Using Physics to Understand Higher Education

Presented by David Longanecker to the OCCA
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Physics Lesson #1: String Theory

- You all know this new theory: “our most promising candidate for understanding quantum gravity”
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- Is This a Public Good or A Private Good?
- What Is Quality -- Zen And The Art of Motorcycle Maintenance?
  “You know what it is, but you don’t know what it is. But, if you don’t know what it is, then for all practical purposes it doesn’t exist. But, it does exist . . . So round and round you go, spinning mental wheels and nowhere finding any place to get traction. What the hell is Quality? What IS it?” (paraphrased)
  Why don’t more students succeed?
  Why do costs differ so much?
Physics Lesson #2: The Black Hole

- You may know this theory better than String Theory.
- Actually String Theory is just one way of understanding the concept of Black Holes
Lesson #2: The Black Hole – from our perspective

Just look at our diminishing share of state resources

State appropriations for higher education as share of state expenditures

Maintaining 7.3% high point: $21 billion


Author’s calculations based on data from Center for Higher Education and Educational Finance; Bureau of the Census, Department of Commerce.
Lesson #2: The Black Hole – from their perspective

State & local tax appropriations per student, in constant 2001 dollars, FY1970 – FY2001

SOURCE NOTES:
- Finance data are from Grapevine and reflect appropriations of state and local tax funds for operating expenses of higher education. Dollars adjusted with CPI-U.
- FTE are from IPEDS as reported in the NCES Digest of Education Statistics 2002, Table 200, and reflect enrollment at all levels (undergraduate, graduate, and first-professional) in degree-granting public 2-year and 4-year institutions.

Total Educational Funding per FTE, Percent Change by State, FY 1991-2003

Notes: Total Educational Funding is the sum of Educational Appropriations plus Net Tuition Revenue. Constant 2003 dollars adjusted by SHEEO HECA.

Source: SHEEO SHEF
Over the long term, state funding kept pace with enrollment and inflation as measured by the CPI.

The level of support has varied from year to year, at times dramatically.

Sources: Enrollment data from NCES “Digest of Education Statistics.” Funding data from “Grapevine” database of state tax support for higher education, Center for the Study of Education Policy, Illinois State University.
Physics Lesson #4: Wave Theory
Physics Lesson #4: Wave Theory: The Perfect Storm

The Confluence of Three Huge Waves

Rising Demand for Higher Education

The Change in Who You Are Serving

Constrained Finances
The First Wave – Rising Demand

Expected higher ed growth over the next decade -- probably about 20%

On top of 4-6% annual growth over the last 3 years.

WHY?
What’s pushing the wave?

1. Simple Demographics


- More high school grads: Up about 15% over last decade.

2. Policy Goal – Greater post-secondary participation

- High school grad rates are holding steady (2001-2002) *(Measuring Up 2004: C on Preparation)*
  - Oregon – 68.8% (66.6% in ’98)
  - WICHE West – 70.2%
  - U.S. – 62.0%

- But a smaller percentage are going on to college *(Measuring Up 2002: B-)*
  - Oregon – 50.3% (down from 53.8% in ’92)
  - WICHE West – 50.3%

- Associate degree production (per 100 H.S. grads)
  - Oregon – 20.1%
  - WICHE West – 22.6%
  - U.S. – 19.1%

- Baccalaureate degree production (per 100 H.S. grads)
  - Oregon – 50.9%
  - WICHE West – 43.6%
  - U.S. – 48.2%
The Second Wave –
Those we serve will be harder to serve

Increasing share of population from communities that higher education traditionally has not served well.

- From Communities of Color: the number of high school grads will double – from 19% in 2005 to 34% in 2015.
- Projected increase in Hispanic high school grads: from 8% to 20%.
Historic success, or lack thereof, of low-income students in higher education

- In the U.S.: Participation drops from 27.5 to 23.1% (1999-2001)
- In Oregon: that number is 19.1%
The Third Wave – Limited Resources

*What a difference two years make:* The dawning of the millennium – **the Best of Times.**

- Oregon state budget grew by 10.4% between 1997/99 and 2001/03.
- Oregon support for higher education grew by 21.3% in that time.
- Oregonians’ personal income increased by 21.4%.
The Third Wave – Limited Resources

*What a difference two years make:*
The new millennium + two – **the Worst of Times.**

- Oregon’s support for higher education declined by 3.5% in FY 2005.
- Amounts to a 22.3% decline since FY 2002
- And prospects remain grim.
Perspectives on Taxes and State Support of Higher Education

Taxable Resources and Effective Tax Rate Indexed to the U.S. Average, by State, Fiscal 2000

States whose effective tax rate exceeds the national average are plotted above the horizontal axis, and states with above average wealth (total taxable wealth per capita) are plotted to the right of the vertical line.

Shaded states have tax revenues per capita within +/-10% of the national average.

Source: SHEEO SHEF
Oregon higher education finance policies don’t “measure up”

Institutions lack financial capacity to increase capacity.

- State support is limited, and will likely remain so.
- Oregon was 33rd in the nation in per-capita spending for higher ed (2002). It is no doubt lower today.
Access is at risk

- One of the highest tuition rates in the West.
  - Community Colleges
    - Oregon (04-05): $2,834
    - WICHE: $1,945
  - Four Year Public Institutions
    - Oregon (04-05): $4,671
    - WICHE: $3,673
- Oregon trails the West and the rest in need-based financial assistance.
The Makings of *The Perfect Storm*

- Increasing demand
- Increasingly difficult-to-serve clientele
- Limited finances – capacity but no will
The Lessons From Physics

- String Theory tells us there is much noise in the system
- Black Hole Theory tells us life could be worse
- Newton’s Theory of Gravitation tells us it will probably get worse
- Wave Theory confirms All of the Above

- But you do have some light at the end of the tunnel.