# The Potential Impact of a New Football Stadium for Baylor University and Related Development on Business Activity in the Waco/McLennan County Area

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- Baylor University is considering construction of a new football stadium complex on a 93-acre site on the Brazos River. Such a facility would lead to notable gains in business activity in the Waco area. The Perryman Group has evaluated the economic benefits as well as gains in tax receipts that would likely be realized by local taxing entities. The report provides a summary of the key findings from this analysis.

- Any economic stimulus or expansion generates spinoff effects which ripple through the economy. The new stadium and related development will lead to positive effects on business activity in the Waco area during the construction process, ongoing operations of the stadium itself as well as new restaurants, retail stores, and hotels. The enhanced venue will also lead to incremental spending by additional visitors and those who presently attend games.

- This direct stimulus increases business activity across a spectrum of industries through purchasing of goods and services. Because of this chain of multiplier effects, the total economic benefits are much larger than the initial stimulus, spanning a broad array of business and stemming from both increased purchases and from higher payrolls (and, hence, increased consumer spending).

- In addition, recent academic research and experience in a number of areas has demonstrated that new stadiums have substantial and statistically significant synergistic effects on business activity, particularly if (1) they are located in the central business area as opposed to a suburban site and (2) they are accompanied by an overall redevelopment program. These characteristics are present in the case

of the proposed Baylor Stadium, thus yielding notable aggregate benefits.

- The Perryman Group developed a model to measure these relationships almost 30 years ago (the US Multi-Regional Impact Assessment System) and has consistently maintained and updated it since that time. It has been used in thousands of applications, including the analysis of numerous major sports and entertainment facilities. It includes a submodel which reflects the specific economic structure and characteristics of the Waco/McLennan County area. The model and terms used herein are described in the attached Appendix. All monetary values are given in constant (2012) dollars.

- As a result of the gains in business activity associated with the stadium complex, tax receipts to local entities would also rise. Increased tax receipts were quantified using the fiscal module of The Perryman Group's impact assessment system. This system essentially uses typical purchasing, property enhancement, business activity, user fees, and other elements of the fiscal revenue structure to determine the likely gains in receipts resulting from an economic stimulus.

- The remainder of this report presents the major conclusions from of The Perryman Group's analysis.

## Construction Effects

- Building the stadium and associated facilities will lead to a substantial stimulus for the Waco area, generating hundreds of millions in economic activity.

- Initial cost estimates were based on current estimated project costs under the assumption that 70% of the required labor and materials would be procured locally.

| The Impact of Construction and Development of the Proposed Baylor University Football Stadium on Business Activity in Waco (Monetary Values in Millions of 2012 Dollars) | |
| --- | --- |
| | |
| Total Expenditures | $573.1 million |
| Gross Product | $276.6 million |
| Personal Income | $188.7 million |
| Retail Sales | $80.2 million |
| Person-Years of Employment | 3,416 |

## *Ongoing Operations Benefits*

- The new stadium will likely increase attendance at games given strong support indicated in the community and the experiences in other areas where new stadiums have been built.

- Incremental benefits to the area from operations stem from projected increased attendance and additional spending by those attending games. In addition, the stadium complex will be available for other uses, which would lead to modest additional visitor spending in the community. The new stadium will also yield economic benefits through incremental stadium operating outlays. Only activity over and above that achieved at the current stadium is included in this segment of the analysis.

| The Incremental Impact of Ongoing Operation of the Proposed Baylor University Football Stadium (Including Incremental Visitor Spending) on Business Activity in Waco (Monetary Values in Millions of 2012 Dollars) | |
|---|---|
| **Total Expenditures** | $20.4 million |
| **Gross Product** | $11.4 million |
| **Personal Income** | $7.0 million |
| **Retail Sales** | $5.7 million |
| **Permanent Jobs** | 165 |

## *Collateral Development Effects*

- Even beyond these significant economic benefits, the stadium complex will also have synergies with other development, increase exposure, and enhance economic development. In particular, it will be a catalyst and synergetic component of other proposed projects along the Brazos River corridor.

- These benefits will increase over time due to population growth and income base expansion. The Perryman Group analyzed the likely synergies as of Year 1, Year 20, and a cumulative total over the first 20 years.

- A review of existing literature related to the economic benefits of stadiums revealed that they do have synergistic effects on economic development when placed in the proper context. Major determining factors include characteristics such as being centrally located (rather than in a suburb) and offering easy access (preferably by walking) to other area amenities and attractions. One study was particularly

enlightening, and its underlying model served as a partial basis for this analysis.[1]

- The increase in business activity was calculated by solving for relative synergy coefficients for other football stadiums built in downtown areas as part of redevelopment efforts (which is the case for the new Baylor University stadium). (Baseball stadiums were also examined, but excluded because the effects tend to be significantly higher.)
  - o These coefficients were consistently statistically significant in all cases and very similar in relative magnitude despite differences in city size, team success, location, and other factors. This finding, particularly in light of the control factors in the model, suggests that it is the stadium itself which is the critical factor which is driving the relative gains.
  - o The lowest of these coefficients was used for purposes of conservatism. It was then localized to the Waco market and adjusted for differences between college and professional sports (based on average attendance, typical hotel room-nights, spending patterns, and other factors).
  - o The result reflects the total change, which is equivalent to the direct, indirect, and induced effects combined. The Perryman Group's impact assessment system was then used to determine the effects on other measures of business activity. The results are also adjusted for spending directly associated with events and operations (previously described), thus providing a measure of the benefits solely attributable to the synergies of the stadium with the surrounding redevelopment efforts.

- Results of this segment of the analysis are presented in the following table.

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[1] Santo, Charles. "The Economic Impact of Sports Stadiums: Recasting the Analysis in Context." *Journal of Urban Affairs*, Volume 27, Number 2, pp. 177-191. 2005.

| The Impact of Anticipated Synergies Associated with Development of the Proposed Baylor University Football Stadium* on Business Activity in Waco (Monetary Values in 2012 Dollars) | | | |
|---|---|---|---|
| | Year 1 | Year 20 | Cumulative: Years 1-20 |
| Total Expenditures | $714.0 million | $1,515.8 million | $22.8 billion |
| Gross Product | $395.7 million | $840.2 million | $12.6 billion |
| Personal Income | $239.0 million | $507.5 million | $7.6 billion |
| Retail Sales | $265.0 million | $562.7 million | $8.5 billion |
| Jobs | 5,743 Jobs | 12,194 Jobs | 183,249 Person-Years of Employment |
| *Results for a location in an urban area with accessibility and significant redevelopment potential (such as the site now under consideration). | | | |

- Note that an increment of this magnitude represents an addition of about 2.75% to the size of the Waco-area economy.

## *Tax Effects and Concluding Comments*

- All of this economic activity generates tax receipts to local entities. In fact, adding local tax receipts during construction and for the first 20 years of operations (on a net present value basis) yields a total of approximately $10.625 million. The much larger positive effects from the synergies will lead to additional tax receipts; these gains were estimated to be a cumulative $404.3 million over the first 20 years (on a net present value basis). **The total increase in taxes through**

**construction and the first 20 years of the stadium's operation is projected to be more than $414.9 million (on a net present value cumulative basis).**

- The new stadium venue would create a landmark image along Interstate 35 and lead to sizable economic benefits in the Waco area and beyond. Its development, particularly as it relates to the overall initiative in the surrounding corridor, could have a transformative effect on the local economy.

# APPENDIX

# US Multi-Regional Impact Assessment System Methodology

# US Multi-Regional Impact Assessment System

- The basic modeling technique employed in this study is known as input-output analysis. This methodology essentially uses extensive survey data, industry information, and a variety of corroborative source materials to create a matrix describing the various goods and services (known as resources or inputs) required to produce one unit (a dollar's worth) of output for a given sector. Once the base information is compiled, it can be mathematically simulated to generate evaluations of the magnitude of successive rounds of activity involved in the overall production process.

- There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated. In this case, construction spending for the stadium complex was assumed to be $250 million, the current project estimate. Ongoing operations effects were based on assumed incremental staffing and procurement outlays at the facility in the current financial plan, while incremental visitor spending is derived from estimates of increases in attendance from the feasibility study and studies of typical spending by football attendees in comparable areas. The methods used to determine the likely synergies associated with the project were described within the report.

- Once the direct input values were determined, the present study was conducted within the context of the US Multi-Regional Impact Assessment System (USMRIAS) which was developed and is maintained by The Perryman Group. This model has been used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility. In addition, the model has been in operation and continually updated for over two decades. The systems used in the current simulations reflect the unique industrial structure of McLennan County and the Waco Metropolitan Statistical Area.

- The USMRIAS is somewhat similar in format to the Input-Output Model of the United States and the Regional Input-Output Modeling System, both of which are maintained by the US Department of Commerce. The model developed by TPG, however, incorporates several important enhancements and refinements. Specifically, the expanded system includes (1) comprehensive 500-sector coverage for any county, multi-county, or urban region; (2) calculation of both total expenditures and value-added by industry and region; (3) direct estimation of expenditures for multiple basic input choices (expenditures, output, income, or employment); (4) extensive parameter localization; (5) price adjustments for real and nominal assessments by sectors and areas; (6) measurement of the induced impacts associated with payrolls and consumer spending; (7) embedded modules to estimate multi-sectoral direct spending effects; (8) estimation of retail spending activity by consumers; and (9) comprehensive linkage and integration capabilities with a wide variety of econometric, real estate, occupational, and fiscal impact models. The models used for the present investigation have been thoroughly tested for reasonableness and historical reliability.

- As noted earlier, the impact assessment (input-output) process essentially estimates the amounts of all types of goods and services required to produce one unit (a dollar's worth) of a specific type of output.  For purposes of illustrating the nature of the system, it is useful to think of inputs and outputs in dollar (rather than physical) terms.  As an example, the construction of a new building will require specific dollar amounts of lumber, glass, concrete, hand tools, architectural services, interior design services, paint, plumbing, and numerous other elements.  Each of these suppliers must, in turn, purchase additional dollar amounts of inputs.  This process continues through multiple rounds of production, thus generating subsequent increments to business activity.  The initial process of building the facility is known as the *direct effect*.  The ensuing transactions in the output chain constitute the *indirect effect*.
- Another pattern that arises in response to any direct economic activity comes from the payroll dollars received by employees at each stage of the production cycle.  As workers are compensated, they use some of their income for taxes, savings, and purchases from external markets.  A substantial portion, however, is spent locally on food, clothing, health care services, utilities, housing, recreation, and other items.  Typical purchasing patterns in the relevant areas are obtained from the *ACCRA Cost of Living Index*, a privately compiled inter-regional measure which has been widely used for several decades, and the *Consumer Expenditure Survey* of the US Department of Labor.  These initial outlays by area residents generate further secondary activity as local providers acquire inputs to meet this consumer demand.  These consumer spending impacts are known as the *induced effect*.  The USMRIAS is designed to provide realistic, yet conservative, estimates of these phenomena.
- Sources for information used in this process include the Bureau of the Census, the Bureau of Labor Statistics, the Regional Economic Information System of the US Department of Commerce, and other public and private sources.  The pricing data are compiled from the US Department of Labor and the US Department of Commerce.  The verification and testing procedures make use of extensive public and private sources.  Note that all monetary values, unless otherwise noted, are given in constant (2012) dollars to eliminate the effects of inflation and to be consistent with the direct estimates provided for this analysis.
- The USMRIAS generates estimates of the effect on several measures of business activity.  The most comprehensive measure of economic activity used in this study is **Total Expenditures**.  This measure incorporates every dollar that changes hands in any transaction.  For example, suppose a farmer sells wheat to a miller for $0.50; the miller then sells flour to a baker for $0.75; the baker, in turn, sells bread to a customer for $1.25.  The Total Expenditures recorded in this instance would be $2.50, that is, $0.50 + $0.75 + $1.25.  This measure is quite broad, but is useful in that (1) it reflects the overall interplay of all industries in the economy, and (2) some key fiscal variables such as sales taxes are linked to aggregate spending.
- A second measure of business activity frequently employed in this analysis is that of **Gross Product**.  This indicator represents the regional equivalent of Gross

Domestic Product, the most commonly reported statistic regarding national economic performance. In other words, the Gross Product of, say, Amarillo is the amount of US output that is produced in that area. It is defined as the value of all final goods produced in a given region for a specific period of time. Stated differently, it captures the amount of value-added (gross area product) over intermediate goods and services at each stage of the production process, that is, it eliminates the double counting in the Total Expenditures concept. Using the example above, the Gross Product is $1.25 (the value of the bread) rather than $2.50. Alternatively, it may be viewed as the sum of the value-added by the farmer, $0.50; the miller, $0.25 ($0.75 - $0.50); and the baker, $0.50 ($1.25 - $0.75). The total value-added is, therefore, $1.25, which is equivalent to the final value of the bread. In many industries, the primary component of value-added is the wage and salary payments to employees.

- The third gauge of economic activity used in this evaluation is **Personal Income**. As the name implies, Personal Income is simply the income received by individuals, whether in the form of wages, salaries, interest, dividends, proprietors' profits, or other sources. It may thus be viewed as the segment of overall impacts which flows directly to the citizenry.

- The fourth measure, **Retail Sales**, represents the component of Total Expenditures which occurs in retail outlets (general merchandise stores, automobile dealers and service stations, building materials stores, food stores, drugstores, restaurants, and so forth). Retail Sales is a commonly used measure of consumer activity.

- The final aggregates used are **Permanent Jobs** and **Person-Years of Employment**. The Person-Years of Employment measure reveals the full-time equivalent jobs generated by an activity. A person-year is simply the equivalent of a person working for a year. As an example, it could be a carpenter employed for five months, a mason for three months, and a painter for four months. In the case of a construction project, these are typically spread over the course of the construction and development phase. It should be noted that, unlike the dollar values described above, Permanent Jobs is a "stock" rather than a "flow." In other words, if an area produces $1 million in output in 2011 and $1 million in 2012, it is appropriate to say that $2 million was achieved in the 2011--2012 period. If the same area has 100 people working in 2011 and 100 in 2012, it only has 100 Permanent Jobs. When a flow of jobs is measured, such as in a construction project or a cumulative assessment over multiple years, it is appropriate to measure employment in Person-Years (a person working for a year). This concept is distinct from Permanent Jobs, which anticipates that the relevant positions will be maintained on a continuing basis.

**Texas Econometric Model Methodology**

# The Texas Econometric Model

## Overview

- The system was developed by Dr. M. Ray Perryman, President and CEO of The Perryman Group (TPG) approximately 30 years ago has been consistently maintained and updated since that time.  It is formulated in an internally consistent manner and is designed to permit the integration of relevant global, national, state, and local factors into the projection process.  It is the result of more than three decades of continuing research in econometrics, economic theory, statistical methods, and key policy issues and behavioral patterns, as well as intensive, ongoing study of local, regional, and national economies. It is extensively used by scores of federal and State governmental entities on an ongoing basis, as well as hundreds of major corporations.
- In this instance, the Texas Econometric Model was used to determine baseline growth in population and income levels in the Waco area.
- This section describes the forecasting process in a comprehensive manner, focusing on both the modeling and the supplemental analysis.  The overall methodology, while certainly not ensuring perfect foresight, permits an enormous body of relevant information to impact the economic outlook in a systematic manner.

## Model Logic and Structure

- The Texas Econometric Model revolves around a core system which projects output (real and nominal), income (real and nominal), and employment by industry in a simultaneous manner.  For purposes of illustration, it is useful to initially consider the employment functions.  Essentially, employment within the system is a derived demand relationship obtained from a neo-Classical production function.  The expressions are augmented to include dynamic temporal adjustments to changes in relative factor input costs, output and (implicitly) productivity, and technological progress over time.  Thus, the typical equation includes output, the relative real cost of labor and capital, dynamic lag structures, and a technological adjustment parameter.  The functional form is logarithmic, thus preserving the theoretical consistency with the neo-Classical formulation.
- The income segment of the model is divided into wage and non-wage components.  The wage equations, like their employment counterparts, are individually estimated at the 3-digit North American Industry Classification System (NAICS) level of aggregation.  Hence, income by place of work is measured for approximately 90 production categories.  The wage equations measure real

compensation, with the form of the variable structure differing between "basic" and "non-basic."

- The basic industries, comprised primarily of the various components of Mining, Agriculture, and Manufacturing, are export-oriented, i.e., they bring external dollars into the area and form the core of the economy. The production of these sectors typically flows into national and international markets; hence, the labor markets are influenced by conditions in areas beyond the borders of the particular region. Thus, real (inflation-adjusted) wages in the basic industry are expressed as a function of the corresponding national rates, as well as measures of local labor market conditions (the reciprocal of the unemployment rate), dynamic adjustment parameters, and ongoing trends.

- The "non-basic" sectors are somewhat different in nature, as the strength of their labor markets is linked to the health of the local export sectors. Consequently, wages in these industries are related to those in the basic segment of the economy. The relationship also includes the local labor market measures contained in the basic wage equations.

- Note that compensation rates in the export or "basic" sectors provide a key element of the interaction of the regional economies with national and international market phenomena, while the "non-basic" or local industries are strongly impacted by area production levels. Given the wage and employment equations, multiplicative identities in each industry provide expressions for total compensation; these totals may then be aggregated to determine aggregate wage and salary income. Simple linkage equations are then estimated for the calculation of personal income by place of work.

- The non-labor aspects of personal income are modeled at the regional level using straightforward empirical expressions relating to national performance, dynamic responses, and evolving temporal patterns. In some instances (such as dividends, rents, and others) national variables (for example, interest rates) directly enter the forecasting system. These factors have numerous other implicit linkages into the system resulting from their simultaneous interaction with other phenomena in national and international markets which are explicitly included in various expressions.

- The output or gross area product expressions are also developed at the 3-digit NAICS level. Regional output for basic industries is linked to national performance in the relevant industries, local and national production in key related sectors, relative area and national labor costs in the industry, dynamic adjustment parameters, and ongoing changes in industrial interrelationships (driven by technological changes in production processes).

- Output in the non-basic sectors is modeled as a function of basic production levels, output in related local support industries (if applicable), dynamic temporal adjustments, and ongoing patterns. The inter-industry linkages are obtained from the input-output (impact assessment) system which is part of the overall integrated modeling structure maintained by The Perryman Group. Note that the dominant component of the econometric system involves the simultaneous estimation and projection of output (real and nominal), income (real and nominal), and

employment at a disaggregated industrial level.  This process, of necessity, also produces projections of regional price deflators by industry.  These values are affected by both national pricing patterns and local cost variations and permit changes in prices to impact other aspects of economic behavior.  Income is converted from real to nominal terms using Texas Consumer Price Index, which fluctuates in response to national pricing patterns and unique local phenomena.

- Several other components of the model are critical to the forecasting process.  The demographic module includes (1) a linkage equation between wage and salary (establishment) employment and household employment, (2) a labor force participation rate function, and (3) a complete population system with endogenous migration.  Given household employment, labor force participation (which is a function of economic conditions and evolving patterns of worker preferences), and the working age population, the unemployment rate and level become identities.

- The population system uses Census information, fertility rates, and life tables to determine the "natural" changes in population by age group.  Migration, the most difficult segment of population dynamics to track, is estimated in relation to relative regional and extra-regional economic conditions over time.  Because evolving economic conditions determine migration in the system, population changes are allowed to interact simultaneously with overall economic conditions.  Through this process, migration is treated as endogenous to the system, thus allowing population to vary in accordance with relative business performance (particularly employment).

- Real retail sales is related to income, interest rates, dynamic adjustments, and patterns in consumer behavior on a store group basis.  It is expressed on an inflation-adjusted basis.  Inflation at the state level relates to national patterns, indicators of relative economic conditions, and ongoing trends.

- A final significant segment of the forecasting system relates to real estate absorption and activity.  The short-term demand for various types of property is determined by underlying economic and demographic factors, with short-term adjustments to reflect the current status of the pertinent building cycle.  In some instances, this portion of the forecast requires integration with the Multi-Regional Industry-Occupation System which is maintained by The Perryman Group.

- The overall Texas Econometric Model contains numerous additional specifications, and individual expressions are modified to reflect alternative lag structures, empirical properties of the estimates, simulation requirements, and similar phenomena.  Moreover, it is updated on an ongoing basis as new data releases become available.  Nonetheless, the above synopsis offers a basic understanding of the overall structure and underlying logic of the system.

**Model Simulation and Multi-Regional Structure**

- The initial phase of the simulation process is the execution of a standard non-linear algorithm for the state system and that of each of the individual sub-areas. The external assumptions are derived from scenarios developed through national and international models and extensive analysis by The Perryman Group. The US model, which follows the basic structure outlined above, was used to some extent in the current analysis to define the demand for domestically produced goods on a per capita basis.
- Once the initial simulations are completed, they are merged into a single system with additive constraints and interregional flows. Using information on minimum regional requirements, import needs, export potential, and locations, it becomes possible to balance the various forecasts into a mathematically consistent set of results. This process is, in effect, a disciplining exercise with regard to the individual regional (including metropolitan and rural) systems. By compelling equilibrium across all regions and sectors, the algorithm ensures that the patterns in state activity are reasonable in light of smaller area dynamics and, conversely, that the regional outlooks are within plausible performance levels for the state as a whole.
- The iterative simulation process has the additional property of imposing a global convergence criterion across the entire multi-regional system, with balance being achieved simultaneously on both a sectoral and a geographic basis. This approach is particularly critical on non-linear dynamic systems, as independent simulations of individual systems often yield unstable, non-convergent outcomes.
- It should be noted that the underlying data for the modeling and simulation process are frequently updated and revised by the various public and private entities compiling them. Whenever those modifications to the database occur, they bring corresponding changes to the structural parameter estimates of the various systems and the solutions to the simulation and forecasting system. The multi-regional version of the Texas Econometric Model is re-estimated and simulated with each such data release, thus providing a constantly evolving and current assessment of state and local business activity.

**The Final Forecast**

- The process described above is followed to produce an initial set of projections. Through the comprehensive multi-regional modeling and simulation process, a systematic analysis is generated which accounts for both historical patterns in economic performance and inter-relationships and best available information on the future course of pertinent external factors. While the best available techniques and data are employed in this effort, they are not capable of directly capturing

"street sense," i.e., the contemporaneous and often non-quantifiable information that can materially affect economic outcomes. In order to provide a comprehensive approach to the prediction of business conditions, it is necessary to compile and assimilate extensive material regarding current events and factors both across the state of Texas and elsewhere.

- This critical aspect of the forecasting methodology includes activities such as (1) daily review of hundreds of financial and business publications and electronic information sites; (2) review of all major newspapers in the state on a daily basis; (3) dozens of hours of direct telephone interviews with key business and political leaders in all parts of the state; (4) face-to-face discussions with representatives of major industry groups; and (5) frequent site visits to the various regions of the state. The insights arising from this "fact finding" are analyzed and evaluated for their effects on the likely course of the future activity.

- Another vital information resource stems from the firm's ongoing interaction with key players in the international, domestic, and state economic scenes. Such activities include visiting with corporate groups on a regular basis and being regularly involved in the policy process at all levels. The firm is also an active participant in many major corporate relocations, economic development initiatives, and regulatory proceedings.

- Once organized, this information is carefully assessed and, when appropriate, independently verified. The impact on specific communities and sectors that is distinct from what is captured by the econometric system is then factored into the forecast analysis. For example, the opening or closing of a major facility, particularly in a relatively small area, can cause a sudden change in business performance that will not be accounted for by either a modeling system based on historical relationships or expected (primarily national and international) factors.

- The final step in the forecasting process is the integration of this material into the results in a logical and mathematically consistent manner. In some instances, this task is accomplished through "constant adjustment factors" which augment relevant equations. In other cases, anticipated changes in industrial structure or regulatory parameters are initially simulated within the context of the Multi-Regional Impact Assessment System to estimate their ultimate effects by sector. Those findings are then factored into the simulation as constant adjustments on a distributed temporal basis. Once this scenario is formulated, the extended system is again balanced across regions and sectors through an iterative simulation algorithm analogous to that described in the preceding section.