Industry Targeting: Theoretical Underpinning and Practical Application

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Introduction

Many communities in Appalachia still suffer from economic problems such as stagnant growth, high levels of poverty, unemployment, out-migration and resulting loss of population. The Central Appalachia Empowerment Zone (CAEZ) was established to foster economic opportunity in Braxton, Clay, Fayette, Nicholas and Roane counties in West Virginia. These counties are among the poorest in the state. Hence, a challenge for local policy makers is to foster economic growth. Clay County is the only county that is entirely in the CAEZ. Economic development indicators provide a picture of a county with a stagnant economy.

Most rural counties only have a small budget to support economic development (Homm et al. 2000). Hence, development efforts need to be refined to insure maximum payoff with a limited resource base. Target industry analysis is a tool that can be used to refine such efforts. The analysis is a systematic method for identifying suitable industries for a given area or community. The future prospects of such industries are also evaluated. The attributes of the industries are then matched with local economic development goals. Local policy makers and business leaders can use the resulting information in business recruitment, retention, and expansion efforts.

Some results of a target industry analysis for Clay County are presented here. Initially, a short discussion provides a picture of the economic structure of Clay County. A review of the literature in the area is then provided. In the review, the theoretical concepts that underlie target industry analysis are emphasized. An input-output model of the Clay County economy is used to support our recommendations. The model was modified based on a variety of data sources. Hence, the process of model verification and construction is discussed. Finally, results from the model are discussed including industry targeting recommendations.

Economic Structure of Clay County

Clay County is located in central West Virginia, 42 miles northeast of Charleston, the state capital. Much like other nonmetropolitan areas in West Virginia, it has not experienced significant economic growth in recent years. According to Goetz and Lego (2000), per capita income in Clay County, ($1,526 and well below the state average), ranked 146 out of 148 nonmetropolitan counties in a region stretching from Maine to West Virginia in 1998. Unemployment in Clay County, in 2003, was 10.0 percent, exceeding the state unemployment rate of 6.1 percent (West Virginia Programs of Employment Security, 2005).

Most growth in the county has occurred in both its western end and along Interstate 79, which is more accessible to Charleston. Currently, one coal mine, several sawmills, a wooden roofing truss manufacturer, and an electrical motor repair facility are the chief non-service sector employers. Like many other rural West Virginia counties, the Board of Education is the single largest employer (County Profiles West Virginia Programs of Employment Security, 2005). .

The county's need to develop a sustainable economy is underscored by the high level of out-commuting and poverty. In 2000, 1,653 out of 3,128 local nonfarm workers were employed outside of the county. In 2000, the number of people of all ages in poverty in Clay County was estimated at 2,841 (27.5 percent of the county population) while an estimated 35.4 percent of all children ages 5 to 17 lived below the poverty line in 2002 (US Census Quickfacts, 2005).

The county is 342 square miles in size. However, a combination of steep terrain and flood plain designation in flatter areas limits development. The county has a population that has hovered at 10,000 over the past several decades, with few minority members. In recent years county government and the government of the town of Clay have both experienced an uncertain financial situation due to fluctuations in coal severance tax revenues, a primary source of local government funding.

Despite an award winning school system, educational attainment levels are low in Clay County. According to the 2000 census, 63.7 percent of the age 25 and older population had at least a high school diploma, but only 7.3 percent had a bachelor's degree (US Census Quickfacts). Over the last decade and a half school dropout rates have decreased significantly, but better education is leading to higher rates of out-migration (a general tendency in rural West Virginia).

Its low per capita income, high unemployment rate, and concentration of poverty means that Clay County is eligible for United States Department of Agriculture Empowerment Zone/Enterprise Community status. Consequently, the entire county is located within the Central Appalachia Empowerment Zone, an enterprise community. Further, since 1981 (the first year the designation was made), Clay County has been consistently designated as a distressed county by the Appalachian Regional Commission (2005).

A general lack of development points to a need for a major restructuring in the local economy. However, like rural areas in general, funding for economic development efforts is limited. Further, because it contains such a concentration of problems, only certain types of businesses would be candidates for development in or for attraction to Clay County. Hence, industry targeting is an especially appealing development tool.

Some Key Literature

Industry targeting studies have been a popular tool, especially with local economic development officials (Chi, 1989). Such studies can be useful, because local policy makers can target certain sectors for maximum economic payoff from their development efforts. Proponents of industry targeting have been properly criticized for overemphasizing the recruitment of large manufacturing establishments (so-called smokestack chasing) (Flora et al., 1997). In our view, however, industry targeting is not necessarily inconsistent with the expansion of current local business and entrepreneurship. For example, local capital may

be used to start new local industries. Also, current businesses may be encouraged to grow because excess local demand is identified in an industry targeting study.

A more telling criticism is the difficulty in "picking winners" in implementing an industry targeting strategy (Barkley et al., 1998). For example, an industry may be targeted because of rapid growth in employment in the recent past. However, the growth phase of the industry could have now ended. Hence, past employment growth would be a poor predictor of future employment growth. We argue that a strong emphasis should be placed on the future prospects of industries at the national and local levels.

Industry targeting studies are based on an amalgamation of concepts and theories including export base theory, import substitution, industry location theory, and industry clusters. Much of the current popularity of industry targeting stems from the concept of industry clusters in our view. Clusters can be defined as "geographical concentrations of firms in related industries that do business with each other and share needs for common talent, technology, and infrastructure" (Waits (2000), p.37). A closely linked idea is the concept of agglomeration economies, where the productivity of different firms is enhanced due to their proximity to one another.[1]

As Steiner (1998) points out, there are many different definitions of clusters, but all have several common elements. First is specialization, meaning a particular set of firms are oriented towards providing a given set of goods. For example, twelve clusters have been identified in Arizona ranging from a high technology aerospace and information cluster to a senior living cluster (Waits). Specialization is in turn based on the division of labor, which leads to interlinked activities between firms and industries and the need for interaction or cooperation. Linkages can occur as market input-output relationships in terms of goods and services (Marshallian effects). Another form of linkage is information exchanges, which may occur among firms, and between firms and research institutions.[2] The relationship

between industries and public and semipublic policy entities, including development agencies, is another form of linkage.

Linkages can be based on formal contracts, mutual trust, or even tacitly held relationships. According to this view, nonmarket exchanges are critical. These exchanges are based on often-subtle social, political, and cultural ties. Proximity is a necessary element for cooperation to arise. According to Steiner, proximity facilitates communication, knowledge exchanges (particularly tacit knowledge), and just-in-time delivery, which is of growing importance. We would add that based on the adoption/diffusion model (Rogers, 1983), proximity is also important because firms will often borrow new technologies and practices from their more innovative neighbors. Finally, clusters enhance the productivity of their member firms (i.e., lead to agglomerative economies) because interaction between specialized firms in close proximity results in spillover and synergetic effects.

Bradshaw et al. (1999) argue that cluster analysis is a separate concept from industry targeting. This distinction is made because cluster analysis usually focuses on the linkages between businesses that are currently in-place in a particular region. Industry targeting studies, on the other hand, usually focus on bringing new industries from the outside into a region. Because of the emphasis on current firms, cluster analysis often employs the analytical tool of shift-share analysis, where growth rates are differentiated both by type of industry and between a region and the country within a particular industry (Bradshaw 2000). The former set of values provide a comparison concerning whether the local economy was specializing in industries that were “winners” (i.e., relatively high growing) on the national level. The latter set of values indicates how competitive the local industry was in comparison to its national counterpart. The implicit policy conclusion is that local industries with such a competitive edge could be targeted for further development, especially if these industries were national winners.

Location quotients are also used in cluster analysis studies to gain a picture of the extent and type of specialization in a given economy (Bradshaw et al. 1999). The variable is usually examined over a period of time, to see if the degree of specialization is increasing or decreasing.

The better industry cluster studies involve the business community in eliciting the structure of clusters (Wait; Bradshaw 2000). Such involvement is necessary because of the importance of information exchanges between businesses in cluster formation and growth. Because such exchanges may occur tacitly or in ways that can not be easily tracked in economic models or published data sources, businesses themselves must provide the information concerning cluster existence and "operation".

Despite the distinction drawn by some, implicit behind the idea of industry targeting is that industries can be targeted for development that can lead to clusters. For example, Homm et al. (2000), Lamie et al. (1997), Wright et al. (1998), and Barkley et al. (1998) all used multipliers from a regional input-output model as an indication of the desirability of developing certain industries. An industry with a large multiplier effect may be desirable for targeting because of its high potential for Marshallian type linkage development (i.e., a cluster may develop through backward linkages).

Export base theory (Richardson 1972) can lead to an emphasis on export enhancement—expanding what a region sells to the outside world—as part of an industry targeting effort. The presumption is that the region already has an emphasis on and a comparative advantage in the product of exported commodities. Another logical consequence is an emphasis on so-called value added products. For example, Clay County's primary export is coal so a reasonable strategy could be attracting industries that use coal as a major input. Also, the focus on natural resource based industries in many industry targeting studies of rural areas is a natural consequence of the export base approach.

Import substitution (Richardson 1972) is also based on export base theory and multiplier analysis. For target industry analysis, import substitution is based on the concept that external suppliers are satisfying a local market and perhaps local producers can more readily meet this market.

In two studies similar to the approach used here (Holland et al. 1997 and Sorte et al. 2000), an input-output model was first generated with the use of IMPLAN based databases and software (Minnesota IMPLAN Group, Inc, 2000).[3] Regional data generated by the U.S. Department of Commerce was then used to improve model accuracy. In the Sortie et al. study, the model was then ground-truth with several local businesses. These two studies were also based on the policy concepts of export enhancement and import substitution. In their study of a regional economy in Oklahoma, Homm et al. also emphasized the importance of these concepts by targeting industries based on their levels of exports and imports.

Location theory also under-girds target industry analysis. Location theory indicates that businesses and industries locate where they can maximize profits. Their location decision is influenced by an entire set of factors, including access to output markets and access to critical inputs. Of at least equal importance are the factors already cited in the discussion about clusters (access to information, infrastructure, and favorable government policy).

Several industry-targeting studies have focused on the relationship between targeting and location theory. Martin et al. (1993) estimated translog production functions for the meat-products and household furniture industries in eight midwestern states. They examined the relationship between the degree of urbanization, and productivity and industry scale effects. Location was found to only influence productivity for larger household furniture plants and smaller meat-product plants. They argue that regional policy makers should consider plant size in industry targeting efforts. Goode and Hastings (1989)

developed a database that matched industry needs with community attributes for 69 manufacturing sectors and nonmetropolitan communities in northeastern states. Leatherman et al. (2000) extended this type of analysis in examining the prospects for economic development for nonmetropolitan areas in the Great Plains Region.

For a rural area such as Clay County, natural resource endowments play an important role in determining why primary manufacturers would locate there, as such firms must minimize the transportation cost of bulky and/or perishable inputs (Kohls and Uhl, 1998). Accordingly, studies that have focused on developing more rural regions have tended to emphasize natural resource based industries. For example, Lamie et al. (1997) identified high impact and high potential wood products industries in South Carolina through a screening process. Input requirements, income and employment effects, export markets and linkages to input suppliers were considered in the attraction of new or the nurturing of current industries. Input requirements for 34 wood products industries were taken from a state level input-output model. Income and employment effects were evaluated based on number of employees per firm, output multipliers, value added per dollar of sales, and average wages. Calculations from a location quotient analysis and a shift-share analysis were then used to identify the industries where South Carolina had a competitive advantage. Based on indices of input orientation and export orientation, eight industries with extensive out-of-state markets were targeted for attraction.

Wright et al. (1998), in another study with a natural resource orientation, targeted food, fiber and forestry industries for development of rural areas in South Carolina. A comprehensive look at the competitive position of 150 food, fiber and forestry processing industries at the two- and three-digit level was provided. The focus of the study was on industries that have favored rural areas in South Carolina for new or expanded plants compared to Georgia and North Carolina (Wright et al. 1998). Location quotients, shift-share analysis, and employment growth trends from 1988 to 1996 were used to identify

industry clusters. Ordinary least squares (OLS) and Tobit regression analyses were used to determine the industries that prefer rural areas.

Industry targeting studies can be viewed as an attempt to first determine the feasibility of developing certain industries. Once feasibility is established, researchers can focus on the desirability of attracting or developing an industry.

For example, in their study of Anderson County and the upstate region in South Carolina, Barkley et al. (1998) had a stronger orientation towards the desirability of attracting certain industries. Wages paid to residents and contributions to the local tax base, pressure on local public services and environmental degradation were also seen as important variables. Twenty-two industry clusters with high potential for employment growth were determined. Comparisons of employment growth rate, average establishment size, average production worker wages, fixed assets per employee, industry multipliers and import substitution potential were conducted. Industry clusters were identified based on number (1996) and growth (1988 to 1996) in firms, on county-level and region-level industry employment, on a location quotient analysis and on shift-share analysis. Un-weighted and weighted indices of industry characteristics were used to address utility usage and environmental quality, water usage and discharge, and the release of toxic chemicals. Comparing industry multipliers in terms of income, identifying principal input suppliers and estimating potentials for import substitution provided potential interregional linkages.

Cox et al. (2000) used interviews with local economic development officials and the analytical hierarchy process (AHP) to evaluate the desirability of different types of industries. They argue that the AHP provides a systematic and consistent process of eliciting preferences. Development officials were asked to rate their preferences concerning various industries that they may recruitment. Preference weights were then determined by calculating weights in a matrix through an eigenvalue-based procedure. They evaluated the desirability of different types of industries for three counties in Virginia based on number of

jobs, average compensation, average returns to proprietors income, average level of utilities required, environmental impacts, effect on population growth, and impact on property values.

The Clay County Model Input-Output Model

Our research effort was been placed on verifying and, when appropriate, changing the original Clay County input-output model (1997 data). We feel that such efforts are important, in that a misspecified model could yield inaccurate results and hence, erroneous conclusions and recommendations. The result was a so-called hybrid input-output model, where a nonsurvey input-output model, such as the one produced by IMPLAN, is changed to improve accuracy that is based on knowledge of the local economy and superior data (Miller and Blair 1985).

The original IMPLAN model was verified and, when appropriate, changed based on four data sets: the ES202 data set for Clay County from 1997-1999 at the four-digit Standard Industrial Classification (SIC) Code level; the Regional Economic Information System (REIS) data set for 1997-1998 at the two-digit SIC Code level produced by the U.S. Department of Commerce; information concerning the level of self-employment in industries based on the North American Classification System (NAIC) also produced by the U.S. Department of Commerce; and the ReferenceUSA Business Database (formerly the American Business Disk). [4]

Undisclosed ES202 data at the four-digit level were obtained from the West Virginia Bureau of Employment Programs for 1997-1999. The data set covers approximately 90 percent of all employees in the state (West Virginia Bureau of Employment Programs, 1995). Wage data reported in the data set included compensation in the form of pay (wages, salaries, tips, and gratuities), meals and hotels. However, ES202 data does not include the self-employed; it also excludes certain forms of labor income that are included in the definition of earnings used by the U.S. Department of Commerce and in IMPLAN. [5]

Accordingly, the REIS data set was also employed in calibrating the IMPLAN model for Clay County.

The calibration of the IMPLAN model is similar in many respects to that found in the IMPLAN User's Guide (Minnesota IMPLAN Group, 2000). However, our version of the model has the added advantage of being constructed based on a completely disclosed ES202 data set for Clay County (IMPLAN relies on County Business Patterns to account for data not disclosed in their ES202 data set). Further, their data set for a county involves a RAS procedure based on a state data set, which we found to produce inaccurate results for some industries. For example, the supply estimate of local Doctors and Dentists (490) in the original IMPLAN model was much too high, because jobs and income in a Nursing and Protective Care (491) facility had been inappropriately credited there. As in the IMPLAN model itself, adjustments excluded agriculture, construction, railroads, and certain government sectors because of noncoverage problems.

The IMPLAN sectoring scheme provided in Appendix A of the IMPLAN User's Guide (2000) was implemented in an Excel array formula based program. This program was employed to sum our Clay County ES202 data set for number of establishments, number of jobs, and total covered wages. A separate Excel array formula based program was used to calculate the ratio between earnings (from REIS) and ES202 wages at the West Virginia state level. This ratio at the two-digit level was used to bridge ES202 wage data for each IMPLAN sector in the Clay County model into earnings estimates. The ratio between these earnings based estimates were then used to provide estimates of industry output, and of all elements of value added in the modified Clay County IMPLAN model. Employment estimates were obtained in a similar fashion, except more recent data concerning self-employment at the state level (U.S. Bureau of the Census, 2001) were used to provide the bridging ratios. Our estimates were then compared to those found in the ReferenceUSA

Business Database. We made some minor adjustments to our estimates in certain service sectors based on sectors that our estimates seemed to miss.

Finally, we evaluated the estimates of Regional Purchase Coefficients (RPCs) used in IMPLAN. Supply Demand Pool values (SDP) and RPCs are important in estimating regional imports and exports in any IMPLAN-based input-output model. The SDP is the maximum amount of regional supply that is available to meet regional demand. It is the ratio of regionally produced net commodity supply to gross regional commodity demand. A SDP of less than one means that the commodity in question will be imported, even if none of that regional supply is a domestic export (Alward et al., 1989).

The RPC is a measure of the actual amount of local demand that is satisfied by local production. For a given commodity, it represents the ratio between regional purchases of regional output and the total net regional supply of the commodity. RPCs for all non-service commodities in IMPLAN (Commodities 1 through 438) are estimated through an econometrically based procedure. RPC estimates for IMPLAN service commodities (Commodities 438 through 514) are calculated on the basis of observed 1977 values for state supply, exports, and imports. Because the SDP is the maximum amount of regional supply available to meet regional demand, it is the upper bound on the RPC values used in IMPLAN models (Alward et al., 1989).[6] RPCs were modified for a number of commodities based on discussions with local policy makers and on our judgement and knowledge of the local economy.

Model Results

Model results are analyzed in several different ways. First, the effect of RPCs on regional trade estimates in the Clay County model is examined. Next, we review the impact of our modifications to the model based on estimates of commodity imports and exports. This review is important, because these estimates will play an important role in our ultimate policy recommendations. We then review the sectors with the largest levels of imports and

exports in the model. Our concerns and satisfaction with these model results are emphasized. Finally, we make some suggestions about targeting industries for local recruitment or development.

Influence of Regional Purchase Coefficients (RPCs) on Model Results

We feel that the examination of RPCs is especially important for an industry targeting study. Estimates of imports and exports will drive many of our recommendations. Furthermore, the process by which RPCs are currently generated and used in IMPLAN is not a strength of the model. The estimation is based on old (1977) data and for services it is based on observed values at the state level. These values may or may not be appropriate for rural areas in 2001. In fact, researchers at IMPLAN are currently in the process of updating their RPC estimates based on a gravity model procedure (Olson and Alward, 2000). Because our emphasis was on trade relationships, we decided to test the influence of RPCs on trade estimates (the RPC scenario) as opposed to only using SDP coefficients (the strict SDP scenario).

The use of RPCs in our modified input-output model of the Clay County economy had only a minor effect on the results of this study. Changes in our estimate of trade due to the use of RPCs was quite small ($4.680 million increase) in the modified model. Only 4.0 percent of estimated total exports and 2.4 percent of estimated total regional imports were due to the use of RPCs in IMPLAN. The increase in trade estimates due to the use of RPCs was concentrated in three commodities, Industry Machinery NEC (354) at $1.376 million, Forestry Products (24) at $0.915 million, and Used and Second Hand Goods (518) at $0.801 million.

Commodity estimates were also ranked in terms of relative levels of imports and exports. All else equal, higher levels of imports would support the idea that the commodity was a candidate for import substitution and hence, targeting, for example. A larger than

average level of exports would, all else equal, mean that the commodity is question was a candidate for export enhancement or value added processing (and hence, targeting efforts).

The rankings of commodities in terms of imports and exports were also examined under the strict SDP (where the SPD was used as the RPC for all commodities) and the RPC scenarios. In terms of exports, using RPCs versus the use of a strict SDP approach resulted in moderate changes in the rank of export between various commodities. Among the top twenty exported commodities, only Forestry Products (24) had a marked change in rank moving from 34th in exports under the SDP only scenario to 18th under the RPC scenario. While eleven commodities out of the top twenty had changes in the level of exports, the changes tended to be slight. Among the top ten exports, seven commodities retained the same rank with a very slight change in the order of the other three commodities. The Spearman's correlation coefficient (Hogg and Tanis 1983) was 0.9006 for the 79 commodities with meaningful (at least $1,000) levels of exports in either scenario. This result also indicated little change in the estimate of exports when RPCs were used or not used.

Imports showed an even smaller change under the strict SDP versus RPC scenarios. Among the top twenty imported commodities, 18 commodities retained the same rank under either scenario. Among the top 50 commodities in terms of estimated imports, only Industrial Machinery NEC (354) had a marked change with an increase in rank from 436 under the strict SDP scenario to 28 when RPCs were employed. Forestry Products (24), and Used and Second Hand Goods (518) had marked changes in rank going from the strict SDP scenario to the RPC scenario. Spearman's correlation coefficient was 0.9423 for the 453 commodities with meaningful (at least $1,000) levels of imports in either scenario. This result also indicated little change in the estimate of imports when RPCs were used or not used. Based on these results, the use of RPCs by themselves would have little influence on any IMPLAN-based recommendations concerning industries to target for Clay County.

The original, ready-made, IMPLAN model for Clay County was also analyzed in terms of how much RPCs influenced trade estimates. As compared to a model when the strict SDP scenario was used, trade increases by $6.287 million due to use of RPCs. Out of $131.958 million in domestic exports, 4.8 percent was due to the use of RPCs. Out of $204.075 million in total imports, 3.1 percent was due to the use of RPCs. In terms of ranking commodities based on relative levels of imports and exports, the original model of the Clay County economy showed less sensitivity to the use of RPCs than did the modified version. The Spearman's correlation coefficient was 0.9254 for the ranking of commodities based on their export levels (as opposed to 0.9006 for the modified model). The Spearman's correlation coefficient was 0.9778 for the ranking of commodities based on their import levels (as opposed to 0.9423 for the modified model).

Trade Estimates in the Original versus the Modified Model

Because of the relationship between the RPC and the SDP coefficients, changes that we made to the model influenced our estimates of trade. That is, by changing gross supply estimates in the model, the SDP coefficient could alter the RPC for a given commodity, which would, in turn, affect trade estimates.

The most important comparison was between the estimates of exports and imports in the original model versus those same estimates from the modified version in terms of the relative levels of commodity trade. As previously indicated, changes in the relative rank of a commodity could alter industry targeting recommendations. For this analysis, a comparison was only made of RPC based estimates between the original and modified versions of the model.

The relative level of exports between the original and modified versions of the Clay County economic model showed both similarities and differences. As shown in Table 1, the top three commodities were the same in terms of exports (Coal, Petroleum and Miscellaneous Repair Shops). However, other commodities, such as Electrical Repair

Services (480), with $1.621 million in exports and ranked seventh in among all commodities, had marked differences in estimates (Figure 1). The Spearman's correlation coefficient between exports from both model versions with meaningful levels was a relatively low 0.2568, indicating marked differences in export rankings between the two sets of results.

The estimates of imports in the original versus modified version of the Clay County input-output model were also compared and contrasted. An especially large increase was noted in imports for certain medical services (Table 2, Figure 2). For example, imports of Doctors and Dentists (490) increased from $0.415 million in the original IMPLAN model to $6.228 million in the modified version. The lower import estimate in the original model was due to an erroneous allocation of a Nursing and Protective Care (491) facility to the Doctors and Dentists sector. Other notable changes included an increase in the level of imported Electric Services (443) and in Education Services (496) and a decrease in imports for Communications other than Radio or Television (441). However, the Spearman's correlation coefficient between imports from both model versions was a relatively high 0.9118, indicating a good deal of similarity in rankings between the two sets of results. This result is expected, since the demand for many commodities is largely, if not completely, met outside the county. Hence, our modifications to the model, which are exclusively on the supply side at this point, would not alter the estimates of imports for most of these commodities in any major way.

Model Estimates of Imports and Exports

Model estimates of important imports tended to meet our expectations (Figure 3). Large imports were concentrated in financial-related services such as Real Estate (462) ($12.507 million), Banking (456) ($4.615 million), and Insurance Carriers (459) ($4.402 million). Imports were also concentrated in medical services. For example, Hospital Services (492) had imports at $12.036 million, Doctors and Dentists Offices (490) at $6.229 million, and imports of Nursing and Protective Care Facilities (491) were estimated at $3.009

million. The concentration of imports in financial and health services was expected, as it was consistent with the makeup of urban to rural trade observed elsewhere (Hughes and Litz 1996; Hughes and Holland 1994). Our expectation, which is confirmed by discussions with local individuals in some cases and consistent with central place theory (Christaller 1966), is that these services are provided by the Charleston area economy.

Other estimates of other important imports in the regional economy also met our expectations. The large level of imports for Restaurants (454) ($6.276 million) is probably due to out-commuting to work by many local residents and limited local choice (Figure 3). Demand by the coal industry is responsible for the importation of Construction Machinery and Equipment (311) at $6.481 million. Virtually all (over 99 percent) of the demand for Construction Machinery and Equipment was held by Coal Mining (37) in the Clay County model.

The only anomaly in the results presented in Figure 3 was for Owner-Housing (461) with imports of $11.777 million. The U.S. Department of Commerce created this sector in the national input-output table to account for the imputed value of home ownership (which is a part of national income and product accounts). That is, this sector is an estimate of what a homeowner would pay if they were renters instead of owners. This sector accounts for various expenses of owning a home, such as closing costs for home mortgages. Likewise, IMPLAN also contains the sector for consistency with national income accounting (Minnesota IMPLAN Group, Inc, 2000). Hence, by definition, this sector is an imputed valuation to ownership. While it may be conceivable to have trade in the commodity (such as vacation home ownership by nonresidents), it is unlikely that such a high level would be occurring in Clay County. (The county is not a major vacation home destination area.) Thus, this result is probably a model artifact where estimates of supply and demand do not reflect reality.

Model estimates of major exports only partly met our expectations. Coal (37) was by far the largest export, at $77.052 million, and well over ten times larger than Gas and Oil (38) at $5.556 million (Figure 4). This result was expected, given the dominance of coal production in the local economy. The importance of wood products (Logging Camps and Logging Contractors (133)) at $1.712 million in exports and Structural Wood (140), at $1.673 million in exports, was also expected. Wood products are also an important part of the local economy, although not nearly important as coal.

However, large levels of exports in other commodities were a surprise. For example, Local Government was projected to export $3.406 million in K-12 Education (522) to the outside world (Figure 4). It is very doubtful that the local public education system has provided such a large level of educational services to nonresidents. The large export for Faith Organizations (505), at $3.169 million, was also a surprise. It is doubtful that many people travel into Clay County regularly to attend religious services. Miscellaneous Repair Services and Electric Repair Services are other commodities that we did not expect to be major exporters.

Model results indicate industries that could be targeted for local development. In particular, consistent with a value added processing strategy, where further local processing of local natural resources is encouraged, one area that should be investigated for targeting is the forest products sector. While certain parts of the sector have been under increasing pressure from international competition, other forest products industries have experienced growth. Certain value added forest products sectors may consider Clay County as a region for further development. This result is consistent with both the findings of Lamie et al. (1997) in their industry targeting study for upstate South Carolina and with a value added processing approach.

One also at least wonders if a degree of import substitution could occur in certain sectors. For example, a firm that is headquartered in Charleston dominates the local real

estate market. Would it be possible for local competition to arise so that they could at least gain a share of this local market? The city of Charleston is located in Kanawha County, but local leaders complain that the northern part of the county is in general under-served by the metropolitan economy. A company, with a market strategy that concentrates on northern Kanawha County, Clay County, and some of the surrounding counties, might be feasible for development. Another area worth considering for import substitution could be certain carefully selected medical services. Research indicates that development of the local medical sector is an important element in attracting new industries and retaining local residents (St. Clair, 2000). A carefully constructed import substitution strategy is consistent with the recent emphasis in the economic development literature on local entrepreneurship and small business development.

Summary and Conclusions

Industry targeting is a useful tool for areas wishing to grow but with limited industry recruitment and development budgets. The concept has its theoretical roots in many areas including cluster analysis, export base theory, value added processing strategy, and import substitution policy. Clay County is a location in central West Virginia that is in desperate need of economic growth. Hence, industry-targeting efforts should be useful to local policy makers.

Model results contain several implications. Results indicate that the use of RPCs in the IMPLAN model of Clay County would not significantly change our policy recommendations. However, changes that were made to the basic input data to enhance accuracy would alter recommendations. Hence, researchers should carefully evaluate underlying economic models when making industry-targeting recommendations.

Model results also suggest a policy of enhanced value added processing of local natural resources for Clay County policy makers. The careful development of certain services may also serve as an effective import substitution policy. In particular, real estate

and certain medical services could be evaluated as possible candidates for development by local or outside entrepreneurs.

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Figure 1. Selected Commodity Domestic Exports in New and Original Clay County Model, 1997.

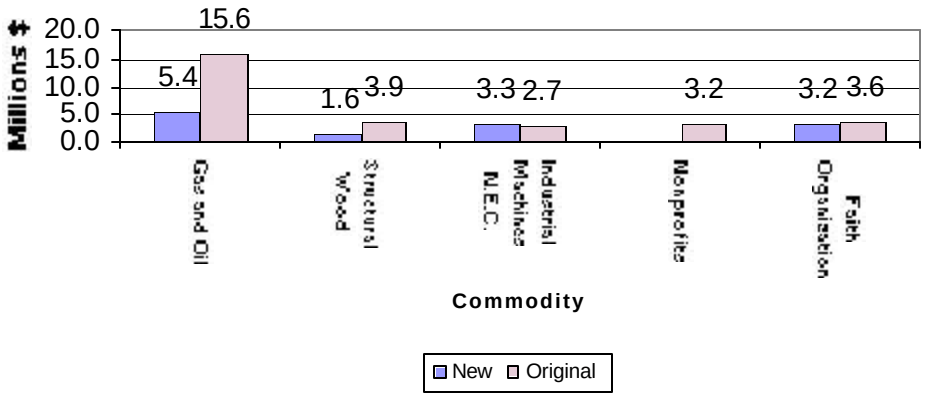

Figure 2. Selected Commodity Imports in New Versus Original Clay County Model, 1997.

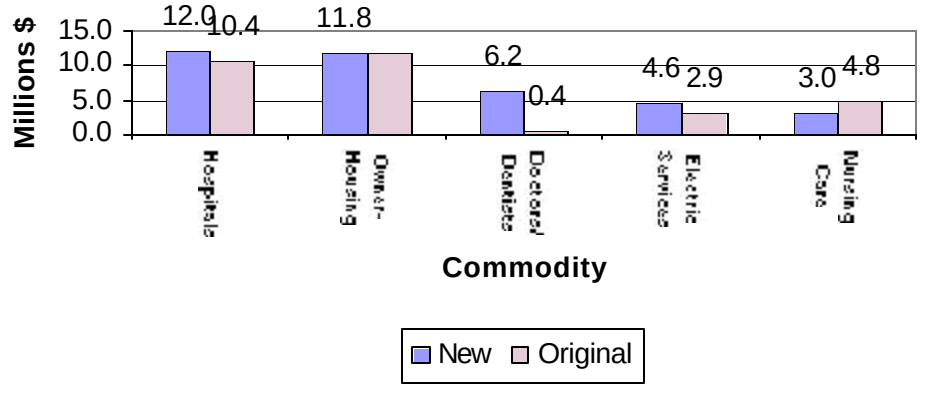

Figure 3. Top Ten Imported Commodities in Clay County, 1997.

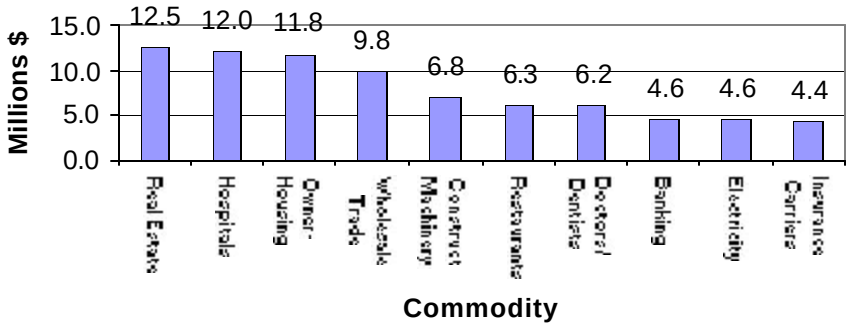

Figure 4. Top Ten Exported Commodities in Clay County, 1997.

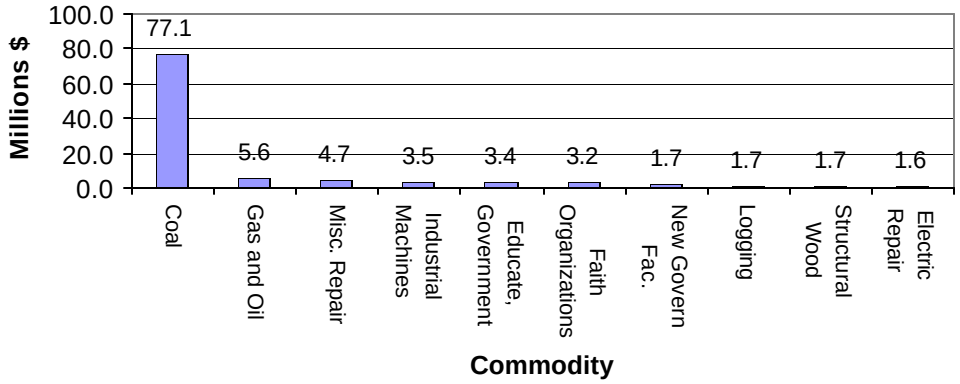

Table 1. Comparison of Domestic Regional Exports for Selected Commodities from the Clay County Model, 1997.

	Commodity	New Version Estimated Exports Level Millions $	Rank	Original Version Estimated Exports Level Millions $	Rank
37	Coal Mining	67.085	1	66.060	1
38	Natural Gas & Crude Petroleum	5.444	2	15.586	2
482	Miscellaneous Repair Shops	4.314	3	6.739	3
522	State & Local Government - Education	3.406	4	0.000	47
354	Industrial Machines N.E.C.	3.262	5	2.700	10
505	Religious Organizations	3.169	6	3.552	7
54	New Government Facilities	1.736	7	1.736	12
480	Electrical Repair Service	1.621	8	0.000	47
140	Structural Wood Members - N.E.C	1.580	9	3.860	5
518	Used and Secondhand Goods	1.496	10	1.173	13
500	Social Services - N.E.C.	1.460	11	4.001	4
133	Logging Camps and Logging Contractors	1.416	12	0.682	19
56	Maintenance and Repair Other Facilities	1.363	13	1.032	15
435	Motor Freight Transport and Warehousing	1.228	14	3.780	6
51	New Highways and Streets	1.166	15	1.166	14
498	Job Trainings & Related Services	1.021	16	0.162	23
524	Rest Of The World Industry	0.971	17	0.000	47
24	Forestry Products	0.915	18	0.915	16
55	Maintenance and Repair- Residential	0.764	19	0.830	17
513	U.S. Postal Service	0.743	20	0.724	18
39	Natural Gas Liquids	0.709	21	2.086	11
517	Scrap	0.280	22	0.083	28
12	Feed Grains	0.182	23	0.222	22
463	Hotels and Lodging Places	0.160	24	0.000	47
3	Ranch Fed Cattle	0.159	25	0.000	46
445	Water Supply and Sewerage Systems	0.140	26	0.000	47
134	Sawmills and Planing Mills - General	0.108	27	3.285	8
454	Eating & Drinking	0.073	28	0.000	45
13	Hay and Pasture	0.060	29	0.104	25
144	Prefabricated Wood Buildings	0.041	30	0.093	26
7	Hogs - Pigs and Swine	0.020	31	0.000	47
284	Fabricated Plate Work (Boiler Shops)	0.018	32	0.015	30
285	Sheet Metal Work	0.016	33	0.013	31
9	Miscellaneous Livestock	0.015	34	0.012	32
40	Dimension Stone	0.007	35	0.007	34
295	Plating and Polishing	0.005	36	0.004	38
391	Aircraft and Missile Equipment-	0.005	37	0.004	36
460	Insurance Agents and Brokers	0.004	38	0.293	20
174	Newspapers	0.004	39	0.092	27
446	Sanitary Services and Steam Supply	0.003	40	0.143	24
220	Miscellaneous Plastics Products	0.003	41	0.004	37
296	Metal Coating and Allied Services	0.002	42	0.002	42
332	Pumps and Compressors	0.002	43	0.002	39
271	Metal Heat Treating	0.002	44	0.002	41
282	Fabricated Structural Metal	0.002	45	0.002	40
142	Wood Pallets and Skids	0.002	46	0.016	29
190	Cyclic Crudes - Interm. & Indus. Organic Chem.	0.002	47	0.007	33
336	Power Transmission Equipment	0.002	48	0.002	44
147	Wood Products - N.E.C	0.001	49	0.002	43
141	Wood Containers	0.001	50	0.005	35
490	Doctors and Dentists	0.000	51	0.292	21
502	Other Nonprofit Organizations	0.000	52	3.188	9

Table 2. Comparison of Regional Imports for Selected Commodities from the Clay County Model, 1997.

Commodity	New Version Estimated Imports Level Millions $	Rank	Original Version Estimated Imports Level Millions $	Rank
462 Real Estate	12.507	1	16.642	1
492 Hospitals	12.036	2	10.352	4
461 Owner-occupied Dwellings	11.777	3	11.777	2
447 Wholesale Trade	9.787	4	11.297	3
311 Construction Machinery and Equipment	6.841	5	6.546	5
454 Eating & Drinking	6.276	6	6.106	6
490 Doctors and Dentists	6.228	7	0.415	46
456 Banking	4.615	8	4.252	10
443 Electric Services	4.561	9	2.908	14
459 Insurance Carriers	4.402	10	4.589	9
210 Petroleum Refining	4.374	11	3.814	11
441 Communications - Except Radio and TV	3.631	12	5.365	7
455 Miscellaneous Retail	3.275	13	2.768	15
496 Colleges - Universities - Schools	3.146	14	2.020	23
384 Motor Vehicles	3.067	15	3.077	12
491 Nursing and Protective Care	3.009	16	4.787	8
493 Other Medical and Health Services	2.822	17	2.622	17
433 Railroads and Related Services	2.653	18	2.630	16
124 Apparel Made From Purchased Materials	2.521	19	2.528	18
494 Legal Services	2.426	20	2.935	13
451 Automotive Dealers & Service Stations	2.407	21	1.911	25
195 Drugs	2.347	22	2.370	19
506 Engineering- Architectural Services	2.304	23	1.810	27
449 General Merchandise Stores	2.295	24	2.257	20
463 Hotels and Lodging Places	1.986	25	1.763	28
458 Security and Commodity Brokers	1.849	26	2.248	21
437 Air Transportation	1.759	27	1.888	26
354 Industrial Machines N.E.C.	1.376	28	1.359	30
516 Noncomparable Imports	1.375	29	1.444	29
452 Apparel & Accessory Stores	1.355	30	1.273	32
488 Amusement and Recreation Services - N.E.C.	1.347	31	1.262	34
519 Federal Government - Military	1.312	32	0.000	50
475 Computer and Data Processing Services	1.234	33	2.042	22
58 Meat Packing Plants	1.197	34	0.401	47
24 Forestry Products	1.175	35	1.925	24
453 Furniture & Home Furnishings Stores	1.156	36	1.044	37
450 Food Stores	1.094	37	0.249	48
508 Management and Consulting Services	1.093	38	1.065	36
479 Automobile Repair and Services	1.062	39	0.197	49
477 Automobile Rental and Leasing	0.977	40	1.318	31
474 Personnel Supply Services	0.939	41	1.272	33
104 Cigarettes	0.931	42	0.931	39
448 Building Materials & Gardening	0.926	43	0.937	38
312 Mining Machinery- Except Oil Field	0.916	44	0.877	41
470 Other Business Services	0.883	45	1.115	35
95 Bottled and Canned Soft Drinks & Water	0.882	46	0.884	40
434 Local- Interurban Passenger Transit	0.847	47	0.671	45
518 Used and Secondhand Goods	0.801	48	0.844	42
213 Lubricating Oils and Greases	0.792	49	0.779	44
436 Water Transportation	0.774	50	0.792	43

[1] Agglomeration economies, in turn, link the idea of clusters to the new economic geography as popularized by Krugman (1991) and others.

[2] New growth theory (Romer 1994) also becomes relevant when discussing information exchange. For an excellent and accessible article where the relationship between information exchange and development policy is discussed in an international context, see Romer (1993).

[3] IMPLAN is one of several ready-made modeling systems, where regional data is combined with the US input-output tables to generated regional input-output models in one computer package.

[4] ReferenceUSA is an Internet-based library reference service provided by the Library Division of infoUSA (ReferenceUSA 2000). The database contains detailed information on nearly 12 million U.S. businesses. This information is amassed from Yellow Page and Business White Page telephone directories; annual reports, 10-Ks and other SEC information; federal, state and municipal government data; Chamber of Commerce information; leading business magazines, trade publications, newsletters and major newspapers; and postal service information, including National Change of Address updates. Business information is verified each year by telephone and information for businesses, with at least 100 employees, is verified twice a year.

[5] The vast majority (98 percent) of this income is payments by employees to privately administrated employee benefit plans. The remainder is payments to corporate directors and other miscellaneous fees.

[6] RPCs are used to account for crosshauling, (the simultaneous exporting and importing of the same commodity), which occurs when the RPC and SDP values differ in the IMPLAN model. Research has indicated that crosshauling is very prevalent for many reasons (Beggs 1986) and that estimates of regional trade flows may be the largest source of error in nonsurvey models such as IMPLAN (Stevens and Travors 1980). Hence, the use of RPCs is designed to reduce such errors by allowing the crosshauling phenomena to occur (Minnesota IMPLAN Group, 1998).