- Will purchased gas adjustments be allowed under a decontrol proposal? What discretionary authority will FERC have to allow pipelines to recover purchased gas costs?

- How will FERC balance consumer protection with the need to pass through additional gas costs?

- To what extent are pipeline purchases of high-cost gas motivated by the need to acquire additional gas reserves?

Another factor that limits competition in the gas market is that many gas users do not have equal access to gas sold by various producers. A gas consumer, therefore, cannot easily bargain directly with a producer without first arranging a transportation agreement with a pipeline. This is partly attributable to the natural logistical advantage that pipelines have in arranging gas sales since most producing fields are connected only to one pipeline. In addition, pipelines generally own the gas they ship and, as a result, are not considered "common carriers" such as airlines or trucks. The ability of pipelines to influence the accessibility to gas raises the following questions:

- If the regulatory status of pipelines is changed to common carrier status upon decontrol, will this affect the competitive bidding for gas supplies?

- How will common carrier status for pipelines affect the obligations of pipelines and distributors to deliver gas to final users?

Gas Supply Allocation Policies

As a result of the controlled price of natural gas, demand sometimes has exceeded supply. In the discussion of decontrol in a competitive market, it was assumed that the limited supply was allocated as it would be in a free market--to those who were most willing to pay for it. In fact, the limited supply of natural gas has been distributed partially by historical accident and partially by regulation. To some extent, history has determined who receives existing gas supplies, for distribution companies must serve customers on a first-come, first-served basis. Once the distributor has agreed to provide service, regulations mandate that he must continue to do so as long as supplies permit. (There are some exceptions, but they are not significant.) The distributor cannot end service to one customer and begin service to another merely because the second customer is willing to pay more for the gas.

Gas demand has been constrained further both by law and by a series of rules issued by regulatory authorities. The Powerplant and Industral Fuel Use Act of 1978, before its amendment in 1981, prevented electric utilities from building new gas-fired plants, forbade those not using gas at the time of the bill's passage to convert to natural gas and required those that did to find another fuel source by 1990. Regulatory actions also have prevented new natural gas hook-ups and have resulted in curtailments of natural gas deliveries to some commercial, industrial, and electric utility customers.

From an economic viewpoint, existing gas supplies have been misallocated for many years, in that those willing to pay the most for the gas do not necessarily receive it. This implies that wellhead decontrol of natural gas could result in efficiency gains greater than those described for an ideal competitive market. Specifically, as price, rather than regulation, is allowed to allocate gas supplies at the end-user level, economic gains would be realized through a more efficient distribution of existing supplies as well as through the production of additional natural gas. Understanding these conditions requires answers to the following questions:

- How much will gas consumption increase if hook-up restrictions, the threat of curtailments, and fuel-use restrictions are eliminated?

- How much will gas prices increase, if at all, from eliminating these nonmarket restrictions? How much will some potential gas users be willing to pay for newly available gas?

Average Cost Pricing Policies (the Fly-Up Problem)

As shown above, the efficiency gains realized by decontrol in a competitive market are determined by supply and demand relationships and the improved access to gas supplies if the decontrol proposal eliminates restrictions on gas use. The gains occur because natural gas price controls presumably preclude the production of some gas whose value exceeds its cost. The total social benefit of producing this gas is equal to the difference between the value its user assigns to it and the costs of producing it. A competitive decontrolled gas market would produce gas up to the quantity at which supply equals demand. At that quantity, any further production of gas would incur costs greater than the value attached to the gas itself.

Conversely, some circumstances can lead to the "overproduction" of gas--that is, some gas is produced at costs that exceed the value of that gas to its user. This situation can create efficiency losses in the manner that decontrol would produce efficiency gains. Average cost pricing policies by

regulated pipelines is one of these circumstances, and the resulting over-production is commonly known as "the fly-up problem," since it leads to prices for new gas supplies that fly up over the presumed market price.

As stated before, regulated pipelines are usually required to sell gas at its average cost to the pipeline, plus some fixed rate of return on their net investment in the pipeline. This fixed return is averaged annually over a volume of gas sales estimated by FERC. Pipeline companies, therefore, can increase profits by increasing the quantity of gas sold, up to this estimated volume. This is true regardless of the relationship between gas prices and costs. In the absence of controls, if pipeline companies purchased all gas of equivalent characteristics for the same price, then the resulting gas market equilibrium would be identical to the one that would occur in an idealized competitive market. In the current gas market, however, similar gas is often purchased at very dissimilar prices.

Price differentials in the natural gas market arise partly from legal requirements, partly from custom. The NGPA defined eight major categories of natural gas, with gas assigned to a particular category on the basis of the reserve from which it is drawn. Each type of gas is subject to a different price ceiling, even though the gas has equivalent characteristics. In general, gas drawn from older reserves is eligible for a lower price than is gas drawn from reserves that are newer or more expensive to tap. For example, assume that a pipeline operates in a market in which the competitive price for gas at the wellhead is $4.00 per thousand cubic feet. But because of its historic, long-term contracts, this pipeline can obtain a third of its gas for $2.00 per thousand cubic feet. In this situation, a pipeline can spend up to $5.00 per thousand cubic feet for the additional two-thirds of the gas it seeks to purchase, and still offer its consumers an average gas price of $4.00. The price of the additional gas has flown up to $5.00. Thus, under this type of average cost pricing policy, gas could be produced at costs ($5.00) greater than the value that the market places on that gas ($4.00). Under these conditions, average cost pricing on the resale of gas to distribution companies could lead to inefficient production and consumption decisions, and change the income transfers and efficiency gains associated with wellhead price decontrol. When the NGPA expires in 1985, a significant portion of natural gas is scheduled to remain subject to price controls. Several questions, therefore, arise at this juncture:

- Will old, cheap gas be freed from price controls under the decontrol proposal?

- If so, to what extent will the elimination of price controls on old gas provide sufficient incentive to renegotiate high-cost gas prices downward?

- Will there be more pressure to renegotiate old gas prices to higher levels than new gas prices to lower ones?

But even if new legislation removed all price controls from natural gas, wide differentials might exist for some time. As discussed above, pipelines have sought to assure long-term supplies by purchasing gas under long-term contracts; often a price is specified for the duration of the contract. As a result, producers might not receive higher prices on some gas now under contract, even if the Congress were to remove price controls from all natural gas. The extent to which these contract prices could rise would depend upon escalation provisions in the contracts and whether the contracts are renegotiated. Although the exact number and content of these provisions is unknown, many existing contracts would allow some price increases in the event that gas controls were removed. The duration of gas contracts and their flexibility to respond to changing market conditions raise the following questions:

- How much gas is sold under long-term contracts?

- How are the pricing provisions in these contracts affected by decontrol?

- How is contract renegotiation encouraged by the decontrol proposal? Does the decontrol proposal allow both parties to abrogate contracts by instituting a universal market-out provision?

Regional Imbalance. The efficiency losses associated with average cost pricing and its attendant fly-up problem could be compounded if different pipelines serving different regions have unequal amounts of old gas under contract. Suppose the pipeline in the example given above competes with another pipeline. This second pipeline has no old gas under contract, and faces the same market price of $4.00 per thousand cubic feet. Since it has no older, cheaper gas with which to average the cost of new supplies, the second pipeline is constrained in the price it can offer for new gas. The unconstrained pipeline can spend $5.00 per thousand cubic feet, while its unendowed competitor can offer only $4.00. In this case, the pipeline with an endowment of older, cheaper gas (sometimes referred to as a "gas cushion") has a tremendous advantage when competing for new supplies.

If the disadvantaged pipeline decides to match this higher price, it will have to charge a higher price to its customers than it would in the absence of an average cost pricing policy. In so doing, it will reduce sales. Alternatively, the pipeline may restrict its sales to that level of gas that it can procure at the presumed market price of $4.00. In either event, the pipeline without contracts that provide it with cheaper gas will probably sell

less gas than it could, or should, in a competitive market. Since average cost pricing results in an artificial restriction on the ability of unendowed pipelines to sell gas to its customers, the effects are similar to those of price controls, resulting in efficiency losses in the regions served by the disadvantaged pipelines. Analysis of individual pipeline purchases of gas is necessary to answer the following related questions:

- What is the regional distribution of low-cost gas?
- Does the regional distribution of low-cost gas endanger individual pipelines that lack such reserves?

Price Contagion. Most existing natural gas contracts were written in an environment of uncertainty about the future content of federal natural gas policy. Many contracts include features designed to accommodate future gas pricing rules. Among these are contracts that tie the price of gas to the highest price paid for gas in the relevant region (most-favored-nation" clauses) to crude oil, or to distillate fuel. These contract provisions are generally referred to as "indefinite price escalator" clauses. Thus, upon decontrol, many contracts would allow the price of their gas to rise to these levels. If this "price contagion" was widespread, either many of these contracts would have to be renegotiated, or the price of gas might be locked into a level higher than competitive markets would sustain. If prices were locked into above-market levels, then many of the benefits of decontrol might be minimized, the income transfers increased, and some gas pipelines might fail. Moreover, the effects of price contagion would be reinforced as the fly-up phenomenon forced gas prices far beyond the levels competitive markets would produce. In that case, the fly-up price offered by the pipeline with the greatest endowment of low-cost gas would set the standard for other gas contracts.

The price contagion problem raises the following questions that must be answered in any analysis of natural gas policies:

- What pricing provisions exist in current gas contracts? To what extent do these contracts tie gas prices to the price of oil or other regional gas?
- To what extent will the elimination of indefinite price escalator clauses alleviate price contagion?
- What oil price is assumed for purposes of analysis?

Vertical Integration in the Natural Gas Market

Thus far, this chapter has assumed that producers sell in an "arm's length" competitive market to pipelines that act as regulated monopolies. In reality, some pipelines also own natural gas production facilities. The common ownership of regulated and nonregulated activities poses problems for the coherence of any regulatory scheme. When the regulated subsidiary of a firm acts as a customer of the nonregulated subsidiary, the potential exists for circumventing regulatory controls by charging a "transfer price" that allows monopolistic profits to be transferred from the regulated sector to the nonregulated sector. In a competitive world, the price of gas is determined by market interactions between gas producers and pipelines. Pipelines, seeking to expand sales so as to earn their allowed rate of return, may have some incentive to buy gas at the lowest available price in order to prevent loss of sales volume. But if a pipeline is linked to a gas producer through common ownership, this incentive is blunted. In these circumstances, the producer may charge the pipeline this higher transfer price. In effect, the pipeline serving a region can potentially behave like an unrestrained monopoly. While doing so would ultimately result in selling less gas, the higher price obtained for remaining gas sales may more than compensate for the reduction in sales. In economic theory, the rule generally used to characterize this type of monopoly is as follows: the monopoly will produce and sell so long as the revenues realized by sale of incremental production (that is, the gain in new sales minus the price discount allowed all previous sales) are greater than the cost of that incremental production. A monopoly conforming to this rule produces output so long as its sale adds to profits.

The application of this rule characteristically results in less output sold and a higher price for the output that is produced. If unrestrained, an integrated producer-pipeline may be able to restrict its output and increase its price in this fashion. By curtailing gas flows to its service region, the producer-pipeline prohibits gas consumption that would have occurred in a competitive market--that is, some amount of gas will not flow to this region, even though the value of this gas to its users is greater than the cost of producing it. Thus, some efficiency gains are precluded by monopolistic practices. To learn the extent of these efficiency losses, the following questions must be answered:

- To what extent do gas pipelines own their own reserves? How was information about this pattern of ownership obtained?

- Are the pipelines with owned reserves endowed with low-cost gas, allowing them to pay themselves a higher, fly-up price?

State PUC Pricing Policies

State public utility commissions set the prices that different classes of final users pay for natural gas. These pricing policies have evolved over time and probably reflect the outcome of competing political considerations rather than market forces. In addition, these pricing policies must conform to the incremental pricing system under the NGPA, whereby low priority users (generally large industrial users) of natural gas pay a larger share of gas costs. As a result, many state PUC pricing policies may encourage an inefficient use of gas.

Typically, natural gas prices, as administered by state PUCs, vary substantially among the principal customer classes: residential, industrial, and commercial. This practice is referred to as "price discrimination," and, combined with average cost pricing, tends to compound existing inefficiencies. The problem in price discrimination is that charging different classes of users a gas price that is either above or below the competitive price of gas tends to encourage either underconsumption or overconsumption of gas by the users. In terms of rates, therefore, the overconsumption by the consumer class paying artificially low prices is subsidized by the underconsumption of the users paying artificially high prices. The economic effects of these inefficient payments do not cancel each other, however. In the group paying artificially high prices, too little gas is consumed, suggesting that uses for gas remain that have values in excess of the cost of producing that gas, analagous to the problem of monopoly. In the consumer class paying artificially low prices, gas will be burned for uses with values less than its production cost, analagous to the fly-up problem. Thus, while underconsumption and overconsumption may cancel themselves in the aggregate--that is, the total amount of gas sold may resemble the amount that would be sold in a competitive market--the efficiency losses associated with each group's consumption do not offset each other. Rather, they are compounded, as each group is unable to achieve the allocation of gas that would occur in a purely competitive setting. These regulatory practices raise the following questions:

- To what extent do different classes of consumers pay different prices for gas?
- What assumption is made about how the new cost burden created by decontrol would be allocated among different classes of users?
- If incremental pricing is abolished under a decontrol proposal, how will this affect industrial gas demand and, in turn, gas prices in the residential and commercial markets?

INCOME-RELATED CHANGES IN DEMAND: THE LINK TO MACROECONOMICS

A final problem in the decontrol of natural gas is the relationship between the natural gas market and the aggregate level of economic activity. Natural gas takes up a large portion of some household budgets and of industrial and commercial costs in particular sectors. Thus, large increases in the price of gas could reduce the income of these households and the profits of these firms. Such households and firms would have to, in turn, reduce expenditures on other goods or inputs, resulting in a reduced level of total real spending. This initial loss of national income would cause a shift of gas demand, that is, less gas would be demanded at every possible gas price.

The potential reduction in gas demand is of consequence in estimating the benefits of gas decontrol. If gas demand dropped as a result of reduced national income, then the efficiency gain associated with gas decontrol would be smaller. This would happen because there would be fewer new gas users and efficiency gains are realized when new users foresake more expensive alternatives and switch to gas. Conversely, as national income grew (for example, as producers respend their revenues), the efficiency gains of decontrol would grow as well.

The central question here is the extent to which the decontrol of gas prices would have an income-reducing effect. If all households and firms were to react perfectly and instantaneously to gas decontrol, and if all factors of production were perfectly mobile and interchangeable, it is doubtful that such an income effect would occur. In the absence of such a perfectly fluid world, however, the existence and possible magnitude of an income reducing effect becomes worthy of concern. This effect depends on a variety of factors concerning respending of the revenues raised from decontrol and the speed of decontrol adjustments. Moreover, while this income effect might reduce gas demand and, therefore, the amount of income gas decontrol might redistribute, the size of the redistribution would play an important role in determining the magnitude of the income effect. Thus, the size of the income redistribution created by gas decontrol and the effect of gas decontrol on national income would be determined simultaneously. These macroeconomic issues are discussed in the next chapter.

CHAPTER IV. EFFECTS OF DECONTROL ON THE ECONOMY

The decontrol of wellhead natural gas prices would change relative prices, redistribute significant amounts of income, and promote efficiency in energy production and use. These adjustments throughout the economy would influence the level of national income and employment.

The economic effects of natural gas decontrol would cause adjustments in wages and prices and consumption and production activities. Higher gas prices initially would reduce consumer discretionary income and, unless offset by price reductions for other items, would reduce the amount consumers could spend on other goods and services. As consumers reduced their purchases of nonenergy goods and services, the producers who supply them might curtail their production and, in turn, their investment and employment levels. Nonenergy producers that use natural gas would also need to readjust their fuel and other input use in response to decontrol. In contrast, gas producers would recirculate their additional revenues in the form of higher taxes, payrolls, dividends, or investment. These shifts in the composition of consumption and output would initially reduce overall employment, output, and income. As households and firms reduced their natural gas consumption in response to higher prices, however, they would generate the efficiency gains discussed in Chapter III. These efficiency gains could eventually offset the output losses incurred during the initial stages of the adjustment period and could result in higher levels of national income, output, and employment.

The major macroeconomic consideration about natural gas decontrol, therefore, is whether the additional spending by energy producers and the efficiency gains generated by decontrol would lead quickly to greater economic growth. This chapter provides a macroeconomic context that describes how the timing and magnitude of these effects are determined.

THE ROLE OF NATURAL GAS PRICES IN ECONOMIC ACTIVITY

In a competitive economy unfettered by the constraints of time or resource mobility, increases in the price of natural gas would promote changes in the mix of economic activities and a more efficient use of resources. These higher prices would generate additional revenues in the gas industry that could be used to increase gas production by bidding capital, labor, and other productive resources away from other industries, just as

higher oil prices have stimulated investment and employment in the oil industry. According to this perfectly competitive model, the resulting shift in the mix of economic activities would maintain the overall level of output and employment.

Resources are never as interchangeable as they would have to be to obtain this immediate and complete adjustment, however. The mix of goods and services and the allocation of productive resources require time to adjust. Furthermore, prices and wage rates often do not reach levels that balance supply and demand. These features of the economy, therefore, lie at the heart of the timing and sequence of the macroeconomic adjustments under natural gas decontrol.

The macroeconomic effects of decontrol can be best understood by dividing the economy into three groups--consumers, nonenergy producers, and energy producers. Nonenergy and energy producers purchase input services (labor, capital, and energy) and make payments for these factors of production. These payments make up total personal income (wages and salaries and capital returns) and energy producer receipts. The output produced by nonenergy producers becomes the consumption and investment goods purchased by households and energy producers. These relationships constitute a circular flow of goods, services, and income and are affected by the response of all prices and wages to natural gas decontrol. The government and foreign trade sectors of the economy have been omitted here for the sake of simplicity. The inclusion of these sectors would not significantly affect the following qualitative discussion. 1/

Within the context of this circular flow, four major economic mechanisms appear to determine the macroeconomic adjustments under natural gas decontrol. First, there would be adjustments in consumer spending. Higher natural gas prices would reduce gas consumption as households switched to other less expensive fuel and used gas more efficiently. These adjustments would dampen the increases in the Consumer Price Index (CPI) caused by higher gas prices. Increased natural gas prices, however, would reduce consumer income available for purchasers of nonenergy goods and services. Lower expenditures on these items would translate into reduced demand for nonenergy products. As a result, nonenergy producers might

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1. Since this report is intended only to provide a background setting for understanding natural gas decontrol, it does not attempt to analyze probable quantitative macroeconomic changes. These are presented in a CBO companion paper, Natural Gas Pricing Policies: Implications for the Federal Budget (January 1983).

reduce their demand for labor and capital, which, in turn, would result in lower personal income.

Second, while nonenergy producers would reduce output and employment because of lower household demand for their products, they also would substitute other fuels and inputs for gas. These changes on the production side of the economy would limit the extent to which higher natural gas costs would be passed on to the next stage of production and, therefore, dampen the cost-push inflationary impact of decontrol. Input substitutions could also offset the output and employment reductions caused by declines in consumer spending and eventually lead to higher employment and wage and capital income. For example, nonenergy producers might increase their investment in order to replace or upgrade that portion of their capital stock made obsolete by higher gas prices. In sum, wages and capital returns would change as nonenergy producers adjusted their production processes to higher gas prices and their output levels to changes in general economic conditions caused by decontrol.

The third mechanism would be the respending of the additional income that energy producers received from nonenergy producers and consumers. This respending would take place as energy producers invested in new equipment and other assets, thus stimulating economic activity in the non-energy producing sectors. Additional stimulus would occur as energy producers hired more workers.

Finally, the flexibility of wages and prices would also be important. 2/ The response of wages and prices to natural gas price increases would be largely determined by the above three mechanisms. Price and wage flexibility would determine the inflationary effects of higher gas prices and, therefore, the level of real income and output under decontrol.

The ultimate macroeconomic effects of decontrol, therefore, would represent a balance of these three effects: the reduced consumption of nongas goods and services, the drive by the producers of these nongas goods and services to adjust to changing demands for their products and higher gas prices, and the respending of new revenues by gas producers. The key to understanding this balance lies in accurately describing the behavior of these three groups of economic actors: consumers, nongas producers, and

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2. See, for example, Knut Anton Mork and Robert E. Hall, "Energy Prices, Inflation and Recession, 1974-1975." The Energy Journal, vol. 1, no. 3 (July 1980), pp. 31-63.

gas producers. The balance of this chapter provides these descriptions, and raises the major questions surrounding each of them.

CONSUMER DECISIONS

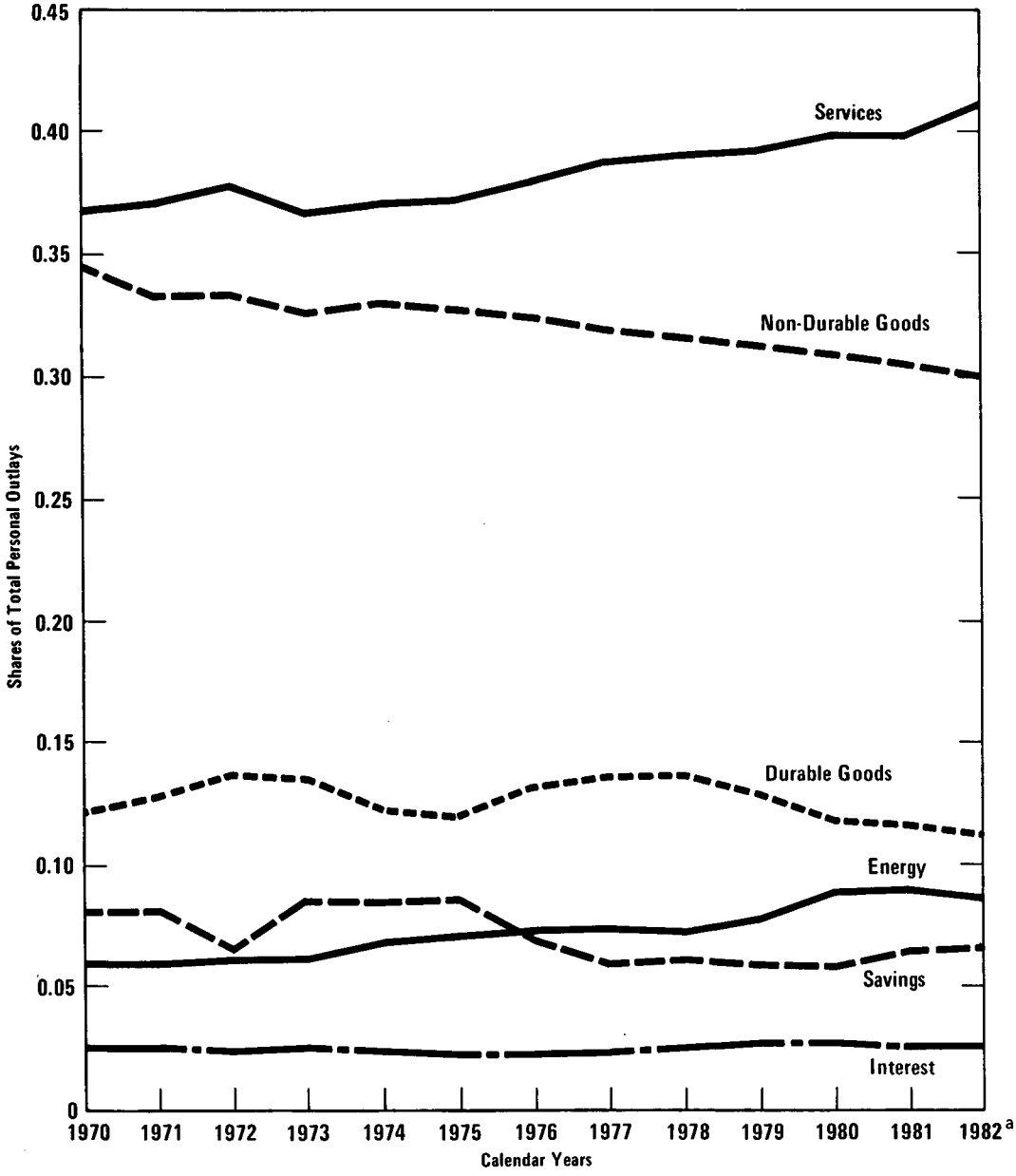
The allocation of total consumer outlays would be affected by an increase in real natural gas prices caused by decontrol. Given the historically observed inelastic nature of short-run energy demand, a rapid rise in natural gas prices would increase the share of energy expenditures in total consumer outlays. Since it is unlikely that household income would increase as rapidly as these expenditures, either savings or consumption of other goods and services would decline in the short run.

The composition of total personal outlays is illustrated in Figure 1 for the period 1970 to 1982. The share of energy expenditures increased 51 percent from 1973 (the first year of the OPEC oil embargo and dramatic jump in oil prices) to 1980. Also during this period, the share of expenditures devoted to services increased. The shares for savings and non-durable goods, however, declined during the post-embargo period. The time profile for the share of durable goods suggests some sensitivity to the energy share, particularly during the 1978 to 1980 period. The data illustrated in Figure 1 suggest that the rising share of energy expenditures may be partially responsible for some compositional shifts in total consumer outlays in addition to shifts in the relative prices for the various consumption items.

These shifts in the composition of consumption could affect employment and output. A reduction in consumption of other goods and services caused by higher energy prices would translate into lower receipts for these sectors of the economy. Lower business receipts in these sectors could lead to reductions in output and employment. The most likely category of consumption that could be reduced is discretionary spending on durable goods, such as automobiles and appliances, which are characteristically most sensitive to the levels of income available after purchases of "essential" goods.

A reduction in personal savings because of energy price increases would probably be short-lived, since aggregate savings rates are generally constant over the long term. If consumers financed their higher natural gas bills by reducing their savings, then the output losses attributed to shifts in consumer spending would be offset. Lower personal savings, however, would tighten capital markets and result in higher interest rates leading to lower capital formation and investment, reducing potential output and future productivity. Total personal savings have been observed to respond primarily to real disposable income. Higher natural gas prices effectively reduce the amount of goods and services a household can purchase and, thus, lower real

Figure 1.
Composition of Total Personal Outlays After Taxes



SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

NOTE: Total Personal Outlays is a category of the National Income and Product Accounts.

[a] Preliminary figures.

disposable income. Hence, the effect of higher natural gas prices on personal savings would operate through lagged changes in real income.

Any analysis of natural gas pricing policy must address the following questions about consumer behavior:

- What assumptions are made about the response of consumers to higher gas prices? (Alternatively, what are the price and income elasticities of gas demand?)
- How are the elasticities measured?
- If consumer gas expenditures increase, for which goods will consumer spending decrease? How is this result obtained?
- What assumption is made regarding the effect of higher gas prices on savings? On what basis is this assumption made?

NONENERGY PRODUCERS

Nonenergy producers purchase fuels from energy producers, hire workers, and borrow capital to produce goods used for final consumption or as inputs into other production processes. Workers, capital, and fuels are often termed "factors of production," and payments for them become household income and energy producer receipts. The elimination of natural gas price controls would, according to economic theory, promote substitutions among these factors in the production of nongas goods and services. The result would be a more efficient allocation of resources through which society could produce more goods with fewer inputs and, thus, earn more income. The key uncertainty is the speed with which these changes would generate higher personal income.

Factor substitutions represent the efficiency gains described in Chapter III. These substitutions are functions of the relative prices and the level of business activity that result from nonenergy consumption. As they occur, factor substitutions in the production process would translate efficiency gains into additional national income. This increased income could eventually offset reductions in planned output caused by the reduced consumption of nongas goods and services. In addition, efficiency gains would be realized as firms substituted other less costly fuels for natural gas.

This description of factor substitution raises questions concerning the responses of nonenergy producers under decontrol:

- How do natural gas prices affect a firm's demand for labor, capital, energy, and materials? How is this effect estimated?

- To what extent are other fuels substituted for gas in the production of nonenergy goods?

Changing Demands for Labor and Capital

The cost of production for nonenergy producers is influenced by input prices and the level of demand for their final products. Relative prices for labor, capital, energy, and materials affect the allocation of business expenditures. Assuming all other factors remain constant, a change in the relative price for an input will affect the allocation of business expenditures through two effects. The first--called "own-price" effects--is the simple law of demand--less of any good or input is typically demanded as its price rises. The second--"cross-price"--effects reflect the substitutability and complementarity between factors of production. If natural gas and labor are substitutes, then the quantity of labor demanded would increase with a rise in natural gas prices. For example, a manufacturer may hire an additional worker to monitor gas saving equipment. On the other hand, if they are complements, the quantity of labor demanded would decline with an increase in the price of natural gas. This would occur if a producer reduced his operation of some equipment to save gas and, therefore, reduced his work force.

In addition, changes in natural gas prices could also affect the utilization of the capital stock. The relationship between energy and utilized capital stock is subject to debate. If energy and capital stock are substitutes, then higher natural gas prices would increase the demand for capital stock. This could result in higher personal income (all other factors remaining constant) through investment which would increase dividends and capital gains.

A different rate of utilization of the capital stock could also affect investment in the nongas sector. If higher natural gas prices made a portion of the capital stock obsolete, then replacement investment might increase. Investment decisions, however, are often made on the basis of expected output, rather than the possible efficiency gains from substituting new capital stock for higher-cost energy.

If consumers reduced their consumption of nongas goods and services, increased replacement investment might not take place. When workers are hired or capital employed, businesses must make expenditures. The level of business expenditures depends on the demand for final products. Reduced

consumption, in turn, would reduce nonenergy producers' planned output or anticipated business expenditures. If producers did not anticipate the reduction in the demand for their goods correctly, unplanned inventories might accumulate. In either event, firms would seek lower levels of total costs and expenditures, including investments. Therefore, output effects would be important for determining the investment effects of decontrol.

Any analysis of the macroeconomic effects of decontrol, therefore, must focus on these questions:

- How will higher natural gas prices affect the hiring of labor in the economy? Are labor and energy complements or substutites?
- To what extent will higher gas prices lead firms to replace their old capital or use less of their existing stock?
- What, therefore, is the effect of higher gas prices on investment?
- To what extent will firms reduce the amount of labor and capital they employ in response to possible lower levels of output that follow decontrol?

Fuel Substitutions

Shifts in the fuel mix could reduce the demand for imported fuels. This could improve the balance of trade and increase national income. Moreover, by substituting other fuels for gas, firms and households would reduce both the cost burden that decontrol imposed on the economy and its inflationary impact. The questions that must be answered regarding fuel substitution possibilities include:

- What assumptions are made regarding relative fuel prices?
- Do regulatory policies and institutional factors influence perceptions of long-term fuel availability?
- Are there technological constraints that determine the feasibility and cost of fuel switching? How will these affect the economy's response to higher gas prices?

ENERGY PRODUCERS

Two important questions about energy producers' behavior under decontrol are: how much more gas would they produce, and when would they

produce it? These factors would determine the availability and cost of natural gas. If the supply of natural gas was not responsive to higher prices, then the economic adjustment costs could be substantial. The converse is true to the extent that higher prices bring forth generous supplies. Furthermore, since the lead times can run several years for new production facilities, the supply response is likely to be limited in the short run. This would be another source for transient adjustment losses.

The consumption and investment behavior of energy producers would be pivotal in the economic adjustments set in motion under decontrol. As natural gas producers received prices in excess of the costs of production, they would receive profits. These profits might be invested or distributed through dividends. The profits that enter the consumption expenditure flow would offset the reduction in consumption caused by higher gas prices. Investments in new plants and equipment would stimulate final demand and increase productive capacity. Natural gas producers also could invest these profits in nonproductive assets, which would erode the nation's ability to produce goods and services.

On the other hand, increased exploration, development, and production would increase employment in the energy industry. This employment stimulus and its associated impact on wage income must be weighed against the possible declines in employment caused by reduced consumer spending for nongas goods and services and by potential plant closings caused by capital obsolescence among nonenergy producers.

The composition of ownership in the energy industry would affect the recycling of energy revenues. If most of the revenues accrued to individual proprietors rather than multinational corporations, then a higher proportion of the revenues might stimulate consumer spending. Larger corporations might allocate revenues to retained earnings. These funds could then be used to finance projects in the United States or abroad, depending on corporate rates of return. The different propensities to consume and invest among various owners of energy resources would affect the rate of respending of revenues and ultimately the costs of adjustment.

Any analysis of gas decontrol, therefore, must address the following questions:

- What assumption is made regarding the response of gas supply to wellhead decontrol or other price changes?
- How will gas producers respend the revenues they realize through decontrol and how quickly will they respend it? How are these estimates obtained?

- What new demands for labor and capital are created by gas industry respending?

WAGE AND PRICE FLEXIBILITY

The degree of wage and price flexibility under various natural gas policies would influence real income and output in the economy. The total impact of higher natural gas prices on the level of wages and prices would be composed of direct and indirect effects. First, higher gas prices would directly increase the CPI since natural gas is used as a heating fuel. Gas is also used to produce many goods and services, such as glass, chemical products, and processed foods. Thus, producer prices would increase as nonenergy producers passed on at least some higher gas costs, depending on substitution possibilities. Prices for consumption and investment goods are, in turn, linked to these product prices. Therefore, higher producer prices would indirectly increase the CPI. Another inflation transmission mechanism set in motion by higher gas prices would be the wage-price link. Since many wage rates in the economy are either partially or wholly adjusted to reflect inflation, the first-round direct inflationary effects of decontrol would be augmented by a second round of indirect wage increases.

After estimating the impact that decontrol would have on natural gas prices, several other questions must be addressed to estimate the overall inflationary impact of these price increases:

- What are the direct effects of higher gas prices on consumer and producer prices?
- How are the increased producer prices transmitted to final product prices?
- How will wage rates respond to the increases in consumer and producer prices caused by higher gas prices?

THE ROLE OF ECONOMIC POLICY

By understanding how consumers, nongas producers, and gas producers behave when gas prices rise, the macroeconomic effects of decontrol can be understood. The level and rate of increase in natural gas prices would largely determine the inflationary effects of decontrol and changes in relative prices that influence consumption and production decisions. The initial loss of purchasing power created by higher gas prices would result in reduced consumption of other goods and services. This would lead producers of those