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The Economic Impact of the Mercedes Benz Investment on the State of Alabama

Ellene Kebede and Mudiayi Sylvain Ngandu

ABSTRACT

As part of its strategy to attract new businesses, in 1994 the State of Alabama won the Mercedes Benz bid to establish an automobile assembly plant in Vance, Tuscaloosa County, Alabama at the cost of \$222 to \$253 million worth of incentives. The study assessed the economic impact of the Mercedes Benz investment using IMPLAN. The IMPLAN industry code 49, industrial construction, and industry code 384, motor vehicle, were used to project the impact of the investment for the construction and production phases respectively. The results from four scenarios indicated that the investment would generate sizable direct and indirect employment, income, output, and tax revenue for the state economy. From the estimated revenue, the pay-out period for the cost of the incentive would be from four to seven years. The scenarios also indicated that the increase in the volume of locally purchased automobile parts will increase the multiplier effects for the state economy. Currently, the direct benefits from suppliers accrue to other states with established suppliers networks. The finding also suggested a heavy concentration of the impact of Mercedes Benz plant in the north and northeast part of the state. These counties were also the beneficiaries of past agglomeration economies in terms of critical physical infrastructure and human resource development.

Key Words: economic impact, IMPLAN, Mercedes Benz, spin-off effects.

In the 1990s, the Alabama State Government and the Alabama Development Office (ADO) took a significant step in providing incentive packages to existing and new firms willing to establish business in the state. The purpose was to raise income, generate employment, and broaden the tax base. The principal incentives legislation during this period was the Mercedes Benz Bill which provided Mercedes Benz an incentive package estimated to be \$232 to \$253 million in value (ADO, 1993). Incentives were also extended to automobile

parts suppliers. The rationale for the extension of the incentives to automobile parts suppliers was to maximize the benefits to the state economy from the backward and forward linkages generated from the Mercedes Benz investment.

Such policies supportive of the economic growth and development of the state date at least as far back as the 1970s. They are also part of the Southeastern state governments' bidding wars to entice domestic and foreign automobile assembly plants with lucrative incentive packages (Ngandu and Kebede). The state took several initiatives to enhance Alabama's competitiveness in attracting private investment through the provision of critical human and physical infrastructure. Such infrastructure development consisted of improving

Ellene Kebede is research assistant professor and Mudiayi Sylvain Ngandu is associate professor at Tuskegee University, Tuskegee, Alabama.

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land, labor training, and supplying adequate transportation facilities (Office of State Planning). The ADO, with branch offices or proxies in each county, coordinates the program of various government agencies, private groups, and institutions, in support of such infrastructure development activities.

Vance, initially a rural town in Tuscaloosa county, is now the site of the Mercedes Benz automobile assembly plant. Tuscaloosa County, one of the Metropolitan Statistical Areas (MSA)¹ in Alabama is centered around the city of Tuscaloosa (U.S. Department of Commerce). In 1994, Mercedes Benz invested \$300 million to produce sports utility vehicles, with a projected employment of about 1,500 workers at full capacity by the end of 1998. Production started in February 1997 and an output of 60,000 vehicles per year is expected at full capacity. About 50 percent of the production is for the U.S. market and the other 50 percent for export markets in Europe and the rest of the world (discussion with Mercedes Benz Communication Office).

The factors accounting for the choice of Vance as the site for the Mercedes Benz plant are consistent with the theoretical underpinnings of industrial location decisions. Mercedes Benz selected Alabama for various reasons: a trainable and non-union work force; proximity to higher educational facilities; access to reasonable labor costs; the benefits of pro-business attitudes within the government; strong local support; efficient access to highway, rail, seaport, and air transportation systems; and lucrative tax subsidy and financial incentives from the government (Doresy). Expectations are high on the part of the state, local governments, and communities about employment, income, and revenue generation. However, there is a lack of ex-post economic impact analysis of the Mercedes Benz incentive packages.

The overall objective of this paper was to

¹ MSA is defined as community with a large population nucleus together with adjacent major commuting counties and are thus presumed to have a high degree of economic and social integration with the nucleus. The nucleus is a city or twin cities with a population size of 50,000 or higher.

assess the economic consequences of the investment by Mercedes Benz for the State of Alabama. Specific objectives were to (i) assess the linkages, especially the backward linkages created in the economy and (ii) assess the economic impact of the assembly plant on the state economy through the geographic location of suppliers.

An input-output model was utilized to perform the economic impact analysis. IMPLAN, developed by the USDA Forest Service, and currently licensed under agreement with the Minnesota IMPLAN Group (MIG), Inc. was used to estimate the economic impact. IMPLAN is an input-output database available in microcomputer software. It has an input/output account with 528 industries and 14 columns of additional economic data on the 528 industries for all counties in the U.S. It can be used to compute multipliers and analyze economic impact analysis for any region in the U.S. IMPLAN has been widely used for economic impact analysis of recreational activities (Alward). Carihfield and Campbell used IMPLAN to estimate the impact of the Diamond-Starr automobile plant in Ohio. Bairak and Hughes used IMPLAN to evaluate the impact of agricultural exports on the economy of Louisiana. This study used the 1994 IMPLAN data for the State of Alabama (MIG, Inc.).

Industrial Location and The Empirical Evidence

In the 1970s and 1980s, the Alabama state government implemented policies, incentives and regulations designed to attract both foreign and domestic capital. The policies included the development of convenient and reliable sources of raw materials, land, capital, trained labor, and adequate transportation facilities (Office of State Planning). Consistent with empirical findings in the literature, incentive packages and tax regulations in Alabama were used to stimulate economic growth, employment, and tax revenue, and develop growth centers (Smith; Higgins). Such factors have been identified as contributing to the development of social overhead capital of the state, which indirectly decreased the cost of produc-

tion of interested investors (Hirschman). Access to a diversified pool of labor, specialized and organized capital markets, and enhanced competitive advantage of a location (Greenhut) are known to lead to agglomeration economies which in turn attract additional investment (Isard).

Firm location decisions were based on the simple model of least-cost combination of inputs and output (Weber; Webber). Recent research results, however, indicated that local wages, local environment, local taxes, local public utilities, environmental pollution regulations, services, fees, and quality of life are also key factors influencing firm location decisions (Schmenner; Hekman; Newman; Steinnes; McPherson). Studies of industrial location and public policy provide examples and empirical support for the influence of public policy on firms' location decisions (Herzog and Schlottmann). Policy incentives and packages in the form of subsidies and low taxes, as well as amenities and business climate, have been identified in the literature as factors which reduce short-run and long-run production costs, consequently influencing industrial location (Blair and Premus). A study of the movement of companies to the South by Barkley and McNamara emphasized the contribution of such factors.

According to Knox *et al.* industrial location is guided by the basic geographic principles of distance, accessibility, interaction, comparative advantage, and agglomeration. Locational agglomeration with specific kind of social and political process enhances regional productivity and competitive capability (Scott). Harrington and Warf suggested that the basis for comparative advantage were the existing resources enhanced and supplemented by various local government policies, including the provision of supporting physical and social infrastructure. Comparative advantage was a critical component to the firm in understanding past industrial location and future economic growth. Comparative advantage and agglomeration economies influence industrial location and at the same time set the stage for further economic growth. This observation suggests that economic growth and the phys-

ical location of plants were not independent but inter-connected (Richardson, 1969) and reflected the historical development, public policies pursued, and the existing industrial structure.

The Alabama State's incentive packages in the 1990s was an extension of the development policy of the state geared toward improving the state's comparative advantage. Different industrial recruitment incentives continued to be used by the State of Alabama to encourage expansion of existing plants and relocation or construction of new industrial plants. Eighty seven companies, including Mercedes Benz, took advantage of the Alabama incentives program and established new plants or expanded old plants (ADO, 1995). These firms are not dispersed throughout the state, but are generally concentrated in counties and MSAs with similar characteristics. These counties are relatively well endowed with adequately developed physical infrastructure, a trainable workforce, and inexpensive land. The north and northeast portions of the state form part of the existing national automobile corridor, i.e. concentration of automobile assembly plants and automobile parts suppliers. The corridor is an extension of the traditional automobile assembly center from Detroit, Michigan through Ohio, Kentucky, and Tennessee down to some Southeastern states, including Alabama, Georgia, and Mississippi (Ngandu and Kebede).

Vance, Alabama was an attractive location for the Mercedes Benz plant because of its proximity to the port of Mobile, the presence of automobile parts suppliers located in north and northeastern Alabama, and the incentives offered by the State and the Tuscaloosa County government. Mercedes Benz received the highest incentive packages ever given by the State of Alabama. The incentive packages from the Alabama Development Office, the Tuscaloosa County Industrial Development Office, and Tuscaloosa County were estimated at \$223 to \$253 million in value. The incentive packages financed site improvement, an industrial development bond, tax abatements for ten years, training, and training facility. The contribution by Tuscaloosa County to the

Table 1. Construction Period Estimation Results, 1994–1997 (\$ million)

Description	Direct	Indirect	Induced	Total
1. Employment	5,478	436	2,166	8,080
2. Output	263.5	37.2	136.8	437.5
3. Employment Compensation	126.6	11.6	40.6	178.8
4. Indirect Business Taxes	4.2	1.3	8.5	13.9
5. Proprietary Income	26.2	2.5	12.8	41.4
6. Other Property Incomes	35.2	3.4	17.6	57
Value Added*	192.5	18.7	80.8	292

Source: Estimation results (figures are rounded)

* Value added is the sum of employment compensation, indirect business taxes, proprietary income, and other property incomes.

incentive packages was estimated at \$99 million. The contribution by the Alabama Development Office (ADO) to the incentive packages was estimated at \$123 to \$153 million. ADO contributed \$43 million for construction through an industrial development bond, \$60 to \$90 million for training and training facility, and \$20 million for advertisement and public relations. State government contributed an estimated 55 percent to 60 percent of the total value of the incentive packages (ADO, 1993).

The economic impact of Mercedes Benz on the state's economy depends on its backward and forward linkages with other sectors of the economy. Linkages are the purchase from and sales of goods to other sectors in the economy. Backward linkages are created when buyers attract suppliers and forward linkages are created when suppliers attract buyers. One firm's backward linkage is another's forward linkage. For example, when Firm A purchases an input

from Firm B, it is spending money on a backward linkage, but what constituted a cost to A is sales to B, a forward linkage. Firm B in turn spends money on inputs purchased from another firm to produce its own output. The process, thus, ripples through the economy. Policy makers attempt to maximize the benefits from backward and forward linkages by providing strategic supporting services and infrastructure and stimulating demand (Blair).

The Mercedes Benz investment in Alabama had both backward and forward linkages. The incentive provided by the state to Mercedes Benz and automobile part suppliers maximizes the regional backward linkages. The same incentives have given rise to additional investment by firms in other sectors induced by the increase in local economic activity which is part of the forward linkages.

According to the Mercedes Benz public relations office, engines and transmissions were

Table 2. Result of the State Model Year One, 1997 (\$ million)

Description	Scenario I				Scenario II		
	Direct (1)	Indirect (2)	Induced (3)	Total (1+2+3)	Indirect (4)	Induced (5)	Total (1+4+5)
1. Employment	1,500	2,595	2,158	6,253	2,472	2,081	6,053
2. Output	792	307	145	1,243.8	304	139.3	1,235
3. Employment Compensation	83.6	84.4	43.7	211.6	78.5	42.1	204.2
4. Indirect Business Taxes	20.1	12.2	8.9	41.2	11.3	8.6	40
5. Proprietary Income	0.9	5.8	6.9	13.7	5.6	6.5	13
6. Other Property Income	27.6	31.8	25.6	85.1	30.1	24.7	82.4
7. Value Added*	132.2	1,246.4	85.1	351.6	125.5	81.9	339.6

Source: Estimation Results (figures are rounded).

* Value added is the sum of employee's compensation, indirect business taxes, proprietary income, and other property incomes.

to be imported from Germany and the remaining components were to be supplied locally, domestically (from any region in the U.S.), or internationally. The domestic content, generally determined by international trade agreement guidelines, was targeted to be about 70 percent. Mercedes Benz has signed agreements with 65 suppliers. Out of the 65 suppliers, only two were from overseas, (one in Canada and one in Mexico). The majority of the domestic US suppliers were located in Michigan, Ohio, and West Virginia (*Birmingham News*, August 6, 1994). Nine out of the 65 suppliers or 14 percent were located in Alabama (ADO, 1997). This implies that the impact of Mercedes Benz in terms of backward linkages was likely to benefit other states more than Alabama because of the location of existing suppliers. Alabama suppliers are in the five adjacent counties of Cullman, Greene, Jefferson, Madison, Tuscaloosa, and, located farther south, Autauga. The five counties are adjacent to Tuscaloosa County where the plant is located and are in the north and northeastern parts of the state and all in MSAs. It was projected that Mercedes Benz would not only impact directly the county where it is located, but also could lead to additional spin-off effects throughout the state.

Model and Data

The economic impact of an initial investment depends on the level of income and employ-

ment generated in the economy. Increased demand for output of additional goods and services is likely to stimulate the use of local resources and thus strong backward linkages. Such linkages are best illustrated by multipliers. One approach in estimating the spread effects of a capital inflow on a local economy is to examine the inter-industry linkages through input-output analysis.

The input-output model is a system of equations that characterize the state of the economy. The model is demand driven and assumes that supply is perfectly elastic. The assumptions of the model are as follows: linear production structure with fixed input requirements, constant returns to scale, and inputs available at fixed relative prices and in sufficient quantity to meet the demand, and therefore, an increase in demand of input does not lead to a rise in input prices (Hewing; Miller and Blair). Since the Mercedes Benz plant did not exist at the time the study was initiated, two additional assumptions were made: some inputs were to be purchased locally and labor was to live and make purchases in the state.

Some of the assumptions of input-output models are limiting. However, there are offsetting advantages. First, input-output models can be disaggregated, thus allowing analysts to alter the sector composition of output and to identify the growth impact sector by sector. Second, input-output models allow for the construction of multi-regional models (states

Table 2. Continued

Description	Scenario III				Scenario IV		
	Direct (6)	Indirect (7)	Induced (8)	Total (6+7+8)	Indirect (9)	Induced (10)	Total (6+9+10)
1. Employment	1,500	2,352	2,007	5,859	2,235	1,935	5,670
2. Output	792	263.4	134.3	1,189.7	242.3	129.4	1,163.8
3. Employment Compensation	83.6	72.8	40.6	197	67.2	39.2	198.9
4. Indirect Business Taxes	20.1	10.5	8.3	38.9	9.7	8.0	37.8
5. Proprietary Income	0.9	5.4	6.4	12.8	5.3	6.2	12.4
6. Other Property Income	27.6	28.5	23.9	80	27	23	77.5
7. Value Added*	132.2	117.2	79.2	328.7	109.1	76.4	317.6

Source: Estimation Results (figures are rounded).

* Value added is the sum of employees' compensation, indirect business taxes, proprietary income, and other property incomes.

Table 3. Result of the State Model Year Two, 1998 and Subsequent Years (\$ million)

Description	Scenario I				Scenario II		
	Direct (1)	Indirect (2)	Induced (3)	Total (1+2+3)	Indirect (4)	Induced (5)	Total (1+4+5)
1. Employment	1,500	5,147	4,301	10,948	4,902	4,150	10,552
2. Output	1,584	608	287.3	2,479.3	564.5	277.2	2,425.2
3. Employment Compensation	167.2	167.2	86.9	421.4	155.5	83.8	406.5
4. Indirect Business Taxes	40.2	24.3	17.8	82.2	22.5	17.2	79.9
5. Proprietary Income	1.8	11.7	13.7	27.2	11.2	13.2	26.2
6. Other Property Income	55.3	63.1	51	169.4	59.7	49.2	164.2
7. Value Added*	264.5	266.3	169.4	699.8	248.9	163.4	676.8

Source: Estimation results (figures are rounded).

* Value added is the sum of employment compensation, indirect business taxes, proprietary income, and other property incomes.

or counties) or economic growth within a single region (state or county) with the option of changing the technology (Richardson, 1973). Local purchases induce economic activities that affect several sectors and output if each sector expands to meet demand. Therefore, the outcome is higher demand for local unutilized resources, namely labor, capital, and natural resources. The initial demand for the factors of production arising from the new producers results in an increase in household income. The subsequent increase in household demand leads to output expansion in another sector. The ripple effects spread in the economy through subsequent rounds of spin-off effects. The estimation of such effects are based on multipliers which show the sum of all of the partial effects of an initial investment (Blair). The size of a multiplier is influenced by the number of backward suppliers' linkages, leakages from the local economy through imports, the nature and volume of expenditures by the workers, and technological relations (Harrington and Warf). The higher the leakage from the local economy and the lower the expenditures by the workers, the lower the multiplier effect.

Technological relations show the amount of inputs necessary to produce a given quantity of output. Highly "robotized" production such as the Mercedes Benz plant requires less labor per unit of output, but requires more automobile parts per unit of labor than less "ro-

botized" production. Therefore, the multiplier is likely to be higher.

The input-output matrix is constructed from data of a given economic area. The economic activity in the given area is divided into a number of producing sectors. The Alabama IMPLAN input-output data were used in this study. The direct input requirements are estimates of the amount purchased from each of the economy's sectors. The direct input requirements were used to produce the table of direct and indirect coefficients which were also used to estimate the multipliers. Using the standard Leontief inverse matrix, the equations for this estimation were:

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

$$(2) \quad \Delta X = (I - A)^{-1}\Delta Y$$

where

Y = final demand for sectors

X = gross output of sectors

A = a matrix of the direct input requirements

The above equations showed that the gross output of all sectors depended on the value of Y or the final demand for the vehicles. The $(I - A)^{-1}$ captured the ripple effects, specifically how a change in a unit of final demand of the vehicle was transmitted through the producing sectors of the economy. There were two pos-

Table 3. Continued

Description	Scenario III				Scenario IV		
	Direct (6)	Indirect (7)	Induced (8)	Total (6+7+8)	Indirect (9)	Induced (10)	Total (6+9+10)
1. Employment	1,500	4,663	4,003	10,166	4,429	3,858	9,787
2. Output	1,585	251.1	267.3	2,372.4	478.9	257.6	2,320.5
3. Employment Compensation	167.2	144.2	80.8	392.2	133	78	378
4. Indirect Business Taxes	40.2	21	16.6	78	19.3	16	75.5
5. Proprietary Income	1.8	10.8	12.7	25.5	10.5	12.3	24.6
6. Other Property Income	55.3	56.4	47.5	159.2	53.2	45.8	154.3
7. Value Added*	264.5	232.3	157.6	654.6	215.9	151.9	632.4

Source: Estimation results (figures are rounded).

* Value added is the sum of employment compensation, indirect business taxes, proprietary income, and other property incomes.

sible ways of introducing a new activity within an economic area: a change in the direct input requirements table and/or the addition of new final demand vectors (Miller and Blair). The estimation of the direct input requirements table called for data on industry expenditures which were not accessible for the Mercedes Benz plant. New final demand changes in volume of sales were used to estimate the economic impact.

The IMPLAN sector 384 (motor vehicle) was used to conduct the economic impact analysis for the projected production phase. In the model construction stage, the value of annual vehicle output was used as the new final demand. The plant was projected to produce 30,000 vehicles per year the first year, 1997. Starting in 1998, at full capacity, production would reach 60,000 vehicles. The approximate purchaser price of a vehicle was \$33,000.00 at 1997 prices. In the computation of annual sales for each period, a price margin of 20 percent adopted from the 1994 IMPLAN data was applied to convert the purchase price to producer prices. The projected computed annual sales for 1997 and 1998 were respectively \$792 million and \$1,584 million. The industry's 1997 price deflator was used to deflate the base year data for consistent estimation. In order to construct the predictive model for estimating the impact of the new expenditures, the value-added component of industry sector 384 was modified applying the base-year ratio from the IMPLAN regional data. Value added

accounted for 16.7 percent of total output. The distribution of value added showed that 63.2 percent of the value added was allocated to employee compensation, 20.9 percent to other property incomes, 15.2 percent to indirect business taxes, and 0.7 percent to proprietary income. These percentage distributions were applied to the 1997 and 1998 automobile sales of the Mercedes Benz plant and used in the economic impact analysis. The model was closed with respect to employees' compensation and proprietors' income and the regional average was used to distribute income between the three levels of households.

Nine of the 65 Mercedes Benz parts suppliers are located in Alabama. The location of suppliers from north to south is as follows: Madison County has one supplier, tires (industry 215); Cullman County has one supplier, automobile bumpers (industry 386); Jefferson County has two suppliers, automobile body metal stamping and automotive lighting assembly (industry 386). Tuscaloosa County will have two suppliers, plastic products and injection molding parts (industry 220) and has one axle (industry 386); Green County has one supplier, tire and wheels assemblies (industry 386); and Autauga, in Central Alabama, will have one supplier, plastic injection refuse system (industry 220) (ADO, 1997). Currently, only the automobile body metal stamping in Jefferson County and auto bumpers in Cullman County have local production. The tire and wheel assembly plant in Greene County

has just started production and other suppliers will begin operation in late 1998.

The automobile parts suppliers are the main source of the backward linkages and only nine out of the 65 suppliers or 14 percent are located in Alabama. Out of the nine suppliers, five provide motor vehicle parts and accessories (industry 386), and three suppliers provide miscellaneous plastic and rubber products (industries 215 and 220). Based on the small number of suppliers located in Alabama, it is reasonable to reduce the regional purchase coefficient (RPC)² for parts suppliers, a measure of how much a given commodity a purchasing industry buys from local or regional sources. The original IMPLAN RPC of industry 386 is 0.256 (1994 IMPLAN data) which assumes that the regional purchase is 25.6 percent of the requirement³. In order to account for the small number of suppliers in Alabama,⁴ four scenarios were tested. Scenario I has an RPC of 0.256 which is assumed in the IMPLAN model. Scenario II has an RPC of 0.192 and assumes that the local purchase is 75 percent of the original RPC. Scenario III has an RPC of 0.128 and assumes that the local purchase is 50 percent of the original RPC. Scenario IV has an RPC of 0.064 and assumes that the local purchase is 25 percent of the original RPC.

Empirical Results

The empirical estimations were computed for the construction and production phases. A state model was used to estimate the direct,

indirect, and induced effects for employment, employees' compensation, proprietary income, and taxes generated during the three years of construction. The estimation for the construction period showed a one-shot impact of the investment in the state's economy. The estimation for the production phase showed the impact of the investment on the state's economy in 1997, 1998, and subsequent years.

Construction Period Results

The total estimated plant construction cost was \$300 million. Construction took from 1994 to 1997 to complete. The IMPLAN industry code 49, new industrial and commercial building, was used for estimation. Because of the lack of reliable data on expenditures on local construction materials, the IMPLAN default data were used to generate the multipliers. It was also assumed that all the construction materials were locally purchased.

Table 1 shows the employment, output, employees' compensation, and the indirect business taxes generated during the construction period. A total of 8080 jobs were created during the construction phase. The employment figures consisted of workers employed during the three-year construction phase, including temporary employees. It included all employees who worked on the site. Employment data distribution showed that 5476 or 68 percent of the total were directly employed on the site, 2166 or 27 percent of the total were employed in jobs induced by the construction work, and 436 or 5 percent were indirectly employed during the construction phase. The induced jobs were in the trade and services sector, mainly food and drinks, financial services, residential services, and recreation. Total value added consisted of employees' compensation, indirect business taxes, proprietary income, and other property incomes. Total value added or the payment made to local factors of production during the period accounted for \$292 million. The employees' compensation contributed \$179 million to value added and was also an important source of individual income tax for the government. Total compensation was divided by the total number of jobs

² RPC represents the proportion of the total supply of a good or service required to meet a particular industry's intermediate and final demand. The upper limit of RPC is 1 and it is constrained by the supply/demand (S/D) pool ratio. The S/D ratio indicates the physical capacity of the region to meet the local demand; therefore RPC can not be larger than S/D ratio. If the RPC is less than the S/D ratio there is a potential to increase the local supply of the commodity. For this analysis the RPC for industry 386 was 0.25 and S/D ratio was 0.97 which shows that there is some potential for increasing local supply.

³ Sufficient data was not available to adjust the RPCs of industries 215 and 220.

⁴ Confidentiality and disclosure problems precluded detailed data on the value of local parts suppliers.

to arrive at the average income per job. Personal income tax was estimated on the basis of the tax liability of an average family size of four applied to the Alabama income tax form and tax tables. An estimated total of \$5 million in income was collected by the state. Indirect business taxes⁵, sales and excise tax imposed on any market transaction that takes place within the state amounting to \$14.0 million, were generated as additional revenue for the government. Also a total of \$1.9 million was collected from tax levied on proprietary and other property income. Proprietary income tax and other income taxes were calculated according to the definition and computation provided by the Alabama Department of Revenue.

Production Phase Results

The results of the four scenarios for year one (1997) and year two (1998) are presented in Tables 2 and 3. The direct output, employment, and value added that were generated by the automobile assembly plant remained constant in each scenario. The indirect impact generated by the automobile parts suppliers and the induced impact generated by the expansion of other industries as a result of increased household consumption changed in each of the four scenarios. Production in year one was at half capacity. The results in Table 2 showed that for the four scenarios total employment was estimated at 6253, 6053, 5859, and 5670, respectively. The percentage share of direct and indirect impact on total employment is estimated at respectively 26 percent and 40 percent. The output value was projected respectively at \$1244 million, \$1235 million, \$1189 million, and \$1163 million. Indirect output as a percentage share of total output was estimated respectively at 24 percent, 22 percent, 21 percent, and 21 percent for the four scenarios. Another impact was the estimated total value added of \$351 million, \$339 million, \$328 million, and \$317 million for the four scenarios. On average, 40 percent

of the total value added originated from the direct impact, 37 percent from the indirect impact, and the induced impact accounts for the remainder.

Production was estimated at full capacity in year two and the following years. The results of estimation in Table 3 indicated higher values than in year one. Total employment was projected at 10,948, 10,552, 10,166, and 9,787 respectively for the four scenarios. The relative percentage shares of each type of impact in total employment were 15 percent for direct employment, 46 percent for indirect employment, and 39 percent for induced employment. The total output value was projected respectively at \$2479 million, \$2425 million, \$2327, and \$2320 for scenarios I, II, III, and IV. Indirect output as a percentage share of total output was estimated at 24 percent, 22 percent, 21 percent, and 21 percent respectively, for the four scenarios. Another impact, the total value added, the major source of income to the economy for the production activity, was estimated at \$700 million, \$677 million, \$655 million, and \$632 million for the four scenarios.

The tax revenue estimated in the model for 1997 and 1998 is presented in Table 4 for each of the four scenarios. Indirect business taxes accounted for the bulk of estimated total revenue, or 80 percent. Individual personal income tax from employees and proprietary income and other property tax account for the remaining 20 percent. Consistent with the declining RPCs, the estimated total revenue decreased as one moved from Scenario I to Scenario IV. For 1997 and 1998, the total estimated revenue for Scenario I was \$150 million, \$145 million for Scenario II, \$140 million for Scenario III, and \$135 million for Scenario IV. It was cautiously inferred from the estimated revenue⁶ that the pay-out period in terms of recouping the cost of incentives could be four to six years under the most optimistic assumption of Scenario I and Scenario II and five to seven years under the pessimistic Scenarios III and IV. The analysis does not include increased costs that could arise from

⁵ Indirect business taxes are assumed to be shared between the state and the local government.

⁶ The estimated revenue was not discounted.

Table 4. Tax Revenue Collected by the State and Local Government in 1997 and 1998 (\$ million)

Description	All Scenarios Direct		Scenario I Indirect + Induced		Scenario II Indirect + Induced		Scenario III Indirect + Induced		Scenario IV Indirect + Induced	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Personal Income										
Tax	3.3	6.7	4.6	8.9	4.7	8.6	4.1	7.9	3.8	7.4
Indirect Business										
Tax	20	40	21	42	20	40	19	37	18	35
Proprietary Income										
Tax	0.03	0.1	0.5	0.9	0.4	0.8	0.4	0.8	0.4	0.8
Other Property										
Income Tax	0.2	0.5	0.5	1.0	0.5	0.9	0.3	0.9	0.2	0.8
Total	24	47	27	53	27	50	24	47	22	44

Source: Estimation results (figures are rounded).

(1) tax for fiscal year 1997.

(2) tax for fiscal year 1998.

publicly provided goods and services directly or indirectly to the plant.

Summary and Conclusion

Incentive packages have been extensively used in the 1990s to attract manufacturing plants to Alabama. Eighty seven plants, including Mercedes Benz, took advantage of the program. The pattern of the 87 investments is highly concentrated in the north and northeast corridor and the Gulf area of the state, in counties designated as Metropolitan Statistical Areas.

Consistent with the above geographic concentration, the Mercedes Benz and the automobile parts suppliers investment was also concentrated in the north and northeast corridor of the state. Mercedes Benz chose Vance, Alabama for a number of agglomeration economies: the existing automobile corridor along Interstate 75, a well-established suppliers network in Northern Georgia and Southern Tennessee and a lucrative incentive packages for physical and human infrastructure development. The incentive packages of \$222 to \$253 million granted to Mercedes Benz consisted of tax rebates for infrastructure development and training.

Results of the impact analysis showed that the assembly plant had a significant direct and

indirect impact on the state's economy during the construction phase. A greater economic impact at full capacity production than during the construction phase was estimated. While the direct impact remains the same, the four scenarios consistently emphasized the backward linkages reflected in the large indirect effect on employment, output, and total value added. Scenario I has an RPC of 0.256 which is assumed in the IMPLAN model, Scenario II, Scenario III, and Scenario IV assume 75 percent, 50 percent, and 25 percent of the original RPC respectively. The scenario analysis also showed the increasing economic impact of each scenario with an increasing RPC. The larger the share of parts purchase from suppliers located in Alabama, the greater the impact on the state's economy. In addition, the increase in local parts purchases improved the tax revenue collected and could shorten the pay-back-period needed to recoup the state's cost of the incentives packages. Under the most optimistic assumptions of Scenario I and Scenario II, the pay-back-period was estimated at four to six years and under the pessimistic assumptions of Scenario III and Scenario IV, the pay-back-period was estimated at five to seven years.

Several implications could be drawn from the location of the Mercedes Benz assembly

plant in Vance, Tuscaloosa County, and the nine suppliers located in Tuscaloosa and other counties in the north and northeast parts of the state. First, the heavy concentration of the impact of the Mercedes Benz plant in the north and northeast parts of the state suggests concentration in terms of direct and indirect employment and output effects. Tuscaloosa County is projected to benefit from the direct impact of the automobile assembly plant and a fair share of the direct impact of the suppliers and the associated indirect and induced employment and income. Second, it can be reasonably inferred that the direct and indirect benefits from the automobile suppliers for counties in other parts of the state probably will be limited. Third, the agglomeration economies created now and in the past have enhanced the area's comparative advantage and have set the stage for further attraction of investment as indicated by the emerging automobile assembly plants in the Southeast. Fourth, the remaining challenge is for all stakeholders to develop strategies that create agglomeration economies in other less-developed parts of the state.

The study shows that the Mercedes Benz investment had a significant impact on Alabama and the impact would be maximized by increasing in the value of the local purchase of automobile parts. It further confirms the link between firm locations and economic growth.

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