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# Foreign Students' Demand for United States Higher Education

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## Introduction

The demand for college education is expected to decline absolutely in the decades ahead as the size of the young college eligible population declines.[1] However, the supply of student slots in higher education is relatively inelastic due to a large fixed capital stock and a high proportion of tenured faculty. The result is likely to be excess capacity in American higher education in the coming decades.

In response to this potential decline in demand and the difficulties in reducing their existing capacity, institutions of higher education are expected to explore alternatives for increasing or maintaining their enrollment levels. The feasible alternatives are to lower admission standards, reduce tuition charges, and recruit students from new sources. The most likely and widely accepted alternative would appear to be energetic recruitment from new sources.

Potential sources of additional enrollments include, among others, continuing education enrollments as discussed in Bishop and Van Dyk (1977), and Education Opportunity Programs to attract minorities. Another unexploited source is students from other countries, the focus of this study. This paper estimates the demand for U.S. higher education by foreign students to shed light on how this goal might best be accomplished. Most previous studies on the estimation of educational demand or the prediction of student enrollment have often overlooked enrollment of foreign students (Campbell and Siegel, 1967; Galper and Dunn, 1969).

Increasing enrollment of foreign students may be attractive to U.S. colleges and universities not only because this may allow them to avoid painful "retrenchment," but also because they typically need not worry about employment of graduates.

Most studies of the demand for higher education assume individuals are utility maximizers who invest in higher education when the benefits exceed the costs. This theory implies enrollment demand should vary positively with the expected monetary and other yields of education and negatively with the monetary and other costs of education. In addition, since personal income is often used to finance the investment, demand is expected to increase with real household income.

Several studies have been carried out to date on the domestic demand for higher education. One of the earliest was by Campbell and Siegel (1967) who found an income elasticity of 1.2 and a price elasticity of −0.4 for time-series data covering the United States enrollments between 1919 and 1964. Elaborations of the Campbell-Siegel model have been presented by Galper and Dunn (1969), Radner and Miller (1970), and Corazzini, et al,

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[1]This finding is based on projections made by U.S. Office of Education (1973), p. 15.

(1972). Because the benefits of higher education cannot be accurately forecasted, these studies typically use real household income in the United States as a proxy.

The economic theory underlying migration studies is similar to that which underlies educational demand in that individuals are assumed to invest in a move if the expected benefits of migration exceed the costs. Sjaastad (1962) first made this application of human capital theory of migration. While there have been some studies of international migration, especially the "brain drain," most research has focused on internal migration in the United States and elsewhere. The literature of internal migration surveyed by Krugman and Bhagwati (1976), and Greenwood (1975), includes studies of Brazil (Sahota, 1968), India (Greenwood, 1971), the United States (Greenwood, 1969), and Venezuela (Levy and Wadycki, 1974).

These studies generally find that propensity to migrate decreases with age, increases with education, decreases with distance, and increases with amount of information available. Income plays a dual role—higher incomes in the region of origin increase the ability to finance a move but also increase the opportunity costs of migration. When related to foreign student migration, these studies suggest that opportunity costs would be incurred by foreign students whether they migrate to another country for education or remain in their home country for education.

Foreign students' demand for an education in the United States may be looked upon as demand for higher education which necessarily entails migration. One of the more important implications of migration studies for a study of foreign student enrollments is that the amount of information available, as proxied by the number of migrants who have previously made the move from the same country, may have a strong effect on current foreign student enrollments in the United States or in any particular college or university.

The objective of this paper is to study the *flow* of foreign students (i.e., new students) to the United States during the period 1954–73. Eleven Latin American countries are selected for inclusion in this study. The primary concern lies in identifying the economic variables that influence a foreign student's decision to invest in an education in the United States.

### *Choice of Countries*

Any country which had 400 or more of its students in the U.S. in any year was selected for inclusion in the analysis. The number of countries included declined from 50 to 43 as data were not available for all the years and as the national boundaries of some countries changed over the time period 1954–73. Lack of comparable time series data on domestic per capita income led to a further reduction in the number of countries to 17.

As stated later, the data on some variables in the theoretical model are not available. Furthermore, the United States has followed a differential immigration policy towards persons originating from the independent countries of the Eastern and the Western Hemisphere. Even though immigration policy has changed during the period covered in this study, the impact of these changes was not uniform on countries in the Eastern Hemisphere. In contrast, the independent countries in the Western Hemisphere were affected uniformly by the changes in the U.S. Immigration Policy.[2] Therefore, only developing countries from the Western Hemisphere were selected for this study.

[2]Prior to 1965, all the countries in the Eastern Hemisphere were classified as Quota Countries, whereas there was no limit on the number of immigrants from the independent countries of the Western Hemisphere. The immigrant quotas for the quota countries varied a great deal. The change in the Immigration and Nationality Act of 1965, effective July 1, 1968, imposed a limit of 170,000 immigrants from the Eastern Hemisphere and 120,000 from the Western Hemisphere. This Act also provided a numerical ceiling of 20,000 immigrants from any country in the Eastern Hemisphere, but this ceiling did not apply to independent countries of the Western Hemisphere.



## The Model

It is implicitly assumed that individuals consider only one foreign alternative to higher education in the home country, namely the United States,[3] and that they intend to return to their country of origin after completion of education and training. The individual will purchase higher education abroad at time zero if present value of net benefits is positive, i.e.,

$$\sum_{t=0}^{n}\left[\frac{Y_t^f - C_t^f}{(1+r)^t}\right] - \sum_{t=0}^{n}\left[\frac{Y_t^d - C_t^d}{(1+r)^t}\right] \geq 0$$

or

$$\sum_{t=0}^{n}\left[\frac{Y_t^f - Y_t^d}{(1+r)^t}\right] - \sum_{t=0}^{n}\left[\frac{C_t^f - C_t^d}{(1+r)^t}\right] \geq 0 \qquad (1)$$

where $Y_t^f$ = expected benefits from education abroad in year $t$
$Y_t^d$ = expected benefits from education at home in year $t$
$C_t^f$ = cost of education abroad in year $t$
$C_t^d$ = cost of education at home in year $t$
$r$ = rate of discount
$n$ = consumption life of the individual

It is expected that

$$\sum_{t=0}^{n}\left[\frac{Y_t^f - Y_t^d}{(1+r)^t}\right] \geq 0 \qquad (2)$$

The present value of benefits from education abroad for the sample used here is likely to be greater than the present value of benefits from domestic education due to several factors. First, in most developing countries foreign education is considered at least equivalent to domestic education. Second, many students obtain work experience in the foreign country where salaries are typically higher after finishing their education abroad. Finally, the possibility of a better paying job earlier increases with education and work experience abroad.

The expression

$$\left(\sum_{t=0}^{n}\left[\frac{C_t^f - C_t^d}{(1+r)^t}\right]\right) \qquad (3)$$

equals zero when the costs of education in each year are equal in both countries. If the cost of education at home exceeds the cost abroad, the decision to undertake education abroad is reinforced. This will be the case when either the facilities at home for obtaining education do not exist or when an individual cannot obtain education at home but is able to do so abroad. The most realistic and frequently encountered case is when the costs of obtaining an education abroad are considerably greater than those at home.[4] Travel costs for education abroad are quite significant. Maintenance costs abroad are generally higher as an individual may be able to obtain part-time employment more easily

[3]This implied assumption is not very restrictive for the countries selected for this study. During 1962–68, the only time period for which extensive data on students studying abroad is available, a large proportion of students from these countries who were studying abroad were in fact studying in the United States. The only exception is Peru; in this case the proportion of students studying in the U.S. increased from nine percent in 1962 to 24.7 percent in 1968. For the other countries, this proportion remained fairly constant over this time period.

[4]Since the analysis deals with the choice of receiving a higher education in the United States or in the home country, the opportunity costs will not affect the individual's decision. The cost of education that influences a student's decision, thus, consists of direct money outlays.

at home than in a foreign country. Thus, the expected benefits and costs in (1) work in opposite directions in terms of how they affect the individual's decision.

Variations in enrollment demand are related to variations in the factors affecting the expected rate of return. A general rise in expected benefits from an education abroad should increase the demand for foreign higher education. The availability of financial support from other sources, like the U.S. government, the home government, U.S. colleges or universities, and private foundations, reduces the cost of education in the U.S. A lower cost of education in the U.S. relative to the cost of education in the home country should lead to an increase in the students' demand for U.S. higher education. Finally, because people must substitute personal resources if borrowing is not sufficient, it is expected that the demand for foreign higher education should vary directly with disposable family or household income.[5]

In summary, theory suggests that foreign students' demand for U.S. higher education will vary positively with the expected benefits from U.S. education, positively with family income, negatively with the expected benefits from domestic education, positively with the financial support, and negatively with the cost of education in the U.S. A formal statement of the model is given by (4).

$$D_t^i = f_i(Y_t^f, Y_t^d, C_t^f, C_t^d, FS_t^i, DY_t) \quad (4)$$

where $D_t^i$ = demand for higher education by new students from $i^{th}$ country in year $t$.
$Y_t^f$ = expected benefits from education abroad in year $t$.
$Y_t^d$ = expected benefits from education at home in year $t$.
$C_t^f$ = cost of education abroad in year $t$.
$C_t^d$ = cost of education at home in year $t$.
$FS_t^i$ = availability of financial support to students from the $i^{th}$ country for education in the U.S. in year $t$.
$DY_t$ = per capita income in the domestic country in year $t$.

Earlier it was assumed that the individual intends to return to the home country following completion of the education. However, depending on how congenial the immigration policy is toward his/her intentions, the individual might be influenced to stay abroad. Also, some individuals can enroll in school abroad with the pretext of pursuing higher education but with the intention of staying abroad permanently. The 1952 Immigration and Naturalization Act incorporates a provision for adjustment of status from a non-immigrant to an immigrant or permanent resident. The Annual Reports of the Immigration and Naturalization Service (INS) also provide evidence that some students do adjust their status and become immigrants or permanent residents. Therefore, for some individuals, the decision to undertake higher education abroad is likely to depend on the probability of immigration as well as the other factors discussed above. (4) is modified to take account of the effects of U.S. immigration policy on the demand for U.S. higher education by foreigners. The formal model thus becomes

$$D_t^i = f_i(Y_t^f, Y_t^d, C_t^f, C_t^d, FS_t^i, DY_t, PM_{it}) \quad (5)$$

where $PM_{it}$ = probability of immigration for students from $i^{th}$ country in year $t$.

The preceding analysis holds if students have perfect information on costs and benefits of United States higher education. But students may not have complete information, and the quality of information they do have may be very poor which is likely to lead to misleading results. To correctly specify the model, it is then necessary to include a variable to capture the information effect. Greenwood (1970) introduces a migrant stock variable (i.e., the number of persons born in State $i$ and living in State $j$) in the estimated relationship to capture the effect of information on current migration. His results showed that failure to include the migrant stock variable in the relationship caused the true direct effects of other variables to be obscured and generally overstated in absolute value.

In the present context, the stock of students in the United States from a country is used as a proxy for the information available to the potential students. Equation (5) is modified to include the stock variable and the model can be represented as

$$D_t^i = f_i(Y_t^f, Y_t^d, C_t^f, C_t^d, FS_t^i, DY_t, PM_{it}, S_{t-1}^i) \quad (6)$$

where $S_{t-1}^i$ = total number of students in the U.S. from $i^{th}$ country in year $t-1$

### *Specification of the Model*

To test the model in (6) empirically requires time series data on both educational costs and finances as well as expected future streams. All the necessary data required to test the model, unfortunately, are not available in the form of continuous time series. The statistical data to measure benefits from U.S. education or to measure benefits from domestic education as well as data on the direct costs of education in the home country are not available. However, some data are available which can be related to the variables described in the model.

The data on number of new students ($D$), total foreign students ($S$), and financial support available to foreign students in the U.S. ($FS$) comes from an annual survey conducted by the Institute of International Education. The limitations and necessary adjustments required to use the data are explained in Agarwal (1977). It is necessary to point out the financial support is not known in monetary units. Only the number of students receiving some support and the sources of their support are known. In fact, $FS$ is the ratio of students from a given country receiving some financial support to all students from the same country who respond to the question on financial support.[6] This variable, therefore, is interpreted as the probability of receiving support for an education in the United States.

The measure of income used in this study is real per capita income ($DY$) expressed in dollars and was obtained from the U.S. Agency for International Development (1974). The nominal per capital income was first adjusted for domestic price increase using 1972 as the base year. The prevailing exchange rates of 1972 were then used to convert real per capita income in domestic currency to equivalent dollars for each year. The real per capita income of the home country embodies two effects. These are the ability of a student to pay for U.S. education and an index of the cost of education in the home country.[7] The former is clearly the income effect; therefore, its impact on the flow of students is expected to be positive. The latter effect can be interpreted as the substitution effect. This measures the change in the flow of students due

[5]If income and access to "good" jobs (resulting from obtaining education in a foreign country) are correlated, this may further raise the gain from foreign education.

[6]In computing this variable, it is implicitly assumed that students not responding to the question on financial support are distributed similarly to those who answered the question. This assumption appears to be quite reasonable. In the late Sixties and Seventies, increasing numbers of higher education institutions, citing budget cutback, started sending computerized information on their students. These responses did not include information on sources of financial support.

[7]It is assumed here that domestic income can be used as a proxy for the direct cost of domestic education. Therefore, the real per capita income of the home country accounts for the domestic income as well as the cost of domestic education.

to changes in the relative cost of education in the two countries. An increase (decrease) in the domestic cost of education relative to the foreign cost of education is expected to lead to an increase (decrease) in the number of students seeking education abroad. Since both the income effect and the substitution effect are positively related to the flow of students, the sign associated with the coefficient on domestic income is expected to be positive.

Statistical data published by the U.S. Office of Education on tuition and fees provide one estimate of costs of U.S. education. However, non-immigrant foreign students are required to pay nonresident tuition as long as they are enrolled at public institutions. What is thus required is an index representing the costs of education in the United States for the foreign students. Under the assumption that institutions of higher education set price equal to marginal cost, an estimate of the price charged to foreign students can be obtained. This assumption appears to be quite realistic for private and public institutions.

One problem in estimating cost for the foreign students is that higher education is a multiproduct process. Colleges and universities engage in several activities including instructions (graduate enrollment), research (journal articles, numbers or pages), and support services. In implicit form, the production function of institutions of higher education is

$$H(Q_I, Q_R, Q_S, X) = 0 \qquad (7)$$

where $Q_I$, $Q_R$, $Q_S$ are respective outputs representing instruction, research, and support services. $X$ represents composite input for faculty, administrative staff, secretarial staff, and buildings, etc. The costs of these institutions may be expressed as a function of output levels and input price.

$$\text{i.e., } C = C(Q_I, Q_R, Q_S, W) \qquad (8)$$

where $W$ represents the cost of the composite input.

The production process of these outputs are joint, which makes it difficult to determine the associated costs. However, assuming that the cost function is separable,[8] (8) can be written as

$$C = C_I(Q_I, W) + C_R(Q_R, W) + C_S(Q_S, W). \qquad (9)$$

The marginal cost of instruction then is

$$\frac{\partial C}{\partial Q_I} = \frac{\partial C_I}{\partial Q_I}$$

Let the costs for instruction be represented by the following relationship:

$$C_I = \gamma Q_I^{\alpha_1} W^{\alpha_2} \qquad 0 < \alpha_i < \infty,\ i = 1,2 \qquad (10)$$

where $Q_I$ = total enrollments[9]
$W$ = cost of the composite input.

The marginal cost of instruction is[10]

$$\frac{\partial C_I}{\partial Q_I} = \gamma\alpha_1 Q_I^{\alpha_1 - 1} W^{\alpha_2} \qquad (11)$$

The only remaining variable is the probability of immigration. This probability, unfortunately, is not known. The closest approximation is the estimate of non-returning students. Estimates of non-returning students run from a low of one percent to a high of 95 percent, depending on the student population and the definition of student non-return (Myers, 1972; pp. 53–9). Two alternative proxies for the probability of immigration are the number of non-immigrant students who adjusted their status to become permanent residents, and the ratio of adjustments to applicants. The latter cannot be obtained as the INS does not provide data on applicants. The Service has published data on the number of non-immigrants adjusting their status since 1958. However, data on *non-immigrant students* adjusting their status is available only since 1962. Furthermore, the 1965 Immigration and Nationality Act barred non-immigrants from Western Hemisphere countries from changing their status without leaving the United States. Accurate data on students from Latin American countries adjusting their status, therefore, is not available even though many students may reenter as immigrants. Since data are not available on the probability of immigration, this variable is omitted and the actual model to be tested empirically is reduced to

$$D^i = F^i(S, FS, DY, P) \qquad (12)$$

This equation indicates that the number of new foreign students demanding U.S. higher education is a function of the stock of foreign students in the United States ($S$), the probability of obtaining financial support ($FS$), domestic income ($DY$), and the price of education in the United States ($P$).

The majority of studies dealing with migration and demand for higher education use the log-linear functional form which is also used here for ease of interpretation of the coefficients as elasticities. The demand function in the log-linear form becomes

$$D^i = AS^{i\beta_1} FS^{\beta_2} DY^{\beta_3} P^{\beta_4} e^{\epsilon} \qquad (13)$$

where $\epsilon$ is the random error component, assumed to be normally distributed with zero mean and constant variance, and the $\beta_i$ are the respective elasticities. Substitution of the marginal cost for price from (11), into (13) yields

$$D^i = AS^{i\beta_1} FS^{\beta_2} DY^{\beta_3} (\gamma\alpha_1 Q_I^{(\alpha_1 - 1)} W^{\alpha_2})^{\beta_4} e^{\epsilon}$$

or

$$D^i = A' S^{i\beta_1} FS^{\beta_2} DY^{\beta_3} Q_I^{\beta^*} e^{\epsilon} \qquad (14)$$

where

$$A' = A(\gamma\alpha_1 W^{\alpha_2})^{\beta_4}$$

$$\beta^* = (\alpha_1 - 1)\beta_4$$

Note that the coefficient on total enrollments, $Q_I$, is $\beta^*$ which equals $(\alpha_1 - 1)\beta_4$. The magnitude of the parameter $\alpha_1$ indicates the increasing ($\alpha_1 > 1$), decreasing ($\alpha_1 < 1$), or constant ($\alpha_1 = 1$) marginal costs of higher education. $\beta_4$ is the own price elasticity of demand for U.S. higher education by foreign students. Economic theory suggests that $\beta_4$ is expected to be negative and $\alpha_i$ is expected to be positive. However, the magnitude of $\alpha_1$ is unknown. Therefore, $\beta^*$ will be positive or negative depending on whether $\alpha_1$ is less than or greater than one, respectively. *A priori*, the sign associated with $\beta^*$ is indeterminate.

### *Estimation Procedure and Results*

The model presented in (14) is to be estimated for the 11 countries. The Seemingly Unrelated Regression Model (SURM) technique developed by Zellner (1962, 1963) is utilized in the regression analysis to estimate the model. There are several theoretical reasons for the choice of SURM over the Ordinary Least Squares (OLS) procedure.

First, there are several variables which have been omitted from the regression equations due to lack of available data. These are: (i) Benefits of U.S. Education, (ii) Benefits of domestic education, and (iii) The probability of immigration to the U.S. Due to similarity

[8]This assumption of separability is probably less distortive for undergraduate than for graduate education.

[9]The data on total enrollments in the U.S. includes degree credit enrollments in public as well as in private institutions of higher education.

[10]In this formulation, marginal cost equals $\alpha_1 C_I/Q_I$ and Average Cost of Instruction is $C_I/Q_I$. Therefore, Marginal Cost is proportional to Average Cost.

of these countries in terms of educational opportunities at home, it is expected that the first two variables will affect the decision of the students from these countries to study in the U.S. uniformly. Since the change in the U.S. Immigration Policy was the same for all the countries in the Western Hemisphere, it is expected that the probability of immigration will affect all the equations in a similar fashion.

Second, the data on foreign students in this analysis comes from a survey conducted annually by the Institute of International Education. Estimates of the number of new students and financial support available to the foreign students are based on students' responses. These responses have fluctuated a great deal and any bias or errors are likely to be reflected across all the equations.

Finally, depending on whether institutions of higher education face increasing or decreasing enrollments of domestic students, the institutions may limit or increase the slots available for foreign students. These decisions will also affect all the equations.

Since these variables are omitted, they require analysis in terms of the disturbances across equations which are expected to be correlated. To test the appropriateness of SURM, the correlations of the residuals from OLS regressions were obtained. These correlations, shown in Table 1, indicate that the residuals are in fact highly correlated.[11] The lowest degree of correlation is between the residuals from the Dominican Republic and Panama, its value being 0.570. The highest correlation (0.896) is between the residuals for Mexico and Venezuela. This high degree of correlation of residuals across equations provided sufficient evidence that the SURM results are expected to yield efficient estimators. Zellner (1963) shows that if errors are contemporaneously correlated, SURM yields estimates that are at least asymptotically more efficient than OLS. Furthermore, the gain in efficiency increases with the correlations between the disturbances across equations.

The SURM results of the estimation of the

[11]The presence of autocorrelation in time series data may have caused a high degree of correlation in the residuals obtained from OLS. To check for this spurious correlation of residuals, Cochrane-Orcutt (CORC) adjustment was made. The correlation of residuals obtained from CORC were found not to be significantly different from those obtained from OLS.

TABLE 1
CORRELATION MATRIX OF RESIDUALS OBTAINED FROM OLS

| | DMN | MXC | NCG | PNM | AGT | BZL | CHL | CLB | EDR | PRU | VZL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DMN | 1.000 | 0.664 | 0.721 | 0.570 | 0.793 | 0.782 | 0.648 | 0.733 | 0.572 | 0.601 | 0.851 |
| MXC | | 1.000 | 0.871 | 0.808 | 0.782 | 0.820 | 0.873 | 0.862 | 0.798 | 0.725 | 0.896 |
| NCG | | | 1.000 | 0.781 | 0.673 | 0.759 | 0.846 | 0.790 | 0.646 | 0.602 | 0.851 |
| PNM | | | | 1.000 | 0.599 | 0.793 | 0.894 | 0.768 | 0.852 | 0.786 | 0.779 |
| AGT | | | | | 1.000 | 0.785 | 0.690 | 0.834 | 0.806 | 0.713 | 0.771 |
| BZL | | | | | | 1.000 | 0.757 | 0.875 | 0.820 | 0.729 | 0.841 |
| CHL | | | | | | | 1.000 | 0.724 | 0.821 | 0.737 | 0.818 |
| CLB | | | | | | | | 1.000 | 0.776 | 0.787 | 0.867 |
| EDR | | | | | | | | | 1.000 | 0.775 | 0.725 |
| PRU | | | | | | | | | | 1.000 | 0.813 |
| VZL | | | | | | | | | | | 1.000 |

Note: The countries included with their pneumonic symbols are: Dominican Republic (DMN), Mexico (MXC), Nicaragua (NCG), Panama (PNM), Argentina (AGT), Brazil (BZL), Chile (CHL), Colombia (CLB), Eduador (EDR), Peru (PRU), and Venezuela (VZL).



model in (14) are individually presented in Table 2 for all the Latin American countries included in this study. The coefficient on total enrollments, $\beta^*$, is interpreted first before the remainder of the results are discussed.

This table shows that $\beta^*$ is negative for all the countries and it is significant for five countries at the five percent significance level. These results are of great importance due to their implications for the supply curve of higher education. Recall that $\beta^* = (\alpha_1 - 1)\beta_4$, and $\alpha_1$ is expected to be positive and $\beta_4$ is expected to be negative. It is clear then that if $\alpha_1$ were equal to one, $\beta^*$ will be zero. The fact that $\beta^*$ is consistently negative and significant for some countries implies that $\alpha_1$ is not equal to one. The negative sign of $\beta^*$ further implies that $\alpha_1$ is not less than one, assuming $\beta_4 < 0$.

TABLE 2
ESTIMATION RESULTS FROM "SURM"

| | Constant ($t$)* | Stock ($t$) | Support ($t$) | Domestic Income ($t$) | Total Enrollment ($t$) |
|---|---|---|---|---|---|
| DMN | 1.040 (0.385) | 0.826 (10.396) | 0.245 (3.819) | 0.276 (0.910) | −0.135 (0.557) |
| MXC | 2.071 (1.046) | 1.327 (8.487) | 0.495 (4.261) | 0.200 (0.177) | −0.393 (0.888) |
| NCG | 5.333 (2.789) | 1.719 (11.456) | 0.290 (3.470) | −0.793 (1.643) | −0.336 (1.269) |
| PNM | 6.141 (2.490) | 1.649 (7.287) | 0.029 (0.338) | 1.848 (3.269) | −1.489 (3.803) |
| AGT | 0.225 (0.128) | 0.772 (7.628) | 0.690 (5.530) | 0.769 (1.894) | −0.283 (1.313) |
| BZL | 8.976 (2.627) | 1.583 (5.591) | 0.799 (2.675) | 0.417 (1.564) | −1.013 (3.012) |
| CHL | 3.170 (0.850) | 1.062 (5.903) | 0.270 (1.856) | 0.907 (1.917) | −0.644 (2.148) |
| CLB | −4.669 (1.869) | 1.099 (10.582) | 0.511 (4.577) | 3.311 (4.760) | −0.977 (4.248) |
| EDR | −2.400 (1.020) | 0.814 (6.006) | 0.255 (2.865) | 0.978 (2.839) | −0.159 (0.729) |
| PRU | −12.334 (2.921) | 0.298 (1.207) | −0.285 (2.886) | 2.730 (5.458) | −0.042 (0.113) |
| VZL | −0.443 (0.276) | 1.949 (11.821) | −0.094 (0.968) | 0.726 (2.225) | −0.792 (3.817) |

*The $t$ values of the coefficients are in parentheses.

The assumption that $\beta_4$, own price elasticity, is negative is not very restrictive. For example, Campbell and Siegel (1967) find that the price elasticity of higher education is negative, its value being −0.44. Also note that the coefficient on the support variable, $\beta_2$, in Table 2 is positive for most of the countries. The support variable can be interpreted as a lower price, since availability of financial support implies a subsidy available to the foreign students. The positive sign of this coefficient further substantiates the validity of this assumption.

These results imply that institutions of higher education face neither constant nor decreasing marginal cost but increasing marginal cost of enrollment. This result appears to be consistent with Carlson (1972) who provides evidence that, in fact, for some institutions, marginal costs increase with enrollment. Layard and Verry (1975) find neither economies of scale nor declining marginal costs in British academic departments. However, the results are at odds with Broomall, *et al* (1978) who find that marginal costs decrease over the normal range of enrollments.

Unfortunately, it is not possible to obtain an estimate of $\alpha_1$ from the model. Therefore, the magnitude of $\beta_4$, the own price elasticity, cannot be inferred. However, estimates of $\beta_4$ can be obtained for all these countries conditional on assumed values of $\alpha_1$. Note, however, that since $\alpha_1$ represents increasing marginal costs of higher education in the United States, it must have the same value for all the countries. It is thus possible to draw inferences about relative price elasticities. The policy implications can be inferred only on the basis of relative price elasticities. Suppose the institutions of higher education increase the price of higher education by ten

percent. What are the effects on the flow of students from these countries? An increase in the price of higher education leads to a change in the mix of the flow of students, as indicated by the range of $\beta^*$ in Table 2. It can be seen that $\beta^*$ is not significantly different from zero for four countries; namely, Peru, the Dominican Republic, Ecuador, and Mexico. It can be concluded demand is relatively most price inelastic for these countries.[12] Therefore, a ten percent increase in the price of higher education is not likely to have any significant impact on the flow of students from these four countries. On the other hand, the relatively significant high values of $\beta^*$ for Panama, Brazil, Colombia, and Venezuela indicate that for these countries, price elasticity of demand is relatively quite high. Hence, the impact of a given increase in the price of higher education will be largest for these students. The effects are relatively less pronounced for students from Chile, Nicaragua, and Argentina.

Table 2 also shows that the coefficients on the stock variable have the expected positive signs for all the equations. Further, all coefficients are significant at the five percent significance level except for Peru. The elasticities, which are significant, range from a low of 0.772 for Argentina to a high of 1.949 for Venezuela. Interpreting this variable as one of information source, then it can be concluded that information plays a very important role in determining students' demand for U.S. higher education.

Note that the coefficients of this variable have the highest *t*-values for all the countries except for Peru. This finding is consistent with the studies on migration of labor force. For example, Greenwood (1969) and Levy and Wadycki (1973) find that in terms of its contribution to $R^2$, the migrant stock variable is the single most important variable in their equations. The policy implications of this finding are obvious. If the objective of the institutions of higher education is to increase the enrollment of foreign students, the institutions must provide more information (both quantity and quality) to the potential students in these countries, or build a base of students from these countries.

Turning now to the income effects (the coefficient on domestic income, or $\beta_3$), it can be seen from Table 2 that the income effects on demand for U.S. higher education are positive for all countries except for Nicaragua. These coefficients are significant except for the Dominican Republic and Mexico. Other coefficients range from 0.417 for Brazil to 3.311 for Colombia. It is difficult to interpret this coefficient as a pure income effect because domestic income accounts for the income measure as well as the cost of education in the home country. As stated earlier, both the income and the substitution effects are expected to be positive but the magnitudes of the income and the substitution effects are not known. However, the effects of changes in domestic income on the flow of students from these countries can be easily stated. For example, $\beta_3$ for Colombia equals 3.311. It can then be inferred that a ten percent increase in Colombian per capita income, *ceteris paribus,* will lead to approximately a 33 percent increase in the flow of Colombian students to the United States.

Finally, the financial support effects (the coefficient on support, or $\beta_2$) are all positive except for Peru and Venezuela.[13] All the coefficients are significant at the five percent level except for Panama. Other coefficients range from 0.245 for the Dominican Republic to 0.799 for Brazil. These results indicate that the availability of financial support for an education in the United States plays an important role in a foreign student's decision to obtain U.S. higher education.

These results become even more significant if it is realized that data on financial support is not known in monetary units. Recall the probability of financial support was defined as the ratio of the number of students receiving *any* support to the total number of students responding to the question on financial support. It is obvious that the effects of a full support for higher education should be stronger than the effects of a partial support. In addition, the effects will also depend on which students get financial support, e.g., students from upper or lower income class. Unfortunately, the available data did not permit such distinctions. These results, however, do indicate that the availability of financial support encourages foreign students to seek higher education in the United States. Therefore, institutions of higher education can increase the enrollment of foreign students, and also perhaps the quality of these students, by offering increased financial assistance to qualified students.

Peru appears to be the only country in this study for whom the results do not consistently agree with the other countries. $\beta_1$ (the coefficient of stock) for Peru is not the most significant coefficient, $\beta_2$ (the coefficient of support) does not have the expected sign and is significantly different from zero, and $\beta_4$, even though it has the hypothesized sign, is not significantly different from zero. It was noted earlier that a very small percentage (nine percent in 1962) of the Peruvian college student population was studying in the United States. This percentage increased to 25 percent in 1968. This increase over a period of only seven years possibly represents a structural shift. Unfortunately, the data for the earlier years or for the later years, on students studying abroad, is not available to test this hypothesis.

### *Policy Implications*

The policy implications discussed here are related to one specific question: How can the enrollment of foreign students in the United States be increased or the mix of nationalities improved, given the projected decline in domestic enrollment in the near future? Two recent changes in the United States policy towards foreign students are relevant in this regard. Since July 1973, students have been required to provide evidence of having full support for the entire duration of their degree program in the United States, rather than just one year as was the case earlier. In addition, students are now required to apply to the INS rather than school officials for summer work permits.

It was not possible to test the effect of these changes on the cost of migration as the data used refer to the time period prior to their implementation in 1974. But these policies will affect those who do not have enough funds to finance their education in the United States. Furthermore, the institutions of higher education, as well as private foundations, are not likely to commit themselves to supporting these students for the entire degree program. Therefore, it is expected that either the flow of students to the United States will decline, or the mix will change toward obtaining more students from wealthier families.

The results of this study indicate that the real per capita income of the domestic country has a positive effect on foreign students' demand for U.S. higher education. This implies that, as incomes of these countries increase, a larger flow of foreign students to the U.S. is expected. The range of coefficients on this variable, 0.417 for Brazil and 3.311 for Colombia, as examples, further indicates that if domestic incomes increase by the same percentage for every country included in this study, the mix of foreign stu-

[12]It should be noted that coefficient on financial support is positive and significant for three of the four countries, namely, the Dominican Republic, Ecuador, and Mexico. Peru, on the other hand, has a negative and significant coefficient. A discussion of results for Peru is provided later in the text.

[13]However, note coefficients on income for both these countries are positive and highly significant. This may offer partial explanations for the insignificance of this coefficient.

dents in the United States might change in the future.

Turning to specific policy recommendations, the study found that the existing stock of foreign students in the United States has a positive effect on the flow of foreign students. This stock of students was a measure of information (both quantity and quality) available to potential students in the home country. The significance of this variable suggests that foreign student enrollments may be increased if the U.S. colleges or the U.S. government were to provide more information in other countries. Other means of providing more information include extensive advertising by individual colleges and/or by the U.S. government in other countries.

As already noted, institutions of higher education collectively face increasing marginal costs. This implies that average tuition for foreign students should decline as U.S. college enrollments decline. Unfortunately, precise estimates of the real rate of tuition for foreign students, based on a prediction of domestic student enrollment, cannot be provided because this model does not solve for a unique value of the parameters of the cost function. However, the own price elasticity of demand for U.S. higher education implies that if the tuition were to decline, the enrollment of foreign students would increase.

It is also evident from the results that availability of some financial support has a positive effect on the flow of students to the United States. Unfortunately, the amount of financial support as evaluated in this study is not known in monetary units. Furthermore, even the extent of financial support is not known, i.e., the available data do not permit a distinction between students who are fully supported and students who are only partly supported. The results are still significant, because this implies that providing some assistance to foreign students leads to an increased enrollment of foreign students. Therefore, if institutions of higher education are unable to reduce tuition charges to attract more foreign students, a feasible alternative will be to provide support to needy students. The policy may also enable the institutions to improve the quality of foreign students.

In conclusion, it must be noted that recent changes in the United States visa regulations and in authorization of work permits will have the greatest impact on students from low-income families. For any given set of regulations, the policy to increase foreign student enrollment consists primarily of providing more and better information to potential students in other nations, and providing more financial support to a larger number of foreign students. However, determining the cost-effective method of implementing this policy is beyond the scope of this study.

In addition, U.S. colleges and universities should adopt policies to encourage foreign governments to send their sponsored students to the United States. Such policies may include designing special courses suited for the needs of foreign nations. Some countries have already started sending their sponsored students to the U.S. For example, Venezuela has made a commitment to send 10,000 students to the United States in the next few years (Open Doors, 1974; p. v). These policies also imply that institutions of higher education will be able to increase their foreign student enrollments at minimum cost.

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