Financial resources, regulation, and enrollment in US public higher education

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Abstract

While total financial resources for higher education have been rising, there has been a significant shift in the share of resources coming from tuition and fees and a decline in the share coming from state appropriations. We seek to understand the enrollment consequences of this shift and to explore policy options using the results of a two-stage least-squares model of the demand for and supply of enrollment in public higher education. We estimate the model using 1990–95 data for the 48 continental US states. Tuition, average wage levels, and average education levels significantly affect enrollment demand, while state appropriations, other revenue, number of institutions, and the level of regulation significantly affect enrollment supply. Our simulations of policy options illustrate the difficulty of maintaining enrollment levels in the face of tuition increases. If tuition continues to rise, states are faced with reducing supply through lower state appropriations, or attempting to maintain current supply by increasing the amount of regulation in higher education. © 2002 Elsevier Science Ltd. All rights reserved.

1. Introduction

> Changes in the financing of higher education in the 1990s have gradually shifted the burden of paying from the state to the individual. Rapidly increasing costs […] combined with continued intense competition for state resources […] and enrollment jumps […] threaten to exacerbate those changes (Breneman & Finney, 1997, p. 55).

Although the total financial support for higher education in the United States is continuously increasing —

measured as a share of gross domestic product (GDP), the higher education sector reached an all-time high of nearly 3% in 1995 — structural changes in the financial pattern of this support are striking. Especially for public colleges and universities the changes since the early 1980s are dramatic. Whereas there have been increases in tuition and fees as well as the share of support from "private gifts, grants, and contracts", the share of support from state appropriations has been steadily decreasing. Overall, this development can be characterized as a significant shift in the financial burden from the public sector — the state governments — to the private sector — the students and their families. Should these trends continue, considerable consequences concerning supply and demand for public higher education are possible in the long run.

If that is the case, what effects on policy objectives concerning higher education are to be expected? One of

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the major objectives, especially for public institutions, is to provide broad access to higher education. However, shifting the financial burden from state government to students and their families appears to work against the objective of maintaining broad access to higher education. Currently, the policy responses to this financial development seem to be just short-term oriented or ad hoc in nature. Long-term oriented state policies are essential, in particular, to maintain or improve access to higher education programs and to secure affordability for the future (Breneman & Finney, 1997, pp. 51–52).

For a more complete understanding of the various policy options, empirical evidence on both supply-side and demand-side effects of the recent financial developments is necessary. While there are many studies dealing with the demand for higher education (e.g., Becker, 1990; Heller, 1999; Leslie & Brinkman, 1987; McPherson & Schapiro, 1991; Wetzel, O'Toole, & Peterson, 1998) and there are some supply-side studies (e.g., Ehrenberg, Rees, & Brewer, 1993; McPherson & Schapiro, 1993), there are very few studies that consider both demand and supply forces (e.g., Hoenack & Pierro, 1990; Quigley & Rubinfeld, 1993). For public colleges and universities it is sometimes argued that the supply side does not matter when estimating the parameters of demand — and vice versa — because public institutions are not free to retain revenues from increased tuition charges and, typically, they have open admittance policies (Becker, 1990, pp. 162–163). However, this may no longer be the case in the wake of the recent financial developments described above.

To shed light on these issues, this study analyzes the determinants of enrollment in public higher education, simultaneously considering both demand and supply forces. We pay particular attention to the extent to which differing financial resources, most notably tuition and state and local appropriations, influence the enrollment rate in public higher education in the United States. We estimate our demand and supply model for higher education using 1990–95 data for the 48 continental US states. Our estimates provide evidence on the magnitudes of the effects of various supply and demand forces on public higher education enrollment, and allow us to simulate the effects of various options facing policymakers in states in the US.

The paper is divided into six sections. Section 2 provides an overview of the data used in the analysis. Section 3 describes the econometric model, particularly the demand and supply equations. In Section 4, the empirical results are presented and analyzed. In Section 5 we present the results of some simulations that show the likely enrollment changes caused by different policy options. A brief conclusion is found at the end of the paper (Section 6).

2. Data

This study uses data for 48 continental states for the period from 1990 to 1995. Most of the data used in the analysis were obtained from the Digest of Education Statistics. Additionally, data from various surveys conducted by the US Bureau of the Census and from Volkwein and Malik (1997) are employed. All variables measured in money terms are inflation-adjusted by the 1995 consumer price index (CPI-U).

The data show wide variation across states in the structure of higher education. For example, the public higher education enrollment rate varies from 26% (Massachusetts, 1990) to over 70% (Wyoming, 1990 and 1991). The dispersion in private enrollments is also considerable: under 1% in Nevada (1990–95) and over 40% in Massachusetts (1994 and 1995). States with low average tuition at public institutions are Texas, North Carolina, Wyoming, and Idaho, while comparatively high average tuition is found in Vermont, Pennsylvania, New Hampshire, and Massachusetts. State and local appropriations vary from a low of $750 (per 18- to 24-year-old population within the state) in New Hampshire (1990) to a high of over $3800 in Wyoming (1990).

The descriptive statistics and a detailed description of the variables are provided in Table 1. To control for the size of the group most likely to attend institutions of higher education across states, the dependent variable *enrollpub* — as well as *enrollpriv* — is measured as the total enrollment in public (private for *enrollpriv*) four-year and two-year universities and colleges relative to the 18- to 24-year-old population. To approximate the direct cost of higher education the statewide average on undergraduate tuition fees ("sticker prices") at four-year public and private institutions, *tuitionpub* and *tuitionpriv*, are employed. For public colleges and universities this is the average for in-state students only.

The variable *wagediff* is employed as a proxy for the wage differential between workers with and without a college or university degree. This variable is obtained from the Annual Survey of Manufactures and is the ratio of the wage of nonproduction workers to production workers in manufacturing. Because nonproduction and production workers do not perfectly match college and non-college graduates there is measurement error in this variable which, if classical, will bias the estimated effect on enrollment toward zero. Other possible sources of measurement error include different mixes of production and nonproduction workers across states and the fact that today's wage differential may not reflect expected future returns. However, this measure does have the advantage of being available on a state-by-state basis over the sample period.[1] Another possible source for this variable

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[1] One available validity check for the *wagediff* proxy is to compare it to national data on college−high school wage differ-