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Mallard Fox Creek Industrial Park and Cummings Research Park: Investigating Employment and Income Impacts

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Abstract – A research park and an industrial park are each a hub of economic activity and their effect on the local economy can be measured in terms of jobs, income and output generated from its development. These sites provide an opportunity for the surrounding institutions and businesses to likewise develop post hoc. An economic impact study can shed light on the supply chain of the industries in the region, the kinds of jobs created, and the value of the industries in these parks to the region. The purpose of this paper is to investigate the economic impact of the Mallard Fox Creek Industrial Park in Decatur, Alabama, and Cummings Research Park in Huntsville, Alabama, and to understand the similarities and differences between the two. Interviews with key stakeholders, administrators, and participants within the parks were conducted in order to obtain qualitative and quantitative data on each park. Our findings suggest that the two parks are comparable in terms of job creation and income generation. Both parks observe significantly large job multipliers in steel/metals industries, and the research park observes significantly large income multipliers in research and development, management, and computer/engineering services at the state level. Disparities in the multipliers of each park increase when comparing local impacts to state impacts.

I. Introduction

Wassily Leontief, a Harvard economist, utilized data collected by the U.S. government to aggregate transactions of American individuals and firms on one “two-way table” (Leontief, 1936). His conceptual table could be modified by joining multiple accounts, i.e. rows or columns, to reflect transactions that occur between industries. This paper established the application of the theory that permits economic analyses such as the one exhibited in this paper.

Later, in 1967, Leontief elaborated upon his earlier findings by adjusting the model to reflect the intricacies of industrial interdependence. In doing so, Leontief was able to demonstrate the effects of one industry on another based upon the required inputs such as labor, capital, and raw materials. As an

illustration, Leontief stated that “...the production of the nonmetal inputs absorbed by metalworking industries often requires the use of various metal products in its turn...” (Leontief 1967). This observation may be illustrated with the modified model through the utilization of matrix operations. Leontief’s dedication to the model resulted in his Nobel Prize in Economic Sciences “for the development of the input-output method and for its application to important economic problems” (Nobel Media AB).

The idea of the input-output model is not universally accepted. Citing “unrealistic” assumptions about the output of firms within the model, some sought to loosen restrictions through modified definitions to create “a more realistic interpretation” of the model (Klein, 1952). Others, such as Carl F. Christ, noted that assumptions on singular inputs in industries had been abandoned and criticized Leontief’s claims that the model is “a general-equilibrium system” because the model lacked information on preferences or demand for output (Christ, 1955). Similar to the Kingman Airport Industrial Park study, the authors will investigate the respective impacts of Mallard-Fox Creek Industrial Park and Cummings Research Park on their economic regions.

Today, various entities, including state governments (EDRG, 2012), industrial trade organizations (Dunham & Associates, 2015), industrial parks (Coffman, 2005), and universities (Mahalingam & Thompson, 2015, 2016) conduct or otherwise commission economic impact studies based upon the foundations that Leontief provided.

The application of Leontief’s model is not limited to industrial parks. Other applications include investigating the environmental impact of energy production in the U.K. (Hawdon & Pearson, 1995) and general improvements, replacements, or upgrades to existing industries (Bess & Ambargis, n.d.). Each considers the direct, indirect, and induced effects of their respective subjects. The direct effects are employment and expenditures generated by the industry activity itself, while the indirect is the same

for supply chain or suppliers of inputs, and induced, for industries affected by the spending of those employed in the industry.

Economic impact studies are undertaken to understand the effect that a particular industry or industries may have on the chosen region, either a city, county, multiple counties, or even the state. The spending or employment that occurs in that industry has an effect on the spending and employment in the entire region in which it is located, as discussed before. Generally, the indirect and induced effects are combined and compared to the direct effect to derive a multiplier for the industrial activity. For instance, Arizona State University and Coffman Associates found that the Kingman Airport Industrial Park's impact created over two and a half jobs for every job in the industrial park and observed a significant portion of indirect output resulting from the manufacturing firms in the park (Coffman).

This research undertakes to study the economic impact of two parks, the Mallard Fox Creek Industrial Park and Cummings Research Park, in an effort to quantify the contribution of these parks to the local economy. Mallard Fox Creek Industrial Park (MFCIP) is located in Decatur, Alabama, on the banks of the Tennessee River. The MFCIP covers over 1,000 acres of land in the city of Decatur. A Tennessee Valley Authority (TVA) dock, railroad lines, and tractor trailers comprise the supply chain of the fifteen firms located there. Most firms are steelworking firms, but some chemical processing and rocketry is also based in the park (MCEDA).

Cummings Research Park (CRP) is located in the middle of Huntsville, Alabama, directly adjacent to the University of Alabama in Huntsville and the Redstone Arsenal Missile Defense Base. The result of collaboration between Milton Cummings and Werner von Braun, the CRP was founded shortly after 1962 as an effort to promote a high-tech university-industry partnership to support the young NASA program at the height of the space race. Since then, the park has grown, with research and development driving much of its expansion. CRP hosts over one hundred firms, several of which are Fortune 500/100 companies. Because of its surroundings, the CRP hosts several engineering-related firms as well as auxiliary services for the firms. To this day, the CRP attracts several contractors partnered with the Arsenal and NASA, both of which have maintained their presence in Huntsville (Chamber of Commerce).

Both parks have had significant impact on the regions that they are located in with regards to

economic development. While both the industrial and research park have developed supply chain industries to support them, both parks have also developed wholesale trade, retail sales, and other industries where the parks' employees spend their incomes. Even so, it is possible to see some differences in the types of industries developed by each of these parks. While the MFCIP has manufacturing and steel firms, the CRP has communication, electronic, computer, and engineering services as the primary industries.

The rest of the paper is organized as follows: Section 2 describes the methodology that describes the data collection and processes that were used in the study to derive the results. Section 3 presents and discusses the results, and Section 4 presents the conclusion where the overall results are discussed.

II. Methodology

In order to use the Leontief input-output model effectively, a list of firms currently operating in the MFCIP and CRP was gathered after interviews with the Chamber of Commerce of Huntsville, Madison County, and respective directors of both the organizations. The industrial directory for the industrial park was used to determine the relevant employment data and industrial codes along with interviews and surveys of relevant stakeholders. The directory for the Cummings Research Park was available on the park's website (Chamber of Commerce). Interviews with the director of Cummings Research Park, and the Chamber of Commerce of the city of Huntsville provided data for a number of firms as well. There were a few other firms listed but many attempts and searches for data did not yield any response. Most firms are included in this study; however, the firms with no data were excluded. The study was conducted for the year 2015.

One of the challenges in measuring the economic impact of a research or industrial park is accounting for leakages, individuals who work in one geographic area but live and spend their earnings in a geographic region outside of the focus of the study. To account for this, commute patterns for the employees were also studied to determine the region where employees of these parks originated. The commute patterns were obtained from the Census Bureau. Most employees of the industrial park were from the Decatur metropolitan statistical areas (MSA), and for the research park, employees were from the Huntsville MSA. This further confirmed the choice of MSAs for the study. However, the surrounding areas are equally important in providing employees for the respective

parks. To account for this, the regions chosen for the economic impact study were the MSAs as defined by the Bureau of Labor Statistics (BLS). The BLS defines the Decatur MSA as the counties of Morgan and Lawrence, and the Huntsville MSA as the counties of Madison and Limestone. To get a more complete picture of the leakages, the economic impact for the two parks for state of Alabama was also undertaken.

IMPLAN, software that is used to study economic impacts, was used in this study. This software also produces the top ten industries affected in terms of employment and output. Though IMPLAN produces the tax effects, a separate method was used to calculate the taxes generated by both parks. After consulting with an accountant, the IMPLAN tax impact results were categorized according to the type of tax and the recipient of the tax. Sales and property taxes were each divided based upon the relative proportion that the county and state respectively share.

III. Results

The results of the economic impacts are presented in two major parts. First, the economic impacts of the two parks at the MSA level are presented, followed by the impacts at the state level. As mentioned earlier, the indirect and induced effects are presented as the multiplier effect. The income column represents the total labor income including compensations. The value added column is the regional equivalent of the national GDP. The output column presents the total output generated including the intermediate purchases.

MSA Level Results

The total number of firms at MFCIP is estimated to be 15 and at CRP, 204. Each firm was placed under a major category according to the output produced by that firm. For instance, the United Launch Alliance, which produces rocket components, was categorized under Propulsion units and parts for space vehicles in MFCIP. There were five (5) categories for MFCIP and twelve (12) categories for CRP.

The MFCIP results are presented first at the MSA level. This includes Morgan County and Lawrence County. Table 1 presents the employment, income, value added and output effects for MFCIP.

The direct impact for employment for MFCIP is 1,560 workers, and the total impact for MFCIP for employment is 2,752 workers. The direct impact for output is \$747 million for MFCIP and the total impact for output for MFCIP is \$907 million. The total tax impact for MFCIP at the MSA level is over \$29 million.

Figures 1a and 1b show the breakdown of the firms at MFCIP. The top five industries are presented along with the output and employment in those five industries that are affected by MFCIP. Steel and propulsion units are the main contributors to MFCIP's impact followed by chemicals and plastics and graphite manufacturing. Figure 1c is a graph that shows employment and output for the top six industries. For instance, propulsion units produces over \$240 million in output and employs about 850 workers. On the other hand, rolled steel manufacturing produces over \$167 million in output but employs only about 165 workers.

Figure 1c illustrates that the ratio of output per employee differs between industries, e.g. rolled steel manufacturing produces more output per employee than the propulsion units industry. Since the propulsion units industry involves significant research and development, output per employee is markedly lower than the other industry ratios in the MFCIP.

The industries in the MFCIP are primarily concerned with manufacturing, so in general, the output per employee ratio helps illustrate how manufacturing industries result in employment that produces taxable goods. Table 2 presents the economic impact of CRP. It shows that the direct employment at CRP is 18,744, and total employment effect for CRP is 34,047. The direct impact of output at CRP is about \$3.8 billion, and total impact of output is a little over \$5.7 billion. The total taxes impact for CRP is about \$117 million.

Table 1 Economic Impacts of MFCIP (MSA)			
Impact Type	Direct Effect	Multiplier Effect	Total Effect
Employment	1,560	1,192	2,752
Labor Income (millions)	\$150	\$45	\$195
Value Added (millions)	\$245	\$82	\$327
Output (millions)	\$747	\$160	\$907
Sales and Other taxes and fees			\$18,087,238
Property taxes			\$8,941,159
State Income			\$2,186,414
Total			\$29,214,811

Figure 1a: Employment by category for MFCIP (MSA level)

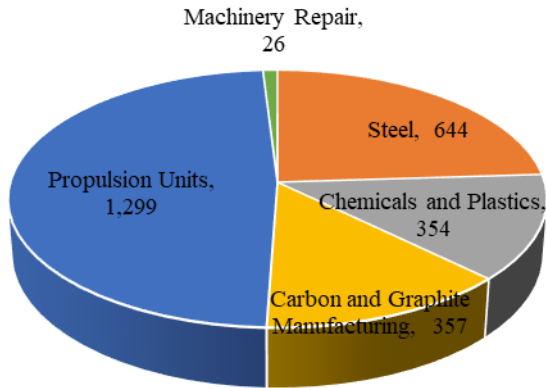


Figure 1b: Output by category for MFCIP (MSA level) (millions)

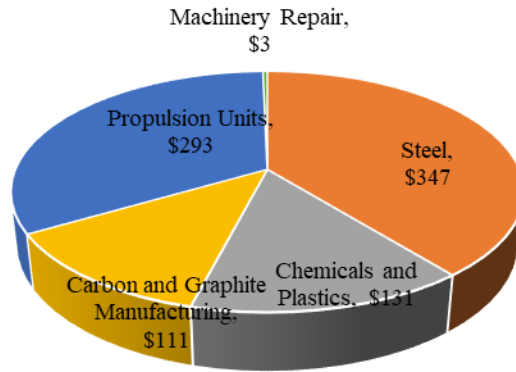


Figure 1c: MFCIP Top 6 Industries by Employment (MSA)

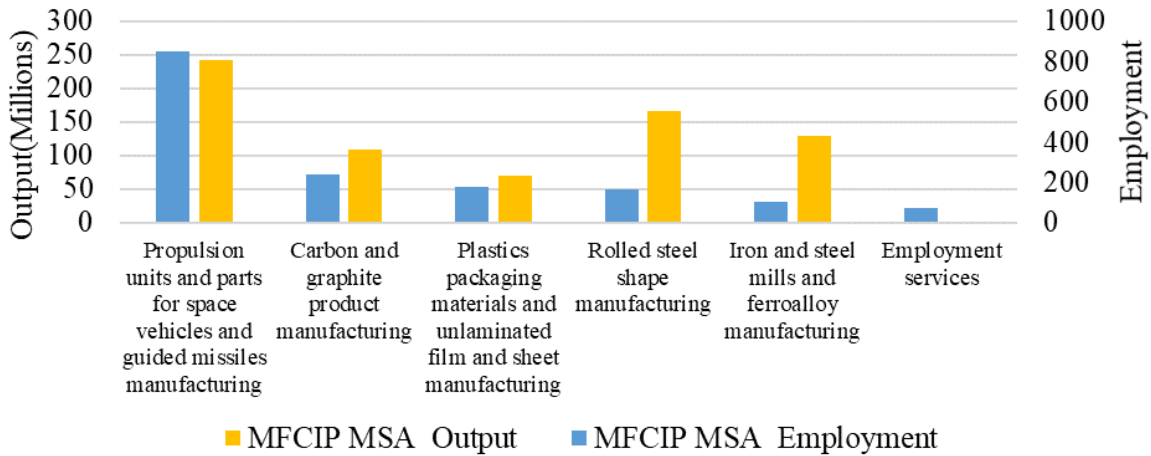


Table 2 Economic Impacts of CRP (MSA)			
Impact Type	Direct Effect	Multiplier Effect	Total Effect
Employment	18,744	15,304	34,047
Labor Income (millions)	\$1,536	\$660	\$2,197
Value Added (millions)	\$1,890	\$1,126	\$3,016
Output (millions)	\$3,793	\$1,946	\$5,739
Sales and Other taxes and fees			\$71,255,067
Property taxes			\$36,089,563
State Income Taxes			\$9,900,238
Total			\$117,244,868

Figure 2a: Employment by category for CRP (MSA level)

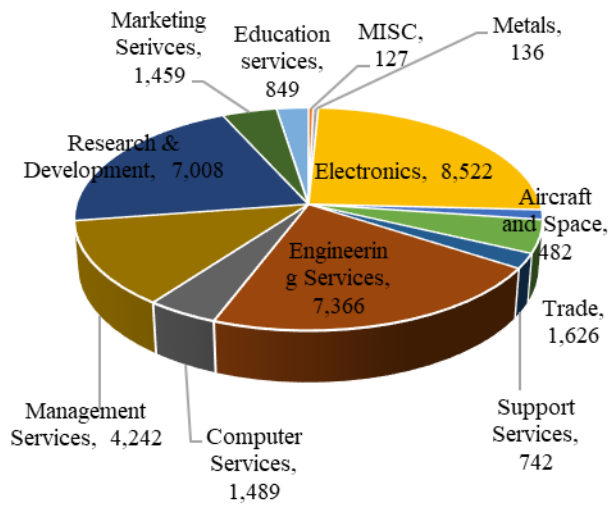


Figure 2b: Output by category for CRP (MSA level) (millions)

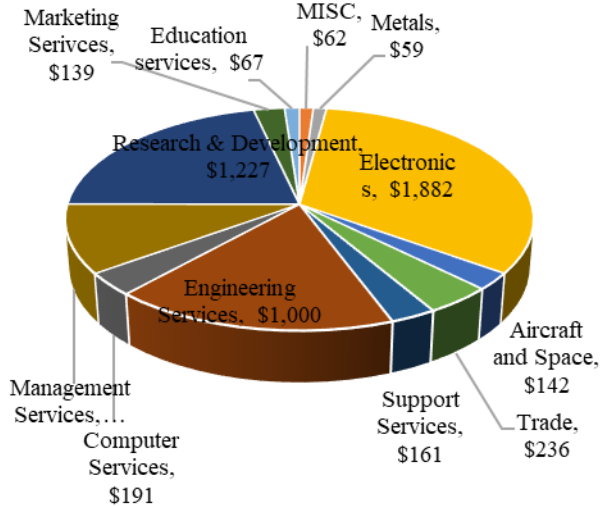


Figure 2c: CRP Top 6 Industries by Employment (MSA)

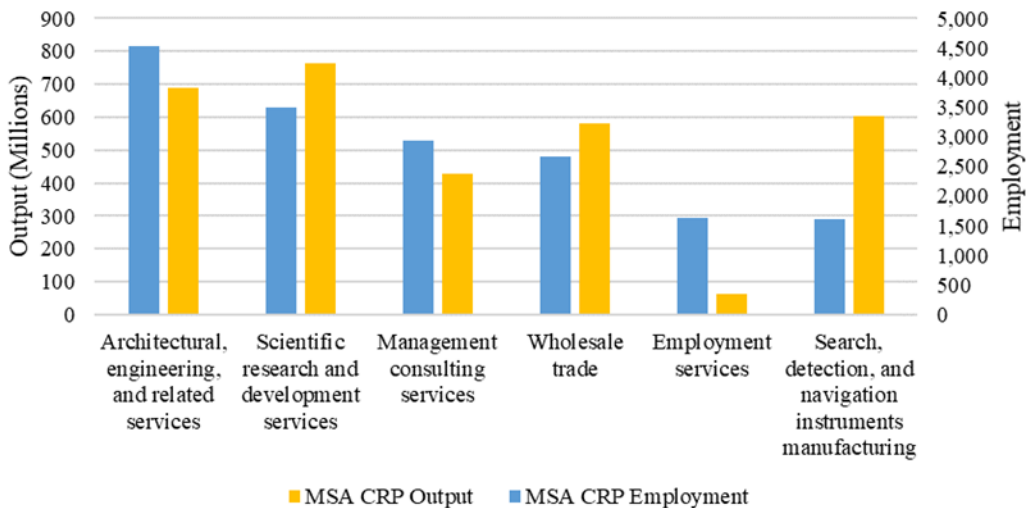


Table 3 Economic Impacts MFCIP (State) (in millions)			
Impact Type	Direct Effect	Multiplier Effect	Total Effect
Employment	2,295	4,780	7,075
Labor Income (Millions)	\$231	\$239	\$470
Value Added (Millions)	\$477	\$441	\$918
Output (Millions)	\$1670	\$876	\$2,546
Sales and Other taxes and fees			
			\$20,432,690
Property taxes			
			\$1,761,138
State Income			
			\$7,132,948
Total			\$29,326,776

Figure 3a: Employment by category for MFCIP (State level)

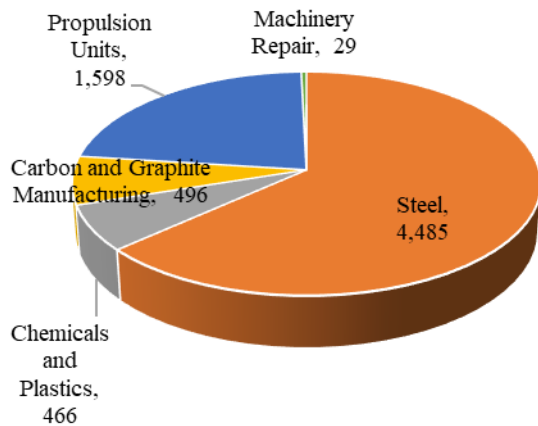


Figure 3b: Output by category for MFCIP (State level) (Millions)

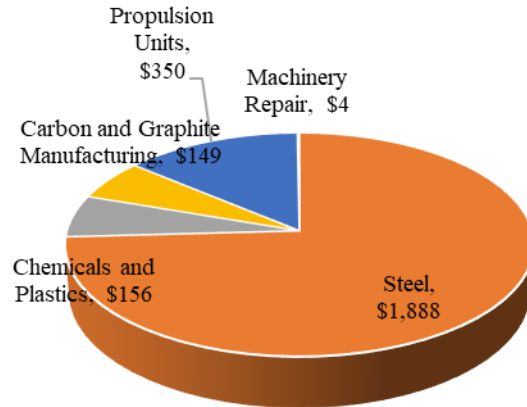


Figure 3c: MFCIP Top 6 Industries by Employment (State)

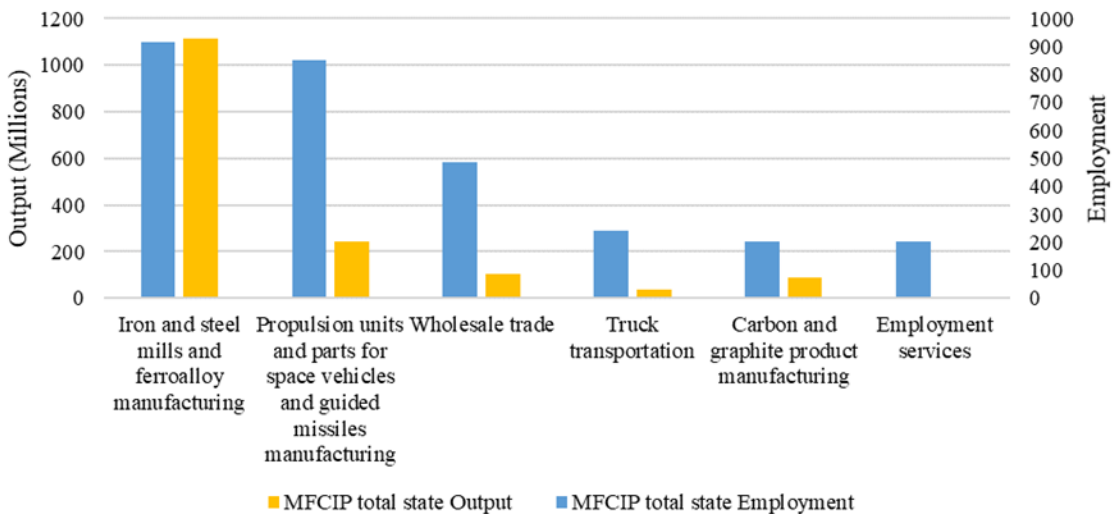


Table 4 Economic Impacts of CRP (State)			
Impact Type	Direct Effect	Multiplier Effect	Total Effect
Employment	\$18,746	\$19,442	\$38,188
Labor Income (millions)	\$1,302	\$817	\$2,118
Value Added (millions)	\$1,655	\$1,386	\$3,041
Output (millions)	\$3,559	\$2,474	\$6,032
Sales and Other taxes and fees			
			\$70,781,704
Property taxes			
			\$4,554,995
State Income			
			\$32,298,505
Total			\$107,635,204

Figure 4a: Employment by category for CRP (State level)

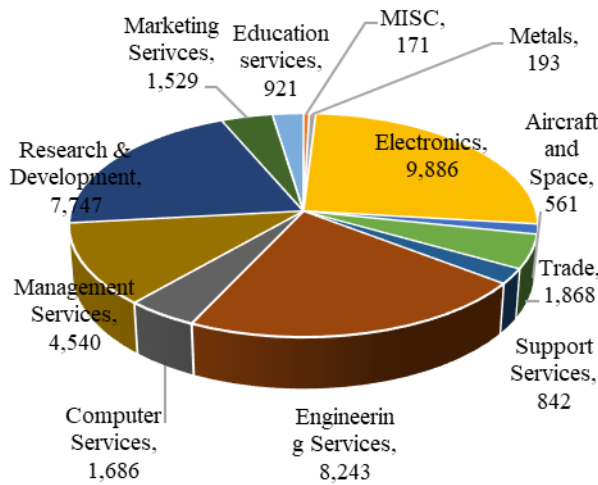


Figure 4b: Output by category for CRP (State level) (Millions)

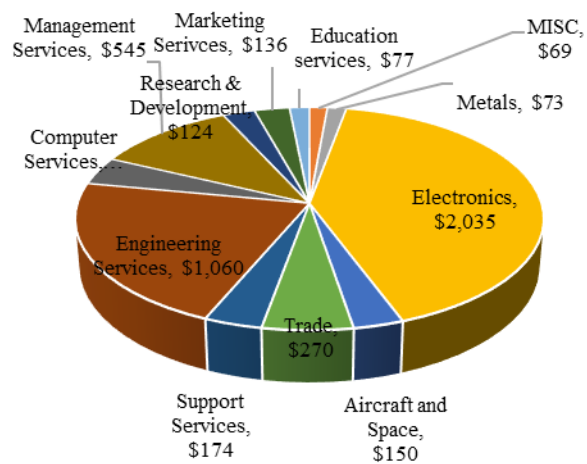
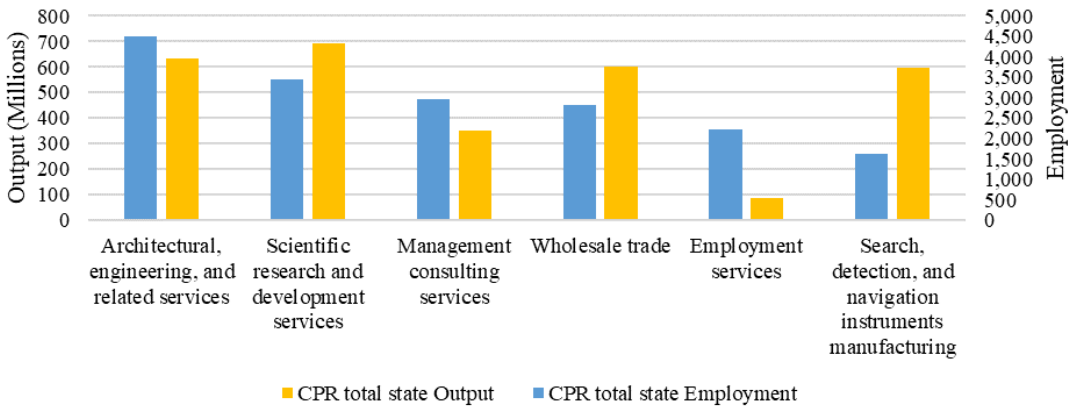


Figure 4c: CRP Top 6 Industries by Employment (State)



The top industries in CRP are service-oriented industries. Figures 2a and Figure 2b show the top five industries in terms of employment and output at CRP. Electronics, engineering services, and research & development are the top three contributors for the CRP. Figure 2c is a graph that depicts output and employment in the top 6 industries. For instance, Architectural and Engineering Services employs about 4,500 workers and produces over \$680 million in output, and Research & Development employs about 3,500 and produces over \$765 million.

For the industrial park, steel firms comprised the majority of output. However, the aggregate output of the steel firms is comparable to that of the United Launch Alliance (ULA), a rocketry joint-venture between Boeing and Lockheed Martin. The ULA, in fact, is responsible for almost half of the MFCIP's employment impact. Unsurprisingly, the research park contains many research and development firms, as well as many electronics and engineering firms. These firms comprise the majority of employment and output effects for the research park. The CRP provides an example of the indirect impact of industries; management services, computer services, trade, and marketing services all observe significant portions of the CRP's employment and output. Interestingly, however, both parks contain steel/metal industry firms, and in both cases, the highest employment multipliers by sector were observed in this category.

State Level Results

Table 3 presents the economic impact of the MFCIP at the state level.

The direct impact for employment for MFCIP is 2,295 workers, and the total impact for MFCIP for employment is 7,075. The direct impact for output is \$1.67 billion, and the total impact for output is \$2.55 billion. Figures 3a and Figure 3b show the top five industries in terms of employment and output at the MFCIP. Steel industries have a significant impact at the state level, with iron and steel mills alone having direct impact of over \$1.1 billion and employing over 900 workers. Furthermore, steel industries in MFCIP observe a significantly higher output per employee than any other industry at the state level.

Table 4 presents the economic impact of CRP. It shows that the direct employment at CRP is 18,746, and total employment effect for CRP is 38,188. The direct impact of output at CRP is about \$3.6 billion, and total impact of output is a little over \$6 billion. Figures 4a and Figure 4b show the top five industries in terms of employment and output at CRP. Not much changes from the MSA level to state level with respect to shares of impacts, as electronics, engineering services, and research & development once again share a majority of employment and output. Figure 4c is a graph that depicts employment and output in the top 6 industries. Notably, output for employees is higher in research & development, wholesale trade, and navigation instruments manufacturing, but lower in engineering services, management services, and employment services. For instance, the navigation instruments industry generates almost \$600 million in output with just over 1,600 employees, while employment services generates about \$86 million with over 2,200 employees.

While the top industries do not change significantly when the state level is considered, their relative portions of total employment and output do. In the MFCIP, for instance, the total effect of the steel firms on the entire state commands the majority of both employment and output. The CRP, meanwhile, observes electronics making larger gains in output from the MSA to state level relative to the other industries and similar relative levels of output in each industry.

Compared to the preceding MSA results, one may observe that the employment multipliers' relative magnitudes change significantly. Indeed, the industrial park observes an employment multiplier greater than two (2) at the state level, while CRP is just greater than one (1). Moreover, the direct effect of the MFCIP on employment changes by several hundred workers from the MSA level to the state level, which suggests that a significant portion of the workforce of those employed at the industrial park do not necessarily live in its MSA, while a similar effect is observed in the research park for indirect effects, suggesting that CRP employees generate significant demand for goods and services available outside of the Huntsville MSA.

Tax Analysis Results

Table 5 Tax Impact per Firm		
	MFCIP	CRP
Sales and Other taxes and fees	\$1,459,478	\$346,969
Property taxes	\$125,796	\$22,328
State Income	\$509,496	\$158,326
Total	\$2,094,770	\$527,624

IMPLAN provides tax estimates for taxation. These estimates have been reorganized to aid clarity.

Sales and property taxes were each separated based upon the relative proportion that the county and state respectively share. Finally, the taxes were adjusted based upon the number of firms in the parks. Rounded totals from these modifications are included below in Table 5. Per firm, the MFCIP generated almost \$150 thousand in overall taxes, while the CRP generates about \$2,600. In each category, and overall, the taxes generated per firm in the industrial park exceed those generated per firm in the research park.

This is consistent with the idea that manufacturing and retail industries generate more tangible goods, while service industries do not produce goods that are taxed. However, as seen above, some industries generate more employment, and some industries generate more output. Some industries generate more taxes than others. The recommendation for local governments from this study is to diversify the industries in parks and to offer a variety of employment and output to maximize benefits for its citizens.

IV. Conclusion

The top industries that are most affected by the industrial park are manufacturing based, while the top industries affected by the research park are all service based industries. Furthermore, while the three industries in the industrial park make up most of the employment, research park employment is widespread across a number of industries.

City and county governments need to understand the effect of different industries and the kinds of development that occur with these industries. This study seeks to give an overview of how the presence of these two parks has affected their respective communities and the state of Alabama overall. The different types of parks bolster different industries so for a balanced development of the region, both industrial and research parks are needed. Both provide various types of employment opportunities for their surrounding populations. Additionally, local governments can develop educational and vocational institutions needed to sustain their region’s industrial and research parks. Indeed, Erin Koshut, the director of the CRP, has indicated that the research park intends to diversify and develop by attracting new industries and firms

Furthermore, some intriguing comparisons between the MFCIP and CRP can be made. First, the MFCIP appears to be a significantly greater generator of consequential employment relative to its size in its region and the state, while the CRP appears to be a greater generator of output. This distinction, however, manifested itself in statewide results more so than countywide ones. Meanwhile, both parks host steel manufacturing industries that induce large employment multipliers despite the otherwise distinct distributions of industry types. Therefore, there may be more to learn about the differences in economic impact between industrial parks and research parks located in neighboring regions of a common state.

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