ABSTRACT
        Student access to higher education, the student's
ability to enroll in some form of postsecondary education appropriate
to his needs, capability, and motivation, and student choice of
alternative higher education activities and institutions have
recently been thought of in terms of the financial burden associated
with attending a postsecondary institution. The study develops a
conceptual framework for deriving measures of access and choice,
develops methods of assessing the impacts of financing policies on
access and choice, and illustrates the potentials and implications of
the framework and methodology for higher education planning.
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Access and Choice in Higher Education: Alternative
Measures and the Implications for Planning

To be presented at the:
1976 Annual Meeting
American Educational Research Association
San Francisco
April 20, 1976

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Access and Choice In Higher Education: Alternative
Measures and the Implications for Planning

In recent years the goals and objectives of higher education in the
United States have often been stated and discussed in terms of access and
choice. The National Commission[1] defined the goal of student access to
higher education as follows:

> "Each individual should be able to enroll in some form
>
> of postsecondary education appropriate to that person's
>
> needs, capability, and motivation."

Similarly, student choice of alternative higher education activities was
defined by this commission as follows:

> "Each individual should have a reasonable choice among
>
> those institutions of postsecondary education that have
>
> accepted him or her for admission."

More recently, access to and choice of higher education activities have
been thought of in terms of the financial burden associated with attend-
ing a postsecondary education institution.[2] Under this approach, equality
of access would be achieved when the financial burden relative to the ability
to pay is the same for all individuals enrolled in higher education. Simi-
larly, equality of choice would be achieved when the financial burden is the
same for all individuals across types of higher education institutions.

Although these objectives for higher education have been discussed
from many different points of view for many years, there has not been
much progress made in conceptualizing, much less quantifying, appropri-
ate measures of access and choice. The purpose of this paper is to de-
velop a conceptual framework for deriving measures of access and choice,
to develop methods of assessing the impacts of financing policies on ac-
cess and choice, and to illustrate the potentials and implications of the
framework and the methodology for higher education planning.

Measures of access and choice:

Most of the empirical work to date on access and choice in higher education have utilized participation rates or enrollment rates as measures of the degree of access and choice that is being achieved. Although many variations have been used, these rates are generally calculated by dividing some enrollment number by some population number. The calculated number is in the form of a proportion which makes it meaningful to compare across time or across states. Also, the proportional nature of these rates fits in well with many of the decision models developed in numerous student demand studies.

Participation rates are a simple, one dimensional summary of a complex set of decisions made by a large number of individuals, institutions, and government agencies. From an economic equilibrium perspective, these participation rates represent the intersection of the supply and demand curves for higher education. Individuals have preferences and desires for different types of educational activities beyond high school. Colleges and universities and all three levels of government (Federal, state, and local) have preferences and objectives for providing different types of educational activities. At some level of enrollment these two sets of preferences may come together. However, as stressed later in this paper it is not always the case that the enrollment level is at the intersection of these two preference sets. It is quite possible in higher education that there are many cases of both excess supply and excess demand.

More recently, attention has focused on equality of price as an appropriate measure of access and choice. Various definitions of price are used but generally net price is used and it is often defined as tuition and living expenses minus parental contribution and student aid. Over the years little agreement has been reached on appropriate parental contribution
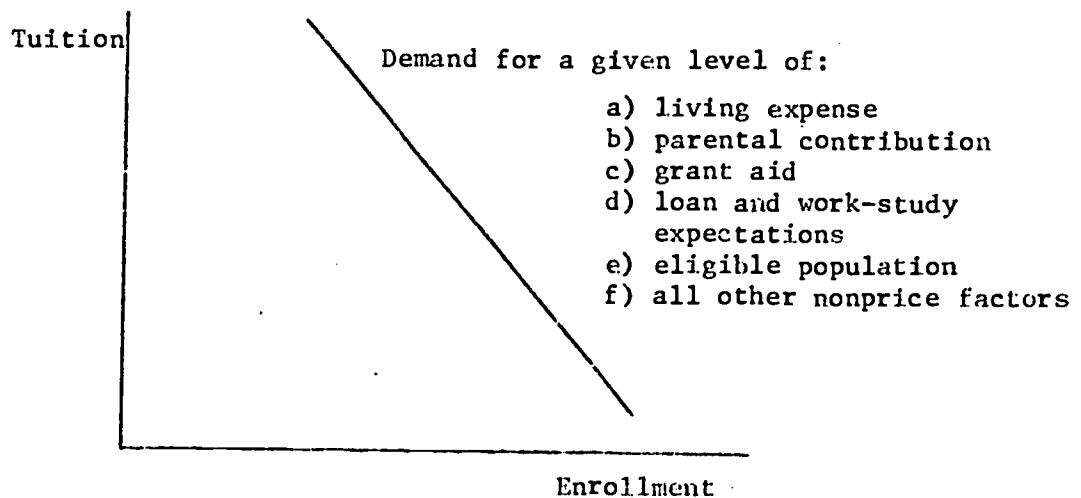
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schedules so that element of uncertainty unfortunately exists in the definition of net price. The component of student aid "netted" out of the net price definition is often restricted to only include grant types of financial assistance.

Theoretically, if individuals made college attendance decisions partially on the basis of net price and if institutions made decisions in part on the basis of tuition, the net price figures might represent the price at which the individual and institutional preference sets intersected. As illustrated later in this paper, other factors enter into the decision process and in many cases the net price may not intersect the demand curve at the same point that the supply curve intersects the demand curve.

Demand functions for higher education:

In the jargon of economists, a demand function is a mathematical representation of the relationship between the quantity of some good or service demanded and the price of the good or service. Using net price the "demand function" for higher education activities might be drawn as shown in Figure 1.

Figure 1: A Higher Education Demand Function

Tuition

Demand for a given level of:

    a) living expense
    b) parental contribution
    c) grant aid
    d) loan and work-study
       expectations
    e) eligible population
    f) all other nonprice factors

Enrollment

Although demand curves are usually drawn as shown above, there are many other variables or factors besides price that determine the quantity demanded. In fact, price may be the least important factor for determining demand in many situations. For example, many other characteristics of the individuals and institutions involved may be much more significant in determining the level of enrollment. However, for many economic analyses and for this examination of access and choice from a financing perspective, the role of price is of central concern regardless of its degree of impact on demand. In Figure 1 the demand curve was drawn with a negative slope which implies that more and more education is demanded as the net price decreases. In other words, as the price of college attendance drops, some additional individuals are able to enroll who could not afford to attend at the higher price or who did not figure that the returns from the education were great enough to compensate for the higher price. The downward slope of the demand curve has not been rejected by several empirical studies. A recent review article[3] based on seven major studies concluded:

> "While the various studies have used different data bases
> covering different time periods and have used different
> mathematical forms to describe student demand relation-
> ships, the policy implications of the empirical findings
> of all of these studies with respect to price changes
> are consistent: (1) individuals from low-income families
> respond more to price changes in higher education than do
> individuals from middle- or high-income families; (2) at
> any income, increasing price decreases the proportion of
> individuals who choose to attend higher education; and
> (3) a change of $100 in the price of higher education
> will induce an average change of 2.5 percent in the en-
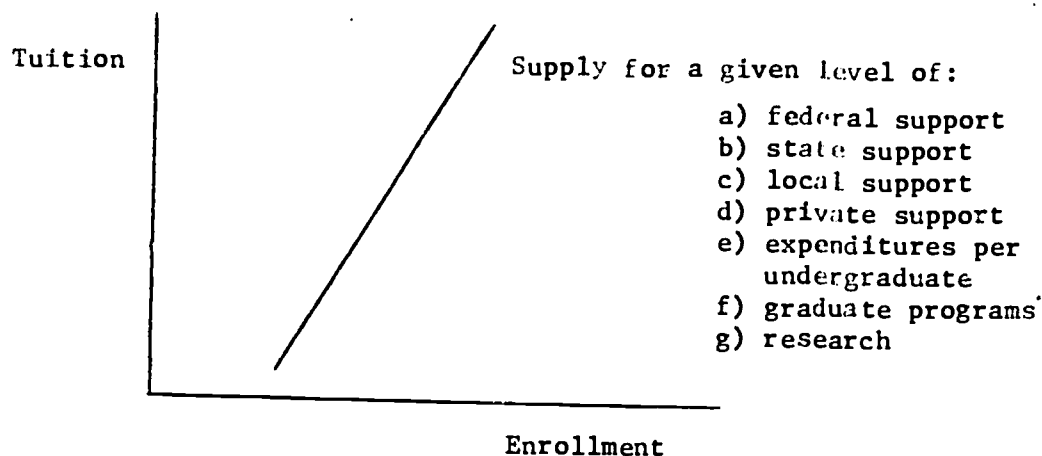> rollment in higher education, under 1974 conditions.

There are currently no comparable estimates for the relative impacts of student grants, loans, or work."

The conclusion from these empirical studies is that enrollments are relatively insensitive to price (2.5% decrease in demand per $100 increase in price) and, graphically, the demand curve shown in Figure 1 should be almost vertical indicating that as price changes, enrollment shifts vary little. In addition to price variables (tuition, living expenses, book and supplies, student aid, parental contribution), three other major sets of variables might be specified as important demand factors for higher education. First, characteristics of individuals (age, sex, race, income, parental occupation, parental education, educational background) are extremely important determinants of education demand. Second, characteristics of the colleges and universities (type, control, programs available, location, expenditure per student, research activities) are key factors in education demand functions. Third, environmental factors (employment opportunities, inflation) can be important demand function variables. It is crucial that price be put into perspective with all of these other "demand-influencing" factors when financing policies are evaluated. These demand factors act to shift the demand curve as drawn in Figure 1 in either direction.

Supply functions for higher education:

As defined in economic theory, the supply function for a producing unit states the quantity that the unit will produce as the price of the product is varied. Obviously, many of the classical economic assumptions and principles do not apply to the operation of colleges and universities. However, the basic notion of a supply function as shown in Figure 2 is a useful relationship for further analysis.

Figure 2: A Higher Education Supply Function

Tuition

Supply for a given level of:

a) federal support
b) state support
c) local support
d) private support
e) expenditures per
   undergraduate
f) graduate programs
g) research

Enrollment

Supply curves are drawn with a positive slope implying increased quantity (enrollment) made available as the price (tuition) increases. If tuitions are raised to higher levels, colleges and universities might be able to increase their desired level of supply (especially at the present time because of tight budgets) in terms of the number of students enrolled. Also with generally increased tuitions, new institutions may come into existence to increase the availability of educational activities.

Supply functions are usually expressed in terms of quantity supplied as a function of the price of the output being produced. The prices of all production inputs are generally specified as factors which shift the supply curve. In cases like higher education where institutions are highly subsidized and supported by private gifts, these other financing sources need to be specified as supply-shifting factors. Also, since most colleges and universities are engaged in a multitude of different activities, one of which is undergraduate education, these other activities which compete for institutional resources in a truly joint production relationship must also be expected to shift the supply function. Unfortunately, there has been very little if any research on higher education supply. As demonstrated
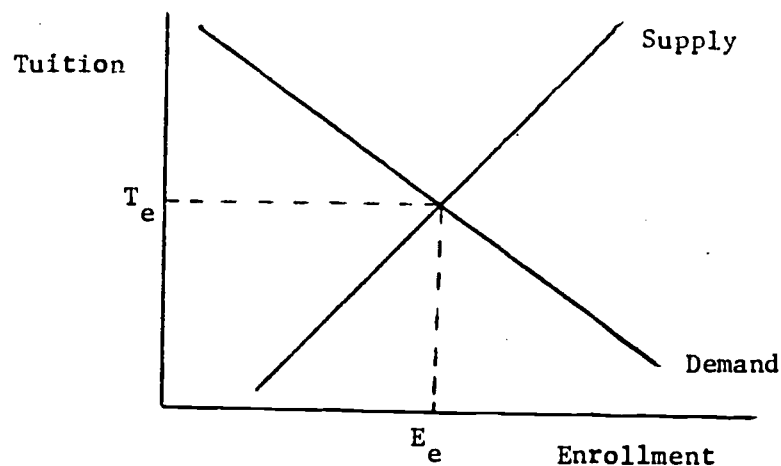
later in this paper it is just as important (if not more so) to have estimates of education supply relationships as it is to develop estimates of higher education demand.

Because of the multiple sources of funding and the joint product situation, a variety of quite different supply functions for different groups of institutions are expected. Private, church-affiliated colleges are funded on such a completely different basis than public community colleges that their supply functions would be based on significantly different specifications. A large public university with numerous graduate programs and a heavy research commitment is involved in drastically different activities than a small four-year liberal arts college. Again the supply functions would be specified quite differently.

Enrollment determination:

In higher education if price plays the role of an adjustment factor for equating demand and supply, an equilibrium level of enrollment at some price should eventually be achieved. This equilibrium situation is illustrated in Figure 3 where the actual tuition and enrollment levels are determined by the intersection of the supply and demand curves. It should be noted that the demand curve in Figure 3 is drawn with tuition as the price variable instead of net price as in Figure 1. The demand curve in Figure 3 represents the relationship between enrollment demand and tuition for a given level of living expenses, student aid, and estimated parental contribution.

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Figure 3: Supply and Demand Equilibrium

In reality there may be few situations where price is the sole supply-demand adjustment factor; other variables such as the location of the in-stitutions and the program offerings may also play an important role. For certain types of institutions, demand may exceed supply at current price levels. This nonequilibrium situation is illustrated in Figure 4.
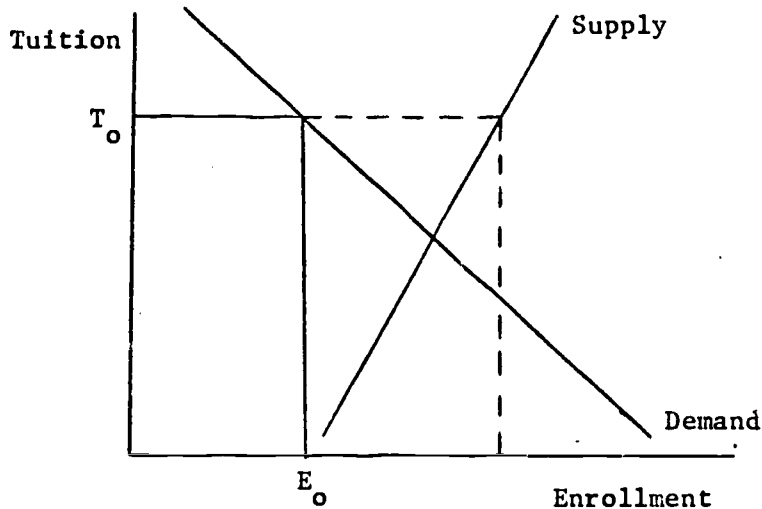
Figure 4: Excess Demand or Under Supply

In cases such as this, the enrollment level is determined essentially on the basis of the supply function alone. Due to either institutional preferences and objectives or to other financing and production factors the institutions are not able to adjust their operations so that the supply

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curve shifts to a point where it intersects the demand curve at the current price.

Another nonequilibrium situation is illustrated in Figure 5. In this case, excess supply exists as a result of either overexpansion or rapidly increasing tuitions without corresponding increases in student aid.

Figure 5: Excess Supply or Insufficient Demand

In this situation, the enrollment level is determined essentially on the basis of the demand function alone. Two types of adjustments may occur in this situation, either separately or simultaneously. First, some institutions may not survive and as a result the supply curve will shift to the left until a new equilibrium is reached as in Figure 3. Second, Federal and state sources of student aid may increase which may shift the demand curve to the right until a new equilibrium is achieved.

This framework for examining how enrollment levels are determined will be utilized in the following sections of this paper to define alternative measures of access and choice, to develop a categorization of colleges and universities, and to illustrate several important implications of the analysis for higher education finance planning.

Alternative measures of access and choice:

Equality of opportunity in higher education does not imply equality of demand. That is, there is no reason to expect or even desire that all types of individuals should enroll in colleges and universities in equal proportions. Because of these varied preferences across segments of the population, the usefulness of enrollment rates as measures of access and choice is very limited and without any sound foundation. As implied by the definition of access and choice given by the National Commission, the availability of supply relative to demand at a price that reflects an equal burden across the population may be more appropriate. Since excess supply is costly and serves no useful function, an appropriate definition of equal access to higher education is defined as:

> At a socially desirable net price or lower, the
>
> supply curve should intersect the demand curve at
>
> this net price level for all individuals.

In other words, access would be achieved when everybody who wanted to go to college at a net price determined to be equitable would be able to enroll. The desired net price is a critical component of the definition as it should be. For example, the net price may be defined as tuition plus living expenses minus grant aid and parental contribution and the socially desired net price may be $200. The definition of access then is that all individuals who want to attend college at a net price of $200 or more should be able to enroll in some institution of higher education. A similar definition seems appropriate for equality of choice of higher education institutions as given below:

> At a socially desirable set of net prices or lower,
>
> the supply curves for different types of institutions

should intersect the respective demand curves at the
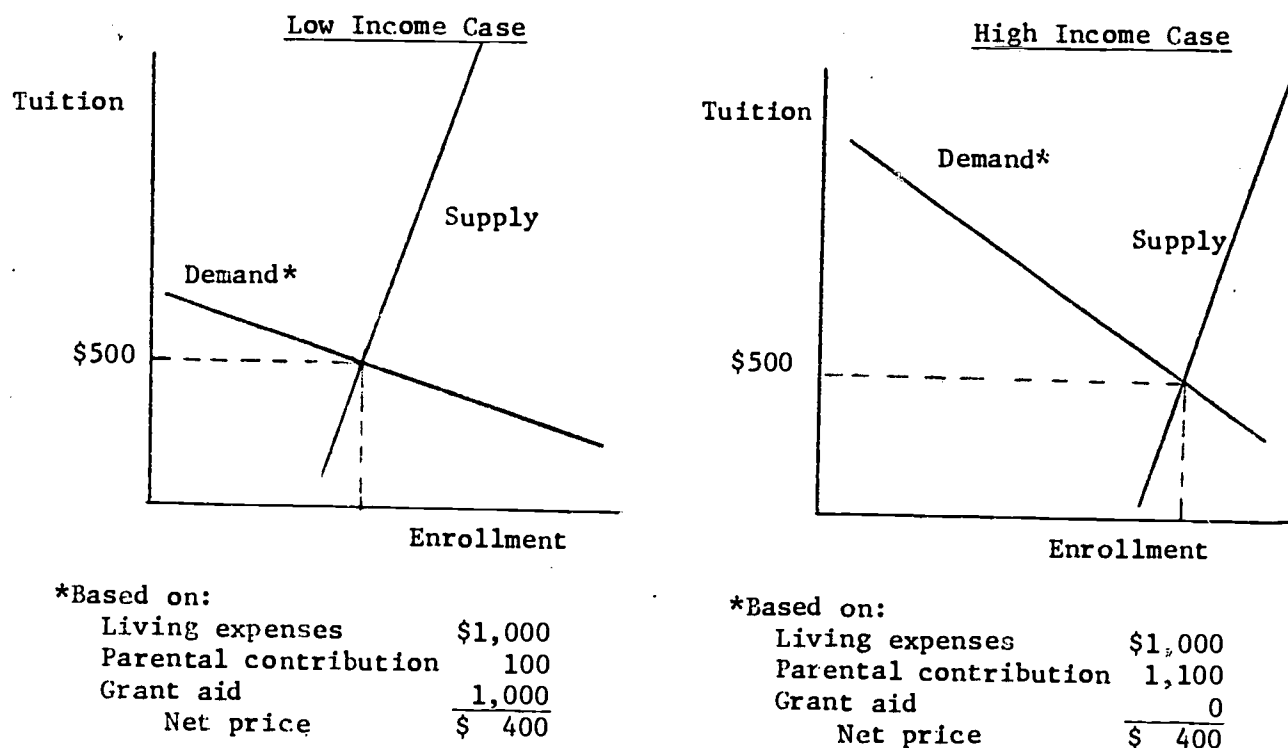
same set of net price levels for all individuals.

Since the inherent value of attending different types of institutions varies, it may be desirable (but not necessary for the methodology) to specify a set of net prices varying across categories of colleges and universities. For example, a $200 net price may be specified for public two-year colleges, $400 for public four-year comprehensive college, $500 for major public universities, and $1,000 for elite private colleges. This approach is consistent with much of the thinking on how nongrant forms of student financial assistance should be rationalized. Grants should be made available to provide access. Choice should be at least partially provided for by loans and work-study. Since net price is being defined with only grants "netted out" this formulation is consistent with the above thinking.

A numeric example may be useful. Consider a situation where the specified net price in the definition of access to public four-year institutions is $400 and the current tuition is $500. To illustrate, the situation for two different income categories of individuals is described. One group has a family income of less than $6,000 and their expected parental contribution is $100. The second group has a family income of $15,000-$20,000 with an expected parental contribution of $1,100. In order for the net price to be $400 or less for both groups, the low-income group will require a grant of $1,000 and the high income group requires no grant aid at all. The demand and supply situation is illustrated below.

Given the way the demand curves are drawn in this illustration, the enrollment is much higher for the high income individuals. However, with this methodology, equality of access is achieved as long as the supply curves intersect the demand curves at the same level of net price, $400

(tuition = $500). It should be emphasized that there is nothing sacred about the $400 level. The same procedure could be followed for a net price of $200 or $800. The important elements of this formulation of access and choice are that the net prices are the same for all individuals attending each type of institution and that supply equals demand at that net price level.

Figure 6: Illustration of an Access Measure

*Based on:
Living expenses	$1,000
Parental contribution	100
Grant aid	1,000
Net price	$ 400

*Based on:
Living expenses	$1,000
Parental contribution	1,100
Grant aid	0
Net price	$ 400

This approach to defining access and choice implies that equal net prices would be a necessary but not a sufficient condition for equality of access and choice. Furthermore, equal enrollment or participation rates imply nothing about equality of access and choice. This approach does require substantially more information, namely estimates of the demand and supply functions, than the net price or participation rate methods. An important step in the empirical determination of these functions is an appropriate classification of higher education institutions on the basis of

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excess demand or excess supply. The empirical procedure necessary to de-
termine quantitative measures of access and choice based on this approach
is the topic of a forthcoming paper.[4/] The following sections of this
paper describe alternative demand-and-supply settings and discuss the im-
plications of these measures and institutional categories for planning and
for assessing the expected impact of alternative financing policies.
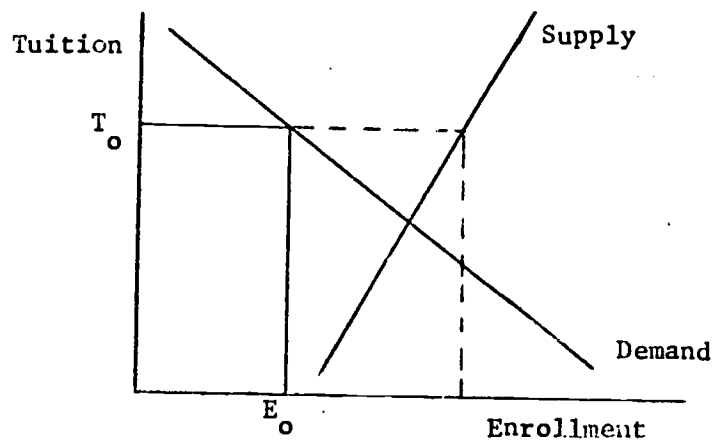
A categorization of institutions:

Based on the above description of different possible supply and demand
relationships that may exist at a particular point in time, it is appropri-
ate to group colleges and universities on the basis of their type of "mar-
ket" situation. This grouping procedure is a necessary step towards de-
veloping quantitative specifications of aggregate demand and supply func-
tions and eventually towards calculating measures of access and choice. In
excess demand situations it may be possible to estimate the supply function
from observations of tuition, enrollment, and other supply factors. For
excess supply situations, on the other hand, it may be possible to only es-
timate the demand function. Finally for equilibrium cases, it may be pos-
sible to use simultaneous equation methods for determining both the supply
and demand relationships. Several alternative estimation methods have been
discussed in the literature[5/] for markets in disequilibrium. Five cate-
gories of institutions are defined in this section in terms of the alter-
native supply-demand relationships.

I. Excess supply institutions: Since the late 1960's, this cateogry
most likely represents a growing proportion of American colleges and uni-
versities. The situation confronting these institutions is shown in Fig-
ure 7. In general terms, these are institutions that have effectively
priced themselves out of a market. At their current tuition levels and with

the existing availability of student financial assistance, the demand for enrollment at these colleges is significantly less than the capacity of the institutions. Several of the less prestigous public and private four year colleges fall into this category. Also, shifts in student interests may cause the demand curve to move to the left and yield an excess supply situation without a tuition change. Liberal arts colleges are possibly victims of these demand shifts as interests have shifted to more "socially relevant" and applied programs. The important point to note about the situation shown in Figure 7 is that changes in price and enrollment levels should yield movements <u>along</u> the demand curve since the supply curve does not enter into the determination of the enrollment level at all. Obviously the demand curves may vary over time and across the population in different states but if other price and nonprice demand factors are included into the estimation process, it may be possible to obtain reasonable estimates of the aggregate demand function of individuals for these institutions.
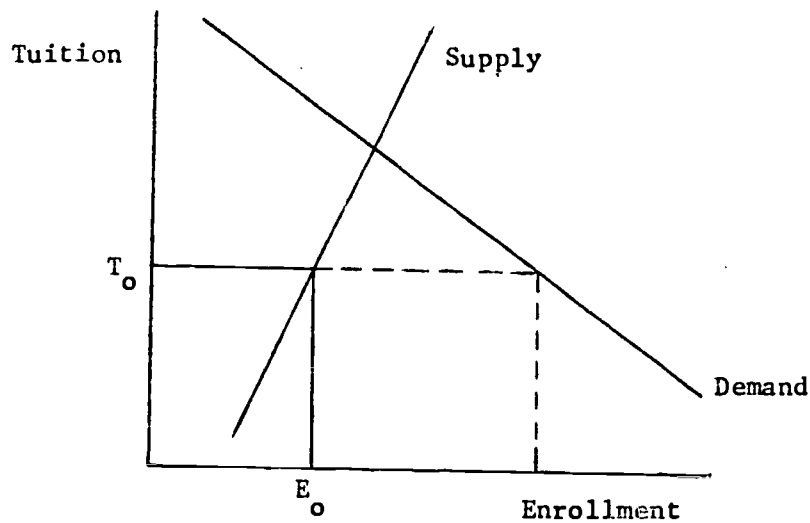
Figure 7: An Excess Supply Situation

II. <u>Excess demand institutions with elastic supply</u>: This category might be most appropriately matched to the rapidly growing public two-year colleges and to some of the private and public four-year institutions which have continued to have modest growth rates in recent years. Developing institutions also might fall into this category. The situation for

these institutions is illustrated in Figure 8. In this case, the demand

for enrollment significantly exceeds the available supply. This was most

likely the case for most institutions during the mid 1960's.

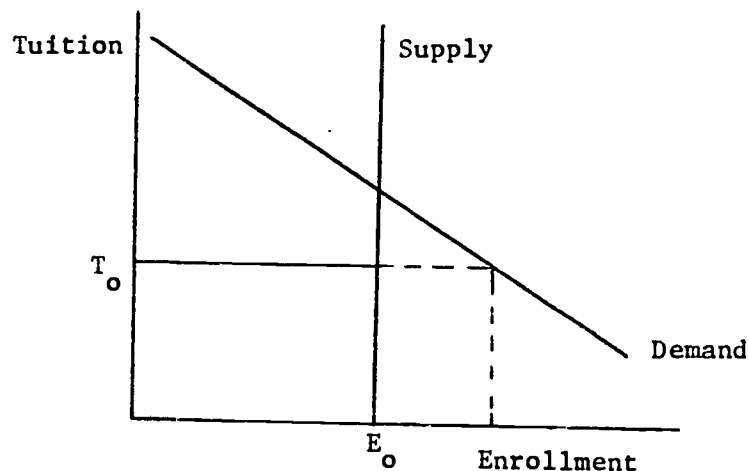Figure 8: An Excess Demand Situation With Elastic Supply

The important point to note about the situation illustrated in Figure

8 is that changes in price and enrollment levels should yield movements

along the supply curve since the demand curve does not enter into the de-

termination of the enrollment level at all. Obviously the supply curves

may vary over time and across the institutions in different states but if

other price and nonprice supply factors are included into the estimation

process, it may be possible to obtain reasonable estimates of the aggregate

supply function of these institutions. This situation has been labelled as

having "elastic" supply; that is, these institutions are assumed to respond

in terms of their enrollment capacity to changes in the level of tuition.

One might expect this assumption to be most relevant to institutions with

full-cost or at least very high levels of tuition. For public institutions

and especially two-year public colleges the crucial relationship to be de-

termined is the response of local and state revenues to the excess demand.

The extent to which local and state funding is increased to meet anticipated demand increases must be estimated.

III. Excess demand institutions with inelastic supply: Mature, high-quality universities might best represent this group of institutions which are characterized by a leveling off of enrollment by design rather than by lack of demand. This situation is illustrated in Figure 9.

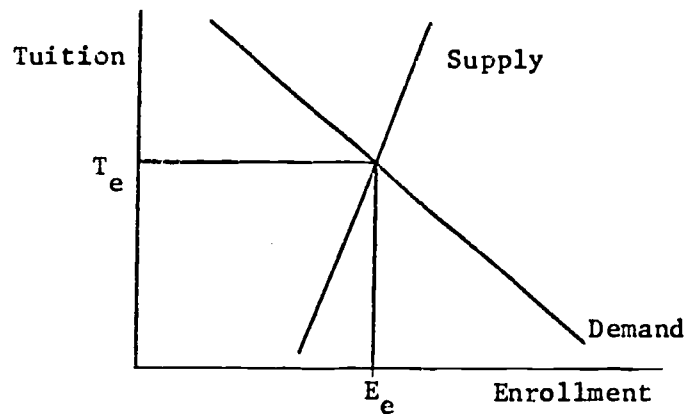Figure 9: An Excess Demand Situation With Inelastic Supply

The important point to note about the above situation is that changes in tuition will not be associated with any enrollment rate changes. That is, for example, the tuition at Harvard could be increased substantially and the enrollment level would not change. For these institutions, it is assumed that they have achieved their desired maximum size and that demand still significantly exceeds the supply. Observations of price and enrollment data will yield, at best, estimates of the constant level of enrollment. Certainly very little can be said about the demand curve except that it lies to the right of the supply curve at the current net price.

IV. Supply = demand institutions with elastic supply: For some situations at different points in time, an equilibrium point may have been

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achieved between the supply and demand functions at the desired net price.
This situation is illustrated in Figure 10. Perhaps the closest example
of institutions in this category are "open-access" public two-year col-
leges. If these institutions are truly open to anyone who applies and if
the colleges base their revenues and expenditures on enrollment, the de-
mand and supply curves should intersect at the current net price. Esti-
mates of the demand and supply functions will require simultaneous equa-
tion techniques in order to separate the functions on the basis of tuition
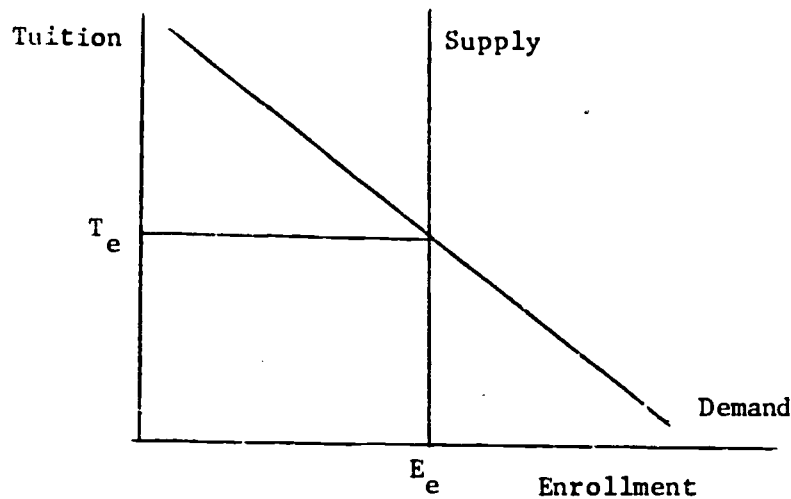and enrollment observations.

Figure 10: An Equilibrium Situation With Elastic Supply

V. _Supply = demand institutions with inelastic supply_: Similar to
the above an equilibrium point may have been achieved between the supply
and demand functions at the desired net price. However, in this case the
institutional supply function may not be responsive to tuition changes as
illustrated in Figure 11. It is also possible that "open-access" public
two-year colleges may characterize this situation. Especially in cases
where tuition is zero or extremely low, the supply curve may shift as
local and state revenues are changed and tuition changes may not induce any
change in supply at all. As in the previous case, estimates of the demand

and supply functions will require simultaneous equation techniques in order
to separate the functions on the basis of tuition and price observations.

Figure 11: An Equilibrium Situation With Inelastic Supply

To further complicate the empirical estimation process it should be
noted that many institutions have most likely moved through several of
these alternative situations during the past ten years. The most likely
path is from an excess demand situation in the mid 1960's to an equili-
brium situation in the late 1960's to an excess supply situation now in
the early 1970's. It is important to emphasize the dynamics of the supply
and demand situation in higher education and to realize at any specific
point in time that the institutions are in different positions with respect
to the supply and demand situations described above.

Implications for higher education planning:

If access and choice are defined as stated previously in this paper,
the classification of institutions on the basis of supply and demand rela-
tionships has very important financing policy and planning implications
for the achievement of access and choice equality. As stated before, the
goal of access would be achieved when everyone who wanted to go to college

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at a net price determined to be equitable would be able to enroll. The
first step in attempting to formalize and make this goal operational is
to decide on the appropriate desired net price. Recall that net price was
defined as tuition and living expenses minus grant aid and parental contri-
bution. This net price is the amount the student would have to make up out
of summer and term-time work, loans, and savings. The second step is to
determine the current levels of tuition, student aid (grants only), and
net price. The remaining steps in determining the appropriate policies or
financing plans to achieve the goals of equal access and choice depend on
the particula demand and supply situation. The current method of policy
formation in higher education for promoting access and choice focuses pri-
marily on decreasing tuition charges and increasing student aid availability.
The implicit assumption being made is that these policies will have similar
effects across all types of colleges and universities although the degree of
impact is expected to vary. As shown in Table 1, the effects of tuition de-
creases and student aid increases can have significantly different impacts
on enrollment across the different supply-demand categories of institutions.
In fact, it is only at the institutions characterized by excess supply that
the tuition and student aid changes have the usually anticipated effect. In
all of the other supply-demand categories, student aid increases will have
no enrollment impact unless the supply curves are simultaneously shifted
to the right by increases in nontuition sources of institutional revenue.
Also shown in Table 1 are two situations where tuition decreases may actually
lead to enrollment decreases unless nontuition sources of revenues are in-
creased.

From the perspective presented in Table 1 it seems clear that the
categorization of institutions on the basis of these five supply-demand
relationships is important for planning financing strategies consistent

TABLE 1: Expected Enrollment Effects of
Tuition and Student Aid Changes

Demand-Supply Situation	Effect of a:	
	Tuition Decrease	Student Aid Increase
Excess supply	enrollment increase	enrollment increase
Excess demand with elastic supply	enrollment decrease	no effect
Excess demand with inelastic supply	no effect	no effect
Supply = demand with elastic supply	enrollment decrease	no effect
Supply = demand with inelastic supply	no effect	no effect

with the promotion of access to and choice of higher education institutions. Knowledge of the supply functions are equally as important as information about the demand functions.

As indicated in the above discussion, the appropriate policies for achieving access and choice may vary depending on the type of institutions being considered. An outline of financing policies consistent with the goals of access and choice described previously and the five supply-demand situations is presented in Table 2. It is important to note the significant role of institutional support from nontuition sources in promoting access and choice in all of the supply-demand institutional categories except the excess supply situation. Also the two cases where tuition decreases are clearly inappropriate should be noted. Similarly, in the excess demand with inelastic supply situation student aid increases are inappropriate. In the other excess demand case, student aid is inappropriate unless coupled with an increase in tuition.

Conclusions:

The discussion in the previous sections of this paper have attempted to describe and illustrate the following points which are of significance for higher education finance planning that is intended to promote access to and choice of higher education activities.

(1) The accomplishment of access and choice can not be measured directly in terms of either enrollment rates or net prices.

(2) Careful attention must be given to the supply functions for higher education as well as the demand functions.

(3) Complete specifications of the demand functions must be made in order to place the effects of tuition and student aid policy changes in perspective with other individual, institutional, and environmental demand factors.

TABLE 2: Planning for Access and Choice

Demand-Supply Situation	Policies for Access and Choice
Excess supply	a) decrease tuition b) increase student aid
Excess demand with elastic supply	a) increase institutional support from nontuition sources b) increase tuition and increase student aid
Excess demand with inelastic supply	a) increase institutional support from nontuition sources
Supply = demand with elastic supply	a) increase tuition and increase student aid b) increase institutional support from nontuition sources
Supply = demand with inelastic supply	a) decrease tuition and increase institutional support from nontuition sources b) increase student aid and increase institutional support from nontuition sources

(4) Complete specifications of the supply functions must be made in order to place the effects of tuition policy changes in perspective to other revenue, expenditure, and activity supply factors.

(5) It is appropriate and necessary to classify institutions on the basis of the supply-demand situations that they face in order to evaluate the likely impacts of alternative financing policies.

(6) Meaningful measures of access and choice may be developed in terms of the demand and supply curves intersecting at a desired level of net price.

(7) For several supply-demand categories of institutions, tuition decreases are not appropriate policies for promoting access or choice.

(8) For several supply-demand categories of institutions, student aid increases are not appropriate policies for promoting access or choice unless accompanied with tuition increases.

(9) For most supply-demand categories of institutions, increases in institutional support from nontuition sources are an important component of the financing plan to promote access and choice.

Footnotes

1/ The National Commission on the Financing of Postsecondary Education, _Financing Postsecondary Education in the United States_, U.S. Government Printing Office, Washington, D.C. 20402, December 1973, pp. 55.

2/ John B. Lee, _et al._, "Student Aid: Description and Options," Research Report EPRC 2158-10, Stanford Research Institute, Menlo Park, California, October 1975.

3/ G. Jackson and G. Weathersby, "Individual Demand for Higher Education: A Review and Analysis of Recent Empirical Studies," _Journal of Higher Education_, Vol. XLVI, No. 6, November/December 1975, pp. 624-625.

4/ D. Carlson, "Estimating Aggregate Supply and Demand Functions for Higher Education," Department of Agricultural Economics, University of California, Davis, California, April 1976.