent for the target companies. As of March 31, 1985, the primary capital ratio for the average major company was 6.3 percent.

The financial consequences

In the text below, we review the effects of hypothetical acquisitions on the financial position of the acquiring banking institution, as represented by the average major bank holding company we have defined. The analysis focuses mainly on three effects: the change in the primary capital ratio of the acquiring institution, the dilution of earnings per share to the owners of the acquiring institution, and the decline in retained income after the merger. These financial effects vary with the terms and method of financing the acquisition. There are in general four methods: (1) exchange of shares; (2) cash purchase from the acquiring bank's own resources; (3) cash purchase from the proceeds of new equity; and (4) cash purchase from the proceeds of new issues of long-term debt. (These methods are described in more detail in Appendix 1.)

Effect on primary capital. An exchange of shares leaves the capital of both organizations intact. The combined organization's capital ratio would reflect the combined aggregates of capital and assets. In this situation, a well-capitalized target would tend to raise the capital ratio of the combined organization after the merger.

In contrast, an acquisition financed from the acquiring bank's own resources results in a lower ratio of equity to assets for the combined company than for the acquiring bank. Furthermore, the decline in the capital ratio is greater as the premium paid for the target bank increases. As shown in Table 2, the drop in the primary capital ratio for the average major company potentially would be substantial—from 6.3 to 4.3 percent—if the company attempted to expand its total assets by 50 percent without floating new equity. Indeed, the decline in the primary capital ratio could be larger since the supervisory authorities are not likely to allow intangible assets to play an unduly large role in determining primary capital at the bank holding company level (Table 2). Large declines in primary capital ratios would be unacceptable to the market and to the supervisory agencies.[4]

Under the new capital guidelines, the financing of substantial acquisitions from the bank's own resources could be used only by a bank with a relatively high ratio of primary capital to assets, say, 7 to 8 percent or more. Only one bank holding company among the top ten had a primary capital ratio of more than 7 percent as of March 31, 1985. Three other companies had capital ratios in the range of 6½ to 7 percent, and five companies had ratios in the range of 6 to 6½ percent. One company had a ratio of less than 6 percent.

[4]The banking supervisory authorities have recently issued capital adequacy guidelines requiring bank holding companies to maintain primary capital equal to at least 5.5 percent of total assets. Primary capital of bank holding companies consists of common stock, perpetual preferred stock, capital surplus, undivided profits, contingency and other capital reserves, instruments mandating conversion into common or perpetual preferred stock, reserves for loan and lease losses, and the minority interest in the equity accounts of consolidated subsidiaries. Certain intangible assets and equity commitment notes may be included (within limits) in calculating *bank holding company* primary capital, but not *bank* primary capital.

Table 4

Major Bank Holding Company Expansion Financed by New Equity

Earnings effects and size of purchase premium	Expansion of assets of the acquiring company by: 10%	20%	50%
Change in retained income with purchase at:*			
Book value	− 1	− 3	−11
50% over book	− 6	−13	−33
100% over book	−12	−24	−59
Amortization of premium†			
50% over book	3	5	9
100% over book	5	9	17
First-year acceleration in earnings growth to restore aggregate retained income‡			
Book value	§	2	7
50% over book	6	13	30
100% over book	12	24	55
First-year acceleration in earnings growth to eliminate dilution‡			
50% over book	7	14	40
100% over book	17	33	84

The figures shown in this table are based on data given in Table 1. The acquisitions in this example assume dividend costs in the range of 5 1/2 to 7 1/4 percent prorated according to the amount of new equity issued by the acquiring institution (Appendix 2). The first-year acceleration of earnings growth required for the elimination of dilution and restoration of retained income was calculated on the assumption that earnings and dividends of the acquiring company would have grown in the absence of merger at an annual rate of 10 percent.

*In percent of retained income of the combined organization.

†Annual amortization over 20 years, in percent of total net income.

‡In percentage points; includes annual amortization of purchase premium.

§Less than 0.5 percent.

Banking organizations with primary capital ratios close to the required 5 1/2 percent level could employ their own resources for the financing of acquisitions only in the early stages of an expansion program. Additional equity capital would have to be raised to support further substantial expansion.

Debt financing would also reduce the ratio of primary capital to assets because the equity at the acquired bank would be paid off with new debt which is not included in primary capital. As in the case of financing from an organization's own resources, the magnitude of the decline would depend on the size of the acquired company and the premium paid on the acquired bank's stock.

Dilution of earnings. An important factor in the estimation of earnings dilution for the major bank holding companies is that the market value of the equity of the acquiring institution would decline, and the dividend yield on equity would rise, as acquisitions become larger and/or more expensive.[5] The average market value of equity of the average major bank holding company was 84 percent of book value as of specific dates in March 1985 and June 1985. The corresponding dividend yield was about 5 3/8 percent. Using these figures as a starting point, we estimated that equity values would decline and dividend yields would rise in the financing of increasingly large acquisitions in proportion to the volume of new equity that would be required. At the outer range of the examples in this article, namely a 50 percent expansion coupled with a purchase premium of 100 percent of book value, the dividend cost of financing would rise to 7 1/4 percent and the market to book value of equity would drop to 62 percent. These effects are estimated for expansion by an "average" major organization. If many more banks attempted a similar expansion program, the overall impact on equity values could be expected to be more severe (Appendix 2).

Dilution of the ownership interest of the acquiring institution's shareholders in the company's earnings is a major cost in an exchange of shares.[6] It is also one of the cost elements in new equity financing. The two financing methods result in the same level of dilution as long as the price paid for the acquired bank is identical in both situations.

Earnings dilution will be small when the acquisition is small or if the shares are exchanged at market prices which are close to book value. However, earnings dilution increases as the size of the acquisition and the purchase premium increase (and the more the acquiring bank's equity is discounted from book value). To illustrate, dilution amounts to 38 percent for a 50 percent expansion in size at a purchase price of 100 percent over book value (Chart 3, top).[7]

In an exchange of shares, the merger may provide an earnings benefit (in percent of pre-merger earnings) to

[5]An additional factor influencing share prices is the obligation of bank holding companies to issue new equity under equity commitment notes and debt instruments mandating conversion into common or perpetual preferred stock. These notes and instruments accounted for just over 10 percent of the primary capital of the top ten bank holding companies as of December 31, 1984.

[6]Earnings dilution is the percentage decline in earnings per share of the acquiring company after the merger relative to earnings per share of the acquiring company before merger (Appendix 1).

[7]The relationships in Chart 3 are derived from the banking data described in Table 1. Since the rates of return at the target banks are generally higher than at the acquiring organization, some of the dilution effect is mitigated.

the shareholders of the bank being acquired.[8] The benefit in question is positively affected by the size of the purchase premium, but negatively affected by the size of the acquisition. The percentage earnings benefit is largest when the acquisition is small and the premium high; in fact, large acquisitions tend to diminish the benefit. The reason for this effect is that large acquisitions tend to increase earnings dilution, a consequence which the shareholders of the acquired bank cannot escape, since they receive payment in the form of shares of the acquiring bank (Chart 3, bottom).

It is worth noting that earnings dilution significantly higher than 5 percent is viewed by some market observers as prohibitive.[9] Earnings dilution of about 8 percent would occur in acquisitions which expand assets of the acquiring company by 20 percent and the purchase premium approaches 50 percent. To recover from this earnings dilution over a short period of time, say, within three years, would require an acceleration of about three percentage points in the growth of net income of the combined organization, exclusive of provisions for annual amortization of the purchase premium (Table 3).

Larger and/or more expensive acquisitions would boost the required acceleration in earnings or greatly lengthen the time period needed to recover the dilution. For example, a 50 percent expansion with a purchase premium of 100 percent (resulting in an initial earnings dilution of 38 percent) would require earnings growth to accelerate by ten percentage points to recover the dilution in five and one-half years.[10]

As seen in Table 3, a "stretching out" of the earnings adjustment period reduces the required acceleration of earnings growth after the merger. However, it would prolong the period over which the equity value of the acquired bank, and the wealth of its shareowners, would be lowered in relation to what it would have been in the absence of the merger.

It is, of course, possible in specific instances for a substantial acceleration of earnings growth to occur after a well-planned merger. Improvements in management, reductions of costs, and elimination of redundant facilities and low-yielding activities are some of the ways that profitability may be enhanced. To the extent that the prospects for accelerated earnings growth are bright, the market might value the equity of the acquiring organization at an attractive price and be willing to supply the required new equity capital at low cost. In these circumstances, many of the constraints that would otherwise apply would be mitigated.[11]

Effects on retained income. In our example involving a major bank holding company, retained income would decline initially after sizable acquisitions because dividend costs would rise more rapidly than additions to net income.[12] This effect occurs because of the relatively high capital costs likely to face the major bank holding companies, including the cost of financing a sizable purchase premium. Further, the acquiring company would have to set aside a portion of its current earnings for the amortization of the purchase premium, which is typically booked as "Goodwill".

The reduction of retained income due to increased dividend payments is shown in Table 4. The larger the acquisition and the larger the purchase premium, the greater the decline in retained income. For example, a 50 percent expansion of assets at a purchase premium of 50 percent would cut retained income at the combined organization by 33 percent from the pre-merger level.

The size of the reduction of retained income due to amortization of the purchase premium would depend on the size of the purchase premium and the length of the amortization period. In a 20-year amortization schedule, a 50 percent premium would result in yearly amortization amounting to 3 to 9 percent of pre-merger net income of the combined organization for expansions ranging from 10 to 50 percent.

When a substantial premium over book value is paid, a major bank would have to plan on a substantial speedup of its earnings growth in the first year after the merger or shortly thereafter to restore its rate of earn-

[8]An earnings benefit arises in an exchange of shares when the stockholders of the acquired bank are given a premium over the book value of their equity in the form of shares of the acquiring bank. This earnings benefit may also arise without an explicit premium if the shares of the acquiring bank are selling below their book value. The latter type of earnings benefit may be considered a quasi-premium because it can be converted into a capital sum by capitalizing the dollar amount of the benefit at the current rate of interest (Appendix 1).

[9]David C. Cates, "Prices Paid for Banks", *Economic Review*, Federal Reserve Bank of Atlanta, Special Issue (January 1985), page 37.

[10]For a general review of the relationship between earnings growth and elimination of dilution, see Peter C. Eisemann and George A. Budd, "Acquisition and Dilution", *Magazine of Bank Administration*, Volume 58, No. 11 (November 1982).

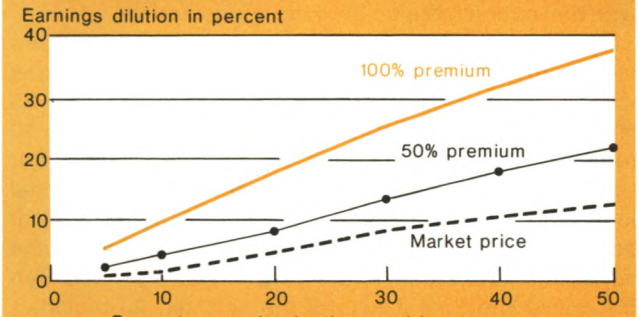
[11]A review of economic literature has found evidence that bank acquisitions by bank holding companies tend to significantly increase both the revenues and expenses of subsidiary banks, but that the net effect on profitability is not well established. Several studies in this area have produced contrary findings. See Timothy J. Curry, "The Performance of Bank Holding Companies", *The Bank Holding Company Movement to 1978: A Compendium*, a study by the Staff of the Board of Governors of the Federal Reserve System (September 1978), pages 101-103.

[12]Acquisitions of well-capitalized targets hold the potential for supporting additional expansion through increased leverage on the equity base of the acquired institution. However, it is not clear how much additional leveraging would be acceptable to the regulatory authorities.

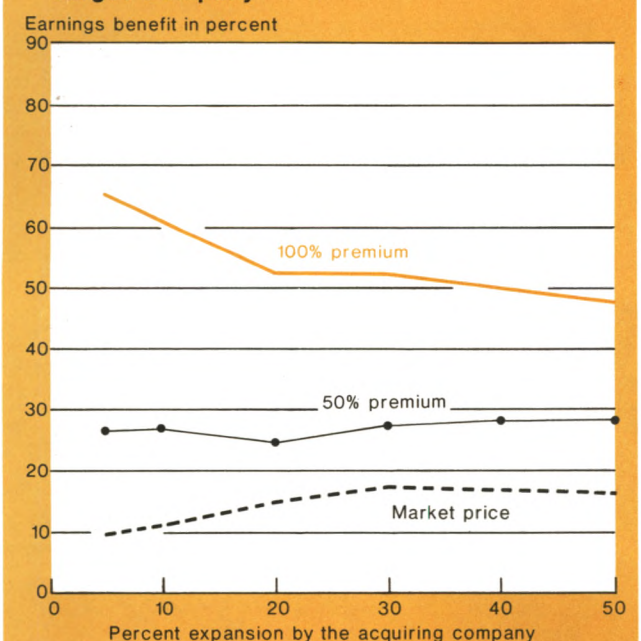
ings retention. As shown in Table 4, the acceleration of earnings growth to restore aggregate retained income of the combined institution in the first year would have to reach six percentage points if the acquisition is 10 percent in size and the purchase premium is 50 percent; a 20 percent expansion would require a thirteen per-

Chart 3

Earnings Dilution to Shareholders of Acquiring Average Major Bank Holding Company



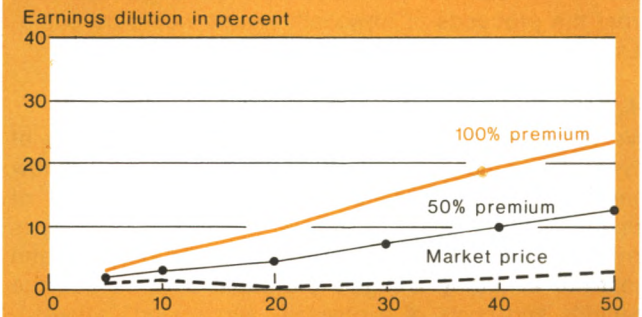
Earnings Benefit to Shareholders of Target Company



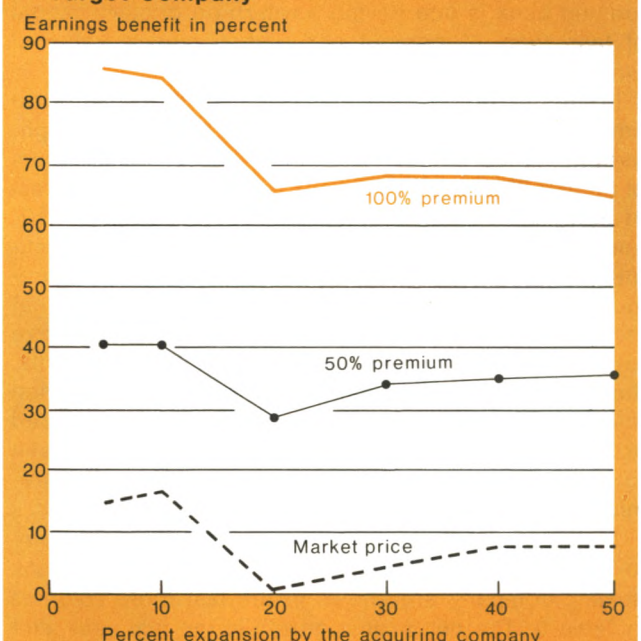
Source: Federal Reserve Bank of New York staff estimates.

Chart 4

Earnings Dilution to Shareholders of Acquiring Average Large Regional Bank Holding Company



Earnings Benefit to Shareholders of Target Company



Source: Federal Reserve Bank of New York staff estimates.

centage point acceleration in earnings growth. Larger and more expensive acquisitions would require even more rapid growth.

The effect on retained income from acquisitions financed from new debt issues has been estimated in the same manner as the effect of new equity financing, except that interest payments were made deductible for income tax purposes. We have assumed the interest cost on debt to be 12 percent per year and the marginal tax rate on bank income to be the present corporate tax rate of 46 percent. Under these assumptions, the decline in retained income after the merger financed from the proceeds of new debt issues would be somewhat higher in acquisitions of moderate size.

High versus low performing targets

We reviewed the financial effects in greater detail of hypothetical acquisitions of high- and medium-to-low performing banks, where a 20 percent expansion of assets of the acquiring major bank holding company is involved. The purpose is to evaluate the benefits and costs of acquiring a highly profitable bank versus the benefits and costs of a possible "turnaround" situation. A high performing target is a bank having a return on primary capital in excess of 15 percent during 1984 and the market value of equity of the bank above its book value as of December 1984. A medium-to-low performing bank is one having a return on primary capital of less than 11 percent and whose market value of equity was below book value.

In the cases we considered, the average large banking institution was assumed to purchase a high-performing target with new equity and pay a premium of 50 and 75 percent over book value. The dividend cost of new equity was assumed alternatively at 6, 6 1/2, 7, and 8 percent. Retained income of the combined institution would decline sharply. To restore it to the pre-merger level in the first year after the merger, the net income growth of the combined institution would have to accelerate by twelve to eighteen percentage points, depending on the dividend cost of equity capital, when the purchase premium is 50 percent. The required acceleration of net income growth would be seventeen to twenty-four percentage points for a 75 percent premium (Table 5).

The effects of the hypothetical purchase of a medium-to-low performing target by the average major bank holding company are shown in the last three columns in Table 5. The net income growth in the first year after the merger would have to accelerate by five to nine percentage points to recover the decline in retained income if the acquired bank is purchased at the market price. Should the purchase price rise to 10 percent above book value, the first-year growth of net income would have to accelerate by seven to twelve percentage points. At a 25 percent premium, required income growth would have to rise by eleven to seventeen percentage points.

Expansion costs of an average regional bank holding company

This section reviews the acquisition costs that large regional bank holding companies would face in an interstate expansion program. This analysis highlights possible cost advantages that well-managed, profitable regional bank holding companies would tend to have over the nation's major banking organizations.

We selected a hypothetical sample of acquiring companies so that it would include large regional bank holding companies with total assets in excess of $5 billion and a market value of equity of more than 10 percent above book value as of December 1984. According to this criterion, we selected 20 large regional bank holding companies operating in various parts of the country. However, none of them were located in the money market centers of New York, Chicago, and San Francisco. The total assets of the selected 20 regionals averaged $174 billion during 1984. Their banking assets accounted for an estimated 6 percent of U.S. banks' total assets booked in both U.S. and foreign branch

Table 5

Retained Income in Hypothetical Acquisition of High and Low Performing Targets by a Major Bank Holding Company

First-year acceleration in earnings growth to restore aggregate retained income, in percentage points

Alternative dividend yields on new equity, in percent	Purchase of a high performing bank with purchase premiums of:		Purchase of a low performing bank with purchase premiums at:		
	50%	75%	market price	10%	25%
6.0	12	17	5	7	11
6.5	13	19	6	8	12
7.0	15	20	7	10	14
8.0	18	24	9	12	17

The figures shown in this table are based on *Reports of Condition* and data given in Table 1. The acquired bank is equal to 20 percent of the acquiring company in terms of total assets. The merger would be financed by new equity. The required increase in earnings includes provision for annual amortization of the purchase premium. The average market price of equity of low performing banks was 101 percent of book value as of March 29, 1985 and June 14, 1985.

Table 6

Assets, Equity, and Earnings of Selected Regional Bank Holding Companies as of 1984

Key financial characteristics	Average large regional holding company	Hypothetical target companies Group (1) 10%	Group (2) 20%	Group (3) 50%
Total assets				
$ million	8,703	870	1,741	4,351
Average ratio of market to book value of equity	1.49	1.23	1.14	1.11
Total primary capital				
$ million	587	54	106	283
% of assets	6.7	6.2	6.1	6.5
Income before taxes				
$ million	110	7	16	41
Net income after taxes				
$ million	91	6	13	33
% of assets	1.04	0.69	0.75	0.75
% of primary capital	15.43	11.07	12.23	11.52
Dividends				
$ million	29	2	6	13

Data on assets and capital are averages of figures for December 31, 1983 and December 31, 1984. Income and dividends are for full-year 1984. The ratios of the market to book value of equity are weighted averages of quotations for March 29, 1985 and June 14, 1985 of bank holding company stock prices relative to their book values. The weights were derived from the December 31, 1984 distribution of assets of companies included in the respective samples.

Sources: *Reports of Condition* and sources shown in Chart 1.

Table 7

Hypothetical Ratio of Primary Capital to Assets After Acquisitions by a Regional Bank Holding Company as of December 31, 1984

Method of acquisition and size of premium	Capital ratio after expansion of: 10%	20%	50%
Starting ratio: 6.8%			
Ratio after cash purchase from own resources or new debt at:			
Book value	6.2	5.8	4.7
50% premium over book*	6.0	5.3	3.6
100% premium over book*	5.7	4.8	2.5

The projected capital ratios were calculated from figures shown in Table 6 and adjusted upward to reflect the growth in the capital positions of the large regional companies as of year-end 1984.

*Primary capital ratio if "Goodwill" is deducted from total assets in the calculation of primary capital. At present, such a deduction is not required in the definition of bank holding company primary capital, but is required in the calculation of bank primary capital. Where intangible assets are allowed, the capital ratio is that shown under "book value".

offices. The average regional company was constructed by taking a simple average of the figures for the 20 companies. The size of the average large regional company was $8.7 billion in total assets.

The target companies were selected from the listing of all companies under $10 billion in assets. The procedure for selecting the hypothetical acquisition candidates was the same as the one described earlier.

The average large regional organization is about one-eighth the size of the average major bank holding company. Its return on primary capital was 15.4 percent in 1984, compared with 9.5 percent for the average major company and an average of 11.5 percent for the target regionals in this section (Table 6). The average market value of equity of the average large regional company was 149 percent of the book value of equity as of specific dates in March 1985 and June 1985. The average ratio of primary capital to assets of both the acquiring and the acquired regionals was relatively high and ranged from 6 percent to 6¾ percent in 1984. Consequently, there would be leeway for these regional companies to expand without severe adverse effects on primary capital.

Acquisition costs, notably earnings dilution, were significantly lower for the average large regional company than for the average major bank holding company (Chart 4, top). Moreover, the earnings benefit to the stockholders of the acquired bank tended to be larger (Chart 4, bottom). Earnings dilution for the average large regional organization was approximately half as large as it was for the average major bank holding company, given large purchase premiums.

If the acquired institution were purchased at market value (through an exchange of shares or from new equity), the cost difference between the regional and the very large bank holding companies would be even more pronounced. The shareholders of the regional company would sustain very little earnings dilution. The reason for the more pronounced difference in this case is that the market value of equity at the large regional company is well above book value.

The primary capital ratio would decline at about the same rate in hypothetical acquisitions by the average large regional bank holding company and the average major company in all the scenarios described. Of course, the level of the primary capital ratio at the regional bank holding company would be higher after merger because of the higher starting level (Table 7).

There is a significant difference in the effects on retained income in acquisitions financed from new equity issued by a large regional company versus a major company. The average decline in retained income at the regional company is approximately 15 percent of the average decline in retained income at the major com-

Table 8

Regional Bank Holding Company Expansion Financed by New Equity

Earnings effects and size of purchase premium	Expansion of assets of the acquiring company by: 10%	20%	50%
Change in retained income with purchase at:*			
Book value	†	3	3
50% over book	−1	1	−4
100% over book	−3	−2	−12
Amortization of premium‡			
50% over book	1	3	6
100% over book	3	5	11
First-year acceleration in earnings growth to restore aggregate retained income§			
Book value	‖	‖	‖
50% over book	2	2	9
100% over book	5	7	20
First-year acceleration in earnings growth to eliminate dilution§			
50% over book	4	7	22
100% over book	9	17	45

The figures shown in this table are based on data given in Table 6. The acquisitions in this example assume dividend costs in the range of 3⅓ to 4 percent prorated according to the amount of new equity issued by the acquiring institution (Appendix 2). The first-year acceleration of earnings growth for the elimination of dilution and restoration of retained income was calculated on the assumption that earnings and dividends of the acquiring company would have grown in the absence of merger at an annual rate of 10 percent.

*In percent of retained income of the combined organization.
†Less than 0.5 percent.
‡Annual amortization over 20 years, in percent of total net income.
§In percentage points; includes annual amortization of purchase premium.
‖No acceleration in earnings growth required.

pany in acquisitions of the same size (Tables 4 and 8). Furthermore, the acceleration of earnings growth during the first year after the merger needed to restore aggregate retained income of the combined regional organization is about one-third, and the acceleration needed for the elimination of dilution is about one-half, of the levels required by the average major company.

These differences in acquisition costs reflect the high profitability of the regionals as compared with the rate of return at the nation's major bank holding companies. The high profitability of the large regional companies is also manifest in the willingness of the market to accept lower dividend yields on common stock. In our study, we estimate that the large regionals could obtain new equity at a dividend yield of 3⅓ percent to 4 percent for various size expansion programs. The dividend yield for the nation's major companies was estimated in the range of 5½ percent to 7¼ percent, reflecting the more substantial market impact the major banks would be likely to have in pursuing major expansion programs.

Conclusion

The hypothetical mergers discussed in this paper were analyzed using a range of assumptions about the cost of obtaining capital and the purchase prices of target banks. The results indicate that prospective large scale expansion programs by major bank holding companies would have to surmount major obstacles in the form of dilution of shareholder interests, relatively high capital costs, and regulatory constraints. At the same time, the expansion opportunities for large and well-managed regional companies could remain relatively attractive for an extended period of time. As a result, these regional organizations can be expected to play a significant, independent role in the growth of interstate banking.

Leon Korobow and George Budzeika

Appendix 1: Financial Consequences of Acquisitions

The financial effects of bank mergers vary with the method of financing the acquisition. There are, in general, four such methods. The first method is an *exchange of shares*. The second is a *purchase for cash*, using the resources of the acquiring firm. The third and fourth methods are cash purchases financed from the proceeds of either *new equity* or *new issues of long-term debt*.

These four methods of financing are illustrated by a hypothetical acquisition in which a banking organization seeks to acquire an institution whose net worth is 50 percent of its own. To simplify, each of the two organizations is assumed to earn the same net rate of return on equity and each has the same ratio of equity capital to total assets. The assets, capital, and income of the hypothetical acquiring and acquired banks are shown in Table A-1.

Table A-1

Key Financial Characteristics of the Hypothetical Acquiring and Acquired Banks Before the Merger

Characteristics	Acquiring bank	Acquired bank	Pre-merger total of acquiring and acquired banks
Total assets	$20,000	$10,000	$30,000
Equity capital/ assets ratio	5%	5%	5%
Tangible net worth	$1,000	$500	$1,500
Common shares outstanding	100	50	150
Book value of equity per share	$10	$10	$10
Market value of equity per share	$7.50	$10	*
Total annual earnings after taxes	$125	$62.50	$187.50
Rate of return on assets	0.625%	0.625%	0.625%
Rate of return on book equity	12.5%	12.5%	12.5%
Rate of return on market equity	16.67%	12.5%	*
Annual dividends paid at $0.50 per share	$50	$25	$75
Annual retained earnings	$75	$37.50	$112.50

*Not applicable.

Exchange of shares

The rate of exchange of shares is a crucial factor in the impact of this type of transaction on both the shareholders of the acquiring and acquired organizations. We make the assumption that the acquiring bank purchases another company by issuing a sufficient number of its own shares to pay the stockholders their market value. We also assume, as a point of departure, that the shares of the acquiring bank are selling at 75 percent of book value in the market and that the shares of the acquired bank are selling at their full book value (Table A-2).

Table A-2

Key Financial Characteristics of the Hypothetical Combined Bank After Merger

Characteristics	Exchange of shares	Cash purchase with: Own resources	Cash purchase with: New equity	Cash purchase with: New debt
Total tangible assets	$30,000	$29,250	$30,000	$30,000
Purchase premium	*	$250	$250	$250
Total purchase price	$500	$750	$750	$750
Tangible book equity	$1,500	$750	$1,500	$750
Tangible equity/ tangible assets	5.0%	2.56%	5.0%	2.5%
Total net annual earnings	$187.50	$182.81	$187.50	$126.75
Number of new common shares at $7.50 per share	67	*	100	*
Total common shares outstanding	167	100	200	100
Net earnings per share	$1.12	$1.83	$0.94	$1.27
After-tax cost of debt at 15% and 46% tax rate	*	*	*	$60.75
Net return on tangible book equity	12.5%	24.4%	12.5%	16.9%
Earnings dilution sustained by shareowners of acquiring bank	−10%	*	−25%	*
Earnings benefit to shareowners of acquired bank	20%	*	*	*
Annual dividend payments	$83.50	$50	$100	$50
Annual retained income	$104	$132.81	$87.50	$76.75
Debt capital	*	*	*	$750

*Not applicable.

Appendix 1: Financial Consequences of Acquisitions *(continued)*

The shareholders of the acquired bank receive in the exchange 67 shares of the acquiring bank valued at $7.50 each to compensate for their investment of $500 in the acquired bank. The total number of outstanding shares of the acquiring bank rises from 100 to 167, and earnings per share decline from $1.25 to $1.12 per share. Because of the increased dividends, retained earnings of the combined institution decline from $112.50 at the two banks prior to the merger to $104 afterward.

After the merger, the original shareholders of the acquiring bank have only nine-tenths of the interest in pre-merger total income they had prior to the acquisition, thus sustaining a 10 percent earnings dilution. Earnings dilution is the percentage decline in earnings per share of the acquiring bank after the merger relative to earnings per share of the same bank before the merger.*

To restore per-share earnings to pre-merger levels would require an 11 percent increase in the combined bank's earnings (the annual return on assets would have to rise to 0.694 percent from 0.625 percent). That improvement would restore the per-share earnings to the pre-merger level of $1.25 and could raise the combined bank's price close to $10 per share if investors were satisfied with a 12½ percent return on their investment.

The shareowners of the acquired company realize an earnings benefit by obtaining command of 20 percent more corporate income than they had before the merger. The capitalized value of this "income benefit" represents a 20 percent (or $100) premium over the book value of their original investment in the acquired bank. The premium has, in effect, been financed from the resources of the acquiring bank's original shareowners and has been reinvested in the combined bank.

Cash purchase with proceeds from sale of own resources

In this method the acquiring organization pays for the acquisition in cash by selling a portion of its assets. It also writes down the value of its tangible net worth and makes a corresponding entry for increased intangible capital or "Goodwill" to reflect the payment of a premium. (Goodwill is not included in bank primary capital.) The shareholders of the acquired bank receive a cash payment of $750 to reimburse them for their investment of $500 in the target bank and to give them a premium of $250 over book value. As a result, the ratio of tangible equity to tangible assets of the combined bank would drop sharply to 2.56 percent from 5 percent before the merger. The earnings of the combined organization would be slightly less than the sum of the pre-merger earnings of the two banks because the acquiring bank has had to liquidate assets to pay a $750 purchase price.

The viability of the acquisition, of course, hinges on the potential for a future increase in the earnings of the combined organization. To rebuild equity as well as amortize the purchase premium in 20 years would require that the return on post-merger assets rise from 0.625 percent to 0.753 percent each year over the 20-year period. Tangible capital would rise to 5 percent of total assets over that time period. To accomplish the same result in five years would require the annual return on post-merger assets to rise to 1.138 percent.

Cash purchase with proceeds of new equity

The acquiring organization floats $750 in new equity at $7.50 per share. The shareholders of the acquired bank would be paid $500 for the book value of their equity and a $250 premium. The total number of shares would rise to 200 and, consequently, earnings per share would decline from $1.25 to $0.9375. The original shareowners of the acquiring bank would sustain a 25 percent dilution of earnings.

To eliminate the dilution, the earnings of the combined institution would have to rise by $62.50—from the combined total of $187.50 before the merger to $250 after the merger. (The latter figure was obtained by multiplying the number of shares outstanding after the merger by the pre-merger earnings per share, *i.e.*, 200 × $1.25 = $250.) The required increase in earnings is quite steep, about 33 percent, but could be spread over several

*Earnings dilution can be expressed as follows:

$$\text{Dilution} = \left[\frac{\text{Earnings per share after merger}}{\text{Earnings per share before merger}}\right] - 1$$

Since dilution is determined by the size of the two organizations involved and the rate at which the equity of the two companies are exchanged, the above relationship can be restated as:

$$\text{Dilution} = \left[\frac{\text{Combined earnings after merger}}{\text{Earnings of the acquiring bank before merger}} \times \frac{1}{1 + R}\right] - 1$$

where R equals the ratio of the market value of equity of the acquired bank to the market value of the equity of the acquiring bank. A similar relationship can be formulated for the earnings benefit to the shareowners of the acquired institution.

	Average annual increase in:	
Number of years	Total earnings (in percent)	Rate of return on assets (in percentage points)
One	33.3	0.208
Two	15.5	0.104
Three	10.0	0.069
Four	7.5	0.052
Five	5.9	0.042

Appendix 1: Financial Consequences of Acquisitions *(continued)*

years. The previous tabulation shows how total earnings and the rate of return on assets could increase over periods ranging from one to five years.

The combined institution's retained income would decline by $25 due to the higher dividend payments on the new equity needed to finance the acquisition. In addition, retained income would be reduced by $12.50 due to amortization of the purchase premium. (In a 20-year amortization period the annual amortization is equal to $250 ÷ 20 = $12.50.) To restore the level of retained income to the pre-merger level would require an increase of 0.125 percentage points in the annual rate of return on assets—from 0.625 percent to 0.750 percent.

Cash purchase with proceeds of new debt

We assume that debt is floated at a market rate of 15 percent and the marginal corporate income tax is 46 percent. The financing cost reduces the retained income of the combined bank to $76.75 from $112.50. The return on assets would have to rise to 0.786 percent per annum to offset this drop and to amortize the purchase premium over 20 years.

Appendix 2: The Dividend Cost of New Equity

The dividend cost of new equity is a critical factor when a bank holding company seeks to finance a large acquisition from external sources. If the yield on the equity raised to finance the acquisition is high, the resulting increase in dividends produces a drain on retained income and a reduction of additions to capital from internal sources.

Evidence from our sample data suggests that the dividend yield on new equity issued by a major company will be higher than the dividend yield on the equity of the acquired institution. Moreover, it is likely that the market value of the equity of the acquiring company would decline the larger and more expensive the expansion program. The extent of the possible changes in dividend yields in the course of an expansion program would, of course, depend on investor expectations about the future income of the combined bank holding company. Using recent evidence, we constructed in the table below what we believe are possible declines in the market value of equity and the consequent rises in dividend yields for various levels of expansion by both major and regional bank holding companies with the payment of a purchase premium of 100 percent.*

*Dividend yields for a purchase premium of 50 percent are not shown.

Alternative Dividend Costs

	Size of acquisition in percent of assets of acquiring company			
	0%	10%	20%	50%
Average major company				
Dividend yield (in percent)	5.38	5.73	6.11	7.25
Ratio market to book value of equity	0.84	0.79	0.74	0.62
Percent decline in ratio	0	−6	−12	−26
Average regional company				
Dividend yield (in percent)	3.30	3.43	3.56	4.00
Ratio market to book value of equity	1.49	1.43	1.38	1.23
Percent decline in ratio	0	−4	−7	−17

How Fast Can Europe Grow?

European economies have grown very sluggishly over the past five years or so. Since 1980, the four major European countries have expanded on average only 1 percent, down sharply from nearly 3½ percent in the 1970s and about 5 percent in the 1960s. Even during the recent recovery period, Europe has grown on average only about 1.7 percent, in contrast to almost 5½ percent in the United States. This relatively poor growth performance has prompted some analysts to adopt a gloomy view of Europe's longer-term prospects, so much so that terms such as 'Europessimism' and 'Eurosclerosis' have become fashionable. Underlying such terms appears to be the belief that structural rigidities and the lack of an entrepreneurial spirit have cut into Europe's potential for growth. Any attempt to grow much faster than the low rates of the past few years, so the argument goes, would translate quickly into higher inflation.

One important, and perhaps obvious, question is whether the recent weakness in European growth does indeed signal a decline in its long-term potential growth rate. This article focuses on estimating the current long-term growth rates in two important European countries—Germany and the United Kingdom—which have grown very slowly in recent years. The results suggest that potential growth rates in both countries, currently about 3 percent in Germany and 2½ percent in the United Kingdom, are significantly lower than they were in the 1960s and the early 1970s. But there is no evidence that they are anywhere near as low as the growth rates of the past five years, which have averaged less than 1 percent. Both countries are currently operating so far below their capacity that there seems to be considerable room for them to grow faster than trend for a period of time without risking a surge in inflation.

In the next section, the notion of potential output is described more fully. Potential growth estimates for Germany and the United Kingdom are then presented. These estimates are in turn compared with figures for the United States. The last section contains conclusions and policy implications.

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Potential output growth in Germany and the United Kingdom: some definitions and methodology

Potential output measures an economy's maximum production capability that is compatible with stable inflation. Over time, a country's potential output level expands primarily due to advances in labor productivity and the labor force. When there is slack in an economy, actual growth must exceed potential growth if unused and underutilized resources are to be employed. In contrast, when real output expands only in line with that of potential, there is no tendency for the gap between actual and potential production to narrow. Unemployment rates, whether high or low, would show no tendency to change in this setting. Only when real output is expanding faster than its potential is there sustained reduction of the unemployment rate.

Two techniques are used in this article to measure the potential growth of Germany and the United Kingdom.

The first involves pinning down the empirical link between GNP and the unemployment rate and then using this relationship to identify the real growth rate that has been associated historically with a stable unemployment rate. The other method relies on decomposing GNP growth into movements in labor productivity and in the labor force.[1] The sum of trend growth in these series is another measure of the underlying rate of capacity expansion. Both techniques have been used extensively in the literature since they provide simple and direct means for measuring potential growth.[2]

Germany

Both methods for measuring potential growth place Germany's present long-run growth rate at about 3 percent (Box 1). Over the past five years, however, real output has grown on average only 0.9 percent, far less than its current long-term trend. Since output growth failed to keep pace with its ever-expanding potential, slack in the German economy has grown sharply (Chart 1).

The equations linking quarterly movements in real GNP and the unemployment rate, which are the basis for the first method of estimating potential growth, are presented in Box 1.[3] This technique shows that from 1963 to 1976, real growth of 4.7 percent would have resulted in a constant unemployment rate. Around 1977, however, the relationship shifted and real growth of only 3.0 percent was required to stabilize the unemployment rate.

The second approach for measuring potential output confirms this slowing in long-term growth and, beyond this, provides insight into the factors responsible for its decline. Potential growth is fundamentally equal to the sum of the underlying trends in labor productivity and in the labor force (Box 1). Estimates of these trends are reported in Table 1. Due to measurement error and compositional changes, the sum of the growth rates yields potential growth figures that differ a bit from the ones obtained by the other method. Yet both techniques are in accord with potential expanding approximately 3 percent currently; down from about 5 percent before 1977.

The drop in capacity growth was due almost entirely to a sharp productivity slowdown. From 1963 to 1976, trend growth in output per employee equaled 4.4 percent, one of the faster growth rates among the industrialized countries. Yet from 1977 to 1984, the trend was halved to 2.2 percent. Numerous factors were behind this slowdown, including the rise in energy prices, persistently high inflation, and a decline in the rate of capital accumulation, the latter in part reflecting a slowing in the rate of overall growth. A concensus, however, has yet to emerge among analysts on the relative importance of these and other factors.[4]

What do these results tell us about how fast Germany has to grow before slack in the economy, as measured

[1]Throughout this article, labor productivity refers to output per worker, rather than output per manhour.

[2]See, for example, Arthur M. Okun, "Potential GNP: Its Measurement and Significance", in American Statistical Association, *Proceedings of the Business and Economic Statistics Section* (1962), pages 98-104; and Douglas M. Woodham, "Potential Output Growth and the Long-Term Inflation Outlook", this *Quarterly Review* (Summer 1984), pages 16-23. A third technique for measuring potential growth, based on estimating an economy-wide production function, was not pursued here due to data limitations and the need to make a number of somewhat arbitrary simplifying assumptions before estimation could proceed. For a recent analysis along this line see Jeffrey M. Perloff and Michael L. Wachter, "A Production Function—Nonaccelerating Inflation Approach to Potential Output: Is Measured Potential Output Too High?", in Karl Brunner and Allan H. Meltzer, eds., *Three Aspects of Policy and Policymaking: Knowledge, Data, and Institutions*, Carnegie-Rochester Conference Series on Public Policy, Volume 10 (1979), pages 113-163.

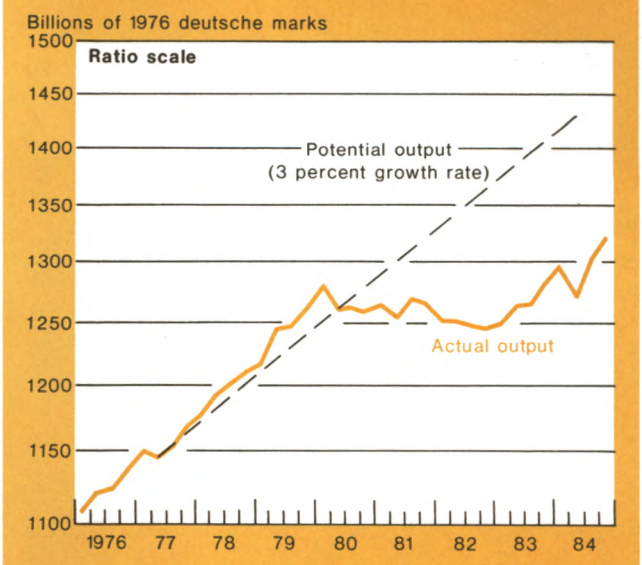
[3]Similar results were obtained with annual data.

[4]The productivity slowdown has been studied by many analysts. See, for example, "The Growth in Productivity in the Federal Republic of Germany and its Determinants", *Monthly Report of the Deutsche Bundesbank* (January 1980), pages 11-16, and Assar Lindbeck, "The Recent Slowdown of Productivity Growth", *The Economic Journal*, Volume 93 (March 1983), pages 13-34.

Chart 1

Actual and Potential GNP in Germany

At annual rate



Sources: Statistical Supplement to the Monthly Reports of the Deutsche Bundesbank, Series 4, and Federal Reserve Bank of New York staff estimates.

by high unemployment rates, begins to disappear? Any decline in the civilian unemployment rate requires real growth above that of potential. As a rule of thumb, every percentage point of growth in excess of 3 percent for one year lowers the German unemployment rate by about one-half of a percentage point. The decline, however, is spread over two years, with the bulk of it occurring in the first year. Thus a significant fall in the unemployment rate will only occur if Germany grows above 3 percent for some time.

The potential growth figures discussed above are somewhat higher than estimates made by the Bundesbank.[5] Their series, which is based on estimates of both an economy-wide production function and the capital, labor, and energy input levels consistent with "normal

[5] "Recalculation of the Production Potential of the Federal Republic of Germany", *Monthly Report of the Deutsche Bundesbank* (October 1981), pages 30-36, and Table A2.1 in Patrice Muller and Robert W. Price, "Structural Budget Deficits and Fiscal Stance", OECD Working Papers No. 15 (July 1984).

Box 1: German Potential Growth Estimates

Data from 1962-IV to 1984-I were used to analyze the statistical link between real output and the unemployment rate. A number of statistical tests suggested that the link between these variables changed within the sample period, most likely at the end of 1976.*

Alternative models were estimated over two sample periods—1962-IV to 1976-IV and 1977-I to 1984-I. The best fitting equations were:

1962-IV to 1976-IV

$$\begin{aligned}(A.1)\ DU(t) = {} & .2615 - .0656\ CGNP(t) \\ & (5.5) \quad (-5.0) \\ & - .0664\ CGNP(t-1) \\ & \quad (-4.7) \\ & - .0666\ CGNP(t-2) - .0293\ CGNP(t-3) \\ & \quad (-4.7) \qquad\qquad (-2.2) \\ & + .1995\ DUM \\ & \quad (2.1)\end{aligned}$$

$\bar{R}^2 = .71$ SE = .14 DW = 1.75 $rho_1 = .4260$ (3.5)

1977-I to 1984-I

$$\begin{aligned}(A.2)\ DU(t) = {} & .4050 - .1054\ CGNP(t) \\ & (13.4) \quad (-4.8) \\ & - .1702\ CGNP(t-1) \\ & \quad (-7.5) \\ & - .1849\ CGNP(t-2) - .0908\ CGNP(t-3) \\ & \quad (-7.8) \qquad\qquad (-4.1)\end{aligned}$$

$\bar{R}^2 = .839$ SE = .12 DW = 2.38 $rho_1 = .7026$ (4.8)
$rho_2 = -.7333$ (-4.7)

*It is possible that the change occurred about two years before this date. As the primary goal of this work is to obtain a good estimate of current potential growth, the data were split in 1977-I, after any shift could have occurred. Note that "proving" that one switch point is better than another, or showing that models with two or more switch points are superior, is not possible with these data since there are too many parameters to be estimated with a relatively small sample.

where the dependent variable, DU, is the change in the unemployment rate from the previous quarter, CGNP is the quarterly growth rate of real GNP, and rho_1 and rho_2 are first and second order autoregressive coefficients. DUM is a dummy variable equal to one in 1974, zero otherwise, to account for aberrant behavior in the intercept term. Both equations were estimated by Cochrane-Orcutt (t-statistics in parentheses).

From 1963 to 1976, potential output is estimated to have grown 4.7 percent a year. This figure is obtained by setting the left hand side of equation (A.1) and the dummy variable to zero and finding the constant rate of growth in GNP that solves the expression. The solution is 1.15 percent, or 4.7 percent at a compound annual rate. From 1977-I to 1984-I, the potential growth estimate is 3.0 percent.

The second method for measuring potential growth is based on the identity:

$$(A.3)\ GNP = \frac{GNP}{EMPLOY} * \frac{EMPLOY}{LF} * LF$$

where EMPLOY equals total employment and LF is the labor force. The first term to the right of the equal sign is labor productivity, the next is one minus the unemployment rate. This equation shows that GNP equals labor productivity, times the proportion of workers employed, times the labor force. If real GNP were expanding at the same rate as labor productivity and the labor force, equation (A.3) implies there would be no pressure for the unemployment rate to change. Thus an alternative method for measuring potential growth is to estimate the underlying trends in productivity and the labor force.

Measuring a trend in a series, however, can prove difficult since there is no clear-cut way to disentangle cyclical movements in a series from its trend or changes in trend. A further complication arises since equation (A.3) is an identity and, as such, the product of the input variables has to equal GNP. Yet the productivity and labor force series that are available are not measured on the same basis. For these reasons, the sum of the trend growth estimates is not likely to equal exactly the potential growth figures from the other method.

utilization", has potential expanding on average 4.0 percent from 1963 to 1976 and 2.4 percent from 1977 to 1983. Since the Bundesbank study used a different sample period and methodology, it is not surprising that our estimates differ somewhat. However, even their lower estimates would imply a sharp increase in the amount of slack since 1980.

United Kingdom

Greater uncertainty surrounds the potential growth figures for the United Kingdom, making it difficult to assess precisely how capacity growth has changed there over the past 25 years. When taken together, however, the empirical results suggest that potential output has been advancing about 2.5 percent since 1974, down from approximately 3.2 percent in the 1960s and early 1970s. There is some evidence that potential growth may have changed once again in the past five years, but testing for this is difficult. Even if the 2.5 percent figure differs somewhat from the current long-term trend, the point remains that over the past five years real growth in the United Kingdom has averaged 0.7 percent, far below any plausible potential growth figure.

For the period from 1961 to 1973, the link between unemployment changes and GDP growth using annual data implies that potential was advancing about 3.3 percent a year (Box 2). Quarterly movements in these series did not produce a dependable statistical relationship that could be used to estimate potential growth.[6] Estimates of the underlying trend in labor productivity and the labor force were more reliable and placed potential growth at 3.1 percent (Table 2). In light of this, it seems reasonable to fix potential growth for this period at slightly above 3 percent, say 3.2 percent.

Interpreting the data from 1974 to 1983 is more difficult. With annual observations, it is hard to choose between alternative empirical models. Two plausible models have potential output expanding 2.4 percent and 3.0 percent. When quarterly observations were used, the estimates imply potential was expanding 2.9 percent. Taken together, these results suggest that capacity growth is closer to 3 rather than to 2.5 percent.

The second approach, in contrast, which sums estimates of trend growth in productivity and the labor force, has potential advancing 2.3 percent over this period. The difference between these numbers is significant when thought of in terms of the larger amount of goods and services that could be produced over time at the higher growth rate. Even so, with no clear-cut way to choose among them, a 2.5 percent figure for this period seems to be a reasonable choice.

Despite some uncertainty about the current rate of potential growth, it is clear that capacity output has advanced slower over the last ten years than in the 1960s and early 1970s.[7] Nevertheless, actual output has grown even less than this significantly reduced potential for the past five years or so. Indeed, based on the potential growth estimate of 2.5 percent, real GDP in the United Kingdom is currently about 8 percent below its potential level (Chart 2). Narrowing this gap would take several years of above potential growth.

A comparison of potential growth in the United States, Germany, and the United Kingdom

A comparison of current potential growth in the United States, Germany, and the United Kingdom reveals that all three countries currently have very similar long-term growth rates. Over the past ten years or so, potential has been expanding about 3 percent in both the United

[6]The unreliable results are probably due to the quarterly data being more variable and possibly because they contain more measurement error than their annual counterparts. Under such conditions, regressions based on data of different frequencies sometimes produce conflicting results.

[7]Potential growth estimates made by the OECD also have the United Kingdom's long-term growth rate falling to approximately 2.3 percent over the period 1974 to 1983. See Muller, *op. cit.*

Table 1

Germany: Cyclically Adjusted Trend Growth in Labor Productivity and the Labor Force

In percent

Time period	Output per employee	Labor force	Implied potential growth rate
1963-76	4.4	0.8	5.2
1977-84	2.2	1.0	3.2

These growth rates were calculated by regressing the natural log of the series on a constant, a time trend, and the current and three lagged values of the unemployment rate. Two other methods for calculating trend growth—average year-over-year growth and peak-to-peak growth—produce essentially the same results. The data, which end in the first quarter of 1984, are described in the appendix.

Table 2

United Kingdom: Cyclically Adjusted Trend Growth in Labor Productivity and the Labor Force

In percent

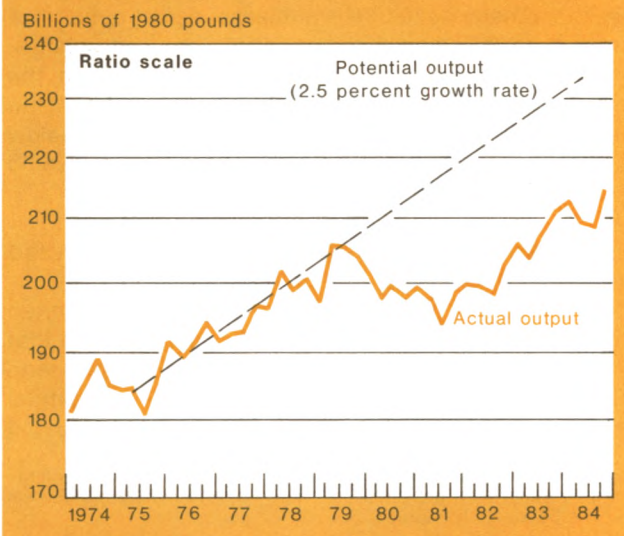
Time period	Output per employee	Labor force	Implied potential growth rate
1961-73	2.8	0.3	3.1
1974-83	1.5	0.8	2.3

These growth rates were calculated the same way as in Table 1. The data end in the second quarter of 1983.

Chart 2

Actual and Potential GDP in the United Kingdom

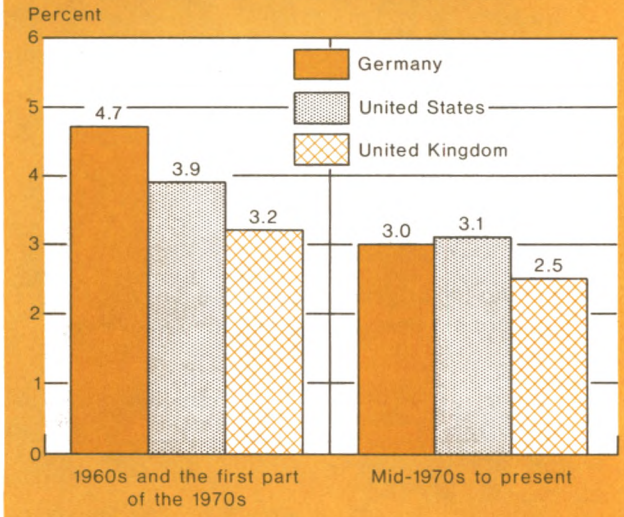
At annual rate



Sources: Bank for International Settlements data tape, and Federal Reserve Bank of New York staff estimates.

Chart 3

Potential Growth Rates in Germany, the United States, and the United Kingdom



Source: Federal Reserve Bank of New York staff estimates.

States and Germany, slightly less in the United Kingdom (Chart 3). A recent study by the International Monetary Fund (which does not give country-specific estimates) also places potential growth in the major industrial countries (except Japan) between 2.5 and 3 percent currently.[8]

Capacity growth rates were not always so alike. In the 1960s and first part of the 1970s, potential was expanding about 4.7 percent in Germany, and 3.2 percent in the United Kingdom. Potential growth in the United States was roughly midway between the German and United Kingdom figures. The recent convergence of long-term growth rates, therefore, reflects different degrees of slowing in capacity growth. The sharpest drop came in Germany where potential growth fell approximately one and one-half percentage points, about twice the declines registered in the United States and the United Kingdom.

A marked productivity slowdown was the primary factor behind the fall in capacity growth in all three countries. In both the United States and the United Kingdom, trend growth in real output per employee fell about one and one-quarter percentage points in the mid-1970s. These declines more than offset one-half percentage point accelerations in labor force growth. The productivity slowdown in Germany was a bit sharper—it fell about two percentage points—and the advance in its labor force was more muted than in the other countries.

The current similarity in potential growth rates belies the fact that there are important differences in how quickly each country's unemployment rate responds to changes in real growth. Roughly speaking, one percentage point of growth in excess of potential for one year lowers the unemployment rate in the United States about 0.4 percentage point in the *long term*. Comparable figures for Germany and the United Kingdom are 0.5 and 0.6 percentage point, respectively. So the long-run impact of faster growth is essentially the same across the three countries. Yet the amount of time that has to elapse before the adjustments are complete varies greatly. In the United States, the effect is largely contemporaneous. But in Germany, the decline is spread out over two years; three in the United Kingdom (Chart 4).[9] Consequently, any change in economic activity is likely to be reflected in employment the fastest in the United States, and the slowest in the United Kingdom. Put another way, stimulative macroeconomic policies,

[8]The figure for the United States is taken from Woodham, *op. cit.* The IMF study is contained in their *World Economic Outlook*, Supplementary Note 6 (April 1985).

[9]About 60 percent of the decline occurs in the first year in Germany; 40 percent in the second. In the United Kingdom about 35 percent of the decline is in place in the first year, 50 percent in the second, and 15 percent in the third.

even if they are put in place now, are not likely to affect the European employment situation quickly.

Why are the adjustment speeds so much slower in Europe? European labor markets are frequently characterized as being less flexible than U.S. labor markets; for example, it is generally more difficult to fire a worker in Europe than in the United States.[10] U.S. firms, consequently, are better able to adjust employment to overall demand changes than are European firms. When

[10]For a comparison of European and American labor markets, see Janet L. Norwood, "Labor Market Contrasts: United States and Europe", *Monthly Labor Review* (August 1983), pages 3-7.

Box 2: United Kingdom Potential Growth Estimates

The statistical link between GDP and the unemployment rate was studied using data from 1961-I to 1983-IV. An analysis of these data suggested that the relationship changed in 1974, and possibly in 1980. Distinguishing between the 1974 and 1980 changes proved difficult, *i.e.*, letting the relationship change in both 1974 and 1980 produced essentially the same results as having it change only once in 1974. In light of this, the data were divided into two groups—1961-I to 1973-IV and 1974-I to 1983-IV—and each subperiod was analyzed separately.

1961 to 1973 period

The best fitting annual regression equation linking changes in the unemployment rate to growth in real GDP is reported in the top row of the Table. This equation implies that potential was expanding 3.3 percent over this period.* Efforts to correlate quarterly movements in these series failed to produce a reliable statistical relationship. The quarterly regressions typically had insignificant intercept terms (implying zero growth in GDP was consistent with an unchanged unemployment rate) and implausibly small coefficients on the GDP growth variables (of which only the current rate of growth was significant).

*This figure is obtained by finding the constant rate of growth in GDP consistent with an unchanged unemployment rate.

As was true for Germany, the productivity and labor force data that are available do not decompose GDP growth exactly. Even so, estimates of trend labor force and productivity growth imply potential was expanding 3.1 percent over this period. Thus the two techniques yield very similar potential growth figures.

1974 to 1983

Interpreting the data from 1974 to 1983 requires more care. First, there are only ten annual observations, so it is hard to differentiate statistically between alternative GDP/unemployment relationships. Two candidate annual models are displayed in the second and third rows of the Table. On a statistical basis, each equation has its own strengths and weaknesses, yet neither one is clearly superior to the other. The first equation has potential expanding 3.0 percent, the second 2.4 percent.

Unlike the earlier period, a reliable quarterly link was obtained. The best fitting equation, which is shown in the bottom of the Table, has potential expanding 2.9 percent since 1974. This regression, taken in combination with the annual regressions, suggests that capacity growth is closer to 3 percent than to 2.5 percent. But estimates of trend growth in productivity and the labor force have potential advancing 2.3 percent. The 2.5 percent estimate used in the text seemed a reasonable, and possibly conservative, compromise.

Regressions Linking Unemployment Rate Changes to GDP Growth in the United Kingdom

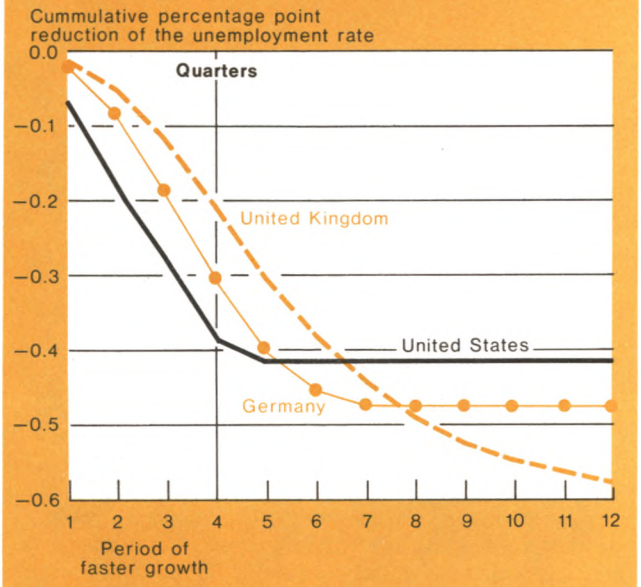
Data frequency	Time period	Constant	$CGDP_t$	$CGDP_{t-1}$	$CGDP_{t-2}$	DU_{t-1}	Implied potential growth rate	$\bar{R}^2$	SE	DW	Durbin's-H
Annual	1961-73	1.308	−0.2219	−0.1758	*	*	3.3	0.64	0.31	2.2	*
		(4.4)	(−4.6)	(−2.6)							
Annual	1974-83	1.704	−0.2638	−0.3009	*	*	3.0	0.62	0.70	2.2	*
		(5.9)	(−2.2)	(−3.8)							
Annual	1974-83	2.120	−0.3823	−0.3354	−0.1580	*	2.4	0.75	0.57	2.6	*
		(6.9)	(−3.4)	(−5.0)	(−2.1)						
Quarterly	1974-I to 1983-IV	0.117	−0.0582	−0.0450	−0.0612	0.7320	2.9	0.78	0.16	*	0.40
		(3.5)	(−3.5)	(−2.7)	(−3.6)	(9.7)					

The dependent variable DU_t equals the change in the unemployment rate from the previous quarter or year and CGDP equals the percent change in real GDP from the previous quarter or year. T-statistics are reported in parentheses. All equations were estimated by ordinary least squares. The implied potential growth rate equals the rate of real GDP growth consistent with an unchanged unemployment rate.

*Not included.

Chart 4

Decline in Unemployment Rate if Real Output Grows Faster Than Potential Output*



*One percentage point faster than potential for one year.

Sources: These figures were derived from equation (A.2) in Box 1, the last equation in the table to Box 2, and equation (A.2) as reported in Woodham, op. cit.

faced with a boost in demand, European businesses often try to adjust the average work week or increase labor productivity before additional workers are hired. All of this suggests that labor market rigidities are an important factor behind the relatively sluggish response of German and United Kingdom unemployment rates to changes in output growth.

Some policy implications

One perhaps obvious conclusion from this analysis is that recent growth performance of Germany and the United Kingdom has been, on average, well below potential. While potential growth in both countries did drop around the mid-1970s to the 2.5-3 percent range, actual growth rates over the past several years have not even matched these lower potential growth figures. As a result, economic slack has increased greatly, as evidenced by rising rates of unemployment. Any significant reduction of the amount of slack—and unemployment—requires sustained growth in excess of potential for a period of time.

Over the near-term, the prospects for reducing the amount of slack in Germany appear to be quite dim. Both the German government and the five leading German Research Institutes are currently projecting 2.5 percent year-over-year growth in German real GNP for 1985. These forecasts imply[11] that real output will only

[11]In other words, if real GNP grows from its fourth quarter 1984 level at a 1.2 percent annual rate, then year-over-year GNP growth will equal 2.5 percent. The Research Institute's forecast is discussed in *The London Financial Times* (April 30, 1985), page 1. The German Economics Ministry reconfirmed its 2.5 percent year-over-year forecast on May 9, 1985.

Table 3

Estimates of the Natural Rate of Unemployment

In percent

Time period	Germany					United Kingdom		
	Layard, *et. al.**	Franz†	Gordon‡	OECD§	Actual Unemployment Rate	Layard, *et. al.**	OECD§	Actual Unemployment Rate
1967-70	‖	0.7	1.6	0.8	1.3	‖	4.9	2.4
1971-75	‖	2.1	1.8	2.5	2.1	‖	5.7	3.2
1976-80	3.7	4.2	3.7	2.8	4.2	4.6	7.5	5.6
1981-83	5.3	4.2	5.0	5.8	7.5	9.5	7.7	11.3

*Richard Layard, Giorgio Baseri, Olivier Blanchard, Willem Buiter and Rudiger Dornbusch, *Europe: The Case for Unsustainable Growth*, Center for European Policy Studies No. 8/9 (1984).

†"The Past Decade's Natural Rate and the Dynamics of German Unemployment", *European Economic Review*, Volume 21 (1983), pages 51-76. Wolfgang Franz estimated that the natural rate equaled 0.7 percent from 1965 to 1973 and 4.2 percent from 1974 to 1981.

‡Robert J. Gordon, "Comments on the Franz Paper", *European Economic Review*, Volume 21 (1983), pages 83-87. Gordon only reported natural rate estimates for 1965, 1970, 1973, 1976, 1979, and 1981. The numbers in the table, therefore, do not apply to the complete sample period.

§David T. Coe and Francesco Gagliardi, "Nominal Wage Determination in Ten OECD Countries", OECD Economics and Statistics Working Paper No. 19 (March 1985). A simple average of the two natural rate estimates is reported in the table.

‖Not available.

rise 1.2 percent from the fourth quarter of 1984 to the fourth quarter of 1985. If real growth does turn out to be this low, a further rise in the unemployment rate is likely this year.

The unemployment outlook in the United Kingdom is somewhat more optimistic. In the most recent budget, the U.K. government projected 1985 real GDP growth of 3.5 percent.[12] If this turns out to be the case, then the unemployment rate may decline slightly over the next year or so.

Another important implication emerging from the potential growth estimates concerns the likely path of inflation that would result from faster growth. When the unemployment rate exceeds its natural rate—the rate consistent with stable inflation—past experience has shown that slack in the economy exerts downward pressure on inflation. Recent estimates of the natural rate place it at about 5½ percent in Germany and 9½ percent in the United Kingdom (Table 3). This suggests that the gap between the actual and natural unemployment rates in these countries is currently 3½ to 4 percentage points, so a great deal of disinflationary pressure is now in place, and has been for some time. Not surprisingly, German consumer price inflation is now less than half of what it was two years ago. Inflation in the United Kingdom also fell over that period, albeit at a somewhat slower pace than in Germany.[13]

With so much slack in place, it seems feasible for actual growth to exceed the estimated 2.5-3 percent potential growth rates for a while without engendering a resurgence of inflation. Obviously the room for faster growth is not unlimited, and a precipitous expansion would run the risk of reviving inflationary expectations. Yet in view of the large amounts of unused capacity, further declines in inflation would seem to be consistent with faster than potential growth in these economies over the next one or two years.

[12]This figure equals projected growth from the latter half of 1984 to the second half of 1985. *The London Financial Times* (March 20, 1985), page 14.

[13]The slowing of inflation occurred alongside a significant rise in the dollar against both the mark and the pound. In the absence of dollar appreciation, price inflation in Germany and the United Kingdom would most likely have been considerably lower.

Douglas M. Woodham

Data Sources

Germany

The data were taken from the *Statistical Supplement to the Monthly Reports of the Deutsche Bundesbank, Series 4*. All the series are seasonally adjusted.

Real GNP:	Gross national product in 1976 marks.
Unemployment Rate:	Number of unemployed as a percent of the civilian labor force. The quarterly unemployment rate used in this article is a simple average of the monthly numbers.
Productivity:	Gross national product per employed person at 1976 prices.
Labor Force:	This series was derived by taking the sum of total employment (a quarterly series) and a quarterly average of the number of unemployed workers.

United Kingdom

The data were taken from a variety of sources. All of the series are seasonally adjusted.

Real GDP:	Expenditure on real gross domestic product at factor cost in 1980 prices. Obtained from the Bank for International Settlements data tape.
Unemployment Rate:	Number of unemployed as a percent of the civilian labor force. The quarterly series is a simple average of the monthly numbers. Obtained from the OECD data tape.
Productivity:	Real output per employee in the economy as a whole. The series was taken from *Economic Trends: 1984 Annual Supplement*, published by the U.K. Statistics Office.
Labor Force:	This series equals the sum of the employed labor force (which includes self-employed persons) and the unemployed (which includes school leavers). It is referred to as the working population. Source is the same as for the productivity series.

Using Monetary and Financial Variables to Predict Cyclical Downturns

Economists rely on several methodologies to predict business cycle turning points, with the indicator approach most commonly used. Various monetary and financial variables are employed within this framework; very popular are the money supply, interest rates, and the volume of credit. This article evaluates how well these monetary and financial variables predict imminent recession. Of particular interest is their performance during the past several years. Considering the extensive deregulation and the many innovations in financial markets and the banking industry, it is only natural to suspect that their value as leading indicators has changed, most likely for the worse during this time of flux, and perhaps permanently.

To evaluate the performances of these variables, we adopt a new approach to the prediction of cyclical downturns developed by Salih Neftçi.[1] In formulating his approach, Neftçi applied to macroeconomic forecasting a branch of statistics called sequential analysis. With this stronger statistical framework, we feel we can analyze the properties of indicator variables better than has been done in the past.[2]

The authors would like to give special thanks to Ted Sikorski for excellent research assistance.

[1]Salih N. Neftçi, "Optimal Predictions of Cyclical Downturns", *Journal of Economic Dynamics and Control* (1982), pages 225-241.

[2]This study, however, is not the first attempt to use advanced statistical methods to evaluate leading indicators; for example, Hymans used spectral analysis. Saul H. Hymans, "On the Use of Leading Indicators to Predict Cyclical Turning Points", *Brookings Papers on Economic Activity II* (1973), pages 339-384.

We begin by illustrating how his method works by applying it to the Composite Index of Leading Indicators. The results suggest that the Composite Index yields more useful information than is commonly believed. Thus, the Composite Index's poor reputation seems largely undeserved and is due to the faulty rules-of-thumb used to determine when it actually signals recession.

Next, we test the leading indicator properties of the monetary aggregates, total debt, and short-term interest rates. We find that the monetary aggregates did very well in the 1950s through the 1970s, but seem to have lost virtually all of their power as leading indicators in the 1980s. This, of course, fits with the judgment of many economists that innovation and deregulation have been distorting the aggregates significantly. Total debt and short-term interest rates do not generally perform as well as the monetary variables, but lately they have provided correct signals. Apparently innovation and deregulation have not been harming their ability to predict downturns.

Finally, since no individual variable is entirely satisfactory, we also pool the forecasts obtained from the money supply, the commercial paper rate, Total Debt, and the Index of Leading Indicators in a way Okun suggested several years ago.[3] The results from this broader perspective look promising: false or premature signals of recessions and failures to signal are sharply reduced. Moreover, the advantage of relying on a com-

[3]Arthur M. Okun, "On the Appraisal of Cyclical Turning Point Indicators", *Journal of Business* (April 1960), pages 101-120.

bination of financial and nonfinancial variables is in accord with monetary policy's current "tripartite" approach, involving the monetary aggregates, the economy itself, and short-term interest rates.[4]

Criteria for judging leading indicators

To evaluate the leading indicator properties of a financial variable (or any economic variable), analysts essentially favor these characteristics:[5]

- A leading indicator should be accurate, with a record of anticipating all actual turning points in the economy while avoiding "false" predictions. This is the foremost criterion by which to judge an indicator.
- The lead time between the "signal" and the actual turning point should not vary too much.
- The lead time should not be too long or too short.
- Given the diverse forces influencing the economy, a multiplicity of indicators is likely to perform better than just one.
- A leading indicator, or composite of indicators, should be chosen partly on theoretical considerations; otherwise, the reliability of a signal will always be in doubt.

Clearly, the second and third criteria require some subjective view on how much variability in lead time is too large, and what lead time is too long or too short. No consensus has emerged on these issues. Some analysts point out that a precise answer depends on such factors as the horizon of decisionmakers and the lag between perceiving an ensuing turning point and taking any action in consequence.[6] Considering these two factors, we will accept a signal with a lead time of between zero and 12 months as valid. Our lower bound, no true lead time, is based on the fact that it often takes several months to recognize that a downturn has indeed occurred, so such a signal can be genuinely useful to a decisionmaker.[7] Our upper bound in effect puts a cap on the acceptable variability of lead time.

[4]Anthony M. Solomon, "Some Problems and Prospects for Monetary Policy in 1985", this *Quarterly Review* (Winter 1984-85), pages 1-6.

[5]Geoffrey H. Moore and Julius Sliskin, *Indicators of Business Expansions and Contractions*, National Bureau of Economic Research (1967); and D. J. Daly, "Forecasting with Statistical Indicators", in Bert G. Hickman, ed., *Econometric Models of Cyclical Behavior*, Volume 2 (1972), pages 1159-1194.

[6]Okun, *op. cit.*, page 102.

[7]See the comments of Alan Greenspan following Hymans' paper, *op. cit.*, pages 376-378.

Perhaps the most serious problem with variables used as leading indicators is their tendency to produce false signals. There appear to be two main reasons why they occasionally do so. One is that the rule used to evaluate the movements of the indicator variables is not sufficiently powerful to avoid making mistakes. Another is that the indicators themselves, particularly those calculated as rates of change, cannot discriminate between economic slowdowns and recessions.[8]

We define a false signal as any two-month or longer reversal of a recession signal before a recession begins. (Because economic data are noisy, temporary one-month reversals are tolerated and not classified as false signals, following Hymans.[9]) As we will show, the difficulty with false signals is much less severe in our analysis than is typical. This is because the Neftci approach is better grounded in statistical theory than the popular rules-of-thumb, and apparently is powerful enough to succeed often in interpreting the movements of the variables we test as leading indicators.

Neftçi's formula

In essence, Neftçi's approach reduces to a formula that takes monthly observations on a selected variable and estimates the probability of an imminent recession for the latest month. When the estimated probability exceeds a critical value—say 90 percent, a standard cut-off value in statistics, which keeps the probability of a "false alarm" at 10 percent—an imminent recession is predicted. A lower critical value would provide more lead time; a higher critical value would reduce the frequency of false signals. Note that the formula, unlike econometric models, produces no specific forecast of the level or growth rate of real GNP.

Neftci's formula derives from a branch of statistics called sequential analysis.[10] Sequential analysis recognizes that in many situations a decision does not have to be made immediately, but can be delayed until additional information has been acquired. Sequential analysis seems particularly applicable to the problem of predicting turning points in the business cycle. Each month during an expansion, a forecaster must weigh the information in the newly released data to determine whether there are sufficient signs of a nearby recession. But the forecaster can always postpone a recession prediction for another month and await additional information. In this situation, sequential analysis can provide a "stopping rule", whereby the forecaster (given a pre-

[8]Sidney S. Alexander, "Rate of Change Approaches to Forecasting—Diffusion Indexes and First Differences", *Economic Journal* (June 1958), pages 288-301.

[9]Hymans, *op. cit.*, page 351.

[10]G. Barrie Wetherwill, *Sequential Methods in Statistics* (1976).

scribed margin for error) neither unnecessarily delays nor prematurely announces the prediction of an imminent downturn. This approach should lead to more reliable projections than purely judgmental ones or those based on a rule-of-thumb. Moreover, since a precise statistical basis is intrinsic to the approach, the forecaster can determine the probability of a false alarm (or type I error) that is to be tolerated.

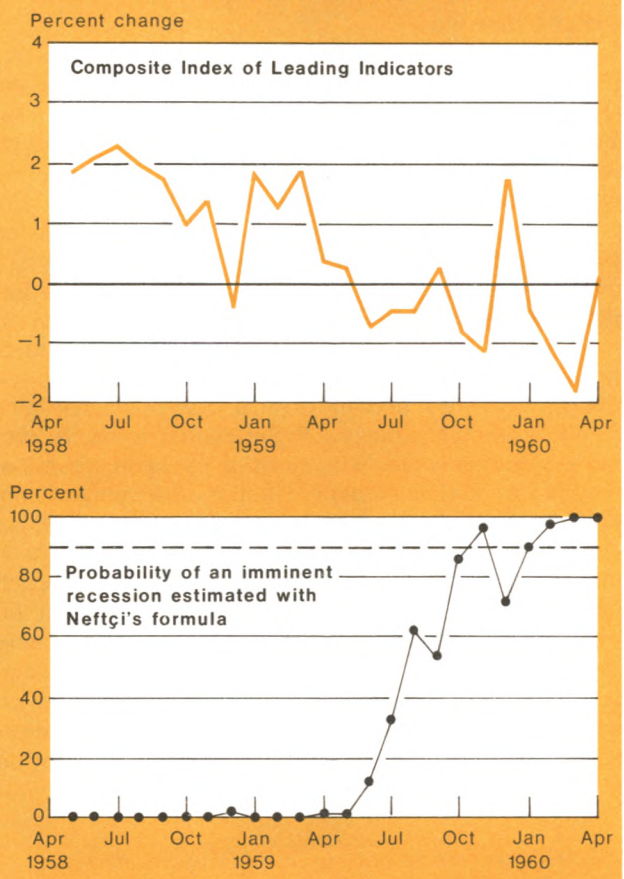
Three pieces of information go into the formula (appendix). The first is the likelihood that the latest observation on an indicator variable came while the economy was (or was soon to be) on a downswing versus the likelihood that it came while the economy was still on an upswing. The likelihoods are estimated by smoothing the frequency distributions of an indicator's historical record, after splitting the data on the indicator variable into periods of expansion and recession.[11] By this method extreme values naturally receive either very low or very high likelihoods of occurring while the economy is in recession; intermediate values are given moderate likelihoods. For example, a two percentage point fall in the Commerce Department's Composite Index of Leading Indicators (CLI) would be assigned a nearly 100 percent likelihood of being associated with a recession, and a two percentage point rise would get a near-0 percent likelihood. Meanwhile, a 0.2 percentage point rise is only a little more likely to be associated with recession than with expansion.

When it is likely that the latest observation implies recession, the formula raises the estimated probability of a nearby recession. Conversely, when the likelihood is low, the estimated probability drops. For instance, the CLI fell 0.8 percent in June 1984; by past experience, a moderately large decline in the CLI like this has an 84 percent likelihood of being associated with a recession. Consequently, the probability of a nearby recession, as estimated by the formula, jumped from 3 percent to 18 percent. In another case, May 1979, the CLI rose 0.8 percent, a value clearly linked with continued expansion, and so the estimated probability of recession dropped from 63 percent to 30 percent.

The second piece of information is the likelihood of an imminent recession based on the length of the recovery to date compared with the average length of postwar recoveries. This simply reflects the "life expectancy" of the current recovery in an actuarial sense, not any specific information on the economy's current state.[12] Historically, after 22 months into a recovery, the likelihood of a recession beginning in the very next month is only 2 percent, since postwar recoveries average much longer, 48 months. But after 73 months, the likelihood of a recession setting in immediately climbs to 10 percent, because a recession is overdue. In general, the formula's estimated probability will rise slightly in each successive month—apart from the new values of the indicator variable—as the recovery's life expectancy shortens.

The third piece of information is the probability of recession estimated in the previous month. This makes the formula recursive, with the estimated probability

Forecasting the 1960 Recession Using the Composite Index of Leading Indicators



Source: United States Department of Commerce.

[11] As in Neftçi's paper, the data were split into the two groups using judgment. Of course, this means different researchers can get different results even though they use the same indicator variable. In our work, we also tried using a specific rule to split M1 data into the two periods; the results were not appreciably different from using judgment.

[12] We conjecture that substituting a measure of excess capacity in the economy would provide a better *a priori* probability, and would improve the power of Neftçi's formula. Our thought is that the likelihood of recession is related more to the amount of room left for the economy to grow than to a notion of typical length of recovery.

revised each month according to the likelihood that the new observation on the indicator variable points toward recession. (In addition, the estimated probability is pushed up slightly each month as the recovery ages.) This way, the estimated probability depends not only on the new observation, but also on all previous observations on the indicator variable. Earlier observations, in other words, can either reinforce or cancel the new reading's importance.

Illustration: Composite Index of Leading Indicators

To illustrate Neftçi's approach, we insert the CLI into his formula and examine its ability to predict the seven postwar recessions plus the 1967 slowdown, which is often treated as a true recession. To begin, we split the data covering the years 1947 through 1978 into periods of recession and expansion, and then estimate the likelihood, for any sized percentage change in the CLI, that the observed change was due to a downswing.[13] We find that declines and small increases (up to 0.2 percent) are more often associated with recession than with continued expansion, with declines of 1.4 percent or greater occurring almost exclusively in recessions. Increases in the CLI of 0.4 percent or more were usually associated with continued expansion. Then, taking (1) Neftçi's formula and (2) his estimate of the likelihood of a recession based solely on the expansion's age, we calculate the probability of an imminent recession for each month from November 1949 through early 1985.[14]

The interval from May 1958 (trough) to April 1960 (peak) provides a clear example. In May 1958, one month after the trough, the CLI registered a sizable 1.9 percent gain and the estimated probability of recession was 0 percent (chart). The probability remained near zero through February of 1959, but climbed to 62 percent in August following three consecutive moderate declines in the CLI. In September, a small increase in the CLI reduced the recession probability a bit, but large decreases in October (−0.8 percent) and November (−1.1 percent) pushed the probability up to 97 percent. After dropping to 72 percent because of an unusual 1.8 percent increase in December, it went back above 90 percent in January when the CLI fell once more. For the next three months, the probability exceeded 90 percent, and in April a peak in the cycle was identified. Thus, the CLI gave a warning with a lead time of five months, counting back to November 1959 or, because the probability dipped below 90 percent in December, three months counting back to January 1960.

Table 1

Performance of the Composite Index of Leading Indicators (1950-83)

Peak in business cycle	Amount of lead time provided (in months)
7/53	1
8/57	Premature (14)
4/60	5
12/66	6
12/69	1
11/73	3
1/80	6
7/81	No signal

False signals April 1951 through May 1952.

In Table 1, we summarize the results for the period 1949-83. The much-maligned CLI, we find, can predict turning points substantially better than is generally recognized. In six of eight recessions, the CLI provides a useful signal: a prediction zero to 12 months before the downturn. In two cases, however, the CLI fails to provide a useful signal. First, it gave no prior warning of the 1981 recession; the probability computed by the formula did not exceed 90 percent until two months after the recession began. Second, before the 1957 recession, it gave a premature signal, a warning 14 months in advance. In defense of the CLI, the economy was teetering on the brink of recession beginning in 1956-III. Thus, while indeed the CLI erred here, it was not as grievous an error as, say, signaling recession when the economy instead boomed for two more years. Aside from these two errors, the CLI gave one totally false signal: it predicted recession continuously for 14 months (from April 1951 to May 1952) with no nearby recession.

During 1984, the CLI indicated a significant probability of recession, but the probability was never high enough to warrant predicting an imminent recession. The estimated probability peaked in July at 67 percent and again in December at 55 percent (Table 2). Through April 1985, the probability stayed below 20 percent.

[13] An assumption underlying Neftçi's approach is that the economy's behavior in recession is basically different from its behavior in expansions. This assumption would mesh with some theories of the business cycle but not with others. For a recent survey on the business cycle literature, see Victor Zarnowitz, "Recent Work on Business Cycles in Historical Perspective: Review of Theories and Evidence", *Journal of Economic Literature* (June 1985), pages 523-580.

[14] When we calculate the probability of an imminent recession at each month from 1949 through 1984, the results obtained up to 1978 are analogous to an in-sample simulation performed with a regression model. The data through 1978 are used twice: first, to estimate the model, and second, to test the model. The results obtained after 1978 are thus analogous to an out-of-sample simulation, since these data were not used in model estimation.

These estimates are based on the data available at the time of the release of the April 1985 figure; the 1984 data were revised several times subsequent to their original release. Using the data available at the time of the release of the December 1984 figure, the estimated probabilities were higher: 85 percent in August, 88 percent in October, and 89 percent in December. The CLI came within an eyelash of predicting recession. Obviously, the lesser reliability of originally-released data creates the same difficulties for Neftçi's method as it does for virtually all methods of economic analysis, and argues against relying on a single indicator when forecasting.

Comparison of results using other rules

The results from Neftçi's approach can be compared with those from some traditional rules for determining when the CLI signals an imminent recession. We tested how three such rules predicted economic downturns in the postwar period:

- When the CLI in a given month is judged to be at a peak for two or more subsequent months.
- Two months of decline.
- Three months of decline.

In its avoidance of misleading signals, the Neftçi approach dominates all the others. It is powerful enough to filter out almost all false signals without losing the lead time of genuine signals. While the three *ad hoc* rules incorrectly predict between seven and 12 downturns, the Neftçi formula (as mentioned above) does so only once, in 1951 (Table 3). We believe the key factor is that Neftçi's approach does what Juster suggested: it takes into account the size of movements in the CLI, not just the direction of the change.[15]

In sum, Neftçi's technique appears clearly superior to traditional ways of interpreting the leading indicators. Moreover, when Hymans applied spectral analysis to the CLI, he too found that most false signals of peaks could be filtered out.[16] This reinforces the view that strong statistical methods can make the CLI more useful. Both Hymans' results and ours show that much of the CLI's reputation as an unreliable predictor of turning points in the economy may have less to do with the CLI itself and more to do with the rules used to interpret its meaning.

Table 2

Performance of the Composite Index of Leading Indicators in 1984 and 1985

In percent

Month	Change in the Index	Probability of recession given by the formula
1984		
January	0.7	0
February	1.2	0
March	0.4	1
April	0.5	1
May	0.1	3
June	−0.8	18
July	−1.8	67
August	0.4	60
September	0.9	12
October	−1.0	46
November	0.7	17
December	−0.6	55
1985		
January	1.3	5
February	0.7	2
March	0.1	5
April	−0.2	19

Table 3

Comparison Between Neftçi Approach and *Ad Hoc* Rules Relating the Composite Index to Business Cycle Peaks

	Amount of lead time provided (in months)			
Peak in business cycle	Neftçi approach	Peak in Composite Index	Two consecutive months of decline	Three consecutive months of decline
7/53	1	4	4	4
8/57	Premature (14)	Premature (23)	2	2
4/60	5	11	11	11
12/66	6	9	9	9
12/69	1	8	3	3
11/73	3	8	8	6
1/80	6	10	Premature (15)	8
7/81	No signal	3	3	3
False signals	4/51	8/50 3/62 3/68 6/78 10/78 11/80 5/84	8/50 1/51 11/55 4/56 11/56 3/62 3/63 1/67 4/69 5/71 11/80 5/84	8/50 1/51 11/55 11/56 5/59 3/62 4/69 11/80

[15]See Thomas Juster's comment on the Hymans paper, *op. cit.*, page 383.

[16]Hymans, *op. cit.*, pages 369-373.

Performance of financial variables

We now use Neftçi's approach to analyze the leading indicator properties of financial variables. In particular, it is of interest to see whether the many innovations and regulatory changes taking place in the banking industry and financial markets over the past ten years have adversely affected the leading indicator properties of financial variables. The intermediate target approach to monetary policy emphasizes that a good target should lead movements in the ultimate objectives.[17]

We evaluate over the 1950-84 period those financial variables most closely watched for clues of the economy's future course: the money supply, short-term interest rates, and the volume of credit. Before applying Neftçi's formula, we transform the variables to increase their ability to signal recession. For the three monetary aggregates and total debt, we calculate in each case the trend rate of growth over a 24-month interval and then measure the deviation from the continuation of that trend six months later.[18] Focusing on the deviation from trend, rather than on the raw data, reflects the theory that sharp decelerations in monetary (or credit) growth precede cyclical peaks. Similarly for short-term interest rates, represented by the commercial paper rate, we use the relative (or percentage) change from its level 12 months earlier. The rationale here is that sharp rises in short-term interest rates can precipitate recessions.

The results suggest that each variable has some legitimate claim as a leading indicator of business cycle peaks (Table 4). Each usually warned of coming recession. Nevertheless, we must emphasize that each variable's performance was far from perfect. All five produced instances of premature signals, failures to provide a signal, or both.

Of the variables we tried, M1's performance is appreciably the best during the 1950s and 1960s. It never gave a totally false signal and provided a warning before each of the five recessions in this period. To be sure, the signal before the 1957 recession came too early, 14 months ahead of the recession. But as we noted in the section on the CLI, a premature signal in this instance should probably not be judged too severely—the economy flirted with recession beginning in 1956-III.

What is most striking and most significant for the present, however, is that M1 seemingly lost all its leading indicator properties in the 1970s and 1980s. It failed to signal the 1973, 1980, and 1981 recessions. (Shift-adjusted M1, constructed to offset the effect of authorizing NOW accounts nationwide, did not do so badly in 1981. It gave an 82 percent probability in July, at the cyclical peak, and a 97 percent probability the next month.) Even worse, M1 emphatically predicted recession during the last three quarters of 1984. As many have argued, financial innovation and deregulation have apparently (but not conclusively, as we will discuss later) so distorted the relationship between money and economic activity that money is no longer a reliable guide to the economy's course. The deterioration of M1's performance also coincides with the Federal Reserve placing greater emphasis on monetary targets. These developments do not imply, however, that M1 will never again be a useful indicator.

The broader monetary aggregates, M2 and M3, are about as accurate as M1. Both missed the 1953 downturn and prematurely predicted recession in 1957. In addition, M2 gave a false signal in 1964. So far in the 1980s, M2 and M3, like M1, have performed poorly. In 1981 both failed to signal and in 1984 both predicted recession; M2 was also too early for the 1980 decline.

M2's 1980 error can be traced to the reversal of the disintermediation that took place in 1973 and 1974. During 1975 and 1976, M2 grew very rapidly, spurred by the return of deposits into savings and small time accounts following a decline in interest rates from their 1974 peak levels. In 1977, with the reintermediation more or less complete, M2 growth slowed significantly, and consequently it gave an unwarranted recession signal in 1978. Although the deregulation of deposit rates has eliminated the problem of disintermediation, it may not have made M2 a better indicator variable in Neftçi's approach. Deregulation may have significantly and permanently altered the behavior of M2 such that its historical record—upon which Neftci's approach relies—may not be useful for interpreting its current movements.

Total Nonfinancial Sector Debt—the debt aggregate currently monitored, but not targeted by the FOMC—performed decently, but not as well as M1 until recently. From 1959 (when the data begin) to the present, this debt measure neither falsely signaled nor prematurely predicted recession. But it failed to call the 1960 and 1973 downturns. Importantly, Nonfinancial Sector Debt has excelled in the 1980s, just when the monetary aggregates failed. Debt clearly signaled the last two recessions, and in 1984 did not call for an imminent recession. Perhaps this success indicates that such a broad credit aggregate was less affected by financial

[17]Richard G. Davis, "Monetary Targeting in a Zero Balance World", Proceedings of Asilomar Conference on Interest Rate Deregulation and Monetary Policy, sponsored by the Federal Reserve Bank of San Francisco (November 1982), page 38.

[18]That is, the trend is measured over a 24-month span; this trend is extended an additional six months. At this point, the actual level of M1 (M2, M3, or total debt) is compared with the extrapolated level to measure (in percent) the deviation from trend. This is similar to Poole's method. William Poole, "The Relationship of Monetary Decelerations to Business Cycle Peaks: Another Look at the Evidence", *The Journal of Finance* (June 1975), pages 697-712.

deregulation and innovation, and so retained its informative value. Our results thus support the view that a debt or credit aggregate can provide policymakers valuable information about the economy.[19]

The commercial paper rate certainly has the weakest performance of this group. Not only did the rate give two totally false signals, it often sent out recession signals prematurely. Moreover, it failed to signal recession in 1953. The errors may not, of course, be the fault of the variable, but the fault of the transformation used. Nevertheless, these errors deserve some comment. First, for 1951 and 1964, when the paper rate falsely signaled recession (as did the CLI in 1951 and M2 in 1964), economic growth, in fact, slowed sharply, particularly in the private nonfarm sector. These two misses suggest that the behavior of short-term interest rates cannot reliably distinguish between recessions and slowdowns, although rates did not signal falsely on other occasions when economic growth decelerated significantly but did not halt. Second, the paper rate's premature signals in 1955 and 1978 may reflect expected increases in inflation that somewhat offset the impact of the rise in nominal interest rates. (The rate of increase in the GNP deflator [fourth quarter to fourth quarter] jumped by one percentage point per year in 1955 and 1956 and by over two percentage points in 1978.) Implied here is that both nominal and real short-term rates matter. Third, the 1953 prediction miss demonstrates that interest rates are not the only important influence on the economy. In particular, the 1953 downturn may largely have been a result of an inventory correction following the unwinding of the lagged effects from the Korean War—a development that had little to do with interest rates. Considering these limitations, the commercial paper rate may at best have a secondary role in a scheme where several indicators are used. But some economists argue with good reasons that financial innovation and deregulation have made interest rates a better barometer of financial market conditions, which means that interest rates should play a more prominent role.

The data through 1984 for the monetary aggregates and total debt (and the CLI) have been refined and revised several times. We would expect them to be less reliable in practice, when initially-reported or first-revision data must be used. Of course, since interest rate data undergo no revisions, they would not do worse in practice.[20]

Earlier, we gave an example of how data revisions lowered the estimated probabilities of recession derived from the CLI in 1984. The large benchmark and seasonal factor revisions to M1 in 1983 raises the possibility that the estimated probabilities derived from initially-reported M1 at that time could easily have provided a false signal. The initially-reported data showed M1 growth to be 13.3 percent in the first half of 1983,

[19]Benjamin Friedman, "Time to Re-examine the Monetary Targets Framework", *New England Economic Review*, Federal Reserve Bank of Boston (March/April 1982); and Albert M. Wojnilower, "The Central Role of Credit Crunches in Recent Financial History", *Brookings Papers on Economic Activity II* (1980).

[20]Another consideration affecting all but M1 and interest rates is the lag until the data are released.

Table 4

Summary of Results for Monetary and Financial Variables

In months

Peak in business cycle	Amount of lead time provided					
	M1	M2	M3	Total Debt	CP rate	Leading Indicators
7/53	2	No signal	No signal	*	No signal	1
8/57	Premature (14)	Premature (19)	Premature (19)	*	Premature (24)	Premature (14)
4/60	2	5	5	No signal	12	5
12/66	2	5	5	2	6	6
12/69	3	7	8	3	6	1
11/73	No signal	6	0	No signal	7	3
1/80	No signal	Premature (27)	10	6	Premature (24)	6
1/81	No signal	No signal	No signal	8	12	No signal
False signals	None	6/64-9/64	None	None	2/51-5/52 5/64-6/64	4/51-5/52

*Data for Total Debt are not available.

slowing to 5.5 percent in the second half. On this and other information, several economists warned of a nearby recession. The benchmark and seasonal adjustment factor revisions made in early 1984 moderated the deceleration: 12.4 percent in the first half; 7.2 percent in the second half. (There have been further revisions since.) These revisions led many economists to quickly back away from predicting recession.

Surprisingly, the revisions had little impact on the estimated probabilities. Using a 24-month interval to measure the trend rate of growth of M1, the estimated probability of recession based on the originally released data was 0 percent from January to December 1983, and 1 percent in January 1984. (The revisions were made in February 1984.) Based on revised data, the probability was 0 percent throughout 1983 and still 0 percent in January 1984; the revisions made little difference. If a 12-month interval is used instead to measure trend growth, the estimated probability was 100 percent in November and December before and after revisions; again the revisions made little difference. This example, however, is not being used to argue that the estimated probabilities derived from M1 are generally insensitive to even major revisions. Indeed, we believe they are somewhat sensitive. Instead, we are simply sharing the unexpected finding that in 1983 the revisions made little difference.

Assessing the results from the 1980s

The poor performance of the monetary aggregates in recent years suggests that innovation and deregulation have harmed their leading indicator properties. But countering this argument is the CLI's weak performance since 1980. It signaled the 1981 recession two months late (although M1 was never able to detect the recession), and in 1984 it estimated (with revised data) the probability of recession to be as high as 67 percent. The trouble the CLI has had raises the possibility that the swings in economic activity during the past few years have been unusual and, in turn, caused the breakdown of the leading indicator properties of the monetary aggregates.

This leaves some questions open. What exactly has been so strange about the economy's behavior lately? Have innovation and deregulation indeed appreciably distorted the monetary aggregates? Curiously, financial innovation and deregulation—which have taken many forms in the banking industry and financial markets—damaged the leading indicator performance of the monetary aggregates, but not the debt aggregate or short-term interest rates. One might think that the new developments would have affected the relationship between the economy and all financial and monetary variables. Therefore, the performance of interest rates and total debt in Neftçi's method should also have changed, since an assumption of an invariant relationship over time between an indicator variable and the economy underlies his method.[21] Nonetheless, the results do not bear this out; more work on these issues is needed.

Combining the forecasts from several indicators

Although each financial variable by itself has proved to be quite fallible as a leading indicator, the ability to predict recession may improve if the variables' signals are combined in some way. Such an approach would pool the specific information from each variable (but not pool the variables themselves) to cover the forces influencing the economy better and allow for several causes of a recession. An advantage of this approach is that the signal from one variable may be confirmed or disputed by that from another variable. For instance, a recession signal from M1 without confirmation from interest rates or the debt aggregate would be interpreted simply as a downward shift in money demand, certainly not a threat to continued expansion. A grouping of signals from a variety of variables, financial and perhaps nonfinancial, could go a long way toward meeting the evaluative criteria of a leading indicator listed above.

But how should such a grouping be assembled? One strategy, proposed years ago by Okun, is to form a group of indicators, all of which are treated equivalently.[22] The group is said to signal a recession when a predetermined number of the indicators (presumably, more than one and fewer than the total in the group) first indicates recession. In this way, one or more of the other indicators must echo the earliest signal before the forecaster makes a recession prediction. Which indicators signal earliest will depend on the cause or causes of each prospective recession.

The results of using this group approach are shown in Table 5. Variables included are M1, the commercial paper rate, Total Debt, and the CLI. (The CLI contains some financial variables and overlaps M1 and Total Debt.) Overall, the performance of the "first n indicators" approach looks good. There is only one false signal; premature signals are reduced to one before the 1957 recession, which we argued earlier is not such a serious error. And only in 1973 and 1981 do some of the combinations

[21]The point that innovation and deregulation may have changed the relationship between interest rates and the economy has been made by M. A. Akhtar, *Financial Innovations and Their Implications for Monetary Policy: An International Perspective*, Bank for International Settlements, Economic Papers No. 9 (December 1983); the effects were illustrated by John Wenninger, "Financial Innovation—A Complex Problem Even in a Simple Framework", this *Quarterly Review* (Summer 1984), pages 1-8.

[22]Okun, *op. cit.*, pages 113-119.

fail to signal recession. Moreover, the lead times are less variable than those of individual variables.

Although several combinations of variables we examined perform very well, there have not been many occasions in the past 40 years on which to conduct these tests; there have been only eight postwar recessions (including 1967). Nevertheless, there are reasons for expecting some combinations to be more accurate predictors than others. In particular, the combination of the commercial paper rate, Total Debt, and the CLI covers a wide range of possible causes of recession, including both real and financial sector disturbances. On the financial side, both a price and a quantity variable are included (supplemented by the quantity variables in the CLI). Moreover, the broad-based debt measure may not have been seriously affected by financial deregulation and innovation, as M1 has been. The CLI represents the nonfinancial side of the economy (although not exclusively).

Because of recent problems with M1 and the desirability of including a direct indicator of the nonfinancial side of the economy, this combination may be preferable to that of the commercial paper rate, Total Debt, and M1—even though both combinations have about the same record in the past. M1 is likely to become a reliable leading indicator again if and when its relationships with the economy and interest rates become tighter. Until then, our analysis suggests that the narrow monetary aggregate should play a secondary role in anticipating economic downturns.

Conclusion

Our analysis has important implications for macroeconomic forecasting as well as for monetary policy. In broad terms, our results indicate that many problems associated with the CLI, or other variables examined for clues of imminent turning points in the economy, arise because of the rule used to evaluate their information, not because of the variables themselves. Nevertheless, even with a rule as sophisticated as Neftçi's, false and premature signals as well as failures to signal do occur, although less frequently. Apparently, the economy and the indicator variables are subject to too many independent influences for any single indicator variable to be infallible. We have shown, though, that a broad enough grouping of three or four variables, comprised of measures of the price and quantity of credit and the strength of the economy's real sector, has been quite accurate to date.

As for the individual financial variables, none has proved to be a totally reliable leading indicator. Movements in short-term interest rates have signaled prematurely, been offset by changes in inflation expectations, and had difficulty distinguishing between economic slowdowns and downturns. The monetary aggregates have apparently been affected by recent financial innovations and deregulation. Thus, their historical relationship to the economy is no longer a reliable guide. Finally, the nonfinancial sector debt aggregate, while performing well so far in the 1980s, erred on occasion in the earlier decades, and cannot be considered entirely reliable.

Table 5

Amount of Lead Time Provided by the "First n Indicators" Approach

In months

Peak in business cycle	M1 CP rate Total Debt	M1 CP rate CLI	CP rate Total Debt CLI	First 2 among: M1 CP rate Total Debt CLI	First 3 among: M1 CP rate Total Debt CLI
7/53	*	1	*	*	*
8/57	*	Premature (14)	*	*	*
4/60	2	5	5	5	2
12/66	2	6	6	6	2
12/69	3	3	3	3	3
11/73	No signal	3	3	3	No signal
1/80	6	6	6	6	6
7/81	8	No signal	8	8	No signal
False signals	None	None	4/51-5/52	4/51-5/52	None

*Data for Total Debt are not available.

This mixed performance illustrates once again the risk of focusing solely on one target in conducting monetary policy. Moreover, the superior results obtained by grouping several variables, financial and nonfinancial, demonstrate the advantages of a wide-ranging view. Indeed, they mesh with what has been called a tripartite approach to monetary policy, involving the monetary aggregates, the economy itself, and short-term interest rates.

Carl J. Palash and Lawrence J. Radecki

Neftçi's Formula

Neftçi's formula is as follows:*

$$\Pi_{k+1} = \{\Pi_k + [P_{k+1} \cdot (1 - \Pi_k)]\}p^1_{k+1} \;/\; (\{\Pi_k + [P_{k+1} \cdot (1 - \Pi_k)]\}p^1_{k+1} + [(1 - \Pi_k)\, p^0_{k+1}\, (1 - P_{k+1})])$$

where: Π is the estimated probability of a nearby recession, assumed to be zero at the beginning of an expansion;

P is the probability (or likelihood) of a nearby recession based on the length of the recovery to date;

p^0 and p^1 are the likelihoods that the latest observation came while the economy was in, or about to be in, expansion and recession, respectively; more technically, they are the values of the conditional densities of the indicator variable during expansion and recession intervals; and

k is a time parameter, set at zero at the beginning of an expansion.

Values for P are found in Neftçi, and values for p^0 and p^1 must be estimated.

*Salih N. Neftçi, *op. cit.*, page 231.

In Brief
Economic Capsules

Corporate Debt-Equity Ratios

Is U.S. business becoming undercapitalized? Since the end of 1983 nonfinancial business corporations, including those involved in mergers, acquisitions, buyouts, stock repurchases, and related activities, have bought far more equities than they have issued. During 1984 companies issued $13 billion in stock but purchased $90 billion worth—a net retirement of $77 billion (Chart 1). This trend has continued into 1985. Since the net reduction of equity capitalization has been mainly debt-financed, the question is whether or not the business sector is becoming too leveraged as a result.

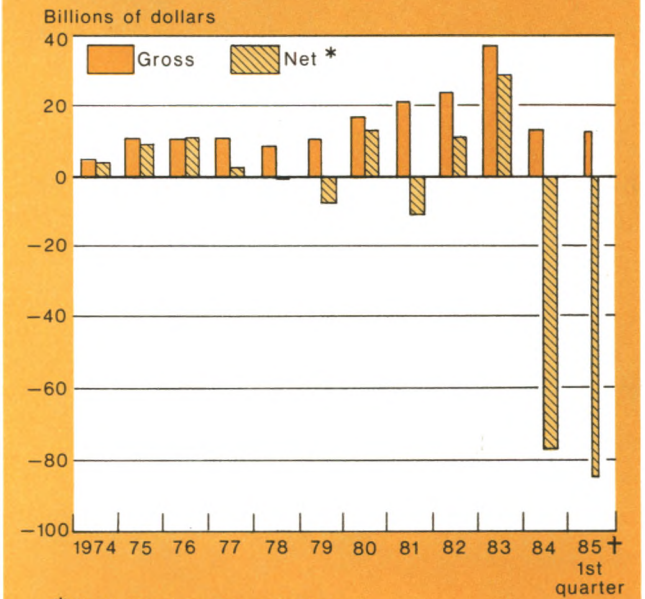
To examine this, we constructed two corporate debt-to-equity ratios. Each compares the market value of corporate debt with a different equity concept. The equity concept in the first ratio is the market value of corporate preferred and common stock. The equity measure for the second ratio is net worth, based on the replacement cost of assets. This second equity measure equals an estimate of the current replacement cost of plant and equipment and inventories, plus the current value of land and other assets, minus our estimate of the market value of corporate debt (box).

These two ratios have differed considerably since the early 1970s (Chart 2). In 1973 and 1974 stock market values fell sharply, driving up the corresponding debt-equity ratio. But over the same period, rising prices of new corporate plant and equipment, inventories, and land caused a drop in the ratio of debt to net worth on the replacement cost basis. This sudden discrepancy between the market and book values of firms is somewhat of a mystery. In part it may have been due to rapid structural change in the economy (*e.g.,* oil prices) or to the interaction of inflation and the tax system. Inflation may also have made it difficult to realistically evaluate corporate assets. In addition, the overall swing in the stock market at the time partly reflected short-run variations in interest rates and earnings, which would not necessarily affect replacement values proportionately. Whatever the full explanation, it is apparent that the

Chart 1

Gross and Net Corporate Equity Proceeds

Nonfinancial corporations



* Excludes farm corporations.

† At annual rate.

Source: Flow of Funds.

causes of the deviation were not all transitory because the difference between the two ratios has persisted into the 1980s.[1]

Which equity measure is better to use in assessing the financial condition of firms? Ideally it is best to know the real economic values of assets and liabilities. It is,

[1]For a discussion of the evaluation of corporate assets, see Franco Modigliani and Richard A. Cohn, "Inflation, Rational Valuation, and the Market", *Financial Analysts Journal*, Volume 35 (March-April 1979), page 25. For a discussion of the tax non-neutrality arguments (inventory valuation, depreciation, housing, etc.) see Marcelle Arak, "Inflation and Stock Values: Is Our Tax Structure the Villain?", this *Quarterly Review* (Winter 1980-81), pages 3-13. The effect of

Footnote 1, continued
structural change in the form of rapid energy price increases, changes in foreign trade flows and defense spending, and the development of environmental and safety regulatory programs is discussed in Martin Neil Bailey, "Productivity and the Services of Capital and Labor", *Brookings Papers on Economic Activity I* (1981), pages 1-50.

Calculation of Debt-Equity Ratios

Two debt-to-equity ratios for the nonfinancial corporate sector were constructed.* The same measure of market debt is used in both, while the definition of equity differs.

The measure of corporate debt includes short-term debt (bank loans, commercial paper, bankers' acceptances, finance company loans, U.S. government loans, profit taxes payable, and trade debt) taken at par value and long-term debt (tax-exempt bonds, corporate bonds, and mortgages) estimated on a market-value basis.

For each year, we calculated a ratio of the market to par value of corporate bonds for U.S. companies listed on The New York Stock Exchange. This ratio was combined with par-value data on all nonfinancial corporations from Flow of Funds to estimate the market value of all nonfinancial corporations' bond debt.

The present value of all mortgage debt (home, multifamily, and commercial) owed by the nonfinancial corporate sector was derived by estimating the mortgages issued (MI) in each year from Flow of Funds mortgage outstanding data (MO).

It was assumed that all mortgage debt was issued with a 10-year—without amortization—maturity at the prevailing Moody's BAA corporate rate.

Mortgage debt retired (MR) in period t is defined as mortgage debt issued in period t − 10.

$$(1)\quad MR_t = MI_{t-10}$$

Mortgage debt outstanding in period t equals the sum of mortgages issued in periods t − 9 through period t.

$$(2)\quad MO_t = \sum_{i=-9}^{0} MI_{t+i}$$

Net mortgage debt issued (NI) is defined as the net change in mortgage debt outstanding.

$$(3)\quad NI_t = MO_t - MO_{t-1}$$

Thus,

$$(4)\quad MI_t = NI_t + MR_t = NI_t + MI_{t-10}$$

Since we know NI, all we need is to estimate MI for the 10 years before 1945, when the Flow of Funds data became available. Mortgage issuance during that period is assumed equal to the level of mortgage debt outstanding in 1945 divided by 10. That is, we assume that an equal amount of the initial mortgage debt is issued each of the 10 years ending with 1945.

Using the mortgage debt issued series, the present value of all mortgage debt outstanding in each period is the sum of present values of all mortgages issued and not yet retired.

$$(5)\quad PV_t = \sum_{i=-9}^{0} \left[\sum_{j=1}^{10+i} \frac{MI_{t+i} r_{t+i}}{(1+r_t)^j} + \frac{MI_{t+i}}{(1+r_t)^{10+i}} \right]$$

r_t = Moody's BAA corporate rate

The first measure of equity, the market value of common and preferred stock† held by nonfinancial corporations, is a residual figure equal to the Security and Exchange Commission's calculation of all equities issued, less the Department of Commerce's estimate of equity issued by foreigners, less the Flow of Funds estimate of all equities issued by the financial sector.

The second concept of equity used, a measure of net worth, was derived by netting out total liabilities (as measured above) from total assets (financial assets, reproducible assets, and land).

Financial assets, based on Flow of Funds data, were taken at face value. Reproducible assets (residential structures, non-residential plant and equipment, and inventories), based on Commerce Department data, were valued on a current cost basis. That is, the assets were valued at the prices that would have been paid in the given period, net of straight line depreciation. The value of land holdings, measured in current market values, is estimated by the Federal Reserve Board.

*The nonfinancial corporate sector includes all private corporations not covered in the financial or farming sectors.

†This figure includes corporate farm equity.

therefore, tempting to rely more on prices in the equity markets. Alternatively, some explanations of the sharp divergence between market and book values in the 1970s focus on the claim that the market has erroneously undervalued firms, in which case the replacement cost net worth measure might be better.[2]

Notwithstanding the great conceptual and quantitative differences between these alternative debt-equity ratios, both tell a similar story about the experience in 1984 (the last year for which data are available). Both ratios have risen, but each remains well within or below the range of experience since the early 1970s.

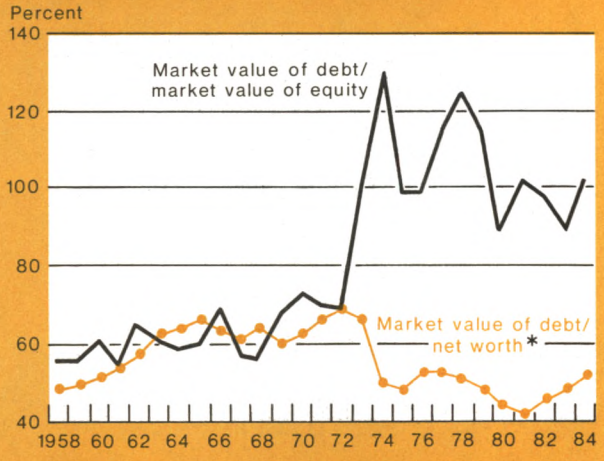
Therefore, at least on this aggregate level, the capitalization of the corporate sector does not appear out of line by past standards. There are important caveats to this, especially the fact that these aggregate debt-equity ratios do not show the variance among individual firms, some of which have increased their debt loads significantly. Moreover, even on an aggregate level, the cost of servicing debt has risen secularly, so that the proportion of gross corporate operating revenues absorbed by interest expenses remains high by historical standards. In addition, the proportion of corporate debt which is short-term has continued to rise steadily.

[2]On the undervaluation of firms, see Modigliani and Cohn, *op. cit.*

Chart 2

Debt/Equity Ratios

Nonfinancial nonfarm corporations



*Current replacement value of assets less market value of liabilities.

Sources: Flow of Funds, The New York Stock Exchange, and the Federal Reserve Bank of New York.

In conclusion, while indicators of corporate financial condition warrant close monitoring, mergers and related activities so far do not appear to have absorbed a disproportionate amount of overall business capital.

Paul Bennett, Anne de Melogue, and Andrew Silver

Capital Goods Sales: Weak Recovery Despite the Spending Boom

Since the trough of the business cycle in 1982 domestic spending on capital goods has surged more than 30 percent in real terms, much more than in any previous postwar expansion and more than twice the pace in an average expansion. Normally such strong growth in capital spending would engender a similar boom in capital goods production. In fact, sales by domestic producers and, consequently output, have grown much slower than spending, well below the pace in an average expansion.

This article examines, at both the aggregated and disaggregated levels, the weakness in domestic sales relative to domestic spending on capital goods and looks at the major factors explaining this divergence. Our analysis indicates that the weakness in sales extends to virtually all capital goods industries. The most important factor behind the significantly slower sales growth is the strong dollar and the associated foreign competition. In the absence of dollar appreciation, our calculations show that domestic capital goods sales would likely have been as much as 15 percent higher in 1984.

A comparison of growth in spending and sales for the current expansion shows that domestic producers have benefited little from the surge in demand. Since the 1982 business cycle trough, sales have increased at less than half the pace of spending (Chart 1). However, even this slow recovery understates the weakness in sales because it followed an unusually sharp decline during the last recession. Sales are still 4½ percent below the 1980 business cycle peak, while capital spending has grown about 19 percent over the same period. Thus, despite the healthy spending picture, capital goods producers have yet to recover the sales lost during 1980-82.

Paralleling this divergence between domestic spending and sales has been the deterioration of the capital goods trade balance—the difference between exports and imports of capital goods.[1] Historically, the United States has been a large net exporter of capital goods. In fact, in every quarter from 1967 to 1979 capital goods exports were at least twice as high as imports, facilitating rapid growth in the U.S. capital goods industry.

In the 1980s, however, this historical pattern began to unravel: with capital exports stagnant and imports rapidly rising, U.S. producers were squeezed from both

[1]Exports are part of sales, but not spending, while imports are part of spending, but not sales.

Table 1

Comparative Growth in Spending and Sales For Four Components of Capital Spending

Percent change in nominal values, 1980-I to 1985-I

Industry (weight)*	Spending	Sales	Ratio of sales to spending
Total (0.26)	43.7	29.8	0.68
Fabricated metals (0.21)	49.9	35.2	0.71
Machinery (0.36)	28.3	17.7	0.63
Electrical machinery (0.34)	56.2	42.0	0.75
Scientific instruments (0.09)	37.6	28.2	0.75

*"Weight" is the ratio of industry sales to total capital goods sales in 1985-I. The weight for "Total" is the share in total manufacturing.

"Total" is calculated using the sum of nominal values for the four components. The table excludes the transportation industry which is dominated by purchases by consumers (motor vehicles) and government (missiles, ships, airplanes, etc.).

Table 2

Growth in Spending and Sales for High Tech versus Other Capital Goods

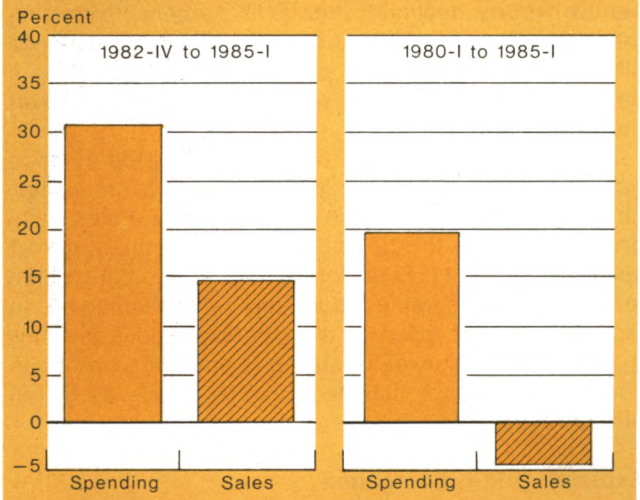
Percent change in nominal values, 1980-I to 1985-I

Industry (weight)*	Spending	Sales	Ratio of sales to spending
High Tech (0.28)			
Computers and office machinery (0.09)	121.8	93.0	0.76
Communications equipment (0.10)	65.5	73.5	1.12
Scientific instruments (0.09)	37.6	28.2	0.75
Other (0.72)			
Fabricated metals (0.27)	49.9	35.2	0.71
Machinery (0.25)	4.5	3.4	0.76
Electric machinery (0.20)	41.7	30.3	0.73

*"Weight" is the proportion of capital goods sales accounted for by each sub-component in 1985-I.

Chart 1

Growth in Capital Goods Spending and Sales*

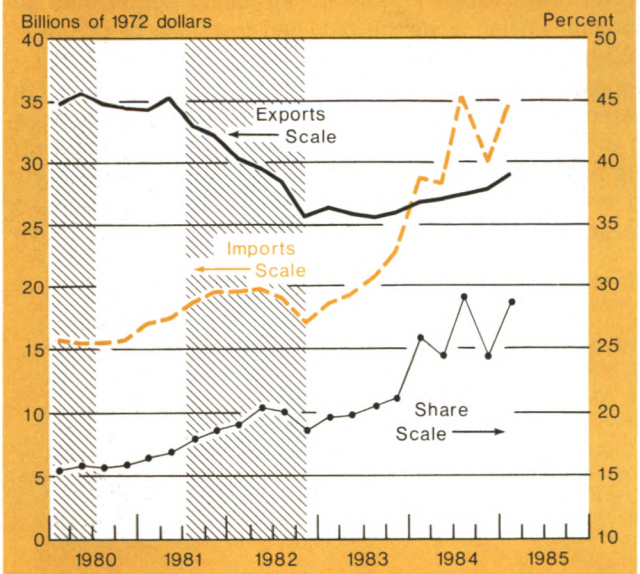


* Constant dollar data, excluding motor vehicles. Sales are estimated using the following (rough) identity: Sales equals Spending plus Exports minus Imports.

Source: National Income and Product Accounts.

Chart 2

Capital Goods Exports and Imports, and the Share of Imports in Spending



Source: National Income and Product Accounts.

sides. From 1980-I to 1985-I imports expanded 121 percent, leading to an 86 percent increase in the import share of the U.S. market (Chart 2). Over the same period exports declined almost 17 percent. Reflecting these developments, the capital goods trade balance moved into a substantial deficit in 1984, following a deterioration of about $26 billion (in 1972 prices) over the preceding three years.

This deterioration of the capital goods trade balance has significantly reduced sales for virtually all industries. For four major categories of capital goods, sales have grown only two-thirds to three-fourths the pace of spending (Table 1). Even for most of the so-called high tech industries, sales have lagged behind spending. In fact, with the exception of the communications industry, the divergence between sales and spending has been about the same for high tech capital goods as for all others (Table 2).

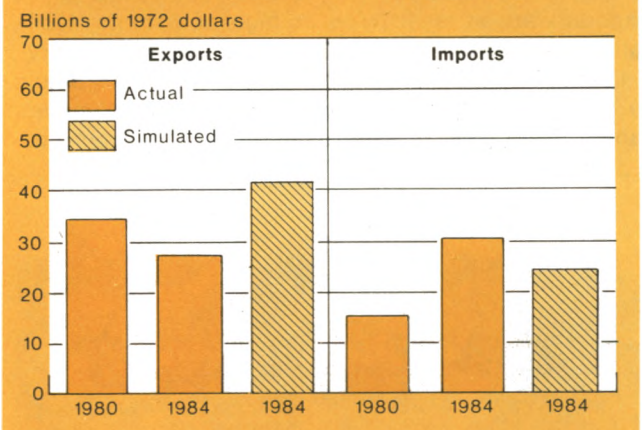
Explaining the divergence

The two major reasons for the "sales-spending gap" are strong growth in real GNP and sharp appreciation of the dollar. From 1980 to 1984 U.S. real GNP grew about three percentage points more than average real GNP for the six largest foreign industrial countries—Germany, France, Italy, the United Kingdom, Japan, and Canada. The weak foreign growth slowed U.S. exports, while the fast cyclical expansion of the U.S. economy led to strong growth of spending and imports.[2]

A more important factor behind the sales-spending gap appears to have been the sharp appreciation of the dollar. From 1980-I to 1984-IV the dollar appreciated 52 percent, driving a wedge between the price of U.S. and foreign capital goods.[3] In judging the impact of dollar appreciation on the sales-spending gap, two factors are particularly important: (1) the degree to which changes in the exchange rate affect purchasers' prices; and (2) the elasticity or responsiveness of imports and exports to price changes. Using plausible estimates of these parameters,[4] we have simulated what would have happened to capital goods imports, exports, and sales from 1980 to 1984 had the exchange rate remained constant.

Chart 3

Capital Goods Exports and Imports With and Without Dollar Appreciation



Source: National Income and Product Accounts.

The results are dramatic, especially for exports. Had the dollar remained flat through 1984, exports would have been about $15 billion higher, and imports would have been about $6 billion lower (Chart 3). Higher exports alone would have pushed sales growth to nearly 9 percent from 1980 to 1984, rather than the actual 3.6 percent decline, closing more than half of the sales-spending gap. Slower imports growth would have narrowed the sales-spending gap further. Firms purchasing fewer imports might have shifted at least part of their spending to domestically-produced goods. In the extreme case, if all of the reduction of imports spending had been switched over to domestic goods, sales would have grown an additional four and one-half percentage points. Of course, these estimates would be higher or lower, using different assumptions or allowing for various indirect effects. For a range of reasonable assumptions, however, the impact of the dollar on sales would be substantial.

In conclusion, the divergence between spending on capital goods and domestic sales of those goods extends to all major industries, and reflects a dramatic deterioration of the capital goods trade balance. Sharp appreciation of the dollar, together with stronger GNP growth in the United States than in other industrial

[2]The effect of relatively slow foreign GNP growth on the sales-spending gap has probably not been large. For example, assuming an income elasticity of 2.0, if foreign GNP had kept pace with U.S. GNP, exports in 1972 dollars would have been only about $2 billion (6 percent) higher in 1984.

[3]The exchange rate used is a GNP weighted average of the value of the dollar for our six largest trading partners.

[4]There are no recently published estimates of the price elasticities of capital goods exports and imports. The assumptions we use here are broadly consistent with recent estimates of exchange rate and price effects on aggregate trade. Specifically, our export and import simulations are based on a "pass through" of 75 percent and a price elasticity of −1.5. In addition, in the export simulation a response lag of two years is assumed. For a recent survey of elasticity estimates see Morris Goldstein and Mohsin S. Khan, "Income and Price Effects in Foreign Trade", in P. B. Kenen and R. W. Jones, eds., *Handbook of International Economics* (1983).

economies, accounts for virtually all of the weakness in domestic sales of capital goods relative to spending. Without dollar appreciation, the rapid recovery in capital spending would have fueled a commensurate boom in the domestic capital goods industry.

Ethan S. Harris

Three Aspects of the Administration's Tax Proposal:

Tax-Exempt Rates

The President's tax reform plan contains a number of provisions that would affect tax-exempt yields relative to taxable yields. Table 1 summarizes the effects of some of these proposals. The first three proposals listed—the reduction of the top marginal tax brackets, the elimination of the 80 percent deduction for commercial banks on interest to carry tax-exempt bonds, and the repeal of the tax exemption for nongovernmental bonds such as industrial development bonds—would probably have the largest effects. We construct estimates of the impacts of each proposal, with a bias toward underestimating those effects that would lower tax-exempt rates relative to taxable rates. Even so, we find that soon after the effective date, the three proposals combined might actually decrease tax-exempt yields by 60 basis points (approximately) relative to taxable yields. However, in the long run, relative tax-exempt rates could rise by as much as 135 basis points if commercial banks respond to the repeal of the interest deduction by allowing their existing holdings of tax-exempts to gradually, but completely, run off.

The effect of the proposed reduction of the highest individual tax rate from 50 percent to 35 percent and of the top corporate tax rate from 46 percent to 33 percent is not likely to be very large because the *marginal* investor in tax-exempts probably would not experience much of a marginal tax rate reduction. In recent years, the ratio of tax-exempt to taxable yields on similarly rated bonds has hovered between 0.70 and 0.80 (chart). Currently, with the ratio at 0.74, one could argue that the marginal tax rate of the marginal investor in tax-exempts is 26 percent.[1] If this were so (and the tax rate consisted only of Federal taxes), approximately the same minimum taxable income would correspond to that tax rate under the current and proposed tax rates.[2] Thus, the change in the tax rates would probably not significantly alter the number of people who would find

[1] If similar ratings imply the same credit risk for tax-exempt and corporate bonds, one would expect that, in equilibrium, the tax-exempt rate would equal the after-tax return from corporate bonds. That is, $(1-t)r_t = r_x$, or $\frac{r_x}{r_t} = 1-t$, where t is the marginal tax rate, r_t is the taxable interest rate, and r_x is the tax-exempt interest rate. Currently $\frac{r_x}{r_t} = 0.74$, so implicitly, $t = 0.26$.

[2] Under the current law, single taxpayers with taxable income over $19,640 have marginal tax rates of a least 26 percent. Under the proposed system, taxable incomes over $18,000 would be taxed at roughly the same rate, 25 percent. For joint returns, taxable incomes over $26,540 and $29,000 under the current and proposed systems, respectively, are taxed at marginal rates of at least 25 percent.

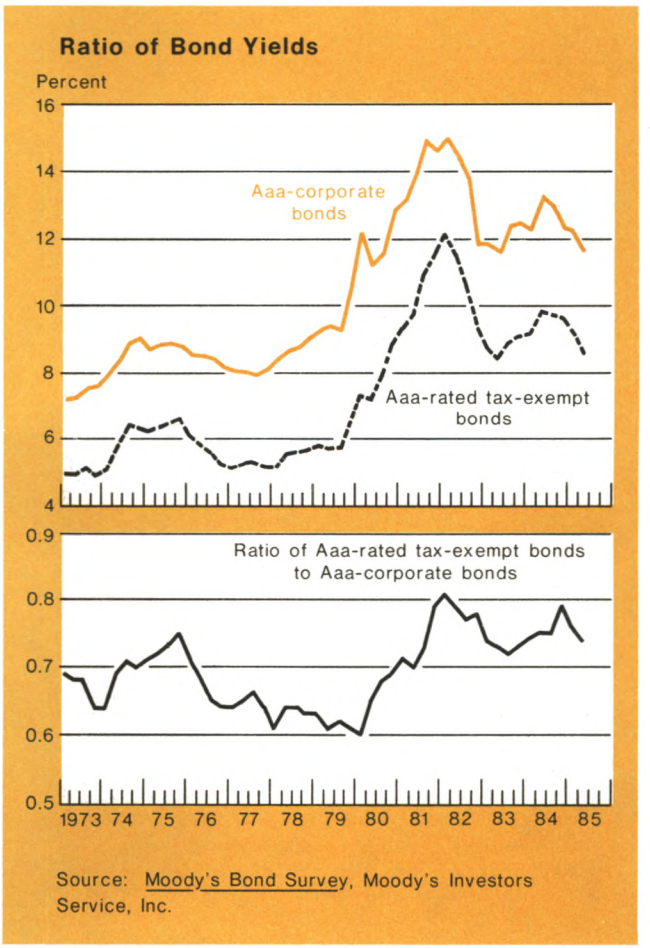


Table 1

Summary of Impacts of Administration's Proposals on Tax-Exempt Rates

Proposal	Effect on tax-exempt yield (with taxable yields constant)	Assumptions
Reduction of top marginal tax rates	+100 basis points for long-term issues, more for short-term	1. Current marginal tax rate of marginal investor is 33% 2. No base broadening of taxable income 3. No interest elasticity of supply
Elimination of 80% commercial bank interest deduction for carrying tax-exempts	+8 basis points in short-run +200 basis points in long-run	1. Entire commercial bank (stock) demand is eliminated as existing holdings mature
Repeal of exemption for nongovernmental bonds	−167 basis points	1. Less than half of actual recent flow of nongovernmental bonds is actually eliminated (*i.e.*, total tax-exempt supply reduced by 25 percent)
Elimination of deduction for state and local government taxes		1. Rates might rise some if municipalities were forced to reduce taxes without compensating cuts in expenditures 2. Increases attractiveness of tax-exempt bonds for residents of issuing states, especially those with high tax rates
Tightening of tax arbitrage provision		1. Less supply, so rates could fall, but less income to states, so risk premiums may rise
Elimination of advance refundings		1. Reduction of supply could reduce yields, but yields could rise if call protection provisions curtailed
Base broadening of income		1. For households and property and casualty insurance companies, could mitigate effect of cut in top marginal tax brackets 2. Could reduce risk premiums for those states that tie taxable income to Federal taxable income

Table 2

Volume of Long-Term Tax-Exempt Bonds by Type of Activity, 1975-84

In billions of dollars

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Total issues, long-term tax exempts*	30.5	35.0	46.9	49.1	48.4	54.5	55.1	84.9	93.3	115.1
Nongovernmental tax exempts	8.9	11.4	17.4	19.7	28.1	32.5	30.9	49.6	57.1	72.5
Housing bonds	1.4	2.7	4.4	6.9	12.1	14.0	4.8	14.6	17.0	20.8
Single-family mortgage subsidy bonds	†	0.7	1.0	3.4	7.8	10.5	2.8	9.0	11.0	13.5
Multi-family rental housing bonds	0.9	1.4	2.9	2.5	2.7	2.2	1.1	5.1	5.3	5.1
Veterans general obligation bonds	0.6	0.6	0.6	1.2	1.6	1.3	0.9	0.5	0.7	2.2
Private exempt entity bonds‡	1.8	2.5	4.3	2.9	3.2	3.3	4.7	8.5	11.7	11.6
Student loan bonds	*	0.1	0.1	0.3	0.6	0.5	1.1	1.8	3.3	1.1
Pollution control industrial development bonds	2.1	2.1	3.0	2.8	2.5	2.5	4.3	5.9	4.5	7.5
Small-issue industrial development bonds	1.3	1.5	2.4	3.6	7.5	9.7	13.3	14.7	14.6	17.4
Other industrial development bonds§	2.3	2.5	3.2	3.2	2.2	2.5	2.7	4.1	6.0	14.0
Other tax-exempt bonds‖	21.6	23.6	29.5	29.3	20.3	22.0	24.2	35.3	36.2	42.6

Totals may not add due to rounding.

*Total reported volume from *Credit Markets* (formerly the *Bond Buyer)* adjusted for privately placed small-issue IDBs.

†$50 million or less.

‡Private-exempt entity bonds are obligations of Internal Revenue Code Section 501(c)(3) organizations such as private nonprofit hospitals and educational facilities.

§Other IDBs include obligations for private businesses that qualify for tax-exempt activities, such as sewage disposal, airports, and docks.

‖Some of these may be nongovernmental bonds.

Source: For data from 1975-83: *The President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity* (May 1985), page 284.
For 1984 data: Office of Tax Analysis, United States Department of the Treasury.

the current tax-exempt rate attractive relative to the after-tax return available on taxable securities.

However, if the marginal Federal tax rate of the marginal investor were higher, say at 33 percent, then it is possible that some current investors in tax-exempts would no longer find it advantageous to invest in them under the proposed law. For example, taxpayers with single returns with taxable incomes of $31,070 are currently taxed at a marginal rate of 34 percent. With joint returns, incomes in excess of $37,980 are taxed at a rate of 33 percent. Under the proposed tax rate structure, those same investors would have marginal tax rates of 25 percent. With current tax-exempt rates at about 8.35 percent, the rates would have to rise by about 100 basis points to remain competitive with taxable instruments yielding 12.46 percent (the taxable equivalent of 8.35 percent tax-free with a 33 percent tax rate).

This is an overestimate of the required increase, for three reasons. First, as noted earlier, the marginal investor's marginal Federal tax rate is likely to be lower than 33 percent, especially after taking into account the possibility that the relevant marginal tax rate might include state and local income taxes.[3] Thus the proposed change in the tax rate structure would probably not significantly alter the number of people who would find tax-exempts more attractive than taxables. Second, some taxpayers could find themselves in higher marginal tax brackets because of the proposed broadening of the definition of taxable income, through such changes as the elimination of the deduction for state and local taxes and the taxation of the inside buildup in the value of life insurance policies. Finally, we implicitly assume a zero interest elasticity of the supply of tax-exempt securities—a negative elasticity would tend to mitigate the necessary interest rate response.

The other proposal tending to raise tax-exempt rates the most relative to taxable yields is the repeal of the 80 percent deduction for commercial banks on interest to carry newly acquired tax-exempt bonds. This proposal would probably completely eliminate bank demand for tax-exempt securities since it would most likely eliminate the spread earned on tax-exempts and would certainly make the spread lower than could be earned on taxable investments.[4]

For example, at the end of May 1985, the cost of three-month large CDs was about 7.6 percent. Tax-exempt notes were paying 4.9 percent during the same period, however. Thus, with the 80 percent interest cost deductibility, banks could have earned 10 basis points after taxes by funding the notes with CDs. But without deductibility, banks would have lost money on such a transaction. If, instead, banks invested in longer-term A-rated tax-exempt bonds paying 8.81 percent (and accepted the asset-liability maturity mismatch) they could have earned a positive spread of 121 basis points, even without interest cost deductibility. But they could have earned an even larger after-tax spread of 178 basis points (at a 46 percent marginal tax rate) by investing in 20-year Treasury securities (paying approximately 10.9 percent). At the proposed maximum corporate rate of 33 percent, the spread earned on taxable investments would have been even higher, approximately 221 basis points after taxes. Therefore, if banks were not able to deduct interest costs, they would not purchase tax-exempt instruments at current rates.

What would be the impact on relative tax-exempt yields if commercial banks no longer demanded new tax-exempt bonds? Suppose commercial banks cut back on demand for tax-exempts by the average annual amount they had purchased from 1981 through 1984, $6.5 billion, or 1.1 percent of the total outstanding stock. Then, using an interest elasticity of −1.27 from a study by Hendershott and Koch,[5] we would expect tax-exempt interest rates to rise by 0.9 percent, or 8 basis points based on a current interest rate of about 8.35 percent. In addition, commercial banks would probably not replace holdings as they mature. Given that banks currently hold $168 billion of tax-exempt securities, or 30.2 percent of the total, the resulting longer-run decline in demand could raise tax-exempt rates by 23.8 percent, or 200 basis points.

Offsetting these effects is the proposed repeal of the tax exemption for nongovernmental bonds. This would severely curtail the supply of tax-exempt securities after the enactment date (although there might be a rush of issues to beat the deadline). The Treasury estimates that in each of the years from 1979 to 1984, over 55 percent of the long-term tax-exempt market was comprised of nongovernmental issues (Table 2). A reduction of the supply of this amount, or some significant portion thereof, would have a major impact on relative tax-exempt rates.

In fact, quite probably the supply would not fall by the full volume of recent nongovernmental issues, since it is likely that various exceptions would be allowed in a final tax bill and that some of the functions financed by nongovernmental units would be taken over, and

[3]However, since the ratio of short-term tax-exempt to taxable yields is much lower than the long-term ratio, the marginal rate for marginal investors in short-term tax-exempts might actually be higher than 33 percent.

[4]In the short-run, however, bank demand for tax-exempts might increase as they attempt to stock up before the December 31, 1985 deadline.

[5]Patric H. Hendershott and Timothy W. Koch, "An Empirical Analysis of the Market for Tax-Exempt Securities: Estimates and Forecasts", Monograph Series in Finance and Economics, Monograph 1977-4.

financed directly, by municipalities. But even if supply were reduced by, say, only 25 percent, the interest elasticity of −1.27 implies that tax-exempt rates would have to fall by about 20 percent, or 167 basis points on an 8.35 percent level, to clear the market.

It is difficult to provide specific estimates of the effects of other parts of the tax plan, such as the proposed elimination of the itemized deduction for state and local taxes, the prohibition against advance refunding issues, the tightening of arbitrage provisions, and the broadening of the taxable income base for businesses such as property and casualty insurance companies (Table 1). As a result, it is difficult to quantify the total net impact of the tax plan or even to determine with certainty the direction of the overall impact. However, since the full impact of the elimination of the carrying cost deduction for commercial banks would probably not be felt for quite some time, it is much less likely that tax-exempt rates would rise relative to taxable rates in the short run than in the long run.

Andrew Silver

Capital Investment Incentives

One of the more controversial issues arising from the President's recent plan for tax reform is whether it will stimulate business investment spending.[1] The reforms are aimed at fostering greater capital formation, especially over the long term, by moderating the distorting effects of the present corporate tax system on the composition of investment. However, a number of economists—including Martin Feldstein and Murray Weidenbaum—have criticized the approach taken in the proposal, arguing that it will stifle spending for new investment in the near term by scaling back existing tax incentives.[2]

In this capsule we look at how the President's proposal would alter the effective marginal tax rates currently applied to income from investment in fixed capital.[3] Our analysis indicates that the reform package would substantially raise effective tax rates on investments in producers' durable equipment (PDE) while reducing them on investments in structures. On this basis, we conclude that the near-term effect will be to slow investment spending on PDE, but to encourage investment in business structures. These effects will persist in the long run as well. At the same time, the proposal would also lead to tax rates that are roughly equivalent across different assets and industries. Therefore, some offset to the overall smaller stock of capital might result from investment expenditures being allocated more on the basis of economic returns than on tax considerations.

Investments in fixed capital are now taxed at widely differing effective marginal rates across asset categories and industries. In fact, effective tax rates not only vary considerably; they are positive for structures but *negative* for most categories of PDE—indicating a tax subsidy.[4] As shown in Table 1, tax rates on investments in PDE range from a high of 7 percent to a low of −57 percent, while for business structures the rates are strictly positive, ranging from 28 percent to 48 percent. The problem with tax rates that are so unequal is that they bias investment decisions. First, within a particular industry they encourage firms to invest in certain assets over others, and second, within a given asset category they favor investments in some industries over others.

Several features of the corporate tax structure contribute to the wide variation in effective tax rates. One is that the statutory depreciation allowances under the Accelerated Cost Recovery System (ACRS)[5] are more generous than a deduction for actual economic depreciation would be. Thus, the cost of capital—and hence effective marginal tax rates—across different assets depends on the excess of ACRS depreciation over

[1]The complete plan is presented in *The President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity* (May 1985), United States Government Printing Office.

[2]See Martin Feldstein, "Improving the President's Tax Reform Proposal", Testimony before the House Ways and Means Committee (June 11, 1985); and Murray L. Weidenbaum, "The Case Against Tax Reform in 1985", Occasional Paper No. 40, Center for the Study of American Business, Washington University-St. Louis (March 1985).

[3]The effective marginal tax rate (t) is defined as $t=(c-r)/c$, where c is the before-tax rate of return on fixed capital net of economic depreciation and r is the after-tax return. For a more detailed discussion of the theory behind this measure, see Alan J. Auerbach and Dale W. Jorgenson, "Inflation-Proof Depreciation of Assets", *Harvard Business Review*, Volume 58 (1980), pages 113-118; and Jane G. Gravelle "Effects of the 1981 Depreciation Revisions on the Taxation of Income from Business Capital", *National Tax Journal*, Volume 35 (1982), pages 1-20.

[4]A negative effective marginal tax rate means that an investment's after-tax rate of return is greater than its before-tax rate of return. In other words, the investment is receiving a tax subsidy. For example, with an effective rate of −50 percent, an asset earning a 7 percent rate of return before taxes really earns a 10.5 percent return after taxes. This type of subsidy comes from built-in features of the tax code, such as accelerated depreciation and the investment tax credit.

[5]The Accelerated Cost Recovery System went into effect with the enactment of the Economic Recovery Tax Act in 1981. All calculations of effective tax rates also include modifications to ACRS from the Tax Equity and Fiscal Responsibility Act of 1982.

economic depreciation. ACRS also effectively leads to varying tax rates across industries because the composition of capital assets held by firms differs among sectors of the economy.

A second feature leading to dissimilar tax rates is the investment tax credit (ITC). This provision of the tax code was designed to stimulate investment spending by giving firms a credit from 6 percent to 10 percent of the cost of new investments against their tax bill. Since the ITC applies only to investments in tangible capital, its implicit effect, particularly in conjunction with ACRS, has been to favor the capital-intensive sectors of the economy. The ITC also favors investment in industries that are profitable, and therefore better able to make use of credits to shelter income from taxation. Moreover, since the ITC only applies to investment in equipment, it favors PDE relative to structures.

Finally, the "first-in-first-out" (FIFO) method of inventory accounting also contributes to the wide variation in effective tax rates on capital. With inflation, the FIFO method creates accounting profits which raise a firm's overall tax liability.[6] The extent to which this occurs, however, differs by industry according to the

[6]Under the FIFO method of inventory valuation, inflation will push the sale price of an inventory item above its original book value. As inventories are depleted, firms realize the difference between the sale price and the book value as profit subject to tax. This results in a higher effective tax rate on corporate income and, hence, on investments in fixed capital as well.

Table 1

Effective Marginal Tax Rates on Investments in Fixed Capital Under Current Law*

In percent, by sector

Asset category	Agriculture	Mining	Construction	Durables manufacturing	Nondurables manufacturing	Transportation, communications, and utilities	Trade and services
Producers' durable equipment							
Computing, electric, and communications	−6	−57	−53	−42	−48	−34	−57
Transportation	7	−40	−42	−33	−37	−37	−36
Agricultural and mining	−3	−45	−45	−21	−22	−24	−21
Light industrial	−1	−35	−36	−24	−21	−36	−32
Heavy industrial	−4	−44	−46	−27	−24	−25	−27
Structures							
Commercial, industrial, and mining	48	35	28	32	31	29	32

*For a definition of the effective marginal tax rate see Jane G. Gravelle, *op. cit.* All calculations are made on the basis of a 4 percent real after-tax return on equity, and a 5 percent rate of inflation. While the absolute levels of the effective marginal tax rate estimates are sensitive to the real rate of interest and the rate of inflation, the relative differences across asset categories and sectors are fairly robust with respect to these assumptions.

Table 2

Effective Marginal Tax Rates on Investments in Fixed Capital Under the Administration's Tax Reform Proposal*

In percent, by sector

Asset category	Agriculture	Mining	Construction	Durables manufacturing	Nondurables manufacturing	Transportation, communications, and utilities	Trade and services
Producers' durable equipment							
Computing, electric, and communications	23	21	21	21	21	19	19
Transportation	20	18	18	19	18	17	18
Agricultural and mining	17	17	17	16	15	15	16
Light industrial	20	18	17	18	17	17	17
Heavy industrial	19	17	17	19	16	16	17
Structures							
Commercial, industrial, and mining	29	33	26	27	27	26	27

*The tax reform proposal is described in *The President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity, op. cit.* For a definition of the effective marginal tax rate see Jane G. Gravelle, *op. cit.* All calculations are made on the basis of a 4 percent real after-tax return on equity, a 5 percent rate of inflation, and a 75 percent switchover to indexed FIFO inventory accounting. While the absolute levels of the effective marginal tax rate estimates are sensitive to the real rate of interest and the rate of inflation, the relative differences across asset categories and sectors are fairly robust with respect to these assumptions.

inventory-to-output ratio and the percent of inventories accounted under the FIFO method. For example, the agriculture sector holds a high proportion of its annual output as inventories—54 percent as compared with an economy-wide average of about 22 percent—and approximately 97 percent of those inventories are valued under FIFO. Together, these factors lead to comparatively higher, or less negative, effective tax rates in this sector of the economy than in other sectors.[7]

The President's reform plan recommends four major changes to the corporate tax system. First, the depreciation lives of assets would be lengthened relative to those allowed under ACRS, and the depreciable basis would be indexed for inflation. Indexing the depreciable basis is relevant mainly for long-lived assets such as structures, where failure to do so substantially raises effective tax rates at even low levels of inflation. Second, the tax plan would eliminate the investment tax credit. A third change would give firms the option of indexing the book value of FIFO inventories to eliminate accounting profits due to inflation. Finally, the proposal would lower the maximum marginal tax rate on corporate income from 46 percent to 33 percent.

The President's tax proposal should greatly reduce the present variation in effective marginal tax rates across asset categories and industries (Table 2). Although the discrepancy between effective tax rates on PDE and structures would be narrowed considerably, tax rates on equipment would still be comparatively lower. We estimate that tax rates on investments in PDE would be higher than they are now and range from 15 percent to 23 percent, while tax rates on structures would be lower than at present and range from 26 to 33 percent.

When evaluated in terms of its impact on effective marginal tax rates, the President's tax plan is, on the whole, likely to depress investment spending. Since the incentives to invest in PDE would not be nearly as great as they are now, spending on durable equipment is likely to fall significantly. This would be partially offset by a boost to investment spending on structures. However, with tax considerations less of a factor in determining the allocation of investment spending, the capital stock, though smaller, is likely to be more productive.

[7]We estimate that the FIFO inventory accounting method has raised the effective tax on corporate income in the agriculture sector from the statutory rate of 46 percent to 67 percent. In contrast, the trade and services sector holds only about 12 percent of its annual output as inventory. With such a low inventory to output ratio, the increased tax liabilities from FIFO accounting are insignificant, therefore the effective corporate income tax rate is essentially the statutory rate. Consequently, the corresponding effective tax on investment in fixed capital is greater in the agriculture sector.

Nestor D. Dominguez and Peter D. Skaperdas

Owner-Occupied Housing Costs

One important aspect of the Administration's tax reform proposal is how it may substantially boost the costs of owning a home, thus damping housing demand. The proposal would lower marginal tax rates for individuals, thereby raising the after-tax level of interest costs. And, it would eliminate deductions for state and local taxes, consequently pushing up the after-tax level of property taxes. In this capsule, we quantify these boosts to the carrying costs of the primary residence of a typical homebuyer.

To begin, we calculate the marginal tax rate faced by the average homeowner under existing and proposed law. We estimate that the proposed law would lower the average homeowner's present marginal rate from about 25 percent to just over 18 percent. These estimates are roughly in line with the tax expenditure data reported in the *Special Analyses* of the Federal budget.

From these numbers we can estimate the changes in costs to a new homeowner. Based on the median new home price and the mortgage rate early in 1985, we calculate that after-tax interest costs would climb by about $670 per year, about 7 percent of the total current carrying costs (table). Moreover, the annual after-tax property tax, now about $950, would average around $230 more per year, a 2.3 percent addition to carrying costs. Together, these tax changes would raise the average annual cost of homeownership by over 9 percent.* To put this increase into perspective, mortgage rates would have to rise by about one and one-half percentage points, without these tax changes, for there to be a comparable increase in carrying costs.

These estimates are for typical homebuyers, *i.e.*, those whose marginal tax rate and property taxes are about average. Individuals who would face larger declines in their marginal rates under the Administration's proposal would be affected more sharply, as would homeowners in communities with relatively high property taxes. On average, though, a sharp rise in the cost of homeownership would be one direct effect of the tax reform proposal, possibly reducing the demand for houses.

*The "rental rate", another widely used measure of the cost of homeownership, by definition is lower than the carrying costs of a home by the expected capital gain. On the basis of the actual annual percent change in the median house price over the past two years, we estimate that the expected annual capital gain on a typical house is now 4 percent. Using this estimate, we calculate that the higher after-tax interest and property tax costs would raise the rental rate by 12.3 percent.

Estimated Impact of the Administration's Tax Proposal on the Carrying Costs of Owner-Occupied Housing

	Level	Percent change from current level
Average carrying cost*	$9850	
Increase From:		
Elimination of property tax deduction	230	2.3
Lower marginal tax rates	670	6.8
Projected average carrying cost	$10,750	9.1†

*Carrying cost = After-tax Interest + After-tax Property Taxes + Economic Depreciation
$= (1-t_F-t_S)iP + (1-t_F)T + dP$

where t_F, t_S, i, P, T, and d are defined as follows:

Variable		Source	Period	Current value	Proposed value
t_F	Average marginal Federal tax rate for homeowners	the authors†	†	24.7 percent	18.4 percent for interest 0 percent for property taxes
t_S	Average marginal state and local tax rate for individuals	MPS model	1984	8.0 percent	
i	Mortgage interest rate	FHLMC	1985-II	12.8 percent	
P	Median price of new homes sold	Bureau of the Census	Jan.-May 1985	$83,200	
T	Average state and local property tax paid per homeowner	the authors†	†	$950	
d	Average yearly economic depreciation of a house	MPS model	‡	2.4 percent	

†Equivalent to a 1.6 percentage point increase in the mortgage rate.

‡Estimated using 1981 and 1983 IRS Statistics of Income data and the tax expenditure data reported in *Special Analyses, Budget of the United States Government* (Fiscal year 1986).

§Not applicable.

Sources: Internal Revenue Service, *Statistics of Income* (1981) and *SOI Bulletin* for 1983; Federal Home Loan Mortgage Corporation; National Association of Realtors; *Special Analyses, op. cit.*; Flint Brayton and Eileen Mauskopf, *The MPS Model of the United States Economy* (1985).

Carl J. Palash and Robert B. Stoddard

February-April 1985 Interim Report
(This report was released to the Congress and to the press on June 7, 1985.)

Treasury and Federal Reserve Foreign Exchange Operations

The dollar rose strongly during February to record highs for the floating rate period against major European currencies, then fell unevenly until mid-April. At the end of April the dollar was trading somewhat above its lows for the three-month period, but was down on balance about 2 percent against most major currencies from end-January levels. Exchange markets were highly unsettled on a number of occasions during the period. Monetary authorities intervened heavily during February and early March following the January G-5 meeting at which the participating countries reaffirmed their commitment to promote convergence of economic policies, to remove structural rigidities, and to undertake coordinated intervention as necessary.

The dollar began to move up strongly as the period under review opened. The dollar's resilience in the face of declining U.S. interest rates during the last quarter of 1984 had increased confidence in the currency. But the main factor spurring the reacceleration of the dollar's rise was the market perception that the U.S. economy was likely to pick up again and maintain strong growth with low inflation after the slowing late in 1984. The expected economic growth and the recent acceleration of the monetary aggregates were thought likely to limit the scope for any further easing of monetary policy.

Moreover, economic recovery in Europe continued to be comparatively sluggish despite the strong contribution to world economic growth provided by the U.S. expansion. Against this background, market sentiment toward the dollar became extremely bullish. There was strong demand for dollars for both commercial and investment purposes as well as by market professionals, even as the dollar set record highs against several European currencies. Markets became one-sided and unsettled as the dollar's rise gained momentum, particularly after it passed levels at which some central banks had intervened in the past. Through February 26, the dollar rose by nearly 10 percent against major European currencies—to about DM3.48 and $1.03 against the German mark and British pound, respectively—while rising 3 percent against the yen.

On three occasions during the first three weeks of February the U.S. authorities intervened, selling a total of $208.6 million against marks, $97.6 million against yen, and $16.8 million against sterling to counter disorderly market conditions in operations coordinated with foreign monetary authorities. But the exchange markets became more unsettled amid uncertainty over the high dollar exchange rates and the speed of the dollar's rise over the preceeding weeks. The dollar started to ease back from its highs. Then, coordinated intervention operations, considerably larger than those of the preceeding months, were undertaken by several monetary authorities. As for their part of these operations, the U.S. authorities intervened on two occasions at the end of February and one in early March, selling a total of $257.2 million against marks. At the end of these operations the dollar was well below its highs of February 26th.

The dollar moved higher during the following week before declining again as newly released U.S. economic

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Table 1

Federal Reserve Reciprocal Currency Arrangements

In millions of dollars

Institution	Amount of facility April 30, 1985	Amount of facility April 30, 1984
Austrian National Bank	250	250
National Bank of Belgium	1,000	1,000
Bank of Canada	2,000	2,000
National Bank of Denmark	250	250
Bank of England	3,000	3,000
Bank of France	2,000	2,000
German Federal Bank	6,000	6,000
Bank of Italy	3,000	3,000
Bank of Japan	5,000	5,000
Bank of Mexico	700	700
Netherlands Bank	500	500
Bank of Norway	250	250
Bank of Sweden	300	300
Swiss National Bank	4,000	4,000
Bank for International Settlements:		
Swiss franc-dollars	600	600
Other authorized European currency-dollars	1,250	1,250
Total	30,100	30,100

Table 2

Net Profits (+) or Losses (−) on United States Treasury and Federal Reserve Current Foreign Exchange Operations

In millions of dollars

Period	Federal Reserve	United States Treasury Exchange Stabilization Fund
February 1 through April 30, 1985	-0-	-0-
Valuation profits and losses on outstanding assets and liabilities as of April 30, 1985*	−$1,294.6	−$841.2

Data are on a value-date basis.

*Cumulative bookkeeping, or valuation, profits or losses represent the increase or decrease in the dollar value of outstanding currency assets and liabilities, using end-of-period exchange rates as compared with rates of acquisition. Valuation losses reflect the dollar's appreciation since the foreign currencies were acquired.

statistics indicated that growth in the first quarter might be lower than previously expected. The pace of the dollar's decline accelerated during March and early April as exchange markets became concerned about the implications for monetary policy and, more generally, of the troubles of the Ohio thrift industry and the slowing of U.S. economic growth. As the market adjusted to these uncertainties, the dollar's decline at times was rapid, moving through levels at which resistance had been expected by some market participants.

By the middle of April, the dollar had fallen 15 percent from its highs of February to a low of DM2.95 against the mark. Its drop in terms of the Japanese yen and the Canadian dollar was much smaller—about 6½ percent and 4 percent, respectively—just as the dollar's earlier rise relative to those two currencies had been more moderate. The dollar fell most dramatically, by over 20 percent, against sterling. Following a sharp rise in British interest rates during late January, market participants had come to anticipate that the British authorities would maintain their anti-inflationary stance, with the result that sterling interest rates would remain substantially above those elsewhere. In these circumstances, sterling benefited more than other currencies from investment flows out of dollar-denominated assets as the dollar declined.

The dollar found support at the lower levels reached in mid-April as professionals covered short positions and strong investment and commercial demand emerged. The dollar closed April down slightly on balance from the opening of the period. In March and April, however, daily exchange rate movements were sharp and bid-offer spreads wider than normal as market perceptions about trends in the economy and likely official responses were in a constant state of flux. Under these circumstances, the dollar-mark exchange rate, for example, fluctuated on average 2 percent each day during the two months.

In the period February through April, the Federal Reserve and the Exchange Stabilization Fund (ESF) realized no profits or losses from exchange transactions. The Federal Reserve and the ESF invest foreign currency balances acquired in the market as a result of their foreign exchange operations in a variety of instruments that yield market-related rates of return and that have a high degree of quality and liquidity. Under the authority provided by the Monetary Control Act of 1980, the Federal Reserve had invested $927.0 million of its foreign currency holdings in securities issued by foreign governments as of April 30. In addition, the Treasury held the equivalent of $1,621.7 million in such securities as of the end of April.

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