

## ***Key Performance Indicators for Higher Education: Lessons from Poland***

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### **Abstract**

It has been argued that quantitative KPIs for academics can create perverse incentives. By narrowing the attention of academia to measurable outcomes rather than its broader mission, they can be a distraction from maximizing universities' positive impact on society. Quantitative assessments are nonetheless required, among others by governments which finance or co-finance the higher education institutions in many countries. This work presents an analysis of past regulations concerning the evaluation of universities and their impact on the Polish higher education sector. Quantitative as well as qualitative aspects are discussed. The results illustrate the Goodhart's law stating :“When a measure becomes a target, it ceases to be a good measure.” However in some aspects the case study of Poland also shows how the absence of quantitative assessments is likely to result in undesired outcomes.

Keywords: higher education, evaluation, key performance indicators, Goodhart's law

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## 1. Introduction

Key performance indicators (KPIs) can be defined as (quantitative) performance measurements used to evaluate the success of a particular activity (project, program, product) or of an organization, a team, or an individual in fulfilling a task or advancing in a certain area. Suitable KPIs have the following characteristics: they cover key strategic goals or areas, and the formulas used to calculate their values have desired mathematical properties.

Quantitative measurements are used for decision-making processes related to funding in higher education both by governments as well as students and their families. KPIs are used in the process of granting government funding to Higher Education Institutions (HEIs) because they are transparent and resistant to bias of the evaluator. Students and their parents also consult quantitative measures (e.g. rankings) because it allows them to reduce the complex reality of nearly unlimited educational choices to an understandable figure. The position of a HEI in rankings is also a signaling tool to future employers. The interdependence of funding, effects, and evaluation in higher education is illustrated in Figure 1.

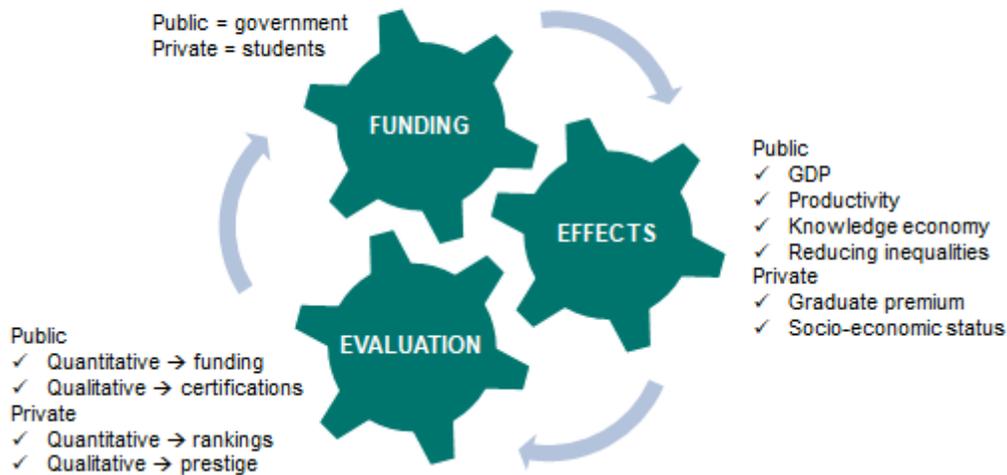


Figure 1. Funding, evaluation, and effects in higher education. Source: own elaboration.

Constructing a mathematical model of reality requires simplifications. When these simplifications are significant and decision-making is based mainly on the model (e.g. a set of KPIs), the incentives to game the system (or even cheat) are strong. This can be summarized by the Goodhart's Law, stating: "When a measure becomes a target, it ceases to be a good measure" (Goodhart, 1975). Multiple illustrations of perverse incentives as well as reports of cheating in the environment of hypercompetition for funding in academia are provided by Edwards and Roy (2016).

While Edwards and Roy (2016) argue for regulators to support science by de-emphasizing output and instead promoting “altruistic and ethical outcomes”<sup>1</sup>, we aim at drafting a framework for assessments of sets of KPIs used for funding, in particular for government formula-based funding. We apply the preliminary framework to analyze a case study of Poland, precisely an algorithm used by the Polish government since 2007 for determining the level of subsidies for didactic and maintenance purposes<sup>2</sup> for public HEIs. Special focus is given to pro-quality KPIs dependent on the student-staff ratio.

## 2. Preliminary assessment framework

The problem of assessment of sets of KPIs used for government funding amounts to verifying the two following umbrella hypotheses:

- A/ The KPIs are a significant driving force behind the evolution of the higher education sector (in other words: the higher education sector develops in the direction set out by the set of KPIs);
- B/ The areas not covered by the KPIs used by governments suffer stagnation or deterioration if government funding is a significant part of HEIs’ revenues.

The framework we propose consists of three stages:

- 1/ Defining the scope of analysis, 2/ Mathematical *ex ante* analysis, 3/ Empirical *ex post* analysis.

## 3. Research methodology

First step of stage 1/ (Defining the scope of analysis) is specifying the subject, i.e. providing enough criteria that an exact list of HEIs under examination can be deduced. The group of HEIs should be regulated with the same set of KPIs. The timeframe of the analysis has to be specified as a second step. It should be a period when the regulations (set of KPIs) were relatively steady and it should be long enough for the HEIs to have enough time to develop adjustment strategies. Next, strategic goals within the sector need to be identified. They can be sourced from strategic documents published by the government or the sector’s regulating body. In absence or insufficiency of such official documents, strategic areas can be indicated by the researcher through literature review or review of official documents by other countries. Finally, the KPIs need to be listed. It is crucial to state for which stream of revenues the specific set of KPIs is used. The share of the stream in total sector’s revenues should be indicated or estimated.

The goal of the mathematical *ex ante* analysis, to be performed as stage 2, is to determine the direction and strength of incentives implied by KPIs. In most cases, this can be performed by analyzing derivative functions of the KPIs’ formulas with respect to key inputs which are within the HEIs’ control. The structures of incentives can be divided into four categories:

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<sup>1</sup> Edwards, M. A., & Roy, S. (2017). Academic research in the 21st century: Maintaining scientific integrity in a climate of perverse incentives and hypercompetition. *Environmental Engineering Science*, 34(1), p. 51.

<sup>2</sup> The Regulations adopted by the Minister of Science and Higher Education mention that the subsidy is for didactic and maintenance purposes, however the money is not “tracked”, i.e. the HEIs’ authorities have discretionary powers in allocating the funds in the best interests of the HEIs.

- Rewarding the progression of a certain area (e.g. the more students participate in a student exchange abroad, the better),
- Rewarding the elimination of certain actions or events (e.g. the smaller dropout rate, the better),
- Rewarding reaching a reference level / punishing moving away from a reference level (e.g. a reference level of student-to-staff ratio),
- Others: there are endless possibilities of the structure of KPIs' incentives (e.g. non-linear, multi-modal functions).

It is important to note that in some cases, assumptions will need to be made because of lacking or insufficient data. It is crucial to comment on what these assumptions are and to what extent they can sensitize the findings.

The last stage (Empirical *ex post* analysis) aims at tracking the evolution that HEIs made during the period of time specified by the analysis' timeframe. Determining to what extent HEIs did eventually progress in the direction set out by the regulator via the set the KPIs used for funding allows to verify hypothesis A. Verification of hypothesis B is more challenging and potentially less conclusive, since it requires assessment of areas which were in most instances not monitored by national statistical offices or are simply difficult to measure. Although the findings might be less conclusive, available information and expert judgment from the sector's stakeholders should be taken in consideration.

#### 4. The case study of Poland 2007-2017

Since 2007, Poland has had an algorithmic formula for dividing funds for didactic and maintenance purposes between public universities. The share of the fund for didactic and maintenance purposes in all government funding for public universities has been oscillating between 81% and 86% and its share in total revenues between 55% and 63%. The KPIs and their weights used in the funding formula during the period of 2007-2017 are presented in Table 1 and Figure 2, respectively. In an absence of an official document outlining the strategic objectives of the Polish higher education system as of 2007, we assume that the KPIs reflected the government's objectives.

**Table 1.** KPIs used in the funding algorithm in years 2007 – 2017. Source: own elaboration.

	2007 - 2012	2013-2014	2015-2016	2017 - now
<b>KPI 1°</b>	Students and PhD candidates			
<b>KPI 2°</b>	Student exchange			Internationalization
<b>KPI 3°</b>	Academic staff			

<sup>3</sup> Fulton, O., Santiago, P., Edquist, C., El-Khawas, E., & Hackl, E. (2007). OECD reviews of tertiary education. *Danvers, MA: Organization for Economic Cooperation and Development Publishing.*

<b>KPI 4°</b>	Research			
<b>KPI 5°</b>	Certifications to issue diplomas			n/a
<b>KPI 6°</b>	Sustainable development	Availability of academic staff	Proportional development of teaching	n/a

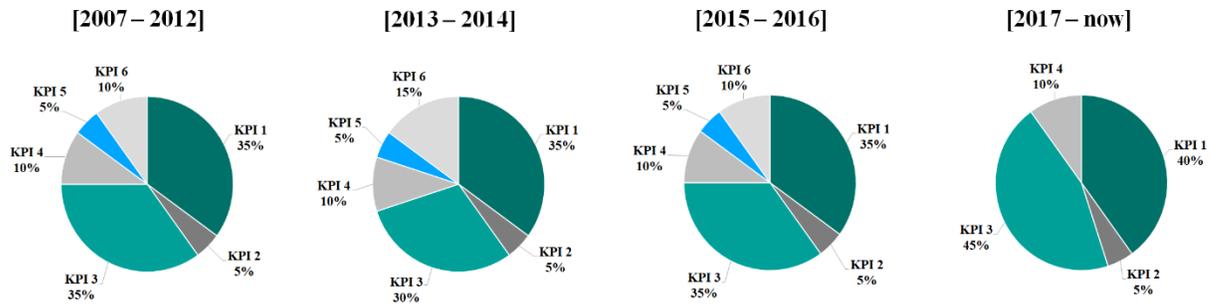


Figure 2. Weights attributed to KPIs (2007-2017). Source: own elaboration.

Since the subsidy has been the dominant source of revenue for Polish public HEIs for over a decade, it is natural to state the hypothesis of the formula's KPIs having a strong impact on the decision-making of HEIs. This hypothesis can be broke down into two research questions. First, the KPIs used in the formula are going to be analyzed critically to verify whether the KPIs effectively incentivize the desired effects. Second, the choice of key areas and strategic goals will be investigated – whether the pursuit of key areas will satisfy public and private demand.

All KPIs are represented as a fraction:

$$KPI_i = \frac{v_i}{\sum_{j=1}^n v_j}$$

where  $KPI_i$  stands for the value of the KPI for  $i$ -th HEI,  $v_i$  stands for the value of the KPI-specific nominator of the  $i$ -th HEI, and  $n$  stands for the total number of HEIs. Therefore, by definition, the value of any KPI for any HEI has to be within the range of [0%;100%], and the value for all HEIs altogether is always 100%.

The KPIs can be categorized into additive and non-additive. The additive KPIs have the following property:

$$v_{i+j} = v_i + v_j$$

where  $v_i$  is the value of the KPI-specific nominator of the  $i$ -th HEI, and  $v_{i+j}$  is the value of the KPI-specific nominator of the  $i$ -th and  $j$ -th HEIs, treated as one HEI (as if the HEIs had been merged). Some KPI-specific nominators will be analyzed in detail below.<sup>4</sup>

We make a simplifying assumption when interpreting the incentive structure of the KPIs. Instead of taking the derivatives of the KPIs, we only take the derivatives of

<sup>4</sup> For more details, please consult the Regulations issued by the Minister of Science and Higher Education (see Literature).

their nominators. This largely simplifies interpretation as well as calculation, while the error resulting from the simplification is negligible when dealing with small changes. For example, if an  $i$ -th HEI increases the value of its nominator by 1% of the denominator, *ceteris paribus*, we assume that the KPI of the  $i$ -th HEI will also increase by 1,0%. However, in reality, the KPI of the  $i$ -th HEI will increase by 0,99%. Therefore the error amounts to 0,01%. The smaller the change, the smaller the error. Since we mostly analyze changes much smaller than 1% of the denominator (e.g. increasing the number of students by 1% of the denominator would mean increasing the number of students by more than 60% for an average academic public HEI, which is unrealistic on a year-to-year basis), the error can be omitted. However, if a case study of a specific, especially bigger, HEI was to be analyzed, it should be taken into account.

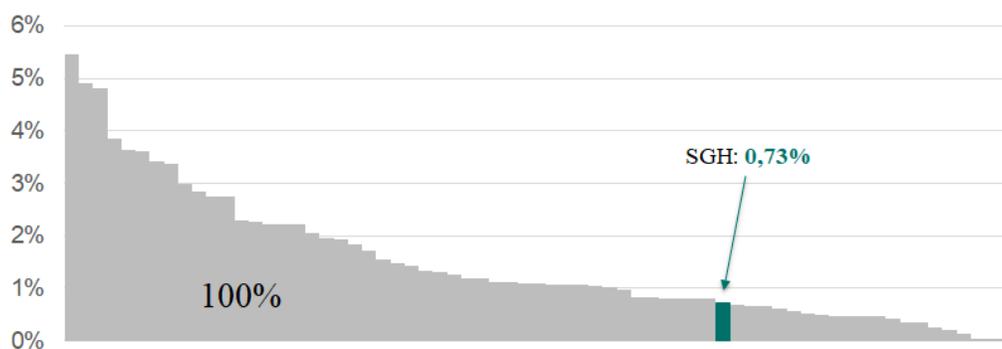
#### 4.1. Additive KPIs used in the funding formulas

Additivity of a KPI's nominator has profound consequences for the structure of incentives implied by the KPI, as well as the easiness of its interpretation. Values of additive KPIs can be calculated not only for individual HEIs but also for subgroups of HEIs, e.g. polytechnics or schools of economics. This also implies that the absolute change in the denominator can be interpreted as progress (or regress) of the entire system.

#### KPI 1° Students and PhD candidates (2007-2016)

Before 2017, the nominator of the KPI 1° was a weighted sum of stationary<sup>5</sup> students and PhD candidates. HEIs receive pre-defined number of “points” for each: student, PhD candidate, and foreigner taking preliminary courses to later undertake studies in Polish. A HEI received between 1 and 3 points for each student, depending on his/her study area. Within study areas, PhD candidates are „worth” up to 5 times more points than bachelor/master students.<sup>6</sup> For illustration purposes, the distribution of KPI 1° values in 2015 are presented in Figure 3.

**Distribution of KPI 1° values in 2015**



<sup>5</sup> Stationary studies in public HEIs in Poland are free of tuition fee. Public HEIs in Poland are also allowed to offer non-stationary studies; in such a case participants need to pay tuition fees.

<sup>6</sup> Some conditions for receiving points were omitted for simplicity. For more details, please consult the Decrees issued by the Minister of Science and Higher Education (see Literature).

Figure 3. Distribution of KPI 1° values in 2015 (KPI values of all 67 public academic HEIs in Poland which were awarded subsidy from the fund for didactic and maintenance purposes).

Source: own elaboration. Data: Ministry of Science and Higher Education.

The derivative function of the nominator with respect to each type of student / PhD candidate took the following form<sup>7</sup>:

$$\frac{\partial KPI}{\partial x_i} = p_i + x_i$$

Therefore, increasing the number of any type of students was beneficial to all HEIs. This was true both in the case of stationary students and non-stationary students. The enrollment of non-stationary students are subsidized indirectly: the real costs of enrolling a non-stationary student in a public HEI are lower than for a private HEI because the former can utilize to this end the resources (i.e. academic staff, infrastructure, administration) which are already paid for through public money (including the fund for didactic and maintenance purposes).

Indicating exactly how much money is rewarded for one point in every KPI is not straightforward. Moreover, it is also only possible to calculate it backwards. Firstly because the total amount of the fund is different every year, but most importantly because of the uncertainty surrounding the developments at other HEIs.<sup>8</sup>

As part of the empirical *ex post* analysis, we inspect the growth of number of students and PhD candidates (see Figure 4). The number of (stationary) students increased 9% during the analyzed decade. This growth occurred while the population of 19-year-olds<sup>9</sup> in Poland fell by 33% from 2006 to 2017. Increasing the number of students when the population of high school graduates is falling is a challenge. In terms of KPI 1°, the same growth can be achieved with either growing the number of students or PhD candidates and it seems HEIs were much more successful with growing the number of PhD candidates (73% increase from 2006 to 2016).

<sup>7</sup> Where  $x_i$  stands for the number of students of type  $i$  enrolled at a HEI, and  $p_i$  stands for the number of points awarded for every students of type  $i$ .

<sup>8</sup> In the case of KPI 1° however, the uncertainty stemming from the unpredictability of management decisions by other HEIs was somewhat reduced in 2013, with the introduction of penalties for increasing the number of stationary students by more than 2%. In such circumstances, reasonable assumptions can be made about the evolution of the denominator from one year to another.

<sup>9</sup> Most Poles are 19-year-old when graduating from high school.

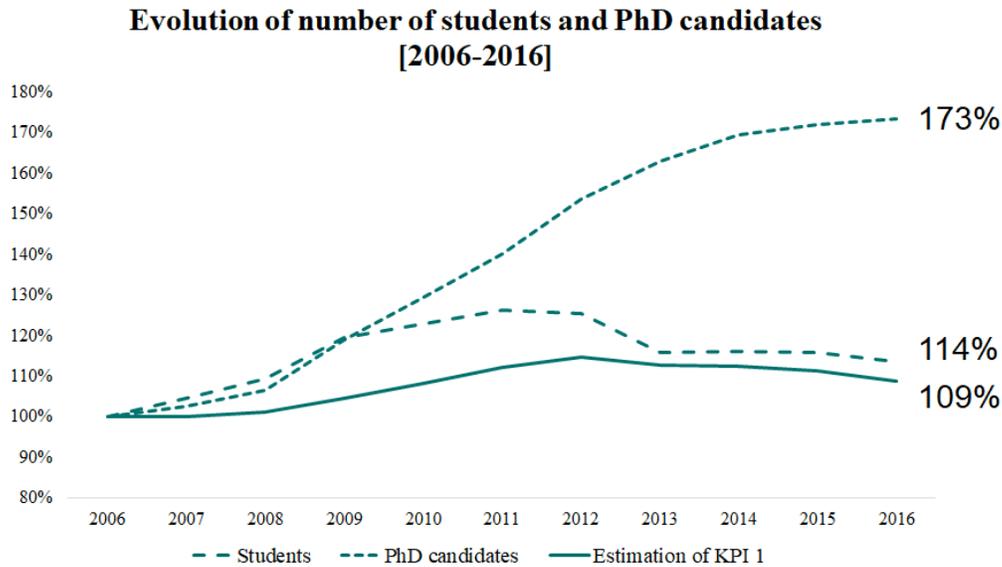


Figure 4. Estimation of KPI 1° is based on the assumption that PhD candidates are equivalent to 5 students. Source: own elaboration. Data: Central Statistical Office (GUS).

In 2017, a HEI-specific multiplier was added to address the issue of indirect costs incurred by the enrollment of non-stationary students. Thus the KPI became non-additive and will be further discussed in the section on non-additive KPIs. However as the multiplier is applied only after the weighted sum has been calculated, the above description of the procedure of awarding points still holds.

### **KPI 2° Student exchange / Internationalization (2007-2017)**

In years 2007-2016, HEIs received points for every (own) student or PhD candidate who participated in a student exchange abroad (1 point), and for every foreign student or PhD candidate who participated in a student exchange at the HEI (3 points). In 2017, the indicator was renamed to Internationalization. One new category was added: 3 points are now awarded for every foreign student or PhD candidate completing full-cycle studies at the HEI.

Polish public HEIs experienced very rapid internationalization (at least in terms of the student body) during the last decade. However, the fact that the growth in number of foreign students was higher at non-public HEIs suggests that the main driving force behind the internationalization might be the general increasing attractiveness of Poland as a study destination, not necessarily the incentives implied by KPI 2°.

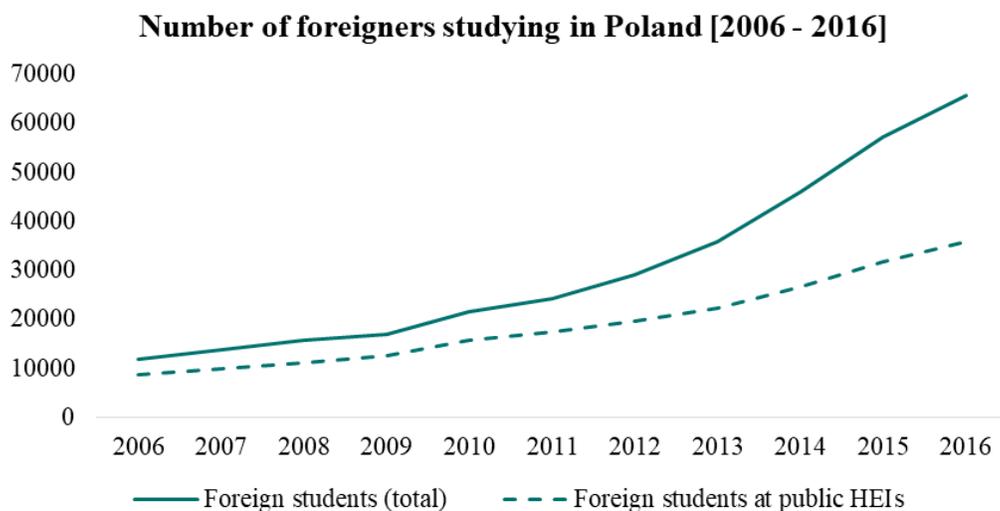


Figure 5. The number of international students at public HEIs increased by more than 300% from 2006 to 2016. When non-public HEIs are included, the increase is 460%.  
Source: own elaboration. Data: Central Statistical Office (GUS).

### **KPI 3° Academic staff (2007-2016)**

In years 2007- 2016, HEIs received a pre-set number of points for each: full professor, lecturer with a PhD and a habilitation, lecturer with PhD title only, assistant professor, foreign visiting professor. As shown on Figure 6, the number of academic staff was rising until 2011, after which HEIs struggled to increase employment. Full-time professors were the main driver of growth in KPI 3°.

In 2015, to account for the fact that many academics were being employed by more than one HEI, points were cut by 50% for all staff for which the HEI was not the primary employer. In 2017, a HEI-specific multiplier was added. Thus the KPI became non-additive and will be further discussed in the section on non-additive KPIs.

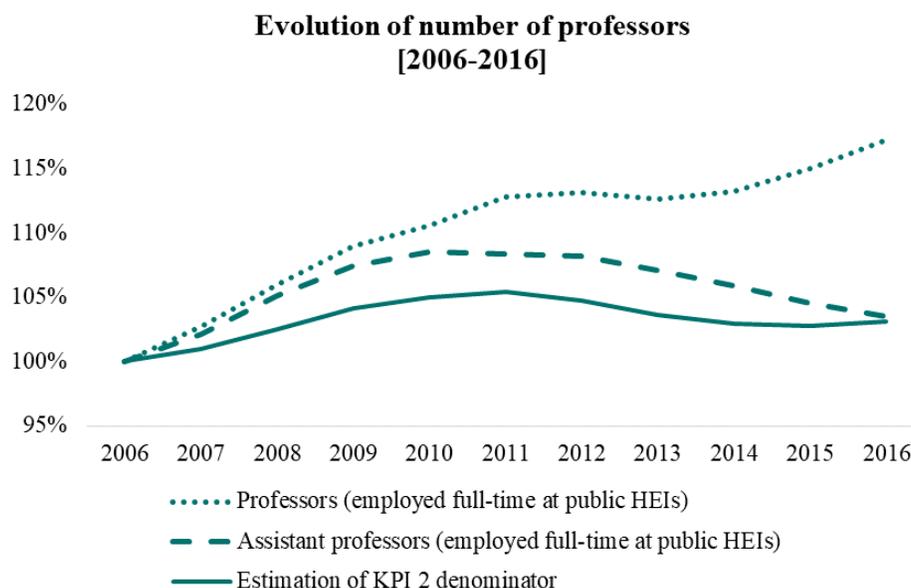


Figure 6. The number of full-time professors at public HEIs increased by 17% from 2006 to 2016. Weighted sum of academic staff increased by 3% in the same period. Source: own elaboration. Data: Central Statistical Office (GUS).

#### **KPI 4° Research (2007-2017)**

In years 2017-2012, HEIs received 1 point for each research project carried out by the HEI and financed (or co-financed) by the Ministry of Science and Higher Education. In 2013, the number of points was raised to 2 for international projects. In 2015, the indicator was made much more sophisticated: differentiating between national projects, international projects, and project financed from Horizon 2020, as well as between HEIs being leaders or participants of a project.  $\frac{1}{2}$  point was awarded for merely participating in a national project, while 4 points were awarded for HEIs being leaders of a Horizon 2020 project. Since 2017, the differentiation between leaders and participants was abandoned, which might turn beneficial by reducing rivalry for the leader's role between HEIs.

As the fund is not the sole source of funding for research, the KPI could be also considered as a proxy for quality of the didactic process at the HEIs since it could be argued that academic staff who is more successful in the dimension of research is also able of creating more value in terms of teaching.

#### **KPI 5° Certifications to issue diplomas (2007-2016)**

In years 2007-2016, HEIs received: 1 point for each study area in which they were certified to issue PhD titles, and 2 point for each study area in which they were certified to issue habilitation titles. The KPI was dropped in 2017.

<sup>10</sup> See: <https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020> (accessed on March 24<sup>th</sup> 2018).

## 4.2. Non-additive KPIs used in the funding formula

Throughout the analyzed period, one indicator was consistently non-additive: KPI 6°, which was modified the most times, to be eventually incorporated into KPI 1° (*Students and PhD candidates*) in 2017, thus making it also non-additive.

The changing names of the KPI have a common denominator: they suggest that the aim of the KPI is to avoid uncontrollable growth of HEIs (*Sustainable development, Proportional development of teaching*) by the means of emphasizing healthy proportions between the number of academic teachers and the number of their students (*Availability of academic staff*). All variants of the KPI are non-linear functions of the number of students and PhD candidates, and the number of academic staff. Therefore for comparability and interpretation purposes, in the analysis of these formulas we present their derivatives as functions of the SSR. As SSR can be considered a proxy for quality of teaching, it is highly likely that the KPI was intended as a pro-quality measure.

### KPI 6° Sustainable development (2007-2012)

The first version of the KPI was calculated according to the following formula:

$$KPI\ 6\ v1_i = \frac{\sqrt{(2prof_i + 1.5lec_i) * (stu\ PhD_i)}}{\sum_{i=1}^n \sqrt{(2prof_i + 1.5lec_i) * (stu\ PhD_i)}}$$

where  $prof_i$  stands for the number of professors employed by the  $i$ -th HEI,  $lec_i$  stands for the number of lecturers employed by the  $i$ -th HEI (these two groups are mutually exclusive), and  $stu\ PhD_i$  stands for the number of (stationary) students and PhD candidates enrolled at the HEI.

When taking the derivative of the KPIs nominator, we assume that only professors are employed<sup>11</sup>. The KPI-specific nominator can be then represented with the following formula.

$$KPI\ 6\ n1_i = \sqrt{(2 * prof_i) + (stu\ PhD_i)} = \sqrt{2} * \sqrt{prof_i} * \sqrt{stu\ PhD_i}$$

It can be noted that the value of the nominator increases with increasing numbers of students, PhD candidates and professors. The strength of this increase differs depending on the starting levels of these aggregates, which can be illustrated through derivative functions.

$$\frac{\partial KPI\ 6\ n1_i}{\partial stu\ PhD_i} = \sqrt{2}/2 * \sqrt{\frac{prof_i}{stu\ PhD_i}} = \sqrt{2}/2 * \sqrt{\frac{1}{SSR_i}} = \sqrt{2}/2 * \frac{1}{\sqrt{SSR_i}}$$

<sup>11</sup> For reasons of simplicity. The simplification does not undermine the findings, since professors are interchangeable with lecturers (a lecturer is worth 3/4 of a professor and a professor is worth 4/3 of a lecturer).

$$\frac{\partial KPI\ 6\ n1_i}{\partial prof_i} = \sqrt{2}/2 * \sqrt{\frac{stu\ PhD_i}{prof_i}} = \sqrt{2}/2 * \sqrt{SSR_i}$$

In the above formulas,  $SSR_i = stu\ PhD_i / prof_i$  stands for student-to-staff ratio at the  $i$ -th HEI.

The resulting derivative functions are illustrated in Figure 7. The higher the SSR, the higher the reward for employing a new professor or lecturer. In other words, this KPI incentivized increasing the body of academic staff more at HEIs which performed worse in terms of SSR. However it also provided an additional incentive for enrolling new students, even when the values of SSR was very high. While the non-linear shape of incentives related to the number of professors is justified, it seems superfluous to provide additional (even if low) incentives for growing the student body when the SSR is already very high.

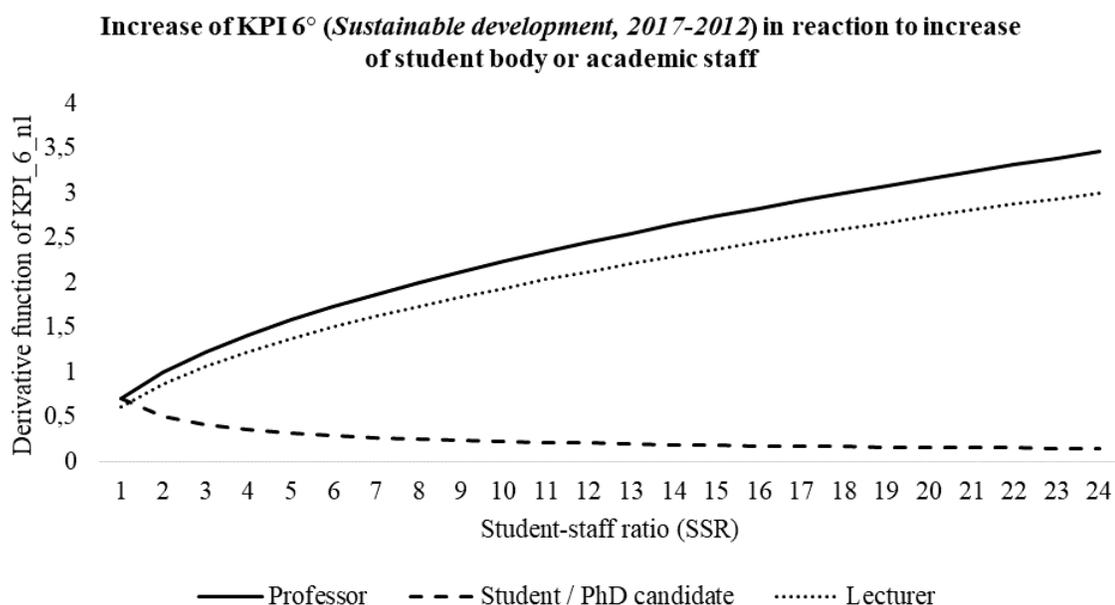


Figure 7. Derivative functions of KPI 6° (Sustainable development, 2007-2012), with respect to numbers of professors, number of students and PhD candidate, number of lecturers.

### KPI 6° Availability of academic staff (2013-2014)

In 2013, the KPI was changed to the following formula, where  $SSR_{ref}$  stands for the reference student-to-staff ratio which was indicated by the Regulation to be 13.

$$KPI\ 6\ n2_i = \frac{(stu\ PhD_i)^{2/3}}{stu\ PhD_i + prof_i * SSR_{ref}} * \sqrt{prof_i}$$

To inspect the properties of this rather complex formula, derivatives were taken with regards to the numbers of students and professors.

$$\frac{\partial KPI\ 6\ n2_i}{\partial stu\ PhD_i} = \sqrt{prof_i} \cdot \left( \frac{3}{2} \cdot \frac{\sqrt{stu\ PhD_i}}{stu\ PhD_i + prof_i \cdot SSR_{ref}} + (stu\ PhD_i)^{3/2} \cdot \frac{-1}{(stu\ PhD_i + prof_i \cdot SSR_{ref})^2} \right)$$

$$\frac{\partial KPI\ 6\ n2_i}{\partial prof_i} = \frac{(stu\ PhD_i)^3}{stu\ PhD_i + prof_i \cdot SSR_{ref}} \cdot \left( \frac{1}{2 \cdot \sqrt{prof_i}} - \frac{\sqrt{prof_i} + SSR_{ref}}{stu\ PhD_i + prof_i \cdot SSR_{ref}} \right)$$

Then, the positivity/negativity of the derivative function was further inspected in order to determine which actions of HEIs were rewarded and which were punished by this version of KPI 6°.

$$\frac{\partial KPI\ 6\ n2_i}{\partial stu\ PhD_i} > 0 \Leftrightarrow stu\ PhD_i > 0$$

$$\frac{\partial KPI\ 6\ n2_i}{\partial prof_i} > 0 \Leftrightarrow \frac{stu\ PhD_i}{prof_i} > SSR_{ref}$$

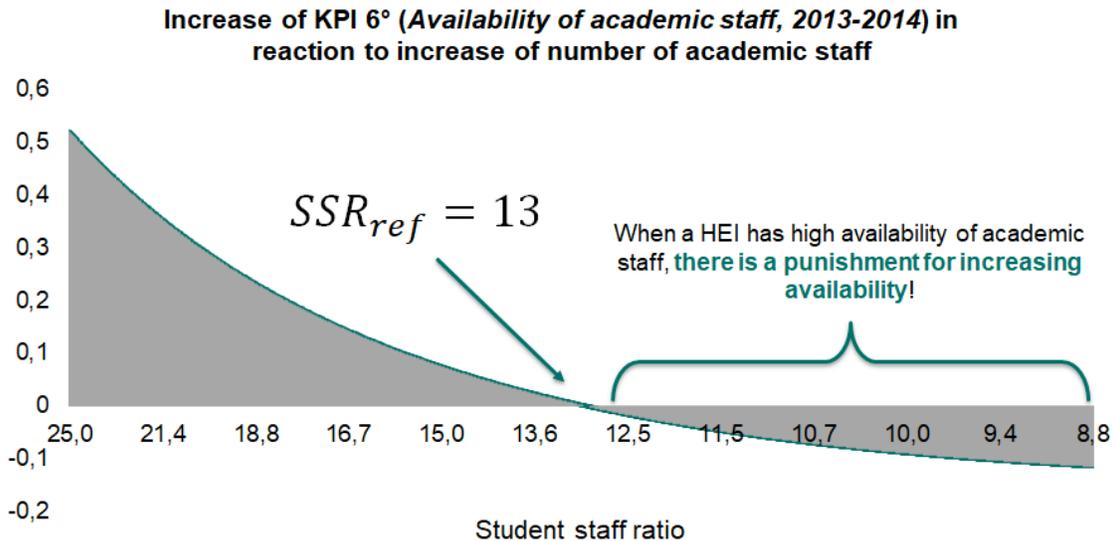


Figure 8. Derivative function of KPI 6° (Availability of academic staff, 2013-2014), with respect to numbers of professors. Assumed values of students ( $stu\ PhD_i = 15\ 000$ ) and  $SSR_{ref} = 13$ .

Source: own elaboration.

The name of the KPI (*Availability of academic staff*) turned out to be somewhat contradictory to the properties of the function. First of all, increasing the number of students was always rewarded – although in reality it decreases the availability of academic staff. At the same time, increasing the number of academic staff is only rewarded when the HEI's SSR exceeds the reference level. When a HEI has high availability of academic staff (less than 13 students per professor), there is a punishment for increasing availability (as illustrated in Figure 8).

The contradictory name of the KPI and properties of this version of the KPI suggests that either the Ministry was in fact targeting a specific student-staff ratio (instead of just lower SSRs), or it was simply a mistake on behalf of the author of the KPI's formula.

### **KPI 6° Proportional development of teaching (2015-2016)**

In year 2015-2016, the KPI was again changed to a formula strongly resembling the one from 2007-2012. The new nominator took the following form.

$$KPI\ 6\ n3_i = \sqrt{(full\ time_i + part\ time_i) * (stud\ PhD_i)}$$

The most important differences between *Sustainable development* and *Proportional development of teaching* is that the latter takes into account all academic staff (not only the senior staff, i.e. professors and lecturers), differentiating only between full-time staff employed at the  $i$ -th HEI ( $full\ time_i$ ) and part-time staff ( $part\ time_i$ ). These changes were introduced to address the growing problem of double employment. This issue was also simultaneously addresses in KPI 3° *Academic staff*. Some issues were still unresolved however. Most importantly, as HEIs use public resources for both stationary and non-stationary programs, non-stationary programs are being subsidized indirectly. While this is not necessarily a negative thing, not accounting for non-stationary students in the KPIs distorts the result. These issues were finally addressed in 2017, when KPI 6° was incorporated into KPI 1°.

### **KPI 1° Students and PhD candidates (2017)**

In 2017, a new multiplier called 'indicator of didactic availability' ( $d_i$ ) was introduced to KPI 1°. The nominator for each HEI is now calculated according to the following formula.

$$KPI\ 1\ n_i = v_i * d_i$$

The indicator is a function of SSR, where  $m$  is the HEI-specific SSR and takes into account both stationary and non-stationary students.  $M$  is the reference SSR, set to be 13 for academic public HEIs. The indicator does not differentiate the HEIs which have better SSR than 13 but strongly affects the HEIs which exceed the reference level (see formula below and Figure 9).

$$d_i = \begin{cases} 1,0 & m \leq M \\ \left(\frac{M}{m}\right)^2 & m > M \end{cases}$$

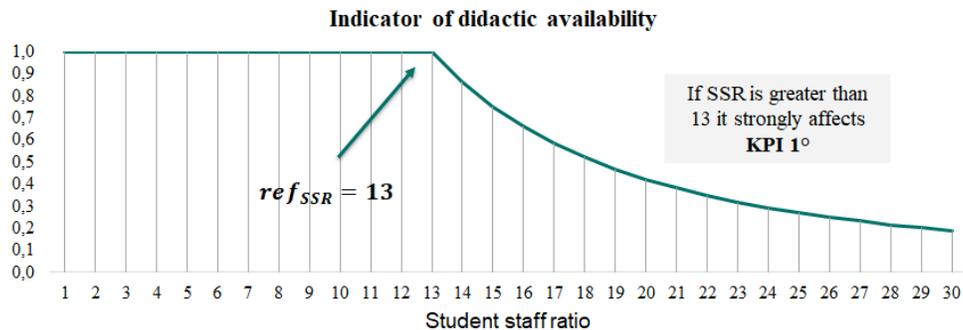


Figure 9. Indicator of didactic availability. Source: own elaboration.

### KPI 3° Academic staff (2017)

In 2017, a multiplier called ‘indicator of academic potential’ was introduced to KPI 3°. Its calculation bases on academic categories which are assigned by the Committee for the Evaluation of Scientific Units. As such, it is a purely pro-quality indicator. The new HEI-specific nominator is calculated according to the following formula ( $p_i$  stands for indicator of academic potential).

$$KPI\ 3\ n_i = v_i * p_i$$

### 4.3. Pro-quality measures introduced in 2017

In 2017, a pro-quality stream was introduced in the funding-formula. The funds from this stream are awarded for two types of achievements. The first one is for departments with a stationary program which received a merit grade from the State Accreditation Committee. A non-intuitive feature of this reward is that the level of the award depends on the number of all students enrolled in the department.<sup>12</sup> The second is awarded for newly-enrolled students who scored a maximum of points at the maturity exams. If a Student A scores a maximum of points in three elective subjects and Student B in one elective subject, the HEI will receive three times more money for enrolling Student A.<sup>13</sup>

### 4.4. Discussion

From the beginning, the funding formula stressed the quantitative dimension of higher education. In all linear KPIs, increasing the scale of activity was always rewarded, even if weights were in place in order to differentiate between e.g. international and national research projects. After a decade, the empirical analysis confirms that HEIs were doing their best to increase the scale of their activity even in an environment of a

<sup>12</sup> Therefore if Department A has one program with a merit grade and 100 enrolled in it, it will receive the same amount as Department B which has two programs in total, with 10 student enrolled in the program with a merit grade and 90 students enrolled in the other program.

<sup>13</sup> HEIs typically require one or two elective subjects to be passed at the maturity exams.

demographic decline. Unfortunately, this approach proved to be rather unproductive. While the denominator of KPI 1° increased during the period (mainly due to the drastic increase of PhD students), the enrollment rate in tertiary education did not increase over the period (net enrolment rate was 38% in the academic year 2005/2006 and 37% in 2016/2017)<sup>14</sup>.

In the meantime, the significance of Polish higher education sector on the international arena does not seem to have risen significantly. Only two Polish HEIs are included in the Top 500 list of the Shanghai Ranking (University of Warsaw and Jagiellonian University) and both have been oscillating between the 300th and 450th placements.<sup>15</sup>

## 5. Conclusions

KPI-based funding is a practical way of distributing funding for HEIs. It allows the regulator to make funding-allocation decisions without the need to discuss and negotiate with each of the 69 HEIs individually<sup>16</sup>. However it comes with challenges, and the case study of Poland illustrates many of them.

The most important lesson which can be derived from the Polish experience is that a smaller set of more sophisticated KPIs is more effective than a bigger set of simpler KPIs. Dropping KPI 5° (which did not serve any strategic objective) and incorporating the student-to-staff ratio into KPI 1° (*Student and PhD candidate*) were positive steps towards making the set of KPIs clearer and strengthening its impact on the shape of the sector of academic public HEIs in Poland. The proposed assessment framework has led us successfully in analyzing the case study of Poland, but of course it has some limitations, most importantly the costs associated with the incentivized actions have not been taken into account.

The challenge that the Polish regulator is facing is to effectively incentivize the increase in quality and importance of the Polish higher education sector. In that sense, the demographic decline can be seen as an opportunity for the HEIs, not a threat. However, the presented case study illustrates how strong of an inspiration the KPIs used in the funding formula are for HEIs. Therefore true quality measures are needed to incentivize HEIs to grow in that dimension. SSR is itself a proxy and so is the second pro-quality measure introduced in 2007 (see Section 4.3.)

Further research should focus on what would be suitable measurements of quality. In the context of the Polish higher education sector, developing more KPIs assessing output instead of input would be desirable. That presents a challenge, as output of higher education is more difficult to measure in comparison to input. In 2016, the Polish government launched Polish Graduate Tracking System, which aims at monitoring careers of graduates by merging employment and enrollment data. This

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<sup>14</sup> Central Statistical Office (GUS) (2017). Higher Education Institutions and their Finances in 2016. *Statistical information and elaborations*. Warszawa: Central Statistical Office.

<sup>15</sup> <http://www.shanghairanking.com>, accessed on March 24<sup>th</sup> 2018.

<sup>16</sup> 69 public academic HEIs received the subsidy from the fund for didactic and maintenance purposes in 2017, 67 HEIs in 2015 and 2016.

data provides significant research opportunities, however it will probably take time before the results can be incorporated to funding formulas.

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## **Regulations adopted by the Minister of Science and Higher Education**

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 2 kwietnia 2007 r. w sprawie zasad podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 9 maja 2008 r. w sprawie zasad podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 9 kwietnia 2010 r. zmieniające rozporządzenie w sprawie zasad podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 25 maja 2011 r. zmieniające rozporządzenie w sprawie podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 8 lutego 2012 r. w sprawie sposobu podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 20 lutego 2013 r. zmieniające rozporządzenie w sprawie podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa z dnia 27 marca 2015 r. w sprawie sposobu podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 7 grudnia 2016 r. zmieniające rozporządzenie w sprawie sposobu podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych

## **Central Statistical Office (GUS), Statistical information and elaborations**

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