What is Research?

The Oxford Dictionary defines Research as…

"The systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions."

Two Fundamental Types of Research – Basic Research & Applied Research

Basic Research - a type of investigation focused on improving the understanding of a particular phenomenon, study or law of nature.

- Advances fundamental knowledge about the world
- Basic Research often provides a foundation for applied research

Applied Research – is a type of investigation looking to find practical solutions for existing problems.

Both types of research can generate economic value.

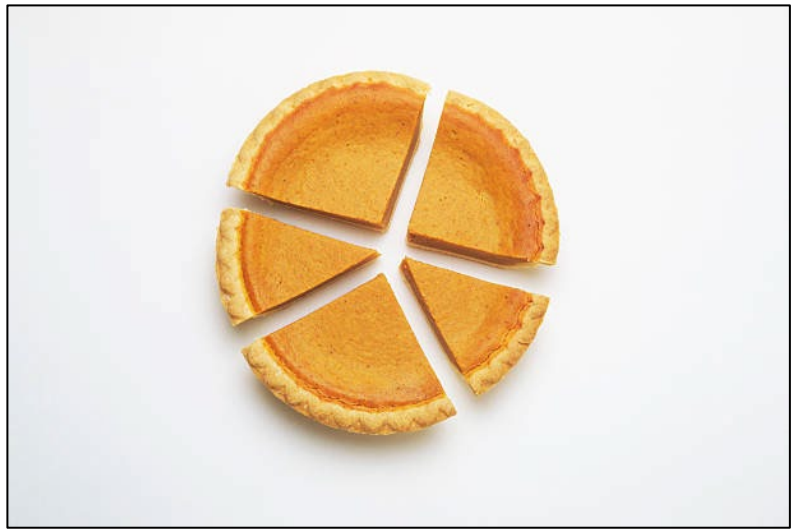
Economics of Research

- Two key ways to think about the Economics of Research – Impacts and Value
  - Regional Economic Impacts
    - Two key metrics: Employment and Sales
  - Economic Valuation
    - Benefit-Cost Analysis – What are the Net Benefits from a given alternative
- Two very different approaches that are not directly comparable
  - Each valuable for their own purposes
- For the most part, I will focus on Economic Value, and leave Economic Impacts to Wayne

Regional Economic Impacts vs. Economic Value

Regional Economic Impacts

- Created by spending in a particular area
- The decision of where and how much to spend creates economic activity (jobs, income)
- Focus is on how the pie is sliced



Economic Value

- A measure of the benefit provided by a good or service to an economic agent.
- Economic Value is NOT created by spending… Value is created by making people better off
- Focus is on the size of the pie

Measuring Economic Value - Benefit-Cost Analysis

- A tool used by economists to evaluate which alternative is “worth it”.
- Sounds simple… Simply add up the benefits and costs of each alternative, and implement the alternative with the greatest net benefits (benefits minus costs)
- **Challenge:** Need to convert benefits and costs into standard measure in order to calculate net benefits
  - Monetary measure is convenient measure… But many benefits (as well as costs) are difficult to monetize.
- **Challenge:** Benefits & costs occur at different times
  - Many projects have significant financial outlays at beginning, and then generate stream of benefits in the future
- **Challenge:** Projects involve risk and/or uncertainty
  - Risk = probability of outcomes is known
  - Uncertainty = probability of outcome is unknown
- **Challenge:** Typically abstracts from issues of equity
  - Who realizes benefits and who experiences costs are of increasing societal concern

Benefits TO MORGAN from the University Research Enterprise

Direct Costs

Revenue for the University – Spent as detailed in the proposal to support/researcher salary, student stipends, etc.

Easy to calculate – already in monetary terms

Facilities & Administrative Costs

Revenue for the University – Can be spent as university chooses to further a broad set of objectives

Easy to calculate – already in monetary terms

Brand/Reputation/Prestige/Quality leads to…

- increased student applications
- higher quality student applications
- increased faculty applications for positions
- higher quality faculty
- higher student/faculty/staff morale
- increased philanthropic investment, endowment
- increased investment by government (Federal, State, local)
- increased private sector engagement

Can be difficult to calculate – often not in monetary terms

The Value of a Brand

- The idea of a brand is intangible – not directly related to sales/income/assets, but still measurable
- Brand value typically ranges from between 10% and 50% of market value of the company

Market-Based Valuation of Top Companies

amazon

$350 billion

Google

$263 billion

$355 billion

Microsoft

$184 billion

Walmart

Save money. Live better.

$111 billion

Source: https://www.statista.com/statistics/264875/brand-value-of-the-25-most-valuable-brands/

What is the Value of a University Brand?

- I've done an extensive review, and have not identified any sources estimating the value of a University brand
- Often, when people talk about the value of a university's name, the discussion centers around endowment.

HARVARD UNIVERSITY

$42 billion

Stanford University

$29 billion

Massachusetts Institute of Technology

$18 billion

Yale University

$31 billion

PRINCETON UNIVERSITY

$26 billion

Total Endowment for top 10 HBCUs is about $2 billion

Source: https://www.usnews.com/education/best-colleges/the-short-list-college/articles/10-universities-with-the-biggest-endowments

Costs TO MORGAN from the University Research Enterprise

Opportunity Costs – A KEY concept in Economics

→ The Opportunity Cost of an alternative is the VALUE of the foregone alternative that could have been achieved by allocating scarce resources (time, money) in a different way

Research Administration

- Expenditures here could be used to further non-research initiatives… *but also consider that much of these expenses are covered by F&A costs*

Faculty Time/Effort

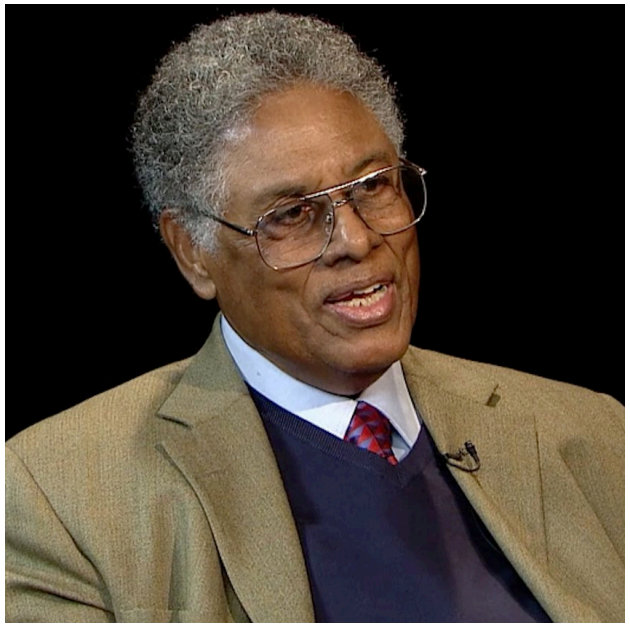
- Effort spent on research is effort that cannot be spent on teaching and non-research initiatives… *also but consider that faculty course "buyouts" through grant funding enable the hiring of another instructor*

Students

- Increased allocation of faculty time could fewer tenured faculty serving as instructors… *but also consider that students benefit from synergies between teaching & research*

To Summarize…

- I've discussed some of the benefits and costs associated with the University Research Enterprise, from the perspective of the University
- A full Benefit-Cost Analysis is beyond the scope of this presentation



Dr. Thomas Sowell - Stanford University

And even with a comprehensive Benefit-Cost Analysis…

"There are no solutions, only tradeoffs"

Thomas Sowell, Stanford University

Just because an alternative has the greatest net benefits (benefit-costs), doesn't mean it should be chosen

→ Equity matters!

→ Who receives benefits and who realizes costs matters!

Circling Back - Top 5 Universities by Endowment

HARVARD UNIVERSITY

$42 billion

Stanford University

$29 billion

Massachusetts Institute of Technology

$18 billion

Yale University

$31 billion

PRINCETON UNIVERSITY

$26 billion

Source: https://www.usnews.com/education/best-colleges/the-short-list-college/articles/10-universities-with-the-biggest-endowments

Top 5 Universities in the U.S. by Endowment… And their respective Research Rankings

HARVARD UNIVERSITY

1

Stanford University

2

Massachusetts Institute of Technology

3

Yale University

6

PRINCETON UNIVERSITY

14

Source: https://www.natureindex.com/institution-outputs/generate/all/global/all

Economic Value of Research – A Societal Perspective

- Still approaching this from a Benefit-Cost Perspective.
  - But we need to broaden our perspective
  - Consider benefits to society, rather than just to Morgan

- Consider Government – Funded Research
  - Benefits: Basic and Applied Research generates knowledge that improves lives
  - Costs: Research Expenditures from a societal perspective have opportunity costs
    - These funds could be invested in other ways

- I'll close by highlighting two examples of societal research benefits
  - Health Care (Think NIH, Morgan ASCEND, & Morgan Neuroscience)
  - Earth Science (Think Morgan GESTAR II)

Example 1 – Benefits of Health Care Research

- **Benefit -** The direct cost savings arising from research that lead to…
  - new, less-costly treatments, or
  - new developments such as vaccines that reduce the number of patients needing costly treatment

- **Benefit -** The value to the economy of a healthy workforce. Indirect cost savings arise when better health leads to the avoidance of lost production.

- **Benefit -** Measure the value to society of the health gain, by estimating the "value of a statistical life"
  - Seeks to get at the value of reduced mortality/morbidity risk
  - EPA uses $7.4 million as the value of a statistical life

Example – COVID Vaccines:

- Using all three approaches described above, Padula et al. 2021 estimate the economic value of vaccines in the U.S. to be $48 billion through August 2021

Example 2 – Benefits of Earth Science Research

- **Benefit** – Cost Savings and Harm Avoidance
  - a) The U.S. Agriculture industry sees $460 million in annual savings from accurate El Nino and La Nina forecasting
  - b) GOES-R satellite system helps predict local weather events (thunderstorms, tornadoes, flash floods, fog, etc.
    1) Estimated savings of $5. 1 billion ($1.3 billion for energy providers, $265 million for airline industry)

- **Benefit** – Consumer Willingness to Pay (WTP) for Product
  - a) LandSat satellite imagery is used in Google Earth and many other applications; this service is provided for free by the USGS;
  - b) U.S. and International users have an aggregate WTP for the (free) LandSat Imagery of $3.5 billion annually

Benefit – Mortality and Morbidity Risk Reduction

- a) Since 1977, investments in R&D at U.S. DOE Office of Fossil Energy have generated $1.3 trillion in public health benefits from reductions in sulfur dioxide and nitrogen oxide emissions

Source: https://www.agu.org/Share-and-Advocate/Share/Policymakers/Position-Statements/Fact-Sheet-Economic-Value

Thank you!

MORGAN™

PATUXENT ENVIRONMENTAL AND
AQUATIC RESEARCH LABORATORY