

Acknowledgements

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Introduction

Mathias DEWATRIPONT and Luc WILKIN

This book puts together a number of research outputs which are the result of a multi-university project funded by the Belgian Federal Scientific program “IAP”, which stands for Interuniversity Attraction Pole. It is the third such book¹, and it reflects on a project focusing on the analysis of universities whose funding started in 1996.

Over these last 12 years, this topic has attracted more and more attention in social sciences, especially in economics since the connection between the functioning of higher education and economic growth is increasingly recognized. The various chapters of this book, many of which have been published in international academic journals, are therefore interesting from a double perspective : from a “pure research” point of view but also, for many of them, from a public policy point of view.

This is especially true for the first set of chapters, which focus on the *organization of higher education systems*. There are indeed many policy discussions in Europe on this topic, both in terms of the need to raise the inflow of (public and private) money into the higher education system as well as the need to alter some of its rules of functioning to improve their “value for money”. There is also a great deal of interest in the evaluation of existing reforms, like the Bologna process which favors compatibility between teaching programs and therefore the mobility of students. Several chapters of this book take an explicit policy perspective on these issues.

The next topic discussed in this book concerns the positioning of *individual higher education institutions*. These chapters are more theoretical, building on the economic theory of contracts as well as on game theory and “industrial organization”. Nonetheless, the results derived using these theoretical models also have concrete implications about the strategies of higher education institutions, starting from the multi-tasking nature of their mission.

¹ The previous two, also edited by M. Dewatripont, F. Thys-Clément and L. Wilkin, were entitled *The Strategic Analysis of Universities : Microeconomic and Management Perspectives* and *European Universities : Change and Convergence ?*, and were published respectively in 2001 and 2002 by the Editions de l’Université de Bruxelles.

The same is true for the last two topics, which concentrate on *individual behavior*, of both *researchers* and *students*. These chapters combine theoretical and empirical methods to discuss the role of career incentives of researchers and the adoption of new technologies by students as well as the predictability of their success rate.

The book thus goes from a ‘macro’ perspective, looking at higher education systems, to a ‘micro’ perspective, looking at individuals, with as intermediate step an analysis of individual universities. In doing so, it builds on a variety of approaches, from microeconomic theory to empirical approaches. These are also diverse, since some rely on econometric analyses, while others concentrate on evidence collected from surveys. They all share the goal of an improved understanding of European higher education, both as a scientific objective and also as a policy objective.

The organization of higher education systems

The first four papers in this part of the book address various facets of existing debates concerning the reform of higher education in Europe.

The paper by Reinhilde Veugelers and Frederick van der Ploeg, entitled “Reforming European universities: Scope for an evidence-based process”, starts with a discussion of the state of higher education in Europe relative to the United States. It stresses that, in comparison with the US, Europe has fewer world-class universities, and that its overall graduation rate is lower (but rising). On the other hand, Europe produces more graduates in mathematics, science or technology (but has fewer researchers in these areas than the US), and more PhDs. Finally, Europe does well in terms of the number of international publications, but less well in terms of citations: quantity is therefore good, but quality is to some extent a problem. After focusing on performance, the authors discuss remedies. They argue for more money – given that European universities suffer from much lower revenue than their US counterparts – but also improved governance, meaning more autonomy from public authorities but also more accountability, in particular through competition (to avoid the risk of monopolization of some markets where a lot of mergers/rationalization have been encouraged). Finally, they evaluate the chances that these reforms might be acceptable to higher education ‘stakeholders’. In particular they discuss Faculty responses to a set of questions concerning reforms. While differences do exist between countries, one sees strong support for student selection (with resistance in Sweden and Belgium, though), and more qualified support for student fees (with opposition in Scandinavia) as a way to raise university budgets. The same is true for increased competition (which does raise eyebrows in France and, interestingly, the UK), while ‘privatization’ meets the strongest objections.

This paper is in the same spirit as the one by Philippe Aghion, Mathias Dewatripont, Caroline Hoxby, Andreu Mas-Colell and André Sapir, entitled “Why reform Europe’s universities?”. This one focuses on the fundamental research mission of universities. Looking at the Shanghai world ranking of universities, it also stresses US dominance when looking at the Top 50 universities in the world. Europe starts doing better when looking at the Top 100, 200 and 500 universities. Moreover, small countries from Scandinavia and the Benelux, and especially Switzerland, do quite well on a per-capita basis. While university rankings do have shortcomings (for

example, the Shanghai ranking puts much too little weight on Social Sciences and Humanities, beyond focusing solely on basic research), they do provide useful information on relative country performances. The paper therefore reports on the results of a survey collected by the authors from the European universities that belong to the Shanghai Top 500. Thanks to a 33 % response rate, this survey provides information about the size, funding and organization of top European research universities. One thing that emerges clearly is that there exist several successful national “models” of organization of higher education, with for example a much more “market-oriented system” in the UK relative to Sweden and Switzerland, to focus just on successful European countries. This being said, econometric analysis suggests that a university Shanghai ranking is boosted by both better funding and more autonomy (specifically, budget autonomy for the university with respect to the public authorities). Moreover, the results show a complementarity between funding and autonomy: it looks like one more Euro of funding per student has an effect which is twice as big for universities that enjoy budget autonomy relative to those that do not. While these results are only suggestive and further research is needed, they point to an interesting policy direction, especially since the authors show that the same effects are at play when looking at the determinants of patenting in the US: more money given to universities of a given US State raises subsequent patenting in that State and the effect is twice as big if the State has autonomous universities.

Taken together, the two papers described above can be used to advocate more funding for universities, more autonomy from public authorities and more accountability, especially through more competition. The next paper, by Françoise Thys-Clément, entitled “Research and higher education in a federal system: The need for a European University Charter”, is complementary to this policy line. It pushes mainly for two ideas: (i) the public good nature of basic research, which pleads for public financial intervention, in particular at the aggregate, i.e. European level, given the importance of international spillovers in this area; (ii) the need for establishing a ‘university charter’ at the European level, in order to guarantee stable funding for higher education institutions, as well as shared principles of governance. This is indeed important because, in the current debate about ‘university accountability’, one has to keep in mind the specific missions that universities are the only institutions able to fulfill, namely the training of Europe’s youth and the advancement of basic research. While it is a good idea to also improve universities’ ability to transfer knowledge towards innovation and growth, it is crucially important that this third mission not be achieved at the expense of training or basic research: if this were the case, the very productivity of knowledge transfer could in fact be greatly diminished.

The fourth paper, written by Marcel Gérard and entitled “Financing Bologna: which country will pay for foreign students?”, looks at one issue which is increasingly important in the current context of European reforms: the nature of student financing in the Bologna context of increasing student mobility across European borders. As the author stresses, the current system of (mostly) public financing of university studies in Europe, coupled with the nondiscrimination principle between EU citizens, has incoming foreign students largely funded by host countries. Since

national Governments naturally put less weight on foreign students than on national students in their social welfare function, this leads to underinvestment in the quality of higher education in comparison to the social optimum. The paper then identifies conditions under which a move to a system where the country of origin of students pays for the cost of university studies represents a Pareto improvement, even though it manages to meet only part of the distance to the social optimum. This conclusion is very relevant, because one can indeed foresee that the Bologna reforms will significantly raise student mobility, at least at the Master level. And one can moreover foresee that, in the absence of a move away from the current financing rules, countries which attract many foreign students will unavoidably raise tuition fees, simply in order to stop significant subsidies in favor of foreign students. While raising tuition fees is not necessarily a bad idea per se, doing it simply as a response to the current European context is not advisable as a policy.

The next paper, by Stijn Kelchtermans and Frank Verboven, entitled “Regulation of program supply in higher education. Lessons from a funding system reform”, considers an alternative to providing the higher education sector in Europe with more revenue: raising its efficiency by ‘rationalizing supply’. This idea of shrinking the supply of degrees is on the table in various regions, including Flanders. This may make sense if there is a lot of duplication and if students are ready to travel a little farther in order to gain access to their favorite degree. However, the balance between the cost saving and the reduced student welfare is an empirical question. The authors conduct an econometric analysis of this question which stresses that, while students are very determined in their decision to pursue higher education, which implies a low elasticity of higher education demand with respect to the availability of degrees being offered near their home, there is much higher elasticity with respect to the *type* of program being chosen. Concretely, students have a significant probability of changing their chosen field of study depending on what is available nearby. This is a cost of a reduction in the diversity of the supply of educational programs. Balancing these different effects leads the authors to conclude that only few programs should optimally be cut, which means that cost savings cannot be hoped to provide a credible alternative to the need to raise the infusion of money into the higher education system.

The final paper in Part I of this book, written by Thomas Gall, Patrick Legros and Andrew Newman and entitled “The timing of education”, takes a somewhat more abstract but nonetheless important perspective. It discusses the desirability of providing higher education relatively ‘early’ or relatively ‘late’ with respect to labor market choices. For example, business degrees like MBAs are undertaken after people have already acquired some labor market experience in the US but this is typically not the case in France. This is in line with more general trends, which indicate that higher education is acquired at a younger age in France relative to countries like the US or Switzerland. This fact has implications for student choices because the amount of information available at the time the choice is made is clearly not the same in the two systems. The authors show that ‘late education’ systems are better at coordinating educational investments *within firms*, while ‘early education’ systems provide incentives more in line with *expected returns* in the labor market. They argue

that recent trends in the way firms are organized, for example linked to the globalization of production within firms, tend to favor ‘late education’ systems, because it becomes harder to provide ex-ante rewards to educational investments. This prediction, which is in line with the need to boost ‘lifelong education’ in a world where the demand for skills is both rising and possibly becoming less predictable, definitely opens an interesting research avenue.

Individual higher education organizations

The three papers in this second part of the book all present theoretical models, and all analyze optimal strategies of individual higher education institutions.

The paper by Alexis Walckiers, entitled “Multi-dimensional contracts with task-specific productivity: an application to universities”, considers the multi-task nature of academia, focusing on the core missions of teaching and research. It considers the optimal contract an academic institution can offer its employees under the assumption that it is faced with heterogeneous individuals, which differ in their ‘effort cost’ of carrying out these two missions. Technically, the institution is facing ‘multidimensional adverse selection’. In this literature, one key question is whether the optimal contract involves ‘bundling’ or not, i.e. whether individuals can be thought of being offered two separate contracts or a single one which involves a specific combination of the two missions to be performed against a single compensation package. Under adverse selection, the institution has to be concerned about getting its missions done without spending too much for it. For example, if it is facing individuals whose cost of performing the teaching mission can be either 10 or 20 and whose cost of performing the research mission can also be either 10 or 20 (and the institution does not know whether it is 10 or 20, only the individual knows it), making sure both missions are undertaken by these individuals costs a price of 20 per mission if ‘single-mission contracts’ are offered. But assume now that a given individual can fulfill both missions, and that moreover, to take an extreme case, there is perfect negative correlation in the adverse selection, i.e. somebody whose cost of teaching is 10 (resp. 20) has a cost of research of 20 (resp. 10): in this case, rather than the above-mentioned single-mission contracts, it is better to offer a unique two-mission contract at a price of 30, which therefore allows the institution to save 10 per individual. The author generalizes this point in his analysis, while explaining how (partial) negative correlation is a natural assumption, in a situation where individuals are able to perform both missions but have limited time overall. This analysis thus sheds light on one reason which favors the emergence of “research university contracts”, which combine these two missions in a given proportion.

The next paper, written by Axel Gautier and Xavier Wauthy and entitled “Teaching versus research: The role of internal financing rules in multi-department universities”, also looks at multi-tasking within universities. But it focuses on moral hazard rather than adverse selection, i.e. ‘hidden actions’ rather than ‘hidden information’. Moreover, it builds on the idea that universities typically have multiple departments, teaching and doing research in a variety of scientific fields. This very often involves redistribution between departments, a feature which can have an adverse effect on teaching and research effort since it reduces the return of such effort for one’s own

department. However, by giving incentives related to the *relative* quality of teaching and research across departments, the university can mitigate this problem. Moreover, even if individuals are intrinsically more motivated by research than by teaching (for example because outside rewards are more driven by research performance, which is more easily observable than teaching performance), institutions can alter the balance of incentives by basing research budgets on student numbers, thereby introducing additional internal incentives favoring the teaching mission. The extent to which they will want to push in this direction is naturally related to their declared mission, which can be oriented more towards being a ‘research university’ or instead towards being a ‘teaching college’. The considerations detailed in this paper are in fact very relevant in the current academic environment, which is becoming more and more competitive, prompting universities to think harder about optimizing their internal reward structures in order to better achieve their mission.

The third paper in this second part of the book, by Eve Vanhaecht and Wilfried Pauwels and entitled “University competition: Symmetric or asymmetric quality choices?”, looks at competition between universities. It allows for both ‘horizontal differentiation’, for example based on geography, with students ranking different universities differently depending on where they live, and ‘vertical differentiation’, which concerns ‘quality’. And here, while all students prefer higher-quality universities, they may end up making different choices because with higher quality comes a higher difficulty of obtaining a degree, and this tradeoff is resolved differently by students who differ in intrinsic ability. Interestingly, whether universities end up choosing to offer symmetric or asymmetric quality levels in equilibrium depends on student mobility costs: when these are low, universities end up being differentiated in the quality dimension, while when mobility costs are high, they tend to be similar. This is interesting, because it is consistent with the US-EU comparison, with higher mobility in the US and more differentiated universities relative to the European landscape. Another interesting result in the paper concerns the effect of competition on quality provision: the need to compete to attract students ends up raising teaching quality. This effect should be kept in mind when thinking of ‘supply rationalization’, a reaction to the Bologna process which should not be pushed too far.

Researcher behavior

The two papers in this third part of the book are concerned with individual researcher behavior. The paper by Doh-Shin Jeon and Domenico Menicucci, is entitled “Money, fame and the allocation of talent: Brain drain and the institution of science”. It links individual researcher incentives with the broader question of the allocation of the pool of skilled individuals in academia and in the private sector, at the overall level of the economy. The authors focus on two differences between the two sectors: (i) the fact that scientists can derive benefits from peer recognition, and (ii) the fact that individual performance may be more easily measured in basic science, thanks to the peer-review system. With these two elements in mind, a ‘good institution of science’ can mitigate a ‘brain drain’ from academia to the private sector which can occur if the latter offers higher rewards for good performance. This may lead to an earning structure that is optimally flatter in academia than in the private

sector. The paper also discusses the risk of raising performance-related monetary rewards in science, in terms of a potentially excessive shift away from basic science and in favor of applied research. At a time where there are many calls for universities to become ‘more commercially-oriented’, this warning is very important. One should indeed not forget that applied research cannot flourish without a solid basic research foundation.

The paper written by Tom Coupé, Valérie Smeets and Frédéric Warzynsky and entitled “Incentives, sorting and productivity along the career: Evidence from a sample of top economists” follows a different path. It takes advantage of the richness of the data on individual research productivity – that is, their publication record, to look at the relation between career incentives and the dynamics of research productivity. Focusing on a sample of 1,000 economics professors, it documents the link between production and subsequent promotions, with a diminishing intensity of this relation for higher levels of seniority. In turn, the paper also documents that the prospect of promotions raises productivity, with a reduction of this productivity over time. There is also evidence of a sorting process, namely the fact that more productive individuals tend to join higher-ranked universities. In a European context with higher mobility across countries and institutions, this factor will strengthen research incentives. While this is good as far as research is concerned, one should keep in mind, in a multi-tasking setting, the need to simultaneously strengthen incentives for the provision of teaching quality, if one wants to avoid this task from being crowded out.

Student behavior

The two papers in the last part of the book look at different aspects of student behavior.

In the first one, written by Luc Wilkin, Périne Brotcorne and Ilaria Faccin, “Clicks and bricks: tuning the promises of information and communication technologies (ICT) with students’ practices”, the authors provide a down-to-earth account about the way ICT are mobilised and integrated into university students’ daily academic activities (with a particular focus on their information seeking behavior). Looking at the students’ point of view, this research tries to better enlighten the place of the electronic information resources compared to “traditional” (paper) and “informal” (relational) ones. Thanks to an extensive empirical study based on a two-fold research methodology (questionnaires and open ended interviews) they explore factors (discipline and year of study) potentially moulding the students’ use/non use of information technologies within the university setting. Internet has a sort of tailored role in the information seeking strategies of students: an important source when facing a new topic, a trigger for further research and a useful tool to provide complementary punctual information. Although students perceive it as weak in terms of scientific reliability, they prefer to address their research to traditional channels (library, and printed-based resources) when looking for in depth information. Students shape their information seeking strategies in a pragmatic way, according to what can be defined as a ‘goodness of fit’ criterion taking into account the suitability of the tool with disciplinary contents and contents related constraints. Therefore,

hard sciences students showed a strong preference for the Internet as an information resource (without neglecting books and scientific journals); whereas soft sciences students were more ‘literate-print-based-oriented’ (without neglecting the Internet). Seniority emerges also as an important crafting factor; still, the disciplinary effect was rather reinforced by seniority. These findings show that students’ information seeking patterns are far beyond the simple and univocal use of the Web, doomed to replace and substitute traditional or informal resources.

Finally, the paper written by Jean-Philippe Vandamme, Nadine Meskens and Juan-Francisco Superby and entitled “Predicting academic performance by data mining methods”, considers a survey of students from three French-speaking Belgian universities. The goal is to look at different methods in terms of their ability to predict potential first-year success in one’s studies, a big concern in systems like the Belgian one with free entry to the university. The idea is to try to classify students into three groups according to success probabilities, to be able to concentrate resources on those students whose success rate could be most increased by remedial activities. The paper establishes the key importance as determinants of success of: (i) high school achievement and background; (ii) the level of involvement at the university (e.g. class attendance); and (iii) the level of personal motivation and confidence. It then presents the effectiveness of three classification techniques – decision trees, neural networks and linear discriminant analysis – in their ability to successfully classify students, showing that they roughly do equally and only moderately well in this respect. These approaches nonetheless offer interesting avenues towards an important goal, achieving a higher graduation rate to be able to position one’s region or country more favorably in the competition between “knowledge-based societies”.

Note that this question of graduation rates in European countries was one of the dimensions considered by the first paper, by Veugelers and van der Ploeg, to evaluate the performance of European higher education systems. Taken together, these two papers illustrate how one can usefully think about key policy questions like this one by relying on complementary scientific approaches.