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State Economic Impacts of Industrial Park Development: Evidence from Virginia's Tobacco Region Megasite Program *

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Abstract: Industrial park development is commonly advocated by state and local economic developers to aid in business attraction efforts. However, there is limited evidence of its effectiveness in promoting economic growth, particularly in rural and lagging regions in comparison to other economic development tools. This paper examines the literature on the relationship between business site availability and economic development and the rationale for public sector industrial land development assistance. Results from a survey of local economic developers in Virginia are used to characterize industrial park absorption and occupant attributes. Using this information, ex-ante state economic and tax revenue impact analyses are performed for a state-funded industrial park development program serving a rural region of Virginia, the Tobacco Region Megasite Program. The paper examines conditions that affect the economic and tax revenue impact potential of industrial parks and highlights remaining information gaps.

Keywords: economic impacts, industrial parks, rural development

JEL Codes: R33, R38, R53, R58

1. INTRODUCTION

Industrial park development is a longstanding favorite economic development tool of state and local economic developers and site location consultants. Site location publications (e.g., *Area Development*, *Site Selection Magazine*) regularly publish favorable articles on public industrial park investments, and some bestow annual awards on states viewed as being at the

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forefront of site development. These state efforts in recent years include the establishment of online business site inventories, programs to characterize and certify the "business readiness" of said sites, and funding for site planning and development. Indeed, the current trend is to build not just more site inventory but larger public industrial parks (e.g., supersites and megasites) with the aim of attracting large manufacturers and their supply chains.

Industrial parks are also often a central feature of rural development efforts. Highly urbanized regions usually have substantially more resources for promoting local growth, including larger economic development departments that oversee diversified economic development efforts spanning workforce development, small business and entrepreneurship, business incentives, and other areas. Moreover, private developers are often more active in the industrial real estate market. For rural communities, such resources can be more limited. The point of contact may sometimes be a county manager, part-time employee or volunteer member of an industrial development authority that oversees little more than park construction and recruitment. Speculative private industrial real estate investment is relatively uncommon. Moreover, some rural areas (e.g., Appalachia) are more likely to be characterized by rough topography where business site inventory is limited.

Industrial park development has also attracted some academic interest as a promising economic development tool. Most prominently, Bartik (2020) has recently advocated that local and regional development dedicate fewer resources to state and local tax incentives and instead provide more support for workforce training, customized business services, public infrastructure and land development, that he argues provide a greater return on public investment. However, there is limited recent, quality academic research on publicly funded industrial park effectiveness in promoting economic development compared to other economic development strategies. Moreover, little is known about the circumstances in which such investments are most effective, including size, location, site pricing strategies, amenity provision, ownership and management characteristics, and park recruitment and firm targeting strategies.

This paper examines issues surrounding public industrial park development, including the link between industrial park provision and local economic growth, the rationale for public involvement in business site development, size and prevalence of industrial park development investment relative to other economic development expenditures, and park features that influence site development economic impacts. In addition, it draws on data from a survey of local economic developers in the Commonwealth of Virginia, including information on local park inventories and their occupancy features, to characterize the development experience of existing large industrial parks. Using information on park absorption and occupancy characteristics from the survey and other assumptions, it simulates the state-level economic and tax revenue impacts using REMI PI+ (Regional Economic Models Inc. Policy Insight Plus) economic modelling software of a state-sponsored regional development program, the Tobacco Commission Megasite Program, designed to significantly improve the availability of large industrial sites in a lagging, predominantly rural region in southern Virginia. The paper finds that under baseline conditions, large industrial park investment in the region can be expected to have fairly small state economic and tax revenue impacts.

There are several arguments presented here why public industrial park investments may not live up to expectations. First, localities often provide and perform little due diligence

such as market feasibility analysis of industrial park need. As a result, parks are often built in suboptimal locations with limited access to labor and other business resources or are built substantially larger in size than local market need would dictate. Even when optimally located, full buildout of park space can take several decades. Second, new parks often attract existing firms from the region rather than new firms to the state, firms providing non-traded goods and services, and firms less likely to provide colocation benefits for other firms in the parks.

The paper is divided into several sections. The first section reviews literature on the effect of industrial parks on local economic growth. The second section examines the growing state involvement in state industrial park development and rationale for public investment. The third section describes the Tobacco Region Megasite Program. The fourth section outlines the procedure used to project park absorption and occupancy characteristics for estimating direct net state employment incentivized by the megasite program. The fifth section presents REMI PI+ state economic and tax revenue impact analyses of a baseline scenario of the program and twenty sensitivity analysis scenarios that vary selected features of the baseline scenario. The final section is a summary and conclusion.

2. INDUSTRIAL PARKS AND ECONOMIC DEVELOPMENT

Industrial parks date back to the turn of the 19th century when planned industrial districts were established in Chicago, but they became much more common in the mid-20th century (Peddle, 1993). They consist of large contiguous areas of land with common infrastructure that can be subdivided to serve several different firms (Peddle, 1993). Other features sometimes offered include park management and operations and covenants and restrictions for firm tenants (Peddle, 1993). Modern business parks can provide other amenities such as landscaping, public spaces, parking, roadways, and on-site business services (Frej, 2001).

Whereas heavy industry was once a common tenant of industrial parks, changes in the industrial composition of the U.S. economy have led to a shift to light industry and more service-oriented business uses such as warehouse and distribution parks, logistics parks, research technology parks, incubator parks, and corporate parks (Frej, 2001). Increasing interest in environmental stewardship has also led to the establishment of ecological parks and "brightfields" sites that provide renewable energy supply options (Frej, 2001).

A substantial amount of research has been conducted in recent years examining the role of economic development incentives in business recruitment and expansion decisions (Bartik, 2018). Although economic development incentives are often conflated with the most visible and controversial financial incentives such as job creation tax credits and grants, customized business services, worker training and infrastructure assistance are also often recognized as falling into this category (Bartik, 2020). Such in-kind incentives to firms are thought to offer special benefits to communities because of the presence of market failures that result in underinvestment in public goods and human capital. Moreover, the incentive spending represents a permanent investment in local capacity rather than economic activity that could very well be ephemeral.

Unfortunately, limited research examines the effects of industrial site provision on regional

economic development, most of it is relatively dated, and the focus is usually not on rural or lagging regions. Chapple (2014) finds that establishments located in industrial zones in the San Francisco Bay area were more likely to expand than those located elsewhere. The author suggests that such zones assist growth by providing more "flex" space that aids industrial expansion. In a study of the Chicago region, Peddle (1984) finds that communities with industrial parks had more manufacturing firms than those without.

Identifying the effect of industrial park provision on firm employment and other outcomes is complicated by various types of endogeneity issues. Parks are not randomly located. Peddle (1988) finds that industrial parks are more likely to be built in particular types of places, including newer communities with better highway, rail, and airport accessibility, higher population and population growth, lower population density, and the availability of public fire protection (Peddle, 1988). Moreover, particular types of firms may be attracted to established industrial parks, such as relatively small businesses (20 to 100 employees), more capital intensive and less energy intensive firms, and light industry (Peddle, 1990).

Several studies link business site features and locational characteristics with firm attraction and park occupancy levels. In a study of Georgia localities, Kriesel and McNamara (1991) find that industrial site quality (as reflected in the estimated price of industrial park sites) is associated with a higher likelihood of attracting a manufacturing plant. Utilizing survey data, Hitzhusen and Gray (1976) find that industrial park employment and wages are associated with park characteristics such as park age, size, rail access, and park management characteristics. In a study of university research parks, Luger and Goldstein (1991) case study research attributes park success to an area's pre-existing levels of research and development (R&D) or high tech activity; the presence of research universities; availability of local air service; business services and infrastructure; and quality of local leadership. An additional regression analysis of paired counties with and without research parks finds that research park counties grew faster than matches when the parks were older, university-owned, and provided garbage collection services (a proxy for park-provided services).

Business and industrial parks have a mixed track record in terms of meeting performance expectations. Reality may fall short of expectations because of inadequacies in planning such as poor location choice, sector targeting errors, inadequate infrastructure investment, and insufficient marketing (Saleman and Jordan, 2014). Needs will vary from community to community. Some industry analysts report that metropolitan areas are more likely to lack adequate inventory of developable business sites (Gemmen, 2014). On the other hand, some business parks are never filled or may become less selective of tenants when targeted firms show little interest (Luger and Goldstein 1991; Schmenner 1982). Business parks may also fail to attract complementary firms that promote industrial clusters and agglomeration effects as sometimes intended. Lastly, parks may displace economic activity outside of the park if firms producing non-traded goods and services move into the park and compete for local markets or firms in the region relocate existing operations to the park (Saleman and Jordan 2014). These findings support the need for economic developers to conduct due diligence that includes an analysis of industrial demand, assessment of existing industrial site resources, and target industry analysis when assessing business site development needs.

3. STATE INVOLVEMENT IN INDUSTRIAL PARK DEVELOPMENT AND RATIONALES

In recent decades, states have become more involved in both public certification and development of industrial parks. North Carolina offered one of the first site readiness programs in 2001. By 2008, 15 states offered such a program, growing to approximately half of states today. Industrial site certification provides a way for property owners and controllers to verify and convey to interested buyers and lessors that a piece of property meets the requirements for development by a prospective firm. Sites that are fully certified are said to be "shovel ready," meaning that they are available for sale, zoned and permitted, adequately served by transportation and utilities, and ready to be developed by private businesses for commercial and industrial operations. In addition, at least 11 states offer site development assistance that funds industrial site planning and construction expenses to bring business sites to higher levels of readiness. According to data from The Council for Community and Economic Research (C2ER) Economic Development Expenditures database, total spending by states on "site preparation and development," "prospect site location assistance," and "project-specific infrastructure" was $396 million in fiscal year (FY) 2021. This amount represents approximately 2.6 percent of all state economic development spending, up from $46 million (0.55 percent) in FY2010.

Public certification and development can potentially address several public policy goals, including rectifying market and government failures and promoting rural or lagging region equity (Saleman and Jordan 2014). Industrial site certification can improve information gathering, lower firm search costs and facilitate a speedier response to market growth opportunities. Increasingly complex land use and environmental regulations have created more opacity and unpredictability in permitting and lengthened the amount of time for industrial site development, providing prior land assembly and development guarantees more value to new firms (Peddle, 1993). Land ownership and land use fragmentation are also more prevalent, which increases land assembly time and costs. Anecdotal evidence from economic developers suggests that firms now customarily demand sites that are available for development within more compact time frames than earlier eras. Site selection consultants claim that certified sites may save six or more months in the site development process and help firms save $50,000 or more for larger industrial sites such as megasites (Mattson-Teig, 2013). Industrial parks that host complementary firms may help generate agglomeration economies and contribute to the growth of industry clusters (Jolley and Paynter 2013; Peddle 1993). To some degree, industrial parks also serve as quasi-public goods since some publicly provided infrastructure continues to be available for public use such as roadways, bridges, and common areas such as parks and greenways. Industrial parks can generate social benefits for the general public by reducing congestion and pollution and creating a hub for multimodal transportation infrastructure (such as roads, rail and public transit) and power infrastructure (Chapple 2014; Frej 2001). Lastly, industrial park improvements are sometimes advocated as regional and rural economic development strategies, providing information and infrastructure to promote business and industrial development in areas with unutilized labor resources that are less mobile.

In addition to potentially addressing these problems, industrial parks can serve as a

locational incentive (Coupal, nd). The availability of business-ready industrial space may move a candidate site up in the corporate site selection process. Public industrial sites are often offered at below development and/or market prices, reducing the costs of land and industrial infrastructure development expenses for relocating and expanding firms. Such in-kind contributions may be similar in effect to traditional grant cash incentives.

4. VIRGINIA'S TOBACCO COMMISSION MEGASITE PROGRAM

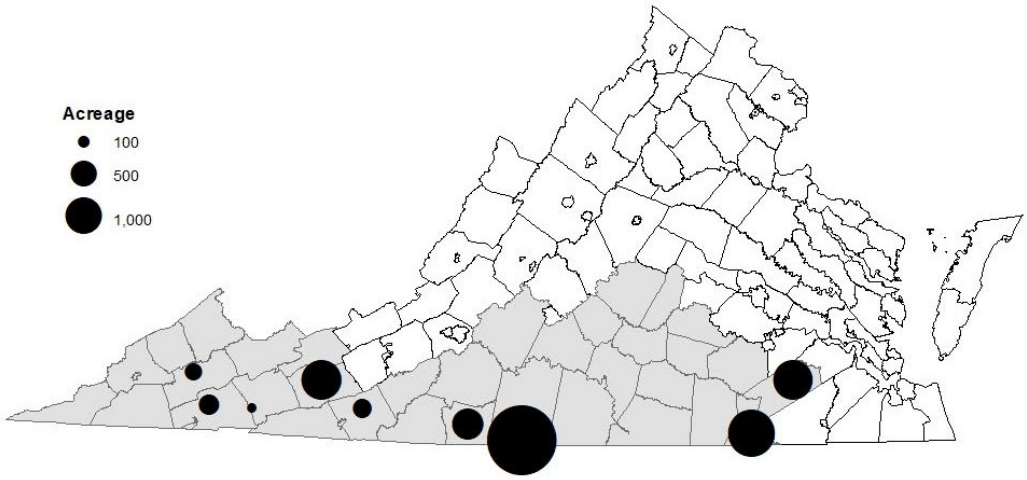
Virginia's largest state industrial park development program is the Tobacco Commission Megasite Grant program. The megasite program was established by a state agency called the Tobacco Indemnification and Community Revitalization Commission (now the Tobacco Region Revitalization Commission or "Tobacco Commission") that was created in 1999 for the purpose of assisting state tobacco growers in southern Virginia affected by regulatory changes in the industry transition from tobacco cultivation to other agricultural products and to promote the economic development of the region. Funding for the Commission is based on half of the $4.1 billion in funds that the state received from the Tobacco Master Settlement Agreement (MSA). The MSA was an over $200 billion settlement reached in 1998 between U.S. states and major tobacco companies to recover state Medicaid costs incurred because of citizen smoking-related illnesses.

The Tobacco Region consists of 40 counties and independent cities in Southside and Southwest Virginia where tobacco cultivation occurred around the time immediately prior to the MSA based on 1998 tobacco production levels (see **Figure 1**). The predominantly rural region has suffered not only from the decline in tobacco production but other industrial activities such as textiles, furniture, and the coal industry. The region had 1.023 million residents in 2018, representing 12 percent of the state population, but accounting for only 7.9 percent of state personal income in the same year according to Bureau of Economic Analysis, Local Area Personal Income data. Measures of socioeconomic status for the region substantially lag both the state and the nation.

The megasite grant program was established because of a perceived lack of business site inventory in the region to meet economic development needs and Tobacco Commission belief that high impact, transformative projects should be pursued to alter the region's downward economic development trajectory. The origin of the megasite program can be traced back to the early 2000s. In 2004, the Tobacco Commission worked with the Virginia Economic Development Partnership (the state's primary economic development agency) to identify potential sites for industrial development and to estimate grading and utility design needs. This action occurred at a time when several foreign automakers were looking at potential industrial sites around the country to locate plants, primarily in the Southeastern U.S. because of more favorable business climates and labor laws. Subsequently, the Tobacco Commission engaged a site location firm (Business Facility Planning Consultants, LLC, 2005) to examine 19 large properties in the region that could potentially accommodate an automotive manufacturing plant. That study formed the basis of the megasite program.

The Tobacco Commission established the megasite program in FY2011 to develop large industrial sites in the region, with a budget that gradually grew to approximately $100 million. Funded sites must meet the criteria in Virginia code for "Major Employment and

Figure 1: Tobacco Commission Megasites by Location and Size



Note: The Tobacco Region is shown in grey.

Investment Project" or "MEI project" (§2.2-2260) – a high-impact regional economic development project in which a private entity is expected to make a capital investment in real and tangible personal property exceeding $250 million and create more than 400 new full-time jobs. The name of the program is a bit of a misnomer, since only four of the nine funded industrial park sites (see **Figure 1**) are bonafide megasites (of the others, one is a supersite, two are large sites, and two are general industrial sites), although over half of program funds have gone to those sites. Megaparks have generally been established at locations in the eastern and central Southside region; such sites are more difficult to construct in the southwestern region because of the mountainous topography. Thus, southwestern sites are generally much smaller in size but may potentially accommodate up to a one million square foot building and are thus able to meet MEI requirements for job creation and capital investment. Only two of the nine parks are located in metropolitan areas: one park is located at the edge of the Virginia Beach-Norfolk-Newport News, VA-NC metropolitan statistical area and another in the Kingsport-Bristol, TN-VA metropolitan statistical area. Three of the parks are located in counties not adjacent to metropolitan areas–this in a state where approximately three-fifths of localities are located in metro areas. Thus, the program has a decidedly rural orientation for a relatively urbanized state.

Initial program eligibility required at least a 10 percent non-Tobacco Commission match that was later raised to 50 percent. Aside from the consultant's study, which provided some guidance to the Tobacco Commission on potential sites, the program largely relied on localities and regions to take the initiative in identifying site locations and submitting projects to the Commission for funding consideration.[1] They have also assumed the responsibility

[1]The Virginia Economic Development Partnership did not play a direct role in Tobacco Region site funding decisions. However, it has played an active role in site characterization and technical assistance funding for

for sectoral targeting strategies, with most megasites favoring manufacturing firms in the automotive, aerospace, advanced materials, electronic, food product, and forest product industries, although it is evident in some park recruitment efforts that a wider net has been cast. The parks have obtained $180 million in total funding from 2008 through 2018. Over half of the funding ($97 million) was obtained from the Tobacco Commission Megasite Program) with residual funding derived from local funds, other state grant programs, and federal grants.

5. PROCEDURE FOR ESTIMATING STATE ECONOMIC AND TAX REVENUE IMPACTS

Economic impact analyses were conducted using REMI PI+ (Policy Insight Plus) software. REMI PI+ is a dynamic, multi-sector regional economic simulation model. It has been described as an "eclectic model" because it combines different regional economic modeling methods such as input-output, pooled econometric estimation techniques, and region specific parameters to characterize the mechanics and path of a regional economy (Partridge and Rickman, 2010). It was selected for this analysis because of its widespread use in commercial and academic policy studies, dynamic properties and ability to simulate annual outcomes, and range of policy variables for use in analyzing other economic development incentives using a consistent framework for benchmarking purposes. Other static economic impact modelling tools such as IMPLAN and RIMS II could be used to undertake some facets of this analysis.

The REMI model is made up of five major modules or blocks that interact simultaneously. The Output Block determines expenditures for final demand, including consumption, investment, government and imports as well as demand for intermediate inputs. Final demand responds to changes in other model blocks. This module contains a key engine in the model, an input-output model based on the Bureau of Economic Analysis (BEA) benchmark transactions table that measures flows of goods and services among industries. The Labor and Capital Demand Block determines employment, capital and fuel demand as well as labor productivity. The Population and Labor Force Block models the population characteristics of the region, including age, race and sex composition. Labor force participation adjusts in response to changes in wages and employment opportunities. A key driver of population changes is migration, which is influenced by relative wage levels as well as amenities. The Wage, Price and Costs Block determines factor and product price. The Market Shares Block helps to measure exports from and imports to the region. Changes in market share are driven by production costs, demand characteristics, distance to markets and output.

The model can be used for economic impact modelling as well as for long-term regional economic forecasting. Because of its complex architecture, underlying equations and parameters cannot be changed, but the model offers several dozen additive and multiplicative exogenous "policy variables" that can be altered to conduct policy analysis. These variables include traditional industry exogenous final demand variables used in input-output analysis plus others that change firm wages, firm production costs, demographic characteristics,

communities in a program it later created called the "Virginia Business Ready Sites Program."

(e.g., birth rates, survival rates, migration flows), and labor productivity. It also produces dynamic simulations, with model outputs from one time period contributing to equilibria in subsequent time periods. Dynamic adjustments that occur in response to exogenous changes include regional wages, labor force, and price levels typical of general equilibrium models.

The REMI model has been evaluated in a number of different ways in the research literature. Early validation efforts centered on its post-sample forecasting accuracy as measured by Mean Absolute Percentage Errors (MAPEs). Results from Treyz (1993) and Cassing and Giarratani (1992) indicated that the model produced acceptable short-term forecasting error, at least in comparison to relatively simple time-series models. More recent evaluations suggest that this feature is not a model strong suite in comparison to customized regional econometric models, and that it "shouldn't be used out of the box for forecasting" (Xiong et al., 2012). This finding reflects an inherent trade-off between the greater structural complexity of the model and the simpler structure, but better data fitting possibilities offered by conventional regional econometric forecasting techniques. The REMI model's comparative strength is as a policy impact tool (Xiong et al., 2012). Rickman and Schwer (1995) show that REMI produces economic impact results similar to commercial input output models (i.e., IMPLAN, RIMS II) when modelling exogenous final demand changes. Model simulations using different policy variables have also been shown to produce results consistent with theoretical expectations and empirical evidence (Cassing and Giarratani 1992; Rose et al. 2011). The model has been indirectly validated by the continued existence of a wide customer base in academia, government, and the private sector and use in hundreds of economic impact and policy studies at the national, state, and regional level.

The REMI PI+ model used for this analysis was customized for the state of Virginia. Ex-ante estimation of megasite program state economic and revenue impacts was conducted by dividing impacts into two phases: an industrial park development phase and post-construction park occupancy phase.

Since megasite program funds formed over half of funds and were instrumental in the decision for localities to pursue park development and construction, it is assumed that the parks would not have been established without the program. Therefore, program and other local and external funding and associated spending for construction would likely have not occurred but for the existence of the program. For the development phase, total park expenditures by year were assigned to REMI PI+ as sales to the professional, scientific, and technical services sector for architectural, engineering, and environmental planning expenses (estimated at 20 percent of total expenditures) and to the construction sector for construction-related expenses, including site grading and infrastructure installation (65 percent of the total). Spending on land acquisition (15 percent of the total) was not counted as an expenditure for impact analysis since it is a transfer.

Estimation of megasite occupancy is a multi-stage process that required generating economic data on the level of new employment to the state that could be attributed to park availability over time. This estimation drew heavily on a statewide industrial park survey of 67 local economic developers (representing slightly over half of the 133 Virginia localities surveyed) that provided information on 23 established industrial parks at least 100 acres in size. The survey asked local economic developers to estimate the size and occupancy levels of existing completed business and industrial parks, year of park opening, source of ownership

(public or private), and total employment of business occupants.[2] It also asked respondents to estimate the percentage of occupants that were business startups (i.e., new companies), relocating or expanding businesses from within the locality or state, or new establishments in the state created by out-of-state firms. Survey respondents were roughly representative of all Virginia counties and independent cities, and thus predominantly metropolitan. The Tobacco Region and localities hosting Tobacco Region megasites are predominantly nonmetropolitan. However, there was substantial rural-urban continuum heterogeneity in the respondent sample, with one to five responses for each nonmetropolitan rural-urban continuum category where a Tobacco region megasite can be found.[3]

New state employment resulting from the megasite program was computed using the following procedure:

Absorption. The first step was to estimate a park absorption rate ($ABSORPTION$) for each megasite for each year over the 2020-2029 period. The absorption rate is the proportion of industrial park land that is developed. This goal was accomplished by using a regression equation estimated from survey data that related absorption rate to the age of the industrial park (AGE) and rural-urban continuum code of its locality ($RUCC$) (See **Table 1**).[4] Locality urbanization ($RUCC$) was measured using a USDA Economic Research Service rural-urban continuum measure varying from one (locality is in a large metro area) to nine (more remote rural nonmetro locality with little urban population). It is interpreted here as a scale variable rather than ordinal or nominal categorical variable for expediency and because of the limitations of competing urbanization measures (Isserman, 2005). The equation is estimated using fractional probit (*fracreg probit* in Stata) because the dependent variable is measured as a proportion bounded by zero and one.

Results indicate that both variables are statistically significant. Holding the park age constant, parks located in larger metropolitan areas had higher absorption rates than more remote rural ones, perhaps reflecting workforce size or market condition advantages. In addition, absorption rates, as one may expect, increase incrementally over time.

Predicted absorption rates ($ABSORPTION$) for 2020-2029 were then estimated for each of the nine megasites using the postestimation average marginal effects ($PRED$) from the fractional probit model and information on the megasite actual or projected opening year ($OPENYEAR$) and its locality's rural-urban continuum category ($RUCC$) as follows:

[2]The average park size for survey respondents was 552 acres (compared to an average of 895 acres for the nine Tobacco Region megasites) of which 205 acres were occupied by businesses for an average absorption rate of 37 percent. Occupancy rates varied from a low of zero percent to 100 percent. Occupancy rates reflect economic developer best estimates of developed land area (buildings, parking areas, landscaped areas) and associated public right-aways and environmental open-space as a proportion of total park land area.

[3]Sixty percent of Virginia counties and independent cities are located in metro areas compared to 67 percent of survey respondents and 61 percent of industrial park respondents. Just two of nine Tobacco Region megasites (22 percent) are located in metropolitan areas.

[4]Industrial park absorption analyses sometimes take into consideration various park and geographical features, including location, park size, park amenities, transportation infrastructure availability, workforce availability, market conditions, availability of space elsewhere in the region, and other factors in assessing absorption potential. Park marketing and recruitment efforts may also improve park occupancy.

Table 1: Results for Fractional Probit Regression of Industrial Park Absorption Rates

Variable	Coef	dy/dx	Std. Dev	z	p value
AGE	0.03406	0.15795	0.02031	1.69	0.094
RUCC	-0.23409	-0.18669	0.09092	-2.57	0.010
CONSTANT	-0.35890		0.62416	-0.58	0.565

Number of Obs: 23
Wald $\chi^2(2)$: 1.27409
Prob $>\chi^2$: 0.0000
Log pseudolikelihood: -12.0349
Pseudo R^2: 0.1363

$$ABSORPTION_{ij} = PRED((i - OPENYEAR_j), RUCC_j) \quad (1)$$

Where $i = 2020, ..., 2029$; $j = 1, ..., 9$

Occupied Acreage. The next step was to obtain occupied acreage ($OCCACREAGE$) at all of the megasites by year. This was obtained by multiplying absorption rates over time for each park by the corresponding megasite total acreage ($TOTACREAGE$) and summing.[5]

$$OCCACREAGE_i = \Sigma_{j=1}^{9} ABSORPTION_{ij} * TOTACREAGE_j \quad (2)$$

Total megasite acreage for the nine megasites was 8,055. Occupied acreage for all of the megasites is projected to rise from 958 acres in 2020 to 1,494 acres in 2029. Thus, in aggregate, megasite parks are projected to have 12 percent occupancy in 2020, only slowly rising to 18 percent occupancy by 2029 (See **Figure 2**)

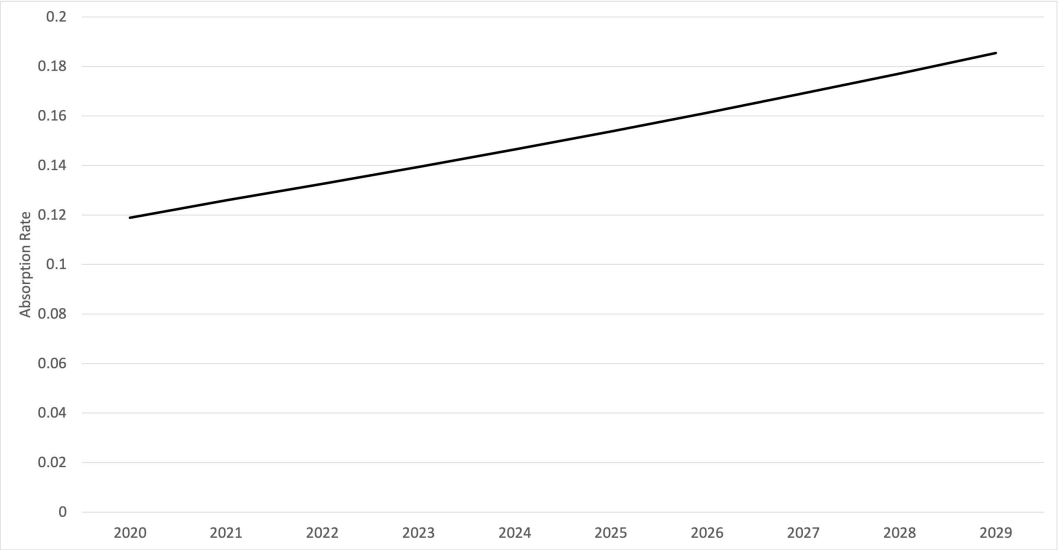
Total Job Creation. The third step was to estimate total employment for the occupied acreage for each year. This was obtained by using an estimate of the mean employment per acre of all surveyed industrial parks (approximately 2.72 jobs per industrial park acre). Employment at the megasite parks for each year was obtained by multiplying estimated occupied acreage each year by a number that rounds to 2.72 jobs per acre average. Results from this estimation indicate that the nine megasites would attract a total of approximately 2,602 jobs in 2020, rising to approximately 4,057 jobs by 2029.[6]

Net New Job Creation. Only a portion of the megasites employment estimated in the previous stage is anticipated to be new employment to the state, since relocations from elsewhere within the community and state to the parks will occur. Based on survey

[5]Five-year estimated occupied acreage predicted by the model for the Southern Virginia megasite at Berry Hill megasite was within the range (300-500 acres) predicted by a private consultant's market analysis for the site (Jones Lang LaSalle, 2014). Validating data from other sites was not available.

[6]Estimates of employment creation provided by Tobacco Commission applicants as part of their grant applicants were generally more optimistic about the economic development potential of their sites. Collectively, the applicants projected that 32,060 jobs would be created at the sites.

Figure 2: Tobacco Commission Megasites Projected Absorption Rate, 2020-2029



responses, this component of park employment is thought to be substantial. Local economic developers estimated that 8 percent of existing industrial park occupants were business startups, 40 percent were relocations from within the locality and 23 percent were relocations from elsewhere in the state (See **Table 2**). The latter relocations may have occurred for business expansion purposes. Also, the parks could have played a role in retaining businesses that were considering sites outside the state, although this was not assessed. Only 29 percent of occupants resulted from relocations from outside the state or new establishments attracted to the state. Thus, a substantial portion of park absorption likely does not represent net new employment to the state but relocated jobs.

Since some portion of firms may have been retained within the state because of the availability of the parks or added jobs after the relocation/expansion, the assumption is made that 50 percent of park occupant employment represents job creation for the state and the other half employment transferred from elsewhere in the locality and state. Thus, of the approximately 4,057 estimated jobs attracted to the megasites by 2029, only half of that amount (2,028) is assumed to represent new jobs in the state.

Table 2: Virginia Industrial Park Occupants by Category

Category	**Percentage**
Business startups	7.57
Relocation or expansion of existing business from within the locality	39.79
Relocation or expansion of existing business from elsewhere in the state	23.21
Relocation or new location of business operating outside of Virginia	29.43
Total	100.00

Source: Survey of Local Economic Developers; based on 18 responses

But For. The "but for" effect represents the proportion of megasite state job creation that would not have occurred "but for" the existence of the megasite program. Estimation of the "but for" effect of the Tobacco Region Megasite Program relies on recent research by Bartik (2018) that relates the size of an economic development incentive to a firm's cost of operations in its ability to influence company site decisions. The "but for" effect is the proportion of firm growth during the period that can be attributed to the incentive and is determined by a tax-elasticity-based formula.[7]

The intuition behind the formula is that smaller incentives relative to the firm's expanded or relocated operations are less likely to "tip the balance" in a firm's location decision than larger incentives. For instance, Bartik estimates that a Wisconsin Foxconn incentive deal (approximately $230,000 per job) reduced operating costs for the proposed plant on a discounted basis over time by 30 percent. This cost reduction would influence the location and expansion decision 97 percent of the time on average. In contrast, an incentive that constitutes just .1 percent of the amount would affect only one percent of the location/expansion decisions.

The "but for" effect for the Tobacco Commission Megasite Program was estimated by assuming that land would be provided to new or relocating establishments at no cost as an economic development incentive. Interviews with Tobacco Region local economic developers indicated that they commonly use such inducements to entice firm's to locate and expand in their communities and would likely use them for recruiting businesses to the new megasites. Furthermore, the land value contribution can serve as a local match for other Virginia economic development grant programs, relieving them of the burden of using entirely locally-derived cash contribution to leverage the state incentive.

Based on funds attracted to megasite projects over 2008-2018, the average spent in park development is approximately $39,498 per acre. The cost of park development was covered by the Megasite Program, localities, and other state, federal, and private sources. For analytical purposes, it is assumed that the industrial parks would not have been built without Tobacco Commission funding and that the entire incentive amount ($14,545) per job (and ability to leverage other funding) was attributable to the existence of the program. This is computed by dividing the average development cost per acre (approximately $39,498) by the average expected new jobs per acre (approximately 2.72) described earlier. This incentive per job figure was used to develop an estimate of the "but for" based on the Bartik methodology that compares the size of the incentive to firm production costs. Bartik recommends proxying firm production costs with readily available industry value-added, which are payments made to capital and labor.

To estimate the "but for" effect of a land donation incentive to a particular project, a

[7]The formula (derivation of which is explained in Appendix D of Bartik (2018)) is as follows:

$$(E_a - E_b)/E_a = (1 - (1 - s)(-R) \tag{3}$$

Where E_a is the employment before the incentive, E_b is the employment after the incentive, R is the elasticity of long-run business activity for business costs (and assumed to be equivalent to -10 in line with business activity tax elasticities of -0.5 and the finding that business taxes represent about 5 percent of value-added or $R = -.5/.05 = -10$), and s is the relative incentive size (i.e., present value of incentives as a proportion of present value of stream of company value added over the 20-year period).

representative firm is assumed that receives the value of the free land in the first year of operation as in incentive. It is assumed that the megasites would attract industry employment in the same proportion as 10 already occupied industrial parks in the Tobacco Region.[8] Value-added per employee for this representative employer would be $192,351, based on data from REMI PI+ for 2019. Next, the land donation value ($14,545 per employee) as a proportion of the discounted stream of production costs for a 20 year project lifespan was calculated. Bartik recommends using 12 percent as the discount rate because it best represents the time value of money for private companies. Based on these calculations, the land donation would represent approximately 0.9 percent of firm production costs ($14,545 out of the discounted sum of value-added per employee of $1,609,166). Thus, using the elasticity formula, 8.7 percent of the total employment creation can be attributed to the program.

Industry Employment Assignment to Model

The sequence of calculations described above produces projections of new state employment at Tobacco Commission megasites attributable to the megasite program for each year over the period 2020-2029. This computed exogenous change in state employment over 2020-2029 is used to simulate total economic impacts with REMI PI+ that reflect multiplier effects (direct, indirect, induced and dynamic effects combined) in terms of employment and other economic measures. In order to simulate the economic impact of the projected new megasite employment, the total employment was apportioned to individual REMI industries to reflect the industrial composition of the 10 existing Tobacco Region occupied parks referenced earlier. Thus, megasite park projected employment by year was assigned to individual REMI manufacturing, warehousing and storage, and other industries. Projected job creation in these industries by year was assigned to the REMI PI+ "firm employment (competes locally)" policy variable, meaning that "competitive" sales destined for state-wide rather than out-of-state markets would partially crowd-out industry sales elsewhere in the state with deleterious effects on competing firm employment.

6. PROGRAM ECONOMIC AND TAX REVENUE IMPACT RESULTS

Results are presented in terms of several economic metrics. They include job creation inputs calculated using the methodology described in the previous section and several REMI PI+ model outputs, such as total employment, gross domestic product (GDP), and personal

[8]The industrial parks included (1) Airside Industrial Park, (2) Cane Creek Centre, (3) Cyber Park, (4) Riverview, (5) Patriot Center, (6) Greensville Industrial Park, (7) Carroll County Industrial Park, (8) Highlands Industrial Park, (9) Roanoke River Regional Industrial Park, and (10) two sites for an early phase of Progress Park, which later received megasite program funding for an addition. Industrial site maps were obtained for each park showing the names of occupied sites. This firm information was matched with confidential Quarterly Census of Employment and Wages (QCEW) payroll records for 2019 to obtain employment by North American Industry Classification (NAICS) code. Information was obtained for 56 firm occupants with a combined total of 5,710 employees. Approximately 75 percent of the firm employment was in manufacturing. Over two-thirds of employment was concentrated in just five industries: food manufacturing (20 percent), furniture and related product manufacturing (15 percent), plastics and rubber products manufacturing (12 percent), textile mills and textile product manufacturing (11 percent), and warehousing and storage (11 percent).

Table 3: Tobacco Commission Megasite Development-Phase State Economic and Revenue Impacts, 2008-2018

Year	Total megasite development spending (Millions)	Megasite program costs (Millions)	Total employment impact	Total GDP impact (Millions)	Total personal income impact (Millions)	Total state tax revenue impact (Millions)
2008	$13.49	$0.00	147	$12.45	$8.17	$0.46
2009	$3.47	$0.00	41	$4.93	$2.84	$0.16
2010	$10.99	$1.72	118	$11.10	$7.15	$0.36
2011	$43.63	$24.98	445	$42.27	$26.45	$1.34
2012	$36.74	$27.17	374	$40.17	$24.60	$1.25
2013	$22.83	$20.96	233	$27.23	$17.64	$0.92
2014	$22.24	$13.57	214	$24.73	$17.22	$0.83
2015	$8.21	$5.07	73	$10.58	$8.67	$0.40
2016	$0.17	$0.00	-10	$0.72	$3.11	$0.10
2017	$7.21	$0.92	48	$5.42	$6.20	$0.25
2018	$11.43	$2.90	83	$9.63	$8.50	$0.38
Total	$180.41	$97.28				$6.44

Note: Land acquisition costs were estimated at $27.1 million. They are transfers and not counted in determining economic impacts

income impacts. In addition, state tax revenue impacts are presented. Although highly correlated with these other measures of economic activity, this metric is of special interest to many state policymakers because it can be compared to program outlays to measure one kind of "return on investment." Tax revenue impacts were estimated by scaling economic activity measures to state tax revenue data from the Census of Government using the procedure described in Regional Economic Models (2012).[9]

Table 3 shows the state economic and tax revenue impacts of planning and construction expenditures during the megasite development phase. Impacts are fairly modest and follow the ebb and flow of program-related expenditures. Program costs were relatively low in the initial years and consisted mainly of land acquisition and some planning expenses. Tobacco Commission funding for major construction projects was received during the 2011-2014 period. The average annual state economic impact over the eleven year period 2008-2018 was 161 jobs, $17.2 million in GDP and $11.9 million in personal income compared to an average annual megasite development budget of $16.4 million and $8.8 million in program costs. During this phase, economic impacts are estimated to generate approximately $6.4 million in state tax revenues compared to $97.3 million in Tobacco Region Megasite Program expenditures or 6.6 percent of total program costs.

The main economic and fiscal impacts of the program occur when businesses begin to occupy sites in the parks. As discussed earlier, only a portion of the projected new employ-

[9]State tax revenues were derived from the Census of Government's State and Local Government Finance and Annual Survey of State Tax Collections. Revenue estimates are calculated by multiplying state revenue rates by the corresponding base quantity, which included state-level demand for selected industries (general sales tax, selective sales tax, license taxes), state-level personal income less transfer payments (individual income tax), corporate income tax (gross domestic product), and personal income (other taxes). The tax revenue impact analysis does not include the effect on other revenues, including non-general revenues. Nor does it estimate the local tax revenues generated.

Table 4: Tobacco Commission Megasite Occupancy-Phase Economic and Tax Revenue Impacts, 2020-2029

Year	Projected megasite state new job creation	Projected megasite state new job creation attributable to program	Total employment impact	Total GDP impact (Millions)	Total personal income impact (Millions)	Total state tax revenue impact (Millions)
2008 - 2018						$6.44
2020	1,301	113	181	$27.52	$10.84	$0.96
2021	1,377	120	200	$33.54	$12.97	$1.18
2022	1,450	126	218	$37.76	$14.97	$1.35
2023	1,524	132	230	$41.33	$16.86	$1.48
2024	1,602	139	241	$44.79	$18.74	$1.62
2025	1,682	146	250	$48.30	$20.59	$1.75
2026	1,765	153	258	$51.88	$22.47	$1.89
2027	1,850	161	267	$55.75	$24.51	$2.04
2028	1,938	168	277	$60.09	$26.91	$2.20
2029	2,028	176	289	$64.85	$29.33	$2.38
Total						$23.29

ment in the parks is connected to the availability of the parks to account for the probability of firm relocations of existing employment within the state and region and "but for" effects computed on the assumption that parks parcels will be offered at no cost to the locating firms. Based on this methodology, it is estimated that job creation in the megasites attributable to the program grows from 113 jobs in 2020 to 176 jobs in 2029 (see **Table 4**). This direct employment is labeled as "projected megasite state new job creation attributable to program" in the table. The total state economic impacts, which include direct, indirect, induced, and dynamic impacts that reflect state economic activity stimulated throughout the state, grows from 181 jobs, $27.5 million in GDP, and $10.8 million in personal income in 2020 to 289 jobs, $64.9 million in GDP, and $29.3 million in personal income by 2029. These are labelled as "total employment impact," "total GDP impact," and "total personal income impact." As a result, over the 2020-2029 period, the state will collect an estimated additional $16.9 million in tax revenues. This amount represents 17.2 percent of total program costs, for a total development and occupancy-related state revenues of 23.8 percent. Another evaluation metric is the expenditure per job-year (this measure represents a job of one-year duration). Through the 22-year development and occupancy period, an annual average of 190 jobs are generated at an annual average cost of $4.42 million. Thus, the number of job-years generated per $1 million in expenditure is approximately 43.

Comparative return to revenue and annual cost per job performance data are available for 42 other Virginia economic development incentives (Joint Legislative Audit and Review Commission, 2021). The median incentive program returns 31 percent of incentive expenditures in state tax revenue and generates 53 job-years per $1 million in expenditure. Thus, baseline performance for the Tobacco Region Megasite Program is lower than the average program. It should be noted that, while the program generally lags loan assistance and discretionary grant programs on these performance metrics, it exceeds them for most non-discretionary tax incentives (e.g., tax credits and tax exemptions).

The assumptions used in this analysis may result in either overestimates or underesti-

Table 5: Megasite Simulation Scenarios

Scenarios	Description
Baseline	Baseline Scenario
Noncompetitive	Megasite firm sales are not competitive with other firms in the state (no local displacement of existing economic activity)
State Industry	Allocate employment by industry in proportion to Virginia manufacturing/warehousing employment
Agriculture and Forest Product Industry	Allocate employment in equal proportion to forest products, furniture, food products, beverage and tobacco product, and textile mill industries
But For	Assume megasite program incentivizes alternative percentages of economic activity: (a) 5 percent, (b) 15 percent, (c) 25 percent, (d) 50 percent, and (e) 100 percent
Employment Density	Assume employment density is in 1st (low) and 9th (high) deciles of surveyed parks
Job Creation	Assume (a) 25 percent, (b) 75 percent, and (c) 100 percent of jobs are new to state rather than 50 percent
Location	Assume megasites are relocated to (a) nonmetro localities with small urban population not adjacent to metros, (b) nonmetro localities with small urban populations adjacent to metros, (c) nonmetro localities with large urban population adjacent to metros, (d) small metros, (e) medium-sized metros, and (f) large metros

mates of economic impacts. For example, the way an industrial park is marketed or potential occupants are screened could make a difference in economic impacts by attracting different types of firms or industries that result in different absorption rates, employment densities or state job creation. Therefore, a series of sensitivity analyses were conducted to examine the effect of varying the variable inputs and parameters used for the baseline economic impact analysis. In total 20 alternative scenarios were examined, in addition to the *Baseline Scenario* consisting of the results for **Table 4**. These scenarios are summarized in **Table 5**.

The first three scenarios explore the effect of alternative types of megasite occupants. Since the baseline scenario assumes that firm sales can compete with other industry firms in the state, the *Noncompetitive Scenario* assumes that they are effectively exported.[10] The second scenario (*State Industry Scenario*) assumes that the mix of industries attracted to the site is different from existing industrial parks in the region and instead reflects the distribution of manufacturing and warehousing industry employment in the state. This decreases the concentration of industries representative of existing occupied industrial parks in the region and increases the concentration in higher multiplier manufacturing industries. The third scenario (*Agriculture and Forest Product Industry Scenario*) assumes that the megasites attract only traditional regional agriculture and forest product industries (i.e., forest products, furniture, food products, beverage and tobacco products, and textile mill industries) in equal proportion.

The next five scenarios explore the effect of changing the "but for" percentage from the baseline level of 8.7 percent based on the value of the financial inducement of a "cost free" site, lowering it first to five percent and then raising it to 15 percent, 25 percent, 50 percent, and finally 100 percent. The latter four scenarios may be valid if the industrial park

[10]This scenario uses the REMI PI+ Industry (Exogenous Production) employment policy variable.

incentive has additional influence over firm location decisions, perhaps because local economic developers are particularly effective at targeting the incentive at competitive projects or leveraging additional financial assistance because of the availability of industrial park sites.[11] Alternatively, firms may place additional value on business-ready site availability than development costs reflect. For example, industrial land assembly has been said to offer substantial search cost savings to some firms.[12] The *But For 100%* Scenario is reflective of naive assumptions often made in industrial park advocacy studies.

Two scenarios (*Employment Density Low* and *Employment Density High*) vary the employment concentration per acre, reflecting the first decile (one employee per acre) and 9th decile (11 employees per acre) of employment densities for respondents to the industrial park survey rather than the mean of 2.72 employees per acre. These scenarios consider the effect of varied park occupant land use intensities.

The next three job creation scenarios change the assumption that half of industrial park occupants provide new employment to the state rather than move the activity within the state. The first scenario (*Job Creation 25% Scenario*) assumes that just 25 percent is new state employment while the latter two scenarios (*Job Creation 75% Scenario* and *Job Creation 100% Scenario*) assume that 75 percent and all of the jobs respectively are new.

Six scenarios examine the effect of spatially reconfiguring the megasite industrial parks to a more rural or urban orientation, either inside the Tobacco Region or perhaps slightly outside the region but within at least commuting distance to some Tobacco Region residents. The first three scenarios consider the effect of moving the sites to particular types of rural areas along the rural-urban continuum including nonmetropolitan localities with an urban population of 2,500-19,999 that are not adjacent to a metro area (*Nonmetro Small Urban Non-adjacent*), nonmetropolitan localities with an urban population of 2,500-19,999 that are adjacent to a metro area (*Nonmetro Small Urban Adjacent*), and nonmetropolitan localities with an urban population of 20,000 or more that are adjacent to a metro area (*Nonmetro Large Urban Adjacent*). The remaining three scenarios consider the effect of moving the sites to metropolitan areas that increase in size from small metro areas (*Metro Small Scenario*), to medium size metros (*Metro Medium Scenario*), and to large metros (*Metro Large Scenario*). The effect of the more rural reconfigurations in the first three scenarios would be to decrease the absorption rates over time while the more urban reconfigurations would increase absorption rates over time.

The final scenario considered is a Combination Scenario. This scenario assumes that firms sales are noncompetitive (*Noncompetitive Scenario*), that all job creation is new to the

[11] The baseline scenario assumes that businesses are attracted to industrial parks because of the financial inducement of cost-free sites. Since the "but for" effect formula is based on firm reactions to business cost changes due to tax changes, it more typifies the likely firm response to an automatic or non-discretionary tax reduction rather than discretionary incentive. Ordinarily, greater discretion and due diligence may be expected to improve the likelihood of selecting only those projects most at risk of expanding elsewhere rather than providing the incentive across the board (Rephann, 2020).

[12] Based on the site selection consultant estimate that business-ready sites can save firms $50,000 for megasites (i.e., 1,000 acre plus park) reported earlier, the average incentive per acre of $500 equates to an estimated savings of $279 per worker occupant of a Virginia industrial park. This amount is relatively small compared to an estimated $14,545 for providing no-cost industrial land and would have minimal effect on the "but for" estimate here.

Table 6: Occupancy-Phase Economic Impacts (2029) and Cumulative Tax Revenue Impact (2020-2029) by Scenario

Scenario	Projected job creation, 2029	Projected job creation attributable to program, 2029	Total employment impact, 2029	Total GDP impact (Millions), 2029	Total personal income impact (Millions), 2029	Total state tax revenue impact (Millions), 2020 - 2029
(a) Baseline	2,028	176	289	$64.85	$29.33	$16.85
(b) Noncompetitive	2,028	176	439	$97.62	$44.34	$25.28
(c) State Industry	2,028	193	348	$74.38	$37.03	$21.36
(d) Agriculture and Forest Product Industry	2,028	123	219	$58.20	$21.26	$14.22
(e) But For 5%	2,028	101	166	$37.36	$16.90	$9.70
(f) But For 15%	2,028	304	499	$112.06	$50.69	$29.51
(g) But For 25%	2,028	507	832	$186.74	$84.48	$48.51
(h) But For 50%	2,028	1,014	1,663	$373.39	$168.95	$96.99
(i) But For 100%	2,028	2,028	3,324	$746.31	$337.77	$193.87
(j) Employment Density Low	747	164	270	$60.54	$27.38	$15.73
(k) Employment Density High	8,216	181	298	$66.86	$30.24	$17.37
(l) Job Creation 25%	1,014	88	144	$32.43	$14.67	$8.42
(m) Job Creation 75%	3,042	264	433	$97.27	$44.00	$25.27
(n) Job Creation 100%	4,057	352	578	$129.68	$58.66	$33.69
(o) Nonmetro Small Urban Nonadjacent	571	50	82	$18.27	$8.15	$4.30
(p) Nonmetro Small Urban Adjacent	899	78	129	$28.79	$12.89	$6.95
(q) Nonmetro Large Urban Adjacent	1,949	169	278	$62.34	$28.11	$15.85
(r) Metro Small	2,682	233	382	$85.75	$38.82	$22.39
(s) Metro Medium	3,547	308	504	$113.36	$51.51	$30.32
(t) Metro Large	4,509	391	640	$144.04	$65.68	$39.44
(u) Combination Scenario (b), (n), and (t)	9,019	783	1,945	$433.88	$198.73	$118.40

state (*Job Creation 100% Scenario*), and that the sites are spatially reassigned to localities in large metro areas (*Metro Large Scenario*).

Table 6 shows the results of each scenario for final year economic impacts and total cumulative state tax revenue. Baseline scenario results are presented for reference purposes. Many of the alternative firm and industry scenarios indicate that higher economic and tax revenue impacts can be obtained with different firm and industry characteristics than existing occupants of Tobacco Region industrial parks. The significantly lower results for the baseline scenario compared to the noncompetitive scenario provides confirmation that existing Tobacco Region industrial parks draw firms from industries whose sales are more likely to compete with other firms within the state. The improved results for the state industry scenario confirm that an alternative industry employment mix could provide more economic impact. However, an industrial attraction scenario representing only agriculture and forest product industries shows that lower economic impacts are also possible.

Varied results are obtained when other variables are changed. Altering the "but for" assumptions has the most sizeable impact for the various scenarios. At 50 percent, the state receives all of its investment back in state tax revenues. At 100 percent, this amount doubles. Altering the percentage of jobs created that are new to the state and metropolitan spatial configuration of parks has an intermediate marginal effect on the results. Decreasing the job creation to 25 percent halves the state economic and tax revenue impacts while increasing it to 100 percent doubles them. Reassigning the parks to large metropolitan areas and more rural areas has more of an impact through the mechanism of increasing and

Table 7: Recommendations for Industrial Park Development

Recommendations	Possible drawbacks
Conduct due diligence (market feasibility and industry targeting studies)	Costs of reports and delays in park development implementation
Increase non-state (e.g., local, federal) resources for park development (i.e., leverage)	Longer development timeline
Create park of suitable scale or phase development rather than all at once approach	Economies of scale in construction are limited
Collaborate with other localities on industrial park development (cost and revenue sharing)	Political disagreements on site location and difficulty drafting revenue sharing agreements add to delay
Site larger industrial parks in centralized urban locations with best workforce access	Site location may not be in area with greatest economic distress
Target appropriate firms (tradable goods and services firms, industrial location and expansion, agglomerative beneficiaries rather than locally relocating firms and nontradable goods and services providers)	Longer park absorption period

decreasing absorption rates over time. In contrast, increasing the employment density has only a marginal impact on economic and tax revenue impacts. This result occurs because the "but for" calculation varies directly with the relative size of the incentive. The firm incentive is based on land area occupied. So, when firm employment on a given site increases, the relative size of the fixed land value incentive decreases relative to firm production costs; therefore, the declining size of the incentive largely offsets the increased employment effect.

The combination scenario shows the effect of varying three megasite features in a direction favorable for park development at once. Changing the regional configuration of parks to large metropolitan regions and altering the types of firms sited in the parks results in state funds being more than recouped. This scenario (like many of the others) does not consider the possible tradeoff between greater firm selectivity and slower absorption rates. However, these results suggest that there is not anything inherent in state industrial park investment that produces low return in state tax revenues. Program design and firm targeting may affect performance outcomes.

Although results suggest that large site development programs are unlikely to provide optimal results in rural regions, they also suggest ways that industrial park planning and finance can be improved to increase state economic and tax revenue impacts. **Table 7** presents some of these options, each of which also has a potential downside. First, state tax return on revenue could be improved by increasing the non-state contribution to park development costs. This option would have the drawback of lengthening the time required to get parks up and ready. Second, a slower and incremental approach of developing sites in response to market demand could be adopted to avoid large up-front costs and long lead times to firm parcel development. This could be accomplished by bringing the sites to a greater level of readiness by assuming control of the land, performing due diligence, rezoning the property for industrial use, and obtaining all necessary environmental permits but leaving more

costly site and infrastructure improvements that can be completed in a reasonable amount of time until tenants have been identified. This choice could have one unfortunate side effect of limiting economies of scale in site construction and increasing overall development costs. Third, communities could better coordinate and collaborate on the location of centrally located industrial parks through regional industrial facilities authorities and avoid the costs of developing redundant parks with intersecting labor market sheds. However, the delicate process of selecting a mutually agreeable site and satisfactory revenue sharing agreement is often politically difficult, and consensus-based decision-making approaches may introduce additional delays. Fourth, absorption potential could be improved by locating industrial parks in more urbanized locations with larger nearby workforces within the rural Tobacco Region, contributing to more rapid job creation. This recommendation may result in some park siting that is more remote from pockets of high unemployment or economic distress. Lastly, sites could be better targeted to firms in export-base industries with the highest economic multipliers and projects that create new state jobs rather than relocated ones. However, there may also be some tradeoffs between more selectivity and park absorption speed.

Even if industrial park development falls short of expectations on economic and revenue tax impact, some level of public subsidy may still be justified by the potential to reduce social costs and increase social benefits. These gains may accrue to both residents and businesses. Reduced social costs may include better land use planning, reduced congestion, and fewer environmental externalities (e.g., air, water, solid waste, and noise pollution) that result from segregated industrial land tracts. Moreover, redevelopment of brownfield sites to increase local usable site inventory would remove environmental disamenities from the community. The provision of land characterization, certification and planning assistance may reduce information imperfections, decreasing firm search and setup costs that have grown because of uncertainty introduced by environmental regulation and delayed decision-making. Even unrelated businesses relocating from the local area into industrial parks may find some colocation benefits in terms of human resources (e.g., recruitment, training), procurement, and technology diffusion from being in closer proximity to business peers.

7. SUMMARY AND CONCLUSION

Industrial parks are a popular economic development tool, and states have begun to ramp up their involvement in providing site development assistance to communities. Evidence of its effectiveness in promoting economic development, however, has been fairly incomplete. This paper examines the literature on the rationale for public sector industrial land development and its link with firm attraction and expansion. Using information from a Virginia survey of local economic developers on industrial park occupancy characteristics, the paper provides ex-ante economic impact analyses of an industrial park development program in a lagging, rural region in Virginia, the Tobacco Region Megasite Program. The paper finds that under baseline conditions presented, economic impacts are fairly limited and unlikely to produce the "transformative" economic impact that program advocates originally envisioned. Moreover, the industrial park investments provide only a partial state tax revenue payback on program funds used and fairly high cost per job-year generated. The program performs slightly below

the average state economic development incentive program on these program performance metrics. Under several alternative scenarios, economic and revenue impacts are generally at least marginally improved. However, they only generate high economic and revenue impacts under scenarios that are less representative of how the program was designed, such as developing megasites in large metropolitan areas.

The results of this study suggest that state policymakers should consider two fundamental questions when allotting funds to similar site development programs with a rural focus. First, are there alternative economic development tools available to stimulate economic development that would provide better state economic and tax revenue impact? Previous research in this area suggests that there are. They include business loan assistance, customized business assistance, job training, and even some discretionary grant programs that target competitive firms. Second, if industrial park investment is pursued, is there a way to optimize the results of the investment? Results here suggest that there are, but sometimes tradeoffs may be required. However, an emphasis on appropriate industrial park scale, "soft cost" development assistance, regional cooperation, and greater orientation towards locating parks within closer proximity to large urban areas (but still within the commuting shed of the rural region) seem to be warranted under most circumstances.

There are several limitations to this analysis. First, the absorption rate analysis is based on a few explanatory variables and a limited sample size. The industrial park survey did not gather information on other relevant community and park characteristics such as sectoral targeting strategies, park pricing strategies, other regional industrial land availability, and locality zoning restrictiveness. These unobserved variables could be correlated with locality rurality or otherwise affect elements of park occupancy such as park absorption rates, industry composition, employment density, and state job creation. Second, even if complete survey data on industrial parks were available, a better economic model is needed that considers how industrial land supply varies geographically in response to market, regulatory, and other factors, including public provision. Industrially zoned business-ready sites are also provided by commercial/industrial real estate developers in response to perceptions of market demand. Land development costs likely vary based on competing land use demands, availability of developable land, restrictiveness of local industrial and commercial land use regulations, land features such as topography that affect development costs, and availability of surplus commercial and industrial properties from vacancies (including developable brownfields). Third, the analysis does not answer the question of how important businesses think the availability of business-ready industrial sites are in their site location decisions. Site location consultants suggest that they are critical factors. More impartial information solicited from firm surveys regarding the extent to which business-ready inventory hinders relocation and expansion relative to other firm location factors, including workforce quality and other types of infrastructure (i.e., highway, telecommunications) would help to better inform economic development practice. Lastly, this analysis is based on survey data that is historical in nature. It extrapolates industrial park development characteristics that have been realized over the last 30 years. Some site location analysts suggest that the demand for industrial space may accelerate as a result of new structural economic shifts caused by political tensions with China and the reshoring of manufacturing, the securement of industrial supply chains due to the disruption of the COVID-19 pandemic, the continued rise of

ecommerce, and a transition to clean energy that will stimulate demand for new products such as electric cars, batteries, and wind turbines. Thus, more attention to this issue is warranted as well.

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