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Budgeting: A Powerful Tool for Enhancement of Quality and Efficiency in Higher Education

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BUDGETING: A POWERFUL TOOL FOR ENHANCEMENT OF QUALITY AND EFFICIENCY IN HIGHER EDUCATION

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One of the major challenges facing higher education systems today is to maximize the quality of outputs in an era of decreasing government funds. In the quest for meeting this challenge, we emphasize that a budgeting model is not only a tool for allocating public funds to the higher education institutions (HEIs) in an equitable fashion, but rather functions as a powerful tool for attaining this goal. Budgeting mechanisms offer incentives that influence organizational behaviour and direct the HEIs towards achieving pre-planned targets. Consequently, maximum quality of outputs may be accomplished by efficient methods, without compromising the autonomy of the HEIs. In constructing a budgeting model, policymakers should avoid the pitfall of utilizing an unbalanced model, whereby too much emphasis is given to obtaining one component at the expense of the others. The current budgeting model utilized in Israel is exhibited in this paper as a test case for demonstrating our theory. The declared goals of the Israeli budgeting model were to provide an objective and fair tool for the allocation of public funds to the regular operating budgets of universities for teaching and research. In practice, the model mainly increased the quantity of output. Unfortunately, the impact on the quality of the outputs is not completely clear yet, and quite probably was counterproductive. In this paper, we suggest a theoretical model, primarily on the basis of the simple principal-agent model and the role of marginal incentives. Accordingly, we propose a new budgeting model for Israeli universities, based on empirical analysis. The proposed budgeting model includes a set of balanced yet competitive parameters and takes into account simultaneously both quality and efficiency in higher education.

Introduction

In recent decades, a growing number of countries have sought innovative solutions to the substantial challenges they face in budgeting and financing tertiary education. One of the principal challenges is that the demand for higher education in most countries has increased more rapidly than the ability or will of governments to provide the necessary public resources to fulfill this demand (Salmi and Hauptman, 2006).

We define two main aspects which are related to this subject: the size of the governmental "budget pie" for higher education systems, and the method for budget allocation - the division of the "budget pie".

The first problem is the decline in public expenditure on higher education. Many countries have deliberately inflicted serious cuts in public budgets for higher education. The extent of the decline in public expenditure on higher education per student as a percent proportion of gross domestic product per capita during the last decade is very significant (Tilak, 2005). Along with reduction in grants, and moreover, as a result of it, many governments changed their budgeting mechanism. The new modes of budgeting include a variety of combinations, such as 'lump sum' or 'block' grant plus grant based on student enrolments, block grant plus performance-
related grant, enrolment-related grant plus research grants, block grant plus incentive grant, block grant plus matching grant, or matching grant to match, for example, the amount of resources generated by the universities through non-conventional measures (Kaiser, Vossensteyn and Koelman, 2002, Tilak, 2005, Salmi and Hauptman, 2006, CPB and CHEPS, 2001).

In many countries, such as the Netherlands and Finland, the goals of these reforms of the funding mechanism are to transform the higher education system into a more differentiated and market-driven system, where students and institutions have more freedom and more responsibility in making decisions. Economic and social developments, it is argued, call for a more flexible higher education system and more competition, and as a consequence, an enhancement of efficiency and quality (Jongbloed, 2005).

On the other hand, especially in developing countries such as Uganda and Mexico, a common tendency is to have no set of guidelines shaping allocations within the sector of higher education. The predominant model for the allocation of public funds is based on annual negotiations, which are based on a scheme of historical increments, in light of different indicators such as the number of students, teachers or researchers or the size of the institution, but not on performance, quality or the institution's organizational capacity to innovate or change. These elements may influence the ability of rectors to negotiate to obtain extra-budgetary resources that are discretionally distributed by the government itself (Tilak, 1993, Didriksson, 2005).

In Israel, the declared goals of the budgeting model, implemented formally since 1996, were to "provide an objective and fair tool for the allocation of public funds to the regular operating budgets of universities for teaching and research while encouraging the efficiency, quality and enhancement of teaching and research outputs" (PBC Annual Report, 2007), while enabling the universities to plan and budget their teaching and research activities in a way that maintains the academic and administrative autonomy of each institution. The principle underlying the budgeting process is that the model is designed for the sole purpose of maintaining the above objectives: "It contains no special incentives for specific subject fields, research topics, types of institution, geographic areas etc." (PBC Annual Report, 2007).

The purpose of this paper is to show that there is no neutral budgeting model. In this paper we argue that every budgeting mechanism is actually a powerful set of incentives for the enhancement of specific goals. Moreover, we claim that the budgeting mechanism should be suited to the specific situation and the evolution of the relevant higher education system.

The case of Israel seems to be an excellent example to show that even when the regulator or the government does not intend to use the budgeting model as a tool for setting priorities, it actually does so. Accordingly we isolate the impact of the current budgeting model on the behavior of HEIs in Israel, given the reduction of the total governmental budgets for higher education in recent years. We examine the extent of the impact, according to the institution’s characteristics, and essentially ask - why is one institution more influenced than another, despite reacting to the same budgetary parameters.
As a consequence, we propose a new budgeting model, based on balanced and quality influenced incentives, according to the theoretical “Principal-Agent” model (Grossman and Hart, 1983, Holmstrom and Milgrom, 1991, Deming, 1986, Pratt and Zeckhauser, 1991).

This paper is presented in the following order: we begin with a literature review and theoretical-historical background, depicting the complexity of the performance-based budgeting mechanism. In part C we present the Israeli case and the current budgeting model in the Israeli higher education system. In Part D we describe the empirical aspects of the research. We begin with descriptive statistics of the relevant Israeli data, then specify the hypotheses of the research and the data base, the econometric model and the empirical findings. The next part E presents a general description and the principles of a new proposed budgeting model, which might fit the current situation of the higher education system in Israel and can be used as a strategic tool for enhancing quality and efficiency. The last part F concludes the paper.

**Literature Review**

**Classification of Funding Mechanisms**

Governments provide direct financial support to universities and colleges mainly because of economic reasons, which means that higher education provides positive externalities. However, the level of subsidies and the distribution across institutions and programs are determined by political, social and economic criteria (Jongbloed, 2007).

Jongbloed and Koelman (2000) use two questions for the classification of funding arrangements. The first deals with the funding base - output and performance or inputs; the second concerns the degree of market orientation and the competition implied by the funding decision. Accordingly, they describe four possible funding systems:

1. **Centralized (regulated) approaches and input orientation** - planned, input based system. More traditional type of budgeting, where allocations are based on requests (activity plans, budget proposals) submitted to budgetary authorities. In this mechanism, which is known as "negotiated funding", the budget allocation is often based on the previous year's allocation of specific budget items.

2. **Centralized (regulated) approaches and outcome orientation** - performance based funding of providers. The criteria for funding refer to outputs rather than inputs, such as students passing exams, number of credits, a mix of enrolment numbers and credits, a mix of first-year students and number of master's degrees conferred or academic research and its quality.

3. **Decentralized (market) approaches and outcome orientation** - purpose-specific purchasing from providers. For example, HEIs are invited to submit tenders for a given supply of graduates or research activities. In this process, HEIs are encouraged to compete with one another to provide education, training and research to meet national needs. Another example is research funds awarded by research councils. This system makes use of contracts signed between the funding agency and HEIs, with the latter agreeing to deliver graduates for targeted labor market needs, or
research outputs targeted at strengthening the innovative capacity of the country. When entering into a contract, the funding agency will make sure it obtains the services it wants for a reasonable price.

4. Decentralized (market) approaches and input orientation - demand-driven, input-based funding through clients, the method of vouchers. Students obtain vouchers, which can be traded for educational services at the HEIs. In this funding system, it is the consumer that drives the system. The students ("clients") decide what institution to attend according to the quality of the teaching and the supply of courses.

The 'right' choice of funding model depends on the priorities that policy-makers have in terms of goals - what they want to achieve on behalf of students and society in general, and what they perceive as problems in the existing model. Later on we will suggest another option for budgeting mechanism, as a combination that takes the advantages of each arrangement.

Theoretical - Historical Background

Jongbloed (2007) indicates that international trends in funding mechanisms developed over time in steps from the "1" to "4" aforementioned funding systems. Indeed, a decade ago, the widespread attitude regarding a budgeting mechanism was as a pricing formula covering the expenditures or costs of the HEI's for teaching and research activities. In most cases the existing data was the average expenditure per student, by field of study and degree. Then governments introduced systems of formula funding, whereby the funds provided would be related to the actions of the institutions, such as the number of students enrolled and their study area mix (Getz and Siegfried, 1991, Turner, 1994).

Perhaps the most important point about the formula used in the allocation of funding to higher education in that period, was that there was a formula. This gave the institutions a publicly proclaimed process, relatively simple, transparent and not biased as were the results of the historic attitude of negotiations. Such historic systems perpetuated inequalities in the distribution of resources between institutions and precluded any realistic strategic planning with regard to program review or evaluation. No institution knew what other institutions were receiving, what criteria were used and how decisions were made. It was assumed that the existence of a clear formula would promote higher standards of efficiency across the board, often as a prelude to expansion of the system (Turner, 1994). Indeed, this method of allocation gave a strong incentive to the HEIs to increase the number of the students. Unfortunately, in many cases it diminished the responsibility of the HEIs' managements, in a sense of setting targets and missions. Moyer and Kretlow (1978) questioned two hundred vice presidents of finance of colleges and universities in the USA about the evaluation processes used by their institutions in making resource allocation decisions. It appears that institutions of higher education act in a manner consistent with the objective of "prestige maximization", subject to some overall budget constraint. The results of their initial questionnaire were consistent with the arguments of Toder (1974) and Breneman (1975). Almost 30 years later, Hübner and Rau (2002) implemented a survey among faculty members and department heads and asked them about performance budgeting: if it would lead to more efficiency, to better performance, to more fairness and equality in allocating money and to perceptible advance in science (positive consequences) or if a contrary effect would be expected.
Nearly 75% of the scientists felt that this would be an inevitable development, especially if the academic organization faces additional financial pressures. What happened in those years that changed the attitude of the academic staff in this direction? We claim in this paper that the changes and the trends of massification in higher education made the managements of the HEIs rely on external incentives for achieving their main goals.

Nowadays, states spend more attention, time and money on performance measurements and evaluation in the public sector than ever before (Pollitt and Bouckaert, 2000, Power, 1997). Believers in this New Public Management (NPM) attribute a high priority to measuring output and outcomes and aim to base their new policies and management activities on this type of information - ideally meant to make policy implementation more efficient and effective. Van Thiel and Leeuw (2002) argue that this increase of output measurement in the public sector can lead to several unintended consequences that may not only invalidate conclusions on public sector performance but can also negatively influence that performance. They show that a number of characteristics of the public sector can be counterproductive to developing and using performance indicators. This phenomena is called the performance paradox, and refers to the weak correlation between performance indicators and performance itself (Meyer and Gupta, 1994, Meyer and O'Shaughnessy, 1993). This is caused by four processes: the positive learning, the perverse learning, selection and suppression. To prevent a performance paradox, Meyer and Gupta (1994) recommend that organizations adopt a so-called paradoxical model of performance assessment with multiple, uncorrelated, and varying but comparable performance indicators. They also recommended the use of targets and comparisons over time, between organizations and/or between different units within the same organization.

Herbst (2007) explores how to govern, manage or fund higher education systems or institutions in order to ensure or even raise the quality of higher education and research. He addresses newer practices of resources-allocation which tie funding to indicators of performance, as part of broader debates about reform in public management. Performance funding has made its inroads in attempts to grant university systems managerial autonomy, that was to be granted in exchange for funding modes which are tied to the measurement of performance indicators. Unfortunately, he found that performance-based budgeting or funding measures cannot meet the various expectations: they do not raise the quality of teaching or learning; they do not raise research performance; they take back a great deal of managerial autonomy which is commonly judged to be essential for the well being of higher education institutions, in particular research universities; and they act as automata in place of proper governance and management.

We claim here, that the balanced solution for this problem can be found on the basis of the Principal-Agent model (Grossman and Hart, 1983, Holmstrom and Milgrom, 1991, Deming, 1986, Pratt and Zeckhauser, 1991). Imbeau (2007) wrote about transparency in the budget process as part of a Principal-Agent model of budgeting, the main idea of which is the "marginal incentives". This means providing a clue from the regulator as to the right directions, according to the approach of funding by mission (Williams and Brown, 2000, Brown, 2001, 2002), but yet, giving the institutions the chance for self-choice, responsibility and self governance. One
additional advantage of this model is that regulation mistakes can cause much less
damage if they are wrong.

The Israeli Case

General Aspects

The framework of the system of higher education in Israel is defined in the
Council for Higher Education Law enacted in 1958, with 14 amendments. This law
established the Council for Higher Education (CHE) and the procedures for the
accreditation of institutions of higher education. Article 15 of the Law guarantees that
the institutions of higher education are autonomous in the conduct of their academic
and administrative affairs within the framework of their budgets and their terms of
accreditation. The Planning and Budgeting Committee (PBC) was established by a
decision of the Council for Higher Education (1974), later endorsed by the
Government (1977), to delegate its responsibilities for planning and budgeting to this
committee.

Funding

Institutions funded by the PBC must meet the following regulations:

1. New institutions, new units or new academic programs will be opened only
after the requests are examined by the PBC from the planning, budgeting and
financial perspectives and approved by the CHE with regard to academic standards.
Non-budgeted institutions need the approval of the PBC only with regard to their
financial solvency and the approval of the CHE in regard to academic standards.

2. The wages of academic faculty, technical and administrative staff must be in
accordance with the joint regulations of the PBC and the Wages Authority in the
Ministry of Finance.

3. Annual budgets must be balanced and approved by the PBC prior to the
commencement of the academic year.

The PBC allocations, 1.6 billion USD in 2008, account for 61% of the budgets of
the universities, 67% of the budgets of art academies, 64% of the budgets of academic
colleges of engineering, 54% of the budgets of academic comprehensive colleges, and
56% of the budgets of the regional colleges.

Higher education in Israel operates within a series of five-year plans. Each plan is
backed up by a five-year agreement between the PBC and the Ministry of Finance.
Higher education is the only public sector that has multi-year agreements with the
Ministry of Finance. Current direct allocations to institutions of higher education are
divided into three main categories: block grant allocations, earmarked allocations, and
matching allocations. In addition, the PBC provides indirect allocations to the
institutions of higher education through its support of external research funding bodies.

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1 Data in this section is taken from the publication of the PBC: "Higher Education in Israel", 2007.
The major source of PBC funds transferred to the institutions of higher education (76%) is the "block grant". The block grant consists of two components – teaching and research, each determined by a special model developed by the PBC.

The existing budgeting model has two main objectives:

1. To provide an objective and equitable tool for the allocation of public funds to the regular operating budgets of universities for teaching and research while encouraging efficiency, quality and enhancement of teaching and research outputs.

2. To enable the universities to plan and budget their teaching and research activities in a way that maintains the academic and administrative autonomy of each institution.

The model was designed with the sole purpose of maintaining the above objectives. It is declared that the model contains no special incentives for specific subject fields, research topics, types of institutions, geographic areas, etc. Budgeting for teaching is based on an absolute model whereas that for research is based on a competitive model. The allocation formulas are based on outputs, the data for which are derived from objective, timely and reliable sources external to the institutions of higher education. Institutions of higher education may use the block grant according to their own internal priorities, on the condition that they maintain a balanced budget.

The teaching component of the block grant is calculated as the sum of the number of students in each field of study multiplied by the tariff (per field of study) and by an efficiency factor parameter (calculated by the proportion of graduates to students). Data on students and graduates come from the Central Bureau of Statistics (CBS).

The research component of the block grant applies only to the research universities. It is allocated on a competitive basis according to the following five indicators, with their proportional weights:

1. Income from competitive research funds (34.6%);
2. Income from non-competitive research funds (19.7%);
3. Scientific publications (14.8%);
4. Numbers of Ph.D. students (29.6%).
5. Numbers of research-track master's degree recipients (1.3%)

The data on research funds come from the research foundations. An external research institution calculates the parameters for publications, based on international and national databases of scientific publications. The number of doctoral students and degree recipients and research-track master's degree recipients is supplied by the CBS. The total sum allocated by the PBC for the research component is distributed among the universities in accordance with the summation of the relative performance outcomes of each university in each of the above indicators.
Governmental Budgets

As mentioned before, the public budget for higher education in 2008 was 1.6 billion USD (about 5.6 billion NIS), or 2% of the State Budget. However, since the year 2001, the higher education budget in Israel has been characterized by continuing substantial cutbacks. From 5,907 NIS millions (in real terms at 2007 prices) in 2001, the budget was cut to 5,292 NIS millions in 2007. The actual decrease was even more, however, since the basic budget comprised 100% of the 2001 budget, while in 2007 it was only about 40%, with the remainder composed of "one-time additions" to partially compensate for the reduction in the budgetary base. A direct result of this drastic reduction was the decline of 14% in the expenditure per student (from 1995 to 2003, while budgets were still decreasing) at the same time that the number of students increased by 52% (OECD, 2006). Budgets were therefore severely curtailed at the very time when budgets should have been increased due to the rapid increase in the number of students. Direct budgetary participation per university student fell from its height of nearly 34,000 NIS in 2000 to about 26,000 NIS in 2005. One of the effects of the budgetary cutbacks was the reduction in the number of senior academic staff financed from the regular budgets in the research universities: from 4,684 in 1999/2000 to 4,314 in 2006/2007. The ratio of students to senior faculty consequently increased, since the number of students increased while the number of academic staff decreased: the ratio was 21.1 students per academic staff member in 1999/2000 and 23.9 in 2006/2007.

In the next section we examine the hypothesis that the institutions of higher education necessarily had to find ways of increasing their budgets, which led them to adapt their internal budgetary allocations to the PBC's budgetary model. The model used to distribute the total budget between the institutions was thus used to allocate the internal budgets of the universities between the various departments and faculties of the institution.

Empirical Aspects

Descriptive Statistics

In 2005/06 there were 209,500 students in institutions of higher education compared to 76,000 in 1990 (Figure 1). In addition there were 41,150 students in the Open University compared to 13,000 in 1990. The growth of student numbers at all degree levels between 1990 and 2006 was 175%, while the growth in the number of students studying for a bachelor’s degree was 188%.

Most of the growth in student numbers occurred in the decade of the 1990's which was a decade of great expansion and change in the Israeli higher education system. During this period the total annual growth rate was 8.1%, while the number of undergraduate students grew at an annual pace of 8.7%.

According to the policy of the CHE and PBC, since the middle of the 1990's most of the demand for undergraduate studies was directed to the academic colleges, while the growth of the research universities at that degree level was curtailed. The share of bachelor's degree students studying in academic colleges increased from 6% in 1990 to 38% in 2006. During that period the share of undergraduate students in the entire non–university sector increased from 15% in 1990 to 57% in 2006.
The expansion and diversification of the higher education system resulted in the emergence of different types of institutions that were intended to provide alternative solutions to the growing demand for higher education all over the country. According to CHE regulations, all institutions of higher education in Israel are non-profit. The institutions of higher education and supplemental programs of study in 2006, can be divided into seven categories (table 1).

Of the 61 accredited institutions for higher education in 2006: 26, with 200,495 students, are funded by the PBC; 27 academic teacher training colleges, with 21,946 students, are funded by the Ministry of Education, and 8 academic colleges, with 26,866 students, receive no public support.

In 2006 (figure 2) there were 41,800 students at the master's degree level, which represents an increase of 155% since 1990. In 2006 most (84%) of the students at this level still studied in the research universities but since the end of the 1990's, studies at this level take place in the Open University and in various institutions in the non-university sector as well. In 2006 there were about 6,775 students at the master's degree level outside of the research universities, most of them in the non-budgeted academic colleges.

The number of master's degree recipients who did not complete a master's thesis, rose sharply (from 750 in 1992/93 to 7,560 in 2006/07) and surpassed the number of master's degree recipients who did complete a thesis (which rose from 1,980 to 3,774 in the same period) (figure 3). We claim that this is due to the fact that students who write a thesis are unable to complete their studies in the stipulated time frame, thus reducing the funding that the institutions receive for them. The institutions are therefore encouraged to increase the number of non-thesis students, which is what in fact happened.

Studies for the doctoral degree are offered only in the research universities. The number of doctoral students increased steadily from 3,910 in 1990 to 9,835 in 2006 (figure 2).

A reasonable explanation for this increase is that the research funding model includes an indicator, with a relatively heavy weight (29.6% of the research budget), for the number of doctoral students. Some universities have indeed increased the numbers of their doctoral students, to almost 135% of their numbers in 1997. In other universities, the over-all number of doctoral students was relatively stable, although there were great variations according to field of study, with some fields showing a great increase (figures 4-5).

**Research Hypotheses**

**Proposition 1**: During periods of contracting governmental budgets, the budgeting model encourages “Biased Budgeting Behavior” (BBB) and raises the probability of changing academic considerations in order to benefit from larger budgets, by means of enhancing the relevant parameters of the budgeting model.

**Proposition 2**: There are two types of institutions: type A and type B, that given the same budgetary parameters are different in their “Biased Budgeting Behavior” (BBB), among fields of study and degrees.
We examined 3 main parameters (in universities) which represent the “Biased Budgeting Behavior” (BBB):

1. Changing the distribution (“mix”) of first degree student numbers towards fields of study with lower relative marginal costs (e.g. management and legal studies).

2. Raising the number of students in non-research master’s degree programs, who complete their studies within the stipulated time frame, thus increasing the efficiency factor.

3. Increasing the number of doctoral students, without sufficient infrastructure of academic supervisory staff.

**Econometric Model**

We used a binary- selection model (logit) to analyze the likelihood that university $i$ which awards degrees $B$, $M$ and $D$, in fields of study $j_1$-$j_{12}$ in years $t_1$-$t_7$, will change the array of qualitative academic decisions, by raising the relevant budgetary parameters, in order to increase its budget.

The equation for estimation:

$$W_{i} \Pr(Y_{i} = 1 | j = J) = \beta X_{i} + \gamma Tiktzuv_{i} + \delta Taktziv_{i} + \kappa T_{i} + \epsilon_{i}$$

- **Y** - Indicator for biased academic decisions. $Y=1$ if there was a change of more than 20% in the value of BBB parameter relative to the total country-wide average in that field. $Y=0$, if otherwise.
- **X** - Array of statistical characteristics of the university: student numbers by degree, fields of study and socio-economic situation, number of senior academic staff by academic discipline, etc.
- **Tiktzuv** - Array of budgetary parameters of the budgeting matrix of the PBC, by institution and field of study: efficiency factor, tariff of teaching component and budgeted student numbers.
- **Taktziv** - Total direct participation component in the budget of each university.
- **T** (Institution) - Dummy variable which represents the institution, mainly referring to the managerial and strategic structure.

**Data Base**

The data base is formulated by pairing monetary budget files from the Israeli Planning and Budgeting Committee (PBC), for the "Tiktzuv" (budgeting) and "Taktziv" (budget) parameters, with quantitative statistical files from the Central Bureau of Statistics (CBS), for the **X** matrix of statistical characteristics.

The data was compiled as a four dimensional panel-data: 7 universities x 13 fields of study x 3 degrees x 8 years (1999-2006). In total- 2,184 observations.

**Empirical Results**

Table 2 presents the main finding from the initial analysis of the regressions. The time-impact on the tendency toward this "Biased Budgeting Behavior" (BBB), shows...
a significant connection between the budgetary cutbacks and this behavior. There is a very significant and positive correlation between the tendency toward BBB and the progression of the budgetary cuts, confirming our first proposition. Just before budgets were cut, in 2000, the coefficient for budgeting behavior was 2, but it declined sharply to less than 1.5 in the first year of budgetary constraints (2001), followed by a steep increase the next year (2002) to a coefficient for budgeting behavior that was even higher than before the cutbacks, and more moderate increases later (figure 6). This pattern can be explained: the sharp initial decrease in budgets caught the institutions off guard, but they quickly learned to adapt their internal budgeting behavior to the reduced budgets, and fine-tuned their adaptation in following years. The second proposition was examined by the differences in tendency to BBB between the different types of institutions. This hypothesis seems to be confirmed by a clear and evident distribution of the universities into two groups - those in which there was a very significant increase in the overall number of doctoral students in all fields, much above the total average, and those in which overall numbers decreased, although there were a few fields with considerable increases (figures 4-5). The reasons why some universities followed the "Type A" behavior while others the "Type B" behavior is still unclear and should still be examined. The managerial policies or styles of the institutions may affect their behavior, or the status (age, experience, variety of fields and degrees, etc.) of the institution may influence their behavior.

The field of study (academic discipline) has a negative but not significant influence on the tendency to BBB. There was also no significant influence of any particular field of study, so that it is difficult to confirm the hypothesis that institutions were influencing the "mix" (proportion of students in the various fields of study) of their students in favor of fields such as law and business administration. Concerning the variables "Michsa" (the quota for the number of students) and "Taarif" (tariff per student): their coefficients were negative and had a significant influence. As "Michsa" increases and as "Taarif" increases, there is less tendency to BBB. We assume that this is due to the fact that an increase in the number of budgeted students together with an increase in the budgetary tariff per student increases the budgets available to the institutions, so that they have less need for BBB in order to obtain larger budgets.

The coefficient of "Nitsolet" (efficiency parameter) is not significant. This is rather surprising because the general assumption was that institutions would encourage students to complete their studies sooner, at the expense of quality, so as to obtain larger budgets. The variable "Students" influences in a positive and significant direction, in contrast to the "Michsa" variable. It may be that increasing the number of students in proportion to the decreasing number of academic staff enhances the tendency to BBB. An example of this would be the employment of external teachers.

The "Segel" (academic staff) effects in a negative and significant way. A larger number of senior academic staff means less tendency to BBB.
Proposed New Budgeting Model

Guiding Principles

Our proposal for a new budgeting model is based on a combination of budgeting by "historical" methods, and budgeting by incentives. We also take into account that the major portion of the budgets of the universities is rigid, so drastic changes cannot be introduced into it in the short-term. A gradual process of change by small and measured steps is therefore required.

The proposed budgeting model is based on a five-year plan, after which time it will be necessary to reevaluate it and introduce any necessary adaptations or changes, based on the results of its use. Moreover, in view of the approach that calls for adapting the budgeting model to the stage of development of the higher education system, we recommend that the budgeting of universities be separate and different from that of the colleges (which most of them are relatively new institutions). Consequently, this proposed new model is meanwhile intended only for universities.

Methodology

During the first year of implementation of the new model, each university will receive an allocation that is 98% of its allocation in the previous year. The remaining 2% of the budget will be allocated between the universities according to an array of parameters and incentives that will be determined following a comprehensive survey of academic staff members, students and public representatives. Each year an additional 2% of the budget will be allocated according to these incentives, so that at the end of the first five-year period, 10% of the budget will be allocated according to incentives, while allocation of the remaining 90% of the budget will be at the sole discretion and decisions of the managements of the universities.

The system of parameters will apply to both teaching and research and will allow for differentiation in specializations of the institutions. Each institution will be able to create its own special uniqueness, as it sees fit, and to focus on one or more particular parameter from the selected "list". A distinctive and efficient higher education system will thus be created, wherein each university promotes its own unique disciplines, fields and activities for which it receives a higher share of the budget that is allocated according to incentives.

The 2%-10% of the budget allocated according to incentives will, actually, operate as an array of earmarked allocations. The portion of the budget devoted to each incentive will be pre-determined and each institution will be able to benefit from this earmarked budget corresponding to the improvements that it shows, compare to one another and to itself, in the relevant parameters.

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2 Examples of such indicators: The ratio of bachelor's degree students to academic staff; the ratio of doctoral degree recipients to academic staff, Citation–Publication parameters, etc.

3 In a broadened version of this paper we introduce a detailed numerical example of this method and a full list of suggested parameters.
Conclusion

In this paper we have attempted to present a comprehensive survey of the complex and multi-faceted aspects of budgeting in higher education. Much has been written on this subject, although the use of budgeting as a tool to achieve goals in higher education has been dealt with only in recent years and has therefore not been studied sufficiently. How should infrastructure for excellence be budgeted? How can institutions of higher education be encouraged to fulfill their mission and purpose in the best way possible? In other words - how can we ensure that they do not stray from their original goals: to achieve eminence and excellence in teaching and in research. Budgetary models have an inherent danger of bias: the wrong measure of budgetary pressure, or any of a number of other factors can all cause a model to crumble and fail.

We have exhibited here the idea of connection between the stage of development of a higher education system and the budgetary model that it requires for its existence. In Israel, similar to the situation in other countries, the history of higher education can be divided into three main periods: between 1960 and 1980, when higher education defined the social elite and was intended for a limited section of the population; from the 1980's until the end of the 1990's, when the aim was making higher education accessible to all, with expansion of higher education to all of the population; and the 2000's, when a system of private higher education is hot on the heels of the public higher education system and there is a return to focus on quality, excellence and differentiation in higher education. The budgetary model adapted itself to each evolutionary stage of development of the system, according to this analysis. In the first period, during which there were only a few elite research universities, the model served as the basis for negotiations between the institutions of higher education and the PBC. In the second period the model-as-formula was instituted, bringing about an increase in the number of students and enabling them to complete their studies in a set and pre-defined period of time. However, when budgetary constraints began, and the system had already significantly grown and expanded, and on the other hand, once the institutions learned how to make use of the formula, this formula began to produce distortions in the allocation of resources within the institutions themselves and in the stated missions of the institutions. We have seen the damage and biases that were the significant effect and outcome of the lack of coordination between the budgetary system, which had been in use for a long time, and the stage of development reached by the system. We therefore proposed a new combined model that includes an element of autonomy for the institutions' decision-making process, with the responsibility to fulfill the goals of the institutions, while providing incentives, albeit only marginally, for achievements. These incentives are intended to serve as a signal only, without replacing the internal motivation of the HEIs to set their goals and achieve them.

Due to increasing pressures of rising costs along with stable or declining governmental budget available for the HEIs, the public universities and colleges have been put in a severe financial squeeze. In times of budgetary constraints, the question of the budgeting mechanism becomes critical and vital for the HEIs and for the whole higher education system. Despite the fact that the institutions enjoy academic autonomy that enables them to act with academic freedom, they actually utilize the model as a regulator for the internal allocation of their budgets, thus creating
qualitative distortions in order to obtain larger budgets. This places a greater responsibility on the budgeting body, but also provides it with a very powerful tool to achieve desired goals for the higher education system and for the society. Proper use of this tool, with a clear definition of goals and the granting of marginal incentives in order to direct the institutions toward achieving these goals, while at the same time providing them with the freedom and the responsibility for decision-making, can lead to the necessary improvements in the higher education system.
REFERENCES


Jongbloed, B., and J. Koelman (2000), "Vouchers for Higher Education? A Survey of the Literature", Study commissioned by the Hong Kong University Grants Committee, Enschede, CHEPS.


Figure 1: Students in Institutions of Higher Education 1990 – 2006

Source: PBC, Higher Education in Israel, 2007

Figure 2: Students Studying for Post-graduate Degrees, 1990-2006

Source: PBC, Higher Education in Israel, 2007
Figure 3: Master’s Degree Recipients

Source: PBC Annual Report, 2007

Figure 4: Growth in Number of Doctoral Students by
Institution and Field of Study - Type A University

<table>
<thead>
<tr>
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<th></th>
<th></th>
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</table>

Source: PBC Annual Report, 2007 and processing of the data by authors.
Figure 5: Growth in Number of Doctoral Students by Institution and Field of Study - Type B University

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<tr>
<th>Year</th>
<th>Total</th>
<th>Humanities</th>
<th>Education</th>
<th>Social Sciences</th>
<th>Management</th>
<th>Law</th>
<th>Medicine</th>
<th>Para-Medical</th>
<th>Math and Statistics</th>
<th>Physical Sciences</th>
<th>Life Sciences</th>
<th>Agriculture</th>
<th>Engineering</th>
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<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
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<td>2000</td>
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<td>2003</td>
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Source: PBC and CBS and processing of the data by authors.

Figure 6: Time Impact on the Tendency to BBB- 1999-2006

Source: PBC and CBS and processing of the data by authors.
Table 1: The Institutions of Higher Education, 1990-2006

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<th>2004</th>
<th>2006</th>
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<td>7</td>
<td>7</td>
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<tr>
<td>The Open University</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Arts Academies</td>
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<td>2</td>
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<td>2</td>
</tr>
<tr>
<td>Comprehensive Academic Colleges</td>
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<td>6</td>
<td>10</td>
</tr>
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<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Non-Budgeted Academic Colleges</td>
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<td>6</td>
<td>7</td>
<td>8</td>
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<td><strong>Total</strong></td>
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<td><strong>54</strong></td>
<td><strong>55</strong></td>
<td><strong>61</strong></td>
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</table>

Source: PBC, Higher Education in Israel, 2007

Table 2: Factors Affecting Probability for “Biased Budgeting Behavior” (BBB)

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<td>Institution- Type B</td>
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</tr>
<tr>
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<tr>
<td>Taarif</td>
<td>-.0564188 **</td>
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<tr>
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<tr>
<td>Students</td>
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<tr>
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</table>

*, **, *** 10%, 5%, 1% significance, respectively.

Source: PBC and CBS and processing of the data by authors.