

– Explanatory Visualizations and Analysis

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❖ Objective and Communication Plan

The objective of this milestone is to analyze 10 years (2010–2022) of College Scorecard data to study how tuition, debt, and earnings have evolved and to compare ROI across institution types

This milestone uses both static and animated visualizations, developed in R Studio and Tableau, to clearly present data-driven insights and highlight key financial patterns across institution types.

❖ Dataset Description and Preparation

The dataset comes from the **U.S. Department of Education's College Scorecard**, which contains annual institution-level data on tuition, cost of attendance, debt, and graduate earnings.

For this project, the files **MERGED2010_11_PP** through **MERGED2021_22_PP** were merged to create a single dataset covering **2010–2022**.

This period allows us to explore how college costs, debt, and post-graduation earnings have changed over time.

❖ Main Variables Used

- Institution Name (INSTNM)
- Region (REGION)
- Control Type (Public, Private Nonprofit, Private For-Profit)
- Tuition & Total Cost (TUITIONFEE_IN, COSTT4_A)
- Median Debt (DEBT_MDN)
- Median Earnings After 10 Years (MD_EARN_WNE_P10)
- ROI Proxy = Earnings /Debt

❖ Data Cleaning Steps

1. Merged yearly files (2010–2022) using R Studio.
2. Replaced missing or “Privacy Suppressed” values with NA.
3. Converted all numeric columns (cost, debt, earnings).
4. Created new columns for **ROI** and **Tuition Gap**.
5. Labeled institution types (Public, Private Nonprofit, Private For-Profit).
6. Saved final dataset as *scorecard_2010_2022_clean.csv* for Tableau analysis.

❖ **Tools Used:**

- *R Studio* – Data cleaning and animated visuals (ggplot2, gganimate)
- *Tableau* – Explanatory dashboards and comparative visuals

Source: U.S. Department of Education – [College Scorecard Data](#)

Explanatory Visualizations

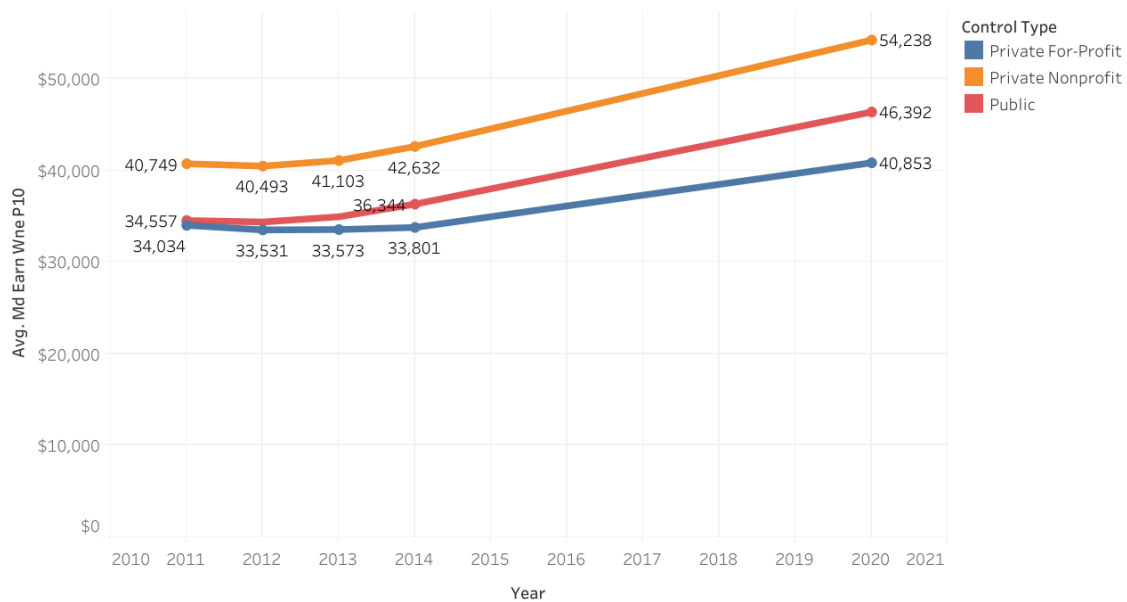
The following visuals summarize the main financial patterns and outcomes found in the College Scorecard dataset.

Chart 1: Median Earnings 10 Years After Graduation (2010–2022)

Created In: Tableau

Goal: Show how graduates' median earnings changed over time by institution type.

Median Earnings 10 Years After Graduation (2010–2022)



Insights:

This line chart shows how graduates' median earnings 10 years after graduation changed between 2010 and 2022 for different types of institutions.

The results indicate a steady increase in earnings across all three categories.

Private Nonprofit institutions show the highest earnings overall, Public institutions follow with moderate earnings and lower tuition costs, while Private For-Profit institutions lag behind with slower growth.

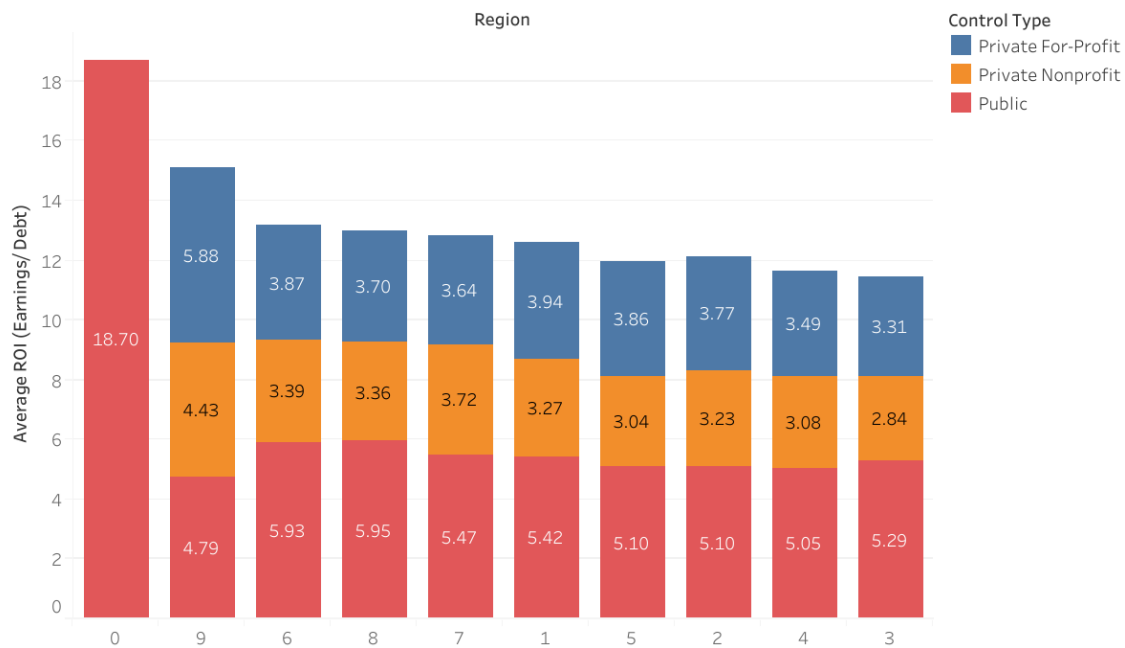
This suggests that institutional type significantly influences post-graduation financial outcomes.

Chart 2: ROI (Earnings / Debt) by Region and Institution Type (2010–2022)

Created In: Tableau

Goal: Compare regional differences in ROI to evaluate financial return for students.

ROI (Earnings / Debt) by Region and Institution Type (2010–2022)



Insights:

This stacked bar chart compares Return on Investment (ROI) across U.S. regions for Public, Private Nonprofit, and Private For-Profit institutions. Public institutions generally show the strongest ROI, especially in Region 0, indicating high returns relative to debt.

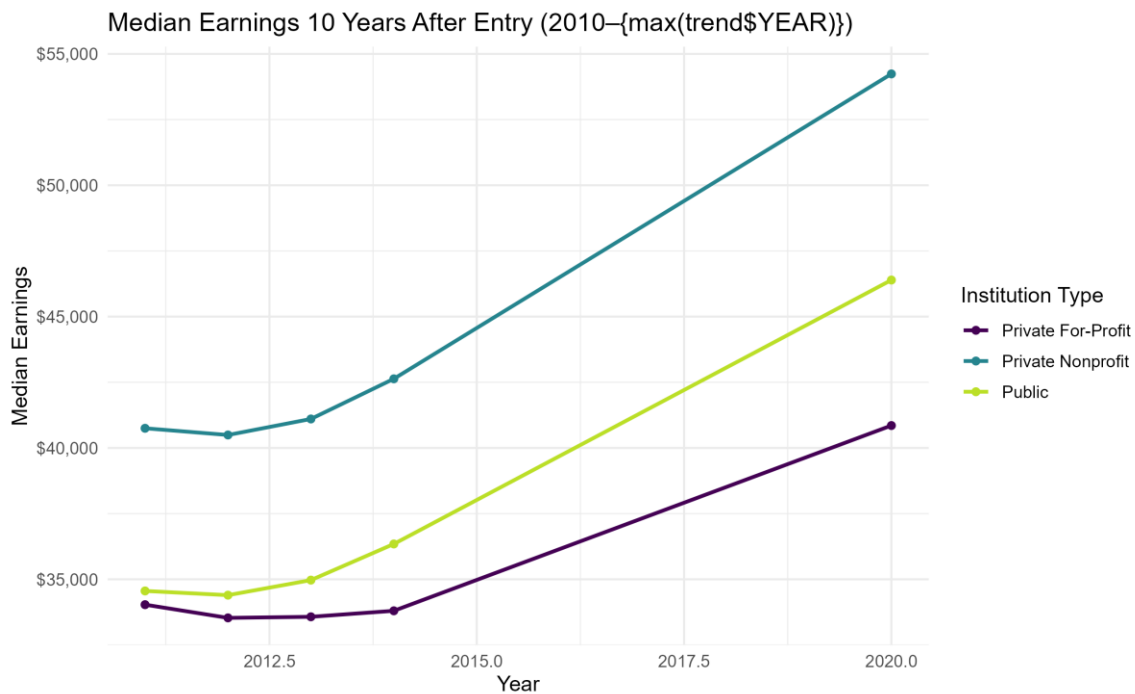
Private Nonprofit institutions show moderate ROI values because of higher tuition costs. while Private For-Profit institutions consistently record the lowest ROI.

This suggests that public education offers the best value for cost in most regions across the United States.

Chart 3: Median Earnings 10 Years After Entry (R Studio Static Visualization)

Created In: R Studio (ggplot2)

Goal: Visualize the relationship between average cost and post-graduate earnings.



Insights:

This static visualization from R Studio displays the relationship between institution type and median earnings using the same Scorecard dataset.

The upward slope across all categories shows that graduates from all institutions earn progressively higher incomes over time.

The chart provides a clean numeric representation of overall growth patterns that support the Tableau trends.

Chart 4: Animated Trend of Median Earnings (2010–2022).

Created In: R Studio (gganimate)

Goal: Display temporal changes in median earnings across years as an animation.

View Animated Version Online:

[Divyaraj M3 Trend.gif](#)

Insights:

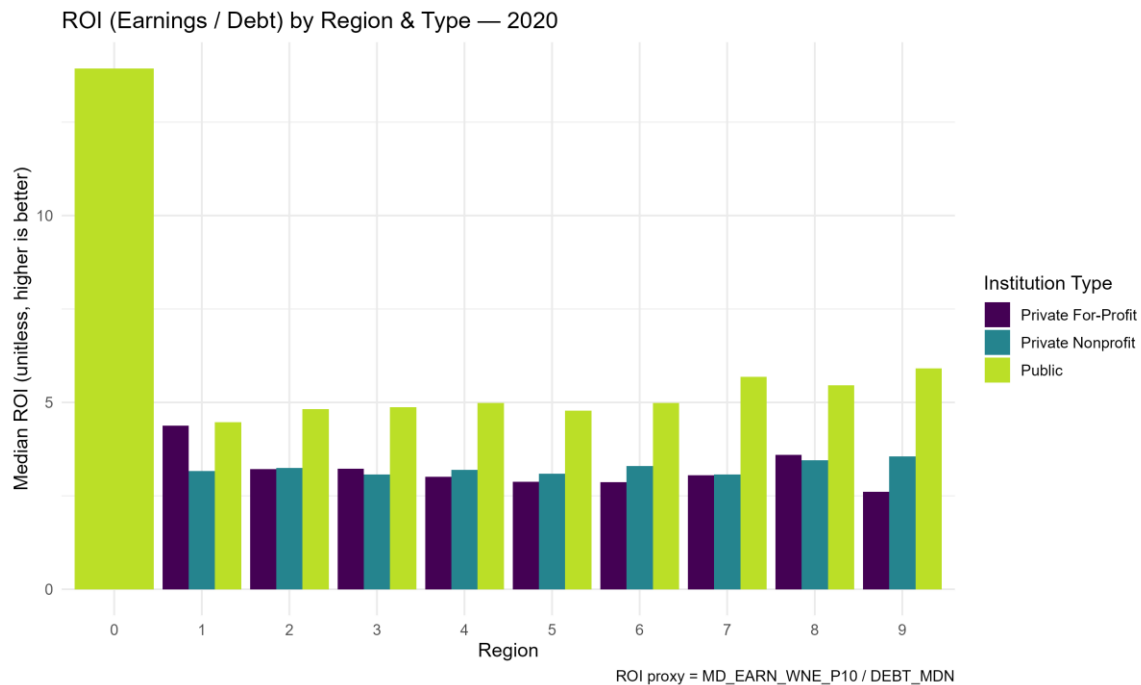
The animated version of the median earnings trend, created in R Studio using gganimate, provides a dynamic perspective of how earnings evolved year by year.

The animation emphasizes continuous improvement in graduate outcomes, particularly for Private Nonprofit and Public institutions.

It effectively illustrates temporal changes and makes the overall upward trend more intuitive.

Chart 5: ROI (Earnings / Debt) by Region (R Studio Version)

Created In: R Studio (ggplot2)



This R Studio bar chart replicates the ROI comparison from Tableau but applies a different color palette for visual emphasis.

Once again, Public institutions maintain the best ROI outcomes, while Private For-Profit institutions show limited financial efficiency.

The consistency between this chart and Tableau's version validates the accuracy and reliability of the trend observed.

❖ Key Insights and Trends

1. Graduate earnings increased steadily from 2010–2022 across all institution types.
2. Public institutions provide the strongest ROI because of lower tuition and manageable debt.
3. Private Nonprofit institutions lead in earnings but carry higher financial risk from student loans.
4. Private For-Profit institutions consistently show weaker ROI outcomes.
5. Regional variations reveal differences in affordability and overall education value.

Conclusion

The analysis of ten years of College Scorecard data provides meaningful insight into the cost-benefit dynamics of higher education in the United States.

Over time, graduates' earnings have steadily increased, but ROI varies significantly by institution type and region.

The findings indicate that while higher tuition may correlate with higher earnings, the most sustainable and affordable educational investments are typically found within public institutions.