

Regulation of Program Supply in Higher Education: Lessons from a Funding System Reform in Flanders

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Abstract

It has become well documented that the performance gap between European and US universities is at least partly due to lower spending on higher education in Europe. Rather than raising the public budget or promoting private contributions, many governments have attempted to make public spending more efficient in various ways. This article reports the results from a proposed funding system reform in Flanders (Belgium), which aimed to save costs by reducing the diversity and duplication of study programs. We draw the following lessons. While reducing program diversity may save on fixed costs, this is typically insufficient to compensate for consumer surplus losses due to low student mobility. Furthermore, decentralized financial incentives mechanisms may be ineffective since they may often promote program cuts when this is undesirable, and vice versa. These findings illustrate the difficulties with regulatory reforms that mainly aim to reduce costs. Hence, the question how to raise total spending on higher education (whether through public or private means) cannot be avoided. (JEL codes: I20; I23; C25)

Keywords: Higher education, program diversity, student mobility, policy reform.

1 Introduction

There is a growing awareness that European universities are lagging behind and are in need for reform. For example, in a recent policy brief Aghion et al. (2007) find that the performance gap between European and US universities is due to poor governance and incentives, but also due to insufficient investment in higher education. Total public and private spending on higher education amount to only 1.3 percent of GDP in the EU, compared with 3.3 percent in the US. Most European governments have not yet succeeded in promoting a substantial increase in higher education spending. On the one hand, because of tight government budgetary constraints, it is unrealistic to drastically expand public spending on higher education. On the other hand, politicians in many countries still show a reluctance to promote private contributions through tuition fees.

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As an alternative, some governments have attempted to increase the efficiency of the public funding systems. An example is the case of Flanders (Belgium), where the government has recently encouraged mergers and formal collaboration agreements, and attempted to provide incentives to institutions to reduce the large diversity and duplication of study programs. According to the 2005 proposals, institutions would receive public funding based on their achieved concentration index (CI), i.e. the average number of students per program, thereby providing incentives to cut the smaller programs. Furthermore, funding incentives were proposed to offer joint programs between universities. The idea behind these proposals was to provide decentralized incentives to make the higher education system more cost efficient, hence reducing the need to expand the overall public budget. However, while there may indeed be cost savings from increased scale and less duplication of supply, this is only part of the welfare picture. It is also necessary to take into account how students will be affected by changes in the supply of higher education.

This article reports on the findings in Kelchtermans and Verboven (2007) to draw some general lessons on social desirability and the effectiveness of funding system reforms that attempt to reduce program diversity. They develop a model to estimate both the profit and welfare effects of reducing program diversity, including the effects on consumer surplus (students), variable and fixed cost savings. They find that the social desirability of reducing diversity is limited to only 10 percent of the programs, because students show a limited willingness to travel to other institutions. The fixed cost savings from program cuts are thus usually too limited when compared with the consumer surplus losses. Kelchtermans and Verboven also find that a funding system based on the CI may be very ineffective: it frequently creates incentives to cut programs when this would be socially undesirable, and vice versa. This stresses that decentralized mechanisms should be chosen with care if they are to achieve the intended objectives.

More generally, these findings emphasize the complexities in regulating program diversity in publicly financed systems of higher education. Governments need to take into account both the universities' and the students' responses to their policies. In this light, no magical solutions can be expected from policies that aim to reduce costs. So the question how to raise total spending on higher education (whether through public or private means), cannot be avoided.

The remainder of this article is organized as follows. Section 2 discusses the cross-country evidence available from the academic literature on diversity in higher education. It also discusses current program diversity in Flanders in this international context. Section 3 discusses international policies towards program supply and diversity, and then describes the

recent Flemish reform proposals. Section 4 provides an economic framework for analyzing program diversity in higher education, stressing the importance of trading off both the benefits and costs. Section 5 summarizes the profit incentives and welfare effects of the funding system reforms in Flanders aimed at reducing program diversity, based on the methodology and detailed analysis in Kelchtermans and Verboven (2007). Finally, section 6 concludes and draws more general lessons on reform.

2 Previous evidence on diversity

Most of the literature has been preoccupied with defining and measuring diversity in higher education. This has resulted in a number of comparative studies documenting the evolution of diversity in several countries. We first review this literature and then discuss current program diversity in the region of our case study, Flanders (Belgium).

2.1 International context

Dill and Teixeira (2000) distinguish between institutional diversity and program diversity.¹ Institutional diversity refers to diversity among institutions in size (number of students), in mission, in type of control (public vs. private) and in location. Program diversity refers to diversity in subject, in degree level (bachelor vs. master), in orientation (academic vs. vocational) and in forms of program delivery (e.g. full-time, part-time, distant learning). According to Dill and Teixeira (2000), the term diversity often refers to institutional diversity in the US and to program diversity in Europe.

An influential early study on the evolution of diversity in the US is Birnbaum (1983). His composite indicator includes the institution's size, institutional control (public or private), enrollment of females and minorities, program types and degree levels. He therefore considers elements of both institutional and program diversity.

Several other studies focus exclusively on program diversity. For example, Ben-David (1972) looks at the number of new programs created in the US and Germany between 1900 and 1930. He finds that both countries started off with a similar number of programs but the US has a much higher number in 1930 because of the stronger competition between universities in the US. Huisman and Jenniskens (1994) compared the evolution of study programs and their locations in Denmark, Germany and the Netherlands; Jenniskens (1997) considers the evolution of new

¹ The literature review in this section draws extensively on Dill and Teixeira (2000).

programs in the Netherlands, France, England and Pennsylvania. Huisman and Morphew (1998) study the evolution of program diversity in the Netherlands and various US states, using the ratio of duplicate programs to the total number of programs. Their findings suggest that program diversity is low because institutions tend to copy the programs of leading institutions.

More recent and complete cross-national evidence is provided by Huisman, Meek and Wood (2007). Following Birnbaum (1983) and several others, they define diversity based on the following variables: the institution's size, institutional control, range of disciplines offered, degrees awarded and modes of study. They find that the group of countries with most diversity in higher education consists of the United Kingdom, Flanders and the Netherlands. Finland, Germany and Austria belong to the second group. The group with the lowest diversity consists of Sweden, France, Denmark and Australia. Overall, the authors conclude that even the countries in the third group show a large degree of diversity, so that there is currently no need to encourage diversity further, except perhaps in some specific areas. The authors also performed a longitudinal analysis for Australia and the Netherlands and caution that some recent mergers may entail the risk of being counterproductive in reducing diversity.

To summarize, there is quite an extensive descriptive literature documenting diversity in higher education. This literature is mainly motivated by a concern whether diversity is sufficiently high. This is in stark contrast with Flanders where policy makers' concern is the opposite: they consider the high diversity of the Flemish system² as an indication that there may be excess diversity, as discussed in more detail in section 3.2.

2.2 Program diversity in Flanders

Table 1 describes the diversity of first-year undergraduate higher education in Flanders in 2001. There are two types of institutions: colleges ("hogescholen") and universities. There are 44 college campuses and 9 university campuses. Given the small size of Flanders this amounts to a high density of one campus per 250 km².

The colleges offer a total of 414 vocational programs, and the universities a total number of 148 academic programs. There is considerable duplication of program supply since most fields and programs are broadly available at multiple campuses across the region. This is particularly true for vocational fields such as engineering, economics and business, education science, and medicine, all offered at

² This is considered common wisdom but is also supported by studies such as Huisman, Meek and Wood (2007).

Table 1 Diversity of higher education in Flanders (2001)

	Number of campuses	Number of study programs	Number of students	Students/ study program
Colleges (vocational programs)				
Total	44	414	25,182	61
By study field				
Architecture	9	11	912	83
Engineering	25	76	4,425	58
Science	n/a	n/a	n/a	n/a
Economics and Business	22	105	7,853	75
Education Science	26	67	6,065	91
Other Social Sciences	13	15	1,572	105
Medicine and Paramedics	23	54	1,904	35
Bio-engineering	15	26	644	25
Languages	5	5	738	148
Cultural Studies	10	55	1,069	19
Universities (academic programs)				
Total	9	148	12,299	83
By study field				
Architecture	3	3	198	66
Engineering	3	3	834	278
Science	7	33	1,169	35
Economics and Business	7	12	1,700	142
Education Science	3	6	711	119
Other Social Sciences	6	19	3,701	195
Medicine and Paramedics	6	19	933	49
Bio-engineering	6	13	1,177	91
Languages	6	17	842	50
Cultural Studies	6	23	1,034	45

Own calculations based on a dataset from the Flemish Ministry of Education. The first column counts the number of campuses offering at least one study program of a given study field. The second to fourth column show averages over all study programs of a given study field.

more than 20 campuses throughout Flanders. The average scale per program is correspondingly low, usually less than 100 incoming students per program at colleges and between 50 and 200 per program at universities.

A key question is whether this level of program diversity is too low or too high. The recent policy reforms aiming to cut diversity (to be discussed subsequently) suggest the level of diversity is too high. From an economic perspective, however, the answer is not clear. It depends on various

factors, including student preferences (mobility), and the variable and fixed costs of providing program diversity.

3 Funding policies towards diversity

Governments in different countries have followed a wide range of different policies towards higher education. Jongbloed and Koelman (2000) classify the higher education funding systems according to two dimensions (Figure 1). The first dimension (horizontal axis) describes to what extent funding is allocated based on output or input criteria (outcoming vs. incoming students). The second dimension (vertical axis) describes the extent of direct government control over the funding arrangements. This dimension is most relevant for our purposes. It ranges from heavily centralized, regulated systems to decentralized, market-driven systems. At the one extreme, we find public funding systems of bilateral negotiated funding (strong central control) while at the other end of the spectrum we find market-oriented approaches such as voucher systems. In reality, funding systems will combine different funding instruments and it is not straightforward to unambiguously classify them as centralized or decentralized. Generally speaking there has been a common trend towards more decentralization, with more autonomy for institutions. This partly follows from the fact that higher education has turned into a mass market,

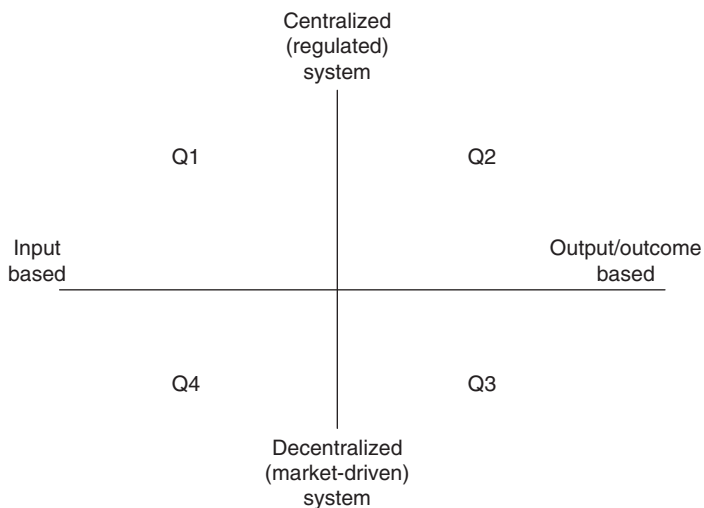


Figure 1 Classification of public funding regimes (Jongbloed and Koelman 2000)

making the funding problem too complex for a central planner (Barr 2004).

Our interest here is in one specific and important aspect of government control over funding arrangements: the regulation of program supply and diversity. We first discuss differences in policies towards program regulation in several countries, and then describe the policy and recent reforms in Flanders.

3.1 International context

Governments typically intervene in public systems of higher education by providing subsidies to universities and regulating tuition fees. At the same time, governments intervene by regulating program supply, since otherwise institutions would have distorted incentives for the sake of obtaining the subsidies.

The regulation of program supply is therefore a crucial aspect of government policy intervention, but there has been fairly little comparative research on the different approaches followed in different countries. To our knowledge, Huisman, Beerkens and Goedgebuure (2003) provide the only detailed cross-country comparison. To put the regulation of program supply in the Netherlands in perspective, they consider the situation in several other systems: Australia, Denmark, Finland, Flanders and Scotland. They look at the regulations on how to set up new programs and at the quality control of existing programs. They summarize their findings by classifying the countries according to the extent of government control (the vertical dimension of Jongbloed and Koelman's framework, Figure 1). They come up with three different groups of countries.

- Flanders and the Netherlands are characterized by strong government involvement in program supply decisions. Educational authorities put forward a number of quality requirements before an institution is allowed to offer a new program. In addition, the Flemish government applies "macro-efficiency criteria" such as the societal relevance of the program, the relation with existing supply and the potential demand for the program.
- In Denmark and Finland, the extent of government control is more limited. For example, in Finland, the establishment of a new program requires the approval from the Ministry of Education, but the universities have the freedom to decide on its content. Government control is rather performance-based, by means of a contract with the institution specifying targets such as the number of graduates.
- In Scotland and Australia, the government hardly interferes in program supply, and only indirectly so. The higher education institutions are

themselves responsible for their supply decisions. Instead of judging requests of institutions to set up new programs, a maximum number of fundable student places per study field is set, which acts as an incentive for the institutions to organize their supply in an efficient way.

Note that the Flemish system is the only one using macro-efficiency criteria in its supply regulation policy. Although this seems a sensible thing to do, our analysis will show that a formal welfare analysis allows a more precise answer to program diversity questions than the currently used criteria of efficiency and transparency.

In sum, this brief review shows that government control over program supply and diversity shows a lot of variation across countries. Flanders is one of the heavily regulated countries during the time of Huisman et al. study in 2003. We now turn in more detail to the case of Flanders, in particular its recent funding system reform proposals.

3.2 The recent funding system reform in Flanders

The Flemish government intervenes by regulating tuition fees, currently uniform at €425 for colleges and €445 for universities, and subsidizing the higher education institutions. The subsidies consist of a fixed component (independent of the number of students) and a variable component, a constant amount per student (specific per program field).

At the same time, the Flemish government intervenes heavily in the quality and diversity of program supply. The quality is controlled through a system of self-assessments and external visiting committees. The diversity is regulated since institutions are not automatically eligible to offer all possible study programs. In practice, however, the institutions form a continuous pressure to be entitled to supply additional programs and attract additional subsidies through the enrolled students. As discussed in section 2.2, this has resulted in large program diversity, relative to other countries, with 562 programs offered across 53 institutions in the academic year 2001–02 (Table 1).

The 2005 reform proposals aimed to make the funding system more efficient. The constant subsidy per student has been made in line with recent and more accurate estimates of the variable cost per student, as obtained by Deen et al. (2005) for various programs and fields. The subsidies per student tend to be lower for colleges than for universities, and lower for humanities and social sciences than for medical and exact sciences.

The more crucial 2005 part of the reform proposals, and the focus of our analysis, consisted of a series of financial incentives to induce institutions to limit the number of institutions and programs. These decentralized

incentives served as an alternative to the former approach which had unsuccessfully attempted to limit product diversity through direct government control.^{3,4} There were three main measures to cut program diversity. First, institutions were required to reach a minimum size to be eligible for funding. Second, there were financial bonuses through phase-out funding for programs that an institution decided to cut; institutions could also earn additional funding by jointly offering study programs. The third incentive proposed to reduce product diversity was the replacement of the fixed funding component by a variable scheme based on the institutions' achieved CI.

The CI of an institution k , C_k , is the average number of students per offered study program:

$$C_k = \frac{Q_k}{J_k}$$

where Q_k is the total number of students and J_k is the total number of study programs at institution k . An institution would then receive a subsidy amount r per unit of the achieved CI.⁵ We will refer to this system as the CI funding system. It provides an incentive to reduce the number of programs J_k , though at the risk that the number of students Q_k also goes down. We come back to the effect of the CI in more detail in section 4.4.

³ During a previous legislation (i.e. prior to the 2005 reforms discussed here), the Minister of Education commissioned former KU Leuven rector Dillemans to work out a plan to optimize higher education supply, which was proposed in 1997. These efforts were not very successful, in part because the government used 'soft' instruments such as consultation with the higher education sector. The next Minister of Education (1999) relieved Dillemans of his tasks and shortly after that the policy debate became dominated by the introduction of the Bachelor-Master structure and overshadowed the plans for the one-shot optimization envisaged in Dillemans' plan. The latest government (2004) showed attention again to optimize supply diversity, in the context of the funding system reforms we are discussing here.

⁴ Next to these incentives aimed at optimizing supply, the funding system reform stepped away from pure input-financing and now includes students' success (in terms of acquired credits) as a criterion of funding. In terms of the funding system classification presented in Figure 1, the reforms therefore represent a move towards not only increased decentralization but also more output-orientation. It is generally recognized that the use of an output-based funding policy may raise concerns of deteriorating educational quality if not accompanied by quality assurance mechanisms. A nice example is provided in the paper by Bagües, Sylos Labini and Zinovyeva (2007) who analyze the impact of the adoption of such a policy in Italy on universities' grading standards.

⁵ In practice, the index is slightly more complicated (Vandenbroucke 2005). It is normalized by the average index over all institutions. Further, this normalized CI is constrained within bounds of 0.5 and 1.5. We account for this in our empirical analysis, but not in our discussion since it complicates the exposition and it only matters for a minority of the institutions. The lower bound is obtained for 5 and the upper bound for 4 out of the 53 institutions.

Although the CI still relies on student counts, the use of formula-based funding rather than negotiated funding clearly represents a decrease in direct government control.

In the remainder of the article we will address the following questions regarding the Flemish higher education system:

- (1) Is reducing current program diversity socially desirable?
- (2) Does the decentralized CI funding system provide incentives to reduce diversity whenever this is socially desirable?

In essence, the second question asks whether an all-in-all modest adaptation of the funding regime is able to create the right incentives and improve efficiency without relinquishing public control of the higher education system. We note, however, that the 2005 proposed CI funding system was not actually incorporated in the 2007 reforms for practical reasons.⁶ Nevertheless, our analysis of the proposed reforms remains of general interest, since it will emphasize the key importance of properly accounting for students' demand responses. It is therefore also relevant for other financial incentive schemes designed to reduce product diversity (such as the financial bonuses to eliminate or merge study options).

4 Economic framework

Despite the policy importance, there has been only limited literature on the benefits of diversity in higher education, and even less on the associated costs. The empirical literature documenting diversity as reviewed in section 2.1 tends to start from an implicit presumption that more diversity is always better. To evaluate diversity, there is clearly a need for a transparent economic framework that clarifies the potential objectives of policy makers, and considers both the benefits and the costs. This section provides such a framework, and applies it in the next section borrowing from the more elaborate analysis in Kelchtermans and Verboven (2007).

We first discuss the effects of diversity on participation, and subsequently the effects on total welfare (which trades off the monetary benefits and costs). We next ask whether the existing market structure is likely to provide too much or too little diversity from a total welfare perspective, and finally consider the effects of the funding system reform in Flanders regarding diversity.

⁶ For example, it was argued by universities that it is common to pool students and share them across study programs so that critical mass is achieved whilst the CI is not able to capture such initiatives.

4.1 Participation

To our knowledge, the only available literature on the economic effects of diversity in higher education relates to the effects on participation. Trow (1972) was an important early author on this issue. He argued that greater diversity was essential for the growth to massification in higher education. As discussed by Huisman, Kaiser and Vossensteyn (2000), this hypothesis is based on the presumption that increased diversity implies more choice and therefore increased the chances to participate. They test this hypothesis based on a cross-section of nine European countries. They construct measures of participation and diversity for each country, and measures for other variables that may affect participation (financial incentives and selection). They find no support for Trow's hypothesis: there is no positive relationship between high diversity and participation. If anything, the relation is negative. For example, France shows a low diversity yet a high participation rate, whereas the United Kingdom and Flanders have a high diversity and a relatively low participation rate.

This conclusion is consistent with our own research for Flanders (Kelchtermans and Verboven 2006). We estimated a logit model of educational choice at the level of potential new students deciding whether to pursue higher education. We found that the travel costs and program availability did not significantly affect the decision whether to participate, but only the decision at which institution to study and which program to take.

Combining these findings, we will henceforth assume that modest variations in program diversity have no significant effects on participation in higher education. This is not to say that large changes in program diversity would not have significant effects, which is perhaps what Trow originally suggested.

4.2 Total welfare

Economic theory has long been interested in the question whether alternative market structures, such as monopoly or free entry, can generate the socially optimal level of product diversity.⁷ To address this question, it is necessary to first define total welfare. Total welfare in the market of higher education is approximately equal to:

- *gross consumer surplus*, i.e. the students' total willingness to pay;
- minus *total variable costs* of providing higher education;
- minus *total fixed costs*.

⁷ For the large economic literature on optimal product diversity and comparisons with free entry or monopoly, see for example Spence (1976), Dixit and Stiglitz (1977) and Mankiw and Whinston (1986).

Note that this definition of total welfare entails some simplifications. First, this welfare definition abstracts from income effects and distributional considerations. In reality, a social planner may want to put a higher weight on low income groups to obtain a fair distribution. Second, the government pays subsidies to the institutions. The welfare definition does not include these since they merely transfers. However, there may be social costs of public funds (e.g. because of distortionary taxes required to finance the subsidies). In this case, a fraction of the paid subsidies would have to be subtracted from the welfare definition. Third, the gross consumer surplus refers to the students' private benefits from higher education and the welfare definition assumes that these coincide with the social benefits. In reality, the social gains from higher education may exceed the private gains if there are spillovers, i.e. students' education may cause positive benefits to society which the students do not take into account. The evidence on the presence of positive spillovers is however mixed, so we do not take this into account.

Consider now the effects on each of the three components of total welfare when a hypothetical social planner with perfect information would eliminate one product, i.e. one program at one institution.

First, such a program cut generally results in a reduced surplus to consumers, i.e. the students. They face less choice so that some students have to substitute to their next best alternative. This effect will especially be strong if students do not find good substitution possibilities for the dropped study program. In higher education substitution may occur in two directions: students may substitute to another program at the same institution or they may decide to pursue the same program but at another institution.⁸ Hence, a program cut at a certain institution is bad for students if they have a strong preference for this particular program, or if they have high mobility costs so that they are not willing to travel to other campuses.

Second, eliminating a program will involve a fixed cost saving because the product no longer needs to be supplied. This fixed cost saving may for example include a reduction in the required classroom space, or a reduced teaching staff (to the extent this is independent of the number of students). The fixed cost savings may be limited if there are important economies of scope, i.e. economies from offering two or more programs at the same institution. For example, different study programs may share some of the courses, in which case classrooms and teaching staff remain needed when only one program is dropped.

⁸ Students may also respond by no longer participating, but as discussed in section 4.1, it is reasonable to assume this effect is very small.

Third, a program cut may result in variable cost savings if students decide to substitute to other programs that have lower variable costs. For example, closing down a medical program at a university may induce some students to substitute to a social sciences program with lower variable costs. Of course, the converse is also possible, i.e. there may be variable cost losses if students substitute to higher variable cost programs after a program cut. For example, closing down a relatively inexpensive vocational engineering program at a college may result in substitution towards a more expansive academic engineering program at a university. A program cut may therefore result in a reallocation of students to more or less expensive programs, so that the variable cost savings may be either positive or negative.

The effects of eliminating a program on total welfare are thus not clear a priori. It will be positive if the savings in fixed costs and variable costs (if any) outweigh the losses to students from the reduced product diversity. There is almost no empirical evidence that has attempted to estimate the students' willingness to pay for program diversity. The evidence on fixed and variable costs associated with program diversity is also limited, but there is at least some indirect evidence suggesting that scale economies are important. Cohn, Rhine and Santos (1989) and Koshal and Koshal (1999) find evidence of economies of scale and scope for US universities.⁹ These findings suggest that higher education institutions can reduce their average costs by growing in size. This indirectly supports the view that reducing program diversity within an institution may raise the size of the remaining programs, and therefore imply average cost savings.

4.3 Too much or too little diversity?

A key question is whether the current market structure provides the correct incentives to higher education institutions to invest in program diversity. The issues are complex, but economic theory suggests that a monopolist tends to invest in too little product diversity from a total welfare perspective, whereas a market with free entry tends to generate too much diversity. The divergence from the welfare optimum stems from the fact that both a monopolist and an individual entrant do not have the same objective function as a social planner, implying both positive and negative externalities.

To understand the institutions' incentives to invest in program diversity, first assume that each institution behaves as a local monopolist. This means that dropping or adding programs does not result in students

⁹ At the secondary school level, Riew (1966, using US data) and Smet and Nonneman (1998, using Flemish data) find evidence of scale economies.

substituting to other universities or colleges. This assumption would be realistic to the extent that students have high mobility costs, i.e. a low willingness to travel to other institutions when a program is cut. Such a monopolist typically has an incentive to invest in too little product diversity. The economic intuition is that a monopolist correctly takes into account fixed cost and variable cost savings, but does not correctly take into account consumers' total willingness to pay. Put differently, it cannot appropriate all consumers' surplus, because it charges a uniform (and actually low) tuition fee regardless of each student's actual willingness to pay. In sum, because a monopolist institution cannot extract all consumer surpluses, an essential component of total welfare, it tends to have a too low incentive to invest in product diversity.

In practice, however, the higher education institutions are not local monopolists. Students can decide not to go to the nearest institution if they find that more distant campuses offer more interesting study programs. As a result, universities and colleges may attempt to compete and steal business from other institutions by introducing additional study programs. This may ultimately lead to too much product diversity, because the business stealing effect implies only a transfer of subsidies from one institution to the other and may not mean a real contribution to total welfare.

The overall conclusion is that universities and colleges may have too little or too much incentives to invest in product diversity depending on whether the non-appropriability of consumer surplus effect or the business stealing effect dominates. The business stealing effect would dominate if student mobility costs are low so that they can easily substitute to other institutions in response to changes in program diversity.

4.4 Impact of the funding system reform in Flanders

Because institutions do not necessarily have the correct incentives to provide program diversity, there is room for government intervention. In section 3.1 we discussed how governments in many countries intervene by controlling quality and deciding on new programs, either through direct control or in a decentralized way through a maximum number of fundable students. Flanders had a tradition of strong direct intervention, but with its new proposed CI funding system, discussed in section 3.2, it aimed to provide decentralized incentives to reduce diversity. We are interested to know (i) whether reducing diversity is actually desirable from a welfare perspective and (ii) whether the decentralized CI funding system provides the right incentives to do so.

To understand the incentives created by the CI funding system, consider the effects of a program cut on the institutions' profits. Suppose first for simplicity that a program cut leads to a complete loss of students, i.e. all

students from the cut program either drop out or substitute to another institution. In this case, dropping a program raises the institution's CI if and only if the program has a below-average size, i.e. the number of students in the concerned program is below the CI. Hence, the CI funding system would provide an extra incentive to drop the programs that are smaller than average. In practice, however, an institution does not lose all students of the dropped program. Some of the students may decide to go to another program within the same institution. The extent to which this happens is measured by the *diversion ratio*. The ratio is the fraction of students that goes to another program within the same institution after the institution drops a program. The diversion ratio is between zero and one. If the diversion ratio is high, the incentive to cut a program will also be high: the CI funding system may then even provide an incentive to drop programs with an above-average student size. In the extreme case where a program has a diversion ratio equal to 1, the institution does not lose any students after cutting the program, so it would even want to drop very large programs under the CI funding system.

The general conclusion is that the CI funding system provides an extra incentive to cut the smaller programs, especially if these have good substitution possibilities within the same institution. It is not however clear whether the correct financial incentives to cut programs are given in precisely those cases where this is socially desirable.

Table 2 compares the profit incentives of the CI funding system with the welfare effects and shows that there are four possibilities:

- Under “desirable status quo”, it is socially desirable not to cut product diversity and the CI funding system does not provide the incentives either.
- Under “undesirable status quo”, it would be better to cut product diversity, but the CI funding system does not provide the necessary incentives (because the program is large or has little substitution possibilities).
- Under “undesirable reform”, the CI funding system provides incentives to cut the program whereas this is not socially desirable.

Table 2 Possible profit incentives and welfare effects of unilateral program cuts

Profit incentive	Welfare effect	
	$\Delta W < 0$	$\Delta W > 0$
$\Delta \Pi < 0$	Desirable status quo	Undesirable status quo
$\Delta \Pi > 0$	Undesirable reform	Desirable reform

- Finally, “desirable reform” means that it is good to cut product diversity and the CI funding system provides the proper incentives to do so.

5 Empirical findings

We now report on the findings of the empirical and simulation analysis by Kelchtermans and Verboven (2007). We first briefly sketch the essential aspects of the approach, and then discuss the effects of reducing diversity on demand, and on the institutions’ profits and total welfare. We focus mainly on the economic intuition without a detailed analysis of methodology and results.

5.1 Methodology

We look at the effects of reducing program diversity by considering all possible unilateral program cuts, i.e. cutting each of the 562 programs. We first simulate the demand effects from these unilateral program cuts, i.e. how students substitute to other programs. We subsequently compute the profit incentives and the various welfare effects from the unilateral program cuts.

To compute these effects we first estimated a logit model of educational choice. We had access to a rich data set from the Flemish Ministry of Education on 37,481 students, which choose one out of 562 possible alternatives (programs at different institutions). The data (summarized in Table 3) include the students’ actual choices, the student characteristics (sex, nationality, years of repetition in high school, high school program, high school religious affiliation, etc.), the institution characteristics (college vs. university, religious affiliation, etc.) and program characteristics (study fields). In addition, there is information on the students’ and institutions’ locations, enabling to compute travel distances and travel times for every student to every possible institution.

Estimation of the logit model enables us to compute the substitution effects from the hypothetical unilateral program cuts.¹⁰ Furthermore, the

¹⁰ We assume students continue to participate. As discussed in section 4.1 this assumption is based on Kelchtermans and Verboven’s (2006) finding that mobility costs only have a very small effect on the participation decision (though a large effect on where and what to study). We also assume that educational quality remains constant. Given the nature of our simulations, i.e. unilateral program cuts, we consider this a reasonable assumption. Conversely, multilateral program cuts resulting in a substantially increased scale of higher education institutions may raise concerns of reduced competition. Jacobs and van der Ploeg (2005) argue this may be the case in The Netherlands where the massive increases in scale in the past 20 years have been accompanied by a dramatic increase in overhead costs and a corresponding fall in real resources per student available for teaching and research.

Table 3 Summary statistics of 2001 eligible pupils

	All students	College	University
Demographic			
Male	0.45	0.45	0.45
Foreign	0.01	0.01	0.01
Catholic high school	0.78	0.79	0.76
Ability			
Years of repetition	0.36 (0.95)	0.46 (0.99)	0.16 (0.83)
General high school	0.60	0.44	0.94
Classical languages	0.14	0.05	0.33
Modern languages	0.24	0.22	0.27
Economics	0.19	0.19	0.17
Sciences	0.20	0.11	0.40
Mathematics	0.30	0.15	0.60
Technical high school	0.33	0.47	0.04
'Product'-focused	0.12	0.17	0.02
Mobility			
Distance (kms) by road to campus	34.71 (28.17)	30.96 (25.65)	42.38 (31.37)
Time (mins) by road to campus	30.74 (17.33)	28.33 (16.2)	35.67 (18.47)
Travel cost to campus ($\times 10,000\text{€}$)	0.38 (0.28)	0.35 (0.25)	0.46 (0.31)
Number of observations	37,481	25,182	12,299

Standard errors for the continuous variables are in parentheses. Demographic and ability data are based on the dataset from the Flemish Ministry of Education; mobility statistics are based on own calculations using postal code information.

logit model enables us to compute the effect on the first welfare component: gross consumer surplus or students' total willingness to pay for the various programs.¹¹ To compute the effect of the program cuts on the other two welfare components, variable and fixed costs, requires additional cost information. As a proxy for variable cost, we use the government's estimates that they also used to determine the cost-based variable subsidies per student (see section 3.2). We do not have a fixed cost measure per program for each institution. However, we were able to impose reasonable upper bounds on these costs, based on the economic assumption that institutions would not offer programs if they are

¹¹ Estimating total willingness to pay is possible because we include travel costs in our model, and convert this in a monetary measure.

unprofitable. This enabled us to obtain unambiguous conclusions about profit and welfare effects for the majority of the 562 considered unilateral program cuts.

Based on this methodology we are then able to determine the demand, profit and welfare effects of reducing program diversity through unilateral program cuts. This enables us to shed light on whether the funding reform based on the CI was socially desirable and effective.

5.2 Demand effects of reducing diversity

Before looking at the demand effects of reducing program diversity, we review some of the empirical findings from estimating the logit model on our data set. The key finding is the ambiguous role of travel costs. Students tend to be quite mobile with respect to their decision whether to participate. Students living relatively far from any campus are not deterred from entering higher education. Stated differently, total demand for higher education is very inelastic with respect to travel costs.

However, students are very immobile with respect to their decision where and what to study. They often tend to choose the most nearby institution, regardless of the programs offered at that institution. This student immobility may be due to two broad reasons. First, students may perceive programs from different universities as close substitutes so that it is not worthwhile to travel further (as emphasized by Kelchtermans and Verboven (2006) based on their nested logit model results). The perceived substitutability partly follows from the large duplication of program supply (the same program being offered at multiple campuses). It may also follow from the fact that we only considered first-year undergraduate education programs, where there is naturally more homogeneity across institutions and reputational differs are less important. See also Aghion et al. (2007) who point at the limited reputation-based competition in most European systems of higher education.¹² Second, it is possible that students are intrinsically immobile, i.e. have high monetary or non-monetary travel costs. Monetary travel costs may be particularly high for our sample of undergraduate students, or because of socio-economic characteristics (as proxied by secondary school variables). Regarding non-monetary travel costs, students in Flanders may have comparatively strong ties with their social networks at home. Because the Flemish higher

¹² It is sometimes argued that student mobility is larger in a country such as the US. However, this belief appears to be based on the casual observation that students travel long distance to top universities. For lower ranked universities and colleges mobility also tends to be lower, see in particular Long (2004) for an empirical analysis of the role of distance in educational choices in the US.

education area is small, students typically tend to maintain active relations with family and friends at their home location and this may induce them to choose their higher education institution while anticipating frequent weekend trips back home. This may contrast with larger countries where students know that due to large distances any schooling decision rules out frequent home visits and accordingly attach lesser importance to distance, implying higher student mobility. In sum, the observed student immobility is a relative phenomenon: it may be either due to close substitutability of programs or due to intrinsic student travel costs.

To gain further intuition on how students value current program diversity, one may use the logit model estimates to calculate the students' willingness to pay for certain study option characteristics.¹³ For example, pupils who previously attended a catholic high school have an additional willingness to pay of €2,500 for attending a catholic higher education institution. Similarly, pupils who took a strong high school education (the "general" type, with classical languages) are willing to pay an additional €3,035 to attend an academic program at university instead of a short vocational program at a college (compared to pupils who took a "professional" type high school education). As a final example, pupils without repetitions during high school are willing to pay an additional €1,534 to attend an academic engineering program instead of a short vocational college program (compared to pupils who had to repeat one year in high school).

These examples indicate that removing a study program may imply big consumer surplus losses. This does not say much however about the likely substitution effects of a program cut. This will depend on the availability of close substitutes at the given campus, and on the availability of duplicate programs at other campuses (as described in Table 1).

To summarize the demand effects of reducing program diversity, the concept of the diversion ratio is very informative. Table 4 presents two kinds of diversion ratios. Diversion ratio 1 is the fraction of students that goes to another institution to attend the same field of study. Diversion ratio 2 is the measure introduced in section 4.4, i.e. the fraction of students substituting to another program within the same institution after a program cut. Both measures are of interest and capture the two dimensions of student choice. The first says how close substitutes other institutions are for taking the same program. The second says how close substitutes other programs are within the same institution. We report the

¹³ This is done by dividing the estimated valuation parameters of the study option characteristics by the travel cost parameter (expressed in Euro). We refer to Kelchtermans and Verboven (2006) for details.

Table 4 Diversion ratios resulting from unilateral study field cuts

Study field	Colleges		Universities	
	Diversion ratio 1	Diversion ratio 2	Diversion ratio 1	Diversion ratio 2
Architecture	0.04	0.11	0.03	0.36
Engineering	0.39	0.11	0.22	0.31
Science	n/a	n/a	0.07	0.22
Business and Economics	0.30	0.15	0.27	0.19
Education	0.22	0.15	0.10	0.30
Society	0.16	0.17	0.15	0.18
Medicine and Paramedicine	0.08	0.18	0.08	0.27
Bio-engineering	0.06	0.18	0.08	0.27
Languages	0.12	0.08	0.14	0.23
Cultural studies	0.16	0.11	0.08	0.20
Total	0.21	0.14	0.13	0.24

The diversion ratios are computed for a unilateral cut of a study field by a single institution, based on the parameter estimates of the logit model. The results reported here are averages across institutions within a given field.

Diversion ratio 1 = average percentage of students choosing the same study field at another institution.

Diversion ratio 2 = average percentage of students choosing the same institution but another study field.

diversion ratios from unilateral *field* cuts per institution, instead of unilateral *program* cuts reports.¹⁴

Table 4 shows that college students are on average more loyal to their initially chosen study field than university students: the average of diversion ratio 1 across fields is 21 percent for colleges, vs. 13 percent for universities). This may be explained by the broader supply of college programs across the region of Flanders, so that college students are more likely to find a nearby substitute campus than university students who face the elimination of their original field choice. There are important differences between study fields. For example, on average only 6 percent of college students and 8 percent of university students in bio-engineering stick to this study field when confronted with a cut of this field. In contrast, up to 30 percent of college students and 27 percent of university students in business and economics substitute to another institution to be able to stay in the same field after the field is dropped at their institution.

¹⁴ This captures the content dimension more clearly. In the profit and welfare analysis subsequently we look however at unilateral *program* cuts, as this was the main interest of the Flemish government.

Table 5 Actual profit incentives and welfare effects of unilateral program cuts

Profit incentive	Welfare effect		
	Negative (%)	Positive (%)	Total (%)
Negative	37.0 (desirable status quo)	0.3 (undesirable status quo)	37.3
Positive	53.7 (undesirable reform)	9.0 (desirable reform)	62.7
Total	90.7	9.3	100.0

Percentages of program cuts for which it was possible to derive unambiguous conclusions on both profit and welfare effects.

Diversion ratio 2 shows that university students are on average more loyal to their initially chosen institution than college students (average across fields of 24 percent vs. 14 percent, diversion ratio 2 in the Table). Universities are thus able to retain a larger share of the affected students after cutting a study field, thanks to their broader supply and less competition (fewer universities across the region). Again, there is substantial heterogeneity between study fields.

In sum, the relatively low diversion ratios in Table 4 show that there is some loyalty to institutions and fields, but students substitute quite substantially to other institutions and fields.

5.3 Profit incentives and welfare effects of reducing diversity

Now consider the profit and welfare effects from reducing diversity through unilateral program cuts. Recall that Table 2 classified the effects of program cuts into four possible cases: desirable status quo, undesirable status quo, desirable reform and undesirable reform. Table 5 applies this classification. Using the fixed cost bounds approach mentioned earlier, we are able to unambiguously classify 65.4 percent of all 562 cases. For the remaining part of supply, we cannot draw an unambiguous conclusion without more precise fixed cost information. We therefore focus only on the cases for which we can draw unambiguous conclusions.

We summarize here the main findings and deal with the welfare results first, as reported in the columns of Table 5. This shows that it is socially undesirable to cut a program at an institution in 90.7 percent of the cases.¹⁵ Only in 9.3 percent of the cases it would be socially desirable to cut these

¹⁵ Note that this classification is relative to the number of programs we were able to unambiguously classify (368 programs out of a total of 562 programs). As discussed in section 5.1, we made an assumption on the upper bound of programs' fixed costs which allows us to evaluate the welfare and profit effects for the majority of study programs. Details are provided in Kelchtermans and Verboven (2007).

programs. This is a remarkable result in the light of the common concerns by policy makers in Flanders with the diversity and duplication of program supply. It is driven by the low student mobility and the corresponding large willingness to pay for a given study program at a given institution. Stated differently, the large consumer surplus losses from the program cuts are typically not compensated by a sufficient amount of fixed and variable cost savings.

Next consider the profit effects of the CI funding system, reported in the rows of Table 5. In the majority of the cases (62.7 percent) the CI funding system gives a positive profit incentive to cut programs. This contrasts with our earlier finding that it is usually not socially desirable to reduce diversity. Considering the four individual cells we find the following:

- We can classify 37 percent of current higher education supply as desirable status quo cases, i.e. the CI funding system correctly does not give an incentive to cut programs.
- However, we can also classify 53.7 percent of current supply as undesirable reform cases, where the system does give the wrong profit incentive to cut the program.
- Furthermore, we can classify a negligible fraction of 0.3 percent as undesirable status quo, i.e. where cutting diversity would be desirable but the CI funding system fails to provide the incentives to do so.
- Finally, 9 percent of the cases are desirable reform, where the CI funding system provides the proper incentives to cut supply.

We can draw two policy conclusions from this discussion. First, the high program diversity and the associated duplication of fixed costs across campuses are economically justified because of the low student mobility. In other words, the intuition that there is too much diversity in Flemish higher education is based on a duplication of fixed costs argument, and it ignores that students actually put a high value on this duplication. Second, policies such as the CI funding system aiming to provide decentralized incentives to reduce product diversity may easily be ineffective. The decentralized policy would have been fully effective if it had led to either desirable status quo or desirable reform (upper right or lower left cells of Table 5). In practice, this is only true for the minority of cases (37 percent + 9 percent). In the majority of cases policy would have led to undesirable reform by cutting diversity where this is not wanted.

6 General conclusion

We have discussed how European countries with a public system of higher education are facing increased financial challenges and how they differ in

their approaches to meet those challenges. Some countries, notably the UK, have made a clear choice towards the private model by (drastically) raising private contributions. Most other countries seem reluctant to make such choices and seek other solutions to increase the efficiency of their higher education systems while keeping them essentially public. Common trends include more performance orientation as well as decentralized decision making.

One particular policy domain that is bound to attract more attention from policy makers given the pressure on public budgets is the regulation of program supply and diversity. Governments are necessarily involved in controlling program supply, either through direct control (as in Flanders and the Netherlands) or through decentralized mechanisms (as in Scotland and Australia). Cross-country evidence suggests that program diversity is large, especially in Flanders, the region of our study. Nevertheless, despite the policy importance very little is known about the optimal degree of program diversity in higher education and even less on how policy can achieve it.

Our analysis shows that reducing supply as a way to cut costs is no magical solution. Although it may yield some fixed costs savings, i.e. efficiencies in the sense of less duplication, these are typically more than outweighed by other major inefficiencies, i.e. consumer surplus losses. Thus our analysis shows the importance of including the demand side effects, a perspective that is typically omitted from the analysis of diversity in higher education. Furthermore, we found that decentralized financial mechanisms carry a substantial risk of being ineffective, in the sense of promoting reductions in program diversity when this is undesirable from a total welfare perspective.¹⁶ Hence, if one would want to take the route of optimizing supply diversity, a well-informed regulatory approach may be preferable unless sufficiently effective decentralized financial incentive schemes can be installed. While there is little doubt that institutions would respond to financial incentives, it is far from certain their decisions would be effective beyond a narrow definition of efficiency. In the absence of full-blown market-oriented approaches to organize higher education, it is therefore important not to make public funding mechanisms overly simplistic.

¹⁶ Although the incentive for reducing supply diversity that we analyzed in this article (the CI) was eventually dropped from the final funding system proposal, the government reaffirmed its position that “current higher education supply is too fragmented” (Vlaamse Regering 2007).

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