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For many resource-based communities throughout Oregon the timber industry plays an important role. In many of these areas, federal land holdings comprise a large proportion of the area's land holdings. Management decisions regarding resource use on the National Forest lands can have a major influence on the stability of local timber industries and on the communities of which they are a part.

Input-output analysis has been used extensively to evaluate the importance of the timber industry to relatively small resource-dependent communities. In the past, the conventional input-output demand model has been used to assess the local impacts of changes in the availability of public timber resources. However, an analysis which interprets a change in primary resource supply as a change in final demand for the processing industry's output may incorrectly evaluate the impacts of shifts in primary resource supply on the local economy.

The regional economic impacts resulting from a change in available primary inputs can be estimated more accurately using a modified approach to the conventional method of demand-pull analysis. Because

of the network of forward linkages present within the regional economy, a change in primary inputs available to one sector may have a direct or indirect affect on all other sectors of the local economy. These supply-induced impacts on total sales can be calculated using an input-output supply model. The resulting change in total sales can be factored into two components--sales to local industries and sales to final demand. Regional impacts resulting from the first component can be calculated directly from the supply model. A modified version of the input-output demand model can be used to estimate the regional impacts associated with the supply-induced change in the value of local industry exports.

This study identifies and evaluates the forward linkage structure present in small resource-based economies. The conventional input-output demand model is modified so that the local impacts of changes in primary resource supply can be evaluated vis-a-vis these structural relationships. A comparative economic impact analysis of three eastern Oregon counties is conducted using the modified input-output methodology. The results obtained using this procedure are compared to results obtained using the conventional method of analysis where changes in primary resource supply are extrapolated to reflect changes in final demand.

In each county, estimates of regional impacts obtained using the modified input-output methodology differed from those calculated using the traditional form of analysis. The difference between the estimates was most significant in Morrow County where a relatively larger percentage of output in the wood products industry is sold locally. The demand-induced impacts in each county were

considerably larger than the supply-induced changes. Although the initial shock to the system is supply-induced, the backward linkage structure plays a significant role in determining the overall impact of the stimulus on regional and sectoral output.

The supply model is able to account for the direct and indirect impacts on regional sales transactions caused by a change in available primary inputs. The input-output demand model, by itself, is unable to account for these transactions. Because the modified input-output methodology provides a means by which changes in scarce primary factor supply can be apportioned into supply and demand related components, a better understanding of the regional economic impacts associated with changes in the availability of public timber can be obtained.

Local Economic Impacts of Changes in the Availability of Public Timber

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CHAPTER I

INTRODUCTION

Public Resource Dependency

The United States government possesses vast holdings of public land. Approximately one-fifth of the total land area of the 48 contiguous states is held in the public domain. Indeed, the Bureau of Land Management and the U.S. Forest Service, the federal government's largest resource management agencies, administer the fourth and fifth largest land holdings in the world.[1/] These areas are concentrated most heavily in the western states where public land holdings account for over one-half of the total land area.

The composition of federal holdings varies among sections of the country. Approximately 52 percent of the total land area in Oregon is held in federal ownership (see Table 1). Of this, 48 percent is administered by the Forest Service. Oregon is one of only two western states where the Forest Service is responsible for the management of over one quarter of the state's land area (Table 2). Between 1958 and 1977, timber harvested from the national forests accounted for 30 to 40 percent of the timber harvested in Oregon

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1/ Krutilla, John V. and Anthony C. Fisher, The Economics of Natural Environments (Baltimore: The Johns Hopkins University Press for Resources for the Future, 1975), p. 4.

Table 1. Public Land Ownership in 12 Selected Western States, 1979.

State	Total Land Area (Acres)	Public Land Area (Acres)	Public Land Area as a Percent of Total Land Area
Alaska	375,303,680	335,712,895	89.45
Arizona	72,901,760	32,108,122	44.04
California	101,563,520	47,334,694	46.61
Colorado	77,718,080	23,690,256	35.51
Idaho	53,476,480	34,106,229	63.78
Montana	94,168,320	28,007,542	29.74
Nevada	70,745,600	60,919,036	86.11
New Mexico	77,866,240	25,906,877	33.27
Oregon	62,067,840	32,592,107	52.46
Utah	54,346,240	34,580,512	63.63
Washington	43,642,880	12,749,831	29.21
Wyoming	62,664,960	30,486,503	48.65

SOURCE: U.S. Bureau of Land Management, Public Land Statistics, 1979, Washington: Government Printing Office.

Table 2. Forest Service Land Ownership in 12 Selected Western States, 1979.

State	Forest Service Land Ownership (Acres)	Forest Service Land as a Percent of Public Land	Forest Service Land as a Percent of Total Land Area
Alaska	20,400,621	6.07	5.44
Arizona	11,270,186	35.10	15.46
California	20,343,494	42.98	20.03
Colorado	14,415,989	60.85	21.61
Idaho	20,423,090	59.88	38.19
Montana	16,753,702	59.82	17.79
Nevada	5,143,891	8.44	7.27
New Mexico	9,243,614	35.68	11.87
Oregon	15,608,221	47.89	25.15
Utah	8,046,186	23.27	14.80
Washington	8,902,422	69.82	11.87
Wyoming	9,253,085	30.35	14.77

SOURCE: U.S. Bureau of Land Management, Public Land Statistics, 1979, Washington: Government Printing Office.

each year.[2/] Timber supplies available from the national forests are clearly an important source of raw materials for the state's timber industry. Management decisions regarding resource use on the national forests will have a major influence on the stability of this industry and on those communities of which they are a part.

Local concerns represent only one of many special interests which influence public land management and use decisions. The relative importance of these concerns in affecting public land use decisions appears to have decreased somewhat in recent years.[3/] The reasons for this have largely been attributed to overriding environmental concerns at the national level. It may be that in some instances, however, the magnitude of the economic costs imposed upon the local economy will be such that local concerns should bear relatively more weight in the determination of public resource use [Haigh and Krutilla 1980, p. 416]. An important element of the management decision must be the correct evaluation of the local economic impacts caused by a change in public resource availability.

Research Problem & Objectives

The importance of the timber industry to relatively small resource-based communities has been studied in some detail. Input-output analysis has been used extensively to evaluate the local economic impacts of changes in the final demand for regional exports.

[2/] U.S.D.A., Forest Service, Pacific Northwest Forest and Range Experiment Station, Production, Prices, Employment, and Trade, Second Quarter, 1979 (Washington: Government Printing Office, 1979), p. 18.

[3/] See: Schallau, Con H., "Can Regulation Contribute to Economic Stability?", Journal of Forestry, April 1974, pp. 214-216.

These models have also been used to assess the impacts of changes in the availability of public timber resources. However, changes in resource supply have been evaluated by extrapolating corresponding changes in the final demand for timber products, i.e., by means of conventional input-output demand models.

A shift in the demand for a region's exports will affect the local economy differently than will a shift in the availability of raw materials. A change in available primary input supply will impact the economy vis-a-vis forward linkages while a change in final demand will influence the economy by means of backward linkages. The forward linkages within an economy may or may not be as highly developed as the backward linkages. An analysis which interprets a change in primary resource supply as a change only in final demand for the processing industry's output may incorrectly evaluate the impacts of shifts in primary resource supply upon the local economy.

It should not be expected that an industry will sell its product to the same firms from which it purchases its factors of production. An increase in the availability of primary inputs used by the timber industry will affect not only industry sales to local firms but will also cause its local purchase of production factors to increase.[4/] The latter occurs because of the expansion in the export sale of timber and timber-related products allowed by the increase in primary input availability. The problem addressed by this

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[4/] It is expected that all sectors of the economy will be affected indirectly by changes in the output level of the timber industry. However, the relative magnitude of direct changes in timber industry transactions will depend upon whether or not a firm participates in purchasing transactions directly with the timber-related industries.

research is to identify and evaluate the forward linkage structure present in small, resource-based economies. Once the forward linkage system has been identified, the local impacts of changes in available federal stumpage are evaluated vis-a-vis these structural relationships.

Specific objectives guiding the research are:

(1) To identify forward linkage relationships for timber industries in selected eastern Oregon counties.

(2) To evaluate changes in intersectoral sales associated with changes in the availability of public timber within these counties.

(3) To assess the local economic impacts of changes in public timber availability within these counties.

(4) To provide a basis for comparison of the differing local impacts upon regional economic growth and dependent community stability associated with changes in forest management policy and programs.

Thesis Approach

The evaluation of the local economic impacts resulting from changes in the availability of public timber involves a relatively straightforward set of procedures. First, an input-output supply model is developed whereby exogenous changes in primary input supply are evaluated by means of forward linkages. Models comparable in structure and time are constructed for three regional economies in

eastern Oregon--Baker County, Grant County, and Morrow County. Second, the supply models are used to calculate the impacts of changes in primary input availability upon regional sales to final demand. The corresponding effects upon the local economy resulting from estimated changes in regional exports are calculated using the conventional demand-pull input-output model. Third, estimates of the local economic impacts resulting from changes in federal resource availability are obtained using the more traditional method of analysis where final demand changes are extrapolated directly from the changes in primary inputs. The input-output model is used to calculate the local impacts resulting from these changes. The estimates obtained using the latter procedure are compared to those obtained using the forward linkage method. The purpose of this comparison is to determine whether a significant difference exists between estimates of local economic impacts when the effects of changes in primary input supply are first evaluated vis-a-vis the forward linkages present within the local economy. The types and degrees of relationships which exist between local timber dependency and the development of vertical linkages are evaluated. Implications are then drawn with respect to the differential impacts of changes in Forest Service timber supplies on regional economies.

Procedures Followed

During the summer of 1980 primary data input-output models were constructed for Morrow and Baker Counties, Oregon. A similar model was developed for Grant County during 1979. The data collected for these studies are used to construct the input-output supply models

developed in this analysis. Sales and purchase data for the Morrow and Baker County models are described for the 1979 calendar year. Information in the Grant County study relates to household and business transactions conducted during 1979. To assure that the estimates of economic impacts resulting from changes in federal timber availability are comparable in time, the Grant County model is recalculated to reflect 1979 prices.

Estimates of the direct and indirect employment and income effects resulting from changes in federal resource availability are calculated using the modified and the traditional approaches. The estimates are presented in relative and absolute terms. The results obtained with each method are compared to determine whether estimates of economic impacts differ significantly when changes in resource availability are interpreted directly as changes in final demand. A comparative analysis is made of the differing regional impacts resulting from changes in forest management policy regarding local timber harvest. This brief analysis is made in line with existing Forest Service guidelines regarding the investigation of the social and economic impacts resulting from changes in forest management policy at the regional and local levels.

Study Area

Baker, Morrow, and Grant Counties are representative of many small, resource-dependent economies in eastern Oregon (Figure 1). Ranching, agriculture, and forestry are major industries in each of these regions; and federally-owned land plays an important role in local economic activity. In each case the Forest Service administers

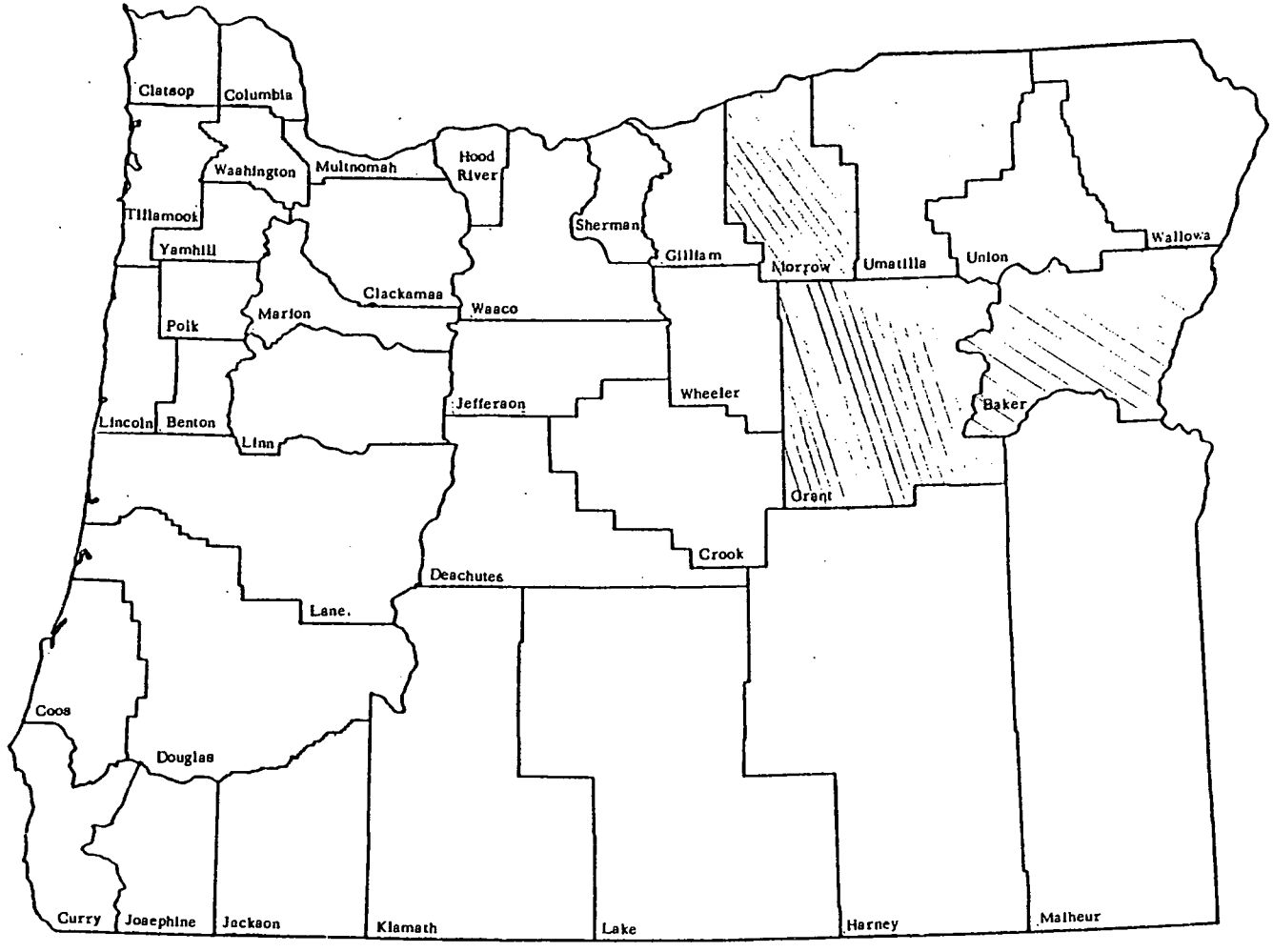

Figure 1. Location Map for Baker, Grant, and Morrow Counties, Oregon.

a significant portion of the federal land located within the county (Table 3).

Grant County possesses the largest inventory of available commercial timber (Table 4). Fully 83 percent of the commercial timber in the county is located on Forest Service land (Malheur National Forest). Similarly, in Morrow and Baker Counties over one-half of the available timber supply is located on national forest land (the Umatilla and the Wallowa-Whitman National Forests, respectively). A change in management policy regarding the availability of this timber would have a significant impact upon the local timber industries. For example, a 25 percent reduction in federally-owned commercial timber would reduce available timber in Grant County by 21 percent. A similar reduction would reduce available commercial timber in Morrow County by 14 percent and by 19 percent in Baker County. These counties are considered typical of other resource-based economies in eastern Oregon. They were selected for this study because sufficient survey data was available for each county to develop an input-output supply model.

Thesis Organization

A discussion of the role of federal involvement in affecting regional economic activity is contained in Chapter II. This discussion includes an examination of the structural relationships within the regional economy and the means by which the Forest Service affects local economic stability via these relationships. A review of input-output analysis is included in Chapter III as well as a theoretical development of the input-output supply model. This chapter also

Table 3. Federal Land Ownership, by County.

County	Federal Land as a Percent of Total Land Area	USFS Land as a Percent of Federal Land	BLM Land as a Percent of Federal Land
Baker	48.0	68.0	32.0
Grant	59.6	89.9	10.1
Morrow [a/]	22.1	46.7	17.2

SOURCE: Oregon State University, Cooperative Extension Service, Resource Atlas for Morrow County, for Grant County, for Baker County (three publications).

[a/] A large portion of federally-owned land in Morrow County is administered by agencies other than the U.S. Forest Service and the Bureau of Land Management.

Table 4. Area of Commercial Timber Land, by County, January 1973 (in thousand acres).

County	All Owners	National Forest Land	Other Public	Forest Industry	Farmers & Miscellaneous Private
Baker	571	437	17	10	107
Grant	1,532	1,276	19	97	140
Morrow	198	111	1	48	38

SOURCE: USDA, Forest Service Resource Bulletin, PNW-56, 1974, Table 2, page 4.

includes a description of the procedure used to update the 1977 Grant County input-output model to 1979 prices. A description of the importance of the timber industry to the three counties examined in this study is contained in Chapter IV. Estimates of the local economic impacts resulting from changes in the availability of public timber are included in this chapter. Results obtained using the modified model are compared to those obtained using the input-output demand model. Finally, results of this study are summarized in Chapter V. Some of the theoretical limitations of the input-output supply model are discussed in this chapter. Policy implications regarding the assessment of the local impacts resulting from changes in national forest management policy are examined as well.

CHAPTER II

LITERATURE REVIEW

Introduction

Recent legislation relating to natural resource management has directed administering agencies to assess the economic and environmental consequences resulting from changes in public resource use. Management decisions are to consider the immediate impacts of change as well as the effects of resource use decisions upon future generations. Several criteria enter into the decision-making process. These include the evaluation of the impacts of changes in public land use upon fish and wildlife habitat, watershed protection, outdoor recreation, and dependent timber and range activities. Consideration of these activities is largely viewed in the national context. Management alternatives are selected so as to maximize the present net worth of goods and services derived at the national level.

A management decision considered acceptable from the national point of view may be deemed less than desirable from the point of view of local resource users. Traditional public land users will most directly feel the costs and benefits associated with changes in public resource use. For example, a federal decision seriously reducing available commercial timber from a national forest area will have an impact upon local timber haulers and processers. Where the costs and benefits associated with a land management decision are distributed unevenly among regions, considerations of interregional equity may become important to the decision process.

> "The fact that 14 western states ... either have passed or are considering legislation which would place within the state responsibilities for the management of public domain--responsibilities now vested in the federal government--is an obvious expression of the relevance of interregional distributions of costs and benefits" [Obermiller 1981, p. 6].

The means by which the federal government is able to affect local and regional economic growth and activity are examined in the following chapter. First, a review is made of the reasons used to justify federal intervention into regional economic activity. Second, the need for the public management of large areas of the nation's resources is analyzed. Third, the importance of local community stability as an element of forest management policy is examined. Fourth, an exploration is made of those factors influencing local and regional growth and activity. Finally, the ability of the Forest Service to affect regional and community stability is examined.

Federal Involvement in Regional Economic Activity

There is a great deal of debate over the role of the federal government in encouraging regional growth and development. Cameron [1970] outlines two theories which attempt to resolve this issue. These theories describe two very distinct viewpoints in assessing the warranted level of federal involvement in influencing regional economic activity. The first of these is known as the national demand approach and the alternative as the theory of planned adjustment.

National Demand Approach

According to the national demand approach, when left to itself

the competitive nature of the free market system will yield the optimal spatial distribution of economic activity throughout the nation. If a particular region experiences declining levels of economic activity and rising levels of unemployment this is merely an indication that, from the national perspective, the optimal distribution of economic activity is shifting away from that region. In such instances the federal government should encourage the decline of economic activity in the lagging region so as to enable factors of production to migrate to other, more productive, regions.

The national demand approach assumes regional growth to be a function of national demand factors. If a region has a comparative cost advantage in the production of certain goods and services it will develop an export base. It is expected that economies of location and scale will develop and, subsequently, regional and per capita incomes are expected to be relatively high. If, however, national demand for regional exports declines, or if the region loses its comparative advantage in production, then there will be a decline in the value of regional output. Regional unemployment will also be expected to increase sharply because of the decline in export production. Under competitive conditions however, the capital and labor resources which are 'freed up' will migrate out of the region and into those areas of greater opportunity. The result, in equilibrium, is a region which will operate at a lower level of economic activity, but without significant levels of unemployment.

Any intervention on the part of the federal government to prevent the decline of regional activity and curb the rise of local unemployment will result in the locking up of productive resources

into less than optimal economic uses. While regional subsidization may be justified on the grounds of redistributing income to areas of need, the result may be a level of output less than that which may have been achieved without subsidization [Cameron, p. 14]. If it is the preferred policy of the federal government to maximize national output then it will be in the nation's best interest to encourage factors of production to shift out of those regions where a comparative advantage no longer exists.

Theory of Planned Adjustment

Alternatively, the theory of planned adjustment argues that the market system will not result in the optimal spatial distribution of economic activity. Concomitant with this assumption is the existence of regions with structural problems of relatively low levels of income and relatively high levels of unemployment. Because the market system is not self-correcting, it is argued that there is a need for federal involvement to better allocate productive resources.

The need for federal intervention is justified on three grounds. The first is that lagging regions are unable to overcome their structural difficulties because public and private capital continues to be invested in large metropolitan areas beyond the point which would be considered optimal from a national perspective.[1/] Secondly, it is argued that some firms would be able to reduce production costs by

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1/ Cameron notes that social externalities or 'agglomeration diseconomies' tend to increase as large metropolitan areas continue to expand. A key assertion of the planned adjustment theory is that most investment and production decisions are based almost solely on the realization of only the private rather than the social costs attendant with the decision [pp. 14-15].

locating away from high cost metropolitan areas. In particular, those firms which use simple production techniques and have minimal human and capital requirements would be best suited for location in outlying regions. A major assertion of this argument is that, if left alone, the market will not direct the location of firms into these areas. The reasons for this may be location prejudice or misinformation as to the merits of these relatively low cost outlying areas [Cameron, p. 16].

The final argument of the planned adjustment theory is that, in the long-run, lagging regions will be able to attract new investment into the area if it is first provided with short-run federal assistance. New strategies of regional growth can be developed and new industries encouraged provided there is an adequate level of financial assistance to ease the region through the transitional period as well as to discourage the outmigration of productive resources.

Under this alternative, federal involvement in regional economic activity is justified on grounds similar to those used to justify the subsidization of infant industries. Federal assistance is provided during a transitional period to allow the industry to overcome regional disadvantages in production and to help create new net advantages. In contrast to the national demand approach, it is argued that national output can be maximized by using federal involvement in regional areas to create a more optimal distribution of economic activity and to provide for a better utilization of a region's resources.

The Need for Federal Involvement

Declines in regional income levels and increases in unemployment levels can occur for a variety of reasons. The decline in national demand for an important regional export can have a major impact upon the local economy. Similarly, the change by a local industry to a more capital intensive production technology can also have a dramatic impact within the local region. Under such conditions the market may serve to redistribute some capital and labor resources to more productive areas. In many instances, however, a decline in the output level of a major industry will mean the persistence of high levels of unemployment and relatively lower levels of regional income. The inability of the market to correct these conditions makes a strong case for federal involvement in enhancing regional economic growth and development.

If it is assumed, as according to the theory of planned adjustment, that perfect information is not available to labor and capital resources and that the competitive forces of the market system will not always result in an optimal distribution of economic activity, then it is possible to acknowledge the need for federal assistance in directing economic activity within and among regions. Musgrave [1959] identifies three primary roles which federal intervention can play in directing regional activity. First, intercession may be required in order to provide a more efficient allocation of economic resources. Secondly, the government may intervene so as to provide for the economic and social well-being of its citizenry. Finally, the government may intervene in the private sector so as to moderate

fluctuations in the price and employment levels of the economy.[2/]

The goals and objectives of most federal agencies can be identified with one or more of the fundamental reasons for federal intervention described above. For example, the Anti-Trust Division provides for the control of resource allocation while the Department of Health and Welfare provides for the improvement of social welfare. The role of the federal resource management agencies, however, may be more difficult to identify. The following section provides a discussion of public intervention as it pertains to the management of the nation's natural resources.

The Federal Role in Resource Management

The public management of natural resources is justified largely on the grounds that the market system is unable to make provision for public goods (or social wants) such as watershed protection and the preservation of wilderness areas.

> "Social wants are those wants satisfied by services that must be consumed in equal amounts by all. People who do not pay for the services cannot be excluded from the benefits that result; and since they cannot be excluded from the benefits, they will not engage in voluntary payments. Hence, the market cannot satisfy such wants" [Musgrave, p. 8].

Haigh and Krutilla [1980] argue that, historically, the establishment of the Forest Service has been defended as providing a means for the management of watershed areas and for guarding against soil erosion. Similarly, the establishment of a wilderness preservation system

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[2/] Musgrave describes this role of government as that of economic stabilization.

"provides for society a range of options . . . that is not likely to be preserved through the market system" [Haigh and Krutilla, p. 414]. The provision of these goods and services by the federal government is consistent with the efficiency, or allocative, function of the federal government in directing economic activity. The Multiple-Use Sustained Yield Act of 1960 (Public Law 86-517) requires not only that the public lands be managed to provide an optimal allocation of use among resource systems but also that they be managed to provide for the welfare of subsequent generations. It is the role, then, of the resource management agency to provide for an efficient allocation of public resource use among alternative activities and to provide for these uses over time.

Although a strong case can be made for the efficiency objective of the resource agency, relatively less justification can be made for the ability of the federal government to provide for equity and economic stability in its role as a resource manager.[3/] In the case of the Forest Service, Haigh and Krutilla [1980] argue that because the agency largely provides either primary commodities or final consumption goods (e.g., dispersed recreation) which tend to be consumed by a large proportion of relatively higher income groups, the Forest Service is not well suited to serve in the governmental role of

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3/ See Krutilla, John V. and Otto Eckstein, Multiple Purpose River Development (Baltimore: The Johns Hopkins University Press for Resources for the Future, 1958), ch. 3. Krutilla and Eckstein argue for the development of large river basin systems for reasons of providing a more efficient allocation of resources. See also, Haigh, John A. and John V. Krutilla, "Clarifying Policy Objectives: The Case of National Forest Management," Policy Analysis, Vol. 6, No. 4 (Fall 1980), pp. 409-439.

providing for a more equitable distribution of welfare.[4/]

The role of the Forest Service in providing for economic stability and, more specifically, for community stability is less clear. Because there exist many small communities whose livelihood depends in part upon the availability of primary commodities from the national forests, the Forest Service must be aware of the impact that changes in policy regarding the management of these public lands will have upon these dependent communities. Haigh and Krutilla [1980] acknowledge that "a decision that would destabilize an existing community and its facilities by reducing the flow of timber should be carefully examined, because efficiency criteria, if carelessly applied would overlook the real social costs of closing down mills and idling workers" [p. 416].[5/] Local concerns, however, are often in conflict with national objectives. Similarly, national objectives may cause undue hardship at the local level. While acknowledging the importance of local concerns, Waggener [1977] argues that policy should be directed simultaneously at facilitating change and easing transitional burdens rather than at preventing change from occurring at all [p. 713].

In conclusion, it can be argued that the principle role of the Forest Service is to allocate resources in a manner that will maximize the production of goods and services relative to the nation. Where changes in Forest Service management policy result in signifi-

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[4/] For a discussion of the distribution of income among wilderness users see, Vaux, Henry J., "Distribution of Income Among Wilderness Users," Journal of Leisure Research, Vol. 7, No. 1 (1975), pp. 29-37.

[5/] Haigh and Krutilla make an important distinction between instability caused by the inavailability of an even-flow of timber--a supply phenomenon, and instability caused by the effects of increasing interest rates and reduced housing starts--a demand phenomenon.

cant impacts upon the stability of forest-dependent communities, considerations of local destabilization may have to be included in the management decision [Haigh and Krutilla, p. 417].

Community Stability as an Element of Forest Management Policy

Public concern for the economic stability of timber-dependent communities has been a constant element in the historical development of public forest land management policy. The Organic Act [1897] of the U.S. Forest Service, while not explicitly naming community stability as a factor motivating the establishment of national forests, did cite as one of its purposes the provision of "a continuous supply of timber for the use and necessities of the citizens of the United States." By establishing a continuous flow of timber as one of the primary objectives of forest management, an implicit statement was made of the need to stabilize the timber industry. This, in turn, was important in helping to maintain the stability of timber-dependent communities.

During the late 1800s federal lands were disposed of in accordance with the philosophy that individual initiative and self-interest would lead to the greatest good for both the region and the nation [Dana, p. 2]. As a result of this policy there was little attempt to maintain the productivity of the forests or to assure the availability of a continuous supply of wood. Forestry practices during this time were not aimed at the cultivation and protection of the forest resource. Rather, timber was harvested in a manner that resembled the mining of a non-renewable resource. When the timber

supply was exhausted in one region, the lumber industry moved on to a new area until this region, too, was exhausted of its resources. The effect of this 'cut out and get out' philosophy was to make timber harvesting and processing a roving industry. This, in turn, "most significantly resulted in movement of population and impacted prosperity of towns--particularly those small, timber-dependent communities" [Dana, p. 9].

Dana argued that the national forest lands could (and should) be used to help stabilize the forest industry. By instituting forestry practices aimed at conservation rather than destruction, the continuous movement of the forest industry could be checked and the permanence of timber-dependent communities established. The livelihood of these communities was seen as being directly linked to the management practices instituted on the surrounding forest lands.

> "A well-managed forest requires labor for fire protection, disease control, nursery and planting work, thinnings, road construction, trails, bridges, telephones and other permanent improvements, timber cutting, transportation, also the manufacturing of timber products and support industries and services" [Dana, p. 32].

Chandler [1920] also argued for the need to stabilize the forest industry. He saw the migrating timber industry as a threat not only to community stability but he also believed that "the cost to society of creating large areas of waste or partial waste forest soil is human degeneracy" [Chandler, p. 33].

In 1944 the Sustained Yield Forest Management Act was passed "in order to promote the stability of forest industries, of employment, of communities, and of taxable forest wealth, through con-

tinuous supplies of timber" (Sec. 1). It became one of the primary concerns of public forest management to secure and maintain the stability of those communities dependent upon the availability of public timber harvest. The Act authorized the Forest Service to establish sustained yield units for the express purpose of maintaining the stability of those communities for whom the units were created.[6/] The units were to be established so as to "sell, subject to such conditions as the Secretary believes necessary, federally-owned or administered timber and other forest products from such unit without competitive bidding at prices not less than their appraised values, to responsible purchasers within such community or communities" (Sec. 3). These sustained yield units were to be established whenever the stability of the communities dependent upon these resources could not be maintained by means of usual timber sales procedures [Dana and Fairfax, p. 167].[7/]

Subsequent legislation regarding the management of the national forests has not made explicit mention of the need for maintaining community stability. The Multiple-Use Sustained Yield Act of 1960 called

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[6/] Schallau [1974] notes that neither in 1944 nor again in the 1960 Multiple Use Sustained-Yield Act was the concept of sustained yield defined [p. 215]. He argues that sustained yield defined as either 'even flow' or 'moderated flow' has been accepted as being consistent with the legislation issued by congress.

[7/] In 1937 Congress passed the Oregon and California Lands Act. This act reversed previous policy concerning these lands as set forth in the Chamberlain-Ferris Act of 1916. Original policy left these lands wholly unregulated. As a consequence, large portions of timberland in the Northwest were severely overexploited by both the timber industry and by homesteaders. The O and C Act was passed in order to remedy this misuse of public resources by providing for conformity in the maintenance and harvest of the remaining timber. The concern for the economic stability of communities was also explicitly mentioned in the Act although the primary intent of the legislation was to prevent further misuse of the timber resource.

for the administration of the national forests for "all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people" (Sec. 4). The Act again emphasized the importance of sustained yield as a management objective but this time made no reference to its relationship with community stability.

In 1974 Congress passed the Forest and Rangeland Renewable Resources Planning Act (RPA). The legislation called for a comprehensive evaluation of Forest Service management policy.[8/] The Forest Service was directed to "assess resource needs and capabilities, define alternatives, and recommend a program of management and investment as a basis for its budget requests" [Dana and Fairfax, p. 324]. Sections (3) and (4) of the RPA called for the development of first an Assessment and then a Program for long-term planning of national renewable resource programs as administered by the Forest Service. The Renewable Resources Program and Assessment (first drafted in 1975) provided an extensive outline of Forest Service policy objectives in six resource areas.[9/] Once again, however, explicit mention of the earlier concern for community stability was missing.

The Renewable Resources Program largely emphasized national goals in its policy objectives. Hyde [1976] writes that:

8/ The National Forest Management Act (1976) later amended the RPA. However, because the legislative directives pertinent to this discussion were contained in the earlier Act, reference will be made only to the Resources Planning Act.

9/ These areas include outdoor recreation and wilderness, wildlife and fish, forest-range grazing, timber, water, and community and human development [U.S.D.A., Forest Service, 1976].

> "... the absence in the Program of any regional disaggregation of goals is at least as serious as its absence in the Assessment. A goal to increase wilderness would have grossly different impacts depending on where the increase was made, and a national increase divded uniformly among regions is preposterous" [p. 284].

Vaux [1976] also calls for the need to assess the Renewable Resource Programs in terms of their localized impacts in order to permit better estimates of "how a specified response in a given use will affect all other outputs from the land" [p. 286]. Adams, et al. [1977] express their concern that, because of the uneven geographical distribution of Forest Service land, the influence of timber harvest from these lands will have differing impacts upon wood products markets and wood products industries across regions [p. 663]. Although these concerns were not focused at the community level, there does seem to be an indication that the Resources Planning Act has renewed concern as to the impact of public management policies at a more localized level than those indicated in the Renewable Resources Program.

The historical concern for community stability developed as a response to the dramatic impact which the unregulated forest industry was having upon local economic conditions. It was believed that these impacts could be controlled if timber were made continuously available to these communities. The assumed policy solution was to make timber continuously available to local community mills rather than to more distant mills [Waggener, p. 711]. Schallau [1974] however, argues that more recently other, more pertinent, resource problems have upstaged the concern for community stability.

> "Clearcutting, log exports, wilderness preservation, the National Environment Policy Act and

> similar issues have justifiably accounted for all of the resource managers' time .... Nevertheless, I do believe there will come a time soon when, for localized situations in the West, community stability will again become an important issue" [Schallau, p. 215].

The fact remains, however, there is still a great deal of concern at the local level as to the management and use of those public land areas upon which these regions are dependent. "From the point of view of local resource users and dependent communities, a decision which is efficient in the national context may be quite inequitable if the local area must forego benefits in the interests of greater net benefit at the national level" [Obermiller, p. 7].

The development of Forest Service management policy has reflected the overriding concern to assure the provision of a continuous supply of timber from the national forests. The livelihood of many small communities are dependent upon the management practices instituted on the surrounding national forest lands. Changes in Forest Service management policy can have a significant impact upon many factors influencing economic growth and change at the local level. In the following section those factors affecting regional growth and change are examined.

The Economics of Regional Growth

Regional economic growth and change is influenced by many factors. Expansion in economic activity can be caused by an increase in final demand for a region's exports, by an increase in the availability of production inputs, or by an expansion in the local infrastructure. These and many other supply and demand factors interact

to provide the means by which regional growth and development occur. Perloff, et al., [1960] cite several factors which they identify as being "central to such growth" [p. 63]. These "change initiating" factors include (a) technology, (b) natural resources, (c) population and labor force, (d) changes in consumer tastes and preferences, and (e) important institutional changes such as those resulting from shifts in governmental policy [Perloff, et al., p. 63]. According to Hoover [1971], "regional activity requires both inputs and a market for outputs, and it does not make sense to argue that either supply or demand is the sole determinant of growth" [p. 221].

Permissive Factors of Growth

Lane [1966] breaks down these "change-initiating" factors into two general groupings: implemental factors (demand) and permissive factors (supply). The permissive factors constitute a region's supply of human, natural, and capital resources. Lane emphasizes that "the ability of a region to grow depends upon its ability to increase the stock of these resources" [p. 345]. He argues that the supply of a region's permissive factors determines the area's potential for growth while the presence of implemental factors is required for actual growth.

Figure 2 provides an illustration of the relationship between a region's supply of permissive factors and the physical ability of the region to grow. The lines AB and CD represent production possibilities curves where each curve denotes a different supply level of permissive factors. Movement along the possibilities curve is motivated by a change in the level of export demand. If final demand increases (a movement from a to b), exports will increase at the ex-

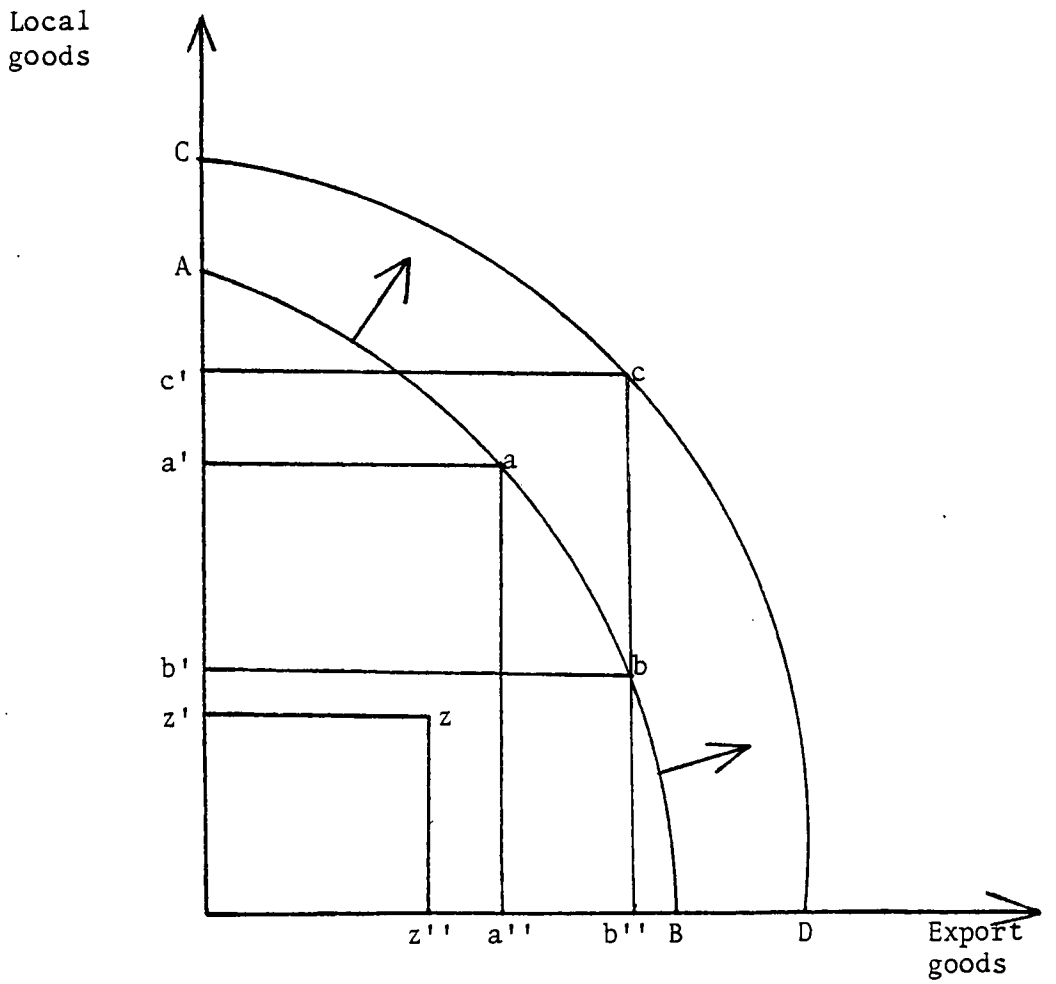

Figure 2. Production Possibilities Curve for a Regional Economy.

pense of a decline in the availability of local goods. "So long as the supply of the region's permissive ingredients is fixed, the economy can only move along the curve in response to changes in demand" [Lane, p. 345].

In order for the regional economy to increase its production of both export goods and local goods (a movement from AB to CD) it must increase its supply of permissive factors. If, however, the region's permissive factors are not fully employed (e.g., point z), an increase in these factors will not necessarily guarantee an increase in the regional production of goods and services. Given that these factors of production are fully employed, an increase in factor availability will be a necessary but not a sufficient condition for regional growth. There must be an adequate level of exogenous demand to employ those new factors of production in order to provide a sufficient condition for growth. Similarly, without an increase in the supply of primary inputs, an increase in final demand will not be a sufficient condition for regional growth.

Structural Linkages in the Regional Economy

In the previous section it was determined that regional economic activity requires both an adequate supply of production inputs and an export market for regional outputs. Demand factors emphasize backward linkages while supply factors emphasize forward linkages within the economy. These linkages are indicators of vertical relationships within the economic structure of the region.

Vertical relationships usually imply a mutual attractiveness among business activities. The presence of one type of activity

enhances the ability of the region to attract other related activities to the area. A backward linkage usually implies an attractiveness to a supplying activity. An increase in the level of output of a firm with a relatively high backward linkage will have a greater impact upon the economy than will a change in the output level of a firm with a relatively lower backward linkage. Those sectors of the economy most significantly impacted will be those firms which directly supply the sector experiencing change.[10/] The residentiary activities in a region are most likely to be stimulated by an increase in the level of regional employment and income and, thus, are usually the recipients of backward linkage effects [Hoover 1971, p. 216].[11/]

Forward linkages, on the other hand, usually imply an atractiveness to those firms which are locationally sensitive to the supply of inputs. For example, the availability of a supply of wood chips is an important determinant in the location of a paper mill. Forward linkages are also important in terms of their agglomeration economies. The availability of a local supply of support services is an important locational determinant for many types of industry. Hoover writes that the "importance of a good local supply of business services for regional growth, and particularly for the establishment of new lines

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10/ However, where households are considered endogenous to the local economy in a regional input-output model, the direct and indirect impacts resulting from a change in the output level of a given sector may be relatively greater in the household sector than in some other industry that directly supplies the sector of change.

11/ Hoover [1971] defines residentiary activities as "including nearly all retail and most wholesale trade, most consumer and business services, local government services, public utilities, construction, and the manufacturing of such perishable or bulky products as ice cream, bread, newspapers, soft drinks, gravel, and cement blocks" [p. 215].

of activity in a region, has become increasingly recognized in recent years" [p. 216]. An increase in the level of output in a firm with a relatively high forward linkage will have a greater impact on the regional economy than will a similar increase in a firm with a lower forward linkage. Those firms most directly impacted will be those firms who purchase (locally) the output of the changing sector.

There are also other types of structural relationships which exist in a regional economy. Horizontal relationships usually imply a mutual replusion among business activities. This will usually occur where differing activities compete for scarce local resources. An example of this relationship would be the rivalry between commercial timber and dispersed recreation activities for the use of a local forest resource.

A complementary relationship develops where firms marketing complementary or comparable goods situate together so as to provide the public with a variety of offerings. Typical of this sort of relationship is the shopping center which offers a wide variety of consumer goods and services. Complementary relationships also develop where a firm provides several products.

> "Many activities (perhaps most) turn out not one but several products, those of least importance or value being called by-products. A regional activity that furnishes a market for one of these by-products helps the supplying activity, and this can make the supplier's other outputs more easily or cheaply available to some third activity which uses them. All three of the activities are then in a situation of mutual assistance and attraction" [Hoover 1971, p. 218].

In each of these instances a mutual locational attractiveness is implied among firms.

The presence of these relationships (most notably vertical and complementary associations) indicates that there is a degree of interdependence among the various activities within the regional economy. In particular, changes in the level of outputs of firms with vertical linkages will have cumulative effects throughout the region. These linkages provide the means by which economic change is transmitted from one regional activity to another. The impetus for this change may originate in activities exogenous to the regional economy or within the local infrastructure itself.

Regional growth, as outlined in the previous section, is motivated by changes in supply and demand factors. A change in the final demand for one sector's output will affect the entire economy primarily by means of backward linkages. The producing firm will require an increase in its primary inputs and in those inputs purchased from the regional economy. In turn, sales in the supplying sectors will increase and they, too, will require additional inputs. The reverberations will continue until these incremental changes have leaked out of the economy. Similarly, an exogenous change in a firm's primary input supply will also have cumulative effects within the economy. These changes move through the economy primarily by means of the sector's forward linkages. An increase in primary input supply will allow an increase in the firm's sales to intermediate as well as to final demand.[12/] The increased availability of inputs to the purchasing firms will, in turn, allow them to increase the level of their output. As in the case of final demand changes, these reverberations

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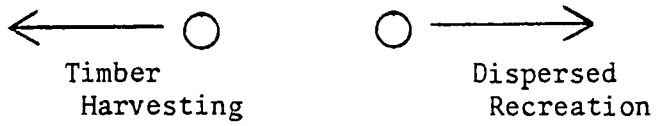
12/ Intermediate sales refer to those outputs purchased within the local economy.

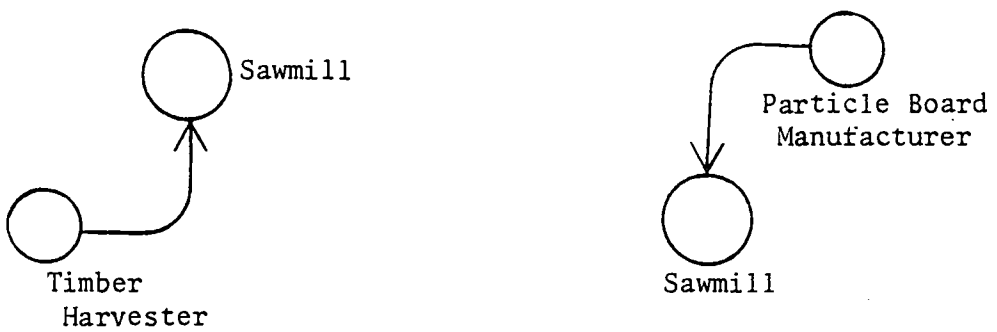
I. Horizontal Relationships (mutual replusion)



II. Vertical Relationships (mutual attraction)

a) Forward

b) Backward



III. Complementary Relationships

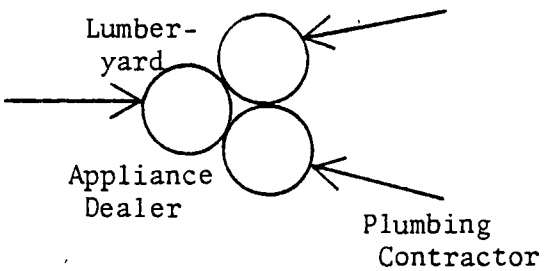


Figure 3. Structural Relationships Between Timber-Related Activities.

will continue until the incremental changes have leaked out of the economy.

The means by which changes in the output levels of various sectors are transmitted to the entire economy have been examined above, as have those factors which cause these changes to occur. It is the intent of the next section to examine the means by which the Forest Service affects regional economic activity vis-a-vis these structural changes.

The Ability of the Forest Service to Affect Regional Growth

Demand Stimulus

Because a portion of Forest Service operating expenditures are made within the management region, the agency develops backward linkages with the local economy. Any change in the level of regional expenditures made by the Forest Service will have reverberations throughout the local community. The level of appropriations made to the regional and local (forest-level) agencies is determined by national and agency priorities. Any change in the level of these funds could be used to initiate new programs or could be applied to existing programs [Darr and Fight 1974, pp. 19-20].

In a study on the economic impacts of a change in the timber resource base of Douglas County [Darr and Fight 1974] interpreted a change in Forest Service appropriations as an exogenous change in final demand. They used the Douglas County input-output model developed by Youmans, et al. [1973], to trace the impact of a $100,000 change in final demand (budget) for the Forest Service appropriations

sector. Those sectors most heavily impacted by this change in operating expenditures were households, wholesale and retail trade, and construction. The Darr and Fight study did not address the extent to which the Forest Service willfully attempts to influence local economic activity via changes in the level of regional operating expenditures. It may be that the ability of the Forest Service to affect significant changes in regional economic growth by means of a budgetary demand stimulus is relatively weak.[13/]

Supply Stimulus

While there may be some question as to the ability of the Forest Service to provide a demand stimulus to regional growth by means of a change in local operating expenditures, its ability to provide a supply stimulus to a timber dependent region seems more evident. Because of its control over commercial timber sales and harvest, the Forest Service is a 'seller' of primary inputs to local timber and wood products industries. It thereby develops forward linkages with the regional economy. The impact of a change in the availability of these timber supplies can be traced through the local economy by means of these forward linkages. In this type of analysis, the availability

13/ In most instances, studies which have examined the impact of a demand stimulus on a timber-dependent economy have largely analyzed the affect of a change in the final demand for timber-related products. These changes are usually analyzed vis-a-vis the timber and wood products sectors rather than by means of the local Forest Service sector. Haigh and Krutilla [1980] argue that changes in the demand for timber products is a demand phenomenon which is entirely out of the control of the Forest Service. For studies analyzing the impact of a change in demand for timber products see, Obermiller, F.W. [1980], "The Local Costs of Public Land Use Restrictions;" and Bromley, D.W., et al. [1968], "Effects of Selected Changes in Federal Land Use On A Rural Economy."

of raw materials, rather than the presence of a sufficient level of final demand for regional exports, is seen as the constraint to growth.

Several studies have examined the impact upon the local economy of an increase in the availability of commercial timber from national forest land. Schallau, et al. [1969], used economic base analysis to determine the level of timber-dependency in 15 growth centers located throughout the Douglas-Fir region.[14/] The percentage of an area's excess employment associated with timber-related industries was used as an indicator of the region's timber-dependency.[15/] An analysis then was made of the impact upon employment and population of a 20 percent increase in available Forest Service timber supply. The study found that changes were not distributed uniformly among growth centers. In highly timber-dependent areas with relatively weaker ties to larger regional growth centers, an increase in available timber supply did not guarantee subsequent increases in area employment and population levels.

Bromley, et al. [1968], examined the affects of an increase in the allowable cut of federally-owned timber upon local resource users in Grant County, Oregon. The impacts were traced through the local economy by means of an input-output demand model. Changes in allowable cut were interpreted as corresponding to changes in the value

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[14/] These growth centers were defined as those shopping and commuting zones delineated by local labor markets and service areas. They were typically the largest and most rapidly growing citieis in the region.

[15/] An industry was designated as having excess employment if its share of regional workers was in excess of the national share in that industry. Any share above the national percentage was considered to be working for the export market and therefore was part of the region's economic base.

of final demand for timber products. Rather than viewing the local economy as being driven by a supply stimulus, the model was driven by extrapolated changes in export demand. If forward linkages within the local economy exist, an analysis of this sort would err in its estimate of the impact of a change in timber supplies on the output level of timber and timber-related industries.

Darr and Fight [1974] also used an input-output model to examine the impact of changes in federal resource availability upon a small, timber-based economy. In their study, the Forest Service and the Bureau of Land Management sales sectors were considered as elements of the processing sector.[16/] A reduction in available federal timber was treated as a proportional reduction in the purchase of this timber by the local wood products sector. Technical coefficients were adjusted to account for the implied change in the purchase pattern. The new set of technical coefficients was used to calculate adjusted levels of output for the other sectors in the local economy. Net changes in the sales of each sector were summed together and divided by the direct change in the sales of the Forest Service sector. The resulting variable was termed a forward linked multiplier.[17/] This multiplier was much larger than the output (backward linked) multiplier obtained for the appropriations sector. The study concluded that the actual impacts upon the local economy resulting from changes

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16/ Each of these agencies was divided into two parts--an endogenous appropriations sector and an endogenous sales sector.

17/ For a more complete discussion of the procedure used see, Darr, David R. and Roger D. Fight, "Douglas County, Oregon: Potential Economic Impacts of a Changing Resource Base," U.S.D.A., Forest Service Research Paper, PNW-179, 1974, Appendix B.

in federal timber availability lay somewhere within the range suggested by the two multipliers.

Summary

Many timber-based economies are highly dependent upon the availability of public supplies of timber. For many years, maintaining the economic stability of these communities was a primary objective of Forest Service management. In recent years, however, the importance of this objective has become less clear. Nonetheless, local concerns regarding the importance of changes in management are still very evident.

Early legislation directed forest management decisions to consider the impact of changes in public land use upon dependent communities and local resource users. It was recognized that the stability of many small communities depended upon the availability of public timber harvest. Recently, the proposed policy for the economic and social analysis of Forest Service programs once again emphasized the need to evaluate the effects of changes in forest management policy upon affected regions and industries [Federal Register, pp. 22404-22413].

In past studies, changes in federal resource availability have been treated largely as changes in the level of final demand for timber products. This type of analysis, however, misrepresents the actual structural relationships which determine the incidence of economic change. Changes in primary input supply are likely to impact the economy differently than are changes in final demand. A methodology designed to directly treat federal timber availability

as a primary input constraint is developed in Chapter III.

CHAPTER III

RESEARCH DESIGN

The methods used in this study to measure the impact of changes in federal timber availability are described below. First, the theory of input-output analysis is briefly reviewed. Two of the input-output models used in the present study previously had been constructed using calendar year 1979 data. The third model had been developed from 1977 data. In order to present all three models in comparable prices, the 1977 Grant County model is modified to reflect price changes between 1977 and 1979. The procedure used to update the 1977 model is discussed in the second section of this chapter. The original structures of the three transactions tables are revised so as to present estimates of economic impacts in a similar format. The revision procedure is presented in the third section. The final section is devoted to the presentation of the revised input-output models used to analyze the regional economic impacts resulting from changes in resource availability.

Input-Output Analysis

The theory of input-output analysis was formalized in the 1930s by Wassily Leontief. According to Miernyk [1965, p. 4] significant contributions to the theory of interindustry economics were made much earlier by Francois Quesney [Tableau Economique 1758] and Leon Walras [Elements d' economie politique pure 1874]. Since that time input-output models have been used extensively as analytical tools to determine the impacts of economic changes at the national, regional,

and local levels. Richardson [1972] argues that the input-output model has two distinct functions:

> "First, it is a descriptive framework for showing the relationships between industries and sectors and between inputs and outputs. Second, given certain assumptions about the nature of production functions, it is an analytical tool for measuring the impact of autonomous disturbances on an economy's output and income" [p. 14].

The assumptions necessary to make the input-output model an analytical tool are presented below.

Assumptions of Input-Output Analysis

The basic assumptions of the input-output model are primarily concerned with the nature of the production function. Chenery and Clark outline three key postulates used in input-output analysis [1959, pp. 33-42]. The first states that each commodity is supplied by only one industry or sector of production within the economy. This assumption also requires that a single method be used to produce the commodity (i.e., all firms included within a sector must have the same production function). A second corollary of this assumption requires that each sector produce only one primary output. This effectively rules out the production of joint products.

The second assumption given by Chenery and Clark states that the inputs purchased by each sector must be solely a function of that sector's output. This postulate is usually restricted even further by requiring that a firm's inputs be a linear function of its output. The final assumption made is that the cumulative effect of carrying on several types of production is the sum of the separate

effects. This assumption, which rules out external economies and diseconomies, is guaranteed by a linear production function where returns to scale are constant.

Linearity in the production process is usually assumed for purposes of mathematical convenience. Henderson and Quandt define a linear production process as "one in which one or more outputs are produced in fixed proportions by the application of one or more inputs in fixed proportions" [1980, p. 120]. Chenery and Clark [1959] argue that the assumption of a fixed proportions production function is a radical departure from more traditional postulates of the production function. There are four implications which result when fixed input ratios are assumed [Chemery and Clark 1959, pp. 156-157]:

i) It is implied that all inputs are uniformly affected by a change in the scale of production. Distinctions between the long and the short run are ignored.[1/]

ii) It is assumed that industries can be classified so as to eliminate multi-product industries whose input structures would be affected by changes in the product mix of their output.

1/ Ferguson [1969] defines the short run as that period of time during which the quantity of one or more inputs used in the production process cannot be changed. These inputs are than called 'fixed' inputs. The long run is defined as that period of time during which all inputs are variable. Definitions become circular, however, because a 'fixed' input is usually defined as one whose quantity cannot be changed in the short run. "It is recognized that a short run may not exist; yet to act as though it exists creates a convenient analytical fiction that is fully justified by the mathematical processes used to define it" [p. 7]. Input-output analysis usually assumes that inputs remain fixed for a period at least as long as the planning horizon.

iii) It is implied that substitutions among inputs due to changes in relative prices or availabilities are of negligible importance.[2/]

iv) Finally, it is implied that technological changes in an industry's input structure are sufficiently rare and slow that they can be either disregarded or adjusted for a simple fashion.

Chenery and Clark conclude that the assumption of fixed input ratios can be taken only as a first approximation to the more complex production functions found in the real world. The critical question is to determine whether projections made vis-a-vis the input-output model are within an acceptable range of error.

Developing the Input-Output Model

The basic element of the input-output model is the transactions table (Figure 4). This table describes the sales and purchase patterns of industries located within the economy. Industry outputs are read across the rows; inputs are read down the columns. Each cell in the table represents the value of purchases made by (column) sector j from (row) sector i. The total value of purchases made by an industry is equivalent to the total value of its sales.[3/]

[2/] Silberberg [1978] notes that no substitution among factors is worthwhile under a fixed-coefficient production function. The marginal product of a factor whose use is increased is equal to zero unless all other factors are increased in the same proportion.

[3/] Silberberg [1980] states that in the absence of economies of scale (production functions homogeneous to degree one), total payments will eactly equal total product. This is a direct result of Euler's theorem.

Purchasing Sectors / Selling Sectors	Intermediate sectors, (j = 1, ..., n)			(Total Intermediate Sales)	Final Demand	Total Sales
Intermediate sectors, (i = 1, ..., n)	x_{11}	x_{1j}	x_{1n}	W_1	Y_1	X_1
	x_{i1}	x_{ij}	x_{ij}	W_i	Y_i	X_i
	x_{n1}	x_{nj}	x_{nn}	W_n	Y_n	X_n
(Total Intermediate purchases)	U_1	U_j	U_n	$(\Sigma U_j = \Sigma W_i)$		
Primary Inputs	V_1	V_j	V_n			ΣV_j
Total Purchases	X_1	X_j	X_n		ΣY_i	GTO $(\Sigma X_i = \Sigma X_j)$

Figure 4. Generalized Input-Output Transactions Table.

The upper left quadrant of the transactions table contains the processing sectors. This portion of the table identifies the transactions among industries which are endogenous to the economy being modelled. The x_{ij}'s show the value of the purchase of commodity i made by sector j. The total value of a sector's intermediate purchases is given by U_j while the total value of a sector's intermediate sales is given by W_i.

The remaining sectors of the transactions table are usually identified as either final demand sectors or as primary input sectors. The final demand columns show the value of sales made by local industries to firms and households located outside of the area of study. Changes in the value of regional sales to final demand is an important factor in regional economic growth and change. The primary input rows record the value of the local economy's purchase of inputs not available from the processing sector. Changes in the availability of these inputs is also an important factor in regional economic growth. Generally, no transactions are recorded in the lower right quadrant of the table. The exception is capital input purchases made from industries and households located outside of the local economy.

The total value of an industry's sales, X_i, is equal to the sum of its intermediate sales and its sales to final demand. This can be written as:

$$X_i = \sum_{j=1}^{n} x_{ij} + Y_i = W_i + Y_i, \qquad (1)$$

where

n = the number of endogenous sectors.

Similarly, the total value of an industry's purchases, X_j, is equal to the sum of its intermediate purchases and its purchase of primary inputs. This can be written as:

$$X_j = \sum_{i=1}^{n} x_{ij} + V_j = U_j + V_j. \tag{2}$$

From the transactions matrix, a table of direct coefficients can be calculated. These coefficients describe the proportion of industry j's inputs purchased from industry i. These coefficients are determined by dividing the value of a sector's purchase of a particular commodity by the value of its total purchases where:

$$a_{ij} = x_{ij}/X_j. \tag{3}$$

In a closed economy (no imports or exports) these coefficients can be considered technical coefficients. In an open economy, however, all the technical requirements of a sector are not necessarily purchased within the local economy [Carroll 1980]. In these instances, the direct coefficients will reflect not only a sector's technical requirements but also the trading pattern developed within the local economy. Trading patterns rather than technical requirements are relatively more important in explaining local industry purchase patterns in the regional input-output models used in this study.

The table of direct coefficients, often referred to as the A-matrix, shows the direct linkage between a given industry and those industries from which it makes its purchases. In order to determine the direct linkages between the industry and all other industries within the economy it is necessary to calculate a table of direct and indirect coefficients. This table can be derived in the following

manner:

Recall Equations (1) and (2) where:

$$X_i = \sum_{j=1}^{n} x_{ij} + Y_i$$

and

$$X_j = \sum_{i=1}^{n} x_{ij} + V_j.$$

Given that

$$a_{ij} = x_{ij}/X_j,$$

then

$$x_{ij} = a_{ij}X_j. \tag{4}$$

Now, substitute Equation (4) into Equation (1):

$$X_i = \sum_{j=1}^{n} a_{ij}X_j + Y_i. \tag{5}$$

If,

$$X_i = X_j \quad \text{for } i,j = 1, \ldots, n$$

then

$$X_i = \sum_{j=1}^{n} a_{ij}X_i + Y_i. \tag{6}$$

Now, convert Equation (6) into matrix form where:

X = a vector of industry total sales (X_i),

A = a matrix of direct coefficients (a_{ij}),

Y = a vector of industry final demand (Y_i)

so that Equation (6) becomes

$$X = A X + Y. \tag{7}$$

Solve for X:

$$X - A X = Y \tag{8}$$

$$(I - A)X = Y \tag{9}$$

$$X = (I - A)^{-1}Y \tag{10}$$

The $(I - A)^{-1}$ matrix, sometimes called the C-matrix, gives the set of direct and indirect coefficients for the local economy. The C-matrix can be used to determine the effect a change in demand will have upon total output within the local economy.

In traditional applications, input-output analysis has used the C-matrix as derived above to analyze the manner in which changes in the final demand or total output levels of a given industry will impact the entire economy. This form of the C-matrix has also been used to determine impacts caused by a change in primary resource availability. However, if forward linkages exist within the local economy, then use of the traditional form of the C-matrix will not adequately describe the initial impact upon the local economy of changes in primary input supply constraints. In order to more accurately describe the changes caused by shifts in primary input availability, an input-output supply model is developed subsequently. A discussion of the procedure used to update the 1977 Grant County input-output model precedes derivation of the input-output supply models.

Updating the Grant County Model

The direct coefficients obtained from the input-output model reflect the trading (purchasing) patterns present in the local economy at the time it is modelled. Miernyk [1965] argues that forecasts made using these coefficients should be limited to relatively short-term projections because the static input-output model assumes no change occurs in the direct coefficients. Studies indicate that these coefficients do change over time and that "the longer the time the greater the change" [Carroll 1980, p. 12].

Changes in these coefficients have been hypothesized to occur for several reasons. First, a change in technology will directly affect an industry's production function. This, in turn, will cause the input requirements of the industry to change. Second, a change in an industry's trading patterns will alter the related direct coefficients. As a region becomes more developed an industry may purchase more of its input requirements from the processing sector thereby increasing backward linkages with the local economy. Third, a change in the product mix within a sector will affect the sector's purchasing pattern. One of the basic input-output assumptions is that each sector can be described by a single production function. In reality, each sector is made up of a group of firms producing various outputs with a variety of production functions. A relative increase in the size of one firm will cause the input requirements of the sector to change. The more highly aggregated the input-output model, the more important this problem becomes. Finally, a change in the relative price of competitive inputs will cause a firm to alter its purchasing pattern of goods and services. If a competitive pro-

duct becomes relatively less expensive than the product currently being used, one would expect a firm to purchase the commodity that is now less expensive.

The length of time after which the direct coefficients are expected to become unstable has been predicted to vary from one to ten years. Tiebout [1957] advised against using a regional input-output model for any form of analysis beyond the year for which the model was constructed [Carroll 1980, p. 10]. Beyers [1972] found that the coefficients obtained from the 1963 Washington State model had changed after four years.[4/] Carroll [1980] tested the stability of the Clatsop County coefficients after nine years and found them to be outdated.

Several methods of updating an input-output model have been developed.[5/] The effectiveness of these methods in developing reliable coefficients has varied. Three of these techniques have been used relatively more extensively than the others. Two of these techniques are described briefly while the third, the procedure used in this analysis, is described in detail.

RAS Updating Technique

The RAS updating technique was developed by Stone and Brown in 1962. They hypothesized that changes in the input-output coefficients over time were due to three factors: (a) a change in prices, (b) sub-

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[4/] Conway [1975] also concludes that the 1963 Washington State coefficients became outdated after four years. He argues, however, that they still provide good approximations of the business relationships within the economy.

[5/] For a discussion of these techniques see Carroll [1980].

stitution of products, and (c) a change in the degree of fabrication applied by any sector to its production process [Czamanski and Malizia 1969, p. 65]. Price changes are assumed to occur uniformly across the rows of the direct coefficients matrix. Each row is multiplied by a vector of price ratios reflecting changes in the average price of sector output between the base year and the update year.

Product substitution is hypothesized to occur along the rows of the A-matrix. Substitution effects account for changes in the sales pattern of a sector over time. The row adjuster is calculated by dividing the proportion of a sector's intermediate sales in the update year by the proportion of a sector's intermediate sales in the base year.

It is hypothesized that a sector's degree of fabrication will be reflected in the industry's purchasing pattern. The fabrication effects are adjusted for by multiplying each column of the A-matrix by a column adjuster. The adjuster is calculated by dividing the proportion of a sector's intermediate purchases in the update year by the proportion of a sector's intermediate purchases in the base year. Each of the adjustment procedures affects all non-zero coefficients along the rows and columns proportionately.

The updated matrix must be consistent with control values calculated for the update year. The control values include (1) the total output for each sector, (2) the intermediate output for each sector, and (3) the intermediate input for each sector. Only the original matrix of direct coefficients is known; the control values must be estimated from secondary data. The accuracy of the update depends upon the accuracy of the control values as well as upon the assump-

tions underlying the distributional impacts of price, product substitution, and fabrication changes.

Best Practice Updating Technique

This method calls for identification of a subsample of the 'best practice' firms in each sector. The major assumption of this technique is that these 'best practice' firms are technologically more advanced than the average firm within the sector. The input structure of these firms is expected to represent those of the average firm at some time in the future.

Miernyk [1970] has developed four ratios which can be used to identify the best practice firms in each sector. These indicators include the ratio of employment to total gross output, the ratio of wages to total gross output, the ratio of profits to total gross output, and the ratio of depreciation to total gross output. These ratios are used in combinations with each other to identify those firms which can be regarded as the best practice firms for each sector. For example, a desirable ratio combination might be a low employment and a high wage ratio along with a relatively high depreciation ratio. If this combination is also characterized by a high profit ratio then the firm could probably be regarded as a best practice firm [Miernyk 1970, p. 22].

After a subsample of firms is selected, a new table of input coefficients is constructed. From this a new inverse matrix can be computed. It is necessary to determine the time interval that would be needed for the best practice coefficients to become average coefficients. If the update year is equal to this estimated time inter-

val then no further adjustments are necessary. If not, then further adjustments must be made by means of linear extrapolation or interpolation. In Miernyk's 1970 study the necessary time interval was estimated to be ten years. This technique is able to identify the probable direction of important technological trends within a sector. However, it is unable to identify business trading patterns which are important in small regional economies [Carroll 1980, p. 19].

Relative Price Updating

The method selected to recalculate the Grant County model was adapted from a 1974 article by Moses dealing with price relationships in interindustry models. Moses distinguishes two sets of input-output coefficients: (1) the set of a_{ij}'s which he identifies as value coefficients, and (2) the set of q_{ij}'s which he calls physical unit coefficients. He argues that input-output studies have accepted the a_{ij}'s as substitutes for the q_{ij}'s. The assumption of short-run stability which has been assigned to the value coefficients is more properly a function of the physical unit coefficients.

The physical unit coefficients can be derived in the following manner. Recall Equation (3) where

$$a_{ij} = x_{ij}/X_j.$$

Let

$$X_j = Q_j P_j, \tag{11}$$

and

$$x_{ij} = q_{ij}(Q_j P_i),^{6/} \tag{12}$$

where

q_{ij} = physical unit coefficient,

Q_j = physical output of industry j,

P_i = price per unit of the i^{th} output,

P_j = price per unit of the j^{th} output.

Substitute Equations (11) and (12) into Equation (3) so that:

$$a_{ij} = {}^{x}ij/X_j = {}^{q}ij^{Q}j^{P}i/Q_jP_j,$$

6/ A fixed proportions production function can be described by a set of coefficients which give the quantities of inputs necessary to produce one unit of output [Henderson and Quandt 1980]. For any specified output level a unique input level can be determined. Moses' input requirement equation can be derived as follows:

$$r_{ij} = q_{ij}Q_j \tag{i}$$

where,

r_{ij} = input of commodity i required by industry j to produce Q_j

q_{ij}, Q_j are defined as above.

Expressed in value terms, Equation (i) becomes:

$$p_i r_{ij} = q_{ij}Q_j p_i. \tag{ii}$$

Let

$$p_i r_{ij} = x_{ij} \tag{iii}$$

where x_{ij} equals total value of commodity i purchased by industry j. Equation (ii) now becomes:

$$x_{ij} = q_{ij}(Q_j p_i). \tag{iv}$$

or

$$a_{ij} = q_{ij}(P_i/P_j). \tag{13}$$

From Equation (13) it can be seen that each value coefficient is the product of the underlying physical input coefficient and a relative price. Although production functions are assumed to be of the fixed coefficient variety, any change in the relative price of goods over time, no matter how slight, will alter the magnitude of the value coefficients.

Relative prices can be used to update the matrix of direct coefficients in the following manner. Define:

$$a_{ij}(1) = q_{ij}(P_i(1)/P_j(1)) \tag{14}$$

$$a_{ij}(0) = q_{ij}(P_i(0)/P_j(0)), \tag{15}$$

where

$$q_{ij}(1) = q_{ij}(0) = q_{ij}.$$

Rewrite Equation (15) so that:

$$q_{ij} = a_{ij}(0)(P_j(0)/P_i(0)). \tag{16}$$

Now, substitute Equation (16) into Equation (14):

$$a_{ij}(1) = a_{ij}(0)(P_j(0)/P_i(0))(P_i(1)/P_j(1)). \tag{17}$$

Let

$$P' = (P_j(0)/P_i(0))(P_i(1)/P_j(1)),$$

so that

$$a_{ij}(1) = a_{ij}(0)P'. \tag{18}$$

Equation (18) defines the value coefficient in the update year in terms of the value coefficient in the base year and a relative price index. The physical unit coefficient is assumed to remain constant between the base year and the update year.

To update the Grant County model each row of the transactions table, T_i, was multiplied by an appropriate price index, Z_i. This procedure achieves results similar to those obtained when the value coefficients are multiplied directly by a relative price index. This can be shown by the following. Let:

$$x_{ij}(1) = x_{ij}(0)(P_i(1)/P_i(0)), \tag{19}$$

and

$$X_j(1) = X_j(0)(P_j(1)/P_j(0)), \tag{20}$$

so that

$$a_{ij}(1) = x_{ij}(1)/X_j(1),$$

or

$$a_{ij}(1) = x_{ij}(0)/X_j(0)(P_i(1)/P_j(1))(P_j(0)/P_i(0),$$

or

$$a_{ij}(1) = a_{ij}(0)P'. \tag{21}$$

The transactions table for the base year is given in Table 5. The

Table 5. Transactions Table, Grant County, 1977 ($1,000)*

Selling Sectors \ Purchasing Sectors	Timber Harvesting & Hauling	Dependent Ranching	Other Ranching	General Agriculture	Mining	Lumber/Wood Products Processing	Food Processing	Other Manufacturing & Processing	Transportation	Communication, Utilities	Finance, Insurance, & Real Estate	General Construction	Agricultural Services	Professional Services	Automotive Sales & Services	Lodging	Cafes & Taverns	Wholesale & Retail Services	Wholesale & Retail Trade	Households	City & County Government	Local Agencies of State & Federal Government	Capital Accumulation/Positive Inventory Change	Nonlocal Households	Nonlocal Government	Nonlocal Business	Total Sales
Timber Harvesting & Hauling	599	1	0	0	0	4,135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1,577	0	0	0	[illegible]
Dependent Ranching	2	0	0	0	0	233	10	0	0	0	0	0	0	0	0	0	0	0	0	292	0	0	980	18	13	2,882	[illegible]
Other Ranching	80	0	2	0	0	205	33	0	0	0	0	0	0	0	3	0	0	0	0	325	3	0	470	0	0	2,225	[illegible]
General Agriculture	0	43	169	45	0	121	0	0	0	0	0	0	0	2	0	0	55	0	25	128	0	166	21	40	0	469	[illegible]
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,153	[illegible]
Lumber/Wood Products Processing	0	22	2	0	26	1,644	0	0	0	0	0	40	0	----	1	0	0	----	0	264	4	4	3,131	0	0	32,719	[illegible]
Food Processing	0	6	7	0	0	0	0	0	1	0	0	0	0	0	----	----	0	5	127	364	0	0	6	19	0	500	[illegible]
Other Manufacturing & Processing	0	0	3	0	38	37	----	0	0	0	0	70	0	0	0	0	0	0	12	232	56	1	8	165	0	0	[illegible]
Transportation	8	10	2	18	26	453	3	14	1	61	2	12	29	6	28	0	2	1	110	40	65	7	79	17	0	21	[illegible]
Communication, Utilities	12	161	62	16	8	404	19	6	13	37	82	27	18	76	186	294	338	94	190	2,930	313	192	133	433	94	26	[illegible]
Finance, Insurance, & Real Estate	35	279	159	30	0	8	22	3	20	38	62	31	0	45	98	138	85	17	235	2,358	230	0	688	63	0	126	[illegible]
General Construction	0	13	39	23	0	30	0	6	3	2	0	165	0	6	4	1	27	25	33	369	401	12	943	101	0	233	[illegible]
Agricultural Services	42	594	106	8	0	18	0	0	----	0	0	0	0	----	2	0	0	0	0	116	1	322	264	0	0	0	[illegible]
Professional Services	36	130	53	10	0	104	8	3	3	8	12	8	18	47	28	11	20	2	11	1,511	107	38	180	263	245	500	[illegible]
Automotive Sales & Services	348	332	73	7	128	810	32	25	----	11	20	21	103	30	1,796	13	3	8	43	4,064	914	136	914	1,363	156	407	[illegible]
Lodging	0	8	3	----	0	10	0	0	1	1	1	0	0	0	0	0	0	3	17	153	6	10	2	156	467	146	[illegible]
Cafes & Taverns	6	8	5	----	0	23	5	0	1	2	11	0	0	----	4	0	4	3	10	379	1	8	349	376	10	101	[illegible]
Wholesale & Retail Services	0	25	13	0	0	10	8	0	2	6	22	11	0	37	87	23	28	18	10	710	73	8	98	12	62	19	[illegible]
Wholesale & Retail Trade	32	1,662	323	8	1,030	215	4	17	55	17	12	13	0	28	394	38	260	93	464	9,705	411	69	712	868	0	91	[illegible]
Households	2,816	2,927	730	233	319	11,133	288	138	269	1,090	1,798	675	221	1,892	1,770	273	453	783	2,066	763	2,706	3,335	473	199	7,110	178	[illegible]
City & County Government	3	473	137	80	3	463	12	12	33	313	10	28	8	8	67	83	27	22	116	2,163	953	----	131	6	2,150	0	[illegible]
Local Agencies of State & Federal Government	729	270	127	13	89	7,562	7	13	10	268	11	78	35	57	371	4	44	60	98	184	118	2	11	261	60	2,722	[illegible]
Depreciation/Negative Inventory Change	312	878	605	93	26	1,135	56	58	33	247	19	81	60	33	130	160	35	19	239	0	7	4	0	0	0	0	[illegible]
Nonlocal Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	100	0	37	9	0	0	0	[illegible]
Nonlocal Government	276	168	87	18	5	776	10	0	33	111	11	147	26	63	215	7	104	27	138	10,161	8	4,411	176	0	0	0	[illegible]
Nonlocal Business	916	1,407	205	637	3,258	8,446	742	332	791	3,046	2,771	1,027	1,307	811	6,636	228	238	130	12,440	8,881	1,006	2,653	2,611	0	0	0	[illegible]
TOTAL PURCHASES	6,310	8,432	2,538	1,260	5,153	38,227	1,236	623	2,228	6,166	4,844	2,632	1,805	3,187	11,820	1,273	1,510	1,256	16,427	46,022	7,033	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* ---- indicates a value of less than $500.

price indicies, Z_i, were selected from the detailed price index series published by the Bureau of Labor Statistics.[7] The price scalers were computed by dividing the 1979 average index selected for each industry group by the 1977 average index. These scalers are presented in Table 6. The value of the scalers ranged from 1.0099 for Local Government to 1.5046 for the Ranching sector.

After price adjustments were made across each row of the transactions table, the new matrix was adjusted to assure that total sales were equivalent to total purchases for each of the endogenous sectors.[8] Where total sales were not equal to total purchases, the former value was considered the more accurate estimate of sectoral output. Industry purchases were modified so that the total value of purchases was equal to the estimated value of total sales. Sectoral adjustments as incorporated in the updated Grant County transactions table are shown in Table 7. From this table the new A-matrix and, subsequently, the new C-matrix were calculated. Following reaggregation of the transactions tables, the updated Grant County tables were used in conjunction with the Baker and Morrow County models to develop the supply models.

Modification of the Original Models

Before supply models were developed for the three counties, the sectors of the original transactions table were reaggregated so as to permit the models to be presented in a similar format. A compari-

[7] The source of each scaler, Z_i, is given in Appendix D.

[8] Unless all relative prices change equally, there is no guarantee that the sum of the columns of the new transactions table will be equal to the sum of the rows (for the endogenous sectors).

Table 6. Vector of Price Multipliers, Z_i, for Grant County Update.

Sector	Z_i
Timber Harvesting & Hauling	1.2806
Ranching[a/]	1.5046
General Agriculture	1.0684
Mining[b/]	1.2261
Lumber/Wood Products Processing	1.2806
Food Processing	1.1956
Transportation, Communications, & Utilities[c/]	1.1372
Finance, Insurance, & Real Estate	1.2902
Construction[b/]	1.2269
Agricultural Services	1.1728
Professional Services	1.1920
Automotive Sales & Services	1.1954
Lodging	1.3144
Cafes & Taverns	1.2127
Wholesale & Retail Services	1.1583
Wholesale & Retail Trade	1.1929
Households	1.1677
City/County Government	1.0099
Local/State/Federal Agencies	1.2633
Depreciation/Negative Inventory Cahnge	1.2874
Nonlocal Households	1.1677
Nonlocal Government	1.2633
Nonlocal Business	1.2874

a/ The Dependent and Independent Ranching sectors were combined into one sector.

b/ The Other Manufacturing sector was divided among the Mining and Construction sectors.

c/ The Communications and Utilities and Transportation sectors were combined into one sector.

Table 7. Transactions Table, Grant County, 1979 ($1,000)*

Selling Sectors / Purchasing Sectors	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Subtotal - All Local Sectors	Nonlocal Households	Nonlocal Government	Nonlocal Business	Subtotal - All Nonlocal Sectors	Capital Accumulation/Positive Inventory Change	TOTAL SALES
Ranching	2	0	30	0	665	94	0	0	0	0	2	0	0	0	0	0	878	4	0	3,728	27	27	13,707	13,756	2,101	[illegible]
Other Agriculture	225	48	0	0	129	0	0	0	0	0	0	2	0	52	24	0	132	0	178	780	43	0	502	545	22	1,347
Food Processing	15	0	0	0	0	0	0	0	1	0	----	0	----	0	157	8	674	0	0	848	23	0	598	621	9	1,478
Agricultural Services	1,457	9	0	0	22	49	0	0	----	0	2	3	0	0	0	0	172	1	418	8,081	0	0	0	0	505	2,356
Lumber/Wood Products Processing	50	0	0	0	2,156	0	33	52	0	0	2	----	0	0	0	----	338	6	5	2,682	0	0	41,915	41,956	4,394	48,921
Timber Harvesting & Hauling	1	0	0	0	5,455	761	0	0	0	0	0	0	0	0	0	0	0	0	10	6,278	0	0	0	0	2,019	[illegible]
Mining	5	0	----	0	55	0	52	46	0	0	0	0	0	0	12	0	221	55	1	428	156	0	6,519	6,475	7	6,510
Construction	65	28	----	0	42	0	11	227	3	0	4	8	3	33	47	31	167	507	15	1,788	169	0	[illegible]	[illegible]	1,161	3,400
Communications, Transportation, & Utilities	266	36	26	54	1,199	20	35	49	149	96	244	94	573	160	541	109	3,312	455	226	7,327	728	112	53	693	168	8,464
Finance, Insurance, & Real Estate	565	39	29	0	5	92	1	65	101	40	128	56	196	110	303	21	5,045	292	0	6,154	82	0	167	249	[illegible]	[illegible]
Automotive Sales & Services	464	8	58	123	979	415	166	31	15	24	2,027	35	11	6	51	10	4,856	854	163	10,370	1,630	166	146	1,324	1,165	13,770
Professional Services	225	11	2	21	174	43	2	8	13	14	31	56	33	24	13	9	1,861	128	45	2,285	316	255	157	866	319	3,770
Lodging	16	----	0	0	13	0	0	0	1	3	0	0	0	0	16	1	203	5	13	269	599	646	192	1,359	5	1,671
Cafes & Taverns	15	----	6	0	30	7	0	0	3	14	5	----	0	5	12	6	702	2	10	817	456	12	123	591	424	1,832
Wholesale & Retail Trade	2,868	9	5	0	256	58	1,214	20	66	14	470	34	46	314	554	52	10,677	490	83	17,810	959	0	108	1,567	873	19,370
Wholesale & Retail Services	41	0	9	0	11	0	0	13	9	26	191	45	26	35	12	21	822	85	10	1,268	14	70	22	156	115	1,447
Households	5,195	236	316	236	13,651	3,464	140	1,050	1,397	2,200	1,857	2,179	545	535	1,885	883	507	2,406	6,447	[illegible]	735	6,299	106	[illegible]	352	[illegible]
Local Government	637	60	12	8	467	5	12	31	331	10	66	8	84	12	119	22	1,163	710	----	4,674	4	2,477	0	1,481	131	7,427
Local Agencies of State & Federal Government	513	19	9	19	3,055	284	101	102	550	14	468	72	5	56	124	76	233	402	4	[illegible]	310	7,276	3,456	[illegible]	14	[illegible]
Subtotal - All Local Sectors	12,787	523	487	482	38,357	6,281	2,378	1,709	2,457	3,493	3,192	2,566	1,101	2,340	3,885	1,747	31,838	6,403	7,567	117,511	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nonlocal Households	0	0	0	0	0	0	0	6	0	0	0	0	0	0	1	0	116	0	61	[illegible]	0	0	0	0	0	[illegible]
Nonlocal Government	527	25	15	33	7,761	1,048	16	188	132	14	772	28	0	136	199	34	13,715	10	5,574	29,103	0	0	0	0	[illegible]	[illegible]
Nonlocal Business	2,612	660	905	1,870	11,418	1,581	4,451	1,408	5,510	5,751	7,838	1,032	335	511	13,192	181	9,850	1,005	3,776	[illegible]	0	0	0	0	3,719	[illegible]
Subtotal - All Nonlocal Sectors	2,958	205	918	2,859	19,179	2,608	4,447	1,586	5,887	5,751	8,110	1,111	347	447	12,323	713	23,781	1,015	8,387	[illegible]	0	[illegible]	0	0	[illegible]	[illegible]
Depreciation/Negative Inventory Change	1,910	119	25	16	3,435	402	81	95	560	75	168	71	225	45	407	25	0	8	5	[illegible]	0	0	0	0	[illegible]	[illegible]
TOTAL PURCHASES	17,591	1,387	1,478	8,588	48,257	8,888	6,810	3,400	8,464	6,269	13,770	3,770	1,671	1,832	19,370	1,447	51,787	7,427	16,959	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* ---- indicates a value of less than $500.

son of the old and new sector specification schemes is presented in Table 8. Under the new scheme, each model contains 19 local economic sectors and five exogenous sectors. Three of the local sectors describe agricultural production (Ranching, General Agriculture, and Agricultural Services) while two refer to the production of timber and timber-related products (Lumber/Wood Products Processing and Timber Harvesting and Hauling). Other product groups described by the models include households, local government, service-related industries, and construction and manufacturing.

The original Baker County model contained 23 local sectors and five exogenous sectors. Several of the original sectors were combined so as to coincide with the new pattern of specification. Dependent Ranching and Other Ranching were combined to form the Ranching sector; Transportation and Communications and Utilities were added together to form a new sector by the same name; and the sectors representing the Forest Service and the Bureau of Land Management were combined with Local Agencies of State and Federal Government. Sectors were reaggregated simply by adding the sales and purchases of the original sectors together.

The original Morrow County model contained 20 local sectors and five exogenous sectors. In this model Irrigated Crop Production and Dryland Crop Production were combined to form the Agriculture sector; Maintenance and Repair was added to the Wholesale and Retail Services sector; and Transportation and Communications and Utilities were combined to form a new sector. Two of the sectors contained in the new model were not part of the original Morrow County model. Transactions by the Timber Harvesting and Hauling sector and the Mining

Table 8. Comparison of Old and New Sector Specification.

New Sectoralization	OLD SCHEME		
	Baker	Morrow	Grant
Ranching	Dependent Ranching Other Ranching	Animal Production	Dependent Ranching Other Ranching
General Agriculture	Other Agriculture	Irrigated Crop Production Dryland Crop Production	General Agriculture
Food Processing	Food Processing	Food Processing	Food Processing
Agricultural Services	Agricultural Services	Agricultural Services	Agricultural Services
Lumber/Wood Products Processing	Lumber/Wood Products Processing	Wood Products	Lumber/Wood Products Processing
Timber Harvesting & Hauling	Timber Harvesting & Hauling		Timber Harvesting & Hauliog
Mining	Mining and Mineral Processing		Mining
Construction	Construction	Construction	General Construction
Communication, Transportation, & Utilities	Transportation Communication & Utilities	Communication, Transportation & Utilities	Transportation Communication & Utilities
Finance, Insurance, & Real Estate	Finance, Insurance, & Real Estate	Finance, Insurance, & Real Estate	Finance, Insurance & Real Estate
Automotive Sales & Services	Automotive Sales & Services	Automotive Sales & Services	Automotive Sales & Services
Professional Services	Professional Services	Professional Services	Professional Services
Lodging	Lodging	Lodging	Lodging
Cafes & Taverns	Cafes & Taverns	Cafes & Taverns	Cafes & Taverns
Wholesale & Retail Trade	Wholesale & Retail Trade	Wholesale & Retail Trade	Wholesale & Retail Trade
Wholesale & Retail Services	Wholesale & Retail Services	Wholesale & Retail Services Maintenance & Repair	Wholesale & Retail Services
Households	Households	Households	Households
Local Government	Local Government	Port of Morrow Local Government	City & County Government
Local Agencies of State & Federal Government	Local Agencies of State & Federal Government Bureau of Land Management U.S. Forest Service	Local Agencies of State & Federal Government	Local State & Federal Agencies
Nonlocal Households	Nonlocal Households	Nonlocal Households	Nonlocal Households
Nonlocal Government	Nonlocal Government	Nonlocal Government	Nonlocal Government
Nonlocal Business	Nonlocal Business	Nonlocal Business	Nonlocal Business
Negative Invesntory Change	Negative Inventory Change	Negative Inventory Change	Depreciation/Negative Inventory Change
Depreciation	Depreciation	Oepreciation	

sector are represented by zeros in the appropriate rows and columns.

Twenty-two local sectors and four exogenous sectors were contained in the original Grant County model. The Transportation and Communications and Utilities sectors from the original model were combined to form a new sector while the Dependent Ranching and Other Ranching sectors were added together to become the Ranching sector. The four exogenous sectors were not modified to coincide with the five nonlocal sectors of the other two models.

The Input-Output Supply Model

Interindustry models largely have emphasized the importance of exogenous changes in final demand as a stimulus for changes in regional economic activity. Regional growth, however, is the result of the interaction of many complex factors. A healthy regional economy requires both the availability of an adequate supply of inputs as well as a market for the region's outputs. It does not make sense, therefore, to argue that either supply or demand is the sole determinant of growth. "The implication in locational terms is that market orientation and backward linkages are all important, with no attention being paid to input orientation or to forward or complementary linkage effects" [Hoover 1971, p. 234].

An input-output transactions table enables the flow of money payments to be traced backwards from purchaser to seller or, just as easily, money flows can be traced forward from seller to purchaser. The transactions table emphasizes neither supply nor demand. Giarratani [1978) notes that the transactions table is simply a neutral accounting array which equates the value of each sector's output with

the value of its inputs. Hoover [1971] argues that the input-output model in and of itself does not indicate whether changes in regional growth are initiated by changes in final demand, changes in the availability of primary inputs, or by changes within the intermediate sector. Indeed, Hoover notes that "we might reasonably infer that change can originate in any one of these three areas" [p. 234].

When using the conventional input-output demand model it is assumed that the supply of inputs is forthcoming without interruption, i.e., supply is perfectly elastic. In the same fashion, the supply model assumes that there is a perfectly elastic demand for regional goods and services produced for either intermediate or final demand. Regional activity is assumed dependent upon the availability of primary inputs rather than upon the final demand for goods and services.

Derivation of the Supply Model

The derivation of the supply model begins with the following identities:

$$x = X\,i + y, \tag{22}$$

and

$$x = X'\,i + v, \tag{23}$$

where

x = the vector of gross total output,

X = the matrix of intermediate transactions flows,

i = the unit vector,

y = the vector of final demand, and

v = the vector of primary inputs.

The demand model assumes that interindustry flows are a function of the output of the purchasing sector where

$$x_{ij} = a_{ij} X_j. \tag{24}$$

This implies that production relationships are determined by technical factors. According to Giarratani [1978] and Ghosh [1958] interindustry flows may also be assumed to be a function of the output of the producing sector

$$z_{ij} = \vec{a}_{ij} x_i, \tag{25}$$

where

$\vec{a}_{ij}$ = the output coefficient which indicates the direct sales from sector i to sector j.

The supply model implies that "production relationships are determined by the availability of inputs rather than by technical factors" [Giarratani 1978, p. 90].

The table of direct and indirect output coefficients can be derived in the following manner. Take the transpose of Equation (23)

$$x' = i' X + v'. \tag{26}$$

Next, convert Equation (25) to matrix form

$$i' X = x' \vec{A}, \tag{27}$$

where

$\vec{A}$ = the matrix of output coefficients.

Substitute Equation (27) into Equation (26)

$$x' = x' \vec{A} + v'. \tag{28}$$

Solve for gross output in terms of primary inputs

$$x' - x' \vec{A} = v', \tag{29}$$

$$x' = v' (I - A)^{-1}, \tag{30}$$

or

$$x' = v' \vec{Q}, \tag{31}$$

where

$\vec{Q}$ = the matrix of direct and indirect output coefficients which relate unit changes in primary inputs to changes in gross output.

Multipliers are calculated by summing the direct and indirect coefficients across each row where

$$\vec{Q}_i = \sum_{j=1}^{n} \vec{q}_{ij}. \tag{32}$$

The supply multipliers can be interpreted in a manner similar to the demand multipliers. Each multiplier describes the total output response by sector of the economy per unit increase in the primary inputs employed by sector i [Giarratani 1978].

Modification of the Conventional Input-Output Demand Model

The input-output supply model permits changes in industry sales to intermediate or final demand to be calculated directly [Giarratani,

p. 96]. Each element of the $\vec{Q}$-matrix represents the direct plus indirect change in the total output of sector j caused by a unit change in the level of primary inputs employed by sector i. If a sector has no forward linkages with the local economy (total output is exported), a change in primary input supply will yield an equivalent change in total industry output with no other sector of the economy being affected by that change.[9/] However, where an industry has developed forward linkages, total output in each sector of the local economy may be directly and/or indirectly affected by the change in the availability of primary inputs.

The resulting change in the value of total sales made by each industry can be factored into two components: (1) sales made to local businesses and households, and (2) sales made to final demand. Let

$$\Delta X = \langle FD \rangle \Delta X + \langle 1 - FD \rangle \Delta X \qquad (33)$$

$$\Delta\text{Total Sales} = \Delta\text{Final Demand Sales} + \Delta\text{Intermediate Sales}$$

and let

$$\langle FD \rangle + \langle 1 - FD \rangle = \langle 1 \rangle \qquad (34)$$

where

ΔX = the vector of total output change in sector j,

FD = the vector of the proportion of total output in sector j sold to final demand,

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[9/] The simplifying assumption is made that the value of primary input change is equal to the total value of output change. This assumption is expanded further in Chapter V.

1-FD = the vector of the proportion of total output in sector j sold to the local processing sector, and

$\langle\ \rangle$ = a diagonalized matrix.

Using Equations (33) and (34) the change in the value of total sales corresponding to a change in primary input availability can be factored directly into its two components. Recall Equation (31):

$$x' = v' \vec{Q},$$

or

$$\Delta x' = \Delta v' \vec{Q}. \tag{35}$$

Transpose Equation (35) so that

$$\Delta x = \vec{Q}' \Delta v. \tag{36}$$

Multiply each side of Equation (36) by $(\langle FD \rangle + \langle 1\text{-}FD \rangle)$

$$\langle FD \rangle \Delta x + \langle 1\text{-}FD \rangle \Delta x = \langle FD \rangle \vec{Q}'\Delta v + \langle 1\text{-}FD \rangle \vec{Q}'\Delta v,$$

or

$$\Delta x = \langle FD \rangle \vec{Q}'\Delta v + \langle 1\text{-}FD \rangle \vec{Q}'\Delta v. \tag{37}$$

The value of the regional impacts resulting from a change in the value of intermediate (local) sales made by area businesses and households can be calculated directly from the supply model (Equation (37)), where

$$\langle 1\text{-}FD \rangle \Delta x = \langle 1\text{-}FD \rangle \vec{Q}'\Delta v. \tag{38}$$

Further analysis, however, is necessary to calculate the economic im-

pacts resulting from the change in local industry sales to final demand. For example, an increase in the quantity of primary inputs available to the local wood products industry may cause sales by that sector and all other sectors of the economy to expand. A portion of the increased value of sales by each industry will be to final demand; while the remainder will be to intermediate demand.

The increase in final demand sales will cause the value of the affected industry's direct input requirements to increase. The induced level of sector purchases will directly or indirectly affect the output level of all industries in the local economy, via induced purchases. The resultant economic impacts can be calculated using the traditional input-output demand model.

In order to more accurately estimate the regional economic impacts resulting from a change in primary input availability the conventional input-output model is modified in the following manner. Recall from Equation (34) that

$$\langle FD \rangle \Delta x = \langle FD \rangle \hat{Q}' \Delta v,$$

or

$$\Delta y = \langle FD \rangle \Delta x = \langle FD \rangle \hat{Q}' \Delta v, \tag{39}$$

where

Δy = the vector of final demand sales for sector j.

Also, recall Equation (10):

$$X = (I - A)^{-1} Y,$$

or

$$\Delta X = C\,\Delta Y, \tag{40}$$

where

C = the matrix of direct and indirect output coefficients.

Equation (39) can now be substituted into Equation (40) so that:

$$\Delta X = C\langle FD\rangle \vec{Q}'\Delta v. \tag{41}$$

Equation (41) describes the impact on regional and sectoral output of a change in local industry sales to final demand where the change in export sales has been directly related to the change in primary input availability.

Summary

The regional economic impacts resulting from a change in available primary inputs can be estimated more accurately using a modified approach to the conventional method of demand-pull analysis. The input-output supply model can be used to calculate the impact of a change in primary inputs available to sector j on the total sales of all sectors of the local economy. Because of the network of forward linkages present within the regional economy, a change in primary inputs available to one sector may have a direct or indirect affect on all other sectors of the local economy. Changes in total sales can be factored into two components--sales to local industries and sales to final demand. Regional impacts resulting from the first component can be calculated directly from the supply model (Equation (38)). A modified version of the conventional input-output demand model is used to estimate the regional impacts associated with the change in

the value of local industry exports. Final demand sales may be affected not only in the industry of primary input change but in all sectors of the local economy.[10/] The resulting vector of direct and induced changes in final demand sales can be used in conjunction with the input-output demand model to determine the overall impact of the change in final demand sales caused by the change in primary input availability. The total change in regional and sectoral output is equal to the change in industry sales to the local processing sector (Equation (38)) plus the change in local industry output induced by the change in local sales to final demand (Equation (41)).[11/]

A portion of the increase in local industry output can be attributed to the supply-push affect of the change in primary input availability (Equation (37)). The remaining portion of the increase is caused by the demand-pull affect of the increase in local industry sales to final demand (Equation (41) minus Equation (39)). The modified approach to the conventional method of input-output analysis is able to account not only for backward linkages but also for forward linkages within the local economic structure; and thus more accurately and directly estimates the economic impacts of changes in the availability of primary inputs.

[10/] Recall that conventional analysis assumes that sales to final demand are affected only in the industry of primary input change.

[11/] The supply-induced change in final demand sales is included in this estimate.

CHAPTER IV

EMPIRICAL RESULTS

The descriptive and analytical results obtained with the modified input-output models are presented below. First, the local economies are described with emphasis placed upon the regional import and export of goods and services. Second, estimates of regional income and employment impacts resulting from changes in the availability of public timber are presented. Third, these estimates are compared to those obtained when economic impacts are evaluated by means of an input-output demand model. Finally, local timber dependency is calculated. This measure then is compared to the development of forward and backward linkages within the local economy.

Structure of the Baker County Economy

In Chapter II it was noted that the input-output model can be used as both a descriptive and as an analytical tool. The model describes the sales and purchases made by the various businesses, households, and government agencies in the local economy. This information can then be used to evaluate the strength of the forward and backward linkages existing among the various sectors of the economy. The structure of the Baker County economy is described below. Descriptions of the Grant County and Morrow County economies are presented in the following sections.

Total Output

In 1979 the total value of output in Baker County was over 463

million dollars. Approximately 55 percent of this, or 257 million dollars, can be attributed to purchases and sales among sectors of the local economy. The remaining 206 million dollars accounts for nonlocal purchases and sales, capital purchases (investment), depreciation, and inventory changes. The 1979 Baker County transactions table is contained in Appendix A. The table describes the trading patterns among the 19 local economic sectors. Imports and exports occur among local firms and three nonlocal sectors (nonlocal households, nonlocal government, nonlocal business). The remaining sectors describe inventory changes, depreciation, and capital goods sales.

Import purchases by local businesses were valued at nearly 189 million dollars. These imports accounted for nearly 41 percent of all goods and services purchased by Baker County. Export sales by local firms accounted for 170 million dollars in 1979. These sales represented approximately 37 percent of all sales made by Baker County firms. The value of import purchases exceeded the value of export sales leaving Baker County with a negative trade balance of 19 million dollars.

Sectoral Output

Table 9 shows the direct value of total output, imports, and exports for the various sectors of the Baker County economy. Households accounted for over 26 percent of the value of total county output. The service industries (sectors 9-16) generated approximately 34 percent of total output while nearly 17 percent of total county output originated in the agricultural and forest products sectors (1,

Table 9. Value of Total Output, Exports, and Imports Among Economic Sectors, Baker County, 1979.

Sector	Total Output		Import Purchases		Export Sales	
	Value ($1,000)	% of Total Output	Value ($1,000)	% of County Imports	Value ($1,000)	% of County Exports
1. Ranching	18,991	4.1	3,135	1.7	11,950	7.0
2. Other Agriculture	6,108	1.3	550	0.3	2,277	1.3
3. Food Processing	5,711	1.2	1,023	0.5	2,922	1.7
4. Agricultural Services	11,573	2.5	7,645	4.0	2,874	1.7
5. Lumber/Wood Products Processing	32,451	7.0	9,860	5.2	22,021	13.0
6. Timber Harvesting & Hauling	8,676	1.9	1,621	0.9	2,366	1.4
7. Mining	15,389	3.3	10,097	5.3	11,348	6.7
8. Construction	31,499	6.8	13,909	7.4	5,503	3.3
9. Communication, Transportation, & Utilities	27,068	5.8	16,661	8.8	8,932	5.3
10. Finance, Insurance, & Real Estate	23,953	5.2	15,676	8.3	4,810	2.8
11. Automotive Sales & Services	22,660	4.9	13,010	6.9	5,446	3.2
12. Professional Services	8,414	1.8	2,345	1.2	721	0.4
13. Lodging	2,103	0.5	283	0.2	1,559	0.9
14. Cafes & Taverns	7,874	1.7	1,882	1.0	5,242	3.1
15. Wholesale & Retail Trade	62,847	13.6	43,857	23.2	6,756	4.0
16. Wholesale & Retail Services	3,425	0.7	731	0.4	100	0.1
17. Households	120,839	26.1	23,654	12.5	34,251	20.1
18. Local Government	22,615	4.9	4,508	2.4	11,937	7.0
19. Local Agencies of State & Federal Government	30,915	6.7	18,430	9.8	28,936	17.0
COUNTY TOTAL	463,111	100.0	188,877	100.0	169,951	100.0

2, 4-6). Wholesale and retail trade was the leading import sector with over 23 percent of county imports being purchased by firms in this sector. Other leading importers included households, local agencies of state and federal government, communications, utilities, and transportation, and finance, insurance, and real estate. Leading county exporters included households, local agencies of state and federal government, and lumber and wood products processing. These three sectors accounted for over 50 percent of total county exports.

Net trade balances can indicate which types of economic activity bring relatively more income into the economy through export sales than they leak out through import purchases. The net trade balances for the various product groups within the Baker County economy are described in Table 10. The county as a whole shows a net trade deficit of 19 million dollars. This deficit can largely be attributed to the service industries. These sectors had a negative trade balance of nearly 61 million dollars in 1979. Local resource-based industries, on the other hand, showed a large, positive net trade balance. These results are indicative of small, relatively open, resource-based economies.

Summary

In summary, payments to local households in the form of wages, salaries, dividends, and profits accounted for over one-quarter of the total value of county output. Local households were also the leading county exporters, a reflection of substantial transfer payments from out-of-county sources to local residents. The natural resource-based industries were net exporters while the service related

Table 10. Net Trade Balances Among Sectors of the Baker County Economy, 1979.

Sector, by Product Group	Net Trade Balance (Exports-Imports) ($1,000)
Households (17)	10,597
Forest Products (5, 6)	12,906
Agriculture (1, 2, 4)	4,771
Services (9-16)	-60,879
Construction/Manufacturing (3, 7, 8)	- 5,256
Government (18, 19)	17,935
TOTAL - ALL LOCAL SECTORS	-18,926

industries were net importers of goods and services. Government agencies, which accounted for 12 percent of county output, were largely net exporters.

Structure of the Grant County Economy

Total Output

Gross total output in Grant County was approximately 226 million dollars in 1979. Purchases and sales among sectors of the local economy accounted for 118 million dollars or 52 percent of total output. The remaining 108 million dollars was distributed among imports and exports, investment, depreciation, and inventory changes. The sales and purchase patterns of the local economic sectors are contained in the 1979 Grant County transactions table reproduced in Appendix A. This table is the updated version described in Chapter III.

Import purchases, valued at nearly 103 million dollars, accounted for 45 percent of all goods and services purchased by households and businesses in Grant County. Inputs represented a slightly higher proportion of all purchases made in Grant County than they did in Baker County. Similarly, relatively more goods and services were exported from Grant County than from Baker County. Export sales were valued at nearly 94 million dollars. This represented 41 percent of all sales made by county firms, households, and units of government.

Sectoral Output

The direct value of total output, imports, and exports for the various sectors of the Grant County economy are presented in Table 11.

Table 11. Value of Total Output, Exports, and Imports Among Economic Sectors, Grant County, 1979.

Sector	Total Output		Import Purchases		Export Sales	
	Value ($1,000)	% of Total Output	Value ($1,000)	% of County Imports	Value ($1,000)	% of County Exports
1. Ranching	17,591	7.8	2,954	2.9	13,756	14.7
2. Other Agriculture	1,347	0.6	705	0.7	545	0.6
3. Food Processing	1,476	0.7	916	0.9	621	0.7
4. Agricultural Services	2,396	1.1	1,859	1.8	0	0
5. Lumber/Wood Products Processing	48,951	21.6	19,179	18.7	41,935	44.8
6. Timber Harvesting & Hauling	8,292	3.7	2,609	2.5	0	0
7. Mining	6,910	3.0	4,447	4.3	6,475	6.9
8. Construction	3,400	1.5	1,596	1.6	455	0.5
9. Communication, Transportation, & Utilities	8,484	3.7	5,667	5.5	893	1.0
10. Finance, Insurance, & Real Estate	6,269	2.8	3,751	3.6	249	0.3
11. Automotive Sales & Services	13,770	6.1	8,110	7.9	2,304	2.5
12. Professional Services	3,770	1.7	1,111	1.1	968	1.0
13. Lodging	1,671	0.7	342	0.3	1,399	1.5
14. Cafes & Taverns	1,832	0.8	447	0.4	591	0.6
15. Wholesale & Retail Trade	19,370	8.6	15,398	15.0	1,067	1.1
16. Wholesale & Retail Services	1,487	0.7	215	0.2	106	0.1
17. Households	54,799	24.2	23,161	22.5	8,740	9.3
18. Local Government	7,427	3.3	1,015	1.0	2,481	2.6
19. Local Agencies of State & Federal Government	16,959	7.4	9,367	9.1	11,042	11.8
COUNTY TOTAL	226,201	100.0	102,849	100.0	93,627	100.0

As in Baker County, households accounted for the largest portion of total county output. Total output in the timber-related sectors amounted to over 57 million dollars or 24 percent of total county output. Agricultural industries generated an additional output of 21 million dollars.

In addition to generating the largest percentage of total output, the household sector was also the leading county importer of goods and services. Over 22 percent of county imports were purchased by this sector. The lumber and wood products processing sector was also a large purchaser of nonlocal goods and services. Nearly 19 percent of county imports were purchased by this industry much of which was due to purchases of National Forest System stumpage--an import purchase from the federal government. The county's largest exporter of goods was the lumber and wood products processing sector. Almost 45 percent of all county exports were sold by this industry. Ranching and local agencies of state and federal government were also large exporters of goods and services. However, these sectors together were responsible for only 26 percent of county exports.

Import purchases exceed the value of export sales by nine million dollars. The net trade balances for the various economic sectors within the county are described in Table 12. Unlike Baker County, the household sector in Grant County shows a large net trade deficit. This sector purchases more from nonlocal sources than it earns through nonlocal employment, transfer payments, and income from nonlocal assets. The service industries were the only other sectors experiencing trade deficits. The resource-based industries were responsible for

Table 12. Net Trade Balance Among Sectors of the Grant County Economy, 1979.

Sector, by Product Group	Net Trade Balance (Exports-Imports) ($1,000)
Households (17)	-14,421
Forest Products (5, 6)	20,147
Agriculture (1, 2, 4)	8,783
Services (9-16)	-27,464
Construction/Manufacturing (3, 7, 8)	592
Government (18, 19)	3,141
TOTAL - ALL LOCAL SECTORS	- 9,222

nearly 90 percent of the county's positive trade balance. This can largely be attributed to the export of timber and timber-related products.

Summary

In 1979, total output in Grant County was less than one-half of that in Baker County. However, the value of output in the timber-related industries was nearly 40 percent greater in Grant County. Exports by this industry were the largest contributor to regional sales to final demand. Apart from payments to households, output in the forest product industries was nearly three times that in any other sector.

Structure of the Morrow County Economy

Total Output

The value of total Morrow County output was over 273 million dollars in 1979. Unlike the previous two counties, payments to households did not constitute the largest share of total county output. General agriculture produced output valued at well over 60 million dollars while payments to households were valued at 48 million dollars. Together these sectors produced nearly 40 percent of county output.

Approximately 36 percent of total output, or 99 million dollars, can be attributed to transactions among the local economic sectors. The remaining 64 percent represents nonlocal sales and purchases, investment, depreciation, and inventory changes. Imports constituted 58 percent of all purchases while exports represented 61 percent of all sales.

Sectoral Output

The value of total output, imports, and exports for the various sectors of the Morrow County economy are described in Table 13. Regional activity is largely dominated by the resource-based industries. Agriculture and forestry accounted for nearly 50 percent of total county output. The service industries generated less than 13 percent of total income within the county. General agriculture was responsible for one-third of county export sales while the wood products sector sold 19 percent of total exports. The total value of exports by the resource-based industries was in excess of 102 million dollars.

The food processing sector also played an important role in the economic activity of the county. This industry was the third largest producer of goods and services with output valued at 40 million dollars. Food processors sold over 20 percent of county exports. Imports by this industry were valued at 13 million dollars making this sector the county's fourth largest purchaser of nonlocal goods and services. The county's leading importer was general agriculture with households and wood products also purchasing large shares of county imports.

Unlike the previous two counties, Morrow County experienced a positive net trade balance in 1979. Again, this can largely be attributed to the dominant role of the resource-based activities. The net balances among the various sectors of the Morrow County economy are presented in Table 14. Households and the service industries showed net trade deficits while all other sectors had positive trade balances. Total county exports exceeded county imports by nine million dollars.

Table 13. Value of Total Output, Exports, and Imports Among Economic Sectors, Morrow County, 1979.

Sector	Total Output		Import Purchases		Export Sales	
	Value ($1,000)	% of Total Output	Value ($1,000)	% of County Imports	Value ($1,000)	% of County Exports
1. Ranching	10,577	3.9	5,557	3.5	10,215	6.1
2. Other Agriculture	60,592	22.2	36,931	23.5	55,444	33.3
3. Food Processing	39,583	14.5	21,077	13.4	35,455	21.3
4. Agricultural Services	15,037	5.5	11,945	7.6	5,452	3.3
5. Lumber/Wood Products Processing	35,919	13.1	22,200	14.1	31,591	19.0
6. Timber Harvesting & Hauling	0	----	0	----	0	----
7. Mining	0	----	0	----	0	----
8. Construction	6,817	2.5	5,308	3.4	3,167	1.9
9. Communication, Transportation, & Utilities	3,298	1.2	1,786	1.1	743	0.4
10. Finance, Insurance, & Real Estate	3,116	1.1	670	0.4	439	0.3
11. Automotive Sales & Services	5,692	2.1	3,690	2.4	1,107	0.7
12. Professional Services	1,434	0.5	559	0.4	197	0.1
13. Lodging	1,587	0.6	776	0.5	981	0.6
14. Cafes & Taverns	1,646	0.6	850	0.5	542	0.3
15. Wholesale & Retail Trade	14,181	5.2	11,594	7.4	1,064	0.6
16. Wholesale & Retail Services	948	0.3	379	0.2	178	0.1
17. Households	47,980	17.5	26,119	16.6	2,600	1.6
18. Local Government	7,636	2.8	2,806	1.8	3,468	2.1
19. Local Agencies of State & Federal Government	17,192	6.3	5,045	3.2	13,847	8.3
COUNTY TOTAL	273,235	100.0	157,292	100.0	166,490	100.0

Table 14. Net Trade Balance Among Sectors of the Morrow County Economy, 1979.

Sector, by Product Group	Net Trade Balance (Exports-Imports) ($1,000)
Households (17)	-23,519
Forest Products (5)	9,391
Agriculture (1, 2, 4)	16,678
Services (9-16)	-15,053
Construction/Manufacturing (3, 8)	12,237
Government (18, 19)	9,464
TOTAL - ALL LOCAL SECTORS	9,198

Comparing Local Economic Structures

Total output in Morrow County exceeded that of Grant County but was far less than that produced in Baker County. The resource-based industries (1, 2, 4-6) contributed relatively more to the value of total output in Morrow County than in either of the other counties. Approximately 45 percent of total output in Morrow County was generated by these industries. Agricultural crop production accounted for nearly one-half of the output value of the Morrow County resource industries. General agriculture is relatively less important in Grant and Baker Counties. The resource-based industries generated 35 percent of total Grant County output and only 17 percent of total Baker County output. However, in both counties the wood products sector contributed relatively more to the total output of the resource industries. Over 21 percent of total Grant County output was generated by the wood products industry while this sector was responsible for only seven percent of total Baker County output.

The relative share of income generated by the service industries in Baker County was nearly three times that generated in Morrow County. Similarly, the service industries in Grant County were responsible for over 30 percent of county income while the same sectors in Morrow County accounted for only 13 percent of total income. The Morrow County economy is relatively more open with respect to imports and exports than either of the other county economies examined in this study. Thus, direct and indirect linkages among the local economic sectors are relatively weaker than those among the local sectors of Baker and Grant County.

Output Multipliers

Input-output supply models as well as the conventional input-output demand models were developed for each of the counties examined in this study. From these models, sets of aggregate output multipliers were calculated. Two sets of multipliers were calculated for each county: (a) a set of supply multipliers reflecting the sales-induced or forward linked impacts on the local economy of a change in primary input availability, and (b) a set of demand multipliers reflecting the purchases-induced or backward linkage impacts on the local economy of a change in final demand sales. The output multipliers reflect the propensity of a region to import and export goods and services. An industry with a high demand multiplier relative to a similar industry in another region is assumed to import relatively less of its direct input requirements. Similarly, an industry with a high supply multiplier is assumed to export relatively less of its final product. The output multipliers for Baker, Morrow, and Grant County are described below.

Supply Multipliers

The supply multipliers for the various economic sectors of the three counties are contained in Table 15. In general, the supply multipliers for the resource-based industries are relatively lower than those for the service industries. The resource-based multipliers are lower because a large proportion of the output produced by these industries is sold to nonlocal firms. Sales made by the service industries are mainly to other firms within the county thereby generating more direct and indirect selling activity within the local

Table 15. Supply Multipliers for Local Economic Sectors, by County, 1979.

Sector	Baker County	Morrow County	Grant County
1. Ranching	1.2556	1.0276	1.1851
2. Other Agriculture	2.2262	1.0581	1.9394
3. Food Processing	2.0416	1.0709	2.4463
4. Agricultural Services	2.2105	1.5948	2.2019
5. Wood Products	1.0438	1.1602	1.0684
6. Timber Harvesting & Hauling	1.8939	(1.0000)	1.8877
7. Mining	1.3825	(1.0000)	1.1358
8. Construction	2.2475	1.6978	2.2147
9. Communication, Transportation, & Utilities	2.6064	2.3993	2.8326
10. Finance, Insurance, & Real Estate	2.6107	2.6399	2.8820
11. Autmotive Sales & Services	2.6074	2.6150	2.6760
12. Professional Services	3.1011	2.9162	2.5392
13. Lodging	1.6089	1.8077	1.3717
14. Cafes & Taverns	1.8141	2.5701	2.0612
15. Wholesale & Retail Trade	3.0791	2.8773	2.9234
16. Wholesale & Retail Services	3.3172	2.8441	3.0371
17. Households	2.4456	2.3539	2.4505
18. Local Government	1.9311	1.9645	2.3986
19. Local Agencies of State & Federal Government	1.1385	1.2721	1.5645

economy.

Demand Multipliers

Demand multipliers for the various local sectors of the county economies are presented in Table 16. The multipliers for Baker County generally are higher than those for either Morrow or Grant County. Again, this indicates that the economy in Baker County is relatively more 'closed' with respect to imports than are the economies in the other two regions. The multipliers in Morrow County are significantly lower than those in the other two counties, reflecting greater relative 'openness' with respect to import purchases.

Comarpsion of Supply and Demand Multipliers

The demand multipliers for the wood products and timber harvesting and hauling sectors are much larger than those obtained by means of the supply model. Apart from the agricultural services industry, the demand multipliers for the resource-based industries are significantly larger than the estimated supply multipliers (Table 17). This results primarily because the value of local purchases by the resource sectors exceeds the value of their local sales. The demand multipliers for the service industries, on the other hand, generally are much smaller than the corresponding supply multipliers. These industries tend to sell locally while purchasing nonlocally. The exception is the lodging sector which sells its services primarily to individuals residing outside the local area.

The demand multiplier is larger than the supply multiplier for the household sector only in Baker County. This would appear to

Table 16. Demand Multipliers for Local Economic Sectors, by County, 1979.

Sector	Baker County	Morrow County	Grant County
1. Ranching	2.6276	1.6483	2.2981
2. Other Agriculture	2.7333	1.4762	1.7871
3. Food Processing	3.0945	1.6201	1.6597
4. Agricultural Services	1.7623	1.2166	1.3679
5. Wood Products	2.1190	1.4574	2.1852
6. Timber Harvesting & Hauling	2.5646	(1.0000)	2.2895
7. Mining	1.7843	(1.0000)	1.5638
8. Construction	2.1925	1.3185	1.9926
9. Communication, Transportation, & Utilities	1.8161	1.4103	1.5894
10. Finance, Insurance, & Real Estate	1.8412	2.0351	1.7966
11. Automotive Sales & Services	1.8880	1.4726	1.7340
12. Professional Services	2.6868	1.7536	2.3704
13. Lodging	2.7052	1.5343	2.2370
14. Cafes & Taverns	2.7360	1.6383	2.3260
15. Wholesale & Retail Trade	1.6463	1.2839	1.3516
16. Wholesale & Retail Services	2.7390	1.9447	2.6444
17. Households	2.5760	1.6739	2.0150
18. Local Government	2.9620	1.9406	2.6972
19. Local Agencies of State & Federal Government	2.0427	2.1766	1.8754

Table 17. Comparison of Supply and Demand Multipliers for Selected Industries, by County.

Sector	Baker County		Morrow County		Grant County	
	Supply Multiplier	Demand Multiplier	Supply Multiplier	Demand Multiplier	Supply Multiplier	Demand Multiplier
1. Ranching	1.2556	2.6277	1.0276	1.6483	1.1851	2.2981
2. Other Agriculture	2.2262	2.7333	1.0581	1.4763	1.9394	1.7871
4. Agricultural Services	2.2105	1.7672	1.5948	1.2166	2.2019	1.3679
5. Wood Products	1.0438	2.1189	1.1602	1.4576	1.0684	2.1852
6. Timber Harvesting & Hauling	1.8939	2.5647	------	------	1.8877	2.2895
9. Communication, Transportation, & Utilities	2.6064	1.8161	2.3993	1.4103	2.8326	1.5894
11. Automotive Sales & Services	2.6074	1.8881	2.6150	1.4727	2.6760	1.7340
13. Lodging	1.6089	2.7053	1.8077	1.5344	1.3717	2.2370
15. Wholesale & Retail Trade	3.0791	1.6464	2.8773	1.2842	2.9234	1.3516
17. Households	2.4456	2.5759	2.3539	1.6740	2.4505	2.0150
18. Local Government	1.9311	2.9622	1.9645	1.9405	2.3986	2.6972
19. Local Agencies of State & Federal Government	1.1385	2.0428	1.2721	2.1764	1.5645	1.8754

indicate that goods and services used for final consumption are relatively more available in this region. The supply multipliers for the government sectors tend to be smaller in value than the demand multipliers. Funding available to the local agencies usually comes from state and federal sources. Consequently, the governmental agencies 'sell' relatively less to the local economy than they purchase.

Estimates of the Local Economic Impacts of Changes in Public Timber Availability Using the Modified Approach

In this study changes in the availability of public timber are interpreted as a change in the level of primary inputs available to the timber-based industries. Payments for stumpage on National Forest lands are made directly to the National Treasury. These purchases are entered into the transactions tables as payments to nonlocal government. A change in the availability of public timber is treated as a change in the purchasing industry's payments to nonlocal government, i.e., a change in primary input availability.

Supply-Induced Impacts

Federal stumpage available to the wood products industry in each county was assumed to decline by one million dollars. Following Equation (34) the supply-induced impact on regional and sectoral output associated with the change in primary input availability can be calculated. The resulting impact on total sales is factored into its two components: (a) sales to local industries, and (b) sales to

final demand (export). The estimates of changes in industry sales to the local processing sector are presented in Table 18. Local sales in Morrow County are most significantly affected by the decline in federal stumpage available to the local wood products industry. Specifically, the decline in local sales by the wood products industry in Morrow County is two and one-half times that in Grant County and nearly seven times the decline in Baker County. This is largely explained by the fact that a relatively higher proportion of the output produced by the Morrow County wood products industry is sold locally.

The estimates of changes in final demand sales are presented in Table 19. In general, final demand sales in the agricultural, construction, household, and government sectors are affected relatively more by the supply-induced changes in the wood products industry. This is primarily due to the forward linkages existing between these sectors and the wood products industry.

Total Impacts

Following Equation (41) the table of direct and indirect output coefficients (the C-matrix) was used to calculate the local impacts resulting from the change in regional sales to final demand. Estimates of the changes in regional and sectoral output induced by the decline in final demand sales are presented in Table 20. The estimates include that portion of output change induced by the decline in final demand sales as well as that portion of change directly attributable to the decline in export sales.

It is estimated that the decline in final demand sales will cause regional income in Baker County to fall by 2.123 million dollars.

Table 18. Estimated Changes in Local Sales Resulting from a One Million Dollar Decline in Federal Stumpage Available to the Wood Products Industry, by County (1979).

Sector	Baker County ($)	Morrow County ($)	Grant County ($)
1. Ranching	202	305	186
2. Other Agriculture	368	236	58
3. Food Processing	195	329	57
4. Agricultural Services	1,682	367	87
5. Wood Products	20,144	138,279	56,143
6. Timber Harvesting & Hauling	363	-------	531
7. Mining	84	-------	56
8. Construction	4,850	153	734
9. Communication, Transportation, & Utilities	733	231	259
10. Finance, Insurance, & Real Estate	574	584	328
11. Automotive Sales & Services	483	217	374
12. Professional Services	622	258	274
13. Lodging	26	38	16
14. Cafes & Taverns	232	134	45
15. Wholesale & Retail Trade	1,554	821	360
16. Wholesale & Retail Services	289	162	170
17. Households	9,137	21,233	7,619
18. Local Government	2,124	1,092	650
19. Local Agencies of State & Federal Government	149	1,258	417
TOTAL	43,811	165,697	68,364

Table 19. Estimated Changes in Final Demand Sales Resulting From a One Million Dollar Decline in Federal Stumpage Available to the Wood Products Industry, by County (1979).

Sector	Baker County ($)	Morrow County ($)	Grant County ($)
1. Ranching	1,198	12,295	1,714
2. Other Agriculture	232	4,064	42
3. Food Processing	205	5,071	43
4. Agricultural Services	1,118	333	13
5. Wood Products	982,056	964,421	993,2S7
6. Timber Harvesting & Hauling	137	0	169
7. Mining	416	0	844
8. Construction	4,2S0	347	666
9. Communication, Transportation, & Utilities	367	69	41
10. Finance, Insurance, & Real Estate	226	116	72
11. Automotive Sales & Services	217	83	126
12. Professional Services	78	42	126
13. Lodging	74	62	84
14. Cafes & Taverns	468	66	55
15. Wholesale & Retail Trade	246	79	40
16. Wholesale & Retail Services	11	38	30
17. Households	4,063	1,267	1,S81
18. Local Government	2,376	908	3S0
19. Local Agencies of State & Federal Government	2,2S1	S,242	783
TOTAL[a/]	999,989	994,S03	1,000,036

[a/] Columns do not sum to 1,000,000 due to rounding error.

Table 20. Estimated Change in Regional and Sectoral Output Resulting from the Decline in Local Industry Sales to Final Demand, by County (1979).

Sector	Baker County ($)	Morrow County ($)	Grant County ($)
1. Ranching	3,976	12,534	25,528
2. Other Agriculture	3,994	4,981	5,666
3. Food Processing	4,975	6,602	6,861
4. Agricultural Services	13,814	3,886	6,754
5. Wood Products	984,308	1,064,133	1,042,372
6. Timber Harvesting & Hauling	174,239	-----	129,018
7. Mining	8,202	-----	4,166
8. Construction	84,442	8,701	12,765
9. Communications, Transportation, & Utilities	53,460	20,686	67,458
10. Finance, Insurance, & Real Estate	48,512	7,271	36,134
11. Automotive Sales & Services	81,808	18,335	90,503
12. Professional Services	23,982	4,741	21,374
13. Lodging	2,779	2,317	2,388
14. Cafes & Taverns	9,265	4,744	7,265
15. Wholesale & Retail Trade	169,131	42,507	117,573
16. Wholesale & Retail Services	9,406	3,089	9,565
17. Households	409,935	209,518	475,945
18. Local Government	29,694	14,744	38,747
19. Local Agencies of State & Federal Government	7,572	28,398	83,458
TOTAL	2,123,494	1,457,187	2,183,540

Regional income in Morrow County is estimated to decline by 1.457 million dollars while total output in Grant County is estimated to decrease by 2.184 million dollars. Apart from the timber-related industries, the value of total output in the household and service-related sectors is relatively more affected by the estimated changes in regional exports. The service industries in Baker County account for a relatively larger proportion of the change in total output than do the associated industries in the other counties. As was discussed previously, this is largely because the Baker County economy is relatively more closed with respect to imports and exports.

The total regional income effect caused by the decline in available federal stumpage is comprised of two components. The first element is equal to the supply-induced impacts on local industry sales to the regional processing sector, or supply-induced endogenous transactions (Table 18). The second component is equal to the change in local industry output induced by the change in regional export sales (Table 20). The supply-induced impact on local industry sales to final demand (supply induced exogenous transactions) is included in the second component.

Estimates of the total regional and sectoral income affects are presented in Table 21. Grant County is expected to experience the most significant decline in total county output with income falling off by 2.252 million dollars. Apart from the local wood products industry, the sectors most affected by the decline in available federal stumpage are local households, wholesale and retail trade, and timber harvesting and hauling.

The reduction in available federal timber is estimated to cause

Table 21. Estimated Total Change in Regional and Sectoral Output Resulting from a One Million Dollar Decline in Available Federal Stumpage, by County (1979).

Sector	Baker County ($)	Morrow County ($)	Grant County ($)
1. Ranching	4,178	12,839	25,714
2. Other Agriculture	4,362	5,217	5,724
3. Food Processing	5,170	6,931	6,918
4. Agricultural Services	15,496	4,253	6,841
5. Wood Products	1,004,452	1,202,412	1,098,515
6. Timber Harvesting & Hauling	174,602	-----	129,549
7. Mining	8,286	-----	4,222
8. Construction	89,292	8,854	13,499
9. Communications, Transportation, & Utilities	54,193	20,917	67,717
10. Finance, Insurance, & Real Estate	49,086	7,855	36,462
11. Automotive Sales & Services	82,291	18,552	90,877
12. Professional Services	24,604	4,999	21,648
13. Lodging	2,805	2,355	2,404
14. Cafes & Taverns	9,497	4,878	7,310
15. Wholesale & Retail Trade	170,685	43,328	117,933
16. Wholesale & Retail Services	9,695	3,251	9,735
17. Households	419,072	230,751	483,564
18. Local Government	31,818	15,836	39,397
19. Local Agencies of State & Federal Government	7,721	29,656	83,875
TOTAL	2,167,305	1,622,884	2,251,904

total regional output in Baker County to fall off by 2.167 million dollars while total Morrow County output is expected to decline by 1.623 million dollars. As in Grant County, the local industries most affected by the decline are households, wholesale and retail trade, and timber harvesting and hauling.

Demand-Induced Impacts

The total change in regional and industry output reported in Table 21 is the result of two different "change-initiating" stimuli affecting the local economic system.[1/] A portion of the change in local industry business activity is attributable to the supply-push effect of the change in primary input availability. The remaining portion of the change in local business activity is caused by the demand-pull effect of the change in local industry sales to final demand. The total change in value of industry output is factored into its supply and demand-induced components in Table 22; while associated employment impacts are summarized in Appendix E.

The demand-induced impact caused by the change in primary input availability is most significant in Grant County where 52.56 percent of the decline in total county output is attributable to the demand-pull effect of the change in regional sales to final demand. Similarly, 51.84 percent of the decline in Baker County output is generated by the demand-induced component of total output change. However, in Morrow County only 28.51 percent of total output change is induced

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1/ In Chapter II it was noted that the interaction of various "change-initiating" stimuli was concomitant with regional economic growth and change (pp. 28-29).

Table 22. The Supply and Demand-Induced Components of the Total Change in Regional and Sectoral Output Caused by the Decline in Available Federal Stumpage, by County (1979).

Sector	Baker County			Morrow County			Grant County		
	Total Impact ($)	Supply-Induced Impact ($)[a]	Demand-Induced Impact ($)	Total Impact ($)	Supply-Induced Impact ($)[a]	Demand-Induced Impact ($)	Total Impact ($)	Supply-Induced Impact ($)[a]	Demand-Induced Impact ($)
1. Ranching	4,178	1,400	2,778	12,839	12,600	239	25,714	1,900	23,814
2. Other Agriculture	4,362	600	3,762	5,217	4,300	917	5,724	100	5,624
3. Food Processing	5,170	400	4,770	6,931	5,400	1,531	6,918	100	6,818
4. Agricultural Services	15,496	2,800	12,696	4,253	700	3,553	6,841	100	6,741
5. Wood Products	1,004,452	1,002,200	2,252	1,202,412	1,102,700	99,712	1,098,515	1,049,400	49,115
6. Timber Harvesting & Hauling	174,602	500	174,102	-----	-----	-----	129,549	700	128,849
7. Mining	8,286	500	7,786	-----	-----	-----	4,222	900	3,322
8. Construction	89,292	9,100	80,192	8,854	500	8,354	13,499	1,400	12,099
9. Communication, Transportation, & Utilities	54,193	1,100	53,093	20,917	300	20,617	67,717	300	67,417
10. Finance, Insurance, & Real Estate	49,086	800	48,286	7,855	700	7,155	36,462	400	36,062
11. Automtovie Sales & Services	82,291	700	81,591	18,552	300	18,252	90,877	500	90,377
12. Professional Services	24,604	700	23,904	4,999	300	4,699	21,648	400	21,248
13. Lodging	2,805	100	2,705	2,355	100	2,255	2,404	100	2,304
14. Cafes & Taverns	9,497	700	8,797	4,878	200	4,678	7,310	100	7,210
15. Wholesale & Retail Trade	170,685	1,800	168,885	43,328	900	42,428	117,933	400	117,533
16. Wholesale & Retail Services	9,695	300	9,395	3,251	200	3,051	9,735	200	9,535
17. Households	419,072	13,200	405,872	230,751	22,500	208,251	483,564	9,200	474,364
18. Local Government	31,818	4,500	27,318	15,836	2,000	13,836	39,397	1,000	38,397
19. Local Agencies of State & Federal Government	7,721	2,400	5,321	29,656	6,500	23,156	83,875	1,200	82,675
TOTAL	2,167,305	1,043,800	1,123,505	1,622,884	1,160,200	462,684	2,251,904	1,068,400	1,183,504

[a] The supply-induced component includes the initial $1,000,000 decline in available federal stumpage.

by the decline in county export sales.

Summary

Input-output modelling enables the indirect as well as the direct economic impacts resulting from changes in regional supply and demand stimulii to be evaluated. In the previous analysis, the direct change in local economic output was caused by a one million dollar decline in federal stumpage available to the local wood products sector. The reduction in primary inputs available to the timber industry generated a supply-induced impact on the output of that industry and all other industries within the local economy. The decline in local industry output included a reduction in the value of regional export sales. This, in turn, generated a demand-induced impact on input purchases made by the local industries. Consequently, the total economic impact of a reduction in available public timber includes both supply-induced and demand-induced components.

In both Baker and Grant County the supply-induced change in regional output is less than six percent of the demand-induced change.[2/] However, in Morrow County, the supply-generated impacts are nearly 36 percent of the demand-induced change in total county output. This appears to indicate that in Morrow County forward linkages are relatively more developed with respect to backward linakges than in either Baker or Grant County.

It is important to note that in each county the demand-induced impacts are significantly larger than the supply-induced impacts.

2/ The supply-induced component summarized here does not include the one million dollar decline in available federal timber.

Although the initial stimulus was the supply-push effect of the change in primary input availability, the subsequent demand-induced impacts are relatively more important in explaining the value of total output change in the regional economy. The relative importance of the two components, however, varies among counties.

The following section includes a brief comparison of estimates of the local economic impacts of changes in public timber availability obtained using the conventional and the modified approach to input-output anslysis. Conclusions are drawn with regard to the manner in which an analysis which interprets a shift in resource supply as a change in final demand may be incorrectly estimating the impacts of such a change on the local economy.

Comparing Conventional and Modified Estimates

Input-output demand models were used to estimate the local impacts of changes in federal resource availability when these changes are interpreted directly as changes in final demand. In keeping with the traditional approach, a one million dollar decline in available federal stumpage was assumed to decrease final demand sales for the local wood products industry by one million dollars. The estimates of final demand changes obtained in the previous section were used in conjunction with the table of direct and indirect input-output coefficients to generate estimates of changes in the value of regional and sectoral output resulting from a decline in federal stumpage availability. The estimates obtained using the traditional procedure are presented in Table 23. Total output in Baker County is expected to decline by 2.119 million dollars. Apart from the wood products in-

Table 23. Estimated Changes in Regional and Sectoral Output Resulting from a One Million Dollar Decline in Federal Stumpage Available to the Local Wood Products Industry (conventional approach), by County (1979).

	Baker County ($)	Morrow County ($)	Grant County ($)
1. Ranching	2,600	100	23,900
2. Other Agriculture	3,500	40	5,600
3. Food Processing	4,600	700	6,800
4. Agricultural Services	12,300	1,700	6,600
5. Wood Products	1,002,200	1,102,700	1,049,400
6. Timber Harvesting & Hauling	177,200	-----	129,700
7. Mining	7,600	-----	3,300
8. Construction	79,800	8,200	12,000
9. Communications, Transportation, & Utilities	52,200	20,800	67,400
10. Finance, Insurance, & Real Estate	47,400	6,800	35,900
11. Automotive Sales & Services	81,600	18,000	90,300
12. Professional Services	23,600	4,600	21,200
13. Lodging	2,700	2,100	2,300
14. Cafes & Taverns	8,700	4,600	7,200
15. Wholesale & Retail Trade	166,500	41,000	116,900
16. Wholesale & Retail Services	9,200	3,000	9,500
17. Households	405,500	206,200	475,900
18. Local Government	26,600	13,500	38,300
19. Local Agencies of State & Federal Government	5,200	23,500	83,000
TOTAL	2,119,000	1,457,540	2,185,200

dustry, the local household, wholesale and retail trade, and timber harvesting and hauling sectors are most significantly impacted by the decline in federal stumpage availability.

The decline in regional exports by the local wood products sector in Morrow County is expected to cause total regional output to decline by 1.458 million dollars. The local household and wood products sectors are most significantly affected by the projected change in final demand sales. Total output in Grant County is estimated to decline by 2.185 million dollars. The local income effects are distributed in a manner similar to those in Baker County. A decline in the regional export of timber and timber-related products will most significantly affect total output in the wholesale and retail trade, household, and timber harvesting and hauling sectors.

In each county estimates of changes in total regional output obtained using the modified approach are larger in value than those calculated using the traditional form of analysis (see Table 24). The difference between the estimates is most significant in Morrow County where the decline in regional output projected by the modified approach is 1.11 times the value estimated with the traditional model. Projected changes in Grant County regional income differ by three percent while estimates of total output decline in Baker County diverge by only two percent.

Changes in sectoral output calculated using the modified approach also are larger in value than those obtained using the traditional approach. The exception is the timber harvesting and hauling sector where estimates are approximately equal. Generally, the estimates differ most significantly in Morrow County where changes in sector

Table 24. Conventional Estimates of Regional and Sectoral Income Change as a Percentage of the Modified Estimates by County (1979).*

Sector	Baker County (%)	Morrow County (%)	Grant County (%)
1. Ranching	62.2	0.8[a]	92.9
2. Other Agriculture	80.2	0.8[a]	97.8
3. Food Processing	89.0	10.1[a]	98.3
4. Agricultural Services	79.4	40.0	96.5
5. Wood Products	99.8	91.7	95.5
6. Timber Harvesting & Hauling	101.5	----	100.1
7. Mining	91.7	-----	78.2
8. Construction	89.4	92.6	88.9
9. Communcation, Transportation, & Utilities	96.3	99.4	94.5
10. Finance, Insurance, & Real Estate	96.6	86.6	98.4
11. Automotive Sales & Services	99.2	97.0	99.4
12. Professional Services	95.9	92.0	97.9
13. Lodging	96.3	89.2	95.7
14. Cafes & Taverns	91.6	94.3	98.5
15. Wholesale & Retail Trade	97.6	94.6	99.1
16. Wholesale & Retail Services	94.9	92.3	87.3
17. Households	96.8	89.4	98.4
18. Local Government	83.6	85.2	97.2
19. Local Agencies of State & Federal Government	67.4	79.2	99.0
TOTAL	97.8	89.8	97.0

* This table is calculated using estimates from Table 21 and 23.

[a] The modified approach is able to account for the relatively strong forward linkage patterns present between these sectors and the wood products industry. The existing backward linkages are negligible. Consequently, the modified estimate is significantly larger than the conventional estimate.

output calculated with the conventional model range from less than one to approximately 100 percent of the total value of the associated modified estimate. The projected changes differ most significantly in the agriculture and food processing sectors.

When local impacts resulting from changes in the availability of public timber are evaluated using an input-output supply model in conjunction with the demand-pull model, estimates of income changes are larger in value than similar estimates obtained using only the conventional demand model. The supply model enables regional impacts resulting from changes in primary input availability to be evaluated by means of the forward linkage ties within the local economy. The direct and indirect changes in final demand may be calculated from the supply model and the resulting local impacts evaluated with the input-output demand model.

Timber Dependency

Because of the direct and indirect linkages among the various sectors of the county economy, each of the local industries is more or less dependent upon the forest products sectors. Darr and Fight [1974] have developed an indicator which can be used to measure the dependency of each local sector upon the timber-related industries. The measure of dependency (D_i) calculates the percentage of an industry's sales which are directly or indirectly ($c_{i,5}$; $c_{i,6}$) dependent upon the final demand (FD_5, FD_6) for timber and timber-related products, or

$$D_i = \frac{c_{i,5}\ FD_5 + c_{i,6}\ FD_6}{TS_i}$$

where

TS_i = total sales in sector i.

This measure follows directly from Equation (10) where the vector of total output is the product of the matrix of direct and indirect coefficients and the vector of final demand.

Timber dependency among local product groups is identified in Table 25. Nearly 47 percent of total Grant County output is either directly or indirectly dependent upon the final demand for timber products. In the other counties less than 20 percent of regional income was generated by the forest industry. Apart from the timber products sectors, households and the service industries were relatively more dependent upon the final demand for timber products than were other sectors of the economy. In Grant County, over 40 percent of the payments to households were directly or indirectly dependent upon export sales in the timber industries. Fourteen percent of payments to households in Morrow County were linked to the forest industry while only 12 percent of these payments in Baker County were related to the timber sectors. Grant County is considerably more dependent upon the timber resource than are the regional economies in Morrow or Baker County.

It was the final objective of this research to determine whether a relationship existed between regional timber dependency and the development of vertical linkages by the local wood products sectors. In particular, it was to be determined whether wood products industries in relatively more timber-dependent regions tend to rely more heavily upon the local economy for inputs to production, i.e., whether these

Table 25. Timber Dependency Among Local Product Groups, by County, 1979.

Sector, by Product Group	Timber Dependent Sales ($1,000)	Total Sales ($1,000)	Timber Dependency (As a percentage of total sales)
BAKER COUNTY			
Households (17)	14,069	120,839	11.64
Forest Products (5, 6)	40,217	41,127	97.79
Agriculture (1, 2, 4)	639	36,672	1.74
Services (9-16)	14,232	158,344	8.99
Construction/Manufacturing (3, 7, 8)	3,181	52,599	6.05
Government (18, 19)	1,108	53,530	2.07
TOTAL - all local sectors	73,446	463,111	15.86
GRANT COUNTY			
Households (17)	23,258	54,799	42.44
Forest Products (5, 6)	56,862	57,243	99.33
Agriculture (1, 2, 4)	1,724	21,334	8.08
Services (9-16)	17,128	56,653	30.23
Construction/Manufacturing (3, 7, 8)	1,072	11,786	9.10
Government (18, 19)	5,793	24,386	23.76
TOTAL - all local sectors	105,837	226,201	46.79
MORROW COUNTY			
Households (17)	6,514	47,980	13.58
Forest Products (5, 6)	34,835	35,919	96.98
Agriculture (1, 2, 4)	57	86,207	0.07
Services (9-16)	3,187	31,902	9.99
Construction/Manufacturing (3, 7, 8)	281	46,401	0.61
Government (18, 19)	1,168	24,828	4.70
TOTAL - all local sectors	46,042	273,237	16.85

industries have relatively higher backward linkages with the local economy.

Local purchases by the forest products industry in Grant County amounted to nearly 60 percent of total purchases (Table 19). Of this, nearly one-half were made from the local household sector. In Baker County local purchases amounted to 50 percent of total value. Again, nearly one-half of these puchases were made from the household sector. The local purchasing pattern of the wood products industries in Baker and Grant County are similar. Grant County, however, is nearly three times as dependent upon the timber resource as Baker County (in terms of regional income). Local purchases by the timber sector in Morrow County comprise less than 30 percent of total county purchases. The region, however, is more timber-dependent than Baker County. There does not appear to be a clear relationship between timber dependency and the development of backward linkages by the local timber industries.

Similarly, there appears to be no relationship between timber-dependency and the development of forward linkages. In all counties less than 20 percent of total sales made by the timber-related sectors were to other firms within the local economy (Table 19). Indeed, most of the local sales made were to other firms within the forest products industry. Vertical linkages, while indicative of local economic development, are not necessarily suggestive of the dependency of the local area upon the timber-based industries.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Summary of the Problem

The timber industry plays an important role in many small resource-based communities throughout Oregon. In many of these regions federal land holdings comprise a large proportion of the area's resource base. Timber harvested from the National Forests accounts for two-thirds of the timber harvested in Oregon each year. Management decisions regarding resource use on the National Forests will have a major influence upon the stability of local timber industries and upon those communities of which they are a part.

Federal management of large areas of the nation's timber resources is justified largely on the grounds that the market system is unable to make provision for associated public goods such as wilderness areas and wildlife habitat. The Forest Service has been mandated to provide for the optimal allocation of use among the various resource systems found upon the National Forest lands. This objective is in keeping with one of the primary purposes for federal intervention into the private market system: that of providing for a more efficient allocation of scarce resources.

Forest policy decisions which maximize national efficiency in regard to the allocation of resources may be in conflict with local concerns. There exist many small communities whose livelihood depends in large part upon the availability of primary commodities from the National Forests. A decision which would reduce the flow of timber in a given region may overlook the social costs of closing

down mills and idling workers.

Concern for the stability of timber-dependent communities arose largely as a result of the early forestry practices of the timber industry. When the timber supply was exhausted in one region, the lumber industry moved on to a new region until this area was also exhausted of its resources. This resulted in the movement of population which impacted the stability of timber-dependent communities. Early legislation was aimed at stabilizing the forest industry. One of the primary concerns of the Sustained Yield Management Act of 1944 was to maintain the stability of those communities dependent upon the availability of public timber harvest. It was believed that adverse local economic impacts could be controlled if timber were to be made continuously available to the dependent regions. Although subsequent legislation has made no direct reference to the need to maintain community stability, there is still a great deal of concern at the local level as to the management and use of those public land areas and associated resources upon which the regions are substantially dependent.

Regional economic stability depends upon both the availability of production inputs and upon an export market for locally produced goods and services. Expansion in regional economic activity can be initiated by an increase in final, or export, demand for local products, by an increase in the availability of primary production inputs, or by expansion in the local infrastructure supporting the export-oriented industries. A change in the final demand for a sector's output will affect the entire economy primarily by means of backward linkages. Similarly, an exogenous change in an industry's

primary input supply will have cumulative effects within the economy. These changes move through the economy vis-a-vis the sector's forward linkages.

Forest Service management policy influences regional economic stability through existing structural relationships within the local economy. Because a portion of Forest Service operating expenditures are made within the management region, the agency develops backward linkages with the local economy. Any change in the level of operating expenditures will have reverberations throughout the local economy. However, the ability of the Forest Service to intentionally influence local economic stability through changes in operating expenditures may be rather limited. The ability of the Forest Service to provide a supply stimulus to regional growth appears more evident. Because of its control over commercial timber sales and harvest, the Forest Service is a seller of primary inputs to local timber and wood products industries. The agency thereby develops forward linkages with the local economy. The impact of a change in the availability of public timber supplies can be traced through the regional economy by means of these forward linkages.

Input-output analysis has been used extensively to evaluate the local economic impacts resulting from changes in federal timber availability. These studies largely have used the conventional demand-pull model. Resource supply changes have been extrapolated to represent corresponding changes in the final demand for timber products. However, a shift in the demand for a region's exports will affect the local economy differently than will a shift in the availability of raw materials. The forward linkages within an economy may or may

not distribute sales solely to the immediate processing sector. Consequently, an analysis which interprets a change in primary resource supply as a change in only the immediate processing industry's final demand may incorrectly evaluate the effects of supply-induced change on the local economy.

The input-output transactions table emphasizes neither supply nor demand. Money flows can be traced backwards from purchaser to seller or, just as easily, they can be traced forward from seller to purchaser. The input-output model does not indicate whether changes in regional growth are initiated by changes in final demand, changes in the availability of primary inputs, or by changes within the processing sector.

The conventional input-output demand model emphasizes the importance of changes in final demand as a stimulus for changes in regional economic activity. Interindustry flows are assumed to be a function of the output of the purchasing sector. However, the input-output model can be modified so that regional activity is assumed to be solely dependent upon neither the availability of primary inputs nor the final demand for goods and services. In this case, interindustry flows can be considered to be a partial function of the output of the selling sector. The input-output supply model enables changes in local industry sales to final demand corresponding to changes in public timber availability to be evaluated directly.

Input-output supply models were developed for three eastern Oregon counties. Changes in local industry export sales resulting from a decline in timber availability were estimated by means of these models. The calculated changes in final demand sales were used in

conjunction with the conventional input-output demand model to obtain estimates of the local economic impacts corresponding to changes in public timber availability. The results obtained with the modified procedure were compared with estimates derived from the more conventional input-output demand-pull analysis. A comparative analysis also was made of the forward and backward linkages present in the three county economies. Conclusions drawn regarding the results of these analyses are presented below.

Conclusions

The major objectives of this research were (1) to identify forward linkage relationships for timber industries in selected eastern Oregon counties, (2) to evaluate changes in intersectoral sales associated with changes in the availability of public timber within these counties, (3) to assess the local economic impacts of changes in public timber availability within these counties, and (4) to provide a basis for comparison of the differing local impacts upon regional economic growth and dependent community stability associated with changes in forest management policy and programs. A short summary of the results obtained from the analysis of these objectives and the subsequent conclusions drawn with respect to the objectives is presented below.

The input-output models developed for each county were used to describe the structure of the local economies. The value of total output in Baker County was significantly larger than the value of output in either Morrow or Grant County in 1979. Import purchases by the various sectors of the local economy comprised less than one-

half of total county purchases in both Baker and Grant County. Conversely, approximately 58 percent of Morrow County purchases were made from nonlocal sources. A similar pattern was found in county export sales. Sixty percent of total sales in Morrow County were sold to export while exports in the other two counties amounted to only 40 percent of total sales. Morrow County was the only region to experience a positive net trade balance at the end of 1979 with the value of exports exceeding the value of imports by nine million dollars.

The resource-based industries accounted for a large proportion of the value of exports and total output in each region. However, the timber-based industries contributed relatively more to these measures in Grant County than did related sectors in either Morrow or Baker County. Indeed, 45 percent of all export sales in Grant County were made by the local lumber and wood products processing sectors. The timber-related sectors in Grant County also contributed relatively more to total import purchases than did these sectors in the other regions.

Although all three counties are representative of small, resource-based economies, the local infrastructure within Baker and Grant County are relatively more developed than that within Morrow County. The service industries in the latter region generated only 13 percent of total county income. These sectors were responsible for 40 percent of total output in Baker County and 30 percent of total output in Morrow County. This, in part, accounts for the fact that Morrow County is relatively more open with respect to both imports and exports than either of the other two regions.

In keeping with the second objective, input-output supply models

were developed for each of the regional economies examined in this study. These models were used to calculate the changes in regional and sectoral sales caused by a decline in federal stumpage available to the local wood products industry. In terms of relative as well as absolute value, regional income changes are most significant in Morrow County. Because the wood products industry in this region sells a relatively larger proportion of its output locally, it has stronger forward linkage ties with the local economy than do the timber industries in either Baker or Grant County. Consequently, the supply-push effect of the change in public timber availability has a relatively stronger impact in Morrow County.

Apart from the wood products industry the sectors most affected by the change in primary input availability tended to be those firms which purchased locally-processed timber or timber products. Generally, these included other resource-based industries. The distribution of the impacts, however, was not entirely consistent among regions.

To facilitate analysis of the third objective, changes in local industry sales were divided into two components: (1) sales to the local processing sector, and (2) sales to final demand (export). The vector of changes in final demand sales was used in conjunction with the input-output demand model developed for each county to determine the demand-induced change in regional and sectoral output caused by the decline in local exports. The total change in regional and sectoral output caused by the decline in federal timber availability was calculated by adding (1) the change in industry sales to the local processing sector calculated from the supply model and (2) the direct and induced changes in sector output caused by the decline in

local sales to final demand.

Regional income changes resulting from a decline in federal stumpage available to the local wood products are most significant in Grant County. A one million dollar decline in available timber would decrease income in the county by 2.252 million dollars. This compares with a decline of 2.167 million dollars in Baker County and a reduction of 1.623 million dollars in total Morrow County income. Although the absolute change in regional income is least in Morrow County, the relative change in total output is less significant in Baker County.

For each county, the total regional income effects can be factored into two components: (a) supply-induced impacts, and (b) demand-induced impacts. The initial stimuli affecting each of the local economies was the supply-push effect of the change in primary input availability. This, in turn, generated a set of supply-induced changes in the value of regional and sectoral sales. As developed above, these impacts were most significant in Morrow County. Because regional sales to final demand were affected by the decline in federal timber availability, a set of demand-induced changes in regional output also was generated. In each county the demand-induced impacts on regional output were considerably larger than the supply-induced changes. Although in the problem scenario the initial shock to the local economic systems was supply-induced, the backward linkage structure plays a more significant role in determining the overall impact of the stimulus on regional and sectoral output.

The final objective of this research was to provide a basis for comparing the differing local economic impacts of changes in timber

management policy and programs. In Chapter II it was noted that although the ability of the Forest Service to provide a demand stimulus to a dependent community via changes in operating expenditures may be relatively weak, its capacity to provide a supply stimulus is more realizable. The provision of such a supply stimulus has provided the basis for this thesis. A methodology has been introduced whereby a supply-induced stimulus on a local economic system can be analyzed and the resulting impacts factored into its various components. The new methodology provides a basis for comparing local economic impacts vis-a-vis the forward as well as the backward linkage structure present within the regional economy.

The input-output supply model calculates the direct and indirect impacts on regional industry sales resulting from a change in primary inputs available to one or more of the local sectors. The impacts are evaluated by means of the forward linkage structure present among the local economic sectors. A decline in primary inputs available to an industry with relatively high forward linkage ties (a relatively high supply multiplier) will have a more significant impact upon local industry sales than will a decline in primary inputs available to an industry with negligible forward linkage ties (a large percentage of output sold to export). When primary input changes are extrapolated directly to reflect changes in final demand, no account is made of the direct and indirect impacts upon industry sales resulting from the decline in the affected industry's output available to the local economic sectors. As was developed above, the exclusion of these impacts will be most significant for sectors with strong forward linkage ties with the local economy.

Approximately 95 percent of total output in the Baker and Grant County wood products sector is sold to export while only 87 percent of sales by the Morrow County wood products industry are made to final demand. The relative impacts of a decline in available federal stumpage (exclusive of the wood products industry) are greater in Morrow County. The input-output supply model is able to account for these impacts; the demand model does not.[1/] Therefore, it is not unreasonable to expect that the divergence between the supply and demand estimates of total output change will be most significant in Morrow County. The difference between the supply and demand estimates is most significant in sectors to which the wood products industry sells its output locally. This is, perhaps, most evident in the divergence between the estimated impacts upon the local ranching sector in each county.

In summary, the supply model is able to account for the direct and indirect impacts on sales transactions within the regional economy resulting from a change in the primary inputs available to one of the local industries. The demand model is unable to account for these supply-stimulated impacts. In empirical applications, the omission of these impacts will be most significant in those industries which have developed relatively strong forward linkages with the local economy. The policy implications of the methodology developed in this study are discussed below. However, methodological limitations are

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1/ In Baker County the estimated change in regional sales to final demand (exclusive of the wood products industry) was 18 thousand dollars. The change in Grant County was calculated to be seven thousand dollars while the projected change in Morrow County was 30 thousand dollars.

relevant to the discussion of policy implications, and thus must be clarified.

Model Limitations

While the descriptive nature of the input-output model emphasizes neither supply nor demand, it necessarily focuses on a single causal agent when used as an analytical tool. The model provides only an approximation of the magnitude and distribution of the economic impacts resulting from changes in one or more factors of growth. The supply model assumes that regional economic growth is constrained only by the availability of primary inputs. Final demand for regional exports is considered to be continuously forthcoming. Such 'real world' conditions are unlikely to exist, particularly during the current period of high inflation and high interest rates. However, the elasticity of demand for wood products facing each of the regions studied is likely to be similar, and quite high, since none of the regions provide a significant portion of the State or Nation's total timber supply. Therefore, any distortions caused by the assumption of perfectly elastic demand among or across regions are likely to be inconsequential.

Although the supply model assumes that an increase in available primary input supply will lead to an increase in regional income and employment, actual conditions within the local economy may not guarantee these results. If a region's factors of production are not fully employed, an increase in primary input supply will not necessarily result in an increase in the regional production of goods and services. Given that these resources are fully-employed, an increase

in primary inputs is not a sufficient condition for economic growth. There must be an adequate level of exogenous demand to employ the new factors of production.

It has been assumed throughout this analysis that the value of primary input change is equal to the value of the direct impact upon total output. In other words, the direct impact of a one million dollar decline in available federal stumpage is assumed to be a one million dollar decline in total sales by the wood products sector. There is no account made of the value added to the timber products produced by the local wood processing industry. A more complete analysis of the local economic impacts resulting from changes in federal resource availability should take into account the difference between the factor cost of the primary input and the price received for the associated output.

Policy Implications

Evaluation Criteria for Changes in Forest Management Policy

In April 1981 the Federal Register presented the proposed policy and principles for the economic and social analysis of Forest Service programs, projects, and resource plans [Federal Register, pp. 22404-22413]. The document, as presented, was proposed for inclusion as a chapter in the Forest Service Manual. One of the primary policy objectives of the Economic and Social Analysis chapter is to ensure that the effects of changes in Forest Service policies and programs on the economic growth and stability of the affected areas is included in the long-range planning process [Sec. 1970.3]. Economic impacts are to be measured in terms of changes in the income, employment, and

population of the appropriate forest user groups, industries, and affected local economies [Sec. 1972].

Economic impacts are to be estimated for those areas where proposed alternatives may have measurable impacts. In regional management plans areas to be considered include the nation and the affected state or multi-state regions. Areas considered in national forest management plans should include county or multi-county areas as well as state or multi-state regions.

The standard approach in the Forest Service for estimating the economic impacts of alternative management programs is the use of conventional input-output modelling. The information required to relate forest output with estimates of associated economic impacts can largely be derived from the input-output tables. This information is to include expenditures made for forest products and on-site uses, Forest Service expenditures associated with the relevant plan, current interindustry transactions made within the affected region, employment and income coefficients for the households and industries identified above, and regional work force and population coefficients [Sec. 1972.51].

The evaluation of economic impacts is to include three components. First, direct impacts are to be derived for those industries which deal directly with the commodities obtained from the national forest lands. Second, the indirect impacts upon the affected economy are to be evaluated. Finally, the induced income effects that result also are to be measured. The resulting economic impacts are to be measured in both absolute and relative terms. These estimates are considered measures of the impacts upon local economic stability re-

sulting from changes in Forest Service management policy [Sec. 1972.8].

Regional Economic Impact Analysis

Given the criteria outlined above, a brief comparative analysis is presented to determine whether the local economic impacts resulting from a reduction in available timber is most significant in Morrow, Baker, or Grant County. The local impacts are evaluated using the modified input-output model presented in Chapter III. The direct and indirect impacts on regional and sectoral output are reported. The value of the decrease in available stumpage is assumed to be one million dollars in each region. Following this short analysis, the policy implications of the modified input-output methodology are discussed.

Because the value of foregone stumpage is the same in each region, the direct impact on total output produced by the timber-related industries also is the same, i.e., total sales by the timber industry will necessarily decline by one million dollars. However, because the value of total output by the wood products sector in Morrow County is less than that in the other two regions, the relative severity of the direct impact will be more significant in this region.

The indirect effects of the decline in available federal timber are factored into two components: (a) supply-induced impacts, and (b) demand-induced impacts. The supply-push effect of the decline in primary input availability generates a set of sales-induced changes in total output within the local economy. These indirect supply impacts are most significant in Morrow County where the induced change in regional output is over 160 thousand dollars. These impacts are

relatively less significant in Baker County. The total value of the supply impact in each county is equal to the direct decline in available stumpage plus the supply-induced change in regional output.

The supply-related change in total output for each sector can be allocated between sales made locally and sales made to final demand. The change in industry sales to final demand generates a set of demand-induced changes in the value of output for each sector. In terms of absolute and relative value, these changes are most significant in Grant County where the demand-related change in total output is nearly 1.2 million dollars. This value is over 17 times the value of the associated supply-induced change. The demand-related changes in regional output are least significant in Morrow County.

The total regional economic impact caused by the decline in available federal stumpage is equal to the value of reduced stumpage plus the sum of the supply and demand-induced changes in regional output. Total regional income effects are most significant in Grant County. This holds for both absolute and relative value. The absolute value of total output change is smallest in Morrow County. However, the relative impacts are least significant in Baker County.

Relative income effects resulting from changes in public timber availability have been found to be most significant in Grant County and least significant in Baker County. Grant County also has been shown to be relatively more dependent upon the income generated by the export of timber and timber-related products (Chapter IV). Because private commercial timber land comprises a relatively smaller proportion of available commercial timber land in Grant County than

in other counties, the region is likely to be least able to compensate decreased public timber harvest with accelerated private timber harvest.

In consideration of these factors, the local economic impacts induced by changes in federal timber availability appear to be most significant in Grant County. If it is the objective of forest management policy to institute changes in timber harvest in that region where direct and indirect economic effects would produce relatively less hardship, this analysis would indicate that these changes should be implemented in Baker County. However, the present analysis has been made using limiting assumptions. A more rigorous study should include the evaluation of any employment and population impacts as well as an analysis of impacts over time to determine the long-range implications of changes in public timber availability.

Policy Implications of the New Methodology

The modified input-output methodology developed in this thesis enables the local economic impacts of a change in primary input availability to be factored into supply-induced and demand-induced components. Although the initial change to the regional economy arises from the supply-push affect of the change in primary resource availability, the consequent economic impacts are dispersed along both the forward linkage and the backward linkage structure of the local economic system. The relative impacts of the supply-related versus the demand-related changes in total output may vary among regional economies. For example, the absolute value of the supply-related changes in regional output calculated above were greatest in Morrow

County. However, the absolute value of the demand-related changes in total output for Morrow County were less than those in the other two counties.

In each of the counties examined in this study, the demand-induced changes in regional output far outweighed the supply-induced changes even though the initial impact on the local economy was a supply-oriented change. Indeed, in Grant County the demand-related change was fully 17 times the value of the supply-induced change. Although the Forest Service may be unable to effectively provide a demand stimulus to a local dependent community (or region), timber management policy may benefit from recognition of the fact that the demand-induced impacts associated with changes in available National Forest Service timber may be very significant.

In more general terms, the modified input-output methodology provides a means by which the impacts associated with changes in factor supply can be factored into supply-related and demand-related components. This may be important for policy decisions which seek to better understand the distributive impacts of alternative management programs. The methodology developed in this thesis has been applied to only one type of resource allocation decision. Further research may be necessary to determine its appropriateness for other resource management scenarios.

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APPENDIX A

TRANSACTIONS TABLES

Table A-1. Transactions Table, Baker County, 1979 ($1,000)*

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Selling Sectors / Purchasing Sectors	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance & Real Estate	Automotive Sales & Services	Professional Services	Lodging
Ranching	1,783	332	606	3	0	0	0	0	11	0	0	0	0
Other Agriculture	400	82	2,636	321	0	0	0	0	0	0	0	0	0
Food Processing	679	41	0	1	0	0	0	0	0	0	0	0	0
Agricultural Services	2,261	1,333	0	1	0	0	3	0	4	0	0	0	0
Lumber/Wood Products Processing	0	0	0	80	24	3	0	232	7	0	0	4	0
Timber Harvesting & Hauling	0	0	0	0	8,996	1,101	0	204	0	0	0	0	0
Mining	0	0	0	0	0	22	77	813	9	0	0	13	0
Construction	0	0	63	132	898	246	0	2,056	226	31	61	48	100
Communications, Transportation, & Utilities	723	1,358	461	131	1	348	208	1,848	343	334	3,137	341	142
Finance, Insurance, & Real Estate	2,344	303	61	475	23	377	137	1,549	788	98	983	330	329
Automotive Sales & Services	4	29	26	333	398	1,386	168	142	863	131	494	32	10
Professional Services	113	12	8	51	30	37	75	89	156	35	70	78	5
Lodging	0	0	0	-----	33	1	1	37	3	14	5	38	0
Cafes & Taverns	0	0	3	3	0	3	0	0	33	34	-----	9	0
Wholesale & Retail Trade	1,673	415	33	121	18	190	30	1,063	1,429	224	534	109	309
Wholesale & Retail Services	-----	0	21	313	3	8	-----	82	42	29	43	33	3
Households	3,929	1,102	670	1,630	7,694	3,123	4,003	6,679	3,628	7,030	4,849	4,464	752
Local Government	434	74	31	39	221	35	111	333	110	38	70	75	61
Local Agencies of State & Federal Government	3	7	2	2	0	56	1	259	43	73	33	9	----
Subtotal - All Local Sectors	*14,000*	*6,138*	*4,848*	*3,720*	*14,341*	*8,881*	*8,843*	*18,898*	*8,878*	*9,058*	*8,039*	*5,780*	*2,835*
Nonlocal Households	-----	0	0	0	0	0	3	0	360	421	37	32	0
Nonlocal Government	393	105	31	213	1,548	761	1,301	1,304	944	3,328	1,335	414	109
Nonlocal Business	2,340	445	986	7,452	2,353	834	8,795	11,605	38,357	15,821	11,618	1,839	374
Subtotal - All Nonlocal Sectors	*8,136*	*868*	*1,023*	*1,848*	*9,860*	*2,833*	*10,087*	*13,909*	*38,681*	*18,879*	*13,010*	*8,348*	*388*
Negative Inventory Change	805	0	0	16	1,051	60	0	41	87	0	176	0	0
Depreciation	1,051	400	40	192	1,193	1,008	448	653	641	189	435	289	205
TOTAL PURCHASES	*18,891*	*8,100*	*5,733*	*11,573*	*33,451*	*8,676*	*18,389*	*81,498*	*87,008*	*38,958*	*33,680*	*8,414*	*3,103*

Selling Sectors / Purchasing Sectors	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Subtotal - All Local Sectors	Nonlocal Households	Nonlocal Government	Nonlocal Business	Subtotal - All Nonlocal Sectors	Positive Inventory Change	Capital Accumulation	TOTAL SALES
Ranching	0	4	0	896	0	-----	3,734	0	131	11,799	11,950	1,273	2,032	18,981
Other Agriculture	0	8	0	216	0	-----	3,721	0	0	2,237	8,277	67	31	6,108
Food Processing	836	131	0	435	102	0	2,789	19	0	2,903	8,823	-----	0	5,713
Agricultural Services	0	0	0	3,331	0	0	8,838	130	300	1,944	8,874	606	1,141	11,573
Lumber/Wood Products Processing	0	3	4	178	80	29	888	0	21	33,000	33,021	9,723	33	32,451
Timber Harvesting & Hauling	0	0	0	0	5	8	8,310	0	0	2,366	3,368	0	0	8,018
Mining	0	1	11	1,431	33	182	3,383	0	191	11,167	12,348	2,130	319	16,389
Construction	326	980	31	10,433	326	19	18,808	3,043	193	2,263	3,503	311	8,837	31,498
Communications, Transportation, & Utilities	316	2,370	181	6,149	131	118	18,062	4,034	243	8,633	8,888	76	7	37,098
Finance, Insurance, & Real Estate	330	834	233	6,933	638	-----	17,208	38	0	4,752	4,810	0	1,933	33,833
Automotive Sales & Services	171	222	101	9,873	478	132	16,589	4,444	13	969	5,448	614	1,001	22,860
Professional Services	43	215	20	6,003	204	361	1,474	336	0	385	781	3	216	8,414
Lodging	1	8	----	398	0	4	544	1,359	2	198	1,559	0	0	3,103
Cafes & Taverns	5	30	1	7,337	1	9	8,920	3,334	261	1,447	3,842	12	0	7,874
Wholesale & Retail Trade	858	3,020	169	41,779	1,052	164	84,800	4,732	34	1,950	8,758	944	892	88,847
Wholesale & Retail Services	83	339	40	3,009	324	18	3,201	96	3	1	100	13	11	3,488
Households	2,495	8,922	1,336	135	9,493	9,394	83,481	14,904	12,509	6,438	34,251	0	3,181	120,838
Local Government	11	110	34	3,613	1,360	1,114	30,878	253	11,361	321	11,937	0	0	32,415
Local Agencies of State & Federal Government	412	41	147	518	206	85	1,910	0	28,936	0	28,936	38	11	30,818
Subtotal - All Local Sectors	*3,708*	*31,929*	*8,888*	*81,183*	*18,068*	*12,470*	*332,878*	*37,544*	*54,327*	*78,800*	*168,851*	*15,038*	*28,550*	*443,111*
Nonlocal Households	0	45	19	1,373	30	2,913	3,843	0	0	0	0	0	0	3,643
Nonlocal Government	333	3,068	132	14,431	2,129	3,736	41,157	0	0	0	0	0	0	41,353
Nonlocal Business	1,341	41,734	360	1,630	2,379	9,718	148,383	0	0	0	0	0	11,459	184,042
Subtotal - All Nonlocal Sectors	*1,883*	*48,887*	*781*	*23,034*	*4,508*	*18,450*	*188,877*	*0*	*0*	*0*	*0*	*0*	*11,859*	*200,730*
Negative Inventory Change	13	516	2	0	0	0	8,781	0	0	0	0	0	0	8,781
Depreciation	211	631	130	0	39	13	7,793	0	0	0	0	0	0	7,793
TOTAL PURCHASES	*1,874*	*88,847*	*3,425*	*120,838*	*33,618*	*30,915*	*462,313*	*37,564*	*54,327*	*78,260*	*169,951*	*15,632*	*33,129*	*880,405*

* ---- Indicates a value of less than $500.

Table A-2. Transactions Table, Grant County, 1977 ($1,000)*

Selling Sectors / Purchasing Sectors	Timber Harvesting & Hauling	Dependent Ranching	Other Ranching	General Agriculture	Mining	Lumber/Wood Products Processing	Food Processing	Other Manufacturing & Processing	Transportation	Communication, Utilities	Finance, Insurance, & Real Estate	General Construction	Agricultural Services	Professional Services	Automotive Sales & Services	Lodging	Cafes & Taverns	Wholesale & Retail Services	Wholesale & Retail Trade	Households	City & County Government	Local Agencies of State & Federal Government	Capital Accumulation/Positive Inventory Change	Nonlocal Households	Nonlocal Government	Nonlocal Business	TOTAL SALES
Timber Harvesting & Hauling	598	1	0	0	0	4,135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1,511	0	0	0	8,320
Dependent Ranching	3	0	0	0	0	233	10	0	0	0	0	0	0	0	0	0	0	0	0	392	0	0	980	18	15	1,582	8,932
Other Ranching	60	0	2	0	0	209	11	0	0	0	0	0	0	0	5	0	0	0	0	322	5	0	420	0	0	2,275	3,238
General Agriculture	0	42	189	45	0	121	0	0	0	0	0	0	0	3	0	0	33	0	25	128	0	166	21	90	0	469	2,230
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,153	6,153
Lumber/Wood Products Processing	8	23	2	0	26	1,624	0	0	0	0	0	40	0	....	1	0	8	....	0	264	6	4	3,421	0	0	32,196	33,327
Food Processing	0	8	7	0	0	0	0	0	1	0	0	0	0	0	....	....	0	5	127	564	0	0	8	19	0	500	1,255
Other Manufacturing & Processing	0	0	5	0	38	51	....	0	8	0	0	20	0	0	0	0	8	0	12	232	56	1	8	185	0	0	623
Transportation	8	10	3	16	26	451	3	14	1	81	2	12	39	6	26	0	2	1	110	40	85	2	79	17	0	21	1,328
Communication, Utilities	12	151	82	18	8	404	18	6	32	51	81	21	18	76	168	294	138	94	190	2,820	513	167	153	611	88	26	6,797
Finance, Insurance, & Real Estate	75	279	358	30	0	4	22	3	20	58	62	51	0	45	88	138	85	11	225	1,336	230	0	885	63	0	118	4,844
General Construction	0	12	39	25	0	30	0	0	1	2	0	165	0	8	4	1	27	25	55	560	401	17	843	101	0	233	2,622
Agricultural Services	42	598	400	8	0	19	0	0	.....	0	0	0	0	....	2	0	0	0	0	146	1	323	261	0	0	0	1,808
Professional Services	36	130	58	10	0	104	6	3	3	6	12	6	16	47	26	11	20	1	11	1,511	107	38	160	167	243	300	2,161
Automotive Sales & Services	348	533	15	7	174	816	32	20	....	11	20	21	103	30	1,796	15	5	8	43	4,064	814	136	814	1,363	150	401	13,820
Lodging	0	9	5	....	0	10	0	0	5	1	1	0	0	0	0	0	0	2	12	355	6	10	2	454	482	146	1,313
Cafes & Taverns	8	8	5	....	0	75	5	0	2	2	51	0	0	....	4	0	6	5	10	579	1	8	348	136	10	101	2,010
Wholesale & Retail Services	0	39	15	0	0	10	9	0	2	8	25	33	0	37	61	25	39	38	10	730	35	8	98	52	87	39	1,594
Wholesale & Retail Trade	32	1,047	535	8	1,030	211	4	17	55	17	12	13	0	78	394	38	250	45	464	9,705	411	86	132	494	0	61	18,927
Households	2,818	2,831	350	753	518	11,159	788	120	269	1,090	1,796	879	222	1,897	1,170	273	453	185	2,084	792	2,708	5,515	413	149	1,110	178	48,933
City & County Government	5	472	157	80	3	485	13	32	15	312	10	28	9	9	61	83	27	22	316	2,183	855	.....	131	4	3,430	0	7,603
Local Agencies of State & Federal Government	719	278	133	15	68	7,542	3	12	10	368	51	72	18	51	511	4	44	60	98	184	315	2	11	291	85	2,722	13,423
Depreciation/Negative Inventory Change	313	878	605	95	26	1,115	54	58	53	247	18	61	60	53	139	160	35	18	239	0	2	4	0	0	0	0	4,212
Nonlocal Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	109	0	57	0	0	0	0	343
Nonlocal Government	216	166	81	16	5	276	10	6	12	111	31	141	78	83	315	7	104	23	158	10,761	8	4,415	176	0	0	0	17,294
Nonlocal Business	815	1,409	205	851	1,256	6,446	141	532	791	2,644	2,331	1,071	1,301	811	6,636	216	338	150	12,440	8,861	1,006	3,655	2,811	0	0	0	47,489
TOTAL PURCHASES	6,320	9,488	3,218	1,280	8,282	88,221	1,255	835	1,329	9,395	8,544	5,882	1,208	8,283	11,920	1,928	2,210	1,288	18,827	88,828	7,603	35,422	14,882	4,781	10,888	83,350	308,817

* ---- indicates a value of less than $500.

Table A-3. Transactions Table, Grant County, 1979 ($1,000)*

Selling Sectors \ Purchasing Sectors	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Subtotal - All Local Sectors	Nonlocal Households	Nonlocal Government	Nonlocal Business	Subtotal - All Nonlocal Sectors	Capital Accumulation/Positive Inventory Change	TOTAL SALES
Ranching	7	0	30	0	465	84	0	0	0	0	1	0	0	0	0	0	926	4	0	3,715	11	22	11,707	19,226	7,107	17,133
Other Agriculture	135	42	0	0	179	8	4	0	0	0	0	2	0	27	24	0	137	0	118	750	43	0	502	546	22	1,317
Food Processing	13	0	0	0	0	0	0	8	1	0	----	0	----	0	151	6	878	0	0	849	21	0	398	821	7	1,678
Agricultural Services	1,457	9	0	0	22	49	0	0	----	0	2	1	0	0	0	0	172	1	178	8,083	0	0	0	8	225	7,388
Lumber/Wood Products Processing	30	0	0	0	2,155	0	13	32	0	0	5	----	0	0	0	---	334	8	8	3,022	0	0	41,913	41,836	4,194	49,552
Timber Harvesting & Hauling	1	0	0	0	3,493	767	0	9	0	0	0	0	0	0	0	0	0	0	10	8,572	0	0	0	0	2,015	8,888
Mining	3	0	----	0	35	0	37	66	0	0	0	0	0	0	11	0	221	83	1	428	154	0	6,319	5,075	7	8,810
Construction	51	28	----	0	47	4	11	212	3	0	4	8	1	13	47	31	762	507	15	2,788	189	0	165	450	1,161	2,400
Communications, Transportation, & Utilities	264	34	76	54	1,199	30	35	44	119	96	248	34	373	160	341	109	3,377	451	228	7,127	175	112	33	322	761	6,898
Finance, Insurance, & Real Estate	563	39	29	5	3	97	1	85	101	80	175	56	196	110	325	21	3,093	797	0	5,224	81	0	167	248	856	8,329
Automotive Sales & Services	984	8	38	113	879	915	164	11	13	24	1,077	35	15	8	31	10	4,258	859	153	10,200	1,639	196	416	8,320	1,106	12,770
Professional Services	275	11	7	11	124	45	2	8	13	14	31	54	13	74	11	8	1,801	178	41	5,582	318	795	357	548	714	8,770
Lodging	18	----	0	0	11	9	0	9	1	1	0	0	0	0	16	1	703	8	13	289	399	609	192	1,288	3	1,871
Cafes & Taverns	15	----	5	0	50	7	0	0	3	14	3	----	0	3	17	8	702	2	10	817	454	12	113	551	424	1,822
Wholesale & Retail Trade	2,848	8	5	0	256	58	1,214	30	86	17	870	34	46	314	534	32	10,877	890	81	17,420	958	0	108	1,057	873	18,870
Wholesale & Retail Services	41	0	8	0	11	0	0	13	8	74	101	43	20	33	11	11	825	85	10	3,882	14	70	22	204	113	1,987
Households	5,291	236	116	316	13,631	3,464	740	1,050	1,197	1,200	1,937	2,179	343	335	1,055	883	307	2,406	8,447	88,607	232	8,299	208	8,788	331	94,788
Local Government	831	90	12	8	167	8	12	31	331	10	66	8	84	27	118	22	3,183	710	----	2,812	4	2,477	0	2,481	132	7,437
Local Agencies of State & Federal Government	513	19	8	18	1,093	284	101	103	350	14	448	72	5	56	138	76	233	402	3	3,802	330	7,276	3,436	11,048	14	15,818
Subtotal - All Local Sectors	32,287	628	477	881	28,237	5,881	8,372	1,708	8,457	2,493	2,493	8,580	1,104	1,240	2,882	1,287	91,628	8,402	7,887	217,211	8,785	18,787	88,501	53,827	74,842	329,701
Nonlocal Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	114	0	87	190	0	0	0	8	0	290
Nonlocal Government	377	15	15	35	7,741	1,048	18	189	157	14	171	78	3	136	190	34	13,213	10	8,579	28,103	8	0	0	0	223	29,324
Nonlocal Business	2,837	580	903	1,526	11,418	1,561	4,433	1,509	3,510	2,232	7,932	1,032	333	311	15,191	181	9,825	1,005	3,728	78,564	0	0	0	0	2,439	76,852
Subtotal - All Nonlocal Sectors	4,214	795	918	1,544	19,179	8,809	8,442	1,698	6,687	2,751	8,110	7,112	348	447	19,368	213	53,181	1,618	8,787	108,848	0	0	0	0	2,442	108,132
Depreciation/Negative Inventory Change	1,910	118	73	78	1,433	402	81	83	340	13	148	71	225	43	397	23	0	8	5	8,897	8	0	0	0	8	1,941
TOTAL PURCHASES	17,691	1,847	1,478	3,385	48,501	8,232	8,810	8,400	8,888	8,368	12,770	8,770	1,871	1,822	18,370	1,487	94,789	7,237	18,550	338,801	8,989	35,252	88,501	22,427	18,323	337,153

* ---- indicates a value of less than $500.

Table A-4. Transactions Table, Morrow County, 1979 ($1,000)*

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities
Ranching	105	70	65	0	0	0	0	0	0
Other Agriculture	453	1,239	5,635	0	0	0	0	0	0
Food Processing	537	1,009	689	0	0	0	0	0	0
Agricultural Services	1,083	6,000	196	109	0	0	0	2	0
Lumber/Wood Products Processing	381	0	0	0	3,257	0	0	0	0
Timber Harvesting & Hauling	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0
Construction	0	0	0	------	0	0	0	150	46
Communication, Transportation, & Utilities	170	392	6	45	503	0	0	41	30
Finance, Insurance, & Real Estate	149	657	20	24	45	0	0	95	41
Automotive Sales & Services	0	21	47	62	87	0	0	61	82
Professional Services	1	27	81	5	3	0	0	6	18
Lodging	102	0	0	------	0	0	0	11	0
Cafes & Taverns	0	4	0	2	0	0	0	15	8
Wholesale & Retail Trade	481	2,623	1	17	22	0	0	35	71
Wholesale & Retail Services	0	0	46	8	12	0	0	6	16
Households	944	6,954	6,828	1,085	8,323	0	0	812	399
Local Government	129	492	635	758	157	0	0	13	36
Local Agencies of State & Federal Government	88	21	1,652	203	696	0	0	58	77
Subtotal - All Local Sectors	*4,555*	*25,170*	*24,350*	*1,514*	*10,108*	*0*	*0*	*1,408*	805
Nonlocal Households	0	3,863	0	34	0	0	0	1,093	260
Nonlocal Government	391	3,143	210	12	4,948	0	0	132	135
Nonlocal Business	5,164	32,245	20,967	11,839	12,752	0	0	4,083	1,891
Subtotal - All Nonlocal Sectors	*3,557*	*38,831*	*81,077*	*12,948*	*32,200*	*0*	*0*	*3,308*	*2,788*
Negative Inventory Change[a/]	52	604	1,634	81	1,667	0	0	105	66
Depreciation[b/]	500	3,542	2,616	1,097	1,918	0	0	98	837
TOTAL PURCHASES	*10,577*	*80,528*	*58,583*	*15,037*	*55,818*	*0*	*0*	*8,817*	*3,888*

	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government
Ranching	0	0	0	0	0	0	0	17	0
Other Agriculture	0	0	0	0	0	0	0	------	0
Food Processing	0	0	0	0	0	40	0	141	0
Agricultural Services	0	0	0	0	0	0	2	366	34
Lumber/Wood Products Processing	0	0	0	0	0	0	0	651	6
Timber Harvesting & Hauling	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0
Construction	0	24	------	14	9	21	8	1,737	44
Communication, Transportation, & Utilities	5	35	16	50	16	154	16	983	84
Finance, Insurance, & Real Estate	365	35	10	85	41	132	98	677	76
Automotive Sales & Services	24	131	1	15	6	43	43	3,132	118
Professional Services	1	4	11	8	5	24	7	963	83
Lodging	0	0	0	0	0	0	1	492	0
Cafes & Taverns	6	0	1	3	1	8	0	1,053	3
Wholesale & Retail Trade	3	1,089	6	8	128	56	28	9,309	25
Wholesale & Retail Services	31	13	4	32	16	63	7	483	33
Households	1,355	460	554	63	342	1,534	224	962	8,665
Local Government	25	10	14	99	10	60	10	1,803	181
Local Agencies of State & Federal Government	32	86	12	95	56	160	32	03	20
Subtotal - All Local Sectors	*3,854*	*1,554*	*864*	*458*	*833*	*8,345*	*518*	*82,882*	*5,888*
Nonlocal Households	1	0	117	13	0	2	0	399	158
Nonlocal Government	127	67	65	99	24	270	00	0,920	1,378
Nonlocal Business	543	3,614	357	664	826	11,122	289	15,750	1,375
Subtotal - All Nonlocal Sectors	*678*	*8,880*	*635*	*778*	*580*	*21,694*	*378*	*88,218*	*8,808*
Negative Inventory Change[a/]	598	75	0	0	166	18	11	0	70
Depreciation[b/]	64	73	257	356	58	220	40	0	479
TOTAL PURCHASES	*3,218*	*5,893*	*1,984*	*2,587*	*2,448*	*14,182*	*845*	*87,080*	*7,538*

	Local Agencies of State & Federal Government	Subtotal - All Local Sectors	Nonlocal Households	Nonlocal Government	Nonlocal Business	Subtotal - All Nonlocal Sectors	Positive Inventory Change	Capital Accumulation	TOTAL SALES*
Ranching	------	*357*	0	64	10,151	*10,215*	25	87	[illegible]
Other Agriculture	------	*8,338*	6	62	55,376	*55,444*	1,812	10	[illegible]
Food Processing	0	*8,408*	26	01	15,348	*35,456*	1,770	0	[illegible]
Agricultural Services	8	*7,893*	53	0	5,399	*5,452*	44	1,646	[illegible]
Lumber/Wood Products Processing	35	*8,338*	0	326	31,268	*31,591*	0	0	[illegible]
Timber Harvesting & Hauling	0	*0*	0	0	0	0	0	0	*0*
Mining	0	*0*	0	0	0	*0*	0	0	*0*
Construction	58	*8,077*	131	116	2,930	*8,167*	65	2,504	[illegible]
Communication, Transportation, & Utilities	26	*8,648*	284	400	59	*743*	0	12	[illegible]
Finance, Insurance, & Real Estate	0	*8,589*	416	5	20	*439*	0	78	[illegible]
Automotive Sales & Services	353	*8,208*	1,046	13	49	*2,207*	50	418	[illegible]
Professional Services	0	*2,537*	161	0	36	*287*	0	0	*1,439*
Lodging	0	*608*	452	25	*824*	*861*	0	6	[illegible]
Cafes & Taverns	0	*2,200*	342	0	0	*348*	4	0	[illegible]
Wholesale & Retail Trade	38	*18,888*	997	0	67	*1,064*	112	83	[illegible]
Wholesale & Retail Services	3	*789*	154	0	24	*178*	4	0	*969*
Households	11,754	*65,378*	1,622	*078*	0	*3,800*	0	7	[illegible]
Local Government	------	*8,188*	0	1,293	8,176	*3,468*	0	0	*7,835*
Local Agencies of State & Federal Government	0	*5,388*	99	12,394	2,154	*14,947*	0	21	*27,752*
Subtotal - All Local Sectors	*18,287*	*89,038*	*5,853*	*38,003*	*143,578*	*188,483*	*3,947*	*3,882*	[illegible]
Nonlocal Households	41	*8,720*	0	0	0	0	0	0	[illegible]
Nonlocal Government	1,160	*81,164*	0	0	0	*0*	0	0	[illegible]
Nonlocal Business	3,844	*152,435*	0	0	0	*0*	0	13,151	[illegible]
Subtotal - All Nonlocal Sectors	*8,044*	*187,383*	*0*	*4*	0	0	0	15,251	[illegible]
Negative Inventory Change[a/]	20	*5,038*	0	0	0	0	0	0	[illegible]
Depreciation[b/]	0	*11,848*	0	0	0	0	0	0	[illegible]
TOTAL PURCHASES	*27,158*	*873,338*	*5,853*	*28,888*	*146,878*	*188,488*	*3,947*	*17,112*	[illegible]

* -- Indicates a transaction with a value less than $500.

APPENDIX B

INPUT-OUTPUT TABLES, SUPPLY MODEL

Table B-1. Matrix of Direct Coefficients, Supply Model, Baker County, 1979*

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Nonlocal Households	Nonlocal Government	Nonlocal Business	Negative Inventory Change a/	Depreciation b/
Ranching	.0676	.0666	.1301	.1953	0	0	0	0	.0267	.1001	.0002	.0134	0	0	.0266	.0001	.0326	.0192	---	---	.0144	.0165	.0918	.1345
Other Agriculture	.0175	.0135	.0083	.1169	0	0	0	0	.0420	.0234	.0012	.0014	0	0	.0066	0	.0091	.0055	.0002	0	.0025	.0029	0	.0520
Food Processing	.0320	.4323	0	0	0	0	0	.0020	.0172	.0025	.0011	.0010	0	.0003	.0005	.0060	.0056	.0023	---	0	.0009	.0064	0	.0051
Agricultural Services	.0002	.0526	.0002	---	.0025	0	0	.0040	.0056	.0198	.0147	.0061	.0002	.0004	.0019	.0913	.0159	.0026	---	0	.0052	.0483	.0018	.0245
Lumber/Wood Products Processing	0	0	0	0	.0007	.5745	0	.0284	.0002	.0009	.0176	.0035	.0155	0	.0003	.0010	.0639	.0100	0	0	.1834	.0150	.8048	.1526
Timber Harvesting & Hauling	0	0	0	0	---	.1266	.0015	.0078	.0128	.0157	.0613	.0032	.0033	.0002	.0052	.0025	.0180	.0015	.0018	0	.0186	.0055	.0068	.1290
Mining	0	0	0	.0002	0	0	.0050	0	.0077	.0065	.0074	.0030	.0005	0	.0005	---	.0332	.0076	---	.0010	.0316	.0571	0	.0575
Construction	0	0	0	0	.0072	.0234	.0530	.0937	.0681	.0646	.0328	.0082	.0270	0	.0169	.0268	.0554	.0147	.0084	0	.0317	.0819	.0047	.0833
Communication, Transportation, & Utilities	.0006	0	.0004	.0003	.0002	0	.0006	.0072	.0126	.0329	.0383	.0185	.0016	.0014	.0227	.0123	.0467	.0048	.0015	.0049	.0279	.0998	.0100	.0821
Finance, Insurance, & Real Estate	0	0	0	0	0	0	0	.0007	.0131	.0041	.0061	.0042	.0067	.0018	.0036	.0085	.0585	.0017	.0024	.0768	.0325	.0905	0	.0242
Automotive Sales & Services	0	0	0	0	0	0	0	.0019	.0785	.0411	.0218	.0023	.0023	---	.0088	.0125	.0386	.0035	.0007	.0105	.0324	.0755	.0200	.0557
Professional Services	0	0	0	0	.0001	0	.0010	.0015	.0126	.0138	.0014	.0093	.0076	.0005	.0030	.0073	.0387	.0011	.0005	.0057	.0115	.0120	0	.0369
Lodging	0	0	0	0	0	0	0	.0032	.0052	.0095	.0005	.0006	0	0	.0049	.0005	.0062	.0030	---	0	.0027	.0011	0	.0267
Cafes & Taverns	0	0	.1464	0	.0002	0	0	.0040	.0117	.0138	.0076	.0051	.0003	.0006	.0136	.0271	.0207	.0051	.0135	0	.0130	.0088	.0015	.0270
Wholesale & Retail Trade	.0002	.0010	.1291	0	.0002	0	---	.0311	.0875	.0356	.0098	.0256	.0024	.0038	.0480	.0699	.0741	.0075	.0015	.0081	.0507	.2712	.0587	.0848
Wholesale & Retail Services	0	0	0	0	.0001	0	.0007	.0016	.0069	.0107	.0047	.0024	.0001	---	.0027	.0118	.0127	.0015	.0048	.0034	.0037	.0036	.0002	.0177
Households	.0262	.0453	.0761	.2878	.0055	0	.0947	.3314	.2269	.2892	.4364	.7142	.1895	.5222	.6645	.5868	.0061	.1598	.0171	.2841	.3512	.0496	0	0
Local Government	0	0	.0178	0	.0025	.0006	.0015	.0119	.0266	.0275	.0209	.0242	0	.0001	.0326	.0946	.0787	.1485	.0067	.0091	.0517	.0151	0	.0049
Local Agencies of State & Federal Government	---	---	0	0	.0009	.0005	.0105	.0023	.0043	---	.0058	.0429	.0017	.0011	.0026	.0053	.0795	.0762	.0027	.5365	.1394	.0652	0	.0019
Nonlocal Households	0	0	.0033	.0030	0	0	0	.0965	.1488	.0024	.1954	.0399	.6459	.4488	.0756	.0276	.1220	.0115	0	0	0	0	0	0
Nonlocal Government	.0080	0	0	.0173	.0000	0	.0117	.0062	.0089	0	.0006	0	.0009	.0532	.0009	.0007	.1028	.5026	.9358	0	0	0	0	0
Nonlocal Business	.6210	.3720	.5083	.1680	.6181	.2744	.7259	.0730	.1730	.1982	.0432	.0449	.0947	.1841	.0310	.0004	.0568	.0142	0	0	0	0	0	0
Positive Inventory Change	.1198	.0110	---	.0524	.2995	0	.0734	.0099	.0028	0	.0271	.0004	0	.0015	.0156	.0039	0	0	.0019	0	0	0	0	0
Capital Accumulation	.1071	.0058	0	.0986	.0017	0	.0207	.2814	.0002	.0817	.0442	.0257	0	0	.0135	.0055	.0262	0	.0004	0	0	.0761	0	0
TOTAL	*1.0002*	*1.0001*	*1.0000*	*0.9998*	*1.0000*	*1.0000*	*1.0002*	*0.9998*	*0.9999*	*1.0000*	*1.0001*	*1.0000*	*1.0000*	*1.0000*	*0.9998*	*1.0000*	*1.0000*	*1.0000*	*1.0000*	*0.9998*	*0.9998*	*1.0001*	*0.9998*	*1.0200*

* -- indicates a value of less than .00005.

Table B-2. Matrix of Direct and Indirect Coefficients, Supply Model, Baker County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government
Ranching	1.0823	.1520	.1419	.2502	.0014	.0019	.0090	.0330	.0753	.1587	.0446	.0755	.0169	.0245	.0886	.0828	.0730	.0429	.0034
Other Agriculture	.0206	1.0307	.0173	.1312	.0006	.0007	.0029	.0107	.0566	.0410	.0172	.0215	.0053	.0077	.0265	.0306	.0229	.0103	.0013
Food Processing	.0439	.4522	1.0145	.0677	.0004	.0006	.0028	.0120	.0489	.0305	.0157	.0206	.0050	.0076	.0225	.0298	.0217	.0108	.0011
Agricultural Services	.0023	.0586	.0072	1.0147	.0028	.0023	.0034	.0154	.0218	.0351	.0296	.0268	.0061	.0089	.0225	.1133	.0256	.0095	.0016
Lumber/Wood Products Processing	.0044	.0186	.0260	.0345	1.0022	.6614	.0161	.0821	.0626	.0642	.1171	.0910	.0424	.0360	.0860	.0872	.1093	.0382	.0054
Timber Harvesting & Hauling	.0015	.0063	.0091	.0114	.0005	1.1459	.0066	.0250	.0372	.0382	.0914	.0323	.0121	.0121	.0321	.0316	.0358	.0108	.0036
Mining	.0018	.0078	.0109	.0147	.0005	.0009	1.0106	.0190	.0279	.0272	.0316	.0389	.0103	.0151	.0353	.0354	.0461	.0191	.0017
Construction	.0043	.0190	.0274	.0330	.0091	.0368	.0715	1.1483	.1280	.1239	.0972	.0931	.0533	.0344	.1008	.1132	.1040	.0446	.0135
Communications, Transportation, & Utilities	.0037	.0140	.0207	.0235	.0011	.0018	.0097	.0385	1.0499	.0684	.0775	.0758	.0178	.0252	.0790	.0698	.0721	.0225	.0043
Finance, Insurance, & Real Estate	.0032	.0136	.0190	.0249	.0008	.0015	.0095	.0332	.0470	1.0390	.0470	.0655	.0236	.0277	.0630	.0679	.0790	.0197	.0051
Automotive Sales & Services	.0026	.0112	.0161	.0198	.0007	.0012	.0077	.0288	.1095	.0727	1.0579	.0527	.0163	.0207	.0584	.0620	.0635	.0187	.0032
Professional Services	.0022	.0092	.0129	.0170	.0007	.0011	.0075	.0238	.0359	.0378	.0295	1.0511	.0193	.0181	.0436	.0480	.0537	.0133	.0022
Lodging	.0005	.0021	.0032	.0034	.0001	.0003	.0015	.0081	.0108	.0149	.0064	.0092	1.0025	.0035	.0135	.0095	.0106	.0060	.0005
Cafes & Taverns	.0079	.0729	.1586	.0208	.0007	.0010	.0050	.0209	.0363	.0352	.0287	.0361	.0088	1.0130	.0459	.0594	.0374	.0144	.0151
Wholesale & Retail Trade	.0110	.0828	.1663	.0469	.0018	.0036	.0168	.0872	.1548	.1005	.0790	.1243	.0304	.0441	1.1458	.1707	.1217	.0385	.0068
Wholesale & Retail Services	.0008	.0035	.0050	.0063	.0003	.0005	.0033	.0101	.0164	.0201	.0155	.0182	.0046	.0066	.0180	1.0274	.0198	.0067	.0056
Households	.0512	.2159	.2973	.4081	.0132	.0230	.1542	.5254	.5313	.5499	.6543	.9941	.2761	.4236	.9607	.9564	1.2946	.2823	.0432
Local Government	.0066	.0349	.0584	.0450	.0045	.0058	.0193	.0737	.0984	.0985	.0986	.1375	.0307	.0455	.1448	.2197	.1377	1.2068	.0134
Local Agencies of State & Federal Government	.0048	.0209	.0298	.0374	.0024	.0036	.0251	.0523	.0578	.0549	.0686	.1369	.0274	.0398	.0941	.1025	.1181	.1160	1.0075
MULTIPLIERS	*1.8558*	*2.2262*	*2.0418*	*2.2105*	*1.0038*	*1.8938*	*1.3825*	*2.2475*	*2.6084*	*2.6107*	*2.6074*	*3.1011*	*1.6089*	*1.8141*	*3.0791*	*3.3172*	*2.4456*	*1.9311*	*1.1382*

Table B-3. Matrix of Direct Coefficients, Supply Model, Grant County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Nonlocal Households	Nonlocal Government	Nonlocal Business	Depreciation/ Negative Inventory Change*
Ranching	.0001	.1669	.0100	.6076	.0006	.0001	.0005	.0190	.0314	.0903	.0332	.0596	.0096	.0084	.1480	.0316	.0063	.0860	.0303	0	.0110	.0342	.3508
Other Agriculture	0	.0359	0	.0037	0	0	0	.0083	.0042	.0062	.0006	.0028	----	----	.0003	0	.0043	.0100	.0011	0	.0008	.0088	.0219
Food Processing	.0017	0	0	0	0	0	.0001	-----	.0030	.0046	.0028	.0017	0	.0031	.0003	.0059	.0058	.0017	.0005	0	.0004	.0118	.0134
Agricultural Services	0	0	0	0	0	0	0	0	.0063	0	.0090	.0056	0	0	0	0	.0043	.0011	.0011	0	.0011	.0232	.0140
Lumber/Wood Products Processing	.0377	.0058	0	.0091	.8440	.6630	.0051	.0139	.1413	.0008	.0711	.0329	.0076	.0166	.0132	.0075	.2484	.0631	.1801	0	.2846	.1484	.7634
Timber Harvesting & Hauling	.0033	0	0	.0205	0	.0028	0	0	.0024	.0136	.0302	.0114	0	.0040	.0030	0	.0630	.0004	.0168	0	.0357	.0205	.0738
Mining	0	0	0	0	.0007	0	.0053	.0031	.0063	.0002	.0121	.0006	0	0	.0626	0	.0135	.0012	.0059	0	.0005	.0576	.0167
Construction	0	0	0	0	.0011	0	.0096	.0652	.0037	.0103	.0022	.0020	0	0	.0010	.0084	.0191	.0042	.0060	0	.0084	.0183	.0176
Communications, Transportation, & Utilities	0	0	.0010	.0001	0	0	0	.0010	.0173	.0162	.0010	.0034	.0009	.0014	.0045	.0057	.0254	.0447	.0207	0	.0033	.0716	.0663
Finance, Insurance, & Real Estate	0	0	0	0	0	0	0	0	.0114	.0123	.0018	.0037	.0005	.0074	.0007	.0173	.0400	.0013	.0008	0	.0003	.0486	.0046
Automotive Sales & Services	.0004	0	.0002	.0008	----	0	0	.0013	.0288	.0202	.1471	.0082	0	.0023	.0242	.0679	.0353	.0092	.0276	0	.0093	.1019	.0509
Professional Services	0	.0017	0	.0002	----	0	0	.0023	.0111	.0090	.0026	.0148	0	.0002	.0017	.0284	.0397	.0011	.0042	0	.0027	.0134	.0131
Lodging	0	0	.0002	0	0	0	0	.0003	.0441	.0314	.0031	.0035	0	0	.0024	.0176	.0063	.0113	.0003	0	.0003	.0043	.0415
Cafes & Taverns	0	.0278	0	0	0	0	0	.0096	.0188	.0176	.0004	.0062	0	.0027	.0162	.0224	.0097	.0037	.0033	0	.0047	.0040	.0083
Wholesale & Retail Trade	0	.0182	.1026	0	0	0	.0017	.0138	.0402	.0483	.0037	.0035	.0095	.0064	.0286	.0079	.0343	.0161	.0073	.0568	.0068	.1975	.0565
Wholesale & Retail Services	0	0	.0043	0	----	0	0	.0091	.0128	.0034	.0007	.0024	.0007	.0033	.0027	.0143	.0161	.0030	.0045	0	.0012	.0023	.0046
Households	.0526	.1014	.4362	.0716	.0069	0	.0321	.2259	.3985	.4869	.3527	.4773	.1213	.3835	.3613	.3527	.0056	.2949	.0137	.6110	.4506	.1278	0
Local Government	.0002	0	0	.0003	.0001	0	.0077	.1490	.0533	.0475	.0620	.0339	.0032	.0008	.0233	.0569	.0438	.0939	.0237	0	.0003	.0131	.0017
Local Agencies of State & Federal Government	0	.1319	0	.1573	.0001	.0012	.0002	.0044	.0267	0	.0018	.0119	.0081	.0056	.0043	.0065	.1173	.0001	.0002	.3323	.1901	.0481	.0009
Nonlocal Households	.0013	.0321	.0134	0	0	0	.0227	.0498	.0866	.0138	.1183	.0836	.3382	.2488	.0493	.0094	.0042	.0003	.0194	0	0	0	0
Nonlocal Government	.0013	0	0	0	0	0	0	0	.0132	0	.0135	.0781	.5638	.0067	0	.0480	.1527	.3320	.4290	0	0	0	0
Nonlocal Business	.7795	.3717	.4051	0	.8567	0	.9141	.0844	.0062	.0254	.0353	.0960	.1147	.0670	.0036	.1500	.0038	0	.2029	0	0	0	0
Capital Accumulation/ Positive Inventory Change	.1197	.0184	.0049	.1286	.0898	.2411	.0010	.5416	.0311	.1414	.0846	.0568	.0018	.2314	.0433	.0762	.0111	.0179	.0008	0	.0076	.0443	0
TOTAL	*1.0000*	*0.9998*	*0.9999*	*1.0000*	*1.0000*	*1.0002*	*1.0001*	*1.0000*	*1.0001*	*1.0003*	*0.9998*	*0.9999*	*1.0001*	*1.0000*	*0.9999*	*0.9998*	*1.0000*	*1.0003*	*2.0003*	*2.0001*	*0.9999*	*1.0000*	*1.0000*

* ---- indicates a value of less than .00003.

Table B-4. Matrix of Direct and Indirect Coefficients, Supply Model, Grant County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government
Ranching	1.0084	.2043	.1057	.6522	.0019	.0016	.0080	.0914	.1326	.1988	.1266	.1491	.0317	.0716	.2520	.1497	.1511	.1631	.0182
Other Agriculture	.0004	1.0586	.0039	.0050	.0001	.0001	.0005	.0137	.0093	.0118	.0051	.0074	.0011	.0031	.0055	.0061	.0075	.0157	.0027
Food Processing	.0021	.0017	1.0044	.0021	.0001	---	.0004	.0032	.0078	.0100	.0072	.0063	.0011	.0065	.0058	.0121	.0084	.0054	.0014
Agricultural Services	.0004	.0012	.0034	1.0010	.0001	---	.0003	.0024	.0103	.0045	.0136	.0092	.0009	.0026	.0044	.0054	.0064	.0042	.0020
Lumber/Wood Products Processing	.0686	.2050	.2265	.1353	1.0494	.7696	.0253	.1751	.5000	.2816	.5215	.2758	.0665	.1951	.2956	.5126	.4246	.2556	.2401
Timber Harvesting & Hauling	.0108	.0174	.0478	.0399	.0007	1.1029	.0036	.0302	.0516	.0126	.0815	.0608	.0121	.0409	.0606	.0615	.0901	.0540	.0258
Mining	.0012	.0056	.0181	.0057	.0009	.0007	1.0064	.0121	.0216	.0110	.0250	.0126	.0036	.0095	.0790	.0166	.0217	.0121	.0088
Construction	.0015	.0053	.0147	.0044	.0014	.0010	.0115	1.0799	.0216	.0785	.0165	.0170	.0057	.0113	.0194	.0286	.0276	.0162	.0090
Communication, Transportation, & Utilities	.0021	.0091	.0221	.0085	.0003	.0005	.0020	.0225	1.0471	.0129	.0251	.0260	.0064	.0175	.0306	.0361	.0389	.0658	.0252
Finance, Insurance, & Real Estate	.0022	.0078	.0263	.0060	.0004	.0003	.0020	.0169	.0578	1.0430	.0251	.0299	.0071	.0715	.0321	.0518	.0397	.0213	.0035
Automotive Sales & Services	.0058	.0145	.0558	.0158	.0005	.0004	.0076	.0255	.0705	.0635	1.2024	.0458	.0087	.0285	.0685	.1742	.0610	.0161	.0382
Professional Services	.0027	.0099	.0268	.0069	.0004	.0005	.0020	.0196	.0381	.0396	.0264	1.0416	.0061	.0201	.0336	.0456	.0501	.0215	.0081
Lodging	.0007	.0022	.0072	.0018	.0001	.0001	.0006	.0071	.0530	.0410	.0083	.0110	1.0018	.0054	.0110	.0781	.0121	.0048	.0027
Cafes & Taverns	.0009	.0322	.0103	.0027	.0001	.0001	.0008	.0173	.0295	.0293	.0086	.0154	.0024	1.0095	.0272	.0519	.0161	.0122	.0053
Wholesale & Retail Trade	.0029	.0285	.1524	.0076	.0004	.0005	.0042	.0357	.0717	.0839	.0300	.0317	.0167	.0219	1.0625	.0464	.0507	.0110	.0138
Wholesale & Retail Services	.0012	.0041	.0160	.0033	.0002	.0001	.0010	.0177	.0251	.0171	.0112	.0140	.0036	.0123	.0166	1.0298	.0216	.0126	.0065
Households	.0645	.1760	.6728	.1372	.0092	.0068	.0420	.5874	.6062	.1015	.5429	.6172	.1557	.4156	.7408	.7930	1.1887	.1547	.0754
Local Government	.0046	.0171	.0457	.0150	.0010	.0008	.0136	.2052	.1006	.1079	.1192	.0822	.0138	.0344	.0827	.1281	.0844	1.1830	.0137
Local Agencies of State & Federal Government	.0078	.1589	.0764	.1752	.0012	.0023	.0060	.0540	.1044	.0881	.0822	.0890	.0278	.0657	.0955	.1055	.1446	.0595	1.0111
MULTIPLIERS	*1.1851*	*1.0394*	*1.4483*	*1.2010*	*1.0684*	*1.0872*	*1.1358*	*1.6147*	*1.6328*	*1.6820*	*1.6760*	*1.6392*	*1.3717*	*1.0612*	*2.9034*	*3.0371*	*2.4225*	*2.3956*	*1.1611*

* -- indicates a value of less than .00005.

Table B-5. Matrix of Direct Coefficients, Supply Model, Morrow County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Governments	Nonlocal Households	Nonlocal Governments	Nonlocal Business	Negative Inventory Change a/	Depreciation b/
Ranching	.0099	.0075	.0136	.0720	.0106	0	0	0	.0516	.0479	0	.0005	.0640	0	.0339	0	.0196	.0168	.0034	0	.0186	.0356	.0074	.0329
Other Agriculture	.0066	.0204	.0755	.3990	0	0	0	0	.1189	.2109	.0038	.0188	0	.0023	.1849	0	.1447	.0645	.0012	.5433	.1004	.2225	.1197	.2290
Food Processing	.0061	.0710	.0173	.0131	0	0	0	0	.0024	.0064	.0082	.0567	0	0	---	.0488	.1849	.1225	.0961	0	.0052	.1447	.3254	.2206
Agricultural Services	0	0	0	.0139	0	0	0	.0001	.0137	.0078	.0109	.0033	.0001	.0005	.0012	.0082	.0226	.0334	.0118	.0071	.0034	.0817	.0161	.0925
Lumber/Wood Products Processing	0	0	0	0	.0906	0	0	0	.1523	.0145	.0153	.0010	0	0	.0016	.0127	.1107	.0206	.0405	0	.2340	.1190	.3300	.1642
Timber Harvesting & Hauling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	0	.0001	0	0	0	.0221	.0125	.0304	.0112	.0045	.0072	.0080	.0045	.0073	.0169	.0018	.0034	.2318	.0062	.0282	.0207	.0081
Communication, Transportation, & Utilities	0	0	0	0	0	0	0	.0068	.0092	.0133	.0144	.0092	0	.0051	.0050	.0172	.0083	.0034	.0045	.0552	.0064	.0096	.0131	.0537
Finance, Insurance, & Real Estate	0	0	0	0	0	0	0	0	.0010	.1171	.0043	.0004	0	.0050	.0001	.0331	.0281	.0020	.0019	.0002	.0060	.0037	.1085	.0054
Automotive Sales & Services	0	0	0	0	0	0	0	.0035	.0100	.0114	.0230	.0030	0	0	.0767	.0141	.0096	.0015	.0033	.0019	.0032	.0249	.0149	.0061
Professional Services	0	0	0	0	0	0	0	---	.0047	.0034	.0003	.0080	0	.0006	.0004	.0045	.0115	.0018	.0012	.0291	.0031	.0025	0	.0200
Lodging	0	0	0	0	0	0	0	.0021	.0153	.0272	.0026	.0032	0	.0011	.0003	.0232	.0013	.0130	.0055	.0028	.0047	.0046	0	.0300
Cafes & Taverns	0	0	0	0	0	0	0	.0012	.0048	.0130	.0011	.0070	0	.0003	.0090	.0174	.0072	.0014	.0033	0	.0011	.0057	.0211	.0049
Wholesale & Retail Trade	0	0	.0010	0	0	0	0	.0017	.0466	.0582	.0026	.0166	0	.0050	.0040	.0661	.0319	.0079	.0098	.0005	.0126	.0781	.0079	.0193
Wholesale & Retail Services	0	0	0	.0001	0	0	0	.0008	.0056	.0314	.0076	.0048	.0003	.0002	.0018	.0072	.0057	.0014	.0016	0	.0043	.0020	.0022	.0033
Households	.0016	---	.0036	.0243	.0181	0	0	.2553	.2979	.2173	.5512	.6720	.3097	.6396	.5858	.5095	.0200	.2360	.0054	.0857	.4716	.1087	0	0
Local Government	0	0	0	.0022	.0002	0	0	.0064	.0163	.0246	.0208	.0573	0	.0013	.0011	.0374	.0762	.0185	.0006	.0335	.0649	.0088	.0139	.0402
Local Agencies of State & Federal Government	---	---	0	.0002	.0009	0	0	.0056	.0080	0	.0410	0	0	0	.0026	.0023	.2445	---	0	.0087	.0541	.0265	.0040	0
Nonlocal Households	0	---	.0004	.0035	0	0	0	.0178	.0860	.1329	.1821	.1129	.2779	.3289	.0687	.1621	.0358	0	.0058	0	0	0	0	0
Nonlocal Government	.0061	.0010	.0023	0	.0091	0	0	.0171	.1216	.0010	.0021	0	.0159	0	0	0	.0203	.1693	.6740	0	0	0	0	0
Nonlocal Business	.9597	.9139	.8928	.3593	.8655	0	0	.4786	.0177	.0065	.0086	.0258	.3299	0	.0048	.0247	0	.2845	.1255	0	0	0	0	0
Positive Inventory Change	.0027	.0299	.0435	.0079	0	0	0	.0101	0	0	-.0104	0	0	.0022	.0079	.0044	0	0	0	0	0	0	0	0
Capital Accumulation	.0078	.0002	0	.1094	0	0	0	.2210	.0038	.0249	.0756	0	0	0	.0059	0	.0002	0	.0012	0	0	.0932	0	0
TOTAL	*1.0000*	*0.9999*	*1.0000*	*1.0000*	*1.0000*	*0*	*0*	*1.0002*	*0.9999*	*1.0001*	*1.0001*	*1.0000*	*1.0000*	*1.0001*	*1.0002*	*1.0002*	*1.0000*	*1.0001*	*1.0000*	*0.9998*	*1.0000*	*1.0000*	*0.9999*	*1.0002*

* .. indicates values of less than .00005.

Table B-6. Matrix of Direct and Indirect Coefficients, Supply Model, Morrow County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government
Ranching	1.0102	.0081	.0144	.0783	.0126	0	0	.0112	.0737	.0780	.0264	.0320	.0766	.0258	.0614	.0332	.0382	.0339	.0083
Other Agriculture	.0074	1.0217	.0277	.4198	.0043	0	0	.0591	.2168	.3436	.1411	.1829	.0662	.1427	.3283	.1628	.2107	.1418	.0171
Food Processing	.0069	.0281	1.0195	.0322	.0054	0	0	.0714	.1045	.1150	.1695	.2512	.0808	.1681	.1735	.2165	.2577	.1968	.1050
Agricultural Services	.0001	---	.0001	1.0150	.0007	0	0	.0095	.0270	.0228	.0325	.0292	.0103	.0221	.0236	.0310	.0329	.0431	.0130
Lumber/Wood Products Processing	.0003	---	.0007	.0040	1.1027	0	0	.0435	.2265	.0786	.1139	.1147	.0481	.1014	.1039	.1147	.1543	.0636	.0192
Timber Harvesting & Hauling	0	0	0	0	0	(1.0000)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	(1.0000)	0	0	0	0	0	0	0	0	0	0	0	0
Construction	---	---	.0001	.0007	.0005	0	0	1.0289	.0217	.0447	.0257	.0211	.0144	.0230	.0181	.0236	.0224	.0079	.0043
Communication, Transportation, & Utilities	---	---	.0001	.0003	.0003	0	0	.0105	1.0146	.0215	.0229	.0188	.0039	.0134	.0144	.0267	.0124	.0069	.0051
Finance, Insurance, & Real Estate	.0001	---	.0002	.0010	.0007	0	0	.0101	.0150	1.1477	.0274	.0274	.0116	.0298	.0246	.0611	.0371	.0120	.0031
Automotive Sales & Services	---	---	.0002	.0004	.0003	0	0	.0083	.0203	.0255	1.0345	.0164	.0051	.0112	.0896	.0309	.0163	.0064	.0047
Professional Services	---	---	.0001	.0004	.0003	0	0	.0038	.0099	.0093	.0087	1.0181	.0043	.0096	.0094	.0135	.0138	.0055	.0016
Lodging	---	---	---	.0002	.0001	0	0	.0040	.0181	.0346	.0072	.0084	1.0018	.0051	.0045	.0290	.0057	.0149	.0059
Cafes & Taverns	---	---	.0001	.0003	.0002	0	0	.0041	.0092	.0200	.0078	.0098	.0032	1.0072	.0159	.0252	.0103	.0061	.0032
Wholesale & Retail Trade	.0001	---	.0012	.0012	.0009	0	0	.0140	.0641	.0859	.0358	.0493	.0136	.0340	1.0332	.0977	.0435	.0199	.0116
Wholesale & Retail Services	---	---	---	.0003	.0002	0	0	.0032	.0092	.0395	.0133	.0113	.0030	.0060	.0080	1.0142	.0085	.0037	.0020
Households	.0019	.0002	.0049	.0288	.0225	0	0	.3042	.4086	.4077	.6663	.8038	.3505	.7307	.7239	.6937	1.1238	.2899	.0273
Local Government	.0001	---	.0004	.0046	.0020	0	0	.0314	.0507	.0639	.0762	.1241	.0282	.0605	.0613	.0964	.0904	1.0426	.0032
Local Agencies of State & Federal Government	.0005	---	.0012	.0073	.0065	0	0	.0806	.1094	.1016	.2058	.1977	.0861	.1795	.1837	.1739	.2759	.0713	1.0070
MULTIPLIERS	*1.0276*	*1.0581*	*1.0709*	*1.5948*	*1.1608*	*(1.0000)*	*(1.0000)*	*1.6976*	*3.3993*	*2.6389*	*2.6150*	*2.9162*	*1.8077*	*2.5701*	*2.8773*	*2.8141*	*3.8539*	*1.5032*	*1.0171*

* -- Indicates a value of less than .00005.

APPENDIX C

INPUT-OUTPUT TABLES, DEMAND MODEL

Table C-1. Matrix of Direct Coefficients, Demand Model, Baker County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Nonlocal Households	Nonlocal Government	Nonlocal Business	Positive Inventory Change	Capital Accumulation
Ranching	.0676	.0514	.1061	.0003	0	0	0	0	.0004	0	0	0	0	0	---	0	.0041	0	---	0	.0028	.1510	.1438	.0634
Other Agriculture	.0214	.0135	.4613	.0277	0	0	0	0	0	0	0	0	0	0	---	0	.0023	0	---	0	0	.0291	.0042	.0012
Food Processing	.0332	.0028	0	---	0	0	0	0	---	0	0	0	0	.1062	.0117	0	.0036	.0045	0	.0005	0	.0371	---	0
Agricultural Services	.1191	.2289	0	---	0	0	.0001	0	.0001	0	0	0	0	0	0	0	.0276	0	0	.0194	.0037	.0249	.0383	.0362
Lumber/Wood Products Processing	0	0	0	.0069	.0007	---	0	.0074	.0003	0	0	.0005	0	.0008	.0001	.0011	.0015	.0036	.0009	0	.0004	.2816	.6145	.0017
Timber Harvesting & Hauling	0	0	0	0	.1539	.1266	0	.0065	0	0	0	0	0	0	0	0	0	.0002	.0001	0	0	.0303	0	0
Mining	0	0	0	0	0	.0026	.0050	.0258	.0003	0	0	.0018	0	---	0	.0033	.0121	.0010	.0052	0	.0033	.1429	.0714	.0101
Construction	0	0	.0110	.0109	.0276	.0283	0	.0937	.0083	.0009	.0027	.0057	.0478	.0161	.0156	.0148	.0868	.0166	.0025	.0809	.0036	.0290	.0196	.2814
Communications, Transportation & Utilities	.0381	.1867	.0818	.0131	.0002	.0400	.0135	.0585	.0126	.0148	.0940	.0405	.0677	.0402	.0377	.0547	.0510	.0319	.0038	.1073	.0045	.0596	.0048	.0002
Finance, Insurance, & Real Estate	.1330	.0921	.0106	.0310	.0006	.0433	.0102	.0491	.0291	.0041	.0435	.0393	.1084	.0419	.0136	.0746	.0576	.0291	---	.0015	0	.0608	0	.0613
Automotive Sales & Services	.0002	.0046	.0015	.0287	.0123	.1594	.0109	.0235	.0319	.0057	.0218	.0038	.0049	.0218	.0035	.0312	.0819	.0209	.0043	.1182	.0002	.0127	.0388	.0317
Professional Services	.0059	.0019	.0015	.0044	.0009	.0031	.0017	.0022	.0057	.0015	.0009	.0093	.0023	.0055	.0034	.0058	.0498	.0090	.0116	.0089	0	.0049	.0002	.0068
Lodging	0	0	0	---	.0010	.0005	---	.0018	.0001	.0006	.0002	.0019	0	---	---	---	.0033	0	.0001	.0362	---	.0025	0	0
Cafes & Taverns	0	0	.0005	.0003	0	.0002	0	0	.0004	.0006	---	.0005	0	.0006	.0005	.0002	.0211	---	.0003	.0940	.0048	.0186	.0008	0
Wholesale & Retail Trade	.0881	.0681	.0058	.0104	.0006	.0229	.0019	.0338	.0527	.0094	.0245	.0225	.1472	.1089	.0480	.0493	.3468	.0907	.0053	.1264	.0010	.0250	.0596	.0269
Wholesale & Retail Services	---	0	.0036	.0270	.0001	.0009	---	.0029	.0016	.0012	.0019	.0030	.0009	.0118	.0038	.0118	.0167	.0143	.0006	.0025	---	---	.0008	.0004
Households	.2031	.1808	.1173	.1452	.2370	.2500	.2602	.2117	.2077	.2940	.2055	.5550	.3582	.3169	.1419	.4485	.0061	.4192	.3096	.3964	.2314	.0875	0	.1002
Local Government	.0229	.0121	.0090	.0051	.0070	.0040	.0111	.0106	.0040	.0016	.0035	.0030	.0321	.0090	.0027	.0100	.0300	.1485	.0557	.0068	.2102	.0041	0	0
Local Agencies of State & Federal Government	.0002	.0011	.0003	.0002	0	.0065	---	.0082	.0017	.0030	.0010	.0010	.0001	.0529	.0008	.0431	.0044	.0091	.0027	0	.5353	0	.0037	.0003
Nonlocal Households	---	0	0	0	0	0	.0004	0	.0133	.0178	.0025	.0038	0	0	.0007	.0055	.0130	.0022	.0961	0	0	0	0	0
Nonlocal Government	.0313	.0172	.0066	.0184	.2325	.0882	.0845	.0413	.0348	.0554	.0590	.0564	.0520	.0680	.0332	.0444	.1189	.0941	.1853	0	0	0	0	0
Nonlocal Business	.1339	.0729	.1725	.6422	.0712	.0981	.5714	.3996	.5667	.5804	.5136	.2188	.0817	.1710	.6634	.1636	.0633	.1029	.3139	0	0	0	0	.3759
Negative Inventory Change[a/]	.0424	0	0	.0014	.2172	.0069	0	.0013	.0032	0	.0078	0	0	.0017	.0081	.0006	0	0	0	0	0	0	0	0
Depreciation[b/]	.0553	.0667	.0070	.0165	.0367	.1169	.0292	.0206	.0237	.0079	.0192	.0343	.0978	.0268	.0104	.0380	0	.0017	.0005	0	0	0	0	0
TOTAL	1.0008	1.0017	0.9996	0.9997	0.9995	0.9987	1.0001	0.9985	0.9986	0.9989	1.0016	1.0011	1.0011	1.0001	0.9991	1.0005	1.0019	0.9995	0.9985	0.9990	1.0012	1.0016	1.0005	0.9957

* -- indicates a value of less than .00005.

Table C-2. Matrix of Direct and Indirect Coefficients, Demand Model, Baker County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local agencies of State & Federal Government
Ranching	1.0823	.0642	.1458	.0037	.0026	.0032	.0023	.0026	.0026	.0025	.0022	.0049	.0041	.0190	.0033	.0045	.0081	.0055	.0029
Other Agriculture	.0489	1.0307	.4825	.0309	.0035	.0045	.0031	.0037	.0031	.0035	.0030	.0067	.0062	.0564	.0080	.0063	.0109	.0094	.0041
Food Processing	.0427	.0163	1.0145	.0036	.0046	.0039	.0040	.0050	.0044	.0045	.0041	.0088	.0088	.1151	.0151	.0084	.0141	.0147	.0055
Agricultural Services	.1526	.7489	.1371	1.0147	.0123	.0151	.0111	.0121	.0100	.0120	.0101	.0234	.0187	.0306	.0086	.0212	.0392	.0230	.0140
Lumber/Wood Products Processing	.0024	.0031	.0024	.0079	1.0022	.0018	.0011	.0093	.0015	.0011	.0010	.0027	.0023	.0028	.0009	.0033	.0036	.0065	.0025
Timber Harvesting & Hauling	.0008	.0010	.0009	.0017	.1772	1.1459	.0005	.0102	.0006	.0005	.0005	.0011	.0013	.0011	.0065	.0013	.0017	.0022	.0010
Mining	.0073	.0072	.0076	.0045	.0076	.0116	1.0106	.0349	.0055	.0061	.0052	.0138	.0109	.0097	.0041	.0148	.0197	.0131	.0125
Construction	.0549	.0555	.0662	.0421	.0798	.0908	.0589	1.1483	.0449	.0436	.0401	.0894	.2221	.0838	.0438	.0930	.1376	.1028	.0533
Communication, Transportation, & Utilities	.1076	.2517	.2320	.0510	.0522	.1160	.0491	.1099	1.0499	.0531	.1312	.1159	.1395	.1248	.0667	.1298	.1195	.1179	.0506
Finance, Insurance, & Real Estate	.2006	.1615	.1279	.0727	.0474	.1054	.0424	.0942	.0605	1.0390	.0771	.1080	.1702	.1072	.0383	.1410	.1095	.1044	.0425
Automotive Sales & Services	.0532	.0637	.0623	.0379	.0816	.2378	.0464	.0097	.0047	.0443	1.0579	.0793	.0693	.0826	.0284	.1025	.1229	.0986	.0301
Professional Services	.0334	.0297	.0303	.0195	.0236	.0312	.0213	.0248	.0235	.0230	.0196	1.0511	.0367	.0385	.0166	.0448	.0693	.0511	.0372
Lodging	.0019	.0018	.0018	.0011	.0027	.0029	.0014	.0035	.0014	.0021	.0015	.0048	1.0025	.0023	.0010	.0028	.0048	.0028	.0019
Cafes & Taverns	.0101	.0100	.0105	.0060	.0087	.0109	.0077	.0086	.0075	.0091	.0072	.0170	.0132	1.0130	.0055	.0152	.0277	.0138	.0101
Wholesale & Retail Trade	.7937	.2733	.2479	.1222	.1663	.2319	.1445	.2010	.1833	.1652	.1622	.3264	.4029	.3509	1.1458	.3306	.5015	.4026	.1912
Wholesale & Retail Services	.0150	.0172	.0178	.0333	.0092	.0124	.0079	.0123	.0088	.0097	.0094	.0195	.0154	.0258	.0093	1.0274	.0272	.0333	.0113
Households	.4635	.4527	.4582	.2665	.4055	.4964	.3607	.3971	.3207	.3967	.3326	.7700	.6093	.5715	.2331	.6971	1.7946	.7331	.4597
Local Government	.0512	.0383	.0426	.0186	.0266	.0282	.0281	.0320	.0187	.0186	.0187	.0358	.0648	.0414	.0139	.0445	.0530	1.2068	.0848
Local Agencies of State & Federal Government	.0055	.0065	.0062	.0042	.0052	.0127	.0034	.0133	.0049	.0066	.0044	.0082	.0070	.0595	.0034	.0505	.0111	.0184	1.0075
MULTIPLIERS	*2.6278*	*2.7333*	*2.0945*	*1.7683*	*2.1190*	*1.7664*	*1.7848*	*2.1926*	*1.8161*	*2.0418*	*2.0880*	*2.6888*	*2.7052*	*2.7360*	*1.6683*	*2.7380*	*2.6780*	*2.0620*	*2.0427*

Table C-3. Matrix of Direct Coefficients, Demand Model, Grant County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Nonlocal Households	Nonlocal Government	Nonlocal Business	Capital Accumulation/Depreciation/Inventory Change
Ranching	.0001	0	.0204	0	.0136	.0115	0	0	0	0	.0005	0	0	0	0	0	.0169	.0005	0	.0047	.0011	.2001	.1150
Other Agriculture	.0128	.0559	0	0	.0026	0	0	0	0	0	0	.0006	0	.0204	.0015	0	.0025	0	.0105	.0075	0	.0075	.0012
Food Processing	.0008	0	0	0	0	0	0	0	.0002	0	---	0	.0002	0	.0078	.0045	.0125	0	0	.0059	0	.0087	.0004
Agricultural Services	.0828	.0066	0	0	.0004	.0060	0	0	---	0	.0001	.0001	0	0	0	0	.0051	.0001	.0225	0	0	0	.0167
Lumber/Wood Products Processing	.0017	0	0	0	.0440	0	.0048	.0152	0	0	.0001	.0001	0	0	0	.0001	.0061	.0008	.0005	0	0	.6122	.2399
Timber Harvesting & Hauling	---	0	0	0	.1121	.0928	0	0	0	0	0	0	0	0	0	0	0	0	.0006	0	0	0	.1105
Mining	.0002	0	.0002	0	.0007	0	.0055	.0195	0	0	0	0	0	0	.0006	0	.0040	.0072	.0001	.0270	0	.0922	.0004
Construction	.0037	.0209	---	0	.0010	0	.0015	.0652	.0004	0	.0005	.0021	.0007	.0178	.0024	.0207	.0139	.0684	.0009	.0292	0	.0042	.0634
Communication, Transportation, & Utilities	.0151	.0266	.0175	.0224	.0245	.0025	.0080	.0145	.0175	.0154	.0177	.0249	.2234	.0872	.0176	.0729	.0615	.0612	.0134	.1259	.0058	.0008	.0144
Finance, Insurance, & Real Estate	.0321	.0289	.0195	0	.0001	.0118	.0001	.0195	.0119	.0128	.0092	.0148	.1175	.0600	.0156	.0145	.0554	.0401	0	.0141	0	.0024	.0484
Automotive Sales & Services	.0275	.0060	.0257	.0515	.0200	.0505	.0241	.0090	.0016	.0039	.1471	.0094	.0091	.0032	.0026	.0068	.0884	.1155	.0096	.2822	.0096	.0071	.0636
Professional Services	.0128	.0029	.0044	.0088	.0025	.0052	.0003	.0022	.0015	.0025	.0022	.0149	.0080	.0129	.0007	.0060	.0528	.0175	.0026	.0546	0.157	.0052	.0117
Lodging	.0009	---	0	0	.0005	0	0	0	.0002	.0001	0	0	0	0	.0008	.0008	.0037	.0007	.0008	.1036	.0514	.0028	.0002
Cafes & Taverns	.0009	.0001	.0039	0	.0006	.0009	0	0	.0005	.0022	.0005	.0001	0	.0027	.0006	.0045	.0128	.0002	.0006	.0788	.0006	.0018	.0251
Wholesale & Retail Trade	.1629	.0067	.0055	0	.0052	.0047	.1760	.0058	.0102	.0025	.0341	.0090	.0272	.1715	.0286	.0348	.1980	.0662	.0049	.1680	0	.0016	.0476
Wholesale & Retail Services	.0027	0	.0059	0	.0002	0	0	.0057	.0010	.0042	.0075	.0112	.0157	.0182	.0006	.0143	.0150	.0114	.0006	.0024	.0037	.0005	.0062
Households	.3007	.1749	.2141	.0985	.2785	.4191	.1075	.3088	.1649	.3519	.1407	.5774	.2062	.2921	.0975	.5955	.0056	.5248	.5804	.0405	.4291	.0030	.0302
Local Government	.0362	.0597	.0084	.0054	.0095	.0004*	.0017	.0091	.0591	.0016	.0049	.0022	.0501	.0149	.0062	.0150	.0598	.0959	---	.0005	.1379	0	.0072
Local Agencies of State & Federal Government	.0291	.0140	.0061	.0018	.0625	.0344	.0146	.0300	.0413	.0022	.0340	.0190	.0030	.0304	.0064	.0511	.0042	.0542	.0002	.0570	.5759	.0502	.0007
Nonlocal Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0004	0	.0021	0	.0040	0	0	0	0
Nonlocal Government	.0185	.0182	.0086	.0136	.1586	.1258	.0025	.0565	.0185	.0023	.0197	.0210	.0055	.0747	.0105	.0229	.2425	.0015	.5785	0	0	0	.0122
Nonlocal Business	.1494	.5048	.6130	.7625	.2349	.1869	.8410	.4146	.6499	.5949	.5695	.2741	.1990	.1698	.7844	.1215	.1794	.1334	.2194	0	0	0	.1872
Depreciation/Negative Inventory Change	.1095	.0887	.0492	.0517	.0293	.0481	.0132	.0290	.0435	.0040	.0122	.0189	.1348	.0245	.0158	.0167	0	.0012	.0005	0	0	0	0
TOTAL	*1.0000*	*0.9998*	*1.0000*	*1.0000*	*0.9998*	*1.0003*	*1.0002*	*1.0000*	*1.0000*	*1.0001*	*0.9999*	*0.9998*	*3.0006*	*3.0003*	*1.0000*	*0.9998*	*1.0000*	*1.0002*	*1.0000*	*0.9998*	*3.0003*	*0.9999*	*1.0000*

* --- indicates a value of less than .00005.

Table C-4. Matrix of Direct and Indirect Coefficients, Demand Model, Grant County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communication, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government
Ranching	1.0081	.0052	.0256	.0026	.0239	.0229	.0031	.0080	.0044	.0076	.0048	.0127	.0071	.0084	.0027	.0139	.0206	.0110	.0081
Other Agriculture	.0156	1.0186	.0016	.0007	.0056	.0028	.0011	.0021	.0014	.0017	.0014	.0036	.0018	.0237	.0020	.0037	.0043	.0031	.0126
Food Processing	.0089	.0013	1.0014	.0021	.0068	.0086	.0039	.0064	.0038	.0062	.0038	.0105	.0063	.0083	.0101	.0159	.0167	.0091	.0067
Agricultural Services	.0861	.0088	.0034	1.0010	.0066	.0116	.0013	.0031	.0023	.0023	.0024	.0044	.0025	.0035	.0009	.0054	.0060	.0048	.0248
Lumber/Wood Products Processing	.0052	.0026	.0021	.0010	1.0494	.0042	.0063	.0202	.0019	.0030	.0019	.0052	.0030	.0037	.0011	.0060	.0082	.0064	.0036
Timber Harvesting & Hauling	.0007	.0003	.0003	.0001	.1297	1.1029	.0008	.0025	.0003	.0004	.0003	.0007	.0004	.0005	.0001	.0008	.0010	.0008	.0011
Mining	.0031	.0026	.0019	.0008	.0033	.0030	1.0064	.0233	.0017	.0022	.0013	.0037	.0027	.0031	.0015	.0046	.0059	.0127	.0024
Construction	.0177	.0346	.0074	.0034	.0120	.0124	.0060	1.0799	.0089	.0092	.0063	.0177	.0145	.0321	.0063	.0405	.0240	.0942	.0108
Communication, Transportation, & Utilities	.0638	.0584	.0447	.0363	.0674	.0529	.0265	.0538	1.0421	.0513	.0432	.0857	.2687	.1364	.0314	.1428	.0935	.1254	.0522
Finance, Insurance, & Real Estate	.0706	.0549	.0423	.0112	.0359	.0549	.0154	.0520	.0316	1.0430	.0288	.0656	.1534	.1001	.0271	.0720	.0798	.0911	.0325
Automotive Sales & Services	.0990	.0525	.0675	.0783	.0903	.1354	.0499	.0659	.0376	.0552	1.2024	.0964	.0683	.0648	.0214	.1040	.1361	.2216	.0468
Professional Services	.0320	.0206	.0160	.0145	.0212	.0278	.0069	.0189	.0116	.0181	.0118	1.0416	.0248	.0317	.0062	.0355	.0424	.0419	.0198
Lodging	.0030	.0013	.0013	.0006	.0023	.0024	.0009	.0018	.0013	.0019	.0011	.0030	1.0018	.0022	.0014	.0041	.0047	.0033	.0027
Cafes & Taverns	.0074	.0042	.0080	.0020	.0072	.0091	.0025	.0061	.0038	.0081	.0038	.0100	.0059	1.0095	.0026	.0152	.0159	.0085	.0069
Wholesale & Retail Trade	.2774	.0793	.0765	.0354	.1169	.1422	.2219	.1104	.0701	.0996	.0963	.1724	.1271	.2880	1.0625	.2160	.2613	.2165	.1092
Wholesale & Retail Services	.0127	.0068	.0122	.0033	.0095	.0116	.0036	.0125	.0063	.0123	.0134	.0251	.0252	.0283	.0036	1.0298	.0215	.0257	.0093
Households	.4715	.2984	.3014	.1474	.4759	.5991	.1728	.4457	.2523	.4370	.2433	.7337	.4087	.4831	.1438	.7979	1.1882	.5933	.4688
Local Government	.0686	.0861	.0271	.0129	.0383	.0328	.0130	.0353	.0576	.0253	.0206	.0421	.0878	.0493	.0157	.0625	.0616	1.1430	.0260
Local Agencies of State & Federal Government	.0464	.0276	.0160	.0143	.0830	.0530	.0215	.0447	.0504	.0122	.0471	.0363	.0270	.0493	.0112	.0738	.0233	.0851	1.0111
MULTIPLIER	*2.2981*	*1.7877*	*1.6597*	*1.3879*	*8.1852*	*8.2895*	*1.6638*	*1.9928*	*1.5894*	*1.7988*	*1.7340*	*2.3704*	*2.2370*	*2.3260*	*1.3518*	*2.8444*	*2.0150*	*2.6972*	*1.8754*

Table C-5. Matrix of Direct Coefficients, Demand Model, Morrow County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government	Nonlocal Households	Nonlocal Government	Nonlocal Business	Positive Inventory Change	Capital Accumulation
Ranching	.0099	.0012	.0016	0	0	0	0	0	0	0	0	0	0	0	0	0	.0004	0	---	0	.0043	.0700	.0060	.0048
Other Agriculture	.0428	.0204	.0413	0	0	0	0	0	0	0	0	0	0	0	0	0	---	0	---	.0009	.0042	.3811	.4711	.0006
Food Processing	.0507	.0166	.0173	0	0	0	0	0	0	0	0	0	0	0	.0028	0	.0079	0	0	.0026	.0061	.2429	.4471	0
Agricultural Services	.1023	.0990	.0050	.0139	0	0	0	.0003	0	0	0	0	0	0	0	.0019	.0076	.0044	.0002	.0089	0	.0373	.0114	.0961
Lumber/Wood Products Processing	.0360	0	0	0	.0900	0	0	0	0	0	0	0	0	0	0	0	.0135	.0007	.0019	0	.0218	.2145	0	0
Timber Harvesting & Hauling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	0	---	0	0	0	.0221	.0140	0	.0042	---	.0091	.0051	.0008	.0055	.0361	.0057	.0027	.0204	.0078	.0702	.0179	.0878
Communications, Transportation, & Utilities	.0161	.0065	.0002	.0030	.0140	0	0	.0001	.0092	.0011	.0058	.0109	.0318	.0095	.0108	.0196	.0205	.0070	.0015	.0477	.0767	.0004	0	.0007
Finance, Insurance, & Real Estate	.0141	.0108	.0005	.0016	.0013	0	0	.0139	.0125	.1171	.0062	.0074	.0534	.0247	.0128	.1033	.0141	.0100	0	.0699	.0002	.0001	0	.0045
Automotive Sales & Services	0	.0004	.0012	.0041	.0024	0	0	.0091	.0248	.0078	.0230	.0010	.0093	.0038	.0030	.0454	.0651	.0155	.0135	.1757	.0008	.0003	.0153	.0244
Professional Services	---	.0004	.0021	.0003	---	0	0	.0009	.0040	.0002	.0008	.0080	.0029	.0017	.0017	.0075	.0701	.0108	0	.0271	0	.0003	0	0
Lodging	.0096	0	0	---	0	0	0	.0017	0	0	0	0	0	0	0	.0005	.0102	0	0	.0727	.0017	.0036	0	0
Cafes & Taverns	0	---	0	---	0	0	0	.0019	.0025	.0026	0	.0007	.0011	.0003	.0000	.0004	.0219	.0003	0	.0910	0	0	.0010	0
Wholesale & Retail Trade	.0455	.0433	---	.0011	.0006	0	0	.0051	.0214	.0005	.1915	.0043	.0030	.0776	.0040	.0264	.1728	.0020	.0012	.1679	0	.0005	.0292	.0048
Wholesale & Retail Services	0	0	.0012	.0005	.0003	0	0	.0010	.0049	.0101	.0023	.0030	.0139	.0100	.0044	.0072	.0100	.0046	.0001	.0258	0	.0002	.0011	0
Households	.0892	.1148	.2249	.0721	.1480	0	0	.1194	.1209	.4342	.0810	.3853	.0396	.2111	.1081	.2889	.0200	.4801	.6841	.2727	.0654	0	0	.0004
Local Government	.0122	.0081	.0236	.0169	.0044	0	0	.0020	.0078	.0050	.0018	.0096	.0624	.0063	.0043	.0109	.0375	.0285	---	0	.0863	.0150	0	0
Local Agencies of State & Federal Government	.0055	.0003	.0417	.0135	.0193	0	0	.0086	.0234	.0104	.0099	.0144	.0599	.0340	.0119	.0290	.0019	.0015	0	.0166	.7745	.0149	0	.0012
Nonlocal Households	0	.0423	0	.0022	0	0	0	.1607	.0789	.0002	.0010	.0957	.0084	0	.0002	0	.0083	.0207	.0024	0	0	0	0	0
Nonlocal Government	.0371	.0350	.0028	.0048	.1376	0	0	.0194	.0408	.0409	.0118	.0453	.0023	.0144	.0191	.0951	.2074	.1798	.0075	0	0	0	0	0
Nonlocal Business	.4880	.5320	.5305	.7873	.4796	0	0	.5092	.4214	.1741	.8351	.3488	.4182	.5025	.7982	.3050	.5276	.1671	.2237	0	0	0	0	.7739
Negative Inventory Change[a/]	.0055	.0100	.0413	.0054	.0463	0	0	.0154	.0200	.1759	.0151	0	0	.0047	.0010	.0116	0	.0092	.0012	0	0	0	0	0
Depreciation[b/]	.0369	.0585	.0662	.0730	.0542	0	0	.0142	.1929	.0200	.0128	.1652	.2244	.0351	.0161	.0418	0	.0026	0	0	0	0	0	0
TOTAL	*0.9994*	*0.9996*	*1.0014*	*0.9997*	*0.9988*	0	0	*1.0018*	*0.9994*	*1.0007*	*1.0016*	*0.9998*	*0.9997*	*1.0008*	*0.9998*	*0.9998*	*0.9979*	*1.0003*	*1.0008*	*0.9998*	*0.9998*	*1.0013*	*1.0001*	*0.9992*

* -- Indicates a value of less than .00005.

Table C-6. Matrix of Direct & Indirect Coefficients, Demand Model, Morrow County, 1979.

	Ranching	Other Agriculture	Food Processing	Agricultural Services	Lumber/Wood Products Processing	Timber Harvesting & Hauling	Mining	Construction	Communications, Transportation, & Utilities	Finance, Insurance, & Real Estate	Automotive Sales & Services	Professional Services	Lodging	Cafes & Taverns	Wholesale & Retail Trade	Wholesale & Retail Services	Households	Local Government	Local Agencies of State & Federal Government
Ranching	1.0102	.0013	.0019	---	---	0	0	---	---	.0002	---	.0002	---	.0001	---	.0002	.0004	.0002	.0003
Other Agriculture	.0464	1.0117	.0431	---	---	0	0	---	---	.0001	---	---	---	---	.0002	---	.0002	.0001	.0002
Food Processing	.0537	.0181	1.0195	.0004	.0007	0	0	.0006	.0007	.0020	.0011	.0017	.0006	.0013	.0034	.0016	.0040	.0020	.0028
Agricultural Services	.1112	.1042	.0123	1.0150	.0017	0	0	.0016	.0015	.0046	.0011	.0038	.0017	.0025	.0012	.0055	.0090	.0091	.0064
Lumber/Wood Products Processing	.0427	.0026	.0049	.0016	1.1027	0	0	.0024	.0028	.0026	.0021	.0069	.0028	.0046	.0032	.0066	.0168	.0093	.0137
Timber Harvesting & Hauling	0	0	0	0	0	(1.0000)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	(1.0000)	0	0	0	0	0	0	0	0	0	0	0	0
Construction	.0072	.0066	.0123	.0043	.0082	0	0	1.0289	.0717	.0221	.0100	.0181	.0171	.0172	.0067	.0230	.0430	.0280	.0319
Communications, Transportation, & Utilities	.0230	.0118	.0087	.0059	.0108	0	0	.0105	1.0146	.0159	.0118	.0229	.0376	.0185	.0149	.0320	.0280	.0219	.0210
Finance, Insurance, & Real Estate	.0230	.0177	.0091	.0047	.0068	0	0	.0205	.0203	1.1477	.0140	.0201	.0079	.0378	.0189	.1298	.0264	.0161	.0184
Automotive Sales & Services	.0141	.0132	.0144	.0123	.0180	0	0	.0114	.0394	.0501	1.0345	.0343	.0157	.0170	.0143	.0797	.0787	.0567	.0681
Professional Services	.0043	.0045	.0093	.0028	.0046	0	0	.0045	.0082	.0126	.0042	1.0181	.0076	.0085	.0050	.0173	.0240	.0134	.0165
Lodging	.0115	.0017	.0032	.0011	.0011	0	0	.0034	.0019	.0059	.0014	.0048	1.0018	.0031	.0015	.0050	.0116	.0059	.0080
Cafes & Taverns	.0040	.0039	.0070	.0024	.0046	0	0	.0056	.0067	.0157	.0032	.0110	.0053	1.0072	.0039	.0105	.0250	.0130	.0112
Wholesale & Retail Trade	.0822	.0768	.0023	.0222	.0410	0	0	.0377	.0618	.1119	.2236	.0930	.0402	.1370	1.0332	.1195	.2136	.1139	.1517
Wholesale & Retail Services	.0030	.0025	.0051	.0020	.0030	0	0	.0033	.0077	.0186	.0052	.0089	.0173	.0145	.0065	1.0141	.0137	.0110	.0096
Households	.1738	.1671	.3135	.1052	.1002	0	0	.1583	.1807	.5723	.1377	.4617	.1734	.3009	.1473	.4339	1.1138	.5691	.7721
Local Government	.0245	.0179	.0380	.0219	.0135	0	0	.0089	.0159	.0294	.0086	.0290	.0715	.0195	.0107	.0302	.0460	1.0426	.0317
Local Agencies of State & Federal Government	.0134	.0048	.0456	.0148	.0235	0	0	.0109	.0264	.0174	.0141	.0191	.0638	.0386	.0140	.0359	.0097	.0073	1.0070
MULTIPLIERS	*1.8683*	*2.9782*	*2.6201*	*1.8188*	*1.4674*	*(2.0000)*	*(1.0000)*	*1.8285*	*1.4108*	*3.0361*	*2.6788*	*1.7638*	*1.6543*	*2.8383*	*1.8839*	*1.9667*	*1.8739*	*2.9048*	*2.3768*

-- indicates a value less than .00005.

APPENDIX D

PRICE SCALERS

Table D-1. Information Sources for Price Scalers Used in the Grant County Update Procedure.

General Sources:

WPI = U.S. Department of Labor, Bureau of Labor Statistics, Production Prices and Price Indexes.

CPI = U.S. Department of Labor, Bureau of Labor Statistics, CPI Detailed Report.

ERP = Economic Report of the President, January 1981.

Sector	Information Source
1. Ranching	WPI, Table 4B (1977), Table 6 (1979); Livestock
2. General Agriculture	WPI, Table 4B (1977), Table 6 (1979); Hay
3. Food Processing	WPI, Table 4B (1977), Table 6 (1979); Processed Foods and Feeds
4. Agricultural Services	WPI, Table 4B (1977), Table 6 (1979); Agricultural Machinery & Equipment
5. Lumber/Wood Products Processing	WPI, Table 4B (1977), Table 6 (1979); Lumber and Wood Products - Other Softwood
6. Timber Harvesting & Hauling	WPI, Table 4B (1977), Table 6 (1979); Lumber and Wood Products - Other Softwood
7. Construction	WPI, Table 5 (1977), Table 9 (1979); Construction Materials
8. Communications, Utilities, & Transportation	CPI, Table 5A; Utilities and Public Transportation
9. Mining	CPI, Table 5A, Concrete Ingredients
10. Finance, Insurance & Real Estate	CPI, Table 5A, Finance and Insurance

Table D-1. Information Sources for Price Scalers Used in the Grant County Update Procedure (continued).

Sector	Information Source
11. Professional Services	CPI, Table 5A; Medical Care Services
12. Automotive Sales & Services	CPI, Table 5A; Private Transportation
13. Lodging	CPI, Table 5A; Lodging While Out of Town
14. Cafes & Taverns	CPI, Table 3A; Food Away From Home
15. Wholesale & Retail Services	CPI, Table 1A, Other Services
16. Wholesale & Retail Trade	CPI, Table 1A, Commodities
17. Households	CPI, All Commodities
18. Local Government	CPI, Table 11A, Property Taxes
19. Local Agencies of State & Federal Government	ERP, Table B-73; Government Receipts and Expenditures
20. Depreciation/Negative Inventory Change	WPI, All Commodities
21. Nonlocal Households	CPI, All Commodities
22. Nonlocal Government	ERP, Table B-73; Government Receipts and Expenditures
23. Nonlocal Business	WPI, All Commodities

APPENDIX E

EMPLOYMENT MULTIPLIERS

APPENDIX E

EMPLOYMENT MULTIPLIERS

The direct employment effects resulting from changes in sector output can be measured by means of an employment-production function. This function defines a simple linear relationship where changes in employment are a function of changes in output, or

$$E_i = a + b_i Q_i \tag{1}$$

An employment production function is calculated for each local sector. The slope of each function, b_i, is used to measure the direct change in employment associated with a unit change in gross output. The employment-production functions calculated for the local economic sectors are contained in Tables E-1 and E-2. The direct and indirect employment effects can be measured in sector j by multiplying the direct employment effect, b_i, for each sector i by the direct-indirect coefficient for each sector i caused by changes in sector j. These measures are then summed over all i, or

$$e_j = \sum_{i=1}^{n} C_j b_i, \tag{2}$$

where

e_j = the employment multiplier for sector j.

Employment multipliers for the various local sectors in Baker and Morrow County are shown in Table E-3.[1/] Each multiplier indicates

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[1/] Multipliers were not calculated for Grant County because of insufficient data.

Table E-1. Employment Production Equations for Local Economic Sectors, Baker County.

Sector	Number of Observations	Slope (b_i)	Intercept	R^2
1. Ranching	NA*			
2. Other Agriculture	NA			
3. Food Processing	5	.0000015	1.2994	.9811
4. Agricultural Services	9	.0000078	1.9591	.9615
5. Wood Products	NA			
6. Timber Harvesting & Hauling	9	.0000125	1.2647	.8629
7. Mining	NA			
8. Construction	20	.0000103	0.9973	.6814
9. Communication, Transportation, & Utilities	15	.0000103	2.3257	.6765
10. Finance, Insurance, & Real Estate	14	.0000091	1.5144	.8053
11. Automotive Sales & Services	22	.0000067	1.8172	.8249
12. Professional Services	21	.0000488	0.9728	.9435
13. Lodging	16	.0000281	5.9097	.8894
14. Cafes & Taverns	NA			
15. Wholesale & Retail Trade	43	.0000089	1.6434	.7706
16. Wholesale & Retail Services	19	.0000741	0.5504	.8823
17. Households	NA			
18. Local Government	14	.0000286	1.2143	.6570
19. Local Agencies of State & Federal Government	14	.0000125	9.9721	.9705

* NA indicates insufficient data to calculate the regression equation.

Table E-2. Employment-Production Equations for Local Economic Sectors, Morrow County.

Sector	Number of Observations	Slope (b_1)	Intercept	R^2
1. Ranching	NA*			
2. Other Agriculture	NA			
3. Food Proceasing	NA			
4. Agricultural Services	11	.0000012	1.9195	.9610
5. Wood Products	4	.0000114	-0.2717	.9999
6. Timber Harvesting & Hauling	--			
7. Mining	--			
8. Construction	11	.0000138	-0.0881	.8940
9. Communcation, Transporation & Utilities	4	.0000145	2.4647	.9864
10. Finance, Insurance, & Real Estate	6	.0000222	-0.1811	.7942
11. Automotive Sales & Services	11	.0000110	0.5924	.7954
12. Professional Services	8	.0000741	-2.5172	.4064
13. Lodging	7	.0000454	4.2600	.3610
14. Cafes & Taverns	5	.0000554	-1.4251	.8708
15. Wholesale & Retail Trade	15	.0000102	2.1207	.4525
16. Wholeaale & Retail Services	13	.0000648	0.1649	.8766
17. Households	NA			
18. Local Covernment	8	.0000260	2.1497	.9806
19. Local Agencies of State & Federal Government	9	.0000240	1.8718	.5009

* NA indicates insufficient data to calculate the regression equation.

Table E-3. Employment Multipliers for the Local Economic Sectors of Morrow ans Baker County, 1979.

Sector	Baker County	Morrow County
1. Ranching	.0000121	.0000048
2. Other Agriculture	.0000134	.0000031
3. Food Processing	.0000136	.0000051
4. Agricultural Services	.0000151	.0000033
5. Wood Products	.0000089	.0000156
6. Timber Harvesting & Hauling	.0000247	0
7. Mining	.0000100	0
8. Construction	.0000197	.0000170
9. Communication, Transportation, & Utilities	.0000164	.0000192
10. Finance, Insurance, & Real Estate	.0000149	.0000323
11. Automotive Sales & Services	.0000134	.0000158
12. Professional Services	.0000608	.0000805
13. Lodging	.0000352	.0000539
14. Cafes & Taverns	.0000130	.0000620
15. Wholesale & Retail Trade	.0000139	.0000131
16. Wholesale & Retail Services	.0000877	.0000753
17. Households	.0000165	.0000108
18. Local Government	.0000475	.0000340
19. Local Agencies of State & Federal Government	.0000214	.0000318

the unit change in sector employment caused by a unit change in sector output. Employment is measured as number of employees.

Regional employment changes resulting from a one million dollar decline in available federal stumpage were calculated for Morrow and Baker County using both the modified and conventional approach. The estimated change in final demand for each sector was multiplied by the respective employment multiplier. Using the modified approach, the decline in available public timber is expected to cause total employment in Baker County to decline by 9.34 employers and by 15.38 employees in Morrow County. The relative impact of employment changes will be higher in Morrow County where total employment was 5,344 in 1979. Total employment in Baker County was 7,022 during the same period.

Employment estimates obtained vis-a-vis the conventional model are similar in value to those obtained by means of the modified model. Recall that the conventional approach extrapolates a decline in primary input availability directly as a change in sales to final demand. A one million dollar decline in exports by the wood products industry in Baker County will cause local employment to decline by 8.9 full-time employees. A similar decline in Morrow County will cause regional employment to decline by 15.6 employees.

Although employment estimates obtained using the different approaches are similar, it may be that the distribution of the impacts will be different. Because the estimates of employment changes are relatively small, the distribution of these changes was not calculated.