

Stabilizing Mechanisms in Formula-based Funding of Universities: The Case of Poland

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Abstract

The research is inspired by the decades-long debate on the effectiveness of education and steering of educational systems in Europe and in particular - in Poland. Government funding serves to stabilize the functioning of public universities and to influence them to get compatibility with the educational *raison d'état*. In the paper an attempt to measure the effect that government funding has on the educational system and public universities is presented. The focus is set on stabilizing mechanism introduced in formula-based funding, especially the case of Poland. The data from Ministry of Science and Higher Education in Poland are used to perform simulations which aim at evaluation of influence on stability and universities motivation to move towards strategic goals set by the government.

Keywords: higher education, formula-based, stabilizing mechanism, influence

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Introduction

There is a visible trend of shifting from centralized to decentralized systems also in higher education, where universities get more financial autonomy (Jongbloed, B., 2010; Estermann, 2008, 2012, 2017). E.g. in Poland, in a simplified way, it can be stated that funds reach public universities in two streams - the first is financing research, education and the processes that support them. They create together an annual budget. Decisions on its spending are made by the university authorities in accordance with the regulations that are formula-based. The second stream reaches the universities in the form of grants, which ensure financing of research projects selected through a competition. The latter stream is managed by the collegiate body equivalent to the national council for research in other countries. As a result of the transformation of the 90s, the body previously subordinate to the executive authority was depoliticized and replaced by two agencies independent of the government - the National Science Center (agency for basic science) and the National Center for Research and Development to finance research.

According to data from Central Statistical Office in Poland (GUS, 2017), higher education institutions had an income from research activities of 2 794.603 million PLN in year 2016 (out of which 1 076.651mln PLN was from the budget of two agencies mentioned above).

Educational expenditures were growing during last years in all OECD countries (OECD, 2017). The split between spending on core educational services and R&D activities differs significantly among OECD countries. It ranges from Switzerland where 20% more money is spend on R&D than core educational services to Chile where R&D expenditures comprise only 5.2% of tertiary educational spending.

There is a tendency to change the method of funding allocation to formula-based budget allocation that is becoming to be the most popular mechanism. (“...*Countries are increasingly reliant on using formula funding to determine overall institutional levels of block grants...*” – de Boer et al., 2010). “*Education systems simultaneously pursue many (often conflicting) goals, with the many system actors continually interacting in complex ways*” (World Bank, 2018). The aim of the formula is to combine those goals in set of the rules that will shape how resources will be allocated to universities. Researchers mention few advantages of formula-based allocation that make it more widely used (McKeown-Moak, M. P., 1999): “*reduced political competition and lobbying by the institutions, simple and understandable basis for measuring expenditures and revenue needs of campuses and determining the adequacy of support, provide a reasonable compromise between public accountability and institutional autonomy, easy comparisons between institutions, promotion of efficiency in institutional operation*”. These circumstances in fact enable implementation of effective educational policy.

Changes in financing are implemented through a change of the algorithm of funding allocation to universities. It is assumed that economically rational agents (universities) will take actions which outcomes will be rewarded with higher payoffs defined by the algorithm. If the algorithm is constructed in accordance with educational policy this leads to achievement of this policy goals.

Changes of algorithm may also lead to unexpected results. The most obvious reasons for that are uncertainty in environment and delayed appearance of effects of the policy, but also lack of stability of the system. In Poland, government has a stabilizing mechanism called “transmitted factor” that makes the previous year subsidy influence the level of this year’s subsidy¹.

Let us focus on the stability perspective now.

Governance is a “processes aimed at coordination, stability and structure in a world of actors of different sizes, power and resources.” (Strehl et al., 2007). It has a broader meaning than allocating funds. In the environment that is changing rapidly, stability becomes more important for governments to provide.

Countries are using different mechanisms to achieve stability in the funding level. In Ireland it is provided by limiting the changes in core grant to plus or minus 2% of average sectoral change in any one year (Higher Education Authority, 2016). England has a similar system for teaching mainstream grant, but the range is plus or minus 5%. Czech Republic introduced a stabilizing mechanism only for the time of shifts in the calculation of budget allocations. The changes were limited to 10% compared to budgets from previous year (Koucký, J., 2013). In Denmark there is a fixed amount per university which is representing 25% of the total teaching budget (Maassen, P., 2000).

The aim of this paper is to define stability mechanisms in such system and investigate conditions influencing this stability. More precisely the objective of the study is to examine the principles of how the stabilizing mechanism in Poland works and assess its influence on stability and universities motivation to move towards strategic goals set by the government.

Research Methodology

Parts of equations in formula-based budget allocation that aim to decrease changes in funding level from year to year are considered to be stabilizing mechanisms. To examine the principles of stabilizing mechanism in Poland – transmitted factor – we analyzed the funding formula in detail.

It is assumed that educational system is stable when its’ agents are financially stable. Universities stability is considered in terms of allocated resources from one year to the next one. The less volatile are the funding levels of universities the more stable the system is. The influence of transmitted factor on stability was assessed through simulations based on data from Polish Ministry of Science and Higher Education. Data included information on funding levels of all public universities covered by the formula-based allocation from three consecutive years (2015, 2016 and 2017). We calculated changes of funding levels and checked the 5. and 10. percentiles. The change in the funding level of university that had the 5. percentile result was

¹ Transmitted factor in Poland is equal to 0.5. This means that each year half of previous year’s subsidy is guaranteed and decision made by university have half of the influence power they would have had if there was no transmitted factor.

considered to be 5% Value at Risk² for the certain year (10. percentile as 10% VaR). To further explore financial stability, we checked how many universities will fall out of boundaries set by governments in Ireland or England depending on different transmitted factor value.

Simulation based on a probable change in one of the universities dimension (number of students and the pay-off related to that change) was used to measure the influence of transmitted factor on motivation. The pay-off was calculated in the first 3 years and following years pay-offs were discounted with 5% rate.

Case of Poland 2015-2017

In Poland universities are rewarded for students taught (S_i), professors and academic staff hired (P_i), research that is conducted (R_i) and internationalization (U_i). The level of funding is determined by a certain part of previous years funding (transmitted factor - T) and the remaining part is influence by the dimensions of universities that were mentioned (equation 1). Each of the dimensions has a different weight that reflects the emphasis that government is putting on a certain task.

$$F_i = F_{i,t-1} * T + (1 - T) \times (W_S \times S_i + W_P \times P_i + W_U \times U_i + W_R \times R_i) \quad (1)$$

If we assume that the weights near the dimensions (components) are constant we can rewrite the equation that I presented as:

$$F_i = \sum_{k=1}^n (W_k \times C_{kt}^*) \quad (2)$$

where C_{kt}^* is the k-th component with distributed lag in time t given by the formula:

$$C_{kt}^* = [T^t \times F_{i0} + (1 - T) \times \sum_{j=1}^t (T^{t-j} \times C_{kj})] \quad (3)$$

When the equation (1) is re-written in the form of equation (2) and (3) it becomes apparent that the funding calculated for a certain year takes into account all the decisions affecting components that were made by the university authorities when the algorithm was in place. Apart from the decisions made by the university starting level

of funding (F_{i0}) and the transmitted factor (T) impact the value of components and thus the level of funding.

² Value at Risk is interpreted as a maximum possible loss with certain probability in a given time.

Due to transmitted factor in the formula, each universities decision, good or bad, affects the level of funding not only in the year it was made. Depending on the value of transmitted factor the effect can be seen in shorter time (for smaller transmitted factors) and in a longer one (for bigger transmitted factors). To illustrate that (see Figure 1) we performed a simulation where the components' values dropped by 30% in one year. University had seen the negative influence and came back to the previous state of components' values. It is visible that eventually the level of funding drifts to what would be the status quo if no changes were made. The lower the transmitted factor is the deeper is the downturn, because this year's decisions has a bigger impact on the funding level. To make up for the losses there has to be a positive influence to net out the negative one.

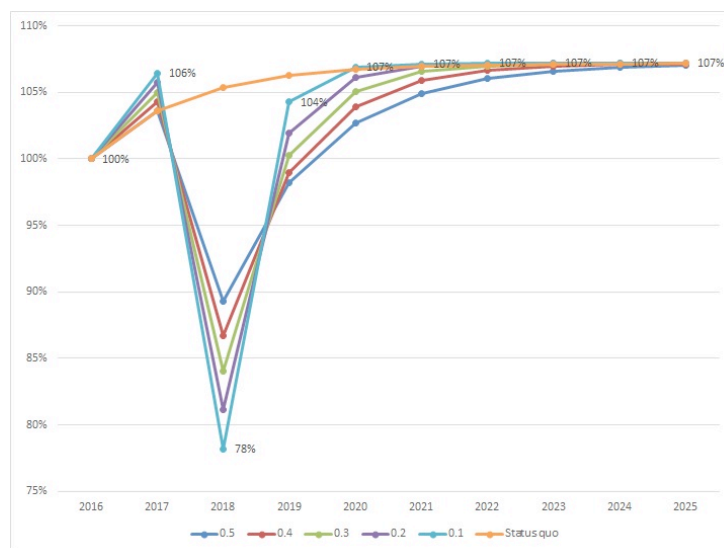


Figure 1. Influence of one-year drop in components values on the level of funding depending on different transmitted factor. (source: own elaboration)

Transmitted factor as a stability influencer

The higher the transmitted factor is the longer is the time that university has to prepare itself for the changes that are to come. Figure 1. shows also that strength of the impact on level of funding in certain years after decision was made is dependent on the value of transmitted factor. Without transmitted factor it would be hard for university to accommodate the decrease in funding level of 30%.

Possible losses are much bigger when the transmitted factor is lower. Table 1. shows 5. and 10. percentile values of year-on-year changes: between 2015 and 2016, between 2016 and 2017. The 10. percentile change between 2015 and 2016 is -14 113.49 for 0.1 transmitted factor versus positive change of 3 511.06 for 0.9 transmitted factor. This means that in worst 5% cases the universities would be losing 14.1 million PLN or more if the transmitted factor was 0.1. If transmitted factor was 0.9 the chance of losing money would be very low, because the 5. percentile worst case is still positive. The changes between 2016 and 2017 were even bigger. The reason for that was the change in the funding formula itself that added the uncertainty and risk in the environment, so the stability of results was harder to maintain.

Table 1. Percentiles of changes between years 2015-2016 and 2016-2017 depending on different transmitted factors.

Transmitted factor	Change between 2016 and 2017 (thousands PLN)		Change between 2015 and 2016 (thousands PLN)	
	5. percentile	10. percentile	5. percentile	10. percentile
0.1	- 22 660.20	- 14 576.33	- 14 113.49	- 10 808.78
0.2	- 16 564.39	- 10 054.92	- 11 343.43	- 7 733.67
0.3	- 12 543.27	- 5 487.07	- 8 573.37	- 5 569.82
0.4	- 8 522.15	- 3 727.81	- 5 576.47	- 3 698.52
0.5	- 4 908.39	- 1 735.26	- 2 352.97	- 1 964.07
0.6	- 1 353.26	- 266.40	- 575.17	- 251.32
0.7	355.96	1 241.86	168.48	705.61
0.8	1 166.58	2 708.05	259.68	1 433.70
0.9	1 368.14	3 511.06	350.88	1 676.12

Negative changes are limited with high transmitted factors so there is less risk of universities going bankrupt, but at the same time, positive changes are limited so the motivation to change is influenced as well (see details in the next chapter).

Stabilizing mechanisms used in Ireland and England limit the changes in the funding level more rigorously than the transmitted factor introduced in Poland. To prove that we compared the influence that transmitted factor has with the ranges that are imposed in Ireland and England (Table 2). For 2% range there are many universities that are below lower band of the range (from 25 with transmitted factor 0.1 to 1 with transmitted factor 0.9). For the transmitted factor used by Polish government currently (0.5) there are still 18 universities below the band, which is above 25% of public universities in Poland. For the 5% range the number of universities below the lower band is significantly smaller (only 5 universities when transmitted factor is 0.5).

Table 2. Number of schools below lower boundary of ranges (2% and 5% from the average sector change)

transmitted factor	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
2% range	25	23	23	21	18	15	12	5	1
5% range	13	12	8	5	5	2	1	1	0

Transmitted factor is influencing stability in a different way than the regimes introduced in Ireland and England. Transmitted factor has an impact on stability of each university based on its performance from previous years (stability of single agent throughout the years) and the regimes are focused on the stability of the system generally. Compared to regimes described, transmitted factor is not forcing universities that are doing extremely well or have very bad performance to move along the sector average. Universities are rewarded and penalized for their own decisions with a specific lag of the effects, but there is no external influence on the funding level. Transmitted factor seems not to decrease the motivation of the universities as strongly, but the exact influence will be further examined.

Influence of transmitted factor on motivation

The higher is the transmitted factor the lower is the motivation of the universities to move towards strategic goals set by the government. Figure 2. shows the effects a 1% increase in number of students has on the funding level in first 3 years and the following years (with use of 5% discount rate). It is visible that for small transmitted factors pay-off is accumulated in first few years (3 years). We see that the pay-off received within the first three years is decreasing when the transmitted factor is increasing. Total pay-off is also diminishing due to discount rate.

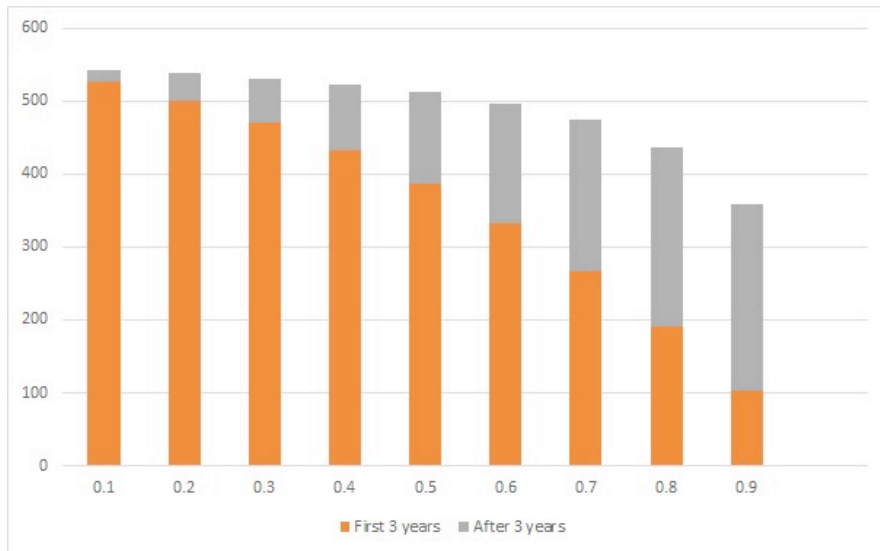


Figure 2. Pay-off of 1% increase in student number depending on different transmitted factor values (source: own elaboration)

Conclusions

The transmitted factor is a very simple, but at the same time efficient, stabilizing mechanism. The government can change the system quite easily by changing only one parameter. It is worth noting that the subsidy of each university is performance-based, because even the stable part is based on performance in the past years.

There are limits of the approach that we have taken. The probability of loss was calculated in a simplistic manner by calculating the 5. or 10. percentile as a reflection of VaR. Probability of loss could have been estimated by prognosing the trend using econometrics models that could be more and more sophisticated. Another issue is that we look at public sector, where the rules that were set and the final result – funding level - can be changed by the government. It has specific provisions and other tools that it can use to change the subsidy for universities (especially those in need).

The above argument motivates new research opportunities regarding stabilizing mechanisms. Further research should focus on comparing different stabilizing mechanisms or parameters in other countries to find the most efficient one.

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Polish decrees

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. zmieniającym rozporządzenie w sprawie sposobu podziału dotacji z budżetu państwa dla uczelni publicznych i niepublicznych.

Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 11 kwietnia 2017 r. w sprawie sposobu podziału i trybu przekazywania dotacji podmiotowej na dofinansowanie zadań projakościowych.

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