

SPECIAL ISSUE

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Editors' Introduction

by Edward W. Erickson (North Carolina State University) and Helmut Frank (Department of Economics, University of Arizona, AZ, USA)

This volume begins with "Energy Taxes and Optimal Tax Theory" by Michael J. Boskin and Marc S. Robinson. It concludes with "Tax Issues in Petroleum Industry Reorganization" by E. Allen Jacobs and Stephen T. Limberg. These are two solid bookends between which twenty-two other excellent papers are gathered. The papers are about evenly split between those that focus on U.S. energy taxation and those that focus on energy tax issues in other countries or that address general questions of energy taxation. Section I examines the critical aspects of national tax policies for the United States (Boskin and Robinson; Sweeney and Boskin); Canada (Watkins and Scarfe); Australia (Bradley); the Federal Republic of Germany (Luhmann); developing countries that hope to become oil-exporting countries (Blitzer, Cavoulacos, Lessard, and Paddock); and oil-importing countries in general (Mork). Throughout this volume the principal focus is unabashedly on oil, although certain of the papers - and all of the principles of standard economic analysis - extend to natural gas, coal, and other fuels as well. Boskin and Robinson use the framework of optimal tax theory, together with accumulated evidence on empirically estimable parameters, to show that the simplistic case for heavy taxation of energy is clearly overstated. Watkins and Scarfe review Canadian oil and gas taxation and the interrelationships between the federal and provincial roles. For those who believe the hallmark of solid economic analysis is the ability to predict, special attention is called to the section entitled New Policy Directions in the Watkins and Scarfe article. Bradley examines the analytical and practical dimensions of the current Australian consideration of a resource rent tax. His careful, concise, and evenhanded analysis sets the tone for an important theme of this volume: because rents are so hard to identify, efficient energy taxation is easier in theory than in practice. Luhmann reviews the history of taxation in Europe to place current energy tax structures in a social and economic context. He concludes that an elastic response to higher taxes on energy use or on pollution of the environment is a special kind of inefficiency because it takes the form of reduced energy use or reduced pollution. Blitzer, Cavoulacos, Lessard, and Paddock argue that the concentration of oil and gas exploration in developed non-OPEC countries is due in part to the fiscal, financial impediments in developing non-OPEC countries. They conclude that recognition of this in the contracting process may allow for more efficient location of risks and increases in exploration and development activity in oil importing LDCs.

Pages 1-15

Energy Taxes and Optimal Tax Theory

by Michael J. Boskin (Stanford University and National Bureau of Economic Research, Inc., Stanford, Calif.) and Marc S. Robinson (Department of Economics, University of California, Los Angeles, Calif.)

Energy taxes provide substantial revenue to virtually every advanced economy. These taxes take many forms, from excise taxes on the use of energy (such as gasoline taxes) to specific taxes on the energy sector (such as crude oil windfall profits tax in the United States). Energy is an important end-use commodity as well as an important factor of production in many industries. Finding, producing, distributing, and using it involves a complicated set of market interactions, various levels of government regulations, and potentially important balance-of-payment issues. Government intervention in the energy sector is not limited to specific energy taxes. Direct controls and other forms of restrictions have been applied to energy sources and uses. Many economists have argued that the energy sector should be taxed more or less heavily than other sectors and products for various reasons, including differential riskiness in exploration, international security, and distributional equity. Today the budgetary situation in the United States and other advanced economies suggests that these governments may seek additional revenues. Recent tax history implies that energy may well be singled out as a likely candidate. For example, Congress has considered proposals for a broad-based energy tariff, a tariff on imported oil, and a Btu-equivalent tax. The crude oil windfall profits tax and the recent incremental tax on gasoline (with revenues earmarked for road, bridge, and other related construction projects) suggest that the issue of how to reduce the deficit by increasing revenue may well focus attention on possible new energy tax sources.

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Canadian Oil and Gas Taxation

by Campbell Watkins (Datametrics Limited, 1414 8th St., S.W., Calgary, Alberta, Canada) and Brian Scarfe (Department of Economics, University of Alberta, Calgary, Alberta, Canada)

"The power to tax involves the power to destroy." -John Marshall

The taxation of Canadian oil and gas production has occasioned significant conflict between the federal government and the provinces, which own most of the petroleum resources. During the upheaval of the world oil market in the 1970s, such conflict became overt, with claims and counterclaims on perceived economic rents. In contrast, the 1950s and 1960s had been relatively quiet, with quite straightforward taxation regimes requiring only a little federal-provincial policy coordination. Federal policies were then preoccupied

with encouraging market growth, with scant attention to pricing and revenue shares, the issues that have dominated federal and provincial energy policy in the 1970s and 1980s. We begin by outlining the tax and royalty systems imposed by the federal government and by the government of Alberta, which accounts for some 85 percent of Canadian oil and gas output. We use the term *system* here in a broad sense to include all revenue-collecting devices and direct subsidies. Then we analyze the nature, problems, and efficiency of these regimes, especially as devices to collect economic rent. A final section speculates about the future evolution of Canadian oil and gas taxation.

Pages 37-48

The Resource Rent Tax in Australia

By Paul G. Bradley (Director, Mineral Revenues Inquiry, 170 St. Georges Terrace, Perth, Western Australia)

Producers of petroleum or minerals are usually subject to levies based on the value of output. These may be royalties paid to private holders of a resource or severance taxes paid to a government (for example, see Lohrenz and Pederson, 1985, this volume). Economists have long criticized these so-called gross royalties because they discourage recovery of resources that are at the margin of profitability. Instead, economists frequently recommend a levy based directly on resource rent, defined as the difference between the receipts from sale of a mineral and the cost of extraction. The preference for resource rent as a tax base has been traced back to Adam Smith, but it was spelled out in more detail by Gray (1914). Recently the desirability of taxing resource rent has been incorporated in optimal tax theory (see Boskin and Robinson, 1985). Why have resource rent taxes not been more widely implemented? Have economists been poor salesmen, unable to communicate with policymakers? Or are real-world decisions based primarily on criteria other than economic efficiency? In the latter case, the rent-based tax systems proposed so far may have been rejected because their efficiency gains are outweighed by other disadvantages. Proponents of a resource rent tax (RRT) have been particularly vociferous in Australia in recent years. This approach to taxation of mineral revenues became a plank in the Australian Labor Party platform in 1977, and when that party took federal office in March, 1983, it sought to implement some form of RRT. The first step has already been taken. Since July 1, 1984, new ("greenfield") offshore petroleum projects lying beyond the territorial sea (thus under federal control) have been subject to a Commonwealth resource rent tax (CRRT).

Pages 49-58

The Coming Age of Energy Taxes and Environmental Levies

by Hans-Jochen Luhmann (Fichtner Consulting Engineers, Stuttgart, Federal Republic of Germany)

For tax policy, energy and the environment simply represent special tax bases. In the longer term a switch to energy and environmental tax bases raises the question of whether such taxes will be capable of general or large-scale implementation. This involves three major objections - namely, unfairness, inefficiency; and the risk of distortion or disadvantage in international competition. History is reckoned in centuries. Natural interruptions that form the starting points of historical periods are generally called revolutions. As elements in the flux of time, tax systems also are linked to these revolutions, and our modern tax systems, which are mostly income-based, thus stem from the French Revolution. Political eras are associated with their own specific tax bases. Both before and after the French Revolution feudal systems in Europe were based on indirect taxes and forms of producer taxation. Europe's history shows that aristocratic governments used taxation and democratic governments used direct taxation. The French Revolution revealed the hatred felt by large sections of the population toward the consumption tax system of the Ancien Regime. Prussia, the United Kingdom, and the United States later introduced personal tax systems. The mutual influence of these tax systems is obvious. The actual introduction of personal tax systems is associated with electoral law reforms. This development is still very obvious in England, where taxation according to the ability to pay has been historically in keeping with the interests of the masses.

Pages 59-72

An Analysis of Fiscal and Financial Impediments to Oil and Gas Exploration in Developing Countries

by Charles R. Blitzer (Senior Research Associate, The Energy Laboratory, Massachusetts Institute of Technology, Cambridge, Mass.), Panos E. Cavoulacos, (Associate, McKinsey & Company, Washington, D.C.) Donald R. Lessard (Professor of International Management, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Mass.) and James L. Paddock (Professor of International Finance, Fletcher School of Law and Diplomacy, Tufts University, Medford, Mass. and Senior Consultant, Arthur D. Little, Inc., Cambridge)

In appraising and comparing worldwide exploration investment opportunities, private companies always ask the same question - namely, given present knowledge about geology, operating environment, and risks associated with various projects, are the expected earnings commensurate with the risks? In evaluating a project, the investor first considers what he or she knows or suspects about the underlying geology. The next step is to evaluate the profitability of the project under the terms offered. This is an averaging process that takes into account the ex ante probabilities of discoveries of varying sizes (including dry holes) as well as the uncertainty about future oil prices. In addition, some correction factors are added to account for the possibility that a part of the promised profits will not be received. This sometimes occurs because of a given country's overall political stability. But adverse changes in the rules of the game more often come about when a company is perceived as earning windfall profits. For example, very high ex post rates can occur if the size of a discovery is greater than what was expected or if oil prices increase

significantly. While such fiscal instability factors are relevant for any investments, they are likely to be especially important in assessing an investment in an oil-importing, less-developed country (LDC).

Pages 73-87

Taxation as a Protection Against the Effects of Price Fluctuations: The Case of Oil

by Knut Anton Mork (Professor, Owen Graduate School of Management, Vanderbilt University, Nashville, Tenn.)

A country that uses no oil would be well protected against the adverse effects of oil supply disruptions. While complete independence would be excessively costly, smaller steps in this direction might be worth the cost. Many conservation measures have been justified along these lines, and the idea has been supported in the literature (e.g., the contributions of Plummer, 1982, and Deese and Nye, 1981). This paper analyzes the effects of tax instruments in the oil market (a consumption tax, an import tariff, a production subsidy) on economic stability. The analysis is related to two branches of the literature. First, it draws upon and extends the already large body of literature on oil import policies (Tolley and Wilman, 1977; Nordhaus, 1980; Bohi and Montgomery, 1982; Hogan, 1981; Verleger, 1982; and Chao and Peck, 1982). In contrast to the previous literature, this paper concentrates on the issue of economic stability. The general literature on commodity price fluctuations is equally relevant (McKinnon, 1967; Massell, 1969; Gilbert, 1978; Newbery and Stiglitz, 1981; Salant, 1983; and Mork, forthcoming). This analysis, while written in the context of oil, has many other potential applications, such as extending the price fluctuations literature by focusing on the macroeconomic effects. On the other hand, its scope is somewhat limited since it focuses on countries whose oil-producing sector is either absent or small compared to the economy as a whole. The case for a tax on oil as a protection against the effects of price fluctuations is not obvious. Newbery and Stiglitz point to the implication of the fundamental welfare theorem (Debreu, 1959), which states that no inefficiency is produced by uncertainty or fluctuations per se as long as all the relevant competitive markets exist and clear without externalities. This paper focuses on one particular reason why these conditions may fail in the case of oil, namely, the presence of macroeconomic adjustment problems. These effects have been estimated empirically by Hamilton (1983) and Darby (1982).

Pages 89-108

Analyzing Impacts of Potential Tax Policy Changes on U.S. Oil Security

by James L. Sweeney and Michael J. Boskin (Center for Economic Policy Research, Stanford University, Stanford, Calif.)

Most tax reform proposals now being discussed in the United States include provisions that could reduce petroleum production. For example, both the original Treasury

Department proposal and the Bradley-Gephardt FAIR proposal would repeal percentage depletion and expensing of intangible drilling costs as well as eliminate the investment tax credit and slow depreciation for equipment. The Kemp-Kasten FAST proposal and President Reagan's proposal retain expensing of intangible drilling costs, but the former retains, and the latter modifies, percentage depletion. Through examination of one specific proposal - the original proposal of the U.S. Treasury Department - this paper illustrates the general oil security and economic consequences of such changes in taxation and shows how one might analyze particular proposals. Impacts are estimated by first ignoring the possibility of oil supply interruptions. Impacts on world oil price, oil imports, and oil import costs are examined both qualitatively and quantitatively. In addition, impacts of oil supply interruptions are examined both with and without the taxation changes. The analysis allows evaluation of the degree to which the proposed tax changes would exacerbate adverse impacts on GNP, inflation, unemployment, and other key variables.

Pages 109-123

The Effects of Petroleum Taxation in the United Kingdom, Norway, Denmark, and the Netherlands: A Comparative Study

by Alexander G. Kemp and David Rose (Department of Political Economy, University of Aberdeen, Scotland)

In all four North Sea petroleum-producing countries, highly complex systems of taxation have been introduced to ensure that governments obtain a high share of the economic rents anticipated from exploitation of the natural resource. Governments have tried to choose fiscal measures that will not inhibit exploration and development work. The effects of the fiscal regimes have been the subject of much controversy, especially in the United Kingdom and Norway, where oil companies have frequently argued that incentives to develop fields were being impaired. The issue is complex, for several reasons. The costs of developing fields have been rising in recent years as exploitation of new fields increasingly takes place in much deeper waters than earlier. In the U.K. and Norwegian sectors in particular, development costs of "old" and "new" fields now extend over a wide range. Oil prices in dollar terms have fallen recently, and expectations regarding future oil prices have changed significantly. Great care is required in comparing the effects of different fiscal systems, especially their effects on investment. Their relative impacts should be considered in the context of the likely size of fields and development costs in the countries in question. The level of taxation obviously influences an investor's expected returns, but the structure of a fiscal system also has an important bearing on his attitudes. Fiscal systems vary in how they distribute investment risks between government and investor. When taxation is based on profits rather than production, government shares in these risks to a greater extent. Production-based levies can also cause fields to be prematurely abandoned. In this paper, the comparative effects of the fiscal regimes applied to petroleum exploitation in the United Kingdom, Norway, Denmark, and the Netherlands are examined to assess (1) their success in capturing economic rents for the respective

governments and (2) their likely distorting effects, particularly regarding investment incentives.

Pages 125-143

Exploration Risks and Mineral Taxation: How Fiscal Regimes Affect Exploration Incentives

by T. R. Stauffer (Center for Contemporary Arab Studies, Georgetown University, Washington, D.C.) and John C. Gault (IEDConsultants S.A., International Energy Development Corporation IEDC S.A., Geneva, Switzerland)

This paper investigates the effects of taxation on exploration risk and establishes certain criteria for an optimal tax on mineral resources, such as oil and gas, where exploration risk (i.e., geological risk) is a key decision variable. The optimization is considered in the context of government ownership of the resource rights, but with an eye to the after-tax incentives perceived by private-sector explorationists. Any government that relies on the private sector for discovery and development must recognize those effects. Taxation affects not only the expected returns from mineral exploration ventures but also the riskiness of such ventures. The potential for misdesign is great. We shall show, however, that it is possible, in realistic cases, simultaneously to increase government revenues, improve the explorationist's return, and reduce exploration risk. The opportunity for such improvements arises because most common mineral tax schemes skew the tax burdens across fields of different sizes or qualities. A key consideration in optimizing a tax regime in designing the tax to assign the appropriate burdens to different classes of discoveries. Fiscal systems are often designed, and agreements between host governments and private petroleum exploration companies negotiated, under a presumption that taxation is a zero-sum game in which the return to the government cannot be increased without reducing the incentive to the private firms. We will show that this need not always be true. Fiscal systems often prevent the development of certain discoveries. By overtaxing smaller (but potentially commercial) fields, a fiscal system can prevent both the government and the private firm from sharing in the income that would be generated by the development and production of the resource.

Pages 137-153

Scheduling and Taxation of Resource Deposits

by Siur D. Flam (Chr. Michelsen Institute, N-5036 Fantoft, Norway) and Trond E. Olsen (Department of Economics, University of Bergen, N-5014 Bergen, Norway)

This paper is concerned with taxation on resource extraction from a finite collection of deposits of uncertain size. The tax system may distort the optimal order of extraction and result in a great loss to society. Specifically, the way the Norwegian tax regime treats

foreign firms may discriminate against certain prospects. We assume that for some reason or another extraction is always concentrated on one deposit at a time. For example, several deposits might share a common facility so that only one deposit could be onstream at any instant. Alternatively, capacity constraints or institutional restrictions might make it impossible to work on several deposits simultaneously. Moreover, at every deposit some fixed costs must be incurred up front. Given these assumptions, we ask, in what order should the deposits be depleted? Clearly, if no initial investments were needed, effort should always be allocated to the deposit having the maximum current flow of profits. In particular, if unit extraction costs were constant within each deposit and the quality of the resource did not vary between deposits, then one should always extract from the deposit having the lowest marginal cost. However, if necessary expenses must be incurred before a deposit comes on stream, then the relevant rule must be expressed in terms that account for these expenses. After a formal presentation of the problem, we provide a simple decision rule indicating where to allocate effort under given circumstances. The optimal strategy turns out to be of an index type. That is, each deposit is indexed by a certain number (a reservation price) depending on its current state, and at any time the deposit having the highest index should be worked on first. Then we examine the comparative statics of how the optimal schedule will change as a result of modifications in the problem data.

Pages 145-153

Effective Federal Tax Rates on Income from New Investments in Oil and Gas Extraction

by Jane G. Gravelle (Congressional Research Services, Library of Congress, Washington, D.C.)

Considerable controversy has surrounded the tax benefits accruing to oil and gas extraction, particularly percentage depletion allowances, but also including the immediate write-off of intangible drilling costs and abandonment losses. These preferential tax provisions have been criticized as inducing inefficiency in the economy and supported for preserving a viable domestic oil industry (for national defense reasons) in the face of competition from cheaper imported oil. The tax incentives for oil and gas have been gradually reduced. The Tax Reform Act of 1969 cut the rate of percentage depletion and included it in the minimum tax base. After the 1974 oil price increases, the percentage depletion allowance was eliminated altogether for integrated firms and retained to only a limited extent for independent producers. In 1980, Congress imposed a windfall profits tax, which is ultimately to be phased out. It is still permissible to expense intangible drilling costs and abandonment losses, however. More recently these advantages were somewhat scaled back; producers must now write off part of their intangible drilling costs over a three-year period and include them in the minimum tax base. While the tax rate on oil and gas extraction was gradually rising, tax burdens on other fixed investments (particularly equipment) were falling. These tax burdens have followed an uneven, though generally

downward, trend in the postwar period, falling as a result of investment credits and accelerated depreciation, but rising from the effects of inflation.

Pages 155-170

Capital Tax Distortions in the Petroleum Industry

by Robert Crum Fry, Jr. (Economist, Conoco Incorporated, 1007 Market Street, Wilmington, Delaware)

Previous studies of the taxation of the petroleum industry, and extractive industries in general, have generally taken one of two distinct approaches to the issue. One approach has concentrated on the qualitative effect of various taxes on the extraction path and the characteristics of taxes that do not distort the extraction path. In particular, work such as that done by Dasgupta and Heal (1979) has shown that severance taxes and royalty payments reduce initial extraction rates and postpone the depletion of reserves. A constant-rate profits tax-such as a corporate income tax that allows sufficient deductions to make the (marginal) effective tax rate on capital equal to zero-which is borne solely by pure profits and economic rents causes no distortion in the extraction path. While the total avoidance of distortions seems appealing, it is only optimal when other industries are not subject to distortionary taxation. When other industries are subject to distortionary taxes, it will generally be optimal to impose distortionary taxes on the oil industry. The second body of work in the petroleum taxation literature recognizes this and seeks to compare the taxation of the petroleum industry with the taxation of other industries. In particular, effective average (Harberger, 1966; Agria, 1969) and marginal (Gravelle, 1982, 1983; Fry, 1984) tax rates on capital have been calculated for many industries, including the petroleum industry. Differences in tax rates across industries are then taken as evidence that some industries receive preferential treatment while others are treated more harshly, with the implication that capital is being misallocated among industries.

Pages 171-187

Efficiency Versus Equity in Petroleum Taxation

by Dale W. Jorgenson (Harvard University, Cambridge, Mass.) and Daniel T. Slesnick (University of Texas, Austin, Tex.)

This paper presents a new approach to the economic analysis of energy policy. Our objective is to provide an ordering of alternative energy policies, in which the most desirable energy policy is the one yielding the highest level of social welfare. This principle can be used to evaluate a specific policy change or select the best policy from a set of alternatives. Our measure of social welfare is defined on the distribution of individual welfare. Individual welfare is specified in terms of households as consuming units. We introduce a money metric for social welfare based on total expenditure. Using this metric, energy policies can be compared in terms of the amount of money required to attain the

level of welfare associated with each policy. Our money measure of social welfare consists of money measures of efficiency and equity. To illustrate the measurement of social welfare, we compare alternative policies for taxation of petroleum production in the United States. These policies have been analyzed by the Office of Policy, Planning, and Analysis of the U.S. Department of Energy (DOE). Our reference case for policy analysis is the policy of petroleum price decontrol instituted in January 1981. Under this policy, price controls have been eliminated on all petroleum products, but petroleum production is taxed under the provisions of the windfall profits tax.

Pages 189-202

The Double Inefficiency of the Windfall Profits Tax on Crude Oil

by Jerry Blankenship (Diamond Shamrock International Petroleum Company) and David L. Weimer (Associate Professor, University of Rochester, Rochester, New York)

It is widely recognized that the imposition of severance taxes can alter the intertemporal extraction decisions of profit-maximizing owners of exhaustible resources. At least in cases where current extraction costs are only a function of current extraction rates, severance taxes levied at a constant real per-unit rate shift some extraction from present to future periods (Dasgupta and Heal, 1979, Chapter 12; Webb and Ricketts, 1980, Chapter 6). This finding assumes that the severance tax is imposed in perpetuity, in which case its permanent removal will shift production back toward the present. An announcement that the tax will definitely be removed at some future date, however, may have a different effect on extraction. Resource owners might find it profitable to select extraction rates in the periods before actual removal of the tax below those they would have selected had they believed that the tax would be permanent. Thus, severance taxes with a built-in termination date (like the Crude Oil Windfall Profits Tax) may have a doubly depressing effect on the current rates of extraction. Our analysis is also relevant to temporary price controls of the type employed in the U.S. during the 1970s. See, for example, Lee (1978) and Smith and Phelps (1978). The Crude Oil Windfall Profits Tax (WPT) of 1980 was in large part a concession to those in Congress who opposed the phase-out (begun by President Carter in 1979) of wellhead price controls on domestic crude oil. The WPT is really an ad valorem severance tax applied to the difference between wellhead price and a specified base price that roughly reflects the 1979 ceiling.

Pages 203-224

Interregional Energy Tax Exportation: An Interpretative Survey

by William E. Morgan and John H. Mutti (Department of Economics, University of Wyoming, Laramie, Wyoming, USA).

This paper examines the economics literature concerning interregional exportation of taxes levied on nonrenewable energy resources. Production (severance) taxes receive particular

emphasis because much of the recent literature has assessed the ability of energy-producing states to export these taxes to residents of other states, or to capture a larger share of the economic rents associated with rising energy prices during the 1970s. Interstate exportation of energy taxes, real or alleged, has become a national legal and political issue. The contention that such taxes result in interstate discrimination and restraint of trade has led to a number of court cases. During the past several years, bills have been presented in the U.S. Congress to limit combined state-local coal production taxes to 12.5 percent of value, a measure that would affect the two major western coal-producing states. The perception of energy tax exportation has certainly helped motivate proposals for federal legislation to limit state taxing authority and to alter federal benefit formulas for programs such as revenue sharing so that state and local taxes that are primarily exported would not be counted in determining degrees of local tax effort. Interregional tax exportation and importation can involve a variety of important economic efficiency and equity effects. These effects are not limited to mineral severance taxes, but may also be associated with broad-based taxes levied on property, income, consumption, sales, or value added. Efficiency effects include overprovision of public goods in the taxing jurisdiction or excessive immigration to that jurisdiction, lower levels of public good provision or higher tax rates at the federal level, and distortion of private goods' prices and the associated reduction in national income due to the misallocation of resources. On equity grounds, the major concern is the much larger scale transfer of income among various income classes and geographic regions.

Pages 225-239

Severance Taxes and the Government's Share of Value from Oil and Gas Production

by John Lohrenz (Gulf Oil Exploration and Production Company, P.O. Box 2100, Houston, Tex.) and John A. Pederson (Pennacle Enterprises, Inc., Cipy Center IV, 801 California St., Suite 4100, Denver, Colo)

Severance taxes on oil and gas production "could be promoted easily as a tax that would fall on oil producers, who enjoy a lucrative business from natural resources. Faded with a general tax increase or a tax on oilmen, it is easy to figure out which one the public would support" (Hampton, 1982). But oil and gas taxes are not as simple as this proposition implies. Three parties are generally involved in oil and gas taxation: (1) an investor among competing investors in oil and gas properties; (2) the landholders of the properties in question; and (3) several levels of government. This analysis considers just two parties, the investor and the government, and "government" is assumed to include both landholders and all levels of government. Neither party is presumed to be altruistic. Each party covets as much value as possible from oil and gas production accruing to its inventory. Both parties are presumed to be risk neutral, measuring values as the appropriately discounted present values of revenues flowing to and from their accounts. We assume that investors will not invest in a venture if they expect that their values will diminish. The severance taxes a government collects during oil and gas production interact with searching for, developing,

and producing the sources. The taxes cause slower production rates and render some sources uneconomic that would otherwise be developed and produced. Most insidiously, those taxes can destroy the value of searching for oil and gas in entire petroliferous areas. Severance taxes thus cannot be viewed as just a weapon in the government's arsenal to negotiate a bigger share of values from oil and gas production.

Pages 241-254

Levies on U.S. Coal Production

by Richard L. Gordon (College of Earth and Mineral Sciences, The Pennsylvania State University, University Park, Pa.)

Transfer of economic rents to government has been a major concern in coal policy in the United States and other countries. There is a well established tradition-widely accepted by economists writing on public finance - that these rents are an attractive and appropriate revenue source. This paper describes and critically analyzes the programs undertaken to effect rent transfer in the coal industry in the United States. My close involvement in U.S. coal-leasing policy debates has convinced me that the long-standing belief in rent taxation is invalid. The traditional case for rent collection employs unrealistic assumptions about the costs of identifying and taxing economic rents. Under actual conditions, rent taxes cannot be administered in a fashion that produces the benefits claimed in standard arguments for rent taxation. After an overview of the case against rent taxation-fuller discussions are available elsewhere - I examine the two main U.S. transfer systems: federal coal leasing sales and state taxes. Other charges are also noted. This article was greatly influenced by my experience in 1983-1984 as a member of the Commission on Fair Market Value Policy for Federal Coal Leasing: the discussions it inspired, particularly with Steve Hanke of Johns Hopkins and Robert Nelson of the Department of the Interior; and work stimulated by the request to address a meeting on the general question of charges for access to federal land. The work of the Commission deliberately concentrated on better implementation of existing laws. This article returns to my prior concern with the wisdom of those laws. Visits to the Australian coal industry were made possible in part by financial assistance from the Penn State Australian Studies Center. These visits were facilitated by an invitation to speak at a coal seminar at Macquarie University.

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The Incidence of Severance Taxes in a Residual Demand Framework

by Albert L. Danielsen and Phillip A. Cartwright (Department of Economics, University of Georgia, Athens, Georgia)

Although severance taxes are directly imposed on producers, the burden of the tax may be passed on to other parties. The incidence of a severance tax depends on the market structure, externalities associated with resource exploitation, the level of taxation, and how

the taxes are imposed. This study focuses on tax incidence and the structure of the U.S. and world oil markets, which we analyze using a residual-demand model. More specifically, we assess the incidence of any increment in severance taxes on owners of oil reserves, given the present structure of oil markets. Within the residual demand framework, the incidence of a severance tax is significantly different from that of a traditional supply and demand mechanism. The world oil market consists of suppliers and demanders of oil. On the supply side the principal actors are members of the Organization of the Petroleum Exporting Countries (OPEC). These countries are striving, individually and in concert, to maximize the net present value of their resources. They are not constrained by antitrust statutes like those of the United States. In an oil market dominated by OPEC, other firms and countries are very appropriately regarded as the "competitive fringe" of oil producers.

Pages 265-278

Sensitivity of Rates of Return and Output to Alternative Tax Scenarios: The Case of the U.S. Gulf of Mexico OCS

by Walter J. Mead (Department of Economics, University of California at Santa Barbara, Santa Barbara, Calif.) and Dennis D. Muraoka (Department of Economics, California State University, Long Beach, Calif.)

Income derived from crude oil and natural gas production has generally received differential tax treatment relative to that of other industries, thus violating the economic concept of tax neutrality. From the inception of the corporate income tax in 1913 and for over a half century thereafter, this tax treatment was distinctly preferential. In particular, the percentage depletion allowance and various expensing options available to the industry provided tax advantages relative to other industries. Since 1969, integrated oil and gas producers have seen the reduction and eventual elimination of the percentage depletion allowance, some tightening of the expensing of intangible drilling costs, and the imposition of the Windfall Profits Tax of 1980. We will first review the pre-1969 preferential tax treatment and the post-1969 nonpreferential tax treatment received by oil and gas producers large enough to operate in the Outer Continental Shelf (OCS). This will be followed by an empirical analysis of the collective impact on the rate of return on lease investment from taxes in general and several of the tax provisions individually. This empirical analysis will be accompanied by qualitative theoretical statements indicating the effect on oil and gas production associated with each tax measure. The federal OCS oil and gas leases issues between 1954 and 1969 form the basis for the empirical analysis.

Pages 279-289

Effects of Taxes and Price Regulation on Offshore Gas

by Henry D. Jacoby (Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Massachusetts) and James L. Smith (Department of Economics, University of Houston, Houston, Texas)

The Gulf of Mexico provides a laboratory for analysis of the effects of taxes and price regulation on U.S. production of natural gas. This offshore region has been a major supplier of natural gas in the past, and it is expected to contribute approximately 26 percent of total offshore gas supplies and 7 percent of total U.S. gas supplies in the future (U.S. Geological Survey, 1981). While other U.S. gas provinces differ from the Gulf in geological and other circumstances, tax and price policies can be expected to have roughly the same effects in all regions. Moreover, with suitable data the type of analysis presented here can easily be extended to other producing areas. Our objective therefore is twofold: (1) to develop quantitative measures of policy impacts on new gas supplies from the Gulf of Mexico, and (2) to demonstrate an analytic method that can be usefully applied on a broader scale. In assessing the effects of alternative tax and regulatory schemes, we are primarily concerned in this paper with efficiency questions. Efficiency effects include influences on minimum economic field size (the extensive margin), extraction rates (the intensive margin), and the timing of development activities.

Pages 291-307

Separate Accounting Versus Formulary Apportionment: What Can Positive Economics Say?

by Robert F. Conrad (Associate Professor, Department of Economics, Emory University, Atlanta, Georgia)

Conrad Enterprises, a large multinational oil corporation, engages in exploration and production in North Carolina and Virginia and carries out refining and marketing activities in over twenty states, including Delaware and Rhode Island. Where should the income from this corporation be attributed? For an economist the answer is simple: the risk-adjusted return to capital goes to the stockholders, while the rents, if any, can be attributed anywhere. Basic macroeconomic models do not attribute income to places, but to people. Can an economist make a meaningful response when asked "where," instead of "to whom" to attribute income? This is the issue addressed in this paper. In particular, I would like to explore the issue of the unitary business as it relates to separate accounting on a geographical basis versus some type of formula to attribute income of multistate firms. With respect to neutral state taxation systems (including equal nominal tax rates), economists can make no recommendations. In this world, income could equally well be divided by any method (formulary apportionment, separate accounting, per capita income, population, and even by the number of states in which a firm operates) because the method of attribution reduces to a revenue-sharing formula with no efficiency effects. However, positive economic analysis does have a contribution to make with respect to the issues involved in the unitary controversy. The major conclusions are: (1) apportionment by a uniformly applied formula may not decrease (and might increase) the level of double

taxation and discrimination, depending on the definitions; (2) "separate accounting rules" based on economic principles can be developed for a so-called unitary business (at least in theory and, if not too costly, in practice) even in the presence of transfer pricing, economies of scale, and economies of scope; and (3) enforced uniformity of the method of attribution (either separate accounting of formulary apportionment) might not increase the level of economic efficiency. These conclusions raise doubt that the unitary concept has either economic meaning or policy content.

Pages 309-324

A Natural Resource Theory of Unitary Taxation

by James L. Johnston (Senior Economist, Amoco Corporation, 200 E. Randolph Dr., Chicago, 111) and Alan Reynolds (Vice President and Chief Economist, Polyconomics, Inc., 86 Maple Ave., Morristown, N.J.)

Corporate income taxation by states normally commands little public attention. Recently, however, much controversy has been aroused by the spread of the unitary form of state corporate income taxation, in which the tax base is a share of the profits of all the firm's activities. The new controversy first was expressed in a series of legal challenges to a state's right to tax activities beyond its borders, followed by President Reagan's establishment of a working group intended to bring all parties together to fashion a solution (Hellerstein, 1982). On July 31, 1984, however, the working group's chairman, Treasury Secretary Donald Regan, reported that "state and business representatives were unable to reach agreement" on several important aspects. As chairman, Regan recommended that the states voluntarily alter their worldwide unitary taxation regimes into one of five other versions that would eliminate from the tax base, in varying degrees, the amount of income earned abroad. These options were intended to maintain the "competitive balance for U.S. multinationals, foreign multinationals, and purely domestic businesses." In exchange, the U.S. Treasury would assist the states in promoting "full taxpayer disclosure and accountability," and not "propose federal legislation" to force adherence by the states (Regan, 1984). Perhaps the most decisive development in recent months was the announcement by several Japanese companies that they would build plants only if states would disavow worldwide unitary taxation. Largely because of their Japanese efforts, Indiana and Oregon are now altering their systems of worldwide unitary taxation, Florida has abandoned its system after just one year, and California and Massachusetts are giving the subject serious consideration.

Pages 325-330

Oil Companies as Tax Collectors

by M. A. Adelman (Department of Economics and Energy Laboratory, Massachusetts Institute of Technology, Cambridge, Mass.)

In 1972, I published a paper subtitled "Oil Companies as Tax Collectors." Fifteen years earlier, the oil companies could not accurately have been described as tax collectors. Nor could they today. But in between lies an interesting chapter of history. The companies holding oil concessions in Latin America, Southeast Asia, and the Persian Gulf originally paid a royalty per barrel. The amounts were small, and had no effect on price. Within a few years after World War 11, the host governments had asserted and maintained a claim to a share of the profits. Venezuela was first to move from royalty to income tax, soon followed by most of the others. The original formula was 50-50 - government and company each taking an equal share. A reinterpretation of U.S. tax law made U.S. companies willing to accept this change in the ground rules. The Treasury ruled that taxes paid to the host government were to be credited, dollar for dollar, against U.S. income taxes. In later years, this ruling - like percentage depletion - aroused much popular disapproval. Allegedly, the companies' cunning lawyers and lobbyists had put one over on the guileless bureaucrats and Congress.

Pages 331-351

Tax Issues in Petroleum Industry Reorganization

by E. Allen Jacobs (Assistant Professor of Finance, University of Texas at Austin, Graduate School of Business, Austin, Texas) and Stephen T. Limberg (Assistant Professor of Accounting, University of Texas at Austin, Graduate School of Business, Austin, Texas)

Previous reorganizations in the oil industry have been merger waves driven by market power, tax, efficiency, and managerial motives. Current reorganizations have both efficiency and tax consequences. This article develops a model of the tax consequences of reorganizations through an explicit capital market model of valuation and tax effects. This is applied in detail to the royalty trust mode of reorganization. It shows how the value of reorganization is affected by the oil price and tax rates, as well as by firm or property specific characteristics such as past profits, cost basis, and shareholder's tax class and stock basis. When the underlying asset appreciates, as happened with oil and gas in the 1970s and 1980s, the gain to reorganization increases. The analysis shows how the 1984 tax law changes the results. Our approach also offers a method of valuing the tax effects of other potential industry reorganizations. The first merger wave was John D. Rockefeller's accumulation of smaller firms into the Standard Oil Trust. Smaller firms were purchased at more than their capitalized value in a competitive world. Efficiencies in organization - but primarily market power - were the sources of the higher value to Standard Oil. Standard never achieved a complete monopoly, peaking at a 90 percent share of the refining industry (McGee, 1958; Nevins, 1953).