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A DYNAMIC MODEL FOR SIMULATING RESOURCE DEVELOPMENT PROGRAM IMPACTS IN THE INTERLAKE AREA OF MANITOBA

A THESIS

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by

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ABSTRACT

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Federal and Provincial Governments have been involved in attempts to improve the low income and unemployment situations in the Interlake Area of Manitoba by means of public investment of $85 million in natural, social and human capital during the period of 1968-77. Of the $85 million Fund for Rural Economic Development (FRED), $20 million is designated for resource development programs including drainage, land clearing and farm management training programs. There is an urgent need to provide quantitative information relevant to the effectiveness of these programs for improving the economic conditions in the Interlake Area. This information is required so that informed decisions in regional and resource planning can be made more effectively. A significant gap exists in the capability of current economic models to provide answers to current issues related to the potential impacts of resource development programs on regional economies.

The basic purpose of this study, therefore, is to develop a model for analyzing the accumulative long-run economic impacts of resource development programs on structural change in the agricultural sectors and their contributions to related sectors of the economy in the study area. More specific objectives of this study are: (1) to explore a method to incorporate changes in trade and primary resource

input coefficients in an input-output model with particular reference to agricultural sectors; (2) to establish a set of economic development indicators to assess program impacts for public concerns; (3) to project economic development indicators specified in five target years, 1971, 1976, 1977, 1981 and 1986; and (4) to simulate impacts of resource development programs, drainage, land clearing and farm management training programs, on selected economic development indicators to assess the program effectiveness.

To meet the objectives, a 24 sector input-output model constructed for the Interlake Area is used as a framework. The 24 sector input-output model is modified in constructing three alternative simulation models referred to as static, comparative static and dynamic simulation models. Each simulation model includes the resource constraints, labor and land, so that the realized gross output is determined not only by the demand factors but also by supply constraints. The static simulation model is the conventional input-output model neglecting changes in trade or technical coefficients as well as primary input requirement coefficients over time. The comparative static simulation considers the changes in trade coefficients as well as primary input requirement coefficients over time but investment is assumed to be exogenously determined. The dynamic simulation model permits the trade and primary input requirement coefficients to change over time. In addition, investment is determined endogenously by the dynamic simulation system.

Productive capacity limitations by farm size class are used to derive the changes over time for trade coefficient and primary input requirement coefficients employed in the comparative and dynamic simulation

models. Each farm size has its productive capacity limits resulting from the fixed technical as well as primary input requirement coefficients associated with the size of farms. The technical coefficient as well as primary input requirement coefficient changes are caused by the structural changes represented by increases in the number of large size farms and decreases in the numbers of small size farms. A modified Markov process emphasizing migration relationships is used to project changes in farm numbers by size class and projection results are employed to adjust the trade as well as primary input requirement coefficients over time for the comparative and dynamic simulation models.

The impacts of the three resource development programs on the selected economic development indicators are determined by the difference between projections and impact simulation results. The projection results represent the performance of the Interlake economy without the three resource development programs. The impact simulation results include changes in the economy due to the cumulative effect of three resource development programs as well as changes projected to occur as a result of economic growth without programs.

The three alternative simulation models mentioned above are used to project the performance of the Interlake economy represented by gross output, employment, area income by sources and primary resource utilization rates. These results are compared with historical observations in assessing the results of the three alternative simulation models. The results indicate that the dynamic simulation model performs best among the three alternative simulation models: (1) the dynamic

simulation model yields consistent estimates of investment; (2) the projected trade and primary resource input coefficients are very close to the actual observations indicating that these coefficients in fact do change over time as a result of structural changes in agricultural sectors; and (3) the simulated economic development indicators for 1971 are all within 12 percent deviation of the historical series for 1971.

Given that the dynamic simulation provides the best estimates of economic performance in the Interlake area, the impacts of the three resource development programs on the selected economic development indicators are derived from the dynamic simulation model. The results indicate that all of the simulated resource development programs yield positive impacts on each selected economic development indicators. The three resource development programs generate increasing employment opportunities for Interlake people. An additional 1,300 jobs are attributable to the three resource development programs in 1976. The area income is estimated to be $88 million if weather conditions were normal in 1971 as compared to actual figure of about $85 million. The three resource development programs contribute about 8 percent of total area income to the Interlake economy in 1971 and this contribution is estimated to be 10 percent of income by 1976. In addition, about 80 percent of income generated from the three resource development programs is farm income. As a result, each farm, on average, has gained an additional thousand dollars of farm income due to the three resource development programs.

The magnitude of impacts per million dollar program expenditure is different for each program and for every selected economic indicator.

In general, there is no consistently "best" resource development program relative to the FRED objectives of increasing employment opportunities and income and improving the standard of living for the Interlake people specified in the FRED plan. The farm management training program in general, is more favourable than the other two programs in terms of their impacts on FRED plan objectives.

A number of policy implications of the results are noted. The most significant implication of the results is that the three resource development programs will not be able to prevent the out-migration of agricultural labor force. Some complementary manpower training and education programs for agricultural labor force are required for monitoring the potential manpower problems in agricultural sectors. Another implication which is useful for regional development planning and program evaluations is indicated by the results that the impacts of each resource development program on the selected economic development indicators are different from one time period to another. The magnitude of the impacts on the selected economic development indicators is not equal for each resource development program. The implication of these results is that governments could be more effective in their pursuit of development targets by making objectives more specific in terms of the selected economic development indicators and analyzing the economic structural changes for both short and long-run caused by particular programs.

Additional findings and some of the limitations underlying these findings are discussed and suggestions are made for further research. The modified dynamic model has the potential for overcoming many

problems in estimating the impacts of government development programs on the structure of a regional economy which is a requirement for effective regional development planning.

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CHAPTER 1

INTRODUCTION

A number of agricultural development programs have been designed in Canada to increase agricultural productivity and improve incomes of low income farmers in marginal agricultural areas. These include programs under the Agricultural and Rural Development Act, 1961 (ARDA), the Fund for Rural Economic Development, 1966 (FRED), and the Small Farm Development Program, 1972 (SFDP). The various programs have unique elements and represent alternative approaches to resolving rural development problems.

However, models of the agricultural development process which permit an analysis of the potential impacts of such programs on jobs, income, the changing structure of agriculture, and the relationship between agricultural and non-agricultural sectors are not available.[1] Such dynamic regional models of agriculture which would provide an explicit linkage between the agricultural development programs and the regional economy (including rural and urban dimensions) are critical for development of a full understanding of regional development and the formulation of future policy.

A. Problematic Situation

The Government of Canada and the Province of Manitoba signed an

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[1] W.J. Craddock, "Interrelation and Use of the Results Obtained with National and Regional Economic Models," National and Regional Economic Models of Agriculture, ed. Roger K. Eyvindson, Economics Branch Publication No. 72/9 (Ottawa: Canada Department of Agriculture, 1972).