भारतीय प्रबंध संस्थान बेंगलूर
INDIAN INSTITUTE OF MANAGEMENT
BANGALORE

WORKING PAPER NO: 350

A Framework for Analyzing Demand and Supply of Faculty and the Quality of Higher Education

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Year of Publication 2011

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I. Introduction and Context

Higher education has a crucial role in India's ability to succeed in the modern global economic system. The number of institutions serving the sector and student enrolments in India have expanded very rapidly in recent decades.[2] Enhanced educational attainments have contributed significantly to the high economic growth rates in the services sector that have buoyed India's recent economic performance. Yet higher education institutions and their performance are plagued by many problems, and this has been a major source of policy concern.[3] This paper will focus on two of these major issues—namely the phenomenon of "faculty shortage" and the "quality" of higher education.

The Indian higher education sector is heterogeneous. Different types of higher education delivery institutions co-exist, and these operate with very different motives and working contexts. All types of higher education institutions face serious problems of faculty shortage and in maintaining the quality of education. However, they follow different strategies while responding to this problem. Moreover, the actions of one type of institution can have important impacts on others. These impacts can be either positive or negative. Hence in order to develop strategies for addressing the problem of faculty shortage, it is important for policy makers to take an overall systemic view of how the higher education sector

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[2] See Pawan Agarwal, *Indian Higher Education—Envisioning the Future,* Sage Publications, 2009, Chapter 1.

[3] These perceived problems have prompted the Government of India to set up a number of expert committees to study different aspects of the higher education scenario. The *Task Force on Faculty Shortage and Design of Performance Appraisal Systems* was among them. Other important expert groups reports include (a) the *Committee to Review Pay Scales and Service Conditions of University and College Teachers, 2008* (G.K. Chaddha, Chairman*);* (b) the *Pay Committee for Faculty and* Scientific*/Design Staff of Central Technical Institutes 2009,* (Goverdhan Mehta, Chairman); (c) *National Knowledge Commission, 2009* (Sam Pitroda, Chairman); (d) *Committee to Advise on Renovation and Rejuvenation of Higher Education, 2009* (Yash Pal, Chairman); *Higher Education in India—Issues Related to Expansion, Inclusiveness, Quality and Finance, U.G.C.,2009* (Sukhdeo Thorat, Chairman). Also relevant in the Report of the National Seminar on *Privatization and Commercialization of Higher Education, NIEPA, 2006* (Ed. Ved Prakash and Sudhangshu Bhushan).

functions, and hence to assess how different components would respond to policy interventions. This paper attempts to examine the two issues of faculty shortage and higher education quality in relation to the relevant choices that higher education institutions make. We assume that these choices are made in response to economic incentives that different categories of higher education delivery institutions face.

The broad scenario prevailing in higher education relevant to faculty shortage and quality of education is briefly delineated below. This picture emerged from the statements made by key stakeholders before the Task Force[4], and also corroborated in reports of other expert committees.

Though reliable data relating to the quantum of faculty shortage are not available, the extent of shortage in percentage terms is believed to be substantial, varying between 20 to 50 per cent. On average, the shortage of faculty is deemed to be around 35 to 40 percent. Most estimates are imprecise and incomplete because there are no regular official surveys where information is collected systematically. There are a large number of unfilled vacancies for faculty in both universities and colleges. Typically, faculty shortage is estimated by the number of unfilled positions as a proportion of the "sanctioned posts". However, there is very little knowledge even among experts and policy makers on the degree of faculty shortage that prevails in different academic disciplines. [5]

However, this method of estimating the extent of faculty shortage is imperfect. This is because it does not accurately reflect the true extent of faculty shortage in any given period, which is the gap between demand and supply of faculty in the academic market. The number of sanctioned positions in any higher education institution (which is taken as a proxy for demand) is administratively determined, and these numbers generally remain fixed for long periods. Thus the number of sanctioned positions does not necessarily reflect the actual demand for faculty prevailing in the academic market. The market demand for faculty resources is determined by the decisions of higher education institutions in response to the demand for higher education from students. The latter in turn depends on the underlying demographic trends, and economic determinants such as trends in income and employment aspirations, all of which change over time.[6]

Most policy makers and experts emphasize inadequate supply as the most important cause of faculty shortage. Qualified persons are not entering the academic profession in adequate numbers due to

[4] Throughout the paper, the term Task Force refers to the *Task Force on Faculty Shortage and Design of Performance Appraisal Systems.* See Chapter VI of the Task Force Report, which provides a summary of information provided by key stakeholders in their interactions with the Task Force.

[5] See Task Force Report, Chapter III for an assessment of faculty shortage based on the available data.

[6] Macroeconomic factors such as the GDP growth rate, trends in industrial and services sector growth are the key indicators of income and employment patterns.

economic reasons. Incentive structures relating to the academic profession are adverse. Academic careers are unattractive when compared with other professions. Not only are academic salaries uncompetitive, there are additional constraints to attracting the best talent. For example, the social status of a teacher is not as high as it used to be in earlier decades. The teachers' work environment and service conditions have steadily turned more difficult. Potential teachers are discouraged from entering the profession also by negative features of their working conditions. These include arcane procedures, transfers, and the trend towards increasing teaching loads of existing teachers. New courses are started without filling posts, thereby making work for difficult for the latter. Hence, remedial steps typically propose addressing these supply side issues.

There is, on the other hand, a clear trend towards the use of part-time and ad hoc teachers in state universities and deemed universities. This is a response by the institutions to the inadequate supply of regular faculty, as well as to the inflexibility faced by some institutions in recruitment of full-time faculty. However, maintaining a high quality of education with this mode of meeting faculty resource requirements is a challenge. Currently, there are inadequate norms regarding certification to ensure high quality of such temporary faculty. In this context, many analysts and policy makers support the idea of increasing the available pool of qualified faculty in the short and medium term through steps such as retention of "mature faculty" (i.e., extending the age of mandatory retirement), or by inducting teaching talent from the large pool of talented professionals who are practicing outside academia.

Many higher education institutions face a serious funds shortage, and they find it difficult to manage the impact of salary increases emerging from pay revisions. This is particularly true of many government-funded institutions, especially the State Universities. Hence there is a fund-constrained de facto hiring freeze in place particularly in state-supported institutions. Therefore, there is a lack of effective demand for new faculty in these institutions. This indicates that the perceived shortage of faculty in Indian higher education has both demand-related as well as supply-side dimensions mentioned above.

The declining quality of higher education is a problem as serious as faculty shortage with regard to education outcomes. This problem can be addressed through multiple measures, including upgrading of existing faculty. However, upgrading of existing faculty quality is costly for the institutions. Efforts to ensure quality standards through imposition of stricter norms by mandate are at best moderately effective. There is therefore an implicit trade-off between providing the higher quality of education vis-à-vis greater quantity of higher education. Internal decisions made by higher education institutions, in the context of

policy directives and regulatory requirements, determine the actual balance between quality and quantity of higher education.[7]

Skewed incentive structures are at the root of faculty shortage in professional education. This problem is marked in most disciplines where the income earned by non-academic professionals is much higher than their academic counterparts. This situation distorts the demand-supply configuration in faculty jobs, creating pockets of relatively acute scarcity. In areas such as medicine, pockets of severe faculty shortage exist in some sub-sectors alongside relative abundance in others.[8].

Salary differentials operate to weaken established government colleges. The shortage of faculty in these institutions is caused or exacerbated by poaching of their faculty by the newer private colleges. In medicine, some potential teachers are drawn away by non-teaching hospitals. A parallel situation is encountered in disciplines such as law.

Universities are expected to exercise supervision over recruitment decisions and to ensure faculty adequacy of their affiliated colleges. In practice, the regulatory and/or supervisory capacities of universities are inadequate to deal with the large number of their affiliated colleges.[9] In general, the private colleges are able to bypass norms regarding permanent faculty, and this contributes to the phenomenon of so-called "absentee faculty", who are nominally on the faculty rolls of more than one college, and are actually not available to the students on a regular basis.

The scarcity of funds in the established public universities has encouraged them to introduce various courses that enable them to earn higher revenues. Some, like the proliferating distance education courses, are cost-effective. However, many "self-financing courses" have been introduced with the primary objective of easing the fund constraint. The use of these revenues for cross-subsidization is commonplace, and quality suffers in consequence. Distance education programmes do have a potential to provide a technological solution to the scarcity of faculty. However, when offered by large universities for

[7] Hence, it is important for policy makers to understand the operating context of higher education institutions. This context is likely to vary across different categories of higher education institutions.

[8] For example, faculty shortages exist in specific fields such as pre-clinical and para-clinical studies, whereas faculty numbers are available in the clinical segment. The misallocation of faculty resources arises because of misalignment of incentives. This arises from the better income prospects in the latter. On the other hand, such clinical-linked faculty personnel are often drawn towards professional practice as a supplementary source of income. This system has obvious benefits, but also requires monitoring to ensure quality in delivery.

[9] According to stakeholder inputs to the Task Force, in the case of dentistry, universities are often not in a position to exercise any control over the recruitment practices of their affiliated colleges. They are not kept informed when a faculty member joins or leaves the college.

commercial objectives, they share many of the quality problems alluded to above in the case of self-financing courses.[10]

Maintaining an appropriate cadre structure is acknowledged as a desirable institutional feature of academic institutions and constituent departments. There are prescribed norms for the ratios between assistant professors, associate professors and full professors. These structural norms are typically not followed in Indian higher education institutions. The situation is not uniform. The older established institutions facing funds constraint are unable to hire younger faculty. Hence their cadre profile is dominated by senior faculty. On the other hand, the newly established institutions find it more convenient to induct junior faculty. This results in a relative imbalance in their case, with a bias towards junior faculty.

It is clear from the above discussion of the higher education scenario, that economic behavior of market participants is at the root of both the problems of faculty shortage and of declining quality of education. In the remainder of this paper, I develop a simple economic framework to explain the behavior of higher education institutions. Our framework takes into account the different operating contexts of categories higher education institutions. Our analysis examines the responses of these institutions to changing regulatory and market conditions in relation to faculty shortage and quality of education.

II. Faculty Shortage and Allocation Decisions of Higher Education Institutions—Analytical Framework

Faculty shortage is a market determined quantity, reflecting the mismatch between the supply and demand for faculty resources in the academic market. Since faculty resource is a key input in the production of higher education services, the demand for faculty resource is derived from the underlying demand for higher education services from students. Hence the economic response to market conditions of academic institutions providing higher education is a crucial determinant of both faculty shortage and quality of education.

How academic institutions behave depends on their operating environment--in particular on the relative importance of markets vis-à-vis government intervention that prevails at any time period. This environment can change with time. Regulatory measures and policy guidelines that might be effective in a

[10] In this context, it is ironic that specialized distance education institutions have difficulty in attracting students as compared with larger universities. The "brand value" of the established universities is the reason for this phenomenon. This confirms the importance of institutional reputation as a key element in student demand.

'command-and control' economy would face opposition and possible evasion in a post market reform scenario if these are not incentive-compatible. We assume that in the present context, financial considerations are very important in the decisions of academic institutions. Several factors define the operating environment of higher education institutions. These include government policies, regulatory norms and requirements, the revenue generation possibilities, other non-revenue sources of funds, institutional capacity and reputations of higher education institutions. Decisions concerning recruitment, deployment and nurturing of faculty resources are all made by academic institutions. Hence, the effective impact of any policy or other ameliorative action depends on how this affects the decisions of academic institutions. Moreover, there are significant differences across academic institutions with regard to their operating context, which affect their behaviour.

Most available estimates of faculty shortage in Indian Higher Education, as mentioned above, are expressed as a proportion of sanctioned faculty positions. However, there are really no solid empirical grounds to assume that sanctioned faculty positions actually reflect the underlying demand for faculty. Hence these estimates are at best tentative. In the absence of systematic data, it is difficult to derive reliable estimates of faculty demand, particularly relating to specific broad academic fields such as humanities and sciences, management, engineering, medicine and so on.[11] In the era of high economic growth, with rising participation of private sector providers of education services and the trend towards higher tuition fees, decisions made by suppliers and demanders of higher education have an economic foundation. Hence the shortage of faculty is the result of underlying trends in the supply-demand configuration of higher education services. For example, the discipline-wise demands for faculty depend on the underlying pattern of demand for higher education from students.

In this section, we develop an analytical framework that sets out the inter-relationships between the key economic determinants of faculty shortage and quality of higher education in a systematic manner. The framework presented below is kept simple. However, it may be useful in illustrating the nature of systemic interconnections that underpin some of the problems affecting faculty shortage that have been identified from our deliberations with stakeholders. The insights so obtained may be useful in the strategic choice and prioritization of policy interventions.

II (A) Demand & Supply for Higher Education

Faculty Shortage represents a mismatch between the demand and supply of faculty resources. Faculty resources are required only as one of several inputs in the production of higher education services. Hence,

[11] In fact, an important recommendation of the Task Force is that detailed and systematic data should be collected and disseminated on a regular basis by official agencies. See Chapter VII of the Report.

the demand for faculty, in both in absolute terms and in composition, is derived from the underlying **demand for higher education.** This latter demand can be analyzed in two parts. The first is the aggregate demand for higher education, and second aspect is the composition of this aggregate into its components—i.e., different types of disciplines. The former is shaped by long term factors and is a function of certain key macro-trends in the economy. These factors include the following:

- Demographic trends: The size and age-structure of the population determines the number of student-age individuals that forms the population pool from which the demand for higher-education will occur.
- Economic growth trends: This is the crucial factor governing the (expected and actual) economic returns to higher education, as the prospects for employment and incomes change. These factors affect both the ability to pay for higher education as well as the disciplinary composition of the demand for higher education. Courses and disciplines where job prospects are bright and expected incomes are high would be in greater demand. This would be reflected in higher enrollments (if seats for admission are available), as well as in the trends of student applications. To the extent that commercialization (or other forms of price flexibility) of higher education is permitted, these sectors would command higher student fees. In addition, social status factors govern job aspirations, which are to some degree independent of the pure economic calculation of the net benefits of higher education by students.

To summarize, the aggregate demand for **higher education i**s a function of the following factors:

- the number of student-age population and
- the 'desired gross enrollment ratio'. [12]

The 'desired gross-enrollment ratio' in turn is a function of following factors:

- trends in per capita income;
- the cost of higher education (tuition fees, etc); and
- sociological trends linking social status with higher education attainment

The above factors determine the broad total demand for higher education. The discipline-specific demands for higher and professional education are components of the aggregate demand for higher

[12] Not every person in the student-age population may want to enroll for higher education. Thus the low GER that is observed is *not necessarily* due to shortage of educational opportunities (supply constraint). This phenomenon is clearly evident in the advanced economies such as the USA. We have not attempted here to statistically estimate the desired GER as a function of its determinants, but rather to explicitly delineate the logic of the relationship. WE However, from a policymakers' point of view, it would be desirable to conduct regular surveys and use the data to estimate reliable statistical projections of the desired GER.

education. The discipline-wise composition of the aggregate demand for higher education stems from the economic choice made by the prospective students. This reflects the relative attractiveness of different academic disciplines. Factors which enter the expected benefit-cost calculations of the potential student population reflect the evolving labour market conditions in different types of professions and employment opportunities.[13] The key variables are:

- average entry-level salaries in the respective fields after the degree is obtained
- tuition fees received by private sector institutions in each of the major fields.

The demand trends would be apparent to the providers of higher education by observing enrollments and applications received in different disciplines of study. In addition, signals from education policy makers provide additional information to academic institutions regarding the demand patterns in higher education.

Based on the above determinants of the demand for higher education, higher education providers (viz., universities, public and private colleges, professional education institutions etc.) make two related choices. They first decide on the ***quantum (and composition) of higher education that they will provide*** during the year.[14] Once this is decided, they then make effective decisions about ***acquiring and allocating faculty resources.*** These decisions in turn determine the ***demand for faculty*** in the academic market space. We assume here that the recruitment and other faculty-resource enhancement decisions are made on the basis of an economic logic that is consistent with the institutional goals of these institutions. What is the logic on which higher education institutions make their decision? An economic logic seems appropriate. We assume that these institutions are essentially economic organizations because they utilize human and other resources (that are purchased from the market) and they also provide higher education services which have a significant economic value to individuals and to society at large. Hence, we shall suppose that these institutions operate rationally as economic agents to maximize an 'objective function'. This objective function should reflect the appropriate context in which they operate. They must satisfy the conditions for their economic survival and institutional growth, and they must meet the expectations of their major stakeholders (e.g., government, owners, funders, faculty, students, recruiters, peers, etc.).

[13] For example, there has been a sharp rise in the demand for software engineers in recent decades, which has impacted the demand for courses in engineering and other related disciplines from students. By contrast, courses in humanities and liberal arts and sciences have witnessed a sluggish demand. The demand for higher education in India is affected by competition from universities abroad, as ever larger numbers of Indian students migrate for higher studies abroad. Even so, the pressure of demand for higher education within India remains strong in relation to supply.

[14] The quantity of higher education is measured in this framework by the number of degrees that are given during the academic year. It is closely related to the number of students that are enrolled.

What are the elements of the objective function of higher education institutions? We assume that academic institutions, through their allocation decisions seek to find the *optimum combination* between two independent objectives. These are (1) *Net Operating Income*; and (2) *Institutional Reputation*. These objectives represent short run and long run dimensions of institutional success. The importance of generating a net surplus in terms has become increasingly important after economic liberalization for all higher education institutions because of rising costs as well as stagnant or shrinking grants. It is relatively easy to measure, being the difference between income flows and recurring costs. Income accrues from tuition and other fees paid by students, other sources such as endowment investment income, grants, funded research projects and consulting activity. The ability of institutions to generate incomes from each of these sources varies considerably, and hence there is a difference in their relative importance in the objective functions of different types of institutions. Institutional reputation, on the other hand, is difficult to measure directly. However, its importance as an institutional objective of institutions providing higher education can hardly be questioned.[15]

Institutional reputation is a more complex entity. It is typically created over a long period of time through a combination of activities that includes consistently providing high quality education services. Also important are the job market performance of its graduates, and the recognition of the institution's research and faculty quality.[16] Institutional reputation can be acquired through expenditure of resources over extended periods. Among the key inputs that lead to high institutional reputation are the quality of faculty resources, an attractive working environment for academic activity and good infrastructure. Each of these items has cost implications. At the same time, institutional reputation is not merely an item of cost. It can also significantly enhance the capacity of the academic institution to earn a higher income. This arises from their improved ability to attract students, charge higher tuition fees, innovate and create new academic programmes and/or courses, to win research projects and to earn consulting incomes.[17] Last but not least, high reputation also makes it easier to attract high quality faculty. The nature and quantity of faculty resources that are demanded by the institutions therefore depends on how they choose to allocate their budgetary resources between net income generating activities and building institutional reputation.

[15] A similar argument could be made for hospitals. These institutions offer services, whose quality and effectiveness are not obvious to the users. Hence reputation serves as a signal for quality and institutional capacity.

[16] The relative importance of research in determining institutional reputation varies over time and across countries. For several decades after independence, in the face of high growth of demand for education, teaching excellence was seen as the pre-eminent component of reputation. Several specialized research institutions sprang up, but outside the university systems. In recent times, research is again gaining importance as Indian higher education gets globalized.

[17] The Task Force was informed that that older established and reputed institutions have had much greater success in starting revenue earning self-financing courses and distance education courses as compared to institutions. This is an example of the differential economic value of reputation in the academic market place.

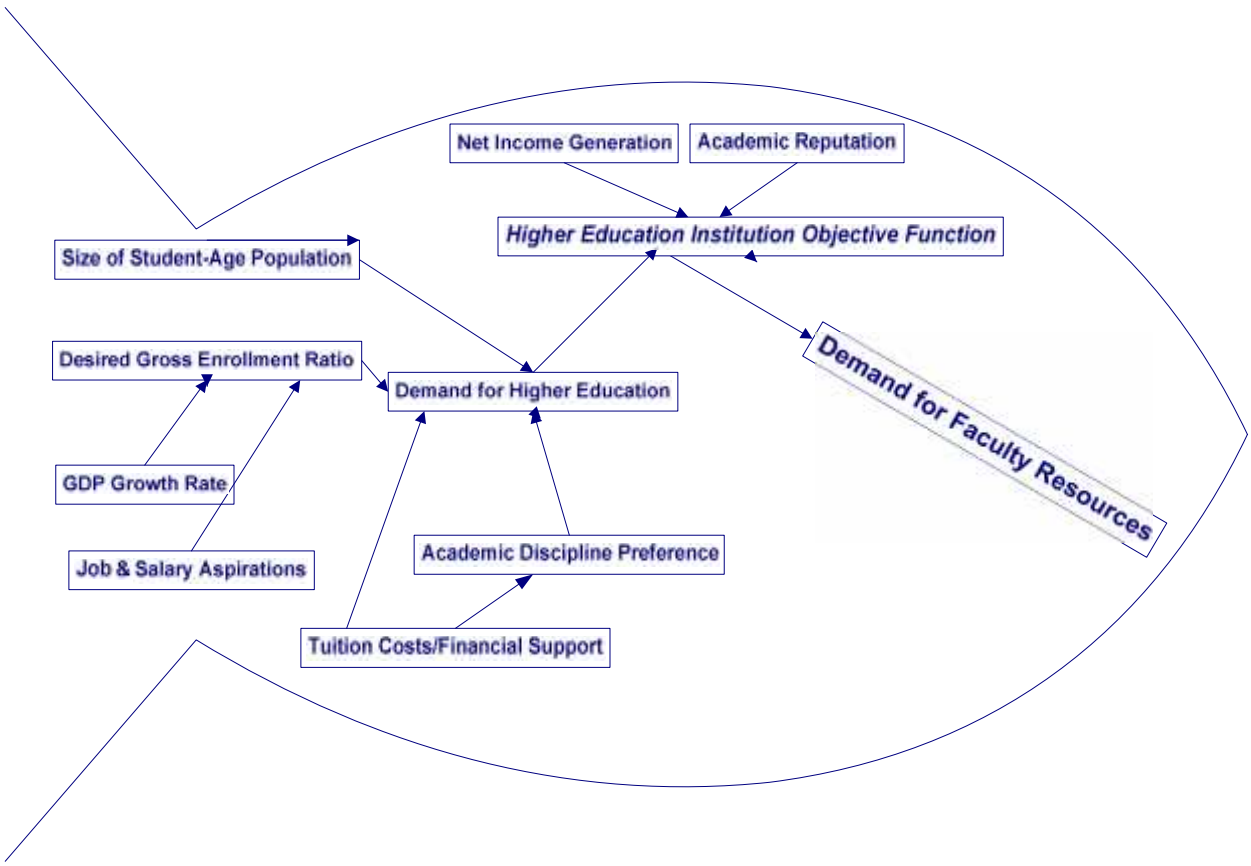
The operating contexts are normally quite different for different types of academic institutions. For example, the nature of infrastructure available to large centrally funded universities is very different from state universities and both differ from private sector institutions. In addition they must conform to the relevant regulatory norms. Regulatory norms govern cadre ratios. Government policies are an important determinant faculty emoluments in public sector supported institutions. [18]

It is clear that the underlying context in which the academic institutions make their faculty-related decisions can and does vary over time and across the type of institution. Unlike commercial firms, they do not mainly seek to maximize profits. It is also true, however, that in the era of market reforms, commercial considerations have grown in importance. Apart from 'pure' economic objectives, the actual demand for faculty is shaped by different characteristics of the operating or 'business environment' faced by higher education institutions. For example, in a system in which all institutions are government-owned and fully funded without major budget constraints, the decisions on faculty deployment would be taken without an explicit economic consideration in mind. Alternatively, for a private sector college without a major endowment support for backup, reliance on tuition fees is high, and this would impact its faculty-related decisions. Apart from the financial and ownership aspects, there are other important elements that influence the decision-making by academic institutions. These elements include constraints placed on their operational freedom and flexibility by means of regulation and/or government policy. Chart 1 provides a schematic representation of the logic underlying the determination of demand for faculty resources.

There could be a trade-off that between the two objectives and institutions must choose the appropriate balance between maximizing net income or reputation. In the initial analysis we shall abstract from this aspect, and assume that they are maintaining a balance between these objectives in a manner that is optimal from their standpoint. In the latter part of the analysis, we shall discuss the choice between the two—in terms of the choice between quality and quantity of higher education.

[18] The demand for permanent faculty may be viewed in economic terms as being similar to the acquisition of an investment good by a firm. In other words, like infrastructure, permanent faculty is a stock which yields a stream of faculty services over a long period. Its quality and productivity can be enhanced by further investment. In this discussion, we have abstracted from this aspect of faculty demand and treated faculty resources as a variable input.

Chart 1: Determinants of the Demand for Faculty Resources



The relationship between the demand and supply of higher education, and the perceived shortage of faculty is explained schematically in the following diagrams. The gap between demand and supply of higher education is commonly attributed to faculty shortage. However, this need not always be true. We examine below a few illustrative scenarios, where the cause of inadequate availability of higher education varies.

Situation 1: Excess Demand for Higher Education without a Faculty Constraint

Figure 1: Excess Demand for Higher Education Services without Faculty Shortage

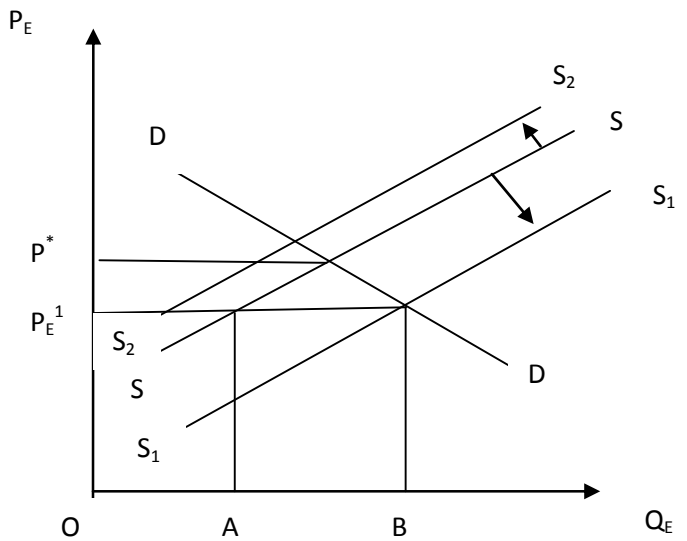


Figure 1 illustrates a situation of excess demand (or shortage) of Higher Education. DD is the demand curve for higher education. The horizontal axis measures the 'quantity of higher education' ($Q_{E)}$. This represents the demand for degrees/diplomas from students. Thus, the quantity measured on the X-axis is the number of degrees/diplomas demanded and/or supplied during each academic year. The price of higher education (tuition fees) is measured along the Y-axis ($P_{E)}$. As explained above, the demand is a function of the tuition fees (price of higher education). Other parameters affecting demand include the number of student-aged population with adequate pre-college qualification, and the 'desired gross enrolment ratio').[19] The SS curve depicts the initial supply of higher education as a function of the price of higher education.[20] Apart from the tuition fees charged, the supply of higher education depends also on other sources of income, and/or financial support received for provision of higher education (grants from government, and/or non-government sources, endowment income, etc.), the price (salary) of faculty inputs to deliver teaching services, and the policy and regulatory requirements that must be fulfilled by the educational institutions.[21]

[19] Changes in any of the other variables, e.g., the desired GER, would cause the demand curve to shift in position.

[20] We assume here that the market for higher education has many service providers who compete with each other. None can exercise monopoly power to influence the market price. Following standard economic logic, for any given level of price $P_{E,}$ net-income maximizing providers of higher education services would supply education quantity up to the point at which the price equals the marginal cost of supplying an additional unit of education. Hence the supply curve coincides with the marginal cost curve. Increasing costs of faculty resources would raise marginal costs and make the supply curve less price-elastic (i.e., steeper in slope). In this paper, we have not extended the analysis to academic markets with non-competitive structures.

[21] We assume in this case that faculty services are in relatively elastic supply. If salaries are raised moderately, faculty may be recruited in the academic market place.

It is obvious that institutions can try to dilute the quality of higher education services in an effort to lower costs.[22]We shall assume initially that the academic institutions supply higher education services *at a fixed level of quality*. If the higher education sector operated according to purely market principles, then the market for higher education would be in equilibrium at price P^*. However, this market price might not be deemed socially acceptable on grounds of equity and the implied financial burden for an "essential" service may be seen as too high. Therefore policy makers and/or regulators may impose an effective ceiling price. The diagram illustrates what would occur if there were a *policy-determined* or *regulator-determined price* P_E^1. In this case, there would be a *shortage of higher education of an amount AB*, since the supply would be OA and the demand would equal OB.

One way to close the gap between demand and supply of higher education is to restrain the demand for higher education by sharply raising the standards required to qualify for admission. This would cause the demand curve to shift to the left. This phenomenon may be observed in the case of certain types of professional education institutions focusing on law, management or engineering, where the excess demand is particularly obvious.[23] This solution may not, however, be optimal from the viewpoint from society as whole.

It is not unlikely that in this type of situation, the higher education institutions might argue that there is a faculty shortage. If faculty resources were more plentiful, their salary would fall, and this would enable the institutions to increase supply and close the gap. However, *this would be a wrong diagnosis* of the problem. What this actually reflects is the fact that there would be a faculty shortage *only if an attempt is made to lower the existing levels of faculty salaries*. The basic reason for excess demand for higher education here is that the price for higher education is lower than equilibrium, and that at existing costs, higher education institutions have no incentive to supply the level required to eliminate the gap. As depicted in Figure 1, the supply curves of higher education are fairly elastic, indicating that there are no severe supply side difficulties in a structural sense (arising from faculty unavailability in a physical sense).

The problem can be addressed by *improving the incentives of the higher education institutions* by means of either freeing the tuition rates that they can charge, or alternatively *to provide subsidies and/or grants so that the supply curve shifts to* S_1S_1.

[22] This can be done in a variety of ways. The most common methods are to increase the class size per teacher, lower the quality of academic infrastructure, and intensifying the teaching load of faculty.

[23] This year for example nearly 186,000 candidates appeared for the Common Admission Test (CAT). They were seeking admission to the Indian Institutes of Management which admitted just about 2800 students in all. In other words only 1.5% of the applicants were able to gain admission.

Under these conditions, if the policy response focuses instead on trying to improve the supply of faculty *by mandating better salaries and working conditions*, this would not ameliorate the situation. The problem might get worse if it raises the cost of production of the institutions, unless there are accompanying measures to relax the financial constraints of the institutions.[24] This is depicted in the diagram as a shift to the left of the supply curve to position S_2S_2. This would worsen the gap between demand and supply of higher education. Hence, *the ability to institutions to earn more revenue or to tap other income sources should be at the core of any solution* aimed at improving supply of education. In this connection, it is easy to understand the phenomenon of institutions attempting to introduce separate 'self-financing courses' with higher fees that was reported by many of stakeholders to the Task Force. A third approach to the problem would be to intensify the work-load of the existing faculty pool by mandating greater sizes of student enrolment, or by increasing the teaching load. This would cheapen the cost of faculty services to the institutions. As we shall see below, there are negative implications of such an approach for the quality of education.

Situation 2: Excess Demand for Higher Education under Conditions of Faculty Shortage and Restrictive Policy

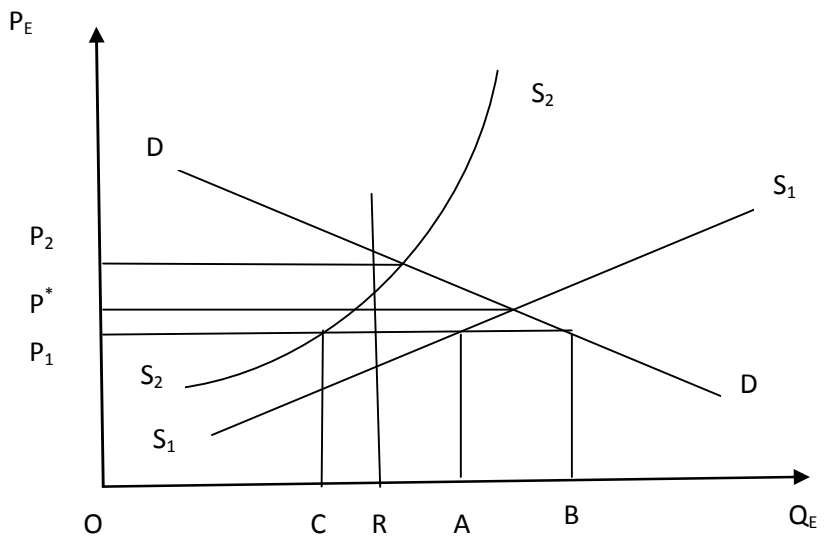
Figure 2 illustrates a situation where there are two different types of constraints on the ability of the higher education institutions to provide education services. The first is a scarcity of faculty available due mainly to the fact that alternative job opportunities are preferred by potential teachers and researchers. The figure shows two different supply curves reflecting alternative cost conditions faced by academic institutions. The S_1S_1 curve depicts the situation discussed earlier in which the supply curve is relatively elastic. This represents the condition where higher education supply can be expanded with modest increases in price because faculty resources are available in the market. The second supply curve S_2S_2 turns steep after a certain level of education has been supplied. The point of inflection marks the level beyond which the availability of faculty has become scarce, due to underlying structural factors.[25] Beyond this point, the price of education would have rise to elicit additional supply, because marginal costs increase. We continue to assume that the price of higher education is subject to an upper limit due to policy and/or regulation. This price is P_1, while P^* is the market-clearing equilibrium price when the supply curve is S_1S_1. When supply becomes inelastic the market clearing price is even higher at P_2.

[24] We are examining the effects in the short and medium term. If the higher faculty salaries bring forth a very high increase in faculty resources supplied, it is theoretically possible that the supply curve for higher education may actually increase. In that case, the shortage of higher education will reduce—unlike what is depicted in Figure 1.

[25] There could, however, be some reasons other than faculty scarcity for the supply curve to become inelastic. This includes constraints in expanding academic infrastructure, which could be due to funding constraints.

Figure 2 shows that when the supply curve is relatively elastic (S_1S_1), the excess demand for higher education is AB (=OB-OA). But in the case where the supply curve is less elastic due to faculty resource scarcity, the gap is larger given by BC. We see that there is an increase in the level of excess demand for higher education in the case where there is a scarcity of faculty. In other words, BC is larger than AB. Thus *faculty scarcity exacerbates the excess demand for higher education, but does not create it.*

Figure 2: Excess Demand for Higher Education with Faculty Shortage and Policy Constraint



Apart from faculty scarcity, there could be other reasons why higher education institutions cannot increase the supply of higher education. *Policy induced restrictions may be a distinct and separate barrier*. Among the problems that were brought to the attention of the Task Force was the fact that several Central and State universities had to impose a "hiring freeze" for an extended period. This was related to strained fiscal conditions of government budgets. There could be other sources of similar constraints. For example, there could be long delays in obtaining regulatory clearance to open new campuses or institutions or courses of study. *The important task from a policy standpoint is to recognize which of these two types of constraints is binding*. In Figure 2, OR represents the limit to provision of higher education posed by such a policy constraint.[26] When the supply curve is elastic (S_1S_1) the supply will be OR, indicating that now the effective constraint is the policy constraint, and thus the excess demand will RB, which is higher than AB. In other words, faculty shortage is not the reason for the observed excess demand for higher education.

[26] For the sake of expositional simplicity, we have depicted OR as a rigid barrier. It may still be possible to increase the supply of higher education in this situation by increasing faculty work-loads and/or reducing education quality.

As far as remedies are concerned, we can see from the figure that *efforts to increase the supply of faculty will have little impact on the core problem when the policy constraint is binding*. Unless the binding constraints can be relaxed, the problem of excess demand cannot be mitigated.[27]

What would be the situation when the policy constraint is not binding?

Figure 2 also illustrates this situation. Consider what happens when S_2S_2 is the supply curve. In this case, OR (the policy constraint) exceeds OC, which is the market supply at price P_1 (the administratively fixed price). *In this case the policy constraint is not the binding constraint, but rather the relative shortage of faculty*. At the mandated price of higher education, the supply of education is OC and the demand is OB. Hence the excess demand for education is amount BC.

What are the appropriate remedies in this situation? In this situation, relaxing the policy constraint on expanding higher education services will not be effective. The immediate steps should address ways of relaxing the faculty shortage through a variety of short term measures that have been detailed elsewhere in the Task Force report[28]. This will improve the supply of education to some degree, and the supply curve would shift to the right, while still remaining inelastic. There may still be a persistence of some excess demand. Alternatively the price ceiling can be lifted, and this will reduce demand. However, the danger in this approach is that the demand for higher education can tend to get skewed towards those courses of study where the potential economic returns are high enough to justify the higher fees paid by students.[29] The long term solution would be to take steps to improve the entry of larger numbers of qualified professionals into the teaching/research careers, and ease infrastructure constraints so that the supply curve for higher education assumes the elastic shape of S_1S_1, while it also shifts to the right. Some relaxation of the ceiling price for education might be needed if the entry of new faculty also requires higher salaries and other institutional costs towards providing better academic environments, unless this is feasible through grants or endowment income.

In this sub-section we have discussed the essential features of the market for higher education, in relation to both demand and supply. We have analyzed the economic logic of decision taken by academic institutions with regard to the supply of higher education, as they try to maximize their net income subject to a variety of constraints. In other words, we have assumed until now that higher education services are

[27] We do not deny that there may be good reasons for the policy or regulatory constraints. Our analysis suggests that these require prior resolution if the larger objective of providing an adequate level of higher education services is to be met.

[28] Task Force Report, Chapter V.

[29] This phenomenon is quite evident in case of professional degrees/diplomas in management, engineering, law and medicine.

supplied while maintaining a given level of quality. We have seen that the core problem of excess demand for higher education can arise from different sources, of which scarcity of faculty resources is only one source. The effective constraint on greater supply of higher education can vary depending on the context. It could be faculty scarcity in some circumstances, but other effective constraints have been identified in the above discussion.

Academic institutions make both output supply and input demand decisions. We have in this section, examined the former. With regard to the shortage of faculty resources, it is the input demand decisions of academic institutions that are directly important. We now turn to an analysis of the market for faculty resources.

II (B) The Market for Faculty Resources

The Demand for Faculty Resources

To summarize the argument thus far, the **demand for faculty** is determined on the basis of the economic decisions made by the higher education institutions. These decisions reflect their economic and strategic objectives as well as the constraints of their operating environment. Since the mix of institutions that provide higher education services is quite diverse, we would expect that the nature of their demand for faculty would vary significantly. It is therefore necessary to take these differences into account in specifying the logic of their faculty resource decisions. Figure 4 illustrates the simple analytics of the demand for faculty resources. The assumptions underlying the diagram are as follows: (1) Academic institutions have made a prior decision (based on the logic discussed above) about the quantity of higher education services that they will provide during the year. (2) They have also decided to offer these services at a certain level of quality. (3) Certain quality norms have been set by regulators that they are expected to respect. This would imply (among other requirements) that they maintain a certain minimum level of faculty, with the appropriate levels of qualifications. (4) There are upper limits to the level of faculty inputs that are effectively set by policy makers/regulators. These may have to do with limits on the number of sanctioned posts, or with a fiscal crisis-induced freeze on recruitment, or with the permission to offer new courses.(5) Subject to all the above conditions, the academic institution attempts to maximize its net income. A diagrammatic representation of the demand and supply for faculty resources is shown in Figure 3.

In Figure 3, the quantity of faculty inputs is shown in the X-axis, while its price (faculty salary) is measured along the Y-axis. The demand curve D_fD_f for faculty services under the above assumptions,

following standard economic analysis, is given by the Value of the Marginal Product curve.[30] The curve depicts the demand for faculty resources as a function of the salary that is paid for them. As discussed above, other factors cause a change in the demand for faculty resources, which are taken as given parameters.[31]These parameters are:

- The quantity of higher education to be supplied
- Regulatory norms and official permissions governing cadre structure, and infrastructure requirements
- Flexibility with regard to starting new academic courses[32]

From stakeholder consultations, the Task Force has noted that in recent years the market for higher education has tended to get fragmented. The demand for professional education courses that promise higher income prospects has expanded much more rapidly relative to the liberal arts and sciences. This factor has affected the functioning of the sector. This has led to a corresponding increase in the demand for faculty resources in these fields. At the same time, the supply of faculty resources has also shown a differential trend. The pattern of supply seems to be as follows. There has been a general slowdown in the supply of faculty resources. For ease of exposition, we show this as a left-ward shift of the supply curve for faculty resources.[33] In addition, the supply of faculty resources in the professional and technical disciplines has tended to contract more sharply than in other disciplines, so that the faculty shortage issue is more severe in these areas. We elaborate on the supply determinants of faculty resources below.

The Supply of Faculty Resources

The supply of faculty may be viewed in relation to the (a) appropriate time frame and (b) both the quantitative and the qualitative dimensions. Faculty availability can be enhanced by actions that are effective in the short run, the medium and long term. The long term dimension may often tend to be neglected in order to address pressing requirements of the present. However, it is necessary to address the long term structural issues that are the fundamental contributory factors to the phenomenon of faculty

[30] The diagram incorporates standard economic analysis of input markets. A key assumption is the law of diminishing returns, i.e., the marginal product of any input (e.g. faculty time) falls as more of it is utilized with fixed quantities of other inputs (e.g., class rooms and academic infrastructure). Net income maximization by the institutions will lead them to hire faculty inputs up to the point where the cost of 1 unit (the salary or wage) will equal the value of the marginal product yielded by that input.

[31] When they change, this results in a shift in the position of the demand curve (to the left or right depending on whether the impact on demand is positive or negative.

[32] This flexibility depends on the extent of autonomy enjoyed by the academic institutions, their credibility and reputation as well as the financial position of the institution.

[33] There is no hard evidence to suggest that the supply of faculty resources at any given salary level has actually shrunk in absolute terms, but this is the strong impression of most observers—particularly if we assume that the quality of faculty is kept constant.

shortage. Moreover, actions that expand the supply of faculty in the short run may not be adequate to ensure that the quality of academic faculty is maintained and improved. This consideration is strategically important in the context of India's aspirations as a "Knowledge Economy".[34]

The long term supply of faculty is determined by structural features of the Indian economy, and also specific characteristics of the higher education sector. There is a general consensus among the key stakeholders that the basic constraint on the supply of faculty is the *relative economic unattractiveness of the academic profession* in the current circumstances. The incomes earned by faculty are below those available at the entry level in alternative professions for persons with comparable intellectual capability and educational attainment. The situation has been exacerbated in the post reform high growth rate scenario. This trend has affected professional and technical education sectors more severely. In the case of liberal education, the problem is less severe. However, the perception itself that programmes in humanities, social and natural sciences are not expanding in academic institutions has had a broad-based negative impact of faculty supply. Hence the long term supply of faculty needs to be addressed through policy measures that restore the attractiveness and status of the academic profession.

Monetary incentives are not the only, nor perhaps the most significant influence on the decision to take up an academic career. Apart from salaries, other important structural determinants of the supply of faculty resources include:

- Service conditions (e.g., teaching work load, opportunities for research, administrative facilitation)
- Salaries obtainable in other professions and employment with comparable qualifications
- Career advancement prospects (e.g., promotion, skill up gradation programmes, possibilities for external recognition of research)
- Institutional reputation (i.e., faculty resources would tend to shift to an institution with a better reputation, and there would be less attrition)
- Better post-retirement benefits
- Providing prestigious fellowships for inducting talented scholars towards PhD work and academic careers

The above key steps would improve the attractiveness of academic careers and enhance the long run supply of faculty resources.

[34] See Task Force Report Chapter V, for its comprehensive set of recommendations for enhancing the quantity and quality of faculty resource supply.

In addition, the supply of faculty resources may be enhanced in the short to medium term by certain other measures. Several of them would have a one-time impact of the supply of faculty resources. These include:

- Increasing the opportunities for participation in academic work by other potential teachers and researchers[35]
- Relaxation of the age of retirement of faculty
- Creation of posts such as emeritus professor/fellow
- Creating policies for "brain gain" that attract NRIs and other international academic personnel

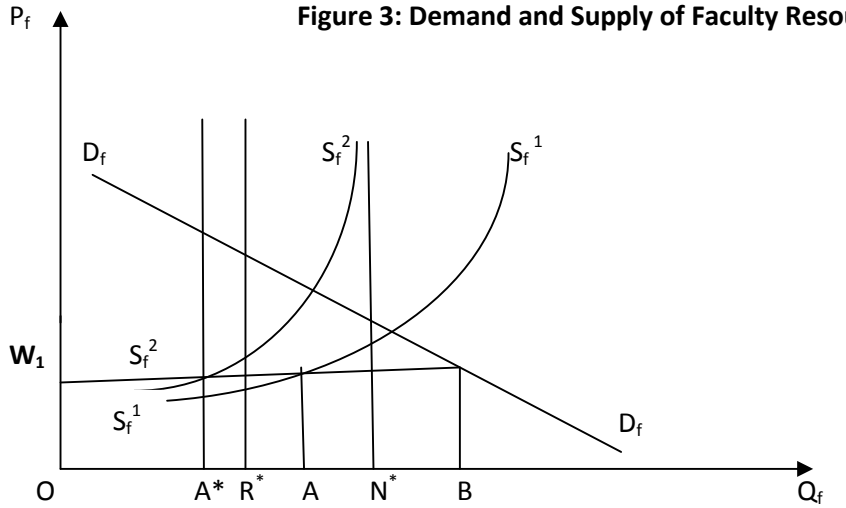
The diagram (Fig. 4) depicts supply curve(s) for faculty resources as a function of the price (salary). Changes in any of the other parameters listed above would cause a corresponding shift in the supply curve.

Figure 3 illustrates the working of market for faculty resources. The quantity of faculty resources is measured on the X-axis and the price (faculty salary) on the Y-axis. The D_fD_f line is the demand curve. As explained above, this corresponds to the "value of marginal product of faculty resources". It is drawn on the assumption that other parameters affecting the demand for faculty resources are given. In particular, it corresponds to a particular quantity of higher education services that the institutions have decided to provide. Two illustrative supply curves are shown. They represent two different configurations of supply in two consecutive periods. $S_f^1S_f^1$ and $S_f^2S_f^2$ are the supply curves in periods 1 and 2 respectively. The supply curve in the latter period shows a shift to the left reflecting the general trend of shrinkage of faculty supply for reasons discussed above. [36]

[35] There is a large pool of technically qualified researchers and practitioners who might be willing to teach part-time. But under current conditions they are unable to supply teaching and/or research services to academic institutions. Their potential to ease the faculty shortage is increasingly recognized. The UGC has instituted a scheme for the purpose. Typically, several categories of faculty appointments could be made that are more adaptable. These include adjunct faculty, visiting faculty, and international visiting fellows with more flexible terms and conditions. The Task Force has endorsed this approach, subject to the proviso that adequate safeguards be there to ensure quality standards. In this analytical framework, we

[36] To keep the diagram simple, we present this situation in terms of a given demand curve and shrinking supply curves. In reality, the demand curve is likely to have shifted to the right as the demand for higher education has expanded, whereas the supply curve has either shrunk or expanded much slower than the expansion in demand. In any case, the net effect is as depicted in the figure.

Figure 3: Demand and Supply of Faculty Resources



$S_f^1S_f^1$ is the initial supply curve for faculty resources. The curve becomes steeper (more inelastic) as Q_f increases because beyond a point there is a growing scarcity of faculty services. In a free market, the market clearing price and quantity would occur at the intersection of the demand and supply curves. However, Indian faculty salaries have been traditionally determined by administrative norms, and this condition continues. The faculty salary is thus assumed to be given at the level W_1. There are certain other regulatory or policy related bounds on faculty utilization. OR^* is the minimum level of faculty recruitment that is mandated by the regulatory authorities. This corresponds to quality specifications such as maintaining a minimum level of faculty-student ratio. Similarly ON^* shows an administratively set upper limit on faculty resources. This corresponds to the number of "sanctioned posts".

The diagram yields the following insights. We notice that the actual shortage of faculty resources when the faculty salaries are given at W_1 is equal to amount AB. This is the gap between faculty demand and supply. The *actual shortage is seen to be greater than the number of "unfilled" positions* relative to the number of sanctioned posts, which is given by AN^*. Hence the standard practice of measuring faculty shortage relative to sanctioned posts is inaccurate, and could be potentially misleading for policy makers. In period 1, there are no violations of any regulatory norms. The actual utilization of faculty resources is OA, which is within both the upper and lower bounds.

Consider the situation in period 2. The supply curve for faculty resources has contracted. Not surprisingly, the actual faculty shortage has increased to A*B from AB. However, in this case *there is likely to be a violation of regulatory norms* because at the given salary level it is not possible to maintain the minimum required faculty resource level OR^*. The available supply is OA^* which is less. There would be a decline in quality of education supplied because faculty inputs to deliver the required standard cannot be

obtained. What would be likely consequence? The institutions would attempt to effectively shift the supply curve back to its original position. Likely responses from the institutions would be some combination of the following: (a) under-supply higher education to maintain quality, but at the cost of creating a shortage in higher education; [37](b) try to expand the faculty supply through short term measures such as use of temporary faculty and lowering of entry barriers into the teaching profession;[38]and (c) to lower the effective cost of faculty resources by intensifying the workloads of existing faculty by demanding more teaching hours per year.[39]

It is possible to extend this analysis to the case where the market for faculty becomes fragmented due to differential trends in the patterns of demand and supply. The Task Force learned from its consultations with stakeholders that certain segments of higher education linked to professional education has experienced much sharper rise in demand compared to the arts and sciences. This is largely due to the perceived difference in income prospects. At the same time, the supply of faculty resources in those very disciplines has tended to decline. The reason is that there are better income opportunities outside academia in these disciplines, due to increased job opportunities and lucrative private practice. It would be more appropriate to analyze the two sub-markets separately rather than in the aggregate as done in Figure 3. Though a separate diagrammatic analysis is not presented here, it is easy to see that in such a situation, there would be a marked difference in the intensity of faculty shortage between the two segments of higher education, *if the faculty salary is the same in both segments.* We may term these as the "high shortage" and "low shortage" sectors respectively. Under such market conditions we would expect the "high shortage" segment to experience a great pressure to increase faculty salaries to enhance supply. They would also be inclined to charge higher tuition fees for these courses. If raising salaries and tuition fees in the high shortage segment is not permitted for some institutions, but is possible for others, this will lead to a fragmentation among the higher education institutions themselves. Institutions that can operate on commercial principles will tend to specialize in the high shortage segments. They would be tempted to "poach" faculty from other more regulated institutions, and this in turn would in turn lead to a secondary negative impact on the supply of faculty resources to the "low shortage" sector, because of relative disincentives. The response of institutions in this sector is likely to include lowering costs and enhancing faculty resources through lowering entry barriers, and endangering quality.

[37] This seems to be happening in the case of engineering, law and management in the reputed institutions.

[38] Unless there are adequate processes in place for certification and quality control, this option also could diminish the quality of education supplied

[39] This line of action would also have a negative impact on quality of education. Moreover, by pre-empting the time of the existing faculty members from research, this would eventually lower the academic reputation of the institution.

From the above discussion we can clearly discern the interrelatedness of the problem of faculty shortage with the quality of faculty resources and of higher education itself. It seems important therefore to examine the relation between quantity and quality in more depth. This is attempted below.

III. The Balance between Quantity and Quality of Higher Education

Higher Education institutions produce both a certain quantity of higher education as well as quality. Until now in this chapter, we have discussed economic decisions by academic institutions relating to both output (higher education services) as well as input (faculty resources) in *quantitative terms,* assuming that the quality is being maintained at a particular level. However, it is useful and more realistic to consider *quality of higher education as an element of conscious decision* made by institutions. Hence, we shall extend our framework to analyze the quality-quantity configuration as a joint decision. In situations of rising demand for higher education and associated shortage of faculty resources, there is an inevitable trade-off between quality and quantity. Typically the service providing institutions must make a choice, and strike the most advantageous balance between quantity and quality. This aspect of the problem confronting higher education is not explicitly recognized in the discussions of faculty shortage. However, this is a crucial aspect of policy because the effectiveness of higher education both for the students as well as for society as a whole ultimately depends on its quality.

During deliberations with stakeholders, the Task Force learned that the threat to quality of higher education arises from the choices made by the delivery institutions in different market situations.[40] Regulatory bodies often find that imposition of stricter quality norms is not easily enforceable.[41] This holds even where regulatory functions have been delegated to other academic bodies, such as the university vis-à-vis its network of affiliated colleges. The arrangement is not very effective. The universities are not accurately informed about faculty presence in the colleges. Quality is compromised in publicly funded institutions also qualified faculty members are 'poached' from older established public institutions by new more commercially run private institutions. Some higher education institutions attempt to meet the challenge of faculty scarcity by increasing the work load of existing faculty members. While this strategy might serve to increase the quantity of higher education, it typically leads to lowered quality.

[40] These deliberations are summarized in the Task Force Report, Chapter II.

[41] These norms typically relate to the maintenance of minimum teacher-student ratios, an appropriate cadre structure of faculty composition with respect to different levels of seniority, and adequacy academic infrastructure.

In this section, we extend our analytical framework to sketch the key elements of this choice between quality and quantity of higher education. As we have seen above, the issue of faculty shortage. It is useful to conceptualize the activity of an institution as the production of both Quality (Q_L) and Quantity (Q_N) of higher education. Institutions produce Q_L and Q_N given a particular configuration of academic infrastructure and faculty resources, as well as regulatory and other institutional norms. Given its operating budget during any particular year, the institution allocates its resources in between Q_L and Q_N in order to maximize its net returns.[42] Thus the choice of the proper balance between quantity and quality of higher education is the key decision that institutional administrators must make. Indeed, the whole point of policy steps to increase faculty resources to relieve the gap would be lost if this were to be accompanied by a marked decline in quality.

We treat quality and quantity of higher education as two analytically separable 'outputs' of higher education institutions. We may measure Quantity of Higher Education (Q_N) terms of the number of academic degrees/diplomas produced. Essentially this reflects the throughput of students in the institution. The institutions can be supply 'quantity' by providing essential physical infrastructure, and routine academic processes such as classroom instruction and examinations. The economic return from this activity can be measured by the payment received by the institution as tuition fees. The Quality of Higher Education (Q_L) is more difficult to measure precisely. However, it has several generally accepted elements. These include academic rigour in courses and instruction, the relevance of the content of courses in terms of being up to date and in consonance with what graduates would need as they enter employment, the ability to provide adequate choice to students through elective course offerings, the ability of the courses to build self-confidence in students so that they can think independently and creatively, and so on. It is clear from the above that, though students experience quality and quantity of higher education jointly, from the institutions point of view, these two 'outputs' can be supplied relatively *independently* of each other. Most important, the institutions can choose the combination of quality and quantity of higher education that they wish to supply. [43]

Quality can be developed and enhanced through ensuring the presence of the following enabling factors[44]:

- Attracting and retaining Talented Faculty members

[42] The concept of returns to quantity produced is straightforward, but this is not easy to conceptualize in the case of quality. We shall discuss this aspect below.

[43] We assume that any higher education institution will produce positive amounts of both quantity and quality of higher education. This assumption rules out economically meaningless choices such as zero quantity and positive quality.

[44] Most of these quality enablers are highlighted by the National Knowledge Commission Report in the chapters dealing with higher education. See, the Commission's *Report to the Nation,* 2006, pp 62-90

- Academic Autonomy (to enable flexibility in curriculum design and delivery)
- Regular review and revision of the curriculum[45]
- Research Capacity (so that new knowledge is created and infused into teaching)
- Sufficiently high Teacher-Student Ratio (to enable closer interaction with teachers)
- Improved examination systems that encourage continuous assessment systems throughout the academic year
- Moderate Faculty Teaching Workload (that allows sufficient time for research)
- Academic Infrastructure (libraries, laboratories, connectivity) that is upgraded regularly
- Schemes for training and skill improvement of teachers (e.g., paid sabbaticals)

All of the above factors that are positively associated with quality of education require careful planning and conscious decisions by institutions. More important, they require considerable commitment of resources. Some of these—such as faculty quality, academic autonomy and institutional mission and relevance are difficult to measure. They can be approximated by proxy indicators.

What can be said about the return to such investments? What is the motivation for institutions to incur quality-enhancing expenditures? Apart from the consideration that a certain quality parameters are mandated by regulators, there are several long term benefits from high quality. The most important benefit is the fact that quality is the most crucial input in building *"institutional reputation"*. A strong reputation is gradually built up over time through the long term sustained satisfactory experience of its stakeholders. A good reputation is of enormous economic value to academic institutions (in a manner analogous to the 'brand value' of corporations and products). Reputation enables them to: (a) attract larger numbers of talented students; (b) it allows them flexibility to begin new courses and to innovate; (c) it enables them to attract talented faculty members; (d) it makes it possible to raise funds from other sources—such as foundations, consultancy and research grants; (e) it enhances their credibility to enter national and international academic collaborations with other respected partner institutions; and (f) it also provides them with the capacity to charge higher tuition fees in the long run. These obvious benefits notwithstanding, it is difficult to measure both the "amount of quality" produced[46] as well as the net economic returns to expenditure on quality. However, it is possible to regard the *expenditures* incurred on

[45] In the case of professional courses, the curricula should have inputs from external stakeholders to ensure contemporary relevance.

[46] In principle it is possible to construct an index of the quantum of quality based on the levels of quality-enhancing indicators noted above. This exercise has not been attempted here.

these items as a "long term investment" in reputation, for which the institution's management receives an "expected return".[47] It is a notional amount, but which is important in deciding whether or not quality enhancing expenditures should be incurred. We shall term this return on the additional rupee spent as the *"Value of the Marginal Product of Quality"*. Given the difficulty in measurement, the analysis in this section should only be taken as illustrative and *indicative of the broad directions of change*.

With regard to quantity, we shall measure it as before in terms of the number of degree granted per year. This enables the institution to earn an income through tuition and related fees. To deliver any quantity level costs resources. The return on the additional rupee spent on generating higher education quantity can be termed as *"Value of the Marginal Product of Quantity"*. [48]

We assume that decision makers in an academic institution allocate their current operating budgetary resources in a rational manner towards the production of two distinct 'outputs', viz., quality (Q_L) and quantity ($Q_{N)}$. Their decision results in producing a particular optimum combination of quality and quantity that maximizes their objective function based on the relative price of quantity and quality.[49] The price received for quantity is the tuition fee. The price received for higher quality can be approximated by the inflows from grants received, research support and consultancy income. It should also be noted that academic institutions can differ with regard to their ability to produce quality and quantity. This capacity depends on the existing levels of academic infrastructure, faculty resources commanded and operating systems for producing quality and quantity respectively.

[47] This return is analogous to Keynes' idea of the marginal efficiency of investment—which is also based on the concept of an expected return.

[48] The Value of Marginal Product of Quality equals the 'price' received for quality multiplied by amount of 'quality' produced by the expenditure of the incremental rupee spent on quality. As explained above, this price is an expected amount that institutions believe a unit of quality to be worth. Since the pecuniary returns from quality will accrue in the future, while the returns from quantity are realized immediately, there is an implicit choice embedded in this value between gains made in the present vis-à-vis the future. It should in theory be equal to the present value of the expected stream of future incomes that accrues from a unit of quality. The Value of the Marginal Product of Quantity may be defined in a similar manner, except that the measurement of both its price and magnitude is straightforward.

[49] For simplicity, we may suppose that the objective function is the weighted sum of quantity and quantity, where the weights are the 'prices' received for quality and quantity respectively.

Figure 4: The Choice between Quality and Quantity of Higher Education by Differently Endowed Institutions

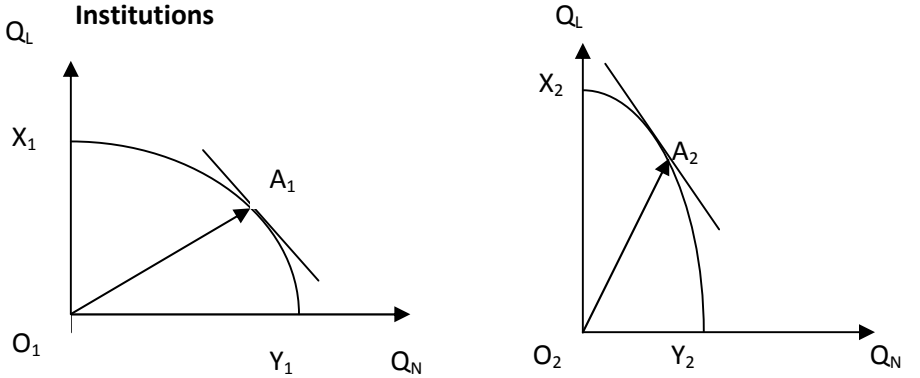


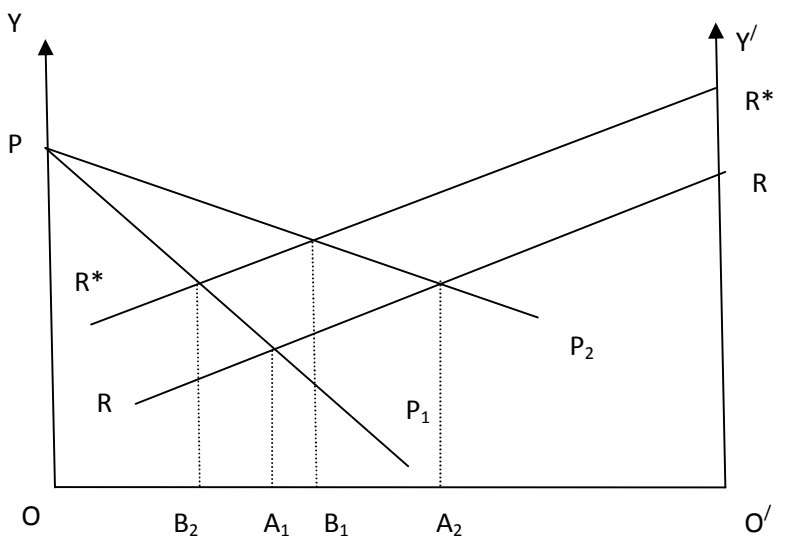
Figure 4 illustrates the logic of the framework thus far developed. The capability to produce quality and quantity may vary significantly across higher education institutions, depending on their existing physical infrastructure, as well as faculty stock and quality-enhancing systems and processes. We therefore distinguish between two distinct types of higher education institutions. The maximal combinations of quality and quantity attainable given the existing resource endowments, from a technical standpoint are given by the two 'production possibility curves' ($O_1X_1Y_1$ and $O_2X_2Y_2$). They represent the production capabilities of the two different categories of academic institutions. $O_1X_1Y_1$ is the curve pertaining to Category I which has *relatively greater capability in producing* Q_N. On the other hand, the Category II academic institution has a *relatively greater competence in producing* Q_L. The convex shape of the curves reflects the economic principle of diminishing returns. In other words, it shows that as resources are shifted from say production of quantity and deployed in producing quality, the additional unit of quality is available at an increasing opportunity cost (in terms of how much quantity must be sacrificed). The difference in shape of the two curves clearly indicates this underlying difference in relative capabilities. Figure 4 also shows that *confronted with exactly identical prices for quality and quantity*, the optimum combination of quality and quantity chosen by the two categories of institutions will differ, in a manner that reflects their relative capabilities. The Category I institution would operate at point A_1, while the Category II would choose the point A_2.[50] It may be observed that the ratio of (Q_N / Q_L) at A_1 exceeds that at A_2, as is evident from the difference in the slopes of the lines joining A_1 and A_2 to the origin. The policy implication from this observation is that even if the 'price' of quality were to be raised relative to quantity, the Category I institution would remain laggard in quality, *unless adequate steps are taken to improve their quality-enhancing infrastructure and faculty resources to bring about greater parity with*

[50] The diagram shows A_1 and A_2 as the points of optimum choice by the two institutions. These are the points of tangency between the lines representing the objective functions with the respective production possibility curves. These are the highest values of the objective functions attainable. The lines of tangency are parallel to each other indicating that the relative price of quality to quantity that both institutions face is identical.

Category II institutions. These steps, as noted above, would include a range of investments that over time enhances the quality producing capacity of the Category I institution.

The analysis above concerns comparison of two types of institutions at a point in time. However, it is also possible to interpret it in terms of a comparison over time. *An institution which neglects to maintain quality and permits its research infrastructure and its talented faculty pool to decay will find that its production possibility curve shifts over time.* Thus an institution can over a period of time be transformed from a Category II institution into a Category I institution. A case could possibly be made that some of our universities have undergone precisely such a transformation. They are much less of research hubs and have become much more of purely degree granting institutions than they were a few decades ago. A similar transformation would occur if the process of "poaching" of talented faculty members from older established public institutions by newly set private or newly licensed foreign institutions were to take place.[51]

Figure 5: The Allocation of Institutions' Operating Budget between Quality and Quantity



The allocation decision made by institutions with regard to their operating budget is explained by Figure 5, which is an alternative depiction of the choice shown in the preceding figure. Let us assume that both the Category I and the Category II institution have the same size of operating resources that they must allocate either towards producing Q_L or towards Q_N. This is given by $OO^/$ which is the X-axis. Any point

[51] As noted earlier, this phenomenon of poaching of faculty was cited by several stakeholders during deliberations with the Task Force.

on the line $OO^{/}$ represents a particular allocation of the operating budget between quantity and quality. Thus for example at point A, amount OA is allocated to Quality, and the remainder of the budget $O^{/}A$ is allocated towards Quantity. The two vertical axes (OY and $O^{/}Y^{/}$**)** measure the *Value of the Marginal Product of Quality* (VMP_L) and the *Value of the Marginal Product of Quantity* (VMP_N) respectively.[52] The VMP_L curve and the VMP_N curve respectively are plotted in the diagram against the amount of operating funds that are incurred towards them. These curves are drawn on the assumption that P_L (price of quality) and P_N (price of quantity) are exogenously given to the institutions.[53] Here PP_1 and PP_2 are two curves for VMP_L that pertain to the Category I and Category II institutions respectively. The curves have a negative slope because of the principle of diminishing returns, i.e., given a particular stock of infrastructure and resources, the additional amount of quality of higher education produced by each successive rupee of operating expenditure falls. The slope of PP_1 is steeper than PP_2 because by assumption the Category I institution has less of quality enhancing resource endowments the Category II institution. Similarly we can draw the curve for VMP_N. For simplicity let us assume that both institutions have the same VMP_N curve, but differ only in respect of production of quality. RR and R*R* represent two such VMP_N curves. Each of these curves is drawn with reference to a given price (P_L). R*R* refers to a situation where the price of quantity (tuition fees) is higher, and hence it is drawn above the RR curve ($P_N^* > P_N$). Both these curves also have a negative slope for the same reason discussed earlier.

It can be easily shown that the optimum allocation of operating budget between Q_L and Q_N that maximizes the total returns is given by the intersection of the two relevant VMP curves.[54] In other words, the operating budget should be allocated so that the marginal returns from both quality and quantity are just equal. Thus in situation 1 where the price of Q_N is P_N, the Institution I will choose A_1. It will allocate OA_1 of its budget towards quality and $O^{/}A_1$ towards producing quantity. Similarly the allocation decision by Institution II would be OB_1 and $O^{/}B_1$ respectively. *The diagram makes clear the fact that Institution I will allocate relatively higher proportion of its budgetary resources towards producing quantity compared to Institution II*. This not only confirms the conclusion drawn from Figure 4, *but also suggests that the future trend will be to further <u>exacerbate the quality gap</u> between the two institutions.* This is

[52] See footnote 29 for a discussion of the definition of the value of marginal product of quality and quantity. We assume here that the in the short period that any institution, by spending more on quality, cannot in the short run bring about a discontinuous rise in its ability to generate more research-based income. In other words, the basic "institutional type" remains unaltered. This assumption justifies our postulating a diminishing 'value of the marginal product of quality' curve.

[53] As noted earlier P_L is an expected price. The assumption reflects the idea that the institutions cannot themselves influence the price through the exercise of monopoly power.

[54] We are making an implicit assumption here that the curves depicting the value of marginal product of quality and quantity are *net* of marginal costs. Hence these represent the values of net marginal returns.

because it would spend relatively less of its internal funds on maintaining quality enhancing resources in each period.

Let us compare now compare situation 1(with P_N) and situation 2(with P_N*). The optimum allocations by the two institutions I and II are B_1 and B_2 respectively. The diagram reveals the consequence of an upward shift in the VMP_N curve caused by a rise in P_N. This rise could be caused by a regulatory decision to allow increase in tuition fees or by allowing the institutions to start new high market value courses. A similar effect could also arise from sources other than higher tuition fees. If for example the institution was able to (a) intensify the teaching load of faculty members, or (b) to induct less expensive faculty resources (say ad hoc teachers), or (c) use IT to lower the cost of education service delivery, the impact on the RR curve would be similar.

The impact of this shift in the VMP_N curve on the equilibrium allocation is evident. In both institutions, the result would be to *bias the allocation of budgetary resources away from quality and towards quantity*. If the size of the operating budget were to remain unchanged, the impact on quality would not be neutral. *Quality would actually become lower*. The situation is of course relatively more acute in the case of Institution I, but the direction of change in both cases would be the same.

The important question for policy and regulation is what could be done to maintain quality. There are several possible approaches.

1. One possible course of action is to *mandate a certain level of expenditure on quality* through regulation. There are, however, some potential obstacles to this approach. It can be easily deduced from the diagram that any allocation other than the perceived optimum would result in lower total returns. The institutions would consequently have a *strong incentive to evade* the regulatory mandate, implying the necessity of a credible enforcement mechanism. We should also note that the actual trend in *policy recommendations appear to be in the opposite direction*. In the face of rising demands, the policy makers find it more convenient to mandate or recommend *higher levels of quantity (say larger enrollments).* While relieving the short term quantity constraint, the long term consequence of these would be to lower quality, unless careful counter measures were taken.

2. The second approach is to directly improve the perceived benefits of quality. In other words, steps should be taken to *shift upward the VMP_L curve*. This could be done in several ways. This line of action is likely to be more effective because it would be in positive alignment with their institutional objectives. The most direct method would be to financially support the creation of

quality enhancing infrastructure, talented faculty recruitment and retention, institutionalization of quality enhancing business processes and norms. Many of the recommendations of the Task Force with specific reference to faculty resources are along these lines. There are, however, certain other channels through which these actions could be reinforced. These are steps that ensure that the price P_L received by institutions for producing quality rises. The avenues through which high quality institutions are rewarded for their investments should be expanded—so that they can either earn a market premium or receive higher grants and support. [55]

IV. *Conclusion*

The problem of faculty shortage is generally recognized as a key problem confronting the higher education sector. It is necessary for policy makers and regulators to keep in view the close connection of faculty shortage with other problems and features of higher education. These problems include (a) the underlying structure and trends in demand and supply of higher education services from which the faculty shortage emerges; (b) the regulatory and policy context, and (c) the tension between providing adequate quantity of higher education services and maintaining high quality. This chapter has presented an analytical framework within which these inter-related problems can be examined. The analytical framework employs an economic logic to understand the behavior of academic institutions that provide higher education. Given an exogenously determined demand for higher education and the policy-cum-regulatory context, the decisions of academic institutions crucially determine the level of demand for faculty resources, as well as both the quantity and quality of higher education. Without their willing compliance, the effectiveness of policy and regulatory actions would be limited.

The analytical discussion presented here yields the following insights:

1. There is a close association between faculty resource scarcity and the excess demand for higher education services. However, it is not a rigid relationship. Even if there is no faculty scarcity in a structural sense, there could still be excess demand for higher education due to other reasons such as the controlled price of higher education services. If in these circumstances, efforts are made to improve the supply of faculty resources by mandating better salaries, it would be ineffective unless simultaneously there is an enhancement of the ability of higher education institutions to earn higher income.

[55] There are several ways that this could be done. This would include stronger accreditation systems and linked-reward systems, among others. We do not develop these ideas here as it is beyond the scope of the Task Force mandate.

2. There could be a different type of constraint on the ability of higher education institutions to increase their faculty resources. This is the 'policy constraint', which sets an upper limit on the number of faculty members a higher education institution can recruit at a given point in time. Hence it important for policy makers to determine which is the binding constraint, and address this on a priority basis.

3. The market for faculty resources operates under a number of exogenously given parameters or norms. There include faculty salaries, the number of sanctioned posts and the minimum faculty-student ratio. Our analysis shows that under these conditions, the actual shortage of faculty resources could be significantly higher than the shortfall as conventionally measured in terms percent of unfilled sanctioned posts.

4. Under conditions of severe under supply of faculty resources, higher education institutions would find it uneconomical to meet the regulatory quality norms, and hence would be tempted to lower quality

5. If some institutions have the capacity to charge higher tuition fees while some others do not, this would lead to a 'fragmentation' of the market for faculty resources. Phenomena such as 'poaching' of qualified faculty members by the more liberalized institutions from the constrained institutions may occur. This would worsen quality in the latter.

6. Our analysis of the balance between quality and quantity of higher education examines this trade-off as a conscious economic choice that academic institutions make. The capacity to deliver quality is the result of sustained investment by the institutions over a period of time. Hence there are likely to be differences in the 'quality infrastructure' across institutions. We find that under similar operating conditions, different institutions will allocate their internal operating budget differently between quality and quantity. This is likely to exacerbate the already existing quality gap between the differently endowed institutions. It is also possible that quality can decline over time even in high quality institutions if investments in quality are not sustained. This situation can arise if these institutions are not able to generate funding for quality investments, and/or have enhanced incentives (through higher tuition fees) or face policy pressures to increase quantity. Hence policy should take care to bolster the institutions' capacity for quality.

This analytical framework developed in this paper can be extended in several ways. It has been confined here to a limited context—namely where the academic market structure is competitive, and where only two specific categories of academic institutions are considered. We can extend the analysis to examine public versus private institutions—where price setting abilities differ. We have also not distinguished between the private costs and benefits facing academic institutions, and the social benefits and costs, i.e., when education has external effects. We have considered a homogeneous faculty resource in our framework. It is, however, possible to examine the implications of two different categories of faculty—namely 'research faculty' and 'teaching faculty, who have relatively higher competence in research and teaching respectively. These extensions offer avenues for future research.