

ECONOMIC IMPACT OF A SWINE COMPLEX IN SOUTHSIDE VIRGINIA

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EXECUTIVE SUMMARY

State and local governments in Virginia have increasingly emphasized the need for economic development opportunities within localities, and the Southside region of Virginia has been the focus of several economic development programs. One large Virginia swine production company, Carroll's Foods of Va., Inc., has indicated an interest in expanding its contract production facilities in Southside Virginia. Previous studies have shown that hog production, either independent or contract, can be profitable in Virginia. According to this analysis, establishing a swine production complex would add a significant number of jobs, income, and tax base to rural communities in Southside Virginia. The models used in this analysis estimate the following overall impacts from the addition of a 72,000-sow swine complex:

- 2,419 temporary construction jobs;
- 1,035 permanent jobs including
 - 792 (77 percent) in direct farm or support positions, and
 - 243 (23 percent) additional jobs generated in the region;
- \$63-\$236 increase in annual per capita income;
- over \$46 million increase in retail sales during construction;
- over \$18 million increase in annual permanent retail sales;
- almost \$170 million increase in real property tax base;
- over \$31 million increase in personal property tax base;
- reduction of approximately \$25,000 to approximately \$73,000 per county in tax burden on the original taxpayers to provide the same level of government services.

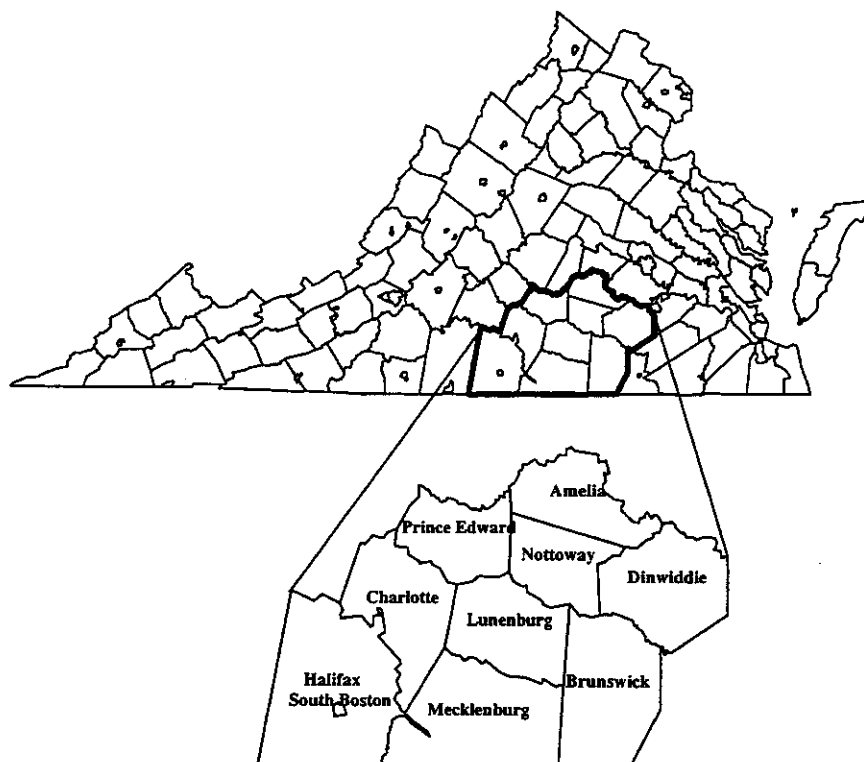
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INTRODUCTION

State and local governments in Virginia have increasingly emphasized the need for economic development opportunities within localities, and the Southside region of Virginia (Figure 1) has been the focus of several economic development programs. One large Virginia swine production company, Carroll's Foods of Va., Inc., has indicated an interest in expanding its contract production facilities in Southside Virginia. Previous studies have shown that hog production, either independent or contract, can be profitable in Virginia (Thornsbury and Kenyon; Harper, Kenyon, and Thornsbury). The contract production method of raising hogs has proven successful in North Carolina and, since 1989, has become more widely available in Virginia. For contracting to work efficiently, however, growers need to be clustered across several contiguous counties allowing the integrating company--the firm that issues production contracts--to handle economically animal and feed transportation, and provide field service by technicians. When the number of growers in an area is large enough, the company can then support a separate feedmill and other servicing facilities for that area.

Figure 1. Southside Virginia counties modeled for an expanding swine complex.



The poultry industry has operated under this type of cluster format for years, with a group of growers located around the processing plant, feed-handling facility, breeder flocks, etc., that are needed to service those growers. Local communities have generally accepted these poultry complexes as a source of employment, income, and tax revenues for the locality.

A *swine complex* is made up of hog production facilities (farms)—under contract with one integrator—along with company feedmilling and technical support. Because the cost of adding hog-packing capacity is extremely high, hogs are normally processed at existing, major slaughter facilities. This arrangement is different from the poultry industry, which usually includes additional processing capacity at the center of the complex.

Much of the interest in expanding the Virginia swine industry has developed in Southside Virginia. Two new contract operations were started in the area during 1992, and there has been additional local interest in both contract and independent hog production. The reasons for the interest in Southside Virginia are several: Southside Virginia is a rural area with a very low population density compared to other rapidly expanding sections of the state; the area is relatively close to the major Smithfield Foods packing plants and is serviced by Norfolk-Southern railroad, giving it access to feed distribution from the Midwest and other regions; and the soils in Southside are generally more suitable for utilizing the nutrients in swine waste than are the more sandy soils in Southeastern Virginia, where hogs have traditionally been located.

No swine contracting complex has ever been established in Virginia, so little information is available to localities about the economic and fiscal impacts from swine production. A previous study (Thornsbury, Kambhampaty, and Kenyon) described the economic impacts from adding 5000 sows and the corresponding finishing capacity within a single county. That study also examined the different impacts from adding hogs via contract versus independent operations, and gave a more detailed description of the procedures used to measure economic impacts. Regional impacts, however, would be expected to be larger than simply multiplying the single county results, for two main reasons. First, as the concentration of hogs increases, the associated services increase. For example, the addition of a feedmill would be expected to increase the economic impacts substantially (especially on the tax base in the county where it is located). Second, by expanding the geographic area included in a region, more economic activities take place within the region, thereby reducing the "losses" to a region, that is, dollars earned in the region but spent outside, or supplies purchased outside the region. As the size of a region grows, the "losses" decrease and, therefore, the impacts are larger. This report takes into account these factors as it expands our previous county-level analysis to an assessment of the regional economic and fiscal impacts of an expanding swine complex in Southside Virginia.

DESCRIPTION of the MODEL SWINE COMPLEX

In this analysis, a complex was defined as 72,000 sows (ninety 600-sow units and eighteen 1000-sow units), 720 finishing units (720-head capacity), and a feedmill (Table 1). The complex was modeled over a nine-county area in Southside Virginia and the feedmill was located in the city of South Boston (see Figure 1). South Boston was chosen as the feed-milling and distribution location due to its access to the major highways in Southside and to the Norfolk-Southern rail line. If a complex were actually developed in Southside, some of the swine units could also be located in adjoining counties, including Pittsylvania, Campbell, and Appomattox. But most of the activity would probably take place between Halifax and the processing facility in Smithfield, Virginia.

Table 1. Description of inputs to the model swine complex.

Location: Southside Virginia

Number of Sows: 72,000 from 90 600-sow Units and 18 1000-sow Units

Number of 720-Head Finishing Units: 720

Feed Mill - South Boston, Virginia

	600-Sow farrowing unit	1000-Sow farrowing unit	720-Head finishing unit	Total
Building Investment:	\$45,900,000	\$15,015,600	\$51,840,000	\$112,755,600
Feedmill Investment:				\$6,000,000
				<u>\$118,755,600</u>
Swine Complex Employment:				
Construction	531	126	495	1,152
Farm	270	90	90	450
Support				342
				<u>1944</u>
Swine Complex Income (wages):				
Construction	\$7,332,921	\$1,738,395	\$6,998,598	\$16,069,914
Farm	\$6,336,720	\$2,100,636	\$2,261,520	\$10,698,876
Support				\$4,847,500
				<u>\$31,616,290</u>
Multipliers (Calculated by IMPLAN model ^a):				
	Personal Income	Employment		
Construction Phase	1.78	1.63		
Operation Phase	1.43	1.51		

^aSource: USDA/U.S. Forest Service, Impact Analysis for Planning (IMPLAN).

The final distribution of swine facilities within the region cannot be determined, so the total complex was divided equally among the nine counties. The following activities were added in each county: ten 600-sow units, two 1000-sow units, and eighty 720-head finishing units. With expected production from the 72,000 sows, the increase in total swine inventory was 590,400 head, or approximately 65,600 head within each county. The concentration of hogs represented by this complex is substantially higher than that historically located in these counties (Table 2), but it is also much lower than that found in the top 100 U. S. swine-producing counties (Table 3).

Modern swine production units require a large investment (Table 1). In the models, investment costs were \$510,000 for each 600-sow unit, \$834,200 for each 1000-sow unit, and \$72,000 for each finishing unit. The total building investment for the swine facilities in this complex was almost \$113 million. Construction of a feedmill required an additional \$6-million investment. These investment costs were estimated for 1990/1991 to coincide with the time frame used in the model. Costs could change substantially in other time periods as construction prices fluctuate.

Table 2. Historical December 1 county swine inventory levels in Southside Virginia.

County	1979 (head)	1987 (head)	Swine Complex Inventory	
			Total (head)	per Square Mile (head)
Amelia	14,500	1,500	65,600	184
Brunswick	11,500	10,000	65,600	117
Charlotte	11,000	2,800	65,600	138
Dinwiddie	17,400	10,000	65,600	129
Halifax	7,900	4,000	65,600	80
Lunenburg	8,500	2,200	65,600	152
Mecklenburg	12,600	5,500	65,600	106
Nottoway	2,800	1,800	65,600	208
Prince Edward	2,500	<1,000	65,600	185
Regional Total	88,700	38,800	590,400	133

Source: Virginia Agricultural Statistics Service.

Table 3. 1987 Inventory in top U. S. hog-producing counties.

Rank	County	Head	Head per Square Mile
1	Sampson, NC	896,710	947
2	Sioux, IA	871,562	1133
3	Lancaster, PA	782,391	822
4	Delaware, IA	745,649	1290
5	Plymouth, IA	623,187	721
96	Dubois, IN	215,732	503
97	Whiteside, IL	214,134	314
98	Ogle, IL	213,839	282
99	Wayne, NC	211,171	381
100	Poweshiek, IA	210,378	360

Source: National Pork Producers Council.

A complex would add jobs directly to the community, initially through construction and later through farm and technical-support positions (Table 1). A total of 1,152 temporary construction positions, 450 permanent farm positions, and 342 permanent support positions were added in the model. The employment levels listed above refer to full-time equivalent positions. There would, however, also be opportunities for both full-time and part-time employment in the farm positions. Carroll's Foods estimates that each finishing floor will require one hour of labor per day, so individuals could contract to build and manage one or more finishing floors. The construction positions are also considered full-time equivalent positions, but these are temporary positions only and were entered into the models during one year—the construction phase. As explained earlier, the construction phase in reality would most likely take place over several years, and fewer than 1,152 full-time people could be employed for longer than one year. However, 1,152 does represent the total person-years of construction work that would be directly created as a result of the swine complex. The farm and support positions would also most likely be added over a number of years. Within the models, one-half of the farm and support jobs were added in the first year and one-half were added in the second year.

Salaries for these positions will vary depending on the exact responsibilities of the job. As shown in Table 1, total wages for the construction positions were slightly more than \$16 million, for an average annual construction salary of \$13,950. Total wages for the farm positions were almost \$11 million for an average annual farm salary of \$23,775. The total wages for the support positions were almost \$5 million for an average annual support salary of \$14,174.

MEASURING ECONOMIC IMPACT

Defining the new economic activity—as was done in the previous section and summarized in Table 1—is only the first step in measuring the total economic impacts on a local community. A necessary ingredient in impact analysis is the use of *multipliers*. In this study, multipliers indicate how the economic changes in the swine sector will affect other sectors in the region. For example, if the personal income multiplier for swine production in a locality is 1.5, then for each \$1 of direct employee compensation (wages and benefits) generated by the industry, 50 cents of additional employee compensation is created in that locality. Similarly, if the employment multiplier is 2, then for each new job created directly by the swine industry, another job is created elsewhere in the community.

Multipliers for five measures of changing economic activity—total industry output, personal income, total income, value added, and employment—were provided by the Impact Analysis for Planning (IMPLAN) input-output model.¹ The IMPLAN model is based on 1985 conditions in a geographic region and can be modified to generate multipliers for individual counties or for an entire region. In this study, regional multipliers were used, allowing the change in total economic activity for the region to be measured.²

Within IMPLAN, the industry spending patterns themselves can also be modified to reflect changing conditions. In the swine industry, for example, spending patterns vary greatly between independent and contract producers. In this analysis, several adjustments were made to the historical spending patterns of the swine industry in Southside to reflect the differences in contract production.

Using the multipliers calculated by IMPLAN, the Virginia Impact Projection (VIP) model³ was used to measure county-level economic and fiscal changes. VIP is designed to measure future economic conditions in a locality with and without the additional activities of interest. Estimates of current population, expenditure, and revenue conditions within a locality are used to project future fiscal and economic conditions for that locality. These values are used to establish a *baseline* that indicates how the population and economic conditions would change over time given current trends *without* any changes to the current situation. Once the baseline is established, changes are introduced to determine their impact. In this study, the changes consist of adding a swine complex. VIP then projects future fiscal and economic conditions *with* the additional activity. Therefore, model results are reported as changes in economic and fiscal variables *over the baseline*. The baseline is changing over time given

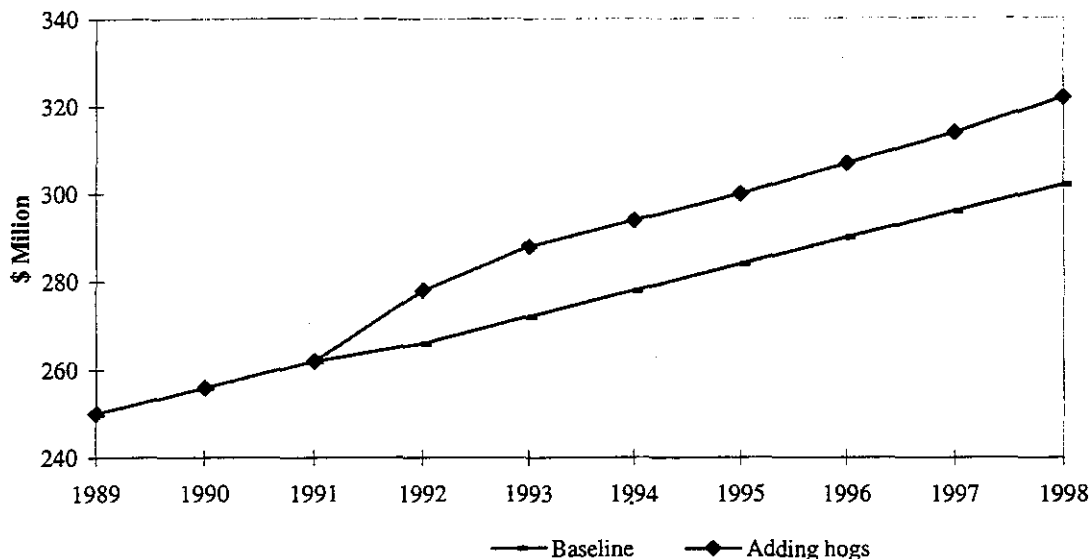
¹ The Impact Analysis for Planning (IMPLAN) model was developed by the U.S. Forest Service to measure economic impacts on 528 different sectors of the economy.

² Other researchers have found that the multipliers estimated by IMPLAN tend to be conservative (Johnson). In other words, the additional impacts generated in the region may be slightly larger than indicated by IMPLAN.

³ The Virginia Impact Projection (VIP) model is actually a series of models for Virginia counties and cities developed under the leadership of Dr. Thomas G. Johnson, Department of Agricultural and Applied Economics, Virginia Tech.

current conditions, and the model results indicate further changes that would occur from adding activity in the swine sector. Figure 2 is a graphical example of one of the county-level VIP results. It shows the projected real property tax base in Amelia County with and without the addition of the swine complex.

FIGURE 2. Virginia Impact Project (VIP) model results projected change in real-property tax in Amelia County.



The VIP model calculates changes on an annual basis, so the change in economic activity will be depicted as a total change in one year rather than the more gradual change which takes place throughout the year or across a series of years. In our model, the complex was assumed to be built over a six-month period. In reality, a complex would grow over a number of years to reach its final size, and the feedmill would likely be added after a number of growers were in operation. In the model, construction and one-half of normal operation are included in the first year, hereafter referred to as the "construction phase." Full operation is included in the second and subsequent years, hereafter referred to as the "operation phase." So, for example, in Figure 2 the change in 1992 is a result of all the construction activities and one-half of the operation activities. The change in 1993 is a result of a fully operational swine complex. In reality, the total change in 1992 might be spread over several years as would be the total change in 1993. However, the difference between the baseline and the line representing the new activity does accurately portray the total change that would result from the construction and operation phases.

Because VIP is specific to individual localities, each county in the region was analyzed separately, and the impacts were then combined at the regional level. Population, labor force, employment, and unemployment estimates can be summed in this manner to represent total changes for the region. To adjust individual county per capita income estimates to a regional basis, total income change must be calculated (per capita change times population). The total regional changes are then added and divided by total regional population to get per capita income change for the region. Changes in retail sales, real property tax base, and personal property tax base can also be summed to get a regional total, but no conclusions can be drawn about the effect on individual taxpayers within the region because each county has a different tax structure. VIP also estimates changes in county revenues and expenditures, as well as the change in tax burden on the old property tax base, but these values are unique to that locality and would be misleading if combined into a regional total.

ECONOMIC IMPACTS of the SWINE COMPLEX

Results for the county-level VIP models, and the regional totals, are shown in Tables 4 through 7. The earlier assumption that the complex would be evenly distributed throughout the region determined how the results were distributed among the counties. In fact, as a complex grew, if more units were located in one county, then that county could expect larger impacts. Conversely, fewer units would result in smaller county-level impacts. The regional results represent the total impacts that could be expected from the addition of the complex. Under the assumption of an equal distribution, each county had a unique set of existing conditions which created a unique "baseline" scenario for each county. The impacts from additional swine enterprises were therefore unique to each county. The only exception was employment. The earlier assumption that the change in activity was equally distributed dictates that the number of jobs created was equal across counties. However, due to differences in the initial conditions in each county, the percentage decrease in unemployment varied.

Employment

In the model, within the nine-county complex area, direct employment increased over the baseline by 1,546 jobs during the construction phase (including temporary construction positions). In addition, 873 jobs were created indirectly in the community due to the increase in local economic activity, making the total jobs added during construction 2419 (Table 4). During the operation phase (Table 5), 792 jobs were created directly by the new activity of the swine complex; 450 were farm jobs and 342 were support positions. An additional 243 jobs were created indirectly within the region. A total of 1,035 permanent jobs were created in the region as a result of adding the contracting complex. Table 6 summarizes the regional employment and income changes from Tables 4 and 5.

Table 4. Changes^a in county economic and fiscal activity from a swine complex during the construction phase.

	Popu- lation (no.)	Employ- ment (no.)	Unem- ployment (no.)	Per Capita Income (\$/person)	Retail Sales (\$)	Real Property Tax Base (\$)	Personal Property Tax Base (\$)	Tax Burden ^b (\$)
Amelia	230	251	-44	556	5,000,937	9,946,834	1,614,580	-5,917
Brunswick	298	251	-37	261	4,745,728	10,792,163	1,555,419	-16,474
Charlotte	403	251	-26	389	4,566,334	12,165,862	1,365,108	-19,072
Dinwiddie	265	251	-40	257	4,774,358	10,467,033	1,443,299	-31,223
Halifax	918	411	-16	227	8,249,648	20,718,067	2,583,599	-94,075
Lunenburg	334	251	-33	340	4,933,122	9,275,758	1,486,435	-30,973
Mecklenburg	204	251	-46	145	4,797,072	8,109,467	1,050,798	+2,951
Nottoway	169	251	-50	329	4,957,768	6,847,227	1,235,878	+5,603
Prince Edward	234	251	-43	275	4,519,622	6,061,687	1,585,851	+25,372
Region	3055	2419	-335	270	46,544,589	94,384,098	13,920,967	^c

^aChanges in county economic and fiscal variables over the Virginia Impact Projection (VIP) model baseline.

^bThis is the change in the tax burden on the original county tax payers to provide the same level of government services.

^cThis value cannot be summed across counties because it is unique to each locality based on government expenditure and revenue patterns.

Table 5. Changes^a in county economic and fiscal activity from swine complex during the operation phase.

	Popu- lation (no.)	Employ- ment (no.)	Unem- ployment (no.)	Per Capita Income (\$/person)	Retail Sales (\$)	Real Property Tax Base (\$)	Personal Property Tax Base (\$)	Tax Burden ^b (\$)
Amelia	111	80	-10	236	1,325,972	17,168,847	1,145,278	-37,949
Brunswick	104	80	-11	112	1,443,911	16,744,543	958,264	-50,127
Charlotte	134	80	-8	172	1,638,581	17,188,379	882,311	-60,705
Dinwiddie	98	80	-11	109	1,308,796	16,706,004	936,370	-72,975
Halifax	879	395	-16	208	5,989,405	38,754,008	23,881,732	-258,908
Lunenburg	136	80	-7	143	1,220,189	16,426,117	993,091	-71,243
Mecklenburg	67	80	-15	63	1,606,543	15,729,618	766,277	-55,862
Nottoway	65	80	-15	141	1,262,382	15,450,315	877,162	-25,009
Prince Edward	72	80	-14	122	2,491,303	15,116,095	926,566	-28,075
Region	1666	1035	-107	137	18,287,082	169,283,926	31,367,051	^c

^aChanges in county economic and fiscal variables over the Virginia Impact Projection (VIP) model baseline.

^bThis is the change in the tax burden on the original county tax payers to provide the same level of government services.

^cThis value cannot be summed across counties because it is unique to each locality based on government expenditure and revenue patterns

Table 6. Employment and income results from the swine complex model.

	Construction Phase		
	Direct	Community	Total
Employment	1546	873	2419
Income	\$23,883,835	\$17,060,238	\$40,944,073
Average Salary	\$15,449	\$19,542	\$16,926
	Operation Phase		
	Farm	Support	Community
Employment	450	342	243
Income	\$10,698,876	\$4,847,500	\$5,027,148
Average Salary	\$23,775	\$14,174	\$20,688

Salary levels varied widely within each category of workers in the model. For example, the average salary level in the farm positions was almost \$24,000. Within this job category, there were farm owners/managers, on 600-sow operations, with expected incomes of \$34,408, and hired farm labor with salaries ranging from \$13,000 to \$20,000. Similarly, in the support positions, the average salary was \$14,174. Within this group there were service technicians, mill managers, etc., with salaries higher than the average, and truck drivers and loaders with salaries lower than the average.

VIP filled the new jobs from a combination of decreased unemployment, new entrants to the workforce, workers commuting into the area, workers no longer commuting out of the area, and workers moving into the area. For example, in Amelia county, 80 new jobs were created and 10 were filled by workers

who were previously unemployed, and 61 were filled by new entrants to the labor force. There was also an additional 36 in-commuters to the county and an additional 27 out-commuters from the county resulting in a net addition of nine workers to fill the remaining positions. Overall, the number of unemployed fell by 335 workers over the baseline during construction and 107 workers over the baseline in the operation phase. The number of workers coming from each category to fill the new positions during the operation phase is listed by county in Table 7.

Table 7. Change^a in Southside Virginia employment and commuting patterns during the operation phase of a modeled swine complex in Southside Virginia.

County	Number of Jobs	Unemployment	Change in		
			Labor Force (no.)	Out-Commuters	In-Commuters
Amelia	80	-10	61	27	36
Brunswick	80	-11	57	25	37
Charlotte	80	-8	74	34	32
Dinwiddie	80	-11	54	23	38
Halifax	395	-16	482	234	131
Lunenburg	80	-7	75	34	32
Mecklenburg	80	-15	37	13	41
Nottoway	80	-15	36	12	41
Prince Edward	80	-14	40	15	41
Regional Total	1035	-107	916	417	429

^a Changes in county employment and commuting variables over the Virginia Impact Projection baseline

The VIP model was run separately for each county, so the change in individual county commuting patterns was calculated without considering the changes occurring in other counties within the region. For example, some of the 27 additional people "out-commuting" from Amelia County could be some of the 37 additional people "in-commuting" to Dinwiddie County. It is not possible, using these models, to distinguish the exact relationship among counties. The effect on the regional totals may, in fact, slightly underestimate unemployment changes.

Within the entire region in the operation phase of the models, 417 additional people were driving out of their county to work and 429 people were driving into another county to work for a net increase of 12 people commuting into the region. Of the total 1,035 new jobs created in the region, 12 were filled by these new commuters and 107 were filled by residents who were previously unemployed. The additional 916 jobs were filled by new entrants to the region's labor force, both new residents and current residents newly joining the workforce.

Population

As workers and their families moved into the area, population levels in the region increased. During the construction phase, the regional population increased by 3,055 over the baseline (Table 4). During the operation phase, the population increased by 1,666 over the baseline (Table 5). As the population level increased, the need for government services also increased. (The impact of population change on net cost to local government will be discussed under fiscal impacts.)

Per Capita Income

Per capita income increased in each county of the region through the additional swine complex activity. The regional changes were \$270 and \$137 per person in the construction and operation phases of the models, respectively. With different population levels among the counties, the change in per capita income at the county level varied widely. The increase ranged from \$145 per person in Mecklenburg County (1992 baseline population 29,577) to \$556 per person in Amelia County (1992 baseline population 7,548) during the construction phase (Table 4), and from \$63 per person in Mecklenburg County to \$236 per person in Amelia County during the operation phase (Table 5).

Retail Sales

Retail sales were defined in the VIP model as sales subject to state and local sales tax. Retail sales increases were substantial during the construction phase as building materials and services were purchased. Outside of Halifax County (where the feedmill was located), the increase in retail sales was between \$4.5 and \$5.0 million per county (Table 4). In Halifax, retail sales increased over \$8 million in the first year. After the construction phase, the change in retail sales over the baseline decreased. In subsequent years, the increase was between \$1.2 million and \$2.4 million for individual counties, except for Halifax, which showed an annual increase of almost \$6 million in sales (Table 5).

Fiscal Impacts

In the models, fiscal impacts varied among the counties depending on current taxes and expenditures within each locality. As stated earlier, because government actions are unique to each locality, these fiscal changes can be summed across government jurisdictions to provide an estimate of the total change, but no conclusions can be drawn about the effect on individual taxpayers within the region.

Real Property Tax Base

In the models, increases in the real property tax base resulted from an increase in the number of homes and businesses in the counties, as well as from the new hog facilities. During the construction phase, the per county increase in tax base varied from \$6 million in Prince Edward County to \$12 million in Charlotte County, with the exception of Halifax County, where additional construction and employment activities associated with the feedmill resulted in an almost \$21-million increase (Table 4). The variation among the other counties resulted from differences in population, per capita income changes, number of businesses, and the number of out-commuters. For example, the changes in per capita income in Prince Edward County and the change in population level in Nottoway County were relatively small. In each case, these smaller increases caused the increase in the real property tax base to be smaller than in the other counties. After all the facilities were complete, in the operation phase, the increase in taxable real property rose between \$15 and \$17 million in each locality (Table 5). Again, Halifax was much higher, with an increase of almost \$39 million. In the operation phase, the additional swine and feed-processing facilities were completed and were included as a part of the real property tax base in the counties.

Personal Property Tax Base

An increase in the personal property tax base occurred as county residents purchased new vehicles, both personal and business-related. The increase in personal property tax base ranged from \$1.0 to \$2.6 million in the model construction phase, with Halifax County showing the largest increase at over \$2.5 million (Table 4). In the model operation phase, the increase in counties without the feedmill equaled between \$0.8 and \$1 million per county (Table 5). Halifax County, on the other hand, showed a much larger increase in personal property tax base in the operation phase—\$23 million—as large feed and livestock trucks were purchased and housed in the county.

Government Revenues and Expenditures

As new activities occurred in a locality and as new residents moved into the county, the demand for government services increased. For example, there were more children in the schools and more fire and police protection were required. Consequently, government expenditures increased in each locality but, at the same time, government revenues also increased. Additional money was available through state and federal aid to localities. Additional money was also generated from increased sales and other taxes.

Tax Burden

One final measure of fiscal performance in the models relates the changes in government expenditures and revenue. The change in the tax burden on the original county taxpayers (those paying taxes before the arrival of the swine complex) measures the fiscal changes needed in order for these residents to maintain the same level of government services. In other words, would the changes result in a fiscal benefit or fiscal cost to the original county taxpayers? Although the initial change in employment and investment was the same in all the counties, except for Halifax, different county revenue and expenditure patterns result in different final changes in individual county tax burdens.

During the construction phase of the model, three of the nine counties saw an increase in the tax burden on the original taxpayers. The other six counties saw a decrease in the tax burden. The changes ranged from an increase of \$25,000 in Prince Edward County to a decrease of \$94,000 in Halifax County (Table 4). During the operation phase, however, all nine counties saw the tax burden on their original residents decrease. The decreases in tax burden during this phase ranged from \$25,000 in Nottoway County to \$72,000 in Dinwiddie County, with the decrease in Halifax County again being much larger (\$259,000) due to the feedmill (Table 5).

In reality, changes in the tax burden would not be so abrupt. In the model, construction of all facilities takes place within one year; in reality, however, construction would occur over several years as additional contracts were signed and new facilities were built. Therefore, changes in government expenditures and in government revenues would be spread over more than one year and the final changes in tax burden would occur more gradually. However, the numbers do represent the total change in county tax burden with and without the new economic activity once the complete swine complex is in place.

OTHER IMPACTS of a SWINE COMPLEX

Economic models do not measure the physical impacts that will occur in a locality due to a change in business activity. In agricultural production, these impacts can often be quite important, so we discuss them here as additional considerations.

An increase in confined animal-production activities in a region will result in an increase in waste. In large swine operations, waste is usually handled through lagoons and land-application practices. In Virginia, the process is regulated by the Virginia Department of Environmental Quality's Water Division, and physical impacts on water and soils are monitored. The primary nutrients of concern in animal waste are nitrogen and phosphorus. If not managed properly, these nutrients may enter streams and fertilize the growth of algae. Excess nitrogen can also leach to groundwater. In this study, we assume that all operations meet Water Division standards and, as a result, negative water-quality impacts will be minimized. Under current Water Division regulations, swine operations with greater than 750 head are required to have a Virginia Pollution Abatement permit. Therefore, the 600-sow units and 720-head finishing units in our model are not currently required to obtain a permit. However, all operations are required to meet the standard of no discharge of pollutants to surface waters, and the Water Division retains oversight authority to enforce this standard for all sizes of animal-feeding operations.

Each operation will require enough land to handle the waste generated by that operation. Estimates are that a 600-sow operation will require between 40 and 120 cropland acres, a 1000-sow operation will require about 70-200 cropland acres, and each finishing floor will require 15-55 cropland acres (Perkinson). Land requirements will vary depending on the topography of the land, the land's soil types, and the crops planted. The model results presented in this paper do not include economic activity that would be generated from changes in cropping or livestock activities associated with waste disposal from swine facilities.

Land application of waste will have several physical impacts on a community. First, a higher level of nutrients will be supplied for crop production, which should reduce the amount of commercial nutrients that are needed. However, if crop production is not sufficient to use all the nutrients that are available, additional cropland will be required or the size of the swine operations will have to be reduced. Second, because the waste is applied in a liquid form, there may be additional irrigation benefits to the cropland. The amount of benefit will vary depending on the crop being grown and the timing of the waste application. If the water needs could be matched to the nutrient needs of the crop, irrigation could be helpful in the Southside area, where frequent droughts during the 1980s have substantially reduced crop yields.

An additional impact from land application of waste, as well as from the waste lagoon at the swine facilities, is the potential for odor problems. State technical and regulatory agencies have developed a series of recommendations and requirements to minimize odors. Consideration of prevailing wind patterns in locating facilities is essential to odor control. Southside Virginia has not experienced the urbanization that other areas of Virginia have felt, so there remain large tracts of rural land available where swine facilities could be placed out of public view, and far enough away from residences to minimize odor problems. Land application of waste is regulated through the Water Division's permitting process. Current restrictions generally include buffer zones--200 feet from occupied residences and 25 feet to property lines--for land application of waste. Adherence to these guidelines will minimize odor from spreading the manure.

Some Virginia counties do not have zoning regulations, or have only very simple regulations. As large, concentrated agricultural enterprises enter a county, the county government may want to consider zoning proposals as a way to balance agricultural and residential interests in the county. At the very least, the county will have to sign a Local Government Ordinance Form (LGOF), which the Water Division requires before issuing a permit for an individual swine operation. The LGOF simply states that the swine operation is in compliance with all local ordinances.

CONCLUSIONS

Establishing a swine production complex would increase employment, income, retail sales and the tax base in rural Southside Virginia. Our models estimate the following overall impacts from the addition of the swine complex described in Table 1:

- 2,419 temporary construction jobs;
- 1,035 permanent jobs including
 - 792 (77 percent) in direct farm or support positions, and
 - 243 (23 percent) additional jobs generated in the region;
- \$63-\$236 increase in annual per capita income;
- over \$46 million increase in retail sales during construction;
- over \$18 million increase in annual permanent retail sales;
- almost \$170 million increase in real property tax base;
- over \$31 million increase in personal property tax base;
- reduction of approximately \$25,000 to approximately \$73,000 per county in tax burden on the original taxpayers to provide the same level of government services.

A contract swine production complex would provide a viable economic opportunity for the Southside Virginia region. Previous studies have shown that swine production can be profitable to individuals in Virginia, and this analysis indicates that swine production can also provide economic and fiscal benefits to local communities and to an entire region.

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