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I. INTRODUCTION

Crude oil price controls are a part of the great body of federal and state regulations which govern the activities of the petroleum industry. Price controls are a rather recent addition to four decades of petroleum industry regulations, which generally have fit into one of the following classifications: market demand prorationing plans, oil import quotas, allocation programs, and price controls. The market demand prorationing plan and oil import programs were designed to raise crude oil prices above their competitive levels, thus stabilizing prices and transferring funds from consumers to producers. Crude oil and product price regulations have the opposite effect; *i.e.*, they are designed to keep prices below world levels and transfer income from producers to consumers.

The current regulations prevent owners of lower cost oil with fixed production costs from seeking the world price of crude oil as established by the Organization of Petroleum Exporting Countries (OPEC). Under this scheme, controls prevent crude oil and petroleum product prices from reflecting the OPEC price of crude. This lower-than-market domestic price of petroleum encourages demand, reduces domestic production, and increases imports of foreign crude as the marginal source of supply to satisfy domestic demand, and thus increases the United States' dependence on an uncertain supply of crude oil. The evidence suggests that these regulations, coupled with environmental restrictions, create a negative impact on the supply of petroleum in the United States.[1] Prorationing plans have diverted investment toward development drilling,

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* The views expressed herein are those the authors and should not be taken as representing the views of either of their employers.

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1. *See, e.g.*, D. BOHI & M. RUSSEL, U.S. ENERGY POLICY 4 (1975).

away from exploration in highly risky but potentially more productive petroleum regions or basins. Together, prorationing and import controls have discouraged necessary investment in domestic refining capacity. Prorationing, by restricting production, has limited the refiners' sources of domestic feedstocks, and import limitations have restricted the refiners' ability to substitute foreign for domestic feedstocks. Likewise, import quotas have reduced competition and efficiency in domestic production, since import quotas are set so that they cannot replace domestic production, a situation which has allowed U.S. producers to exercise effective monopoly power through complete control of both domestic and foreign supplies. Without an import quota, the ability of prorationing to restrict output and allow crude oil prices to rise above their competitive levels would be neutralized by the substitution of imported crude for domestic production.

Price controls on petroleum tend to weaken any incentive by the industry to respond to increased demand for products. Regulated natural gas markets have discouraged producers from exploring for new fields in the face of declining gas reserves. Since natural gas and petroleum are joint products, price controls on both have contributed to their declining reserve positions.

Under any energy program, the average price of domestic crude oil is regulated to be lower than the price of imported crude oil, and as such, the average refiner acquisition cost for domestic crude oil is considerably below that of imported crude. Under each of the Nixon, Ford, and Carter energy programs, phased decontrol of domestic crude oil prices has been deemed preferable to immediate decontrol. Since the domestic production of crude oil is no longer sufficient to meet domestic demand, the marginal barrel of crude oil needed to satisfy this increased demand must come from foreign sources.

From the standpoint of market efficiency, regulations are usually considered harmful in that they reduce production, distort market mechanisms, and fail to account for the interaction of supply and demand. For equity reasons, however, regulations are often necessary to protect consumers, assign costs to externalities, and preserve national security. This paper will discuss the efficiency aspects of crude oil regulations and their consequent impacts on price, domestic production, market distortions, and imports. The study will be divided into three

parts: Pre-Embargo Controls, Post-Embargo Controls, and an Economic Analysis of Controls.

II. PRE-EMBARGO CONTROLS

As demonstrated by MacAvoy[2] and Mead,[3] the crude oil segment of the petroleum industry has been subject to government regulation since the 1930's, though the purpose of the regulations has changed dramatically over the years. Current regulations are designed to restrain prices and transfer industry rents[4] from the producers of crude oil to the consumers of petroleum products. On the other hand, the earliest regulations transferred funds from the consumers to the producers by restricting supply and thereby stabilizing prices at higher than open market levels.

A. *Domestic Prorationing Schemes*

In the 1930's, the major petroleum-producing states joined together to develop a system of prorationing under which any given producer was allowed to produce only a percentage of the maximum efficient rate of recovery from a given reservoir.[5] In 1935 the major producing states executed the Interstate Oil Compact to Conserve Oil and Gas.[6] The prorationing plans encouraged in the compact were designed to prevent overinvestment in oil wells and overproduction from any given reservoir, with state agencies setting the allowable rates of production. Many states have continued to employ alternative forms of these maximum efficient recovery (MER) plans over the last four decades, and while no single plan has ever worked flawlessly, MER's have helped to limit the wasteful production and wild price fluctuations which characterized the early 1930's.

Obviously, the prorationing plans fixed prices and eliminated competition among producers. If permissible production rates were established at too low a level, refiners would com-

2. FEDERAL ENERGY ADMINISTRATION REGULATION (P. MacAvoy ed. 1977) [hereinafter cited as MacAvoy].

3. W. Mead, *Petroleum: An Unregulated Industry?* ENERGY SUPPLY AND GOVERNMENT POLICY 130-160 (R. Kalter & W. Vogely eds. 1976) [hereinafter cited as Mead].

4. Rents may be defined as unrealized gains to the owner of a scarce commodity which is fixed in quantity, whose market value has increased since the owner's procurement.

5. There have been a number of different prorationing plans. The rationale behind each type is explained in Mead, *supra* note 3, at 132-48.

6. The U.S. Congress by joint resolution gave its consent to the compact. *See* J. Res. of Aug. 27, 1935, Ch. 781, 49 Stat. 939 (1935).

plain that they were unable to obtain crude at the current price; the state agency would then either increase the production percentages or raise the price of crude. Production in excess of state-established limits for interstate shipment was prohibited by the Connally Hot Oil Act of 1935.[7] This state of affairs was not changed notably by peacetime legislation for the next twenty-five years.

B. *Oil Import Controls*

When low cost foreign crude oil threatened prorationing plans, and thereby the price of domestic crude oil, the President (at the urging of congressmen whose districts were being affected) established the Mandatory Oil Import Program (MOIP) of 1959.[8] This program set volumetric limits on the amount of crude oil and related products which could be imported. While the regulations and operation of MOIP underwent several changes, the effect was to insulate the price of domestic crude oil from lower world prices. Under this program the quantities of imported oil were rigidly fixed, and the marginal barrel of crude oil necessary to satisfy domestic demand was supplied from domestic petroleum sources.

Declining domestic production of crude oil since 1970, coupled with increased demand, has caused the allowable rate of production under the MER plans to be fixed at 100% by the appropriate state commissions. With full production now permitted, there no longer exists any excess production capacity in the domestic petroleum industry; producers may now provide as much as is profitable to satisfy domestic demand.

Effective May 1, 1973, President Nixon eliminated MOIP's volumetric limits on oil imports.[9] The removal of the quota system exposed a severe shortage of domestic refinery capacity. Refineries which would have been constructed in the United States were built abroad instead, since the quota system had restricted entry into the United States of foreign crude

7. 15 U.S.C. § 715 (1976).

8. Pres. Proc. No. 3279, 3 C.F.R. 11 (1959-1963 Compilation), *reprinted in* 19 U.S.C. § 1862 (1976), and in 73 Stat. c25 (1959). For a detailed account of the history and politics of the mandatory oil import program from 1959-1973, *see* Mead, *supra* note 3, at 148-54.

9. Pres. Proc. No. 4210, 3 C.F.R. 239 (1971-1975 Compilation), *reprinted in* 87 Stat. 1187 (1973). License fees, however, continued to be charged on imported oil: $0.21 per barrel of crude, and $0.63 per barrel of product.

oil supplies. In 1973 domestic U.S. refiners were operating at almost 100% of capacity.

C. *Price Controls*

The United States' first major peacetime experience with petroleum price controls occurred with the Nixon Administration's announcement of a ninety-day wage-price freeze (Phase One) on August 15, 1971.[10] The current crude oil price regulations of the Department of Energy are an extension of the regulations originally promulgated under Phase One. While the program affected petroleum products as well as crude petroleum, the discussion here will focus only on crude oil aspects of price controls.

Prior to the summer of 1971, there had been gasoline price wars among the major brand gasoline dealers. Markets, however, stabilized prior to the establishment of controls, and at the initiation of the price freeze, gasoline prices charged by oil company retail outlets were at normal or near-normal levels. The integrated petroleum companies enjoyed some flexibility under the freeze. Traditionally, major petroleum companies had provided bulk purchasers of gasoline and refined products with discounts below the posted prices. As the discount contracts expired, the suppliers refused to renew them at the discounted level and insisted on selling their petroleum only at the full posted price. Thus, despite the freeze, these companies in effect were able to raise their prices. This practice placed a squeeze on the profits of independent marketers whose products were subject to the freeze but whose inputs were now purchased at nondiscounted prices. These price distortions continued into the second stage of the Nixon wage-price program.

Phase Two lasted from November 15, 1971 to January 11, 1973.[11] Ceiling prices which had been set during the Phase One freeze became base prices for Phase Two. Under Term Limit Pricing (TLP) arrangements, companies were allowed to increase prices of their products for a specified period of time,

10. Exec. Order No. 11,615, 3 C.F.R. 602 (1971-1975 Compilation), 12 U.S.C. § 1904 n (1976). A detailed account of the regulations and the impact of controls during the Nixon Administration's Economic Stabilization Program is presented in W. Johnson, *The Impact of Price Controls on the Oil Industry: How to Worsen an Energy Crisis*, in ENERGY: THE POLICY ISSUES 100-109 (G. Eppen ed. 1975) [hereinafter cited as Johnson].

11. The first announcement of a change in the structure of controls came in Exec. Order 11,627, 3 C.F.R. 621 (1971-1975 Compilation).

provided the weighted-average price increases were consistent with specific cost passthrough and profit margin rules set by the newly established Price Commission. Companies were allowed to spread price increases in any manner across products subject to TLP, but were severely limited in adjusting relative prices for products excluded from TLP arrangements. In the petroleum industry, three-fourths of the refinery yield was excluded. For example, crude oil prices were excluded from TLP agreements if the crude was resold by refineries, while first-sale prices of crude oil were included in TLP arrangements.

During 1972 and continuing into 1973, shortages of crude oil and some refined products began to appear. For example, the controls prohibited price increases on gasoline and number two home heating oil above their August 1971 price levels. However, during the summer months, gasoline prices were at relatively high levels compared to heating oil prices. Since the refiners believed that heating oil prices would not be allowed to follow their seasonal pattern and rise during the winter, they had no incentive to increase their output of heating oil when the winter months arrived, and shortages began to occur.

Phase Three[12] was the government's response to these and similar problems; it was to have provided industry with greater flexibility in conducting business, within fixed price guidelines. Business was to comply on a voluntary basis with standards for cost increases contained in the Phase Three regulations; the Price Commission was abolished and the Cost of Living Council was called upon to monitor compliance with the new standards. As Phase Three began, the combined factors of pent-up demand pressure for petroleum products, decreasing domestic crude production, and a worldwide shortage of crude oil resulted in sharp increases in the price of crude oil and products. On March 8, 1973, however, the Cost of Living Council issued Special Rule Number One,[13] which reimposed mandatory controls on the twenty-three major companies in the petroleum industry,[14] and produced an unfortunate set of incentives which contributed to the shortage of crude in the United States. First, the rule restricted the ability of the majors to raise prices above

12. *See* Exec. Order No. 11,695, 3 C.F.R. 741 (1971-1975 Compilation).

13. 38 Fed. Reg. 6284 (1973).

14. These companies had individual sales in excess of $230 million, and in the aggregate conducted 45% of the industry's sales.

specified percentages, and prohibited them from increasing prices if their profits were over specific base period profit margin levels. Since the largest companies owned and operated profitable holdings, their profits exceeded the base period levels, and thus they were prohibited from passing on higher foreign crude oil costs to their customers. At the same time the rule enabled smaller refiners to bid up the price of crude oil. Since the higher price of foreign crude could not be passed on by the majors, the smaller refineries succeeded in diverting crude from the majors. A second negative byproduct of Special Rule Number One arose from the fact that the major U.S. producers with foreign operations faced a reduction in profits on refined products if the crude was sold in the United States and they were at the profit margin constraint. By selling this crude oil abroad rather than shipping it to the United States, the majors were able to maximize profits, since foreign sales were unaffected by the Phase Three rules. This circumstance further aggravated the shortage of crude oil in the United States and placed more pressure on crude oil prices, exacerbating crude shortages to domestic refiners. A crude oil allocation program eventually was enacted[15] to alleviate the crude shortages created by Special Rule Number One.

Phase 3½ froze all petroleum prices from June 13, 1973 to August 12, 1973.[16] During this period even the increased prices of imported crude oil could not be passed through to consumers in the form of higher product prices. Since imported crude oil prices were rising, this rule effectively stopped all crude purchases by refiners and eventually produced severe petroleum product shortages in the fall of 1973.

Phase Four took effect on August 13, 1973, and continued until December 1973 when all petroleum price controls were transferred to the Federal Energy Office from the Cost of Living Council.[17] The new regulations benefited immensely from the failings of Phases Two and Three, with their reliance on controlling only the major companies: now the pricing of petro-

15. Emergency Petroleum Allocation Act of 1973 (EPAA), 15 U.S.C. §§ 751-760h (1976), discussed *infra*.

16. Announced by President Nixon in Exec. Order No. 11,723, 3 C.F.R. 774 (1971-1975 Compilation).

17. Phase Four regulations were originally set forth in 38 Fed. Reg. 19,462-86 (1973) (proposed), and amended in 38 Fed. Reg. 21,592-613 (1973). Provisions relevant to crude oil appear at 38 Fed. Reg. 19,481-83 (1973).

leum and its products by *all* parts of the industry would be covered. A two-tiered pricing system was established which differentiated between controlled "old" oil and uncontrolled "new" oil. While designed to stabilize the price of crude produced from existing properties, it also provided an incentive to producers to seek out higher cost production from new properties, or to use enhanced recovery techniques to increase production from existing properties.[18] "Old" oil was defined as oil produced from a given property in an amount equal to or less than the amount produced in the same month of 1972 by that property. It was subject to price controls fixed at the May 15, 1973 price of crude oil from the given field, plus thirty-five cents per barrel. The lower tier thus had the effect of preventing the industry from accruing rents on existing properties. Uncontrolled "new" oil was defined as production from new wells on properties not operative in 1972, or production from 1972 properties in excess of 1972 production levels. "Stripper" oil, from wells producing less than ten barrels per day, was not subject to controls. In addition, for each new barrel of crude oil produced on an existing property, a barrel of old oil would be released from lower tier controls. This "released" oil was free of controls and was used as an inducement for producers to increase production above 1972 levels on existing properties. New and released oil were free to seek the uncontrolled import price level. Thus, the two-tiered system was designed to increase domestic crude oil production by raising the crude oil price at the *margin* for each new barrel of oil, while allowing the *average* price for new and old oil to determine refinery product prices.

Although the two-tiered system did encourage new exploration and development, it created problems for refineries. Since each refiner did not have access to the same proportions of controlled and uncontrolled crude oil, the system produced significant differentials between refiners in ultimate product prices. Retail gasoline prices in the same city often differed by as much as twelve cents per gallon.[19] The self-sufficient refinery purchaser had to charge oil into the refinery at the controlled

18. Enhanced recovery techniques are methods of recovering additional energy from a reservoir by fluid or chemical injections. The oil generated by fluid injections is called "secondary" oil, while the result of chemical injections is called "tertiary" oil.

19. Johnson, *supra* note 10, at 110.

price, and the low controlled prices then had to be carried through into low product prices. This procedure placed the uncontrolled crude purchaser at a disadvantage in the product market, since higher price crude imports were charged into the refinery at the higher import price and yielded higher priced refined products. The two-tiered system thus discouraged investment in expansion of refinery capacity.

III. POST-EMBARGO CONTROLS

The Yom Kippur War of October 1973 resulted in an embargo on the sale of crude oil to the United States by the OPEC nations. With the threat of a severe shortage of crude oil supplies, the stage was set for implementation of a crude oil allocation procedure designed to avert the harshest effects to consumers of the impending crude shortage.

A. *Emergency Petroleum Allocation Act*

The Emergency Petroleum Allocation Act (EPAA) became effective on November 27, 1973 and provided for the mandatory and equitable allocation of crude oil among the nation's refiners on a quarterly basis.[20] Under a buy/sell agreement, refiners having a higher percentage of crude oil supplies than the national average (in relation to their refining capacity) were required to resell their crude to refineries with below normal crude availability. Under the allocation scheme, the Federal Energy Office (FEO) took over administration of the EPAA from the Cost of Living Council in December 1973. The effect of the EPAA was to penalize those companies with preestablished crude supplies and to weaken the market function by placing FEO in control of crude allocation.[21]

During the period of the embargo (October 1973 through April 1974), the regulations established under the EPAA remained unchanged. With the end of the embargo in the spring of 1974, legislation was signed establishing the Federal Energy Administration (FEA),[22] which was given authority to administer the regulations established and formerly administered by FEO. The only major changes made in the regulations by FEA in the remainder of 1974 were modifications of the buy/sell program and creation of a crude oil entitlements program. The

20. 15 U.S.C. §§ 751-760h (1976).

21. *See* Mandatory Allocation Regulations amending 10 C.F.R. §§ 200-202 (revoked), 205 (added), 210-212 (added), *reprinted in* 39 Fed. Reg. 1924-1961 (1974).

22. Federal Energy Administration Act of 1974, 15 U.S.C. §§ 761-787 (1976).

original buy/sell program had caused two major problems: (1) the requirement of crude oil sharing among majors had forced needless transfers of supplies between majors experiencing mere short term imbalances, increasing unnecessary bureaucratic costs; and (2) disincentives to purchase imported crude oil, as discussed above. The buy/sell program was modified on May 14, 1974, to limit the sellers of crude oil to the fifteen largest refiners, and the buyers to the smaller refiners.[23] Some imported oil disincentives were also addressed.

B. *Entitlements Program*

In November 1974 the EPAA was supplemented by a crude oil entitlements program designed to equalize crude oil costs varying among refiners as a result of the two-tiered price control system.[24] Under the program, refiners having crude oil in excess of the national average were required to purchase entitlements from refiners having less than the national average. The purpose of the program was to correct inequities created by the earlier price control and allocation procedures; one intended effect was the creation of a bias favoring smaller refiners. Large OPEC price increases in late 1973 had produced a tremendous gap between upper and lower tier oil prices. Depending on the mix of old, new, and imported oil available to the refineries, the average price of imports available had continued to vary considerably. Refineries with more old oil than the national average were forced to purchase entitlements in order to use their excess lower tier oil, while those having less than the average low-cost crude could sell their entitlements. Small refiners were given additional entitlements as a subsidy to help them compete with the majors; these entitlements either could be sold or used to acquire crude oil at a cost below the majors' acquisition cost.[25] The small refiner bias effectively raised the cost of crude oil to large refiners, whose costs were obviously key determinants of the final price of refined products. In addition, the bias encouraged the use of smaller, less efficient refineries.

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23. Amendments to 10 C.F.R. §§ 211.61-211.68, 211.71, 212.88 (revoked), 212.94 *reprinted in* 39 Fed. Reg. 17,288-93 (1974).

24. Amendments to 10 C.F.R. §§ 211.66, 211.67, 212.131, *reprinted in* 39 Fed. Reg. 42,246-50 (1974).

25. *See generally* MacAvoy, *supra* note 2, at 12.

C. *The Energy Policy and Conservation Act and the Energy Conservation and Production Act*

Current crude oil controls operate under laws passed in December 1975 and August 1976. The Energy Policy and Conservation Act (EPCA) of 1975 provided for the phasing-out of price regulations on crude oil over a forty-month time period.[26] The plan established a fixed national average price for all crude oil, which the Federal Energy Administration was given power to adjust by up to 10% per year. Initially, the average price was set at $7.66 per barrel, which was the share-weighted average price of old oil at $5.25 per barrel and upper tier oil at $11.28 per barrel. The upper tier included new oil, released oil, and stripper oil; a third tier not included in the composite existed for uncontrolled imported oil, which sold for approximately $13.25 per barrel. Following passage of EPCA, revisions were made in existing crude regulations to conform to EPCA, including elimination of the released oil category and introduction of a mechanism whereby the base period production level for a given field was placed on a declining basis to correspond with the historical decline rate for each field.[27] In addition, the lease definition was modified to treat new reservoirs developed on old leases as new property, thereby making them available for upper tier rather than lower tier prices.[28]

The Energy Conservation and Production Act (ECPA) of 1976, modified EPCA by exempting stripper oil from upper tier controls.[29] However, stripper oil supplies were still to be included in the calculation of the upper tier price, which prevented the exemption of stripper oil from having an effect on the share-weighted average price of crude oil remaining controlled. Tertiary oil supplies were exempted from controls and allowed to sell at the world oil price, but were not included in the average price.

Current crude oil controls focus on elimination of rents to owners of lower cost old petroleum, unlike the rules in the pre-embargo period, which were aimed at holding down prices and

26. 42 U.S.C. §§ 6201-6422 (1976).

27. FEA began assuming a decline rate of 8% as an average for all fields, based on analysis of a number of sites.

28. Amendments to 10 C.F.R. §§ 212.72, 212.75, *reprinted in* 41 Fed. Reg. 36,172-85 (1976).

29. 42 U.S.C. §§ 6801-6892 (1976).

forcing producers and refiners to absorb increasing costs. The current control system prevents domestic crude oil from reflecting the OPEC price of crude oil. However, any intended benefits of the program are not without costs to the industry and the taxpayer.[30] For the industry there are compliance and administrative costs, interference with distribution patterns, and uncertainty as to the direction of future regulation. The taxpayers bear the costs of increased regulation via higher prices and reduced efficiency. The various programs discourage refinery expansion, continue to be biased in favor of less than optimal refinery utilization, and cause higher marketing costs. The present controls program is exceedingly complex and difficult to enforce.[31] Summary comments from other studies illustrate these points.

MacAvoy concluded that the costs of today's crude oil regulations outweigh their benefits: current market conditions show adequate world supplies of crude and do not warrant continuation of product pricing and allocation regulations. He estimated that the petroleum industry pays reporting and administrative costs for compliance as high as $570 million annually, while the administrative costs of the program maintained by FEA could be costing the taxpayers $47 million per year.[32] In addition, controls could produce longrun inefficiencies by encouraging refineries of less than optimal size (small refiner bias), and inefficiency in the distribution of products.

In analyzing the effects of crude oil controls, Cox and Wright reached similar conclusions. While they found that the entitlements program did equalize refiner crude costs, it had the additional effect of artificially reducing the market price of products and increasing product demand in the absence of an appropriate supply response. Further, the EPAA and EPCA policies increased United States dependence on foreign sources, since the entitlements program provided a subsidy to imported crude oil.[33]

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30. For a detailed discussion of the costs to industry and taxpayers of compliance and enforcement of petroleum regulations, *see* MacAvoy, *supra* note 2, at 39-89.

31. For a discussion of procedural problems with the current regulatory program, *see* MacAvoy, *supra* note 2, at 91-138.

32. *Id.* at 143.

33. Cox & Wright, *The Effects of Crude Oil Price Controls, Entitlements and Taxes on Refined Product Prices and Energy Independence*, 54 LAND ECON. 1-15 (Feb. 1978).

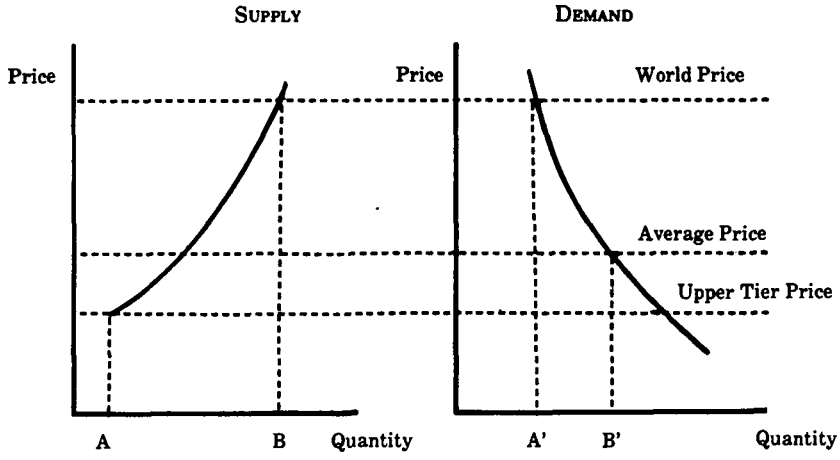
Morici's analysis concluded that the benefits of price regulations to petroleum consumers and refiners were outweighed by the costs to crude oil producers and the loss of efficiency in production.[34] The cost of transferring windfall profits from crude producers to product consumers and refiners yields a negative net welfare gain. Consumers obviously benefit from lower product prices and higher consumption levels as long as refineries pass on their lower crude costs, which have not been fully dissipated by higher refinery costs. However, Morici concluded that this regulated system has the effect of subsidizing crude oil imports and reallocating domestic resources to less efficient users.

IV. AN ECONOMIC ANALYSIS OF CONTROLS

This analysis first will employ a simple static supply and demand model to examine the impact of EPCA-type price controls on consumers, producers, and the international oil markets. Assuming that oil supplies are not perfectly inelastic,[35] which is consistent with both theoretical analysis and empirical work, Figure One illustrates the impacts of EPCA-type price controls on oil demand and supply.[36]

Figure 1

Static Representation of Crude Oil Supply and Demand



34. Morici, Jr., *The Benefits and Costs of Crude Oil Price Regulations*, 3 J. EN. & DEV. 366-77 (Spring 1978).

35. *I.e.*, that oil supplies do not respond to changes in oil price. This could be demonstrated graphically as a vertical line in Figure One.

36. This analysis relies on the work of Cox and Wright, *supra* note 33, which shows

In the case of producers subject to price controls, the upper tier price will equal the marginal cost of production, a figure normally used by producers to compute the profit-maximizing production rate. Given a positively sloped supply curve, production will be lower under price controls than in the absence of price controls. This production loss equals B minus A on the supply function. However, the dynamic solution discussed in the next section may yield far different results.

Because of the exclusion of enhanced recovery techniques in the EPCA, the upper tier price controls are more likely to retard exploration and development of new oil properties than they are to deter investment in enhanced recovery. The new regulations regarding stripper well pricing may induce some suppliers with relatively low producing properties to retard production for a period of time in order to receive stripper well classification and therefore maximize profits in the long run. These types of exceptions in the current regulations tend to alter the simple static analysis presented *supra;* they are, however, relatively small when compared to overall production magnitudes.

The impact on oil demand is straightforward when using the static model illustrated in Figure One. Since consumers base their consumption decisions on the *average* oil price, their oil demand will be greater than the level implied by the *world* oil price. In this figure, demand increases by the amount B' minus A'. However, there is an additional impact on the demand curve caused by the crude oil price regulations, which alter the shape of the demand curve, making it relatively more inelastic above the average price than would be the case otherwise. This is due to the fact that if world oil prices increase by 1% for example, the average price to the consumer increases by somewhat less than 1%, because of the weighting of domestic and imported oil. Therefore, the demand curve becomes relatively more inelastic above the average price than the simple static model would suggest. To summarize in hard figures, the current EPCA price controls impose a wealth transfer from producers to consumers which Montgomery estimates will amount to approximately $2 billion by 1985.[37]

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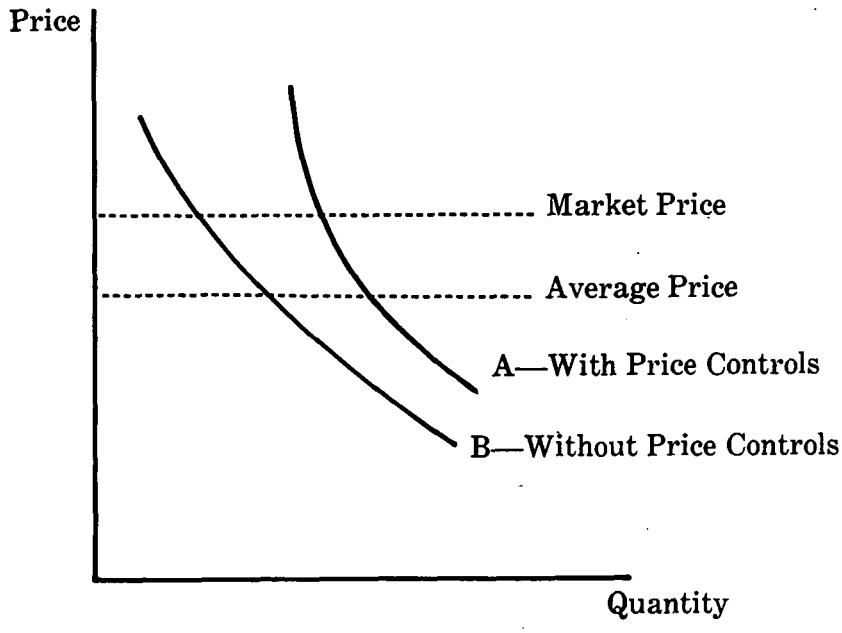
that controls have reduced total, average, and marginal crude oil costs, and therefore, product prices.

37. W. D. Montgomery, The Transition to Uncontrolled Crude Oil Prices (unpub-

Price controls also have a diversified effect on the international oil market. The effect on imports is the sum of the production supply effect and demand response of (B-A) + (B'-A') in Figure One, which translates into a direct additional demand for OPEC oil. This is further illustrated in Figure Two, where the demand for OPEC oil is shown with and without price controls (curves A and B, respectively). As already demonstrated, price controls tend to make the demand curve for oil more inelastic above the average price, as shown by curve A in Figure Two. This effect is also relevant when examining the supply curve for OPEC oil, where a 1% change in the world oil price will cause less than a 1% change in the average price facing customers. This effect would clearly impact the profit maximizing price that OPEC would set; however, the static model will not indicate in what direction OPEC would adjust its prices to maximize profits.

Figure 2

The Demand for OPEC Oil



lished paper presented at the National Bureau of Economic Research, Conference on Public Regulation, Washington, D.C., Dec. 11, 1977).

Another possible international consequence of price controls is that they might tend to create demand competition among the oil-consuming nations, causing more rapid depletion of the world's supply of crude. Since price controls in the United States tend to increase imports, OPEC must deplete its resources faster than it might otherwise, in order to meet this demand.[38] This action would effectively leave less oil available to other consuming countries in later years, which might create an incentive for them to impose their own price controls in competition with the United States in order to maintain their share of consumption. The result, other factors remaining constant, would be a more rapid depletion of reserves.

For any finite resource the timing of extraction is critical to the producer, since it represents one of the most important variables in the profit maximization calculation. Therefore, a dynamic analysis model must focus on the timing of extraction and on price expectations. To the present, there have been no theoretical analyses of the behavior of the petroleum industry under imposed price paths, particularly when these paths are highly uncertain. A few possible solutions to the dynamic problem can be suggested, but these should not be construed as definitive or exhaustive of the possibilities.

If the controlled price is held constant in real terms, assuming prices are known with certainty, initial production would be lower than could be expected absent controls. However, total production continues to increase over time, as depicted in Figure Three by the areas under triangles OAA' and OBB'. We assume that the areas under both production curves OAA' and OBB' are equal, implying identical total reserves under either production curve. However, it is highly likely that total reserves would be lower in the controlled price situation, since the level of recoverable reserves is also a direct function of price. Therefore, the most likely case is that curve OCC' would be the more accurate representation of production in the absence of price controls.

Montgomery has shown also that if controlled prices are

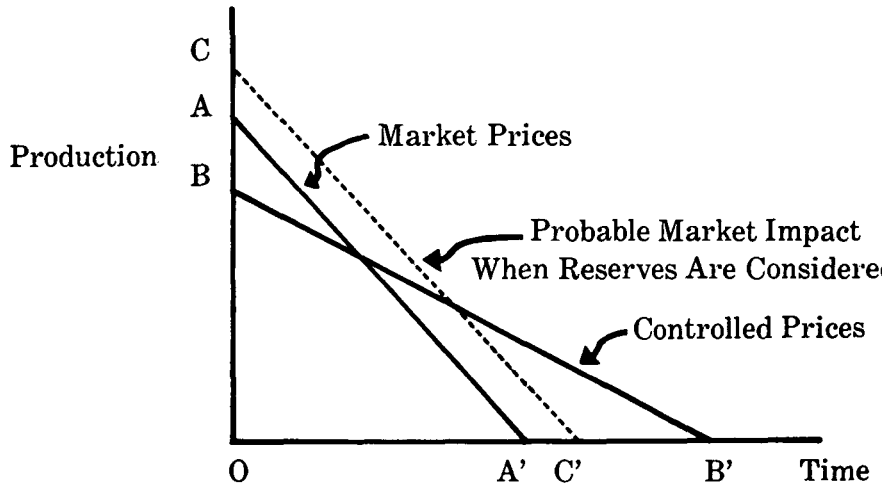
38. This assumes that OPEC has excess supply production capacity, which is presently the case. However, if this capacity disappears, the excess demand would serve to raise the world oil price for all consuming nations. At that point the U.S. effectively would be paying for its price controls through foreign exchange differentials and other macroeconomic occurrences.

increasing so that the difference between the world price and controlled prices is greater than the real rate of interest, resources will be depleted sooner than under the controlled situation, as shown in the second chart of Figure Three.[39] Again, it is reasonable to assume that the total level of reserves is a function of the level of the controlled price. Since the controlled price remains below the market price, the dotted line EE' would be the most likely solution if price controls were lifted. It is important to note that FF' could well lie below the market price solution in most years since this line is determined by the price/recoverable reserve relationship. Thus, the final solution to the dynamic problem is even more uncertain.

Figure 3[40]

A Dynamic Representation of Oil Production

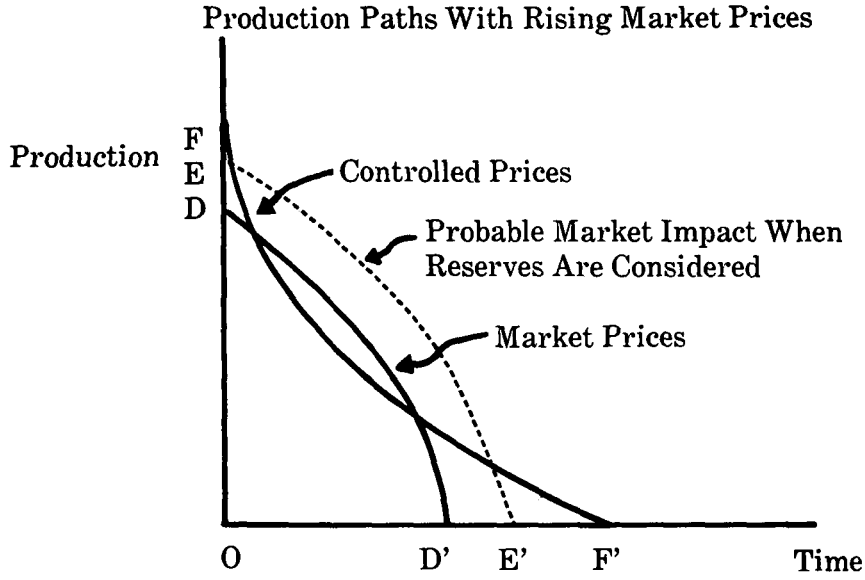
Production Paths When Market and Controlled Prices are Constant



39. Montgomery, note 37 *supra*.

40. Taken from *id.*, with the exception of the dotted lines depicting the impact of price on available reserves.

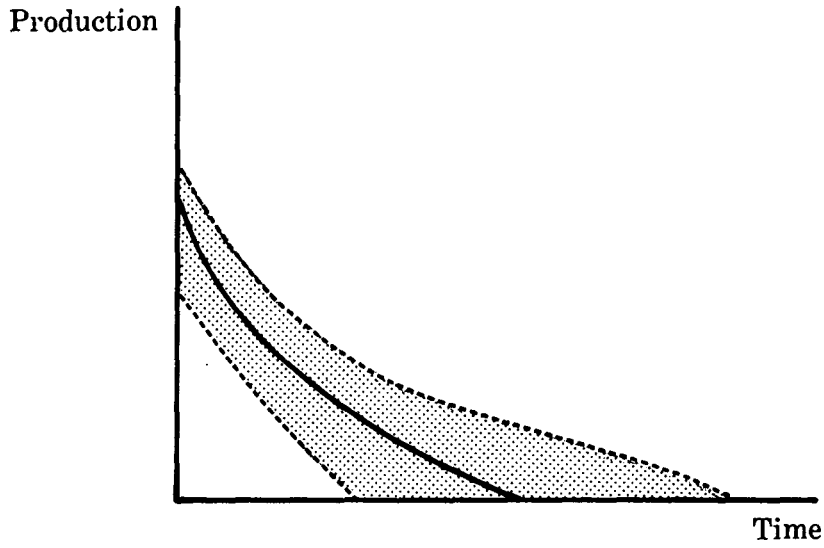
Figure 3, Cont'd



Since the life of a particular field usually runs between twenty and thirty years, price expectations are crucial in determining the extraction rate. In the previous analysis, it was assumed that these price paths were known with certainty. However, one of the major impacts of price controls, especially in recent years, has been to add uncertainty to the determination of the controlled price. The regulations outlined earlier have changed dramatically in just the last five years, and there is no reason for producers to expect any more certainty in the regulatory environment in the future. This instability is imposed on top of the uncertainty introduced by OPEC in their price-setting decisions. The combination of these factors could alter the analysis presented drastically. For example, if producers expected controls to be removed some time far in the future, and at the same time expect OPEC to raise prices rapidly, the profit-maximizing solution might be to withhold current production. While apparently this is not presently taking place, it is not difficult to conceive its occurrence in the future. Figure Four suggests how this uncertainty would alter any expected extraction path (a solid line) with a probability distribution (dotted lines) drawn about this line.

Figure 4

Production When the Controlled Price is Uncertain



The international implications of the dynamic analysis are somewhat similar to those of the static model presented above. The *demand* reaction to price controls in the dynamic and static solutions would be identical, however, the dynamic *production* decisions would tend to alter the position of OPEC. As long as slack OPEC production capacity exists, the dynamic solution would force the excess-capacity members of OPEC to alter their production in response to the extraction rates of the non-OPEC producers, in order to maintain the world oil price at the level they desire. If the spare OPEC production capacity disappeared, the dynamic production decisions of the non-OPEC producers would directly affect the world oil price and, therefore, add an additional variable in the profit-maximizing decisions of both the non-OPEC producers and of OPEC itself. Thus, controls can be seen not only to influence domestic decisions, but to impose significant costs on international markets.