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A Fiscal Impact Model for Rural Industrialization

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The quest for expanded domestic energy production has led to increased interest in the coal reserves of the sparsely populated western states [Federal Energy Administration]. The rapid population influxes associated with large-scale development can easily strain the fiscal resources of the relatively small communities that would be affected [Federation of Rocky Mountain States]. These communities face a greatly increased demand for public services with a local tax base and bonding capacity that already may be inadequate [Rocky Mountain Institute for Policy Research]. The fiscal difficulties that these communities are likely to encounter have become an issue at all levels of government. However, if adequate planning and financial assistance is to be provided these communities, an effective method of projecting the effect of a new development on public costs and revenues is required.

The purpose of this paper is to demonstrate the use of a model for projecting the effects of large-scale industrial development on public sector costs and revenues. The model is demonstrated using the example of an electric power generating facility now under construction in McLean County, North Dakota. Although the coefficients used in this study reflect North Dakota data, the general issue and analytical method are believed to have widespread application.

The Model

Changes in public sector costs and revenues were estimated using a model based on a set of regional input-output coefficients and a set of

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cost and revenue estimators. The input-output model [Senechal, 1971] was used to estimate the indirect and income-induced changes in business volume, employment, and income.¹ These estimates provided the basis for calculating public sector costs and tax payments (figure 1).

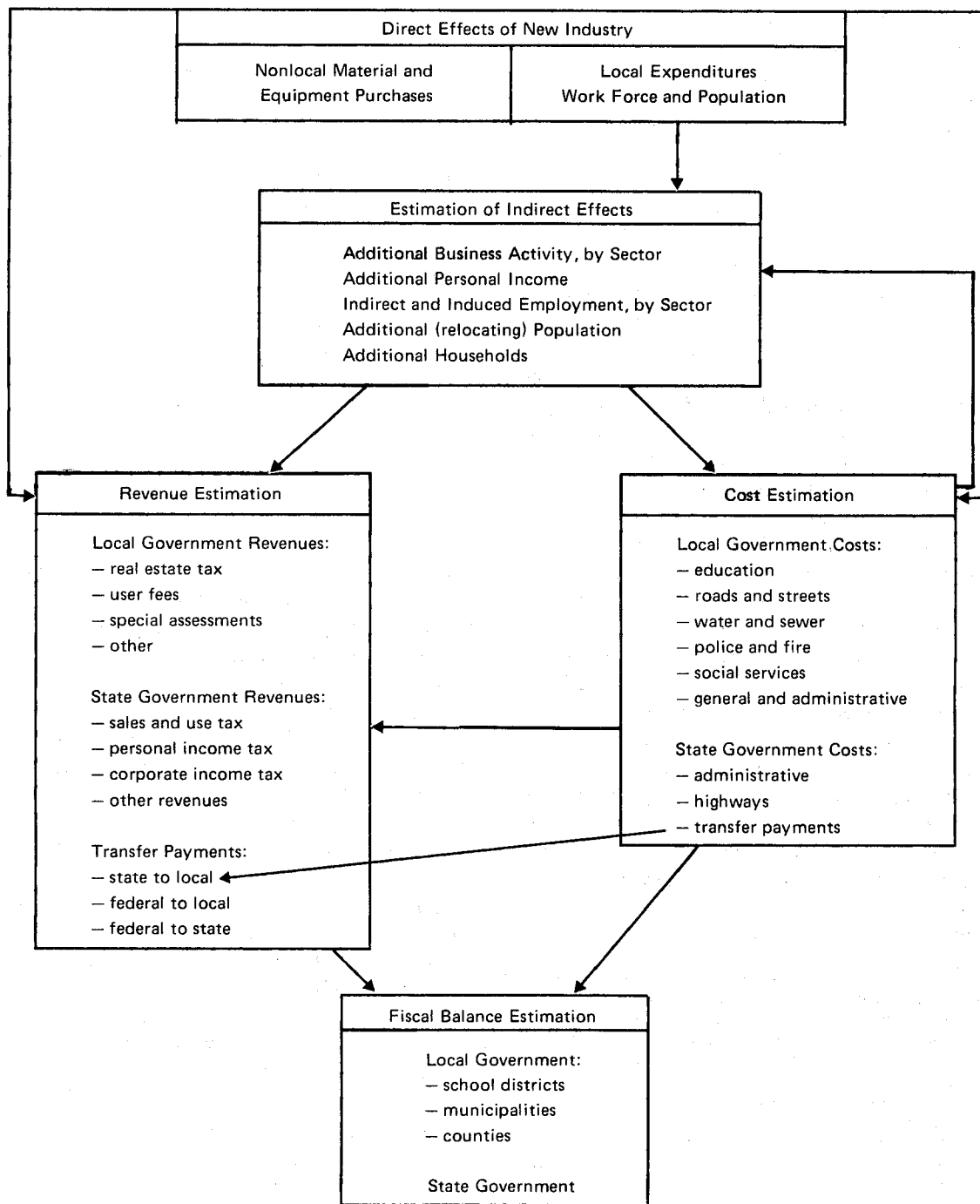
Public Sector Revenues

Changes in public sector revenues were estimated for both state and local levels of government. On the state level, principal revenues include sales and use tax, personal income tax, corporate income tax, business and corporate privilege tax, coal severance tax, and coal conversion tax. Of these state revenues, the conversion and severance taxes provides the greatest increases in revenue.

Changes in state sales and use tax revenues were estimated by first determining the historical relationship between sales tax collections and gross receipts of the retail trade sector and then applying that ratio to the estimated increase in gross business volume of the retail trade sector. Changes in state personal income tax collections were estimated by determining the historic relationship between personal income tax collections and total personal income and applying that ratio to the estimated increase in personal income resulting from construction and operation of the

¹The North Dakota input-output model consists of 13 sectors and is closed with respect to households. The sectors of the model are agriculture (crops and livestock); mining; construction; transportation; communications and utilities; wholesale and agricultural processing; retail; finance, insurance, and real estate; business and personal services; professional and social services; households; and government. The input-output model, developed by Sand, was derived from primary data collected by personal interview from firms and households in southwestern North Dakota and the coefficients were subsequently tested for validity by Senechal.

Fig. 1. A schematic of the fiscal impact model



new plant. A similar procedure was followed in estimating increased corporate income tax collections except that collections were compared to total gross business volume of all business sectors. Increases in collections of the various highway taxes and liquor and tobacco taxes were estimated on a per capita basis [Toman, 1976]. In addition, since 1975, North Dakota tax laws provide for a severance tax on all coal mined in the state and a production tax on large coal conversion facilities.²

Reductions in tax revenue resulting from decreased agricultural production were also accounted for in the model. Of primary interest was the amount of agricultural land that would be strip mined or converted to residential and associated uses. The potential reduction in agricultural production was derived by first estimating the acreage to be used for the plant site, the acreage to be mined, and the acreage expected to be used for residential, transportation, and related uses. This land was assumed to have an agricultural production potential equal to the area average, and thus, the reduction in acreage was expressed as a loss of sales for final demand in the agricultural sectors. Therefore, the estimated changes in employment, income, and state and local tax revenues were *net* changes (i.e., increases resulting from industrial expansion less decreases resulting from reduced agricultural production).

The principal source of local government revenues is the ad valorem property tax, although the local government's share of coal conversion and coal severance taxes is also substitutal. The estimate of added property tax revenue was developed by applying the state average property

tax rate to the estimated taxable value of additional business structures and residences resulting from the industrial development and associated population growth.³

Other sources of local government revenue include user fees, special assessments, and transfer payments. The two largest sources of transfer payments are the state School Foundation Program and the federal Revenue Sharing Program. Increased user fees were estimated on the basis of average rates per household [North Dakota League of Cities], while special assessment revenues were based on amortization at 7 percent of capital investments for streets, water and sewer, and solid waste disposal over a 20-year period. State School Foundation Program payments associated with increased enrollments were based on current payments per pupil. Federal revenue sharing payments were estimated on a per capita basis.

Public Sector Costs

Major increases in public sector costs result from the requirement to accommodate a substantially increased population. Accordingly, estimates of increases in public sector costs were based on the expected increases in population or the expected number of additional users of a particular service (e.g., public schools). Therefore, a critical step in calculating public sector costs was to estimate the family size and settlement-commuting patterns of the new workers. These characteristics were estimated using data obtained from surveys of the permanent operating work forces of eight North Dakota coal mines and electric generating plants [Leholm, 1975] and the workers employed in constructing three large electric generating plants in western North Dakota [Leholm, 1976].

The settlement-commuting patterns of the construction and permanent workers who would relocate to the area were estimated by means of a gravity model based on data from the worker surveys [Toman, 1976].

²The conversion taxes are in lieu of all ad valorem taxes except those on the land occupied by the plant. The severance tax rate of \$0.50 per ton is adjusted quarterly according to changes in the U.S. Bureau of Labor Statistics Wholesale Price Index [North Dakota Legislative Council, pp. 1470-75]. Severance tax receipts are allocated according to statutory formula with 30 percent going to the state general fund, 30 percent to a special state trust fund, 35 percent to a fund for distribution to impacted political subdivisions, and 5 percent to the county in which the coal is mined. Electric generating plants with at least one generating unit of 120 megawatts or more pay a conversion tax of 0.25 mill per kilowatt hour produced for sale [North Dakota Legislative Council, pp. 1476-81]. Revenues from this tax are divided between the state general fund and the county in which the facility is located. The county's portion is further subdivided between the county general fund, school districts, and municipalities.

³The estimated investment cost for houses, apartments, and business structures was used as estimated taxable value for those structures and the taxable value for mobile homes was estimated at one-half the purchase price. The estimated average investment costs for residences were based on a survey of mobile home dealers and on information obtained from the Fargo-Moorhead Home Builders Association. Capital investment in business structures was estimated by Prestgard at \$0.22 per dollar of gross business volume.

Increased local government costs resulting from population growth are of two types: capital costs arising from the construction of new facilities and operation and maintenance costs associated with either new facilities or more intensive utilization of existing facilities. Capital costs of new facilities were based on current engineering standards, while operation and maintenance cost estimates were based on regression analysis of cross-sectional county and city budget data for the 1974 fiscal year from 28 counties and 24 cities in western North Dakota [Toman, 1976]. The counties and cities sampled covered the range of potential population of the communities likely to be affected by the new industrial complex.

Estimated increases in costs of state general government functions were based on state average per capita costs [U.S. Department of Commerce]. Increased maintenance expenditures for state highways were estimated on the basis of average statewide costs per capita [North Dakota State Highway Department].

Case Study Results

The model was used to estimate the public sector effects resulting from the construction and operation of an electric generating plant in North Dakota. The plant will use an estimated 5.6 million tons of coal to produce approximately 6.5 billion kilowatt hours of electricity annually. Conversion and severance tax revenue estimates were based on these figures and would be correspondingly lower for lower levels of production. McLean County, site of the plant complex, had a population of approximately 11,000 in 1970 while the largest town in the county had a 1970 population of about 1,600. The nearest major trade and service center is Bismarck, approximately 50 miles south of the plant site. Construction of the plant and mine facilities is expected to take place over a five-year period, 1975-1980. Employment during construction is expected to reach a peak in 1978 when about 1,300 construction and operation personnel will be employed. In 1981, when the plant and mine are fully operational, approximately 500 workers will be employed [United Power Association/Cooperative Power Association]. Indirect and induced employment was estimated to stabilize at approximately 600

by 1978. Thus, total added employment in the area was estimated to reach a peak of about 1,900 during construction activity and stabilize at approximately 1,100 during operation.

Additional state government revenues were estimated to exceed additional costs by more than \$11,000,000 at the end of construction activity (table 1). By the end of 30 years of operation, the cumulative total of net additional state revenue is estimated to be over \$323,000,000.

At the local level the fiscal situation is not as favorable (table 2). Increased governmental costs are expected to exceed increased revenues throughout the period of plant construction. During the operation period the local fiscal situation would be slightly improved because the local governments would begin to receive a share of the severance and conversion taxes. In addition, ad valorem property taxes should increase as permanent work forces tend to prefer single family dwellings to mobile homes, and houses generally have higher taxable value. The cumulative fiscal balance, however, remains negative throughout most of the life of the plant. A considerable portion of the county's annual revenue is coal conversion taxes, which is a fixed amount per unit of output while all operating costs are subject to inflation. This results in a declining positive annual fiscal balance which eventually becomes negative. Thus, while total additional state plus local revenues are expected to exceed additional costs, a disparity of revenue distribution is apparent. Without exogenous financial assistance the affected communities may be forced to either increase tax rates or reduce governmental services or both to balance their budgets.

Conclusions

In sparsely populated rural areas where a new development can have major impacts, preplanning takes on a special significance. The model presented in this paper could have wide application in projecting the likely effects of a new industry and providing decision makers with useful planning information. In addition to providing estimates of likely impacts, the model could be a useful tool to estimate the effects of changes in the parameters or constraints that were used in this case study. For example, the model could be used to analyze effects of a change in the percentage of local labor utilized or a change in the state's tax structure.

Table 1. Net fiscal impact on state government of construction and operation of an electric generating station by year, North Dakota

Phase and Year	Revenue ^a	Current Operating Cost ^b	Fiscal Balance	
			Current	Cumulative
Construction				
1975	749,343	276,450	472,893	472,893
1976	2,833,162	1,058,895	1,774,267	2,247,160
1977	4,367,111	1,694,530	2,672,581	4,919,741
1978	5,850,028	2,362,885	3,487,143	8,406,884
1979	5,221,352	2,322,747	2,898,605	11,305,489
Operation				
1980	6,425,637	2,142,575	4,283,062	15,588,551
1985	7,898,231	3,080,420	4,817,811	37,467,540
2000	19,660,840	8,498,977	11,161,863	159,736,046
2010	37,504,385	15,625,023	21,879,362	323,535,336

^aIncludes revenues from personal income tax, sales and use tax, corporate income tax, business and corporate privilege tax, highway revenues, cigarette and tobacco tax, liquor taxes, and revenues from business structures, public facilities, and residential construction during the construction and operation phase; as well as receipts for the state's share of coal conversion tax and severance taxes.

^bIncludes increased highway operating expenditures, school foundation program payments, and increased state government operating expenses on a per capita basis.

Table 2. Net fiscal impacts on local government of construction and operation of an electric generating station and associated mine, McLean County.

Phase and Year	Increased Revenue ^a	Increased Operating Costs	Repayment and Debt Service ^b	Fiscal Balance	
				Current	Cumulative
Construction					
1975	72,666	140,748		-68,082	-68,082
1976	259,386	502,408		-243,022	-311,104
1977	786,437	798,317	495,727	-502,607	-813,711
1978	939,592	1,106,436	495,727	-662,571	-1,476,282
1979	953,955	1,151,021	495,727	-692,793	-2,169,075
Operation					
1980	1,931,268	1,148,407	495,727	287,134	-1,881,941
1985	2,355,507	1,700,516	495,727	159,264	-948,400
2000	4,739,007	4,691,778	--	47,229	151,540
2010	8,834,536	9,229,438	--	-394,902	-2,119,040

^aIncreased revenues initially include property taxes, school Foundation Program payments, user fees, and special assessments. During the operation phase, 5 percent of severance taxes, \$413,750 in coal conversion taxes and revenue sharing are added. The decrease in farm property tax revenues due to strip mining are subtracted from this total.

^bThe repayment and debt service was assumed to be paid by special assessments, excluding capital construction costs for schools and recreation. The special assessments are included as an increased revenue.

Primary limitations of the model would appear to be the availability of accurate data for some areas. Data on the characteristics of indirect workers were virtually unavailable and projections regarding, for example, their families size and settlement patterns were based largely on subjective judgment. Costs were based on historical data or

engineering estimates and may not reflect the effects of greatly increased demand in a rapid growth situation. Use of the model in other situations or geographic locations would require modification of estimators peculiar to North Dakota or to the coal industry.

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