

APPENDIX A: ECONOMIC IMPACTS METHODOLOGY

The Mechanics of the Input-Output Model

Economic multipliers are generated through the use of input-output models. These are statistical models that quantify relationships among industries. They examine the pattern of purchases by industries and the associated distribution of jobs and wages by industry. Input-output models identify, for example, all the industries from which a construction contractor purchases its supplies and in what proportion. In turn, the model then identifies the industries that are suppliers to these suppliers, or “second generation” suppliers. This continues until all major purchases are accounted for contributing to the construction contractor’s original purchases. These original purchases are called the “direct sales.” All other associated sales from within the supply chain are considered “indirect and induced sales.” There are other indirect and induced effects associated with the contractor purchases. These include retail and other expenditures made by the construction workers paid to use the materials purchased by the construction contractor.

The size of these indirect and induced effects depends upon the definition of the region being looked at as well as the nature of the economy within the region. A large region with a closed economy, which means that most needs are being met by industries located within the region, would keep many of the sales, earnings, and jobs impacts within the region. In a region like this, the multiplier effects would be relatively large, with a large share of the effects captured within the region. In contrast, a small region with an open economy, which means an economy with a limited array of producers providing goods and services, would leak sales to other regions. Because many purchases would be made from industries outside the local economy, the multiplier impacts on the local economy would be minimized.

Indirect and Induced Impacts Defined

Input-output models measure output, or impacts, in two different ways – “indirect” impacts and “induced” impacts. “Indirect” impacts are the changes in inter-industry purchases as they respond to new demands of directly affected industries. In the case of UC San Diego, indirect impacts reflect the spending that UC San Diego’s suppliers make when purchasing goods and services from second, third and fourth generation suppliers in order to meet the demand generated by UC San Diego. Indirect impacts of UC San Diego spending also include the share of suppliers’ payroll (or employees wages) that is supported by UC San Diego spending. For example, when UC San Diego constructs a new library building, the general contractor purchases lumber, rents construction equipment, hires engineers and employs construction workers to build the library. The spending on the raw materials, equipment rentals, engineer fees and employee payroll that is generated by the UC San Diego contract reflects the indirect impacts of UC San Diego construction spending. UC San Diego construction spending also supports a certain number of jobs and generates a share of the personal income of the employees of these suppliers – and this represents the indirect employment and personal income impacts of UC San Diego construction spending.

On the other hand, “induced” impacts typically reflect changes in spending from households as income increases due to additional production. In the case of UC San Diego, induced impacts reflect the additional spending by the employees of UC San Diego suppliers. Using the UC San Diego construction example, the additional wages received by the employees of the general contractor, lumberyard, equipment rental company and engineering firm “induce” spending at the

grocery store, movie theater and clothing store. The jobs and income that result from these consumer purchases are considered induced employment and personal income impacts.

The IMPLAN Input-Output Model

There are several input-output models commonly used by economists to estimate indirect and induced economic impacts. Because of the difficulty of measuring these effects, all of the models have limitations. Still, economists generally agree that the models can provide an approximate measure of the indirect and induced spending, jobs, and personal income generated by a given amount of direct spending in a particular geographic area. To calculate the multiplier effects of UC San Diego's spending, CBRE Consulting used an input-output model developed by the U.S. Department of Agriculture known as IMPLAN (IMPact Analysis for PLANning).

The IMPLAN model organizes the economy into 505 separate industries and has comprehensive data on every area of the United States. CBRE Consulting organized all University purchasing and payroll into the IMPLAN industry classifications and used the 2006 IMPLAN tables of multipliers for the City of San Diego, San Diego County, and the State of California to calculate the total effect of UC San Diego's spending for 2006-07. The IMPLAN model is based on incorporating regional purchase coefficients, which measure trade flows, i.e., the proportion of local demand purchased from local producers.

Methodology for Estimating Direct, Indirect, and Induced Economic Impacts

In conducting this analysis of UC San Diego's total spending impacts, CBRE Consulting worked with the University to limit the estimates of direct spending to those expenditures that could be identified as having occurred in a specific location. For example, the spending associated with a catered event on the UC San Diego campus is counted as direct spending in the location of the vendor providing the catering. On the other hand, the estimates of direct University spending do not include spending that cannot be attributed to the location where the actual purchase or expenditure occurred. For example, the estimate of direct University spending for the City of San Diego does not include the University's reimbursement of a faculty member for a journal subscription, since the reimbursement itself does not reflect the actual location where the journal purchase took place. Because of this, the estimates of total spending, employment, and income impacts associated with University spending likely underestimate the total economic impact of the University on the state, regional, county, and local economies, albeit modestly.

Another important note regarding the assumptions for the geography of impacts is that jobs are counted in the location of the employer, while payroll is assumed to reflect the address of the employee. For example, for the 2006-07 fiscal year, all direct employment by UC San Diego occurs in the City of San Diego, yet direct University payroll is broken down based on whether the employees live in the City of San Diego, San Diego County, or elsewhere in California.

The impact of University payroll is analyzed differently than the impact of the University's goods and services purchasing and capital expenditures. This is because the University's payroll is a direct expenditure of the University, but is also direct income to the residents who are UC San Diego employees. The full amount of UC San Diego's payroll is counted as direct income, based on employees' places of residence. However, the indirect spending, employment and income impacts of UC San Diego's payroll are based on the spending of UC San Diego employees. Employee spending reflects an assumption, provided by the Bureau of Labor Statistics' Consumer Expenditure

Survey 2006, that employee disposable income is equal to 85.0 percent of earned income. However, this disposable income is not all spent within the location in which the employee lives. Therefore, it was necessary for CBRE Consulting to create assumptions for employee household spending patterns in the City of San Diego and the surrounding geographies. These estimated “capture rates” are based on several factors, such as the distribution of retail and entertainment venues, the expectation that employees who do not live in San Diego make expenditures there because of time spent at the University, and a baseline assumption that 30.0 percent of disposable household income is spent on housing (both rent and mortgage payments) within the employees’ home geography. These geographically-specific capture rates were then applied to total disposable income and aggregated within their respective geographies to arrive at a total of indirect impacts of University payroll expenditures. Induced spending, employment and income multipliers were then applied to the calculated indirect spending estimates in the same way that they were applied to goods and services purchasing and capital expenditures.

Expenditures Excluded from Baseline Estimates of UC San Diego Spending

In addition to reimbursements and other expenditures for which the location of purchasing could not be determined, this analysis excludes several other categories of University expenditures from the direct expenditure estimates that form the basis for measuring the indirect and induced economic impacts. These categories include accounting expense items such as the depreciation of physical property, as well as financing costs including interest payments, insurance costs, and employee benefits.

Benefits contributions are excluded because they do not contribute to economic demand the same way payroll expenditures do. Rather than contributing directly to income, retirement benefits made in the 2006-07 fiscal year contribute to wealth accumulation, since these benefit contributions will be spent sometime in future years. Instead, this study includes the impact of the spending by UC San Diego retirement beneficiaries who received and presumably spent their retirement income during FY 2006-07. The estimate of indirect and induced impacts from retiree payments reflects the same methodology as was used to calculate the impact of UC San Diego payroll.

UC San Diego expenditures for healthcare benefits are not considered in the analysis because the amount of the health benefit contribution is not necessarily equal to the value of the healthcare-related goods and services purchased by UC San Diego employees. Furthermore, the location of the actual purchase of healthcare-related goods and services is difficult to track based on the patterns of UC San Diego health benefits contributions, and therefore does not lend itself to inclusion in this type of analysis.

Despite the exclusion of employee benefits contributions from the analysis of the University’s economic impact, these sizable contributions do play an important role in supporting the personal and financial needs of UC San Diego employees and undoubtedly make important yet distinct economic contributions to the local, regional and state economies.

Finally, for the purposes of the analysis of total economic impacts, the University direct payroll number has been reduced by approximately \$56.20 million, which is the estimated share of total payroll received by student employees. CBRE Consulting measures the impact of student spending in a separate analysis; therefore, to avoid double counting, this share of the total payroll is excluded from the analysis of University payroll impacts.