A Roadmap to Better Data:

Developing a Census Bureau Partnership to Measure National Postsecondary Earnings Outcomes

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Forward:
IHEP Reflections on the Value of Creative Solutions to State Data Challenges

At the Institute for Higher Education Policy (IHEP), we know that accurate, timely, and reliable information about students' experiences before, during, and after college can radically improve postsecondary policy and practice. Through our work convening the Postsecondary Data Collaborative's State Working Group, IHEP has consistently heard from state postsecondary data leaders who emphasize the need for more accurate data on graduates' post-college earnings. This paper, *A Roadmap to Better Data: Developing a Census Bureau Partnership to Measure National Postsecondary Earnings Outcomes*, highlights one solution—a creative workaround to provide critical outcomes data until federal policymakers implement broader scale reform.

Accurate, complete data on post-college earnings are invaluable. They can provide current and prospective students with answers to key questions about their postsecondary education options—including where to enroll, what to study, and how much to borrow. Likewise, to shape and improve their programming, colleges and universities need information about what happens after students leave the institution and enter the workforce and which programs' graduates experience high rates of upward economic mobility. Additionally, state and federal policymakers need reliable data to illuminate equity gaps and encourage postsecondary institutions and programs to deliver strong outcomes for all students.

High-quality data on the employment and earnings of college graduates are sorely needed to support, inform, and empower each of these stakeholders—students, institutions, and state and federal policymakers. Unfortunately, a federal ban on integrating data on student postsecondary and workforce outcomes has left an incomplete picture of how students fare as they transition from college to career. Without a federal student level data network, the onus of developing, maintaining, and using postsecondary data to drive student success has largely fallen to states, and while significant progress has been made at the state level, key challenges remain.[i]

In particular, collecting data on the earnings outcomes of students who move across state lines presents a critical challenge. While many states have developed strategies to understand the labor market experiences for students who stay in the state after they leave school, accessing earnings information for those who relocate remains a key barrier. A lack of information on those graduates' earnings can lead to inaccurate assessments of the economic value of higher education.

While a federal student level data network remains the best solution to postsecondary data limitations, many states have taken matters into their own hands by building creative partnerships to access the data they need. In *A Roadmap to Better Data: Developing a Census Bureau Partnership to Measure National Postsecondary Earn-*

ings Outcomes, Stephanie Huie and David Troutman of the University of Texas System (UT System) highlight one such project. In 2017, the U.S. Census Bureau and the UT System began a first-of-its-kind collaboration with the goal of providing accurate, timely, and privacy-protected data on student earnings outcomes for each institution, degree level, and field of study within the UT System.

The step-by-step guide presented in this report reflects state data advocates' interest in better understanding the experience of their graduates as they enter and build experience in the workforce. The guide provides stakeholders interested in replicating the partnership with specific and actionable recommendations to help them navigate the process, from building buy-in and approval of leadership, developing necessary legal agreements, specific data preparation needs and quality checks, and putting the data in the hands of those who need it most.

IHEP would like to thank the report's authors for providing this thoughtful and detailed contribution to the field and sharing their first-hand experience in developing this innovative partnership. We hope it will inform other states seeking similar solutions to their data challenges.

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Introduction

In 2014, The University of Texas (UT) System set out to conduct a robust assessment of the value of higher education, including the impact of a college education on students' financial well-being and post-college earnings capacity. Researchers soon encountered difficulty accessing data on earnings for students who left Texas after graduation, meaning the UT System initially could only address these outcomes for graduates who remained in the state. While helpful, this limited analysis was likely to underestimate the overall economic impact of a degree from a UT System school, because students working in states with higher costs of living often earn more. Under a federal law banning the collection of student-data linked to employment outcomes at the national level, Texas and many other states struggled to access reliable, comprehensive data on employment outcomes of students who leave the state after graduation.

To work around this obstacle, the UT System partnered with the U.S. Census Bureau (also referred to as "the Census" or "Census") in 2017 to evaluate information about post-collegiate educational and financial outcomes by using earnings data for UT graduates across the country. This first-of-its-kind collaboration generated more accurate assessments than estimates that are based solely on graduates who remain in Texas. By demonstrating the success of its graduates through these nationwide data, the UT System has made significant strides in answering the question, "what is college worth?"

ABOUT THE UNIVERSITY OF TEXAS SYSTEM

The UT System encompasses 14 educational institutions in the state of Texas; eight are academic institutions and six are health institutions. The UT System institutions award degrees at the bachelor's, master's, doctoral, and professional levels. With 14 institutions, an enrollment of nearly 240,000 students and an operating budget of $21.1 billion (FY 2020), the UT System is one of the largest public university systems in the United States. UT institutions produce more than 60,000 graduates annually and award more than one-third of the state's undergraduate degrees and more than half of its health professional degrees.

To date, Colorado, Michigan, and Wisconsin have established similar partnerships with the U.S. Census Bureau. Many other states have expressed a strong interest in having more reliable and accurate estimates of their students' post-college outcomes—and with good reason: this approach provides a more precise picture of academic institutions' post-college employment and earnings outcomes. For state leaders, systems, and individual institutions, data on the employment outcomes of graduates can help demonstrate the value of higher education and provide a broader framework for conversations about state and local appropriations and tuition charges. Further, by presenting the data in a public-facing, consumer-friendly platform, current and prospective students benefit from a more transparent view of the return on investment for degrees and are able to make informed decisions about where to enroll, what to study, and whether and how much to borrow.

This paper provides an overview of the collaboration between the UT System and the U.S. Census Bureau. It also describes the steps institutions should take to obtain national earnings data through such a partnership, as well as alternative ways to access graduates' national earnings data. Such data enables higher education leaders to better understand their graduates' labor market experiences and convey the precise economic returns to individuals from higher education and obtaining a degree.

Overview of Employment Outcomes Available to the U.S. Census Bureau

As part of the Center for Economic Studies at the U.S. Census Bureau, the Longitudinal Employer-Household Dynamics (LEHD) program uses data from employers throughout the country[ii], including federal agencies, state workforce agencies, and U.S. Census Bureau sources, to provide information on labor market trends. State workforce agencies collect employee wage data from employers in order to calculate state unemployment insurance taxes. States then share Unemployment Insurance (UI) earnings data with the LEHD program, enabling national analysis of patterns and trends in the labor market and across employers and employees. Forty-eight states as well as the District of Columbia, Puerto Rico, and the U.S. Virgin Islands, share data with LEHD.[1] UI data elements are fairly standard across states. The earnings data provided by LEHD is generally very broad and comparable across states, but certain types of jobs—such as federal employees and members of the armed forces—are excluded. The UI data contain person and employer identifiers as well as quarterly wages at each job. Any personally identifiable fields (e.g., name, social security number) are removed on arrival at Census and a common anonymous identifier is used to link records. In releasing statistics, the Census utilizes formal privacy techniques along with other statistical disclosure limitation techniques to ensure protection of confidential information.[iii]

In 2017, the U.S. Census Bureau launched the Post-Secondary Employment Outcomes (PSEO) through a pilot with the UT System.[iv] Through this ongoing voluntary partnership, Census officials have linked administrative educational data from the UT System with national UI data held by the LEHD. The resulting PSEO data provide earnings and employment outcomes for college and university graduates disaggregated by program, institution, and degree level. The resulting data may be downloaded as a comma-separated value (CSV) file or interactively viewed using an online visualization tool. Since 2017, Census has expanded the PSEO through collaborations with Colorado, Michigan, and Wisconsin.

1. Alaska and Arkansas do not have current agreements to share data with the U.S. Census Bureau.

What Data Does the Post-Secondary Employment Outcomes (PSEO) Program Provide?

PSEO data are publicly displayed on the U.S. Census Bureau website, both through a visualization tool and as a CSV download. The data include earnings at the 25th, 50th, and 75th percentiles, one-, five-, and ten-years after graduation. Earnings calculations are based on workers who earn at least the equivalent of the federal full-time minimum wage and worked at least three quarters during the year. The data displayed on the visualization tool are determined by user selection of the following criteria:

- **State:** Users can select which state's data to view. As of publication, earnings data for Colorado, Michigan, Texas, and Wisconsin are available, but not all institutions within each state provide data to PSEO.
- **Institution:** Graduates are associated with each participating institution within the state. Colorado currently has the most comprehensive coverage with all two- and four-year colleges. Wisconsin only includes its flagship institution, University of Wisconsin-Madison. Michigan only includes data for its main campus in Ann Arbor, and Texas includes the 14 institutions within the UT System.
- **Degree Level:** Data are available for associate, bachelor's, master's, and doctoral degree programs. Not all included institutions offer degrees at all of these levels. The data display shows only degree levels that are offered.
- **Classification of Instructional Programs (CIP) Code:** The CIP is a classification scheme developed by the National Center for Education Statistics (NCES) for reporting fields of study at three different levels of granularity (two-, four-, and six-digit code levels). Bachelor's and professional degree fields of study are provided at the four-digit CIP level. Associate degree, master's degree, and doctoral degree fields of study are all provided at the two-digit CIP level. Data can also be shown as an overall figure for all fields of study.
- **Cohort Year Post Graduation:** This field lists the first calendar year following the year that the student graduated. Graduates with bachelor's degrees are combined into three-year post-graduation cohorts, and graduate and professional degrees are combined into five-year post-graduation cohorts. The data can also be displayed as an overall figure for all cohort years.

> THE GOAL IS TO HELP STUDENTS AND THEIR FAMILIES MAKE MORE INFORMED DECISIONS ABOUT WHERE TO ENROLL, WHAT TO STUDY, AND HOW MUCH DEBT TO TAKE ON.

The UT System has also incorporated the PSEO data into a separate tool known as seekUT®, which aims to provide information on outcomes of college options, including earnings and debt levels for graduates at different UT institutions and within different fields of study. The goal is to help students and their families make more informed decisions about where to enroll, what to study, and how much debt to take on. The tool was initially created using Texas UI wage records, which were limited only to graduates who remained in the state of Texas. U.S. Census UI wage records allow the tool to account for the majority of all graduates who enter the workforce. The UT System used its own financial aid records to calculate the percent of students with debt in each major; median student debt by major; estimated monthly debt payment based on a ten-year standard repayment plan; and monthly median earnings at one-, five-, and ten-year intervals. When collaborating with PSEO, institutions may want to consider ways to use the resulting data to help inform students about their higher education options, including what other variables may enhance the PSEO data to provide additional context.

How Can the PSEO Data be Used?

Data visualization tools such as seekUT® are just one example of how the PSEO data might be used to benefit various stakeholders, including students, families, higher education officials, the public, and policymakers. States and institutions seeking to leverage Census data should develop plans for how to use and publicize the results of their efforts, keeping in mind their specific objectives and the available time and capacity to carry out the work. Potential benefits include:

- **Students and Families:** PSEO data can inform students' decisions about college major, financial aid, and graduate education plans. Using PSEO data, alone or in combination with other institution-level data, students and families can:
  - Better understand how student debt is or is not offset by the expected post-collegiate income in their major of choice. For example, students may consider finding the best value college with lower tuition for lower paying majors to help manage debt. They may also consider work study or a part-time job to reduce reliance on loans.
  - Determine if graduate school will be necessary for employment in their major. Students should understand which academic fields require graduate education in order for the student to be career ready. In such fields, the student will need to factor in the cost of graduate education and the academic commitment required.
  - Compare earnings outcomes for baccalaureate degrees and graduate degrees in the same fields of study (regardless of whether graduate school is necessary for employment) to assess if baccalaureate salaries and graduate degree salaries differ significantly. If not, the students should discuss with their campus academic and career advisors the reasons they may or may not want to pursue a graduate degree beyond changes to salary, such as specialty within the field or interest in leadership roles.
- **Higher Education Officials:** Data can be used to evaluate and improve program performance and returns to education, especially compared to other systems and states. Institutions and systems can use PSEO data in the following ways:
  - Combine PSEO data with financial aid data to determine the debt-to-income ratio for the baccalaureate program as a whole at intervals of one and five years after graduation. Administrators may want to take a closer look at programs with a debt-to-income ratio of more than ten percent—a common threshold for manageable debt[2] —and determine strategies for improvement.
  - Evaluate median salaries for an institution by STEM degrees, non-STEM degrees, and the overall median income of the institution's graduates compared to high school, state, and national median incomes for working adults.

2. On its federal student financial aid website, the Department of Education ("the Department") recommends that students' monthly student loan repayment only be "a small percentage of your salary after you graduate." However, the Department does not specifically indicate what that percentage should be. For more information, please see: https://studentaid.ed.gov/sa/types/loans. In 2015, financial aid expert Mark Kantrowitz used historical data from the past two decades from the Digest of Education Statistics and the U.S. Census Bureau's Current Population Survey to examine the percentage of available income to repay loan debt. Kantrowitz found that over the past 20 years, individuals' debt-to-income percentages were, on average, 10 percent. He recommends that any student who borrows more than 10 percent debt-to-income percentage be considered a "risky borrower." http://www.studentaidpolicy.com/excessive-debt/Excessive-Debt-at-Graduation.pdf

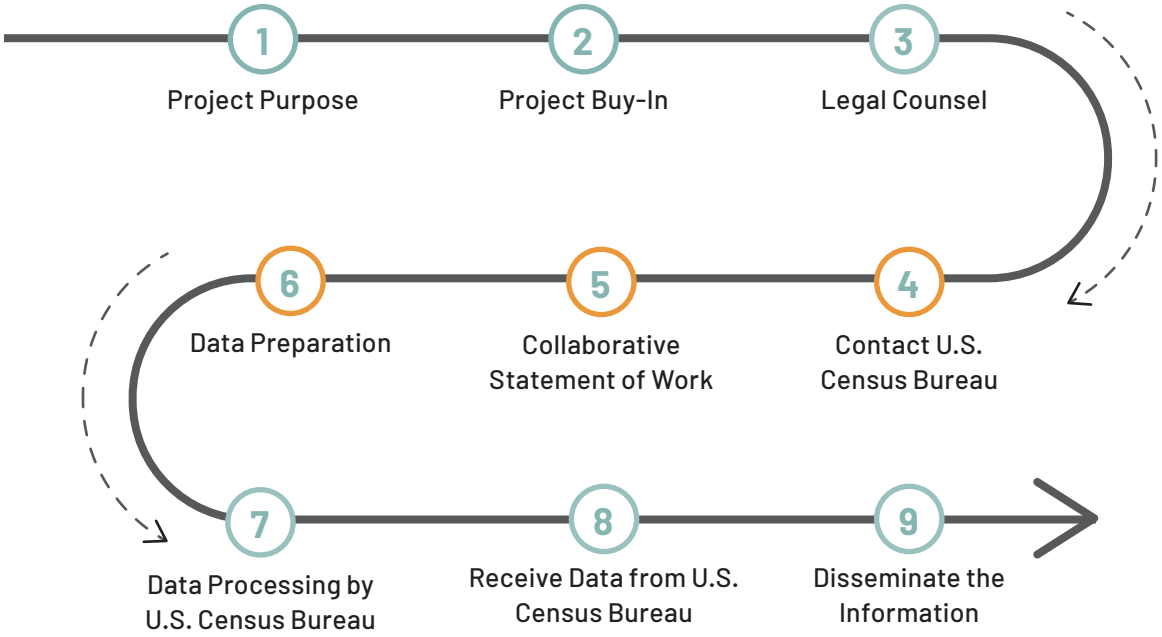
- Implement training for advising and financial aid administrators to help students make complex decisions based on the earnings data, including what fields to study, whether to pursue an advanced degree, and how much to borrow for their education.

- **The Public and Policymakers:** PSEO data can allow institutions, systems, and state education agencies to better inform the public and policymakers about return on investment for various degrees and the reality of student debt. For example, PSEO can help stakeholders:
  - Communicate the financial returns to different types of degrees, including liberal arts degrees. Some of the PSEO data support popular notions of very low earnings for some liberal arts graduates, but other findings have indicated that earnings for liberal arts majors are much higher than conventionally expected—especially over a ten-year period. Information on individual returns to higher education can help policymakers understand the statewide and regional economic impact of different programs of study.[v]
  - Communicate the proportion of students who take on student loan debt by field of study. UT System data revealed fewer students take on student debt than conventionally believed. In fact, for many fields of study, the percentage of students who take on debt is less than half. Low debt levels among UT System graduates can demonstrate the importance of affordable educational options—demonstrating the statewide and regional value of investing in higher education systems.

Steps to Becoming a Data Partner: Strategic Planning and Other Preparation for a Partnership with Census

The sections below provide a step-by-step guide for state education agencies, university systems, and individual institutions interested in partnering with the U.S. Census Bureau. Each section details the purpose of the step, the stakeholders involved, and, based on the experience of the UT System, suggested preparation that will help the process run more efficiently.

A Roadmap for Developing a Census Bureau Partnership



STEP 1: DEFINE YOUR PROJECT PURPOSE

Each state, system, or institution partnering with the Census is required to design a statement of work (SOW) that clearly describes its project purpose, including goals, institutional priorities, and implementation details. Questions the SOW should answer include: What does an institution hope to accomplish with a data partnership; how will the data be used and for what purpose; and is there a plan in place to implement the institutional objectives with respect to the data?

DEVELOPING AN INSTITUTIONAL STATEMENT OF WORK

While a potential partner institution could use data in countless possible ways, it must understand its needs and how it expects to use the data to serve those needs. That understanding informs the statement of work (SOW), which is part of the agreement with the U.S. Census Bureau. In determining needs and expected use of data, institutions should consider the following questions about project goals, use of the data, and project implementation:

- Project Goals:
  - How will the data be used to inform students and families, legislators, or other stakeholders?
  - Will the data be used to evaluate programs?
  - Will the data be used to conduct research on student outcomes and success by major?
  - What questions should the data aim to answer?
- Expectations for how the data will be used:
  - Is there interest in an interactive dashboard?
  - Will the dashboard be public-facing?
  - Will the data be used mainly to conduct research or to create summary documents that may be used to inform various groups inside and outside the organization?
- Project Implementation:
  - What staffing needs are necessary to deploy the work products?
  - What are realistic deadlines?
  - Is funding needed and, if so, how much?
  - Is the funding available?

STEP 2: BUILD PROJECT BUY-IN AMONG ORGANIZATIONAL LEADERSHIP

Whether the organization undertaking the partnership is self-contained or part of a larger system or statewide consortium, it is critical to take into consideration the roles of the executives and ensure high-ranking officials are fully aware of the potential implications of the project. This includes the system or campus CEO, the head of legal counsel, and the executive leadership or officers group, which would typically include the chief academic officer and the external affairs or media relations officer. It is critically important that members of the leadership understand the value of the project and agree that the goals and outcomes of the project are in sync with the mission of the institution. In addition, leadership must understand that:

- Personally identifiable student information, which is protected under the Federal Educational Rights and Privacy Act (FERPA), will be shared with the U.S. Census Bureau LEHD program. The agreement with the Census is FERPA compliant under the audit and evaluation exception.[vi]
- The data will be retained by the U.S. Census Bureau until the agreement expires. This arrangement is clearly addressed in the Census agreement and typically part of standard FERPA data-sharing language.
- Salary outcomes for the graduates of specific programs will be available for public download and presented in the LEHD visualization tool.
- Outcomes for programs may be compared to outcomes of other programs across the country by news agencies, think tanks, and others. As with any data that an institution releases, there is a risk that these individuals and groups may use the information incorrectly or out of context. Leadership should understand that public and media relations offices will need to be prepared to monitor the news for articles about student salaries when the data is released.

STEP 3: SECURE APPROVAL FROM LEGAL COUNSEL

States and institutions should proactively engage legal counsel to ensure the specific terms of the agreement with Census do not violate any state laws or regulations. Developing a close relationship with legal counsel and making sure they are fully informed of all aspects of the project can help things run more seamlessly. It is better to fully include legal counsel in the project planning stage by talking through the issues, thereby avoiding surprises. In addition, approval from legal counsel will likely be necessary for an organization to approve the FERPA audit and evaluation exception that permits disclosure of personally identifiable information from education records to third parties if certain conditions, which are outlined in U.S. Education Code, are met in the agreement with the U.S. Census Bureau.

STEP 4: CONTACT THE U.S. CENSUS BUREAU

Once an institution secures buy-in from both leadership and legal counsel, and has determined the institutional priorities and potential uses of the data, a representative from the organization should contact the U.S. Census Bureau. In an initial conversation with the U.S. Census Bureau, prior to developing a statement of work (Step 5) or beginning data preparation (Step 6), establish a timeline and whether Census currently has capacity to take on additional partners.

For information on partnering with the U.S. Census Bureau, contact: CES.PSEO.Feedback@census.gov. The U.S. Census Bureau will provide a boilerplate contract to the institution to review as a starting point for negotiations. The institution's legal counsel will have the opportunity to propose amendments to that language.

CHICKEN AND EGG: COORDINATION WITH CENSUS

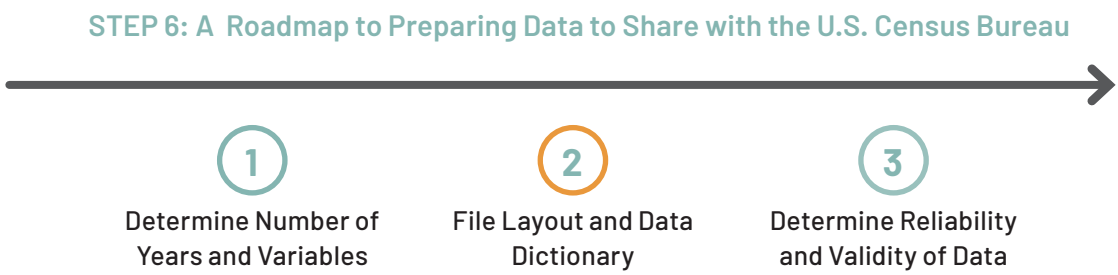
In many cases, coordination with Census will need to begin even earlier in order to generate support from leadership and legal channels. For instance, it may be necessary to have preliminary conversations with Census officials to secure approval from leadership and legal channels. At the same time, more formal conversations will require input from leadership and legal channels. In some ways, this step should occur concurrently with Steps 2 and 3 above.

STEP 5: DEVELOP A COLLABORATIVE STATEMENT OF WORK (SOW)

As part of the FERPA audit and evaluation exception, a SOW must be included in the agreement between an institution and Census. The SOW has two following sections: 1) Background and 2) Description and Primary Tasks.

The Background section includes a high-level description of the overall project and the reason for establishing the relationship from both the state or the institution and the U.S. Census Bureau. The Description and Primary Tasks section has two subsections. In the Description, each entity can provide a high-level overview of all objectives and desired outcomes of the relationship. The Primary Tasks subsection outlines specific steps that each entity will perform to meet the stated objectives. This includes but is not limited to specific research questions, specific data tabulations of interest, and the organization responsible for each task. Specific persons need not be identified as part of the agreement.

STEP 6: DATA PREPARATION



The UT System undertook collaboration with the U.S. Census Bureau as agreed to in the statement of work, in order to obtain earnings of UT System graduates one-, five-, and ten-years after graduation to enhance seekUT®—a proprietary online tool and website that presents data on the earnings and educational graduate outcomes from UT System institutions. The UT System provided data to the U.S. Census Bureau on students who graduated from 1998 to 2015. To achieve this goal, and based on the contract with the U.S. Census Bureau, the UT System agreed to:

1) Prepare a UT System data set including, but not limited to, social security number, degree level awarded, CIP code for each credential, and institution attended (see Table 1);

2) Provide record layouts of the UT System data and data dictionaries with the data delivery;

3) Provide subject matter expertise for the UT System education data; and

4) Participate in research projects exploring topics including, but not limited to, employment, earnings, and location of employment.

When preparing the dataset for the U.S. Census Bureau, the UT System took specific steps to ensure the data were reliable and valid.

Determine Number of Years and Variables Needed for the Dataset

The contract with the U.S. Census Bureau required the UT System to provide information about its students, including their social security number, degree level, and institution attended. After several conversations with Census, the UT System determined that submitting additional variables such as demographic and academic student information would provide context and yield better understanding of what happens to students after they graduate from UT System institutions.

A list of Census-required variables included in the dataset are outlined in Table 1. Table 2 lists optional variables the UT System decided to send to the U.S. Census Bureau to provide contextual information for additional analyses to develop a more accurate understanding of student outcomes and useful data for all stakeholders.

Table 1. Required Variables in the U.S. Census Bureau Dataset

Field Name	Description and Notes
Student Identification Number	Social security number (SSN) for the student reported at the time of enrollment *For an individual whose reported SSN has changed across time, all reported SSNs will exist in the datasets. However, the student will have only one University of Texas identification number (UTID).*
Academic Year	The academic year students received their degree (e.g., 2001, 2002, and 2003)
Academic Term Number	The semester students received their degree (e.g., fall, spring, and summer)
Federal Interagency Committee on Education (FICE) code	Six-digit identification code that identifies the UT System institution from which a student graduated
Degree Type	The abbreviation of the degree (e.g., CER, BA, MS, PhD) *Degrees conferred as baccalaureate-level and graduate-level certificates are identified with "CER" (certificate). There were 181 degree types reported in the data submission. Students who receive multiple degrees during a term will have more than one record for that term.*
Degree Classification of Instructional Programs (CIP)	The six-digit classification scheme developed by the National Center for Education Statistics (NCES) for reporting fields of study (e.g., 16.0102 for Linguistics). The CIP code for the primary major at the time of the degree being conferred is reported. Graduates receiving two degrees simultaneously will be allocated for in each degree CIP code. Please note that CIP codes were revised in 2010, so a crosswalk from NCES should be used if CIP is analyzed longitudinally.

Table 2. Optional Variables in the U.S. Census Department Dataset

UT Person Indicator Number	Unique key for an individual generated by the UT System data warehouse
Last Name	Last name of student
First Name	First name of student
Middle Initial	Middle initial of student
Gender	Student self-report of gender at the time of admission
Ethnic Origin and Race	Student self-report of ethnicity/race at the time of admission
Date of Birth	Student self-report of date of birth at the time of admission
Residence (State or Country)	Student self-report of residence at the time of admission Students who are U.S. citizens report the state (e.g., Texas, New York). International students report the country of citizenship (e.g., China, Japan, Canada).
Foreign Student Indicator	Derived from the state or foreign country of which the student is a legal resident at the time of applying to a UT institution
Institution Type	Indicator for the type of institution the student attended (academic or health)
Entering Status	Indicator of whether a student is a first-time-in-college student or a transfer student at the point of initial enrollment at the UT System institution
Level of Degree or Certificate Conferred	The highest degree student received at UT System institutions (e.g., baccalaureate, baccalaureate-level certificate, master's, graduate-level certificate, doctoral, and professional)
Degree STEM/Non-STEM Indicator	Indicator for whether the program at the UT System is considered a STEM (Science, Technology, Engineering, Math) program, as defined by the Office of Institutional Research and Analysis Selection was based on the STEM classifications by the Texas Higher Education Coordinating Board (THECB) and National Science Foundation (NSF).
Continued Enrollment Indicator	Using the National Student Clearinghouse (NSC), enrollment indicator of whether the student continued their education after receiving their degree at a UT System institution

Determine Reliability and Validity of Data Over Time

Preparing the data for submission to the U.S. Census Bureau uncovered some data anomalies, which UT researchers diagnosed and addressed. Due to the nature of most administrative data sets, which include large numbers of records and are not generally designed for analysis purposes, it is likely that other organizational partners will face similar data quality and consistency issues which must be addressed before sharing with the U.S. Census Bureau. Common data issues and potential solutions include:

- **Social Security Numbers (SSNs):** In the UT System records, researchers uncovered student entries with: invalid SSNs (such as those listed as "8XXXXXXXX"); students with multiple SSNs (based on misreporting or data error); multiple students with the same SSN; and international students with an assigned student ID rather than an SSN, all of which posed challenges for matching with UI wage records held by Census. To address this, UT researchers referred to written documentation from the Social Security Administration to determine how to verify SSNs.[vii] (For example, the first three digits in an SSN will never be "000" or "666.") Next, UT researchers developed a series of frequency tables to determine the number of invalid SSNs within the dataset, along with crosstabulations using the invalid SSNs and other student demographic variables for the sole purpose of determining the source of the error. Additionally, UT researchers created a methodology for determining how to handle data where students have multiple SSNs or multiple students have the same SSN. These errors typically emerge when handling longitudinal data and common causes include data entry errors, such as transposing numbers or misspelling a last name, or a student changing their last name.
- **Data Missingness:** Missing data can cause analytic problems, particularly if the data is more likely to be missing for certain students, as this creates biased estimates of outcomes. To address this, the UT researchers used frequency tables to determine the level of missingness for each variable and how missingness might differ over time for each variable. Other potentially useful steps taken by the UT System include documenting the missingness within the dataset and determining if other variables within the dataset might be substituted for the missing information.
- **Multiple Degrees per Student:** Some students either receive multiple degrees within the same semester or receive multiple degrees over time at the same or different institutions (e.g., earning a bachelor's degree and continuing on to earn an additional degree). To identify students with multiple degrees, UT researchers created indicator variables to flag students who receive multiple degrees in the same semester and identify lowest and highest degrees received. UT researchers also used the National Student Clearinghouse (Student Tracker) to identify students who have received additional degrees after their undergraduate degree. Creating this flag for additional degrees provided a better understanding of which undergraduate majors are more likely to receive additional degrees. Students who receive multiple degrees will be included within the aggregate undergraduate wage reports generated by the U.S. Census Bureau.

Create a File Layout and Data Dictionary

The UT System contract with the U.S. Census Bureau also requires a file layout and data dictionary, which provide detailed information on the variables within the dataset sent to the Census Bureau. (For an example of the file layout, please see Appendix A.) That detailed information yields an operationalized definition for each variable and its values. For example, UT provided a detailed definition for the variable referring to students who are First-Time-In-College (FTIC) or Transfer (TRAN), followed by the values within the variable and a definition for each value:

> **FTICTRAN –** This field is reported only for the first term that a student initially becomes a FTIC or TRAN student at an institution. Note: This field will not be populated for students whose FTIC or TRAN status was initiated prior to AY 2000, as the indicator was not available.

Value	Definition
First-Time-In-College (FTIC)	*First-Time-In-College (FTIC): A student who has never attended college or other postsecondary institution. Students who enter with early college credits (concurrent enrollment, dual credit, and advanced placement) are reported as first-time-entering college.*
Transfer (TRAN)	Transfer (TRAN): A student entering the reporting institution for the first time but who is known to have previously attended another postsecondary institution at the same level (e.g., undergraduate to undergraduate or graduate to graduate; not undergraduate to graduate).
(null)	Students who do not meet the criteria for the two above categories.

STEP 7: DATA PROCESSING BY THE U.S. CENSUS BUREAU

Once the U.S. Census Bureau has received data through a secured file transfer protocol (FTP), the agency links individual-level educational records (e.g., SSN) with a Protected Identification Key (PIK). The PIK provides a crosswalk between UT System graduates and UI wage records. After a PIK has been assigned, all SSNs are stripped from the dataset to reduce risks to individual privacy, after which the de-identified data are accessible to the LEHD economists. The LEHD program economists create earnings tables by CIP, which are referred to as Post-Secondary Employment Outcomes (PSEO).

DATA PRIVACY AT THE U.S. CENSUS BUREAU

One of the top priorities of the U.S. Census Bureau is to ensure individuals' confidentiality and privacy. To protect privacy, the U.S. Census Bureau uses formal privacy techniques (such as differential privacy) as well as other statistical disclosure limitation techniques to ensure individual earnings cannot be discovered from publicly available data.[viii] For example, the U.S. Census Bureau masks individuals' earnings using differential privacy, Laplacian noise, and a histogram approach to transform the data into de-identified earnings information.[ix]

There are several ways organizations can calculate annual earnings using UI wage records. Decisions such as when to measure students' first-year earnings and the number of quarters to use will impact the resulting calculation. The PSEO data from the U.S. Census Bureau uses graduates with three or more quarters of wage records within a calendar year to measure the typical annual earnings for students who graduated from UT System institutions. "First-year earnings" is defined as the earnings made in the calendar year following students' graduating year (i.e., first-year earnings for students graduating in the 2010-2011 academic year will be 2012 earnings). Using the calendar year following students' graduating year also allows future analytic efforts to integrate tax data, which are reported using the calendar year. For the UT System data, all earnings outcomes were adjusted for inflation using the Consumer Price Index for All Urban Consumers (CPI-U). UT System graduates were excluded from earnings tabulation when:

- Graduates had two or more quarters of wage records missing within a given year; or
- Graduates had earned less than the federal minimum wage for a calendar year (less than $13,195).

ALTERNATIVE APPROACHES TO MEASURING EARNINGS OUTCOMES

There are many ways to measure students' earnings outcomes. For example, some organizations use an "entering" approach in which earnings are calculated based on when the student enters the university and measured after a set period of time for each cohort (e.g., ten years after entering an institution). Most notably, the Department of Education's College Scorecard uses this approach to calculate institution-level earnings outcomes. The College Scorecard methodology accounts for both college completers and non-completers.

Other organizations use an "exit" approach to calculate earnings. When using the exiting approach, earnings are calculated after students receive their degree. Some organizations that use exit approaches allow students a set period of time (two to four quarters) to find employment. Other organizations use the calendar year following graduation to calculate annual earnings. For example, whether students graduate in May 2010 or December 2010, quarterly wages starting in the calendar year of 2011 will be used to calculate the students' first-year earnings.

Organizations can also differ on the number of quarterly UI wage records used to estimate annual earnings. Some use the best quarter (quarter with highest earnings), some use last quarter (fourth quarter), whereas other organizations use all four quarters. There is not a consensus on which approach is most appropriate. Using less than four quarters increases the institution's match rates and enables the institution to disclose earnings outcomes for more students and majors. However, annualizing one UI wage quarter might overestimate or underestimate students' actual annual earnings. Conversely, using four quarters-only method can be too restrictive by reducing the number of students included, resulting in non-disclosable (e.g., N/A or missing) earnings cells for certain programs of study.

Working with UT System staff, LEHD economists used UT System data to examine the various methodologies that have been used by various organizations. LEHD found very few differences when calculating annual earnings using three UI wage quarters instead of four UI wage quarters. This finding is beneficial for researchers because using three UI quarters increases the number of students found with earnings in each field of study. The LEHD economists also found that giving graduates time to find employment before measuring the UI wage quarters did not have a significant impact on earnings outcomes.

STEP 8: RECEIVE DATA FROM THE U.S. CENSUS BUREAU

The U.S. Census Bureau provided the UT System a table showing earnings information by CIP level. To ensure the accuracy and reliability of the data for academic programs with small numbers of graduates, Census used a panel cohort design to produce earnings outcomes by CIP category. For UT System graduates receiving PhD and master's degrees, a series of pooled five-year cohorts were implemented and earnings outcomes were produced at the 2-level CIP (e.g., five-year cohorts: 2001-2005; 2006-2010; 2011-2015; and 2-level CIP: 13-Education; 14-Engineering; 51-Health Professions and Related Programs). For graduates receiving bachelor's and professional degrees, a series of panels of three-year cohorts was implemented, and earnings outcomes were produced at the 4-level CIP (e.g., three-year cohorts: 2001-2003; 2004-2006; 2007-2009; 2010-2012; 2013-2015; and 4-level CIP: 13.03-Curriculum and Instruction; 14.08-Civil Engineering; 51.02-Communication Disorders Sciences and Services). Based on work conducted by economists at the U.S. Census Bureau, cells with a protected count of less than 30 individuals are not published due to concerns about data quality.

Once the Census approved the earnings tabulations, the data were shared with the UT System 30 days prior to their public release. At that time, the aggregated data were placed on the LEHD[x] and PSEO[xi] websites. The data files are downloadable in a CSV format or ZIP files that contain data and variable descriptions. The earnings tabulations released to the LEHD and PSEO websites are identical to the earnings tabulations the UT System received as part of the collaboration. Table 3 provides a list of variables that are found in the national earnings PSEO data file.

Table 3. List of Variables in the PSEO Data File

Variable	Label
institution_id	Office of Post-Secondary Education ID
institution_name	Name of Institution
deglevl_code	Degree Level Code
deglevl	Degree Level Label
degcip_4dig	Degree Classification of Instructional Program (CIP) code (4-digit)
ciptitle	Description of Degree CIP
grad_cohort	First Year of Graduation Cohort
grad_cohort_label	Graduation Cohort Label
year_postgrad	Year After Graduation
p25_earnings	25th Percentile of Earnings
p50_earnings	50th Percentile of Earnings
p75_earnings	75th Percentile of Earnings
cellcount	Cell Count

cell_suppressed	Flag for Cell Suppression
state	State Code
system	Incoming Education System
first_release	Initial Release Date
last_update	Most Recent Update Date
cpi_reportyear	Earnings Reported in Dollars of This CPI Year

Each row in the data file represents a unique combination of the institution, degree level, CIP code (either 2- or 4-level), pooled graduating cohort, and earnings one-, five-, and ten-years after graduation. Each row contains earnings at the 25th, 50th, and 75th percentiles, along with the number of students in each cohort grouping.

STEP 9: DISSEMINATING DATA ON THE ECONOMIC VALUE OF COMPLETING A DEGREE

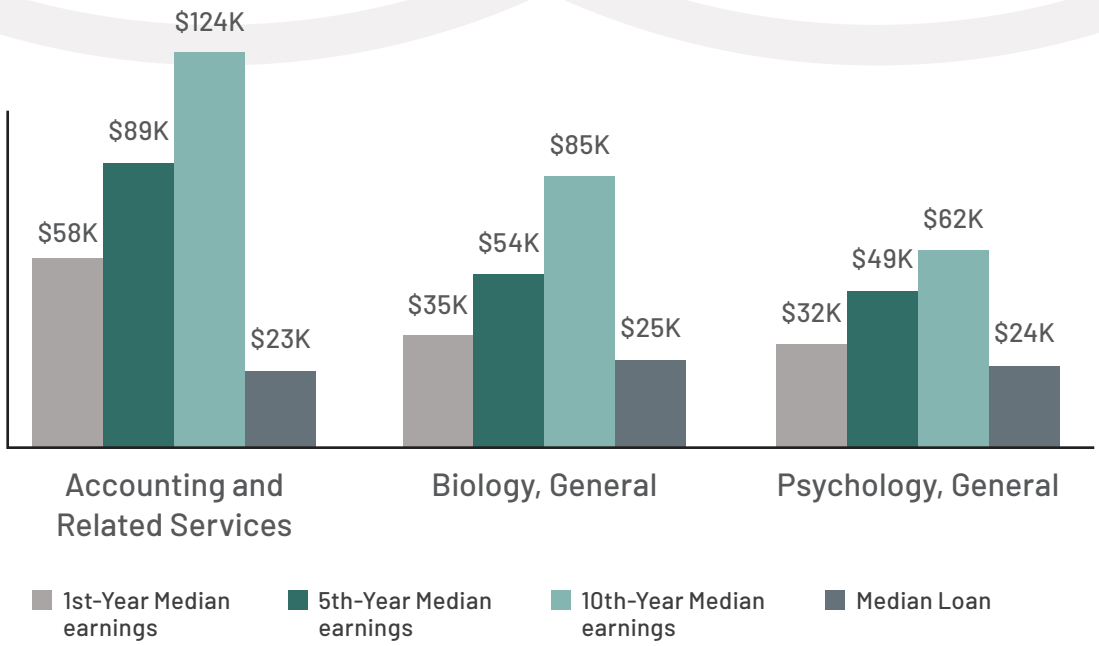
Postsecondary education is a significant investment of time, money, and other resources. Though the value of a college education reaches far beyond earnings, the financial commitment makes increased earnings an important outcome of earning a degree.

U.S. Census UI wage records allow for the examination of national wage records for graduates who entered the workforce. The UT System built seekUT®, a free online proprietary tool[xii] to provide students and parents information on earnings and student debt by major. seekUT® presents straightforward and understandable data on what UT graduates are earning and can be sorted by campus and major, one-, five-, and ten-years after graduation after graduation. The tool initially used only Texas UI wage records, which were limited to graduates who remained in the state of Texas. U.S. Census UI wage records allow the tool to account for the majority of all graduates who enter the workforce.

Combining the PSEO data with data held by the UT System means seekUT® also shows which industries employ UT graduates in Texas alongside predicted job openings. Additionally, seekUT® informs users of the median student loan debt at graduation for those who took out loans, the percentage of students who borrowed, and the estimated monthly loan payment compared to median monthly earnings.

Data are available for approximately 300 degree majors at the bachelor's, master's, doctoral, and professional levels at UT institutions. seekUT® makes data based on UT System graduates available to stakeholders, including prospective and current students, institutional leadership, and policymakers.

Graph 1. Median Earnings of UT System Graduates in Selected Fields, 2016 Dollars Based on Census Bureau Tabulations



Unanswered Questions: Limitations in the PSEO Data Files

The PSEO national earnings tables are very helpful in understanding graduates' earning potential by CIP code. However, the data will ***not*** answer the following questions:

- What are the employment rates for students by CIP code?
- Where are graduates working (city/state, company name, type of company)?
- What kinds of occupations do graduates have within their first year of employment?
- Are graduates working within their field of study?
- How many hours are graduates working per week, and what is their employment status (full-time, part-time, choose not to work)?

Table 4. Number of Rows Suppressed within the PSEO Data File

Degree Level	Number of Rows	Number of Suppressed Rows	Percent Suppressed
Baccalaureate	4,144	1,480	35.7%
Master's	1,021	414	40.5%
PhD	453	242	53.4%
Professional	67	10	14.9%
Total	**5,685**	**2,146**	**37.7%**

Other limitations to the PSEO data file include:

- Earnings reported at the 2-digit CIP code level are not as specific as data aggregated at the 4 or 6-digit CIP level. Institutions need to decide how meaningful it is to produce earnings at the 2-digit CIP code, and whether the 2-digit CIP will be informative enough for stakeholders. For example, the 2-digit CIP code for Engineering (31) has 46 different types of engineering programs nested within it, which limits the level of specificity that the code can provide to stakeholders. A doctoral student obtaining a PhD in chemical engineering might find the information on all engineering fields less compelling than earnings data for chemical engineering, specifically. Institutions need to weigh the benefits of specificity against the challenges of small cell sizes that lead to data suppression.
- Data has a lag time, as it is only expected to be updated every three to five years. Because of this lag, UT System wage data is from 2016. Institutions need to ascertain how often the data file will be updated.

These data limitations are quite common when using state-level UI wage records as well. Also, due to data quality policies with respect to disclosure, some CIP codes may not include enough graduates to allow their aggregate earnings data to be disclosed. Analysts should examine the extent of cell suppression within their institution or system.

For example, Table 4 shows the number of CIP codes that are suppressed for different degree levels in the PSEO data provided to the UT System. Overall, the PSEO earnings table for the UT System contains 5,685 rows. Even in the UT System, where institutions have large student populations and produce thousands of graduates each year, more than one-third (37.7%) of the degree level, program, and institution combinations were suppressed due to small cell size counts which generated concerns about the reliability of the resulting earnings calculations. PhD programs have the highest suppression (53.4%) and professional programs have the least suppression (14.9%). Smaller institutions interested in pursuing a collaboration with the U.S. Census Bureau might be at a disadvantage when reporting earnings outcomes by field of study due to the risk that very few programs will have disclosable earnings outcomes. However, smaller institutions could consider aggregating more years of data to increase cell sizes.

Additional U.S. Census Bureau Efforts Using Higher Education Data

Graduates' aggregate earnings produced by the PSEO provide a deeper insight into how students are succeeding in the workforce across state lines. This information is just the tip of iceberg for how data can inform prospective and current students about the earnings premium associated with completing a college degree.

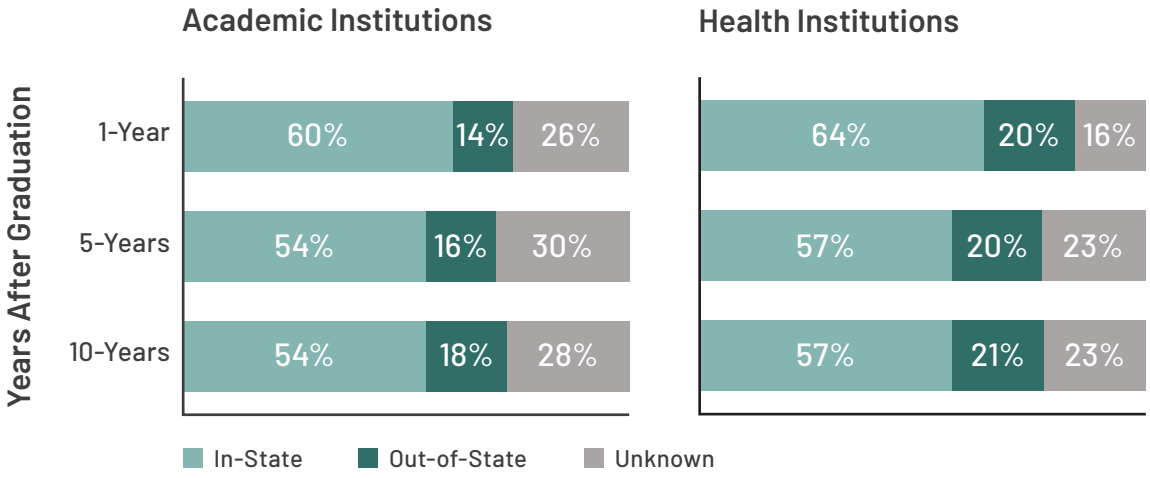
Researchers might be able to answer additional questions with PSEO data. For example, what percentage of graduates stay in Texas and what percentage of graduates move out of the state? When graduates do migrate, what regions of the country are they migrating to? Does relocation vary by the number of years within the workforce by campus, and by degree type?

PSEO has developed Employment Flow tables[xiii] to answer these types of questions about mobility. The tables show employment industry and geographic location for graduates by institution, degree level, degree field, and graduation cohort. They classify graduates into three buckets: found working in-state, found working out-of-state, and unknown/unclassified (defined as graduates not found in the UI wage record data).

GRADUATES' AGGREGATE EARNINGS PRODUCED BY THE PSEO PROVIDE A DEEPER INSIGHT INTO HOW STUDENTS ARE SUCCEEDING IN THE WORKFORCE ACROSS STATE LINES.

Using these data, the UT System found that the majority of their graduates from academic and health institutions stay within the state of Texas when entering the workforce (Graph 2). Over time, the percentage of graduates working within the state declines, but only by six to seven percentage points. This decline occurs because some graduates become employed out of state and some can no longer be located in the UI wage records. By the tenth year, about one in four students from academic and health institutions are labeled as unknown/unclassified.

Graph 2. Share of UT System Graduates Working In- and Outside of Texas



When solely focusing on graduates who do leave the state, the Employment Flow tables indicate that the most common destination for UT System graduates (22.8 to 25.3 percent) is the Pacific Division (Arkansas, Washington, Oregon, California, and Hawaii) (Table 5). Graduates were least likely to migrate to New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont). This information can inform students and state policymakers of the patterns of migrations by degree level and program type. Using these results, the UT System will be able to highlight how it contributes to state and regional economies.

Table 5. Where do UT System Graduates who Leave the State Go?

Census Division	States	1 Year		5 Years		10 Years	
		%	#	%	#	%	#
Pacific Division	AK, WA, OR, CA, HI	22.8%	9,551	23.3%	8,706	25.3%	5,030
South Atlantic Division	DE, DC, FL, GA, MD, NC, SC, VA, WV	17.8%	7,474	17.6%	6,591	17.8%	3,532
Middle Atlantic Division	NY, NJ, PA	14.2%	5,955	14.9%	5,583	12.8%	2,532
East North Central Division	WI, IL, IN, MI, OH	12.5%	5,222	12.2%	4,570	11.6%	2,306
Mountain Division	AZ, CO, ID, NM, MT, UT, NV, WY	11.2%	4,705	11.3%	4,225	12.1%	2,405
West South Central Division (Without Texas)	OK, AR, LA	8.2%	3,429	7.3%	2,750	6.6%	1,300
West North Central Division	ND, SD, MN, NE, IA, KS, MO	6.4%	2,698	6.2%	2,334	5.8%	1,152
East South Central Division	KY, TN, MS, AL	4.8%	2,022	4.6%	1,734	4.7%	935
New England Division	CT, ME, MA, NH, RI, VT	2.0%	849	2.5%	949	3.3%	662

Additional Federal-Level Wage Data Sources to Consider

For states or institutions lacking the capacity or political will necessary to partner with the U.S. Census Bureau, there are alternative ways to gain access to national earnings data, albeit data much more limited than PSEO. For instance, states voluntarily share UI wage records through the Department of Labor's State Wage Interchange System (SWIS),[xiv] which replaces similar data-sharing agreements known as WRIS and WRIS2. States that previously opted into WRIS or WRIS2 must submit a new agreement to benefit from SWIS data-sharing. The completeness of the data a state receives therefore depends upon how many others choose to participate.

As of February 2018, the Employment and Training Administration has temporarily suspended the FEDES system—which provides data on employment outcomes of federal employees to supplement the information in state-based exchanges—in order to conduct an assessment of the system's long-term feasibility.

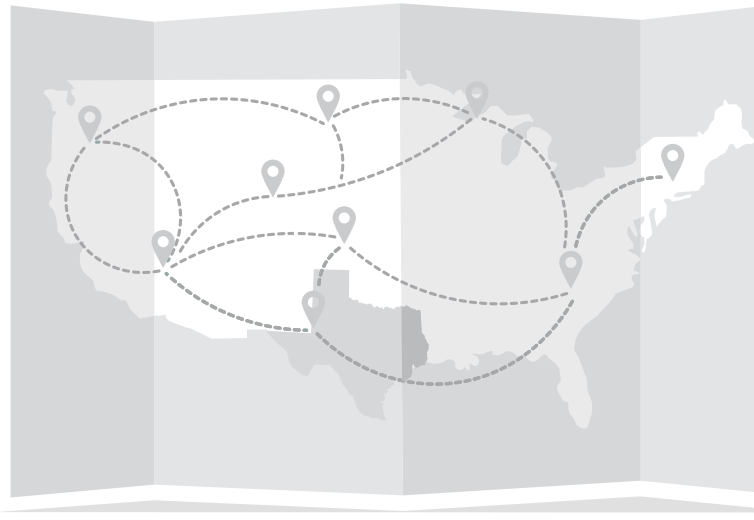
Even though alternative sources of earnings data exist, access to them is limited based on institution type and intended purposes.[xv] States are only eligible to access the SWIS clearinghouse for Departments of Labor and Education reporting requirements associated with the Workforce Innovation and Opportunity Act (WIOA). For purposes of research and evaluation, states participating in SWIS must provide explicit consent to allow data sharing. Because of these restrictions, SWIS data are not accessible for the consumer information purposes that many two-year and four-year higher education institutions would like to pursue, making the U.S. Census Bureau collaboration particularly valuable. SWIS data are much more limited than what PSEO can provide.

Conclusion

The collaboration between the U.S. Census Bureau and the UT System is an excellent step toward providing students, policymakers, and institutions with robust data to inform decision-making. This agreement serves as a critical test case for how the federal government can partner with systems or institutions to build meaningful data-use tools that answer real questions for real decision-makers. The partnership also offers a secure and effective way to demonstrate the value of higher education for individuals and local, state, and national economies.

While this paper offers other systems or institutions a guide for building similar partnerships with the U.S. Census Bureau, relying solely on a state-by-state approach is unwieldy, inefficient, and leaves students in non-participating states to make choices with limited information. A federal solution is needed to expand the value demonstrated by the UT-Census partnership so that all institutions of higher education—both universities and community colleges—can gain access to earnings outcomes for their graduates, whether they work in-state or out-of-state. This data partnership and the seekUT® tool have shown the power of data matching. Policymakers should build on this success by developing a federal student-level data network that encompasses all 50 states.

> **A FEDERAL SOLUTION IS NEEDED TO EXPAND THE VALUE DEMONSTRATED BY THE UT-CENSUS PARTNERSHIP.**



Appendix A
Data Provided to the U.S. Census Bureau

Column	Description	Field	Type	Length
1	UT Person Indicator Number	UTID	Numeric	8
2	Student Identification Number	STUDID	Character	9
3	Last Name	LNAME	Character	50
4	First Name	FNAME	Character	30
5	Middle Initial	MI	Character	1
6	Gender	GENDER	Character	1
7	Ethnic Origin and Race	ETHRACE	Character	45
8	Date of Birth	DOB	Character	8
9	Residence (State or Country)	RESID	Character	60
10	Foreign Student Indicator	FOREIGN	Character	1
11	Academic Year	AY	Numeric	8
12	Academic Term Number	TERM	Numeric	8
13	Institution Code	FICE	Numeric	8
14	Institution Type	INSTTYPE	Character	25
15	Level	LEVEL	Character	50
16	Entering Status	FTICTRAN	Character	15
17	Restricted Program Admission	RESTPROG	Character	150
18	Major	MAJCIP	Character	7
19	Major STEM/Non-STEM Indicator	MAJSTEM	Character	8
20	Level of Degree or Certificate Conferred	DEGLEVL	Character	30
21	Degree Type	DEGTYPE	Character	10
22	Degree CIP	DEGCIP	Character	7
23	Degree STEM/Non-STEM Indicator	DEGSTEM	Character	8
24	Continued Enrollment Indicator	CONTED	Character	4

Appendix B
Forming a Partnership with the U.S. Census Bureau to Measure National Postsecondary Earnings Outcomes: A Checklist

- ☐ **Step 1: Define Your Project Purpose:**
  - ☐ Identify goals of partnership and how they align with our organizational priorities.
  - ☐ Identify data uses that are informed by these goals and priorities.
  - ☐ Develop a work plan with reasonable timeline, funding, and staffing needs.
- ☐ **Step 2: Build Project Buy-in Among Organizational Leadership:**
  - ☐ Ensure senior leadership in your organizations understands project and potential risks.
  - ☐ Inform leadership of the following, at a minimum: 1) protected FERPA data will be shared and retained by the U.S. Census Bureau for duration of project; 2) the data will be publicly available in aggregate form through the PSEO data tool and download; and 3) the media and others may misinterpret the data once it is published, and creating a response plan in advance will be advantageous.
- ☐ **Step 3: Secure Approval from Legal Counsel:**
  - ☐ Include legal counsel early in process, including discussing the required FERPA exception and addressing any concerns this creates.
  - ☐ Maintain open lines of communication with legal staff throughout the project.
- ☐ **Step 4: Contact the U.S. Census Bureau:**
  - ☐ Contact CES.PSEO.Feedback@census.gov with inquiries. See the LEHD website for more information: https://lehd.ces.census.gov/contact.html#partnerwithus.
  - ☐ Review boilerplate contract from Census and coordinate with your organization's Legal Counsel to suggest any needed amendments.
- ☐ **Step 5: Develop a Collaborative Statement of Work:**
  - ☐ Prepare background narrative.
  - ☐ Prepare narrative for description of primary tasks.
- ☐ **Step 6: Prepare Data:**
  - ☐ Determine the variables and years of data to share in order to achieve project goals.

- ☐ Evaluate the data reliability and develop procedures to address data issues, including social security number issues, data missingness, and how to handle students who receive multiple degrees, among other problems that may emerge.
- ☐ Create a file layout and data dictionary.
- ☐ Share data file, file layout, and data dictionary with Census Bureau, and provide any additional expertise about data infrastructure to Census Bureau staff throughout data processing.

☐ **Step 7: Receive data from the Census Bureau.**

☐ **Step 8: Disseminate the data on the economic value of a college degree:**

- ☐ Prepare clear, concise materials tailored to specific target markets including students and parents, industry groups, the media, policymakers, and higher education administrators.
- ☐ Consider doing an institutional press release and talking with local media outlets to help spread the word about your work.

Endnotes

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xv. The tool was initially created using Texas UI wage records, which were limited only to graduates who remained in the state of Texas. U.S. Census UI wage records allows for the tool to account for the majority of all graduates who enter the workforce.