



THE ECONOMIC IMPACT OF THE PROPOSED 26-COURT TENNIS CENTER ON THE CARROLLTON REGIONAL AREA

An Economic Impact Study by
the University of West Georgia



*Center for Business and
Economic Research*

**The City of Carrollton
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Executive Summary

This economic impact analysis examines the economic and fiscal impact of the construction and operational phase of the proposed 26-court tennis center in Carrollton Georgia, behind the Food Depot and CVS Pharmacy on Maple Street. The proposed tennis center would consist of 12 outside courts without seating, 12 outside courts with bleacher seating, and two championship courts with stadium-styled seating, all lit for night play. Impact estimates are developed for both the construction and operational phase of the courts. The total impact of the building phase is expected to be **\$6.95 million**, which includes the initial expenditure on site construction, \$5 million, along with another approximately **\$1.95 million** in indirect and induced impacts for the county. The construction phase is expected to generate total labor income of \$1.87 million, and employ about 61 workers during the construction. Furthermore, the construction phase is expected to generate about \$34 thousand in local sales tax revenues for Carroll County.

The impact of the operational phase depends on the size of and the number of events attracted to the site. Based on information provided by nearby facilities, multiple scenarios were developed. For ten tournaments per year with an average of 150 out-of-town guests (players and spectators) attending, the estimated impact would be **\$836,000 per year**. If the facility attracted 20 tournaments, the impact is estimated to be **\$1.6 million per year**. At this level of operation, the facility would support between 13 and 16 jobs and produce between \$250,000 and \$500,000 in labor income annually. One potential concern is the large number of directly comparable facilities located relatively close to Carrollton (within 150 miles). Many of these facilities would directly compete with the proposed facility for the larger state, regional, and USTA tournaments.

Section 1: Introduction

This economic impact analysis examines the economic and fiscal impact of the construction and operational phase of the proposed 26-court tennis center in Carrollton Georgia. The impacts will be estimated for Carroll County, in which Carrollton is the county seat. This analysis includes the direct impacts of persons who attend the facilities as part of a tournament. Also estimated are the indirect effects that the new tennis center has on other industries that support sports travelers and/or spectators, along with the induced impact from the spending of income by employees of workers in supporting industries (e.g., hotel, restaurant, and retail).

The City of Carrollton and Crawford & Associates have provided engineering estimates for the construction phase. The Center for Business and Economic Research has developed a variety of scenarios based on likely expenditures and visits associated with the new tennis center. In developing these scenarios, the authors of this report have gathered information from other sources (comparable tennis facilities in the Southeastern U.S.) to provide background to the project and provide added insight into the local spending patterns of likely visitors.

The University of West Georgia Center for Business and Economic Research (CBER) conducted this research and used a nationally recognized and industry-standard model, along with generally accepted practices to estimate these impacts. The CBER is a division of the Richards College of Business at the University of West Georgia. The CBER produced this report as service to the City of Carrollton.

The remainder of this report is divided into 7 sections:

- **Section 2 provides background information on the new City of Carrollton Tennis Center.**
- **Section 3 describes trends in the development of tennis centers.**
- **Section 4 examines the economic impacts of the construction phase.**
- **Section 5 examines the economic impacts of the operational phase.**
- **Section 6 presents comments regarding comparable facilities.**
- **Section 7 provides details about the methods used to produce the impact estimates provided in this report.**

- **Section 2: The Carrollton Tennis Center**

The City of Carrollton has proposed the development of a 26-court, hard-surface tennis center on the western edge of the city. The center would be located between the CVS Pharmacy on Maple Street and the Heritage Hills subdivision. Access to the facility would be through the east entrance of the Maple Street Commons shopping center. The proposed tennis center would consist of 12 outside courts without seating, 12 outside courts with bleacher seating, and two championship courts with stadium-styled seating. All 26 courts will be lit for night play. The site will also include a 7,500 square foot club house building with restrooms, dressing rooms, and an office area. The proposed tennis center could be used to host clinics, tournaments, lessons, and leagues for youth and adults. **The total cost of this facility, complete with site upgrades, clubhouse building, courts, netting, lighting and fencing is estimated at approximately \$5.012 million.**

Once completed, the management of the facility would be turned over to the University of West Georgia. This would allow the City of Carrollton to use employees and student workers from the university to operate and maintain the facilities at a lower cost, and allow the university access to the center for conference play.

Figure 2.1: Proposed Location of the Carrollton Tennis Center



Section 3: Comparable Tennis Centers

The West Georgia region has seen an uptick in the number of tennis facilities that have been either proposed or built within 100 miles of the proposed site. 2007 saw the opening of the Yarbrough Tennis Center, a 34-court indoor/outdoor court at Auburn University, while 2009 saw the proposal of the Tennis Center of Georgia, a \$13.6 to \$18 million, 74-court outdoor facility located on the campus of Berry College. Both facilities offer substantial capacity to host tournaments, although ground has not been broken on the Tennis Center of Georgia as of this report.

Table 3.1 lists the different facilities located within 150 miles of the proposed facility. Notable facilities include Peachtree City Tennis Center, a 24-court hard-court facility with indoor courts located in Peachtree City, Cooper Creek Tennis Center, a 30 court clay court facility in Columbus, and John Drew Smith Tennis Center, a 24-court hard-court facility in Macon. Furthermore, there are a large number of hard-court facilities in Atlanta, including Sandy Springs Tennis Center, a 24 court facility, South Fulton Tennis Center, a 24-court facility in College Park (clay and hard), and the historic Bitsy Grant Tennis Center, a 23 court facility (clay and hard).

Table 3.2 lists facilities associated with the Gulf South Conference, where the University of West Georgia competes. Of note are both the facilities in Memphis, where Christian Brothers University is located, and the Huntsville Tennis Center, a 30-court facility where the University of Alabama-Huntsville is located. However, a majority of universities in the conference do not have substantial tennis facilities, and it is reasonable to think that the proposed facility could potentially host Gulf South Conference facilities.

We researched four comparable facilities as bases for comparison: Bitsy-Grant Tennis Center, Sandy Springs Tennis Center, Cooper Creek Tennis Center (through the Columbus Regional Tennis Association), and the John Drew Smith Tennis Center. All three facilities shared important similarities with the proposed facility in Carrollton. First, all three facilities are outdoor facilities. Second, the facilities have nearly an identical number of courts (24 for both Sandy Springs and John Drew Smith, 30 for Cooper Creek). Finally, all four facilities could be characterized as primarily local facilities.

Sandy Springs Tennis Center (Sandy Springs, GA)

The Sandy Springs Tennis Center is a public facility that consists of 24 lighted hard courts and is located in Sandy Springs, Georgia. Among the facility's amenities include a clubhouse, pro shop, and locker rooms. This facility is primarily used for local events and league tournaments. In the 2011 calendar year, Sandy Springs held roughly 20 tournaments, of which 8-12 consisted of ALTA (Atlanta Lawn Tennis Association), T2 (an Atlanta neighborhood tennis organization) and USTA tournaments which drew between 150-200 participants and very few guests, and 6-10 junior tournaments, which consisted of 150-300 juniors, with primarily families and friends as guests.

CORTA (Columbus Regional Tennis Association) and Cooper Creek Tennis Center, (Columbus, GA)

The Columbus, GA Regional Tennis Association is a non-profit organization located in Columbus, Georgia. It is based out of the Cooper Creek Tennis Center, the largest clay court public facility in the United States, with 30 courts. CORTA holds 10-12 events per year, a majority of which are held at Cooper Creek. In 2011, CORTA held two large tournaments with 800+ players, including a USTA Sectional tournament in November and the Georgia State Junior Clay Court Championships. Additionally, CORTA held five 150-350 player tournaments, 2 75 player tournaments, and one smaller tournament. Overall, the facility and organization held two large tournaments with considerable economic impact, as well as a number of smaller tournaments with fewer spectators.

John Drew Smith Tennis Center (Macon, GA)

The John Drew Smith Tennis Center is a 24-court hard-court facility that is located in Macon, GA. It hosts between 15-25 tournaments per year; smaller tournaments are held at the John Drew Smith center only, while larger events are held in conjunction with the other tennis facilities in Macon. During 2011, the facility held one national tournament, with 320 juniors, and a large state/sectional event with 1,000-1,200 players of different levels. Average attendance per smaller tournament was estimated to be between 100-400 individuals. Per information from the facility, the highest estimated economic impact from the Macon Convention and Visitor's Bureau for the facility was between \$3-3.2 million per year.

Bitsy-Grant Tennis Center (Atlanta, GA)

The Bitsy-Grant Tennis Center is a 23-court multiple surface facility (13 clay, 10 hard) and is the largest public tennis center in the city of Atlanta. Because Bitsy-Grant is a multi-surface facility, its ability to hold tournaments is somewhat limited since most tournaments require consistent playing conditions. Nonetheless, Bitsy-Grant hosts between 8-12 tournaments per year, a majority of which are USTA tournaments—both junior and senior levels. These tournaments have between 100-300 participants, a majority of which are local. Bitsy-Grant's largest events have been special events—such as the American Tennis Association tournament in 2010 or an event held by Cadillac in 2011, which are infrequent and are held at different sites each year.

It is difficult to predict the exact the exact number of tournaments that the proposed facility would host. However, evidence from comparable facilities suggests that the number of tournaments that a facility could expect to host is around 10-20. A majority of those tournaments would be expected to be smaller junior events; however, there is the possibility of hosting a large national or state tournament, such as those held in Columbus and Macon.

Table 3.1: Tennis Facilities within 150 miles (3 hours driving distance)

City	State	Facility Name	Courts	Surface	Minutes From Carrollton	Miles from Carrollton
Peachtree City	GA	Peachtree City Tennis Center	24	12 hard, 6 clay, 6 indoor hard	55	34.7
Rome	GA	Tennis Center of Georgia	82	57 hard, 25 smaller	proposed, not yet built	proposed, not yet built
Rome	GA	Rome-Floyd Tennis Center*	16	16 hard	68	55.5
Macon	GA	John Drew Smith Tennis Center	25	hard	135	115
Atlanta	GA	Bitsy Grant Tennis Center	23	hard and clay	63	55.1
Columbus	GA	Cooper Creek Tennis Center	30	clay	104	83.8
Atlanta	GA	Sandy Springs Tennis Center	24	(20 hard, 4 clay)	74	62.2
Atlanta	GA	Blackburn Tennis Center	18	hard	72	62.2
Birmingham	AL	Brook-Highland Racquet Club	22	13 clay, 8 cushion, 1 practice	117	104
Auburn	AL	Yarbrough Tennis Center	34	6 indoor, 12 hard, 16 clay	107	91.7
Huntsville	AL	Huntsville Tennis Center	30	24 clay, 6 hard	178	157
Athens	GA	Dan Magill Tennis Complex	16	12 outdoor, 4 indoor	144	121
Montgomery	AL	O'Connor Tennis Center	12	laykold	146	137
Atlanta	GA	South Fulton Tennis Center	24	20 hard, 4 clay	56	38.4

Table 3.2: Tennis Facilities in Gulf South Conference

City	State	Facility Name	Courts	Surface	College
Huntsville	AL	Huntsville Tennis Center	30	clay and hard (24 clay, 6 hard)	University of Alabama-Huntsville
Memphis	TN	Bellevue Tennis Center	6	hard (4 outdoor, 2 indoor)	Christian Brothers University
Memphis	TN	Eldon Roark	12	hard (8 outdoor, 4 indoor)	Christian Brothers University
Memphis	TN	Leftwich Tennis Center	12	hard (8 outdoor, 4 indoor)	Christian Brothers University
Memphis	TN	Wolbrecht Tennis Center	8	hard (6 outdoor, 2 indoor)	Christian Brothers University
Memphis	TN	Racquet Club of Memphis	27	hard (11 indoor, 16 outdoor)	Christian Brothers University
Memphis	TN	TPC at Southwind	6	hard	Christian Brothers University
Cleveland	MS	Cleveland Country Club	7	hard	Delta State University
Florence	AL	The Court House Racquet Club	5	clay and hard (4 clay, 1 hard)	University of North Alabama
Valdosta	GA	Harry B. Anderson Tennis Center	12	hard	Valdosta State University
Pensacola	FL	Roger Scott Tennis Center	28	clay and hard (10 clay, 18 hard)	University of West Florida

no large facilities associated with University of West Georgia, University of West Alabama (Livingston, AL), and Union University (Jackson, TN)

Section 4: Economic and Fiscal Impacts - Construction Phase

Construction of the proposed tennis facility is expected to take place over a two-year period. Although the economic impact will be spread over multiple years, we examine the total impacts for the entire construction phase (all years taken together) in 2010 dollars. Each year's impact (output and employment) runs its full course within the year. A job created in the process of construction in 2011 does not carry over into 2012 or subsequent years; however, this does not negate the importance of the activity's impact on the economy. In other words, the construction jobs, though temporary, do have a significant impact on jobs, income, and output.

Economic and fiscal impacts from the proposed facility are estimated and reported in Table 4.1. The direct estimate of the facility cost from Crawford and Associates is \$5,012,400.09, which includes the initial expenditures on the construction phase. From those expenditures, we estimate that another \$1.1 million of indirect spending in the construction supply chain will occur. Furthermore, we estimate an additional \$800,000 in spending from labor income in the state, resulting in a construction multiplier of 1.39, indicating that each dollar spent on construction will produce \$1.39 of output for the local economy.

Table 4.1: Economic and Fiscal Impacts: Construction Phase

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect ^(a)	40.2	\$1,203,576	\$1,275,062	\$5,012,400
Indirect Effect	12.8	\$407,274	\$658,942	\$1,112,713
Induced Effect	7.5	\$254,905	\$495,619	\$823,623
Total Effect	60.5	\$1,865,755	\$2,429,623	\$6,948,736

a: Direct Effect includes the initial expenditure on Construction Phase
Multiplier for Construction: 1.39

For ease of exposition, we also graph the employment and output impacts in Figures 4.1 and 4.2. Figure 4.1 presents the employment estimates, while Figure 4.2 presents the output estimates. We estimate a total of 61 new jobs created during the construction of the facility; 40 of which are created directly, while 20 are induced or created indirectly.

**Figure 4.1:
Employment (new jobs created)**

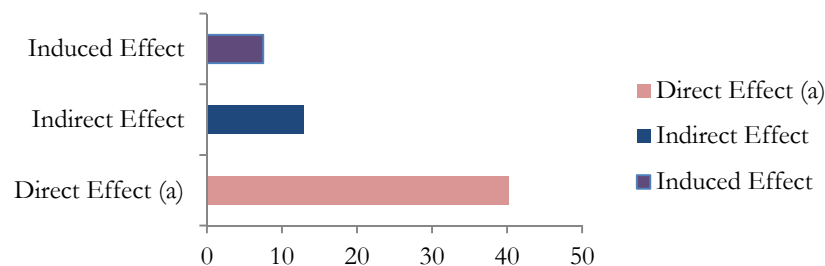


Figure 4.2: Output Generated During Construction
(totals in millions)

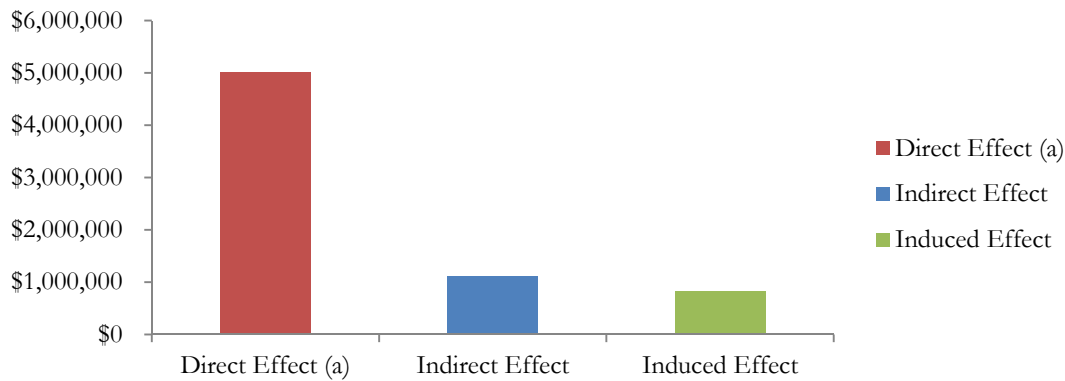


Table 4.2 depicts selected tax revenue impacts for the construction phase of the tennis center. The construction phase requires the purchase of building materials, which are not sales tax exempt. Tax revenues are also generated from the subsequent spending and re-spending of dollars paid to local suppliers and workers. For Carroll County, sales tax revenues are likely to increase by almost \$34,000 during the construction phase.

Table 4.2: The Fiscal Impact of the Construction Phase for Carroll County

	State (4%)	Local (3%)	Total
Sales Tax	\$44,901.71	\$33,676.29	\$78,578
Property Taxes will be reduced because the courts will be publically owned.			

Section 5: Economic and Fiscal Impacts - Operational Phase

Unlike the construction phase, the operational phase impact extends over the usable lifespan of the tennis center facilities. This consists of the new expenditures from visiting players and spectators to tournaments at the facility. Additionally, it consists of the expenditures necessary to maintain the facility. The CBER has surveyed a variety of comparable facilities in the Southeast to develop scenarios of likely average tournament configurations. Based these surveys, the Carrollton Tennis Center is likely to attract between 10 and 20 tournaments per year, ranging in size from 200 to 400 players and spectators. Of these, we estimate that roughly half of those involved will be outside of Carrollton and Carroll County.

Spending for the players and guests for a tournament is based on the average number of players and guests for a tournament. Our estimate for the number of tournaments that the proposed facility could expect is based on the number of tournaments that comparable facilities held in 2011. We estimate that the proposed facility might reasonably be expected to hold between 10-20 tournaments in a given year, with average size of between 150 - 300 players. These estimates are derived from the average number of tournaments and players per tournament as reported by the comparable facilities described in section 3; they differ from the USTA Economic Impact Survey (2006), which reported 620 players and 607 guests

per Southern USTA tournament.¹ Our estimates differ because only a small minority of tournaments held in comparable facilities were sizable USTA tournaments. Most tournaments held were local, regional, or state tournaments with a smaller number of participants and a smaller number of guests (as an example, most T2, ALTA, and USTA tournaments have a negligible number of guests.)

Spending per party is based on estimates from multiple sources. The Georgia Economic Model of Developmental Events suggests that 20% of attendees at a tournament are from outside the local area, and its default per-party spending for a sporting event per day is \$122 per person per day.² USTA estimates of per-person spending for USTA tournaments are higher (\$500 per 3.5 day tournament, or roughly \$152.86 per day)³. Because of Carrollton's relatively rural location, we estimate that a larger portion of guests would be outside of Carroll County and surrounding areas, and that the percent of attendees at a state or regional tournament that reside outside the local area could be as high as fifty percent. However, we also estimate lower shopping and transportation expenditures per person. For our economic impact estimates in Table 5.1, we use \$139 per person per day as our baseline for spending. This is based on assumption of \$79 per guest for lodging (based on the potential for double occupancy of a room), \$35 per guest for food, and \$25 for retail expenditures. Our estimates are between the USTA and Georgia estimates for personal spending.

Table 5.1: Annual Economic Impact for Proposed Facility, 150 guests

Ten Tournaments, 150 out-of-town guests				
Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	10.95	\$180,963	\$312,681	\$584,344
Indirect Effect	1.05	\$40,286	\$64,003	\$139,216
Induced Effect	1.05	\$34,943	\$67,832	\$112,758
Total Effect	13	\$256,191	\$444,516	\$836,318
Fifteen Tournaments, 150 out-of-town guests				
Direct Effect	16.425	\$271,444	\$469,022	\$876,515
Indirect Effect	1.575	\$60,429	\$96,004	\$208,824
Induced Effect	1.575	\$52,414	\$101,748	\$169,136
Total Effect	19.5	\$384,287	\$666,773	\$1,254,476
Twenty Tournaments, 150 out-of-town guests				
Direct Effect	21.9	\$361,925	\$625,362	\$1,168,687
Indirect Effect	2.1	\$80,572	\$128,005	\$278,432
Induced Effect	2.1	\$69,885	\$135,664	\$225,515
Total Effect	26	\$512,382	\$889,031	\$1,672,635

Based on the estimates in Table 5.1, the proposed facility could reasonably be expected to create between 13-26 jobs and generate between \$584,344 and \$1,168,687 in direct economic

¹ We sampled a subset of facilities from Table 3.1.

² This estimate is based on an average hotel rate of \$47.50 per person per night (two persons per room), \$28 of food spending per day per person, \$39 of shopping per day, and \$7.50 in transportation costs per person.

³ Humphreys (2009) uses this figure in estimates of the economic impact of the proposed Tennis Center of Georgia.

impact. Furthermore, the facility would generate an additional \$251,974 to \$501,947 in indirect and induced spending. Indirect spending is defined as additional local business spending as a response to the spending of out-of-town players and patrons, while induced spending consists of the rounds of local consumption spending from local labor income that is generated from the inflow of money from out-of-town guests. Put another way, induced spending is the spending that occurs when local individuals take the money received from spending from out-of-town guests and spend that money on goods and services themselves.

Table 5.2 decomposes the economic impact in sales into the ten industries most affected by the influx of guest activity. These estimates are based on 20 tournaments with 150 out-of-town players and patrons attending. As might be expected, both hotels and restaurants benefit the most from the spending of out-of-town visitors and guests. Our estimates suggest that the addition of these tournaments would lead to nearly 16 additional hotel and motel jobs, as well as six restaurant/food service jobs. Output estimates per industry vary, but our estimates suggest that hotels and restaurants would combine to add \$1 million in additional sales over a calendar year.

Table 5.2: Industry Breakdowns for Economic Impact of Proposed Facility
Twenty tournaments, 150 out-of-town guests

Industry Description	Employment	Labor Income	Value Added	Output
Hotels and motels, including casino hotels	15.9	\$262,296	\$476,713	\$855,086
Food services and drinking places	5.9	\$87,171	\$130,141	\$296,924
Retail Stores - General merchandise	0.9	\$25,528	\$38,018	\$57,843
Employment services	0.2	\$4,495	\$4,855	\$7,130
Services to buildings and dwellings	0.2	\$6,083	\$7,440	\$13,466
Offices of physicians, dentists, and other health practitioners	0.1	\$11,359	\$13,206	\$19,564
Real estate establishments	0.1	\$2,917	\$13,840	\$18,139
Private hospitals	0.1	\$9,292	\$9,759	\$17,910
US Postal Service	0.1	\$9,119	\$8,411	\$12,361
Management of companies and enterprises	0.1	\$10,591	\$14,175	\$26,212

The fiscal impact of the tennis center will be roughly \$54,000 per year, primarily consisting of state and local sales taxes on the purchases of out-of-town guests. Table 5.3 decomposes the sales tax revenue into both state and local constituencies. Carroll County would experience an increase in sales tax revenues of about \$23,000. We do not provide estimates of the impact on property taxes. Given the ownership of the property upon which the Carrollton Tennis Center is to be developed is currently under private ownership, and would be transferred to public ownership, none of the site improvements would be added to the county tax digest. Rather, the current assessed value of the land would be subtracted. The new facility may result in a positive impact on property values nearby, but would be unlikely to offset the reduction in taxable property resulting from the development of the tennis center.

Table 5.3: Fiscal Impact of the Operational Phase for Carroll County (per year)

	State (4%)	Local (3%)	Total
Sales Tax	\$30,688.00	\$23,016.00	\$53,704
Property Taxes will be reduced because the courts will be publically owned.			

It should be noted that labor required to operate the center is not included in the estimates above. Based on the proposal, all labor would be provided by the University of West Georgia. This proposal would add no local employment, and inclusion of these workers would overstate the center's impact.

Section 6: Considerations

A large number of directly comparable facilities are located relatively close to Carrollton, and many of these facilities would directly compete with the proposed facility for the larger state, regional, and USTA tournaments. For example, it is conceivable that should the Tennis Center of Georgia be built, it would have the capacity to host multiple tournaments at the same time, given that its proposed size is three times the size of the proposed facility in Carrollton.

To generate an economic or fiscal impact, the tennis center must attract new visitors from outside the county and induce Carroll County residents to increase their Carroll County expenditures in some way. The estimated economic and fiscal impacts in this report are based upon new tennis tournaments, which attract new attendees from outside Carroll County. Events that are primarily attended by Carroll County residents will only generate an economic or fiscal impact if these residents either a) would have spent income to attend a comparable event outside the county, or b) would not have spent income to attend an event otherwise. In either of these two cases, new dollars are spent inside Carroll County that otherwise would not have been spent. If Carroll County residents simply substitute one similar Carroll County event for another (and there were no net change in spending) the net impact, both economic and fiscal, would be zero.

Section 7: Methods

The methodology consists of multiple steps. First, we estimate the spending by both players and guests. The estimates of the number of players and guests that attend a tournament come from two sources: data obtained from the United States Tennis Association (USTA) regarding the average number of guests per player, and the average expenditure of an individual associated with the tennis tournament. For the estimates of the number of players that could be expected to attend a tournament, we use data obtained by surveying “comparable” tennis facilities. “Comparable” facilities are defined to be any facility located within 150 miles of Carrollton with a capacity of between 15-40 courts. These facilities and basic properties of these facilities are listed in Table 1 in the body of this study

Spending for the players and guests for a tournament is based on the average number of players and guests for a tournament. Our estimate for the number of tournaments that the proposed facility could expect is based on the number of tournaments that comparable facilities held in 2011. We estimate that the proposed facility might reasonably be expected to hold between 10-20 tournaments in a given year, with average size of between 150 - 300 players. These estimates are derived from the average number of tournaments and players per tournament as reported by comparable facilities in 2011; they differ from the USTA Economic Impact Survey (2006), which reported 620 players and 607 guests per Southern USTA tournament. Our estimates differ because only a small minority of tournaments held in comparable facilities were USTA tournaments. Most tournaments held were local, regional, or state tournaments with a smaller number of participants and a smaller number of guests. For example, most T2, ALTA, and USTA tournaments have a negligible number of guests.

Spending per party is based on estimates from multiple sources. The Georgia Economic Model of Developmental Events suggests that 20% of attendees at a tournament are from outside the local area, and its default per-party spending for a sporting event per day is \$122 per person per day. Because of Carrollton's relatively rural location, we estimate that a larger portion of guests would be outside of Carroll County and surrounding areas, and that the percent of attendees at a state or regional tournament that reside outside the local area could be as high as fifty percent. However, we also estimate lower shopping and spending on lodging based on local prices.

The methods used to develop the estimates for the impacts of the construction and operation of Carrollton Tennis Center complex is called input-output analysis. We use industry-standard input-output software and data developed by the Minnesota IMPLAN Group (MIG) to estimate the economic impact of the Carrollton Tennis Center development on the Carroll County Economy. Input-output models use industry-level monetary transactions data to measure the degree to which industries and institutions in the economy interact with one another, and the extent to which changes in final consumption ripple through the rest of the economy (see e.g., Miller and Blair, 1985).

Input-output models can be *descriptive* and *predictive*. Descriptive models estimate the degree to which different industries rely on one another. The relationships are tabulated in tables that summarize the flow of dollars and goods between industries and institutions. As an example of a descriptive model consider a baker, who in order to make x loaves of bread must buy y pounds of flour from a miller who in turn must buy z bushels of wheat from a farmer. The values x , y , and z describe the relationships between the three industries,

measured in units of output. The relationships can also be described in terms of value added (payments to workers, taxes, interests, profits, and other income) and employment.

The predictive models utilize the interdependence between industries to predict how changes in final consumption by households, industries, or governments affect other sectors of the economy. The extent to which an initial stimulus impacts all other parts of the economy is summarized with quantitative expressions called *multipliers* (see Leontief 1936). Multiplier effects can be divided into *direct*, *indirect*, and *induced* effects. The original change in final consumption is the actual *direct* effect. The *indirect* effects are the changes in all production processes in the economy needed to match the new consumption needs. Finally, the *induced* effects are the changes in household spending derived from the increases or decreases in households' incomes. IMPLAN provides estimates of all effects in terms of output, wages, and number of jobs created or destroyed throughout the economy (employment). All dollar figures are in current dollars.

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