

Indicators of academic performance as predictors of financial-resource raising

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Abstract: This study was conducted on State Public Universities (SPU) in Mexico to ascertain the possible existence of a correlation between their performance in their indicators of academic excellence and the level of allocation of financial resources obtained from the main sources of funding from the federal government. By means of the determination of the academic and financial indicators used by the main international and national organisms, a methodological proposal of statistical analysis was constructed to evaluate the academic performance of SPU and its correlation with the reception of financial resources. The results showed that there is insufficient evidence to infer that obtaining better academic results in Mexican SPU is a reliable predictor to obtain greater financial resources. This demonstrates the need for a clear policy in the allocation of resources to institutions.

Key words: Higher education, funding, quality, indicators, policies.

Resumen: El presente estudio abordó el ámbito de las Universidades Públicas Estatales (UPE) en México, para determinar la posible existencia de una correlación entre el desempeño de estas en los indicadores de excelencia académica y el nivel de asignación de recursos financieros obtenidos de las principales fuentes de financiamiento del gobierno federal. Mediante la determinación de los indicadores académicos y financieros utilizados por los organismos internacionales y nacionales más importantes se construyó una propuesta metodológica de análisis estadístico, con el fin de evaluar el desempeño académico de las UPE y su correlación con la consecución de recursos financieros. Los resultados mostraron que no existe suficiente evidencia para inferir que la obtención de mejores resultados académicos en las UPE mexicanas es un predictor confiable de mejor captación de dichos recursos. De esta manera se expone la necesidad de una política clara en la asignación de recursos a las instituciones.

Palabras clave: educación superior, financiamiento, calidad, indicadores, políticas.

Recepción:

03/02/18

Aprobación:

10/10/18



Introduction

There is increasing interest in the recognition of the important role played by administrative management and its leadership in the effective performance of the three substantive functions of Higher Education Institutions (HEI). In the case of universities, Carrasco (2017: 109) points out that such role is based on “the concept of university governance, this way it refers the processes of management and university administration and the analysis of the role of leadership in decision making in university organizations”. This is complemented by Ganga et al. (2015) as they state that “it is held as an undiscussed premise that the management of the university government is one of the defining factors to improve administrative duties and thus, academic tasks”.

However, Brunner (2011) explains that

The challenge is to find an effectiveness principle to facilitate the regular incorporation of strategic decisions and administrate the organization so as to ensure the continuity of its functions, the resources necessary to so do and the production of satisfactory results for the various stakeholders in an turbulent, sometimes hostile, environment (Brunner, 2011: 140).

Focusing on resource management for institutions, Khem (2011) mentions that one of the main notions comprised in the concept of governance is transparency; however, such notion must be enacted considering the guiding principle pointed out by Berrios et al. (2009: 527) on a university management that exercises “an autonomous and responsible action, in which the actors abide by the principle of co-responsibility and additionally establish in the internal and external levels of the organization management for accountability in the processes”.

Indubitably, this will be one of the determinants of success in the search for resources HEI make, mainly the public institutions that depend, to a large extent and substantially, on resources from the federal government and to a lesser extent on state governments. The present study focuses on finding out whether the level of academic excellence “measured in standards and indicators” has some correlation with the success of administrative management, noticed in the reception level of financial resources for State Public Universities (SPU) in Mexico. The research is based on the identification of academic excellence resorted to by the various national programs to recognize academic quality and to financially support SPU, those referred to by various national organizations whose main goal is to

recognize the excellence in the institutions' academic quality and by the people in the main world university rankings.

In like manner, the methodology developed by Pantoja (2016), in order to find out the best scenario to assign the weight and impact on the several variables used in the study. This produced, as a first proposal, a database of indicators of the academic quality of SPU in Mexico, which was not organized, updated and available in an integral manner in any of the government agencies or organisms that recognize the quality of the education institutions or university associations.

Adding to the analysis of academic performance indicators, the variable of financial resources received by SPU from various funds available on tendering in the federal sphere,¹ with the purpose of undertaking a correlation analysis that allowed ascertaining the validity or not of the stated hypothesis.

The study was applied to each academic variable as regards each funding source and the sum of all sources. The tendency with such methodology was verified in the results: there was no significant correlation between the academic performance level of SPU and a better allotment of federal financial funds. This tendency above remained even if two alternative variables based on the economic context of SPU were incorporated, considering these can be a reason to receive funds. With this it was demonstrated that the conclusion of the study has a significant confidence level on the hypothesis test.

Literature review

Academic quality and its performance indicators

The topic of academic quality assessment has been from the start reason for debate in the university sphere, while the decision that indicators that reflect the level of academic quality of institutions is even more controversial. In Mexico, SPU have taken up academic quality federal policies complementing them with the assessment rules of the various national and international accreditation organisms, including the international rankings and some criteria proper to each SPU. Silva (2013) verifies this:

policies are two types: those produced by the institution itself (in this case the university) and those that come from the new environment of higher education public policies, which imply a series of efforts of "incremental adaption" of the universities

1 This article was produced owing to the research funded by the University of Guanajuato, through the program of the Doctorate in Leadership and Management of Higher Education Institutions of Universidad Anáhuac.

to the demands and regulations contained in such policies, empirically expressed in various federal programs that involve extraordinary resources, recognition or prestige for the very universities, academic groups (academic bodies) or individuals (professors and students) (Silva, 2013: 87).

Nowadays, there are several national and international rankings that have become the guideline to recognize the quality in HEI, and even, to allot resources or some supports. Martínez-Rizo (2011: 95) points out that the “serious methodological deficiencies they have render them totally inappropriate as tools to reliably assess the global quality of the institutions they refer to”. However, in Mexico, as in many other countries in the world, rankings and their deficiencies are still applied as tools to detect quality in HEI. Many of these indicators are resorted to by the national assessment systems to produce their criteria and also by the governments to produce federal policies that include the allotment of financial resources on the basis of such indicators. At present there is wide variety of rankings over the world; each measures academic quality differently by means of indicators previously chosen by its creators. The results of an HEI in a certain ranking may be utterly different in another ranking.

This phenomenon occurs because each rating has different objectives, methodologies and contexts. Owing to these and other reasons.

measures or rankings are matter of debate in university cloisters because according to some, these do not take the differences existing between the universities in the world into account. Nevertheless, these rankings have become a suitable tool to increase visibility and competitiveness (Matar *et al.*, 2013).

By contrast, again Martínez-Rizo (2012) mentions there have appeared rankings that, instead of presenting a global listing, carry out a more thorough analysis and do not assign individual places, but establish performance groups (high, average or poor) and by doing so, many of the inconsistencies in the individual rankings, in which the positions noticeably change from year to year, are suppressed.

The three main international rankings most recognized in the world by a number of authors are: Academic Ranking of World Universities (ARWU) or Shanghai Ranking, produced by Shanghai Jiao Tong University, China; World University Ranking by Times Higher Education Supplement (THE), England; and, Webometrics Ranking of World Universities by Laboratorio de Cibermetría del Consejo Superior de Investigaciones Científicas de España. Pusser and Marginson (2013), Martínez-Rizo (2011), Rodríguez (2006), Matar *et al.* (2013), Illera *et al.* (2013) and Jeremić *et al.* (2013) agree on this classification.

The three most cited global rankings mainly used resort to information generated by Thomson Reuters, SCImago, Nobel-prize laureates, Fields Medals, Majestic SEO, Ahrefs, Google, Google Scholar, ministries of education, university associations, rectors' conferences and those produced by the assessed institutions themselves. Most of the Mexican universities are not considered by the three main rankings; maybe because of this, some rankings include sub-classifications that follow differenced indicators and methodologies, which besides group HEI with certain common spheres of action and characteristics.

For the case of Latin America, an instance is the ranking called QS World University Rankings, which is published by Quacquarelli Symonds (QS), a firm specialized in media, events and education software. This ranking has an eminently entrepreneurial goal and it is not frequently used as a reference by the authors in the topic; however, it has also issued a sub-classification called QS University Rankings: Latin America, which follows a different methodology and includes a larger number of Mexican universities.

It is undeniable that HEI recognize the aforementioned rankings' flaws, but also that these are the current rules and if they intend to access resources or position their image in the national and international spheres must accomplish a good performance in such rankings. Albeit, instead of increasing the quality of HEI, the current global methodology of most rankings may actually induce a decrease in it, as important academic areas, which are not valued in the rankings' methodology, are neglected. In the particular case of Mexican HEI, these have not organized and produced their own ranking owing to the high cost of producing them, which not only comprises financial resources, but also man-hours of specialized personnel.

However, there are federal programs which due to their methodology pave the road so that universities, willingly or not, enter into the dynamic of the rankings' approach. An instance of this is presented by Comas et al. (2014), as they mention that one of the main federal funding programs, the one called Integral Program of Institutional Strengthening, uses

a set of indicators to model the characteristics that a high-quality higher education institution must have, taking research universities as a reference, and on this basis establish a hierarchical order to obtain additional economic resources (Comas *et al.*, 2014).

As counterparts, there are the accreditation and certification processes of HEI, conducted by accreditation organizations and peer-review committees. The indicators that such agents utilize are selected in relation to the discipline and professional sphere of the academic field under assessment. Many of the

organizations can concur with those established in the federal programs, though on occasion there exist indicators or priorities that the agencies and committees request from HEI, which fulfillment may frequently contradict the requirements from federal programs. This contradiction poses an enormous challenge for HEI, as the fulfillment of each indicator is relevant owing to its impact, however it is impossible to meet everyone and HEI must decide where they concentrate their efforts and resources, despite it means a possible negative impact on some assessments as a consequence.

Because of this, it is necessary to harmonize criteria for better equity in resource allotment, which must be instrumented even in *Plan Nacional de Desarrollo*, PND [National Development Plan] of the country. The current PND (2013 - 2018) has five national goals or “axes”, among which Goal III is considered “Mexico with Quality Education”, which includes various strategies and action lines that in the case of higher education concentrates a strong effort toward scientific and technologic development and innovation. Because of this, HEI focus on reaching such indicators and concentrate their efforts on research if they intend to obtain additional resources that enable them to further develop. An instance of this is the policies and criteria that several federal programs, including those in Consejo Nacional de Ciencia y tecnología, Conacyt [National Council of Science and Technology], which assign a higher value or score to the initiatives with an impact on 2013-2018 PND, favoring the research components against others of teaching and outreach.

University management and leadership style

Universities’ governability and governance have always been framed into a series of internal and external factors that affect and define them. Acosta (2014) mentions that “institutional governability means the capacity of the university government system to address the institutions’ external and internal demands”. While Aguilar (cited by Acosta, 2014) points out that “institutional governance, for its part, is defined as the organization’s capability to manage and coordinate common goals, coordinate actions to accomplish them and generate the most suitable institutional strategies to reach them”. According to Rodríguez (2014), “a university government must be able to conduct the institution along the road of ethical and political commitment to truth, justice and solidarity”; and the author challenges further in the text if such government is able to accomplish said objectives by means of a pyramidal structure of authority and control.

This questioning must take place in a reality of collegiate participation in universities and in an environment of leadership under groups of specialized professional scholars or by a group of scientists (Rodríguez, 2014). However, it is worth underscoring, as indicated by Castro and Tomás (2016) that the university government has to become a current model, with three that directly influence governability and institutional governance. The first is the matrix structure in the authority lines; the second is the non-professionalism of the staff in charge of management; and third, the transitoriness of the post. In any case, Sánchez (2013) identifies in her study that the best management practices carried out by a university government and its community “are those in which a distributed leadership, collegiate decision making processes, as well as balance between the pedagogical and the administrative are noticed”.

Because of this, the capacity for liberty and leadership is an important factor to negotiate at internal and external level and this last includes the negotiation with federal education authorities. Owing to this, Badillo *et al.* (2015) point out that “leadership appears in the human relationships that develop inside and outside HEI and represents a new sort of coordination and influence”, which turns the transformational leadership style that should prevail among the rectors into a possibility to negotiate effectively. The above was explained by Kouzes and Posner (2003) when they defined leadership as the art of mobilize others so that they want to fight for shared aspirations, in this case those of a university community.

However, we notice that a transitional leadership style prevails in Mexican HEI, autocratic sometimes, focused on decision making, being mostly a leadership based on the characteristics of the leader. Owing to this Sánchez *et al.* (2015) point out that

given the various criticisms received by this classical approach to leadership, another trend of thought has been consolidating in recent years on the topic that prioritizes the awareness of the context and leadership styles, understood as practice, over an individualist and decontextualized consideration of the leader’s personal characteristics (Sánchez *et al.*, 2015).

In the face of this new trend, it is relevant to underscore that both the combination of the context and the leader’s characteristics need the rectors’ right level of ethical practice. Thus is demonstrated by Walumba *et al.* (2008) in their study, in which they identify there is a positive correlation between authentic leadership and ethical leadership, pointing at authentic leadership with leaders with self-awareness, transparency in relations, authentic behavior and a balanced processing of information. Such characteristics are reasserted by Bass and Steidlmeier (1999), when they explain that a moral agent is

deemed praiseworthy or guilty in the light of three primary considerations: development awareness level, effective degree of freedom and probity of intentions. Supported on Bass and Steidlmeier (1999), it may be concluded that the rectors' leadership must abide by an ethical conduct supported on authenticity, transparency and honest behavior. Shared leadership that allows collegiate decision making and ensures the institution's governability and governance; while Abad (1997) points out that "those methods that enable equal participation in decision making processes that can reach better acceptance without risking the decision's quality".

User-Market-Society approach

In the history of administration and its management there are three approaches or main orientations: task-, process- and user-market-society oriented (UMS). At first, according to López et al. (2006), "scientific administration, founded by Taylor and followers, is the first attempt to put forward an administration theory, the concern in creating a science of administration and the emphasis on the tasks". Later on, the modern theories of administration evolve and a new approach on processes appears; it is defined by Mallar (2010) as "a new concept of organization structure which considers that every organization may be conceived as a network of interrelated or interconnected processes, on which a process-based management model can be applied". Finally, as a product of the systemic administration proposed by Ackoff (2008), and according to the UMS organization chart designed by Nosnik (2013) to be applied to the organizations, come from this last approach that responds better to the needs of the competitive functions (commercial and production) of a firm or organization, by means of supporting the effective functions (administration and finance, human resources and systems). In figure 1², the orientation used by UMS utilizes delegating to manage resources, applying the culture of internal service between areas and teams: client-provider. Such culture is applied to the effective variables supporting the competitive ones, intending to satisfy the market that is part of society.

The UMS approach used in the sphere of institutions such as universities allows analyzing, in the concept of value chain, the desirable relationship between administrative (effective functions) and academic (competitive functions) activities; the former being a support for the latter. In this case, the UMS model can be resorted to classify the universities' indicators

2 Figures and tables are in Annex, at the end of the present article (Editor's note).

of academic excellence, responding with quality to the needs to carry out the competitive functions of universities: teaching, research and outreach (dissemination of culture) in society.

Federal funding programs for state public universities

The main drive used by the federal government to incentivize changes in SPU have been the federal programs to fund operability and development, which the indicators of academic excellence considered relevant establish in their goals and objectives. These indicators have even been variables over time and frequently they follow the personal convictions of the directors of federal higher education. The main federal funding programs active at present are:

1. Ordinary subsidy co-financing agreement (Ordinary).
2. Program for the Strengthening of Quality in Educational Institutions, valid up to 2016.
3. Fund for the Recognition of the Staff in Public State Universities (Staff), valid up to 2015.
4. Fund to Support SPU Structural Reforms (reforms).
5. Fund to Increase the Quality of Higher Education.
6. Program to Incentivize the Performance of Teaching Staff (incentives).
7. Program to Broaden the Offer of High-School and Higher Education (expansion).
8. Fund of Multiple Contributions.
9. Program to Support the Development of Higher Education.

Methodology

For the present study, the following hypothesis was put forward:

Obtaining better academic results in Mexican SPU is a reliable predictor of the volume of the ordinary and extraordinary financial resources that such universities capture as they are studied from a user, market and society approach.

It is worth mentioning there is the possibility of an inverse relation; this is, to the extent that SPU accomplish a higher reception of incomes as funding, the results in their academic indicators may be better. For this research, it was decided to take the first reflection in the hypothesis, as it is based on the methodology proposed by Pantoja (2016) in the doctoral thesis in which the author carried out statistical tests on five analysis

methodologies to define the variability and thus ascertain the combination that produces the least variability in the results, incorporating specific weights and normalizers for the case of academic indicators. The period selected to gather information was seven years (from 2001 to 2017) and the study sample included a total of 34 institutions. It was decided to examine the group of Mexican SPU, as it is considered they have a similar structure that allows comparisons between them. Within a generic conception, the last seven years show certain stability, with little variation in the number of federal programs available to fund SPU and the sort of performance indicators asked in such programs.

For the present study, in figure 2, Pantoja (2016) adopted the original diagram by Nosnik (2013) taking it to the sphere of universities; since no SPU structures were measured, this research used the UMS model to causally organize indicators of performance academic and financial management (in databases) indicators. In its *user* element, the students were identified; in market, the products of universities (teaching, research and outreach or culture dissemination), for the market is the recipient of the graduates, research products and the outreach projects of the university. Finally, in the society element, public universities which take special demands and equity between members into account by means of aspects such as inclusion, mobility and opportunity generation.

In figure 3, it is noticed that Pantoja (2016), starting from the UMS approach, defined as independent variable that comprising the set of academic performance and competitiveness indicators that include the functions of teaching, research and outreach (culture dissemination). Moreover, the dependent variable was established by the institutional management and its effectiveness noticed in the reception of financial resources. For the independent variable, a total of 44 indicators were selected on the basis of their availability and the reliability of the information source. The indicators were organized according to the sphere of influence: students, professors, curricula, research and the global university rankings.

As regards performance indicators in administrative management, the averages of the financial resources obtained from the various sources of ordinary and extraordinary budget selected were calculated, all this in the period under assessment. The results were listed following an order defined by the Secretariat of Public Education for SPU. In the end, the correlation between the scores assigned to the indicators of academic performance and the averages of financial resources obtained for administrative management.

Study's results

Correlation analysis

Since there are nine federal funding sources for SPU, a correlation analysis was carried out between the independent variable score and each of the federal funding sources (dependent variables) received by each SPU using Pearson correlation coefficient (r):

$$\rho = \frac{\text{Cov}(X,Y)}{\sigma_x \sigma_y}$$

Furthermore, in order to try the hypothesis in a more accurate manner, it was deemed relevant to calculate, as a verification, Spearman's rank correlation coefficient (r_s). According to Hauke and Kossowski (2011), such coefficient assesses the monotonic relation, this is to say, nonlinear between two continuous or ordinal variables. The coefficient by ranges was developed by British psychologist Charles Edward Spearman and according to Johnson and Kuby (2012), the formula for such calculation is as follows:

$$\rho = 1 - \frac{6 \sum D^2}{n(n^2 - 1)}$$

As in Pearson coefficient, Spearman's is measured by values that range between -1.0 and 1.0, and the difference is that in the latter's measurement verifies if there is correlation in a monotonic relation, this is, nonlinear. The closer the value of r_s to 1, the higher the correlation level, either positive or negative (Johnson and Kuby, 2012).

It is important to mention that in the present study it was intended to evince whether the behavior of a variable defined as independent (academic excellence) is positively correlated with the behavior of a variable defined as dependent (financial resources). This does not mean to find the causality of the dependent variable by means of the correlation coefficient, as the first may be produced by a series of factors that will be subject matter of further, more complex studies. As stated by Pearl (2000), it is relevant to make a clear distinction between statistical parameters and causal parameters. In the former we find correlation, in the latter, concepts such as randomization and confusion.

Hypothesis testing

Table 1 shows the results of the correlation analysis between the independent variable *score* and the various financial support programs for SPU. The Pearson coefficient for the variable *total collection* with a value of 0.259 refers to the existence of a very weak relation that does not sufficiently explain it; declared moderate by Triola (2013) at 0.43 and that is slightly further from the 0.50, mentioned by Witte and Witte (2015), Cohen (1988), Devore (2012) and Lind et al. (2012). Underscoring what Witte and Witte (2015) pointed out, the distance from all the coefficients calculated regarding the value of +1.0 or -1.0 means there is no relation between the variables that explains a linear relation between them.

Likewise, they clarify that the correlation coefficients under 0.50 indicate that there is no strong relation that explains the correspondence. As regards Pearson coefficient in the variables of the various funds, it is noticed that the results produced low or weak correlation coefficients, ranging from a lesser result of $r=0.071$ for variable *FAM*, and one maximum value of $r=0.459$ in the variable *stimuli*, with intermediate results for other variables, but with a downward tendency.

As for Spearman r_s , it is noticed there is no significant variation between the results compared with Pearson r . In most of the cases, the Spearman coefficient increases slightly compared with Pearson's; while in other cases, it even decreases a little. This verifies that both under a linear or a monotonic model the analyzed data do not show strong correlation that implies the possible existence of causality in them. When comparing individually the performance of SPU in the main indicators of academic excellence and grouped by means of the UMS approach v. the reception of resources from each federal and state source, a correlation that goes from excessively low and even correlations that may be considered moderate were noticed, but which do not sufficiently explain a strong linear relation between variables.

It is worth mentioning that only the variable *stimuli* obtained a Pearson coefficient of $r=0.459$ and a Spearman coefficient of $r_s=0.528$, locating this variable in a moderate correlation that allows inferring better correspondence between academic results of SPU and the allotment of financial resources, even though it does not have a correlation level that allows securing a positive tendency to try the hypothesis. This adds to the fact that the fund *stimuli* represents a minority in the total allotment of federal resources for SPU, considering all the federal funds in the variable *total* reception. In table 1, it is noticed that Pearson coefficient is $r=0.259$, while Spearman's, $r_s=0.205$, which means a very weak correlation.

From the above, it may be inferred there is no sufficient evidence to state that the best accomplishment of academic performance indicators in SPU, by means of a UMS approach, is a predictor of a greater reception of financial resources in the ordinary and extraordinary budget programs. The possibility to find causality in the dependent variable generated by an independent variable is still very low, and there are much fewer possibilities to find direct causality between the variables.

Since a weak correlation is not an absolute term, but a vague concept, it was deemed convenient to take economic contexts that may influence a direct causal relation between variables into account. To do so, alternative variables were selected suspecting their influence as regional economic factors on the independent variable. The suspicion was that these and other alternative variables may be equally correlated as the dependent variables of the study are. Owing to this, as a test, it was decided to measure the correlation of the independent variable (academic indicators) with two dependent variables chosen in an alternative manner: the total population by State (population) and gross domestic product by State.

Such information was correlated by means of locating each SPU in the state in which they provide their academic services (results are displayed in table 2). It is noticed that results of $r=0.304$ for the variable *población* and $r=0.379$ for gross domestic product by state, showing a moderate linear relation with limited possibilities to explain in an isolated and direct way the variables' causality. Though it is interesting to underscore that the alternative variables, in many cases, had a correlation factor greater than the various financial funds, evincing that the random variables explain better the possible existence of correspondence with academic indicators. On the other side, Spearman correlation coefficients produced values lower than Pearson coefficient in both alternative variables, indicating that under a measurement of a correlation suspected of being monotonic, the alternative variables show a weaker relation.

At this point there exists the possibility of another alternative hypothesis which explains the decisions of the federal government funding for SPU, maybe in a remedial way: this is, the government intends to remediate the poor performance of some SPU by means of a larger contribution to improve their academic accomplishments. Because of this, in table 3 the results of the complementary correlation analysis, grouping the SPU in thirds on the basis of the results of the academic performance indicators. Such results were comprised at two levels: the third of the SPU that obtained the best result in academic indicators and the third of the SPU that had the poorest result in this indicators.

In the third of the SPU that attained the highest *score* mostly weak and even negative correlations were noticed: to the extent HEI obtain better academic results, they receive a smaller proportional amount of federal funding resources. Even when calculating Spearman correlation coefficient, results showed little difference from Pearson coefficient, locating at a less than moderate level of correlation. Moreover, when analyzing the third of SPU with the lowest results, it was possible to verify that most of Pearson coefficients had negative values, and a few positive, but of very low level; that is to say, there was no sufficient evidence of a possible correlation and much less of a causality.

By applying Spearman coefficient, the results indicated a number of negative values and for some funds positive, even close to 0.50 and 0.60 in the case of one of them. Even though some of the funds may infer a moderate relation, it cannot be concluded that there is linear correspondence between resource allotment and academic results in this group. More so, when the variable total collection was analyzed, it was found that Spearman coefficient had a negative value. In any case, it is important that the distribution of resources constantly responds to a federal policy to allot resources and not only in a moderate way to a few.

Based on the foregoing, it can be stated that it is very likely that federal policies and the allotment of financial resources, via the programs, are exclusively incentivizing the SPU that have maintained poor performance in their academic indicators and are discouraging SPU with sustained development in their academic performance indicators, as they allot them with fewer resources, in spite of improving their indicators. The result turns into an asymptotic curve in which the SPU which have not carried out their duties correctly, measured by means of what the programs themselves have established as the excellence “indicators” in this regard, are proportionally allotted more resources.

Later on, in such curve, one finds the part of the least growth, as SPU that have duly carried out their tasks in this respect receive a lower proportional allotment of financial resources. This last effect is maybe generated by some other causal variables, however it will be difficult to include this analysis in the scope of the present study.

Due to the above, the hypothesis put forward at the beginning is *rejected*, as there is no sufficient statistical difference that allows inferring that obtaining better academic results by Mexican SPU is a reliable predictor of the volume of ordinary and extraordinary financial resources these universities receive, when they are analyzed from the MS approach. As an alternative hypothesis

it is stated there are other economic factors that explain the variation in the allotment of financial resources and among them there is the possibility that the federal government applies a remedial logic for SPU with poor academic performance.

Discussion and conclusions

The debate we propose is to continue researching if the indicators valid at present are the ones that must be requested by the federal programs to assign financial resources or if such indicators must be restated according to the national reflection on education institutions, generating a consensus on the indicators and the way resources need to be allotted. Above things,

mainly, by recognizing that frequently the allotment of resources is made from the standpoint and decision of the functionaries in charge of the federal programs, as very frequently such programs change their requirements from administration to administration, focusing on particular aspects that do not address an integral planning of SPU.

Another important aspect to research is the possible coordination between the indicators particularly required by the accrediting and certifying agencies and those required by the federal programs to allot resources. Although in principle it may be understood that meeting the first indicators implies meeting the latter, frequently there are internal conflicts in Mexican SPU as regards if they focus their efforts on meeting the demands of one agency or another, or the requirements of a federal agency.

The original hypothesis in the study supposed that to the extent that Mexican UPE obtain better results in their academic performance indicators, they collect a larger amount of ordinary and extraordinary financial funds from federal programs. The results of the correlation analysis between the variable SPU score and their reception of financial resources from the various federal support programs produced very low to moderate correlation coefficients. Both Pearson correlation coefficient, which measures the existence of a monotonic correlation or one nonlinear, verified the results and did not show wide variations between them.

Out of the ten total correlation coefficients calculated, seven were identified as weak relations with values close to zero or less than 0.30, showing there is no significant linear or monotonic relation that thoroughly explains its existence and so, there is no possibility for direct causality between variables. It was also verified that there is no sufficient scientific evidence to state that in Mexico to the extent that SPU improve their academic indicators,

they receive more financial resources as a retribution. More so, owing to the sort of correlational analysis conducted, it can be stated that neither is there sufficient scientific evidence to conclude that a higher level of financial resources for a SPU corresponds to a greater academic accomplishments.

This is concerning in the sphere higher education in Mexico, since evidence supposes there would be later hypotheses to research in the future, which would be disquieting in case of being affirmative. One of them may be the supposition there are discretionary factors in the allotment of federal financial resources, which generate slightly significant improvements in the academic performance of Mexican SPU; it would be also very worrying to notice setbacks.

The study of two alternative variables selected at random demonstrated there are other reasons that are not directly related to the federal financing for SPU that demonstrate a similar level of linear or monotonic correlation. This further discredits the possibility of correspondence between what the federal government expresses in its policies to allot financial resources and SPU academic accomplishment. This is evinced by showing that variable such as the number of inhabitants of a state, or the GDP of such state, explain at the same level as the dependent variables of the study, the possibility for correlation and at a certain moment the possible causality between the variables analyzed. Even, when analyzing the Mexican SPU by sector, the results disclosed a new finding in the correlation behavior of the studied variables. It was evinced that the subgroup of SPU with the best results for academic performance indicators have very weak correlation factors and even most of them have a inverse results (negatives).

This finding is worrying, as it evinces that the greatest effort and academic accomplishment of SPU receive a lesser proportional assignation of federal financial resources. In the case of the group of SPU with the poorest results, as opposed to the other group, there is evidence that supports the existence of a low to moderate relation both linear and monotonic, which tends to be significant. This is, it was found that at a higher level of financial-resource allotment there is a lower result in the academic performance indicator, or vice versa. It is disturbing that some SPU do not accomplish the necessary performance in their indicators of academic excellence that reflects the sufficient level to offer equitable education as demanded by society; in spite of this, the present study demonstrated that it is very likely that they receive a proportionally large amount than those which carry out the academic task at excellence levels. However, the importance SPU have for the Mexican state is recognized, mainly for the regions where

they are located, though it is imperative to undertake actions that make it possible that their graduates compete in equal terms in the labor market and advance professionally.

To sum up, the scientific evidence gathered in this research produces the worrying reflection on the fact that to a greater effort and accomplishment in the academic performance, Mexican SPU are less recognized with a shorter budgetary allotment. On the other side, in spite of a mediocre academic performance, a group of SPU is being better recognized with the proportional allotment of such resources; or vice versa, despite that a group of SPU receives a lower proportional amount of federal resources, they manage to maintain and develop excellence academic performance indexes. However, to the extent that a group of SPU receive a larger amount of economic resources, these maintain a poor performance and without improvement in academic results. In any of the previous interpretations, the conclusion is alarming for public higher education in the country, and because of this it is detected the need to carry on researching on the topic, identifying other variables that affect such behavior. Such finding conveys other alternative hypotheses. One of them establishes that maybe the allotment from the federal government obeys a remedial reasoning, in which the state, looking to improve their academic performance, gives them larger resources to strengthen. Likewise, the supposition that high-performance SPU may access other national and international funding sources. In any case, it is important to research whether the possible remedial logic has produced advancement, stagnation or decline; or in the high-performance SPU, which the impact factors that have favored the attainment of their indicators are in spite of the lesser proportional allotment of resources. Such alternative hypotheses are worth a later analysis, in which the variable time might answer these questions.

The results of this research show that the policies and regulation used by the government of the republic to allot financial funds for Mexican SPU do not correspond to a correlational or causal, or in any case fair manner to the effort of academic improvement that institutions strive to, and that is noticed in better indicators. This situation is overly controversial, since the leaders of Mexican SPU must negotiate with the federal government to establish clear and equitable policies that award such effort.

The allotment of financial resources must respond to these accomplishments in a fair and transparent way. It is very important that the federal government, university associations and the certifying and accrediting agencies in Mexico recognize the relevance of having a national policy for higher education that harmonizes the various funding sources for Mexican SPU and incentivizes them to reach the main academic excellence indicators.

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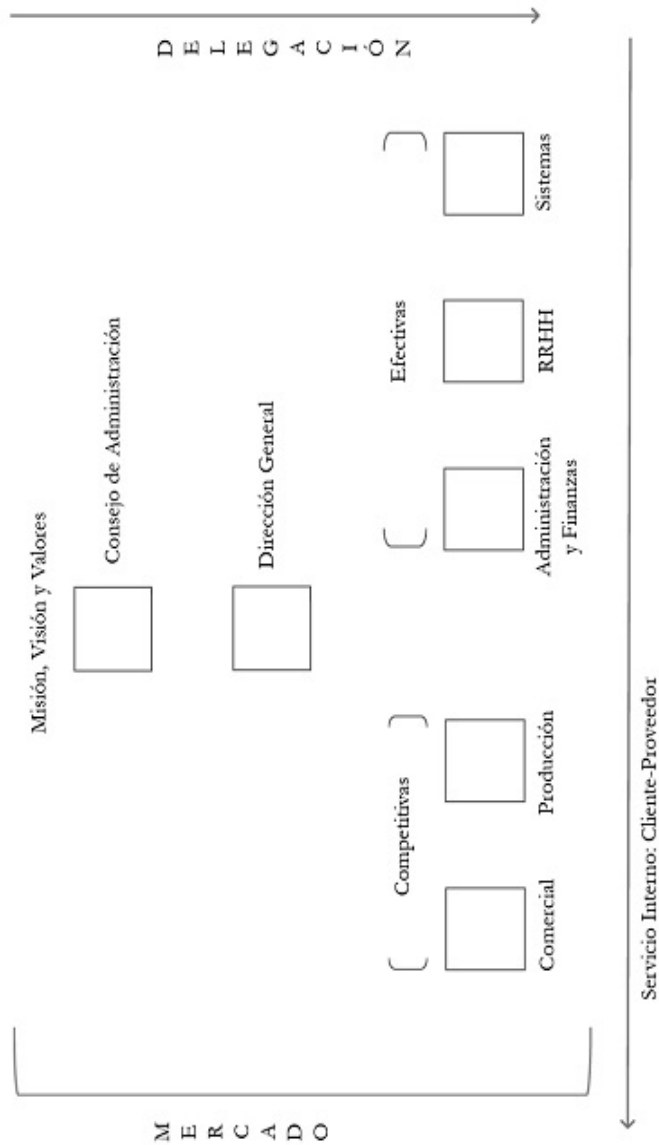
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Figure 1

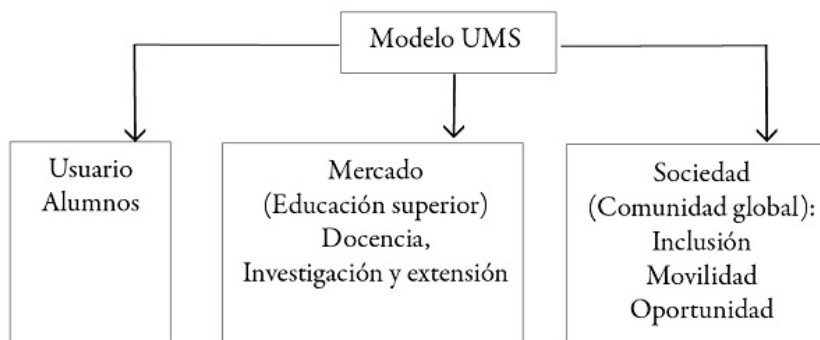
UMS (User, Market and Society) organization chart Chain value oriented to market, niche, client, consumer, end user



Source: Nosnik (2013).

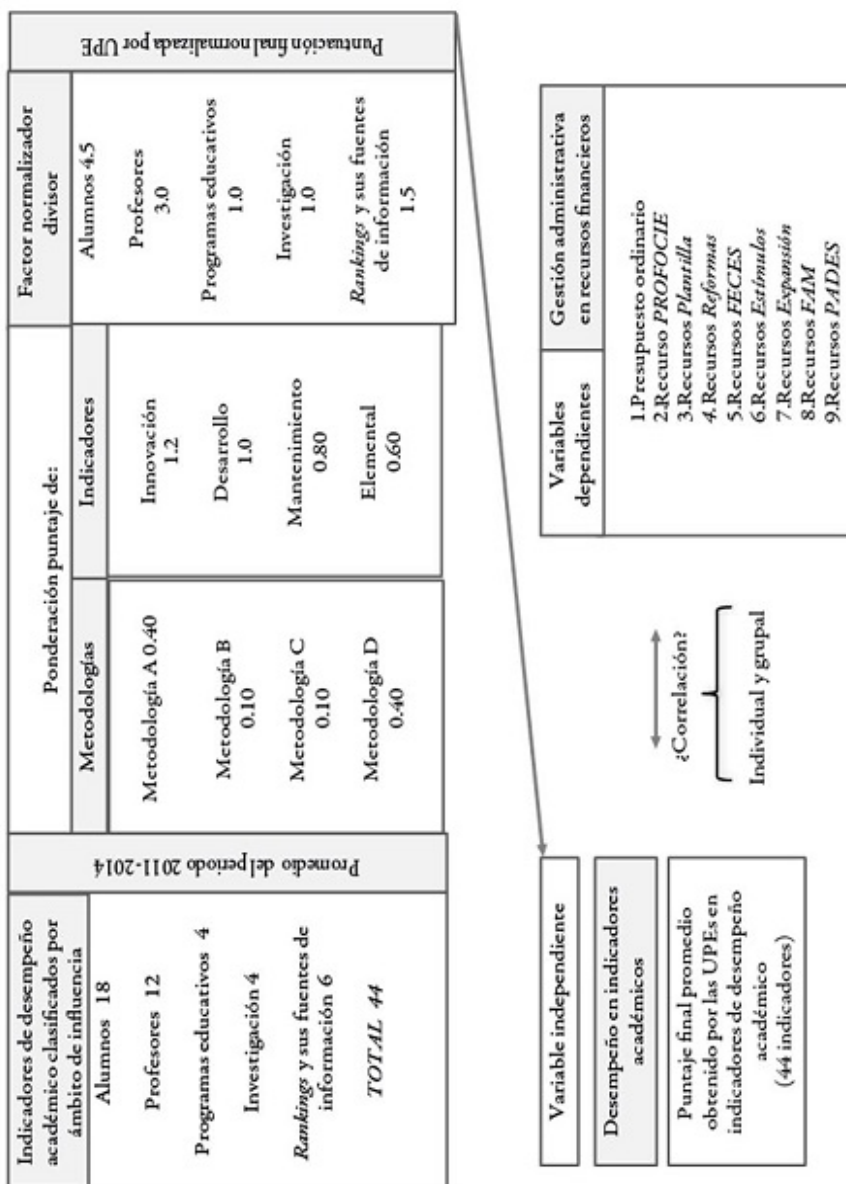
Figure 2

UMS model applied to a university institution



Source: Pantoja (2016).

Figure 3
Correlation analysis between academic performance results and reception of financial resources



Fuente: Pantoja (2016).

Table 1

Correlation coefficients r and rs between the independent variable *score* and dependent variables

No.	Correlation score with:	Pearson coefficient " r "	Spearman coefficient " rs "
1	Ordinary	0.117	0.075
2	PROFOCIE	0.131	0.157
3	Staff	0.094	0.135
4	Reforms	0.165	0.158
5	FECES	0.170	0.232
6	Stimuli	0.459	0.528
7	Expansion	0.202	0.252
8	FAM	0.071	0.089
9	PADES	0.197	0.184
10	Total reception	0.259	0.205

Source: own elaboration.

Table 2

Correlation of the independent variable and the alternative variables (population by state and GPD per state)

Pearson coefficient " r ":	
Academic indicators and population by state	0.304
Academic indicators and GDP per state	0.379
Spearman coefficient " rs ":	
Academic indicators and population by state	0.272
Academic indicators and GDP per state	0.255

Source: own elaboration.

Tabla 3

Análisis de correlación por tercios de grupos de desempeño académico

Grupo de UPE en el tercio más ALTO en indicadores académicos			Grupo de UPE en el tercio más BAJO en indicadores académicos		
Correlation "score" with:	Pearson coefficient "r"	Spearman coefficient "rs"	Correlation "score" with:	Pearson coefficient "r"	Spearman coefficient "rs"
Ordinary	-0.334	-0.236	Ordinary	-0.061	-0.127
PROFOCIE	-0.419	-0.382	PROFOCIE	-0.105	0.018
Staff	-0.315	-0.309	Staff	0.088	-0.018
Reforms	0.305	0.345	Reforms	-0.342	-0.396
FECES	0.284	0.336	FECES	-0.128	-0.091
Stimuli	-0.346	-0.227	Stimuli	-0.180	0.045
Expansion	0.112	-0.136	Expansion	0.255	0.473
FAM	-0.462	-0.336	FAM	0.506	0.418
PADES	-0.424	-0.336	PADES	0.314	0.600
Total reception	-0.335	-0.282	Total reception	-0.212	-0.327

Source: own elaboration.

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