**Online Supplementary Material: Appendix A – Tables of the QCA**

*Calibration*

The first step in each fs-QCA is the ‘calibration’ of sets (both the conditions and the outcome). In this fundamental process, which should be as transparent as possible and discussed in detail, it is crucial to specify qualitative anchors for full membership (1), full non-membership (0) and the point of maximum ambiguity (0.5)[[1]](#footnote-1). Table AA1 summarizes these decisions:

Table AA1 *Calibration of sets (conditions and the outcome) and fuzzy values of countries*

|  |  |  |
| --- | --- | --- |
|  | *Countries* | *Thresholds* |
|  | *A* | *D* | *E* | *FI* | *FR* | *G* | *IR* | *IT* | *NE* | *NO* | *P* | *S* | *1* | *0.5* | *0* |
| R1 | 0.14 | 0.23 | 0.05 | 0.23 | **0.82** | 0.14 | **0.82** | **0.98** | 0.23 | **0.99** | **0.73** | 0.35 | 12 | 6 | 1 |
| R2 | **0.65** | **0.95** | 0.05 | 0.05 | **0.86** | **0.95** | **0.86** | **0.65** | 0.27 | **0.86** | 0.65 | **0.86** | 4 | 1.5 | 0 |
| R3 | 0.14 | 0.35 | 0.14 | **1** | **0.95** | **0.99** | 0.05 | **0.95** | **0.95** | **0.73** | 0.05 | **0.99** | 4 | 2.5 | 0 |
| R4 | **0.68** | **1** | 0.05 | 0.12 | **0.82** | **0.9** | 0.02 | 0.27 | **0.82** | **0.82** | 0.12 | **0.95** | 8 | 4 | 1 |
| R5 | 0.05 | 0.05 | 0.27 | 0.27 | **0.65** | **0.86** | **0.65** | **1** | 0.05 | 0.27 | **0.86** | 0.27 | 4 | 1.5 | 0 |
| R6 | 0.18 | 0.05 | 0.18 | 0.18 | **0.88** | **0.73** | **0.95** | **0.98** | 0.18 | 0.05 | **0.88** | 0.18 | 5 | 2 | 0 |
| R7 | **0.86** | **0.65** | 0.27 | 0.05 | 0.27 | 0.27 | 0.27 | 0.05 | **1** | **0.86** | 0.05 | **0.86** | 4 | 1.5 | 0 |
| R8 | **0.95** | **0.65** | **0.65** | **1** | 0.39 | 0.39 | 0.05 | 0.11 | **0.95** | 0.39 | 0.05 | **0.86** | 6 | 3.5 | 0 |
| R9 | 0.05 | 0.18 | 0.32 | **0.99** | **0.82** | **0.95** | **0.99** | **0.82** | 0.18 | 0.1 | 0.05 | 0.1 | 7 | 5 | 1 |
| R10 | 0.32 | **0.97** | 0.02 | **0.65** | **0.65** | **0.77** | 0.18 | 0.1 | **0.77** | **1** | 0.32 | 0.18 | 10 | 5 | 1 |
| R11 | **1** | **0.95** | **0.73** | 0.05 | **0.95** | **0.73** | **0.73** | **0.73** | 0.05 | **0.73** | 0.05 | 0.05 | 2 | 0.5 | 0 |
| R12 | 0.14 | **0.73** | 0.05 | **0.95** | 0.14 | 0.14 | 0.05 | 0.35 | **0.73** | **0.95** | 0.05 | **0.95** | 4 | 2.5 | 0 |
| E1 | 0.35 | **0.65** | 0.14 | **0.86** | 0.35 | **0.65** | 0.05 | 0.35 | **0.95** | **0.95** | **0.86** | **0.65** | 5 | 2.5 | 0 |
| E2 | **0.65** | 0.14 | 0.05 | **1** | 0.35 | **0.95** | 0.14 | 0.14 | 0.35 | **0.65** | 0.14 | 0.35 | 5 | 2.5 | 0 |
| E3 | 0.12 | **1** | 0.05 | **1** | **0.82** | 0.27 | 0.27 | 0.12 | 0.27 | 0.27 | 0.05 | 0.27 | 5 | 3 | 0 |
| E4 | 0.27 | **0.65** | **0.65** | 0.05 | 0.27 | **0.65** | 0.05 | **0.65** | **0.95** | **0.95** | 0.27 | **0.65** | 4 | 1.5 | 0 |
| E5 | 0.14 | 0.14 | **0.86** | **1** | 0.35 | **0.65** | **0.86** | **0.95** | 0.05 | **1** | 0.35 | 0.05 | 5 | 2.5 | 0 |
| E6 | **0.73** | **0.73** | 0.05 | **0.95** | 0.05 | 0.05 | **0.73** | **0.95** | 0.05 | **0.73** | 0.05 | 0.05 | 2 | 0.5 | 0 |
| T1 | **1** | **0.95** | 0.05 | **0.95** | **0.95** | 0.05 | **0.95** | **0.95** | 0.05 | 0.05 | 0.05 | 0.05 | 1 | 0.5 | 0 |
| T2 | **0.65** | 0.05 | **0.99** | 0.27 | **0.86** | 0.05 | **0.86** | **0.95** | 0.27 | 0.05 | 0.05 | 0.05 | 4 | 1.5 | 0 |
| T3 | 0.05 | 0.05 | 0.05 | **1** | 0.05 | 0.05 | 0.05 | **0.95** | 0.05 | **1** | **1** | 0.05 | 1 | 0.5 | 0 |
| I1 | 0.39 | **0.65** | 0.22 | 0.22 | 0.39 | **0.65** | **0.86** | **1** | 0.39 | **0.95** | 0.11 | 0.05 | 6 | 3.5 | 0 |
| I2 | **0.73** | 0.05 | **0.73** | **0.73** | **0.73** | 0.05 | 0.05 | 0.05 | 0.05 | **0.73** | 0.05 | **0.99** | 2 | 0.5 | 0 |
| I3 | **1** | **0.86** | 0.05 | 0.27 | 0.27 | **0.65** | **0.65** | **0.99** | 0.27 | **0.86** | 0.27 | **0.65** | 4 | 1.5 | 0 |
| Out. | 0.08 | **0.93** | **0.95** | **0.77** | 0.18 | **0.76** | **0.98** | 0.01 | **0.77** | **0.91** | 0.14 | **0.98** | 30 | 25 | 20 |

Cases that have membership in a speciﬁc condition (>0.5) are shown in bold.

Hence, the table below (AA2) summarizes the calibration decisions for the conditions for the ‘best’ configuration of conditions/policy shapes, as well as the outcome. These decisions are also discussed in detail below.

Table AA2 *Calibration of conditions and the outcome*

|  |  |  |  |
| --- | --- | --- | --- |
| *Conditions/outcome* | *Full membership**(1)* | *Point of maximum ambiguity (0.5)* | *Full non-membership (0)* |
| Outcome: Indicator of HE teaching performance | +30Cases: IR; S | +251<cases<0.5: E; D; F; G; NE; NO0.5<cases<0: F; P; A | +20Cases: IT |
| R1: Assessment, evaluation and accreditation (procedural rules) | 12Cases: NO; IT | 61<cases<0.5: FR; IR; P0.5<cases<0: A; D; FI; G; NE; S | 1Cases: E |
| R10: Institutional and administrative governance: more opportunities | 10Cases: NO; D | 51<cases<0.5: FI; FR; G; NE0.5<cases<0: A; IR; IT; P; S | 1Cases: E |
| R12: Rules on goals in teaching | 4Cases: FI; NO; S | 2.51<cases<0.5: D; NE0.5<cases<0: A; FR; G; IT | 0Cases: E; IR; P |
| E5: Performance based institutional funding | 5Cases: FI; IT; NO | 2.51<cases<0.5: E; G; IR0.5<cases<0: A; D; FR; P | 0Cases: NE; S |
| T3: Service-based student fees | 1Cases: F; IT; NO; P | / | 0Cases: A; D; E; F; G; IR; NE; S |

*Calibration*

The calibration of conditions and the outcome needs to be justified at length, especially where the point of maximum ambiguity is concerned. However, due to the limited space at our disposal, we decided to explain our choices only with regard to the conditions for the combination of policy instruments we present in the empirical section of the paper. Otherwise, this appendix would have been extremely long and very difficult to read and understand.

Regarding R1 (the rules of accreditation, evaluation and assessment), we were quite selective in choosing 6 as the point of maximum ambiguity. This choice was made according to the theoretical assumption that these types of regulatory activities are based on the will of the decision makers, who have decided to delegate some autonomy to universities and to monitor and check whether those universities are behaving as expected. Thus, this approach could be considered a specific application of the principal/agent theory, in which there is a constant risk of moral hazard (Moe 1984): universities, in fact, can interpret the accreditation of degree courses simply as a compliance process, without any real attention to substantial quality, or can be capable of finding ‘opportunistic’ strategies to address the periodic evaluation of research (Lane and Kivisto 2008). Thus, to avoid this risk, decision makers are expected to intervene often on the rules of accreditation, evaluation and assessment (Schwarz and Westerheijden 2007; Joao Rosa and Amaral 2014): these recurrent interventions, in fact, are assumed to amend any unwanted results. According to these assumptions, we rewarded the countries (Norway, Italy, France, Ireland and Portugal) that have shown attention over time to the rules and regulations of accreditation, evaluation and assessment, thus charging the related instrumental shape of specific regulative relevance in their HE policies.

Regarding R10 (more opportunities for universities concerning institutional governance and administrative procedures), according to the comparative literature on the diachronic evolution of institutional autonomy (Huisman 2009; Shattock 2014; Capano, Regini and Turri 2016), we based our calibration on the assumption that the process of ‘autonomization’ for universities (in countries where universities were historically not autonomous, that is, in 10 out of 12 in our sample) is not a one-shot game but requires more than one decision to find an equilibrium point, whereas exactly because institutional autonomy is given by the state, the state can intervene at various times to adjust the autonomistic policy. Importantly, the process of autonomization requires time and various interventions to reach a stable equilibrium. Thus, we properly rewarded all the countries that, in the considered period of time, repeatedly intervened in enlarging the margins of institutional autonomy for universities (Norway, Denmark, Finland, France, Greece and the Netherlands). We fixed 5 as the point of maximum ambiguity based on the consideration that these rules need continuous calibration and that having one intervention every 4 years or more can be considered an indicator of carelessness or bad governing. It should be noted that among the six countries below the point of maximum ambiguity, Sweden significantly increased the institutional autonomy of its universities before 1995, while institutional autonomy in England was already very high in the 1980s.

The calibration of instrumental shape R12 (rules on teaching goals) required particular reflection, especially because the specialized literature on HE was not helpful (no empirical or analytical attention has been given to this dimension of governmental steering). However, according to the ‘steering at a distance’ template (Van Vught 1989; Capano 2011), governments should be more interested in fixing the systemic goals than in controlling procedures and processes. Thus, governments are expected to fix some systemic goals that address universities’ behavior. For this reason, we proceeded by rewarding the countries that made more decisions to address systemic goals in teaching (Finland, Norway and Sweden). Then, we fixed the point of maximum ambiguity to reward those countries that reiterated the decision on this issue more than twice (Denmark and the Netherlands), showing that this choice was part of a conscious medium-run strategy and was not based on chance or contingency.

The instrumental shape E5 (performance-based institutional funding) has also been used a few times by certain countries. Here, the calibration was based on the following assumptions (Frølich, Schmidt and Roma 2010; Flannery D. & C. O’Donoghue 2011; Jonkers and Zacharewicz 2016; Zacharewicz *et al*. 2018):

1. Performance funding is one of the fundamental characteristics of the ‘steering at a distance’ template.
2. Performance funding is a suitable instrumental shape through which governments can address institutional behavior.
3. Performance funding can undergo moral hazard and can show some unexpected outcomes (if designed in an inappropriate way).
4. Performance funding is based on goals that can change over time.

According to these assumptions, we should expect that governments can intervene at various times to change the actual rules of performance funding (to correct design mistakes and unexpected results and to overcome moral hazard due to changing goals). Thus, we rewarded the countries that intervened more than one time per decade (this approach justifies 2.5 as the point of maximum ambiguity).

The calibration of T3 is very problematic to theorize. It was included in the list of instrumental shapes according to the main types of fees working in other policy fields, but we expected it to be almost non-existent in HE, where tuition fees are based on criteria such as covering all or part of the costs or are income based. For this reason, we assumed that the use of this type of instrumental shape should be rare and almost experimental; thus, we theorized it in a dichotomous way: it is either absent or present. In other words, this condition is more crisp than fuzzy.

Overall, the calibration of conditions did not stem only from theoretical considerations but was also conducted by looking at whether countries remained above or below the point of maximum ambiguity. Although QCA scholars strongly recommend returning exclusively to ‘theoretical’ rather than empirical or even ‘arithmetical’ considerations when locating thresholds for calibration (Schneider and Wagemann 2010, 403), with regard to policy tools, it was difficult to find theoretical reasons suggesting a particular value in the literature, and we were forced to propose our own theorizations. In contrast, many qualitative studies assess whether a given country devoted particular attention to a set of policy instruments when shaping its HES, whereas other countries followed a different path. Thus, our choices originated from a mix of theoretical reasons and reasons based on previous empirical research.

Finally, for the outcome, we considered an increase of 30 percentage points in our indicator of teaching performance as the threshold for full membership, an increase of 25 percentage points as the point of maximum ambiguity, and an increase of 20 percentage points in the average value of the prior twenty years as the threshold for full non-membership. This choice was not simple because no study addresses this issue. We assumed that the countries that were capable of improving their performance by an average of at least 1.5 percentage points per year could be very effective. In addition, the point of maximum ambiguity was difficult to maintain because it affected the final assessment of the analyzed countries. Overall, the selection procedure placed all the countries that started with higher scores in 1996 above the ambiguity point to reward their efforts related to the outcome. Moreover, the gap between Greece (26.89) and France (22.50) appeared to be a ‘natural’ place to put the maximum ambiguity point (25.00). Finally, in a context of diffused increases, a pace of 1.0 point per year seemed a reasonable threshold for full non-membership.

*Analysis of the necessary conditions for improving teaching performance*

Once the sets were calibrated, the second step of each QCA involves analyzing the necessary relations and should always be conducted *before* analyzing the sufficiency conditions (Schneider and Wagemann 2010, 404). See Table AA3 on this topic:

Table AA3 *Analysis of necessary conditions. Outcome: (adjusted) variation in the % of 25-34-year-old adults attaining a university degree (1996-2015)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Outcome* |  | *~Outcome* |  |
| *Condition* | *Consistency* | *Coverage* | *Consistency* | *Coverage* |
| R1 | 0.45 | 0.59 | 0.78 | 0.62 |
| ~R1 | 0.71 | 0.84 | 0.48 | 0.35 |
| R2 | 0.68 | 0.66 | 0.78 | 0.46 |
| ~R2 | 0.45 | 0.77 | 0.43 | 0.44 |
| R3 | 0.65 | 0.67 | 0.64 | 0.40 |
| ~R3 | 0.41 | 0.65 | 0.47 | 0.45 |
| R4 | 0.64 | 0.73 | 0.60 | 0.42 |
| ~R4 | 0.49 | 0.67 | 0.61 | 0.51 |
| R5 | 0.40 | 0.57 | 0.73 | 0.63 |
| ~R5 | 0.74 | 0.82 | 0.50 | 0.33 |
| R6 | 0.39 | 0.54 | 0.80 | 0.67 |
| ~R6 | 0.76 | 0.86 | 0.45 | 0.31 |
| R7 | 0.58 | 0.79 | 0.45 | 0.37 |
| ~R7 | 0.54 | 0.61 | 0.75 | 0.52 |
| R8 | 0.65 | 0.75 | 0.53 | 0.38 |
| ~R8 | 0.46 | 0.62 | 0.65 | 0.53 |
| R9 | 0.49 | 0.66 | 0.58 | 0.48 |
| ~R9 | 0.61 | 0.71 | 0.59 | 0.41 |
| R10 | 0.64 | 0.81 | 0.51 | 0.39 |
| ~R10 | 0.51 | 0.63 | 0.75 | 0.56 |
| R11 | 0.58 | 0.64 | 0.69 | 0.46 |
| ~R11 | 0.51 | 0.73 | 0.46 | 0.40 |
| R12 | 0.62 | 0.88 | 0.34 | 0.29 |
| ~R12 | 0.50 | 0.56 | 0.86 | 0.58 |
| E1 | 0.67 | 0.73 | 0.63 | 0.42 |
| ~E1 | 0.47 | 0.68 | 0.60 | 0.53 |
| E2 | 0.49 | 0.74 | 0.49 | 0.45 |
| ~E2 | 0.64 | 0.67 | 0.72 | 0.46 |
| E3 | 0.46 | 0.76 | 0.45 | 0.46 |
| ~E3 | 0.67 | 0.67 | 0.76 | 0.46 |
| E4 | 0.64 | 0.79 | 0.49 | 0.37 |
| ~E4 | 0.49 | 0.61 | 0.72 | 0.55 |
| E5 | 0.63 | 0.73 | 0.56 | 0.40 |
| ~E5 | 0.49 | 0.65 | 0.63 | 0.51 |
| E6 | 0.45 | 0.65 | 0.52 | 0.46 |
| ~E6 | 0.63 | 0.68 | 0.61 | 0.40 |
| T1 | 0.43 | 0.53 | 0.72 | 0.54 |
| ~T1 | 0.63 | 0.79 | 0.38 | 0.29 |
| T2 | 0.38 | 0.56 | 0.70 | 0.62 |
| ~T2 | 0.74 | 0.80 | 0.51 | 0.33 |
| T3 | 0.30 | 0.51 | 0.54 | 0.57 |
| ~T3 | 0.75 | 0.73 | 0.53 | 0.32 |
| I1 | 0.58 | 0.74 | 0.62 | 0.48 |
| ~I1 | 0.59 | 0.72 | 0.66 | 0.49 |
| I2 | 0.49 | 0.75 | 0.47 | 0.43 |
| ~I2 | 0.62 | 0.66 | 0.72 | 0.47 |
| I3 | 0.63 | 0.69 | 0.75 | 0.50 |
| ~I3 | 0.55 | 0.78 | 0.53 | 0.46 |

Coefficients indicating a necessity relation (>0.9) are shown in bold.

Logical No (~) refers to the absence of a condition.

Table AA3 demonstrates that no condition (and its non-occurrence, which is indicated with a tilde [~]) is necessary for the outcome.

*Analysis of the sufficient conditions for improving teaching performance*

Table AA4 *Policy instrument mixes from the literature*

|  |  |
| --- | --- |
| *Policy mix* | *Combination of instrumental shapes* |
| *Four conditions* |  |
| Combination 1 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); E2 (Subsidies and lump-sum funding); I1 (Transparency) |
| Combination 2 | R2 (Agency for assessment, evaluation and accreditation); E4 (Loans); E5 (Performance based institutional funding); I1 (Transparency) |
| Combination 3 | R2 (Agency for assessment, evaluation and accreditation); R4 (Content of curricula: more opportunities); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding) |
| Combination 4 | R4 (Content of curricula: more opportunities); R6 (Academic career and recruitment: more opportunities); E1 (Grants); E3 (Targeted funding) |
| Combination 5 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E3 (Targeted funding) |
| Combination 6 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding) |
| Combination 7 | R2 (Agency for assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E3 (Targeted funding) |
| Combination 8 | R2 (Agency for assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding) |
| Combination 9 | R10 (Institutional and administrative governance: more opportunities); R11 (Contracts); T2 (Tax reduction for particular categories of students); I1 (Transparency) |
| Combination 10 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); T1 (Tax exemption) |
| Combination 11 | R8 (Regulation on students admission and taxation: more opportunities); T2 (Tax reduction for particular categories of students); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 12 | R10 (Institutional and administrative governance: more opportunities); T2 (Tax reduction for particular categories of students); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 13 | R1 (Assessment, evaluation and accreditation); R9 (Institutional and administrative governance: more constraints); E3 (Targeted funding); E5 (Performance based institutional funding) |
| Combination 14 | E3 (Targeted funding); E5 (Performance based institutional funding); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 15 | R4 (Content of curricula: more opportunities); E3 (Targeted funding); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 16 | R4 (Content of curricula: more opportunities); E5 (Performance based institutional funding); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 17 | R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 18 | R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 19 | R1 (Assessment, evaluation and accreditation); R4 (Content of curricula: more opportunities); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding) |
| Combination 20 | R1 (Assessment, evaluation and accreditation); R4 (Content of curricula: more opportunities); R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding) |
| Combination 21 | R1 (Assessment, evaluation and accreditation); R2 (Agency for assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12(Rules on goals in teaching) |
| Combination 22 | R9 (Institutional and administrative governance: more constraints); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); E6 (Standard cost per student) |
| Combination 23 | R9 (Institutional and administrative governance: more constraints); R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding); E5(Performance based institutional funding) |
| Combination 24 | R4 (Content of curricula: more opportunities); R6 (Academic career and recruitment: more opportunities); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding) |
| Combination 25 | R4 (Content of curricula: more opportunities); R6 (Academic career and recruitment: more opportunities); R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding) |
| Combination 26 | R10 (Institutional and administrative governance: more opportunities); I1 (Transparency); I2 (Certifications); I3 (Monitoring and reporting) |
| Combination 27 | R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| Combination 28 | R8 (Regulation on students admission and taxation: more opportunities); R10 (Institutional and administrative governance: more opportunities); T1 (Tax exemption); T3 (Service-based student fees) |
| Combination 29 | R8 (Regulation on students admission and taxation: more opportunities); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); E6 (Standard cost per student) |
| Combination 30 | R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| *Five conditions* |  |
| Combination 31 | R1 (Assessment, evaluation and accreditation); R2 (Agency for assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding) |
| Combination 32 | R9 (Institutional and administrative governance: more constraints); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); E6 (Standard cost per student); T3 (Service-based student fees) |
| Combination 33 | R9 (Institutional and administrative governance: more constraints); R10 (Institutional and administrative governance: more opportunities); R11 (Contracts); E3 (Targeted funding); E5 (Performance based institutional funding) |
| Combination 34 | R4 (Content of curricula: more opportunities); R6 (Academic career and recruitment: more opportunities); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| Combination 35 | R4 (Content of curricula: more opportunities); R6 (Academic career and recruitment: more opportunities); R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding); E5 (Performance based institutional funding) |
| Combination 36 | R10 (Institutional and administrative governance: more opportunities); R11 (Contracts ); I1 (Transparency); I2 (Certifications); I3 (Monitoring and reporting) |
| Combination 37 | R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E3 (Targeted funding); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| Combination 38 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding); I1 (Transparency)  |
| Combination 39 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| Combination 40 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); T2 (Tax reduction for particular categories of students); I1 (Transparency); I3 (Monitoring and reporting) |
| Combination 41 | R1 (Assessment, evaluation and accreditation); R4 (Content of curricula: more opportunities); R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding); E5 (Performance based institutional funding) |
| Combination 42 | R1 (Assessment, evaluation and accreditation); R4 (Content of curricula: more opportunities); R10 (Institutional and administrative governance: more opportunities); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| Combination 43 | R4 (Content of curricula: more opportunities); R6 (Academic career and recruitment: more opportunities); E3 (Targeted funding); E5 (Performance based institutional funding); I3 (Monitoring and reporting) |
| Combination 44 | R9 (Institutional and administrative governance: more constraints); R10 (Institutional and administrative governance: more opportunities); E3 (Targeted funding); E5 (Performance based institutional funding); T3 (Service-based student fees) |
| Combination 45 | R1 (Assessment, evaluation and accreditation); R10 (Institutional and administrative governance: more opportunities); R12 (Rules on goals in teaching); E5 (Performance based institutional funding); T3 (Service-based student fees) |

Table AA5 *Configurations of instrumental shapes in a comparative perspective: consistency, coverage, solution terms and cases covered*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Mix* | *Cons* | *Cov* | *Sol\_1* | *Cases* | *Sol\_2* | *Cases* | *Sol\_3* | *Cases* | *Sol\_4* | *Cases* |
| *4 conditions* |  |  |  |  |  |  |  |  |  |  |
| Combination 1 | 0.82 | 0.79 | ~R1 | **A**; D; E; FI; G; NE; S | R10\*E2\*I1 | G; NO | / | / | / | / |
| Combination 2 | 0.81 | 0.73 | Six (6) solution terms: too many |
| Combination 3 | 0.80 | 0.62 | Coverage value is too low |
| Combination 4 | 0.87 | 0.75 | ~R4\*~R6 | E; FI | R4\*E1 | D; G; NE; NO; S | / | / | / | / |
| Combination 5 | 0.85 | 0.75 | R12 | D; FI; NE; NO; S | R10\*~R1 | D; FI; G; NE | R10\*~E3 | G; NE; NO | / | / |
| Combination 6 | 0.89 | 0.83 | R12 | D; FI; NE; NO; S | E5\*R1 | E; FI; G | / | / | / | / |
| Combination 7 | 0.87 | 0.70 | R10\*R12 | D; FI; NE; NO | R2\*R12 | D; NO; S | R2\*R10\*~E3 | G; NO | / | / |
| Combination 8 | 0.87 | 0.69 | Coverage value is too low |
| Combination 9 | 0.74 | 0.81 | Consistency value is too low |
| Combination 10 | 0.87 | 0.81 | ~R1\*~T1 | E; G; NE; S | R10\*~R1 | D; FI; G; NE | R10\*E5 | FI; G; NO | / | / |
| Combination 11 | 0.89 | 0.79 | Five (5) solution terms: too many |
| Combination 12 | 0.89 | 0.85 | I3\*~T2 | D; G; NO; S | R10\*~T2 | D; FI; G; NE; NO | T2\*~R1\*~I3 |  E | R10\*I1\*I3 | D; G; NO |
| Combination 13 | 0.94 | 0.60 | Coverage value is too low |
| Combination 14 | 0.79 | 0.64 | Coverage value is too low |
| Combination 15 | 0.74 | 0.77 | Consistency value is too low |
| Combination 16 | 0.77 | 0.89 | R4 | **A**; D; **FR**; G; NE; NO; S | E5\*~I1 | E; FI | E5\*~I3 | E; FI | / | / |
| Combination 17 | 0.79 | 0.83 | ~I3 | E; FI; **FR**; NE; **P** | R10 | D; FI; **FR**; G; NE; NO | / | / | / | / |
| Combination 18 | 0.87 | 0.65 | Coverage value is too low |
| Combination 19 | 0.90 | 0.74 | E5\*~R1\*~R4 | E; FI | R4\*~R1\*R10 | D; G; NE | R4\*R10\*E5 | G; NO | / | / |
| Combination 20 | 0.92 | 0.74 | ~R1\*~R4 | E; FI | R10\*~R1 | D; FI; G; NE | R4\*R10\*~E3 | G; NE; NO | / | / |
| Combination 21 | 0.86 | 0.87 | ~R2 | E; FI; NE | R12 | D; FI; NE; NO; S | R10\*~R1 | D; FI; G; NE | / | / |
| Combination 22 | 0.87 | 0.74 | E5\*~R9 | E; NO | E5\*~E6 | E; G | R10\*~R9 | D; NE; NO | / | / |
| Combination 23 | 0.86 | 0.63 | Coverage value is too low |
| Combination 24 | 0.90 | 0.72 | E5\*~R4\*~R6 | E; FI | R4\*~R6\*R10 | D; NE; NO | R4\*R10\*E5 | G; NO | / | / |
| Combination 25 | 0.93 | 0.74 | ~R4\*~R6 | E; FI | R10\*~R6 | D; FI; NE; NO | R4\*R10\*~E3 | G; NE; NO | / | / |
| Combination 26 | 0.83 | 0.77 | R10 | D; FI; **FR**; G; NE; NO | I2\*~I3 | E; FI; **FR** |  |  |  |  |
| Combination 27 | 0.89 | 0.77 | E5\*~I3 | E; FI | R10\*~E3 | G; NE; NO | R10\*I3 | D; G; NO | / | / |
| Combination 28 | 0.91 | 0.61 | Coverage value is too low |
| Combination 29 | 0.87 | 0.63 | Coverage value is too low |
| Combination 30 | 0.87 | 0.81 | E5\*~I3 | E; FI | R12\*I3 | D; NO; S | R10\*E5 | FI; G; NO | R10\*R12 | D; FI; NE; NO |
| *5 conditions* |  |  |  |  |  |  |  |  |  |  |
| Combination 31 | 0.85 | 0.82 | Five (5) solution terms: too many |
| Combination 32 | 0.90 | 0.92 | R10\*~R9 | D; NE; NO | R10\*E5 | FI; G; NO | ~R1\*~E6\*~T3 | E; S | R9\*E5\*~T3 | G; IR |
| Combination 33 | 0.86 | 0.71 | Coverage value is too low |
| Combination 34 | 0.88 | 0.78 | E5\*~R6 | E; FI; NO | E5\*~I3 | E; FI | R10\*~R4\*~R6 | D; NE; NO | R4\*R10\*E5 | G; NO |
| Combination 35 | 0.91 | 0.74 | E5\*~R4\*~R6 | E; FI | R4\*~R6\*R10 | D; NE; NO | R10\*E3\*E5 | FI | R4\*R10\*E5 | G; NO |
| Combination 36 | 0.89 | 0.74 | R10\*~R11 | FI; NE | I2\*I3\*~R11 | S | R10\*I1\*I3 | D; E; G; NO | R11\*~R1\*I2\*~I3 | E |
| Combination 37 | 0.87 | 0.81 | E5\*~I3 | E; FI | R12\*I3 | D; NO; S | R10\*E5 | FI; G; NO | R10\*R12 | D; FI; NE; NO |
| Combination 38 | 0.85 | 0.83 | R12 | D; FI; NE; NO; S | E5\*~R1 | E; FI; G | E5\*~I1 | E; FI | R10\*E5 | FI; G; NO |
| Combination 39 | 0.87 | 0.81 | Five (5) solution terms: too many |
| Combination 40 | 0.89 | 0.86 | Five (5) solution terms: too many |
| Combination 41 | 0.90 | 0.74 | E5\*~R1\*~R4 | E; FI | R4\*R10\*~R1 | D; G; NE | R10\*E3\*E5 | FI | R4\*R10\*E5 | G; NO |
| Combination 42 | 0.89 | 0.76 | E5\*~R1 | E; FI; G | E5\*~I3 | E; FI | R4\*R10\*~R1 | D; G; NE | R4\*R10\*E5 | G; NO |
| Combination 43 | 0.88 | 0.80 | Seven (7) solution terms: too many |
| Combination 44 | 0.89 | 0.82 | E5\*~T3 | E; G; IR | R10\*~R9 | D; NE; NO | R10\*E5 | FI; G; NO | / | / |
| Combination 45 | 0.90 | 0.91 | R12 | D; FI; NE; NO; S | E5\*~T3 | E; G; IR | / | / | / | / |

Empirically contradictory cases are shown in bold.

Table AA6 *Combination 45: truth table*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *R1* | *R10* | *R12* | *E5* | *T3* | *Number* | *outcome* | *Raw consist.* | *PRI consist.* | *SYM consist.* |
| 0 | 1 | 1 | 1 | 1 | 1 (66%) | 1 | 0.99 | 0.98 | 0.98 |
| 0 | 1 | 1 | 0 | 0 | 2 (16%) | 1 | 0.97 | 0.95 | 0.95 |
| 0 | 0 | 0 | 1 | 0 | 1 (91%) | 1 | 0.96 | 0.93 | 0.93 |
| 0 | 1 | 0 | 1 | 0 | 1 (75%) | 1 | 0.95 | 0.91 | 0.91 |
| 0 | 0 | 1 | 0 | 0 | 1 (83%) | 1 | 0.95 | 0.90 | 0.90 |
| 1 | 1 | 1 | 1 | 1 | 1 (25%) | 1 | 0.92 | 0.87 | 0.91 |
| 1 | 0 | 0 | 1 | 0 | 1 (50%) | 1 | 0.84 | 0.75 | 0.75 |
| 1 | 1 | 0 | 0 | 0 | 1 (33%) | 0 | 0.65 | 0.35 | 0.35 |
| 0 | 0 | 0 | 0 | 0 | 1 (100%) | 0 | 0.64 | 0.28 | 0.28 |
| 1 | 0 | 0 | 0 | 1 | 1 (58%) | 0 | 0.49 | 0.10 | 0.10 |
| 1 | 0 | 0 | 1 | 1 | 1 (41%) | 0 | 0.41 | 0.07 | 0.07 |

……………… (20 more combinations of conditions without empirical cases) ………………

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 0 | 1 | 0 (100%) | / | / | / | / |

Theoretical assumptions: all conditions should contribute to the outcome when they are present.

Complex solution: R12\*~R1\*~E5\*~T3 + E5\*~R10\*~R12\*~T3 + E5\*~R1\*~R12\*~T3 + R10\*R12\*E5\*T3 (coverage 0.85; consistency 0.95).

Parsimonious solution: R12 + R10\*~R1 + E5\*~T3 + T3\*~R1 +R10\*T3 + R1\*~R10\*~T3 (coverage 0.95; consistency 0.85).

Twenty-one logical remainders exist. Thus, twenty-one combinations of conditions are not characterized by any empirical case, and problems of limited diversity are present in our data. Consequently, the solution formulas – complex, parsimonious and intermediate – are not interchangeable: indeed, in QCA, solution formulas differ based on the assumptions on logical remainders. The complex solution does not include remainder rows when minimizing the consistent rows with cases. The parsimonious solution treats remainders as ‘do not care’, stimulating outcome values to obtain parsimony. Conversely, the intermediate solution evaluates the plausibility of remainders in accordance with the researcher’s simplifying assumptions based on theoretical or substantive empirical knowledge. Even though the most advanced methodological literature does not reach consensus on this issue (Thiem 2016; Thiem *et al*. 2015), it is generally suggested that one should consider the intermediate solution in these cases to lower the risk of drawing incorrect inferences about the automatic counterfactuals used in the parsimonious and complex solution[[2]](#footnote-2) (Ragin 2008, 175; Jano 2016, 15).

**Online Supplementary Material: Appendix B – Robustness check**

Table AB1 *Analysis of necessary conditions (5-year time lag). Outcome: (adjusted) variation in the % of 25-34-year-old adults attaining a university degree (1996-2015)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Outcome* |  | *~Outcome* |  |
| *Condition* | *Consistency* | *Coverage* | *Consistency* | *Coverage* |
| R1 | 0.53 | 0.61 | 0.78 | 0.54 |
| ~R1 | 0.60 | 0.82 | 0.44 | 0.36 |
| R2 | 0.70 | 0.82 | 0.49 | 0.35 |
| ~R2 | 0.44 | 0.59 | 0.74 | 0.60 |
| R3 | 0.62 | 0.70 | 0.62 | 0.43 |
| ~R3 | 0.49 | 0.68 | 0.57 | 0.48 |
| R4 | 0.63 | 0.77 | 0.58 | 0.43 |
| ~R4 | 0.53 | 0.68 | 0.69 | 0.53 |
| R5 | 0.32 | 0.71 | 0.44 | 0.60 |
| ~R5 | 0.82 | 0.71 | 0.79 | 0.41 |
| R6 | 0.49 | 0.64 | 0.74 | 0.59 |
| ~R6 | 0.69 | 0.81 | 0.55 | 0.40 |
| R7 | 0.42 | 0.73 | 0.40 | 0.42 |
| ~R7 | 0.68 | 0.65 | 0.75 | 0.44 |
| R8 | 0.47 | 0.76 | 0.46 | 0.45 |
| ~R8 | 0.66 | 0.67 | 0.76 | 0.46 |
| R9 | 0.49 | 0.82 | 0.38 | 0.39 |
| ~R9 | 0.64 | 0.63 | 0.83 | 0.50 |
| R10 | 0.08 | 0.59 | 0.14 | 0.63 |
| ~R10 | **0.95** | 0.64 | 0.81 | 0.38 |
| R11 | 0.49 | 0.61 | 0.66 | 0.50 |
| ~R11 | 0.59 | 0.74 | 0.48 | 0.37 |
| R12 | 0.60 | 0.81 | 0.43 | 0.36 |
| ~R12 | 0.53 | 0.60 | 0.77 | 0.54 |
| E1 | 0.72 | 0.80 | 0.54 | 0.36 |
| ~E1 | 0.42 | 0.60 | 0.70 | 0.61 |
| E2 | 0.57 | 0.80 | 0.49 | 0.42 |
| ~E2 | 0.59 | 0.66 | 0.77 | 0.52 |
| E3 | 0.42 | 0.76 | 0.41 | 0.45 |
| ~E3 | 0.70 | 0.66 | 0.79 | 0.45 |
| E4 | 0.62 | 0.81 | 0.48 | 0.38 |
| ~E4 | 0.53 | 0.63 | 0.76 | 0.55 |
| E5 | 0.71 | 0.85 | 0.43 | 0.31 |
| ~E5 | 0.42 | 0.55 | 0.79 | 0.62 |
| E6 | 0.26 | 0.74 | 0.32 | 0.55 |
| ~E6 | 0.84 | 0.67 | 0.85 | 0.41 |
| T1 | 0.41 | 0.73 | 0.35 | 0.38 |
| ~T1 | 0.65 | 0.62 | 0.74 | 0.44 |
| T2 | 0.27 | 0.68 | 0.39 | 0.59 |
| ~T2 | 0.84 | 0.69 | 0.79 | 0.40 |
| T3 | 0.30 | 0.66 | 0.35 | 0.46 |
| ~T3 | 0.75 | 0.65 | 0.74 | 0.39 |
| I1 | 0.35 | 0.68 | 0.54 | 0.63 |
| ~I1 | 0.81 | 0.74 | 0.72 | 0.41 |
| I2 | 0.50 | 0.84 | 0.32 | 0.32 |
| ~I2 | 0.60 | 0.59 | 0.85 | 0.51 |
| I3 | 0.43 | 0.66 | 0.63 | 0.58 |
| ~I3 | 0.73 | 0.76 | 0.63 | 0.40 |

Coefficients indicating a necessity relation (>0.9) are shown in bold.

Logical No (~) refers to the absence of a condition.

Here, it was observed that the absence of R10 (more institutional autonomy) was necessary for the outcome. This evidence raises relevant questions about whether increasing universities’ institutional autonomy (in terms of self-governance powers) plays a positive role by having a direct effect on improving the systemic performance in HE, as is very often underlined by the specialized literature.

Table AB2 *Combination 38 (5 year-time-lag): truth table*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *R1* | *R10* | *R12* | *E5* | *I1* | *Number* | *outcome* | *Raw consist.* | *PRI consist.* | *SYM consist.* |
| 0 | 0 | 1 | 1 | 0 | 1 (91%) | 1 | 0.96 | 0.94 | 0.94 |
| 0 | 0 | 1 | 0 | 0 | 2 (50%) | 1 | 0.92 | 0.87 | 0.87 |
| 0 | 0 | 0 | 1 | 0 | 2 (66%) | 1 | 0.90 | 0.85 | 0.85 |
| 1 | 0 | 1 | 1 | 0 | 2 (16%) | 1 | 0.85 | 0.78 | 0.78 |
| 1 | 0 | 0 | 1 | 1 | 1 (83%) | 1 | 0.81 | 0.70 | 0.70 |
| 0 | 0 | 0 | 0 | 1 | 1 (100%) | 0 | 0.68 | 0.41 | 0.41 |
| 1 | 0 | 1 | 0 | 1 | 1 (75%) | 0 | 0.51 | 0.17 | 0.17 |
| 1 | 0 | 0 | 0 | 0 | 2 (33%) | 0 | 0.48 | 0.26 | 0.26 |
| 1 | 1 | 1 | 1 | 1 | 0 (100%) | / | / | / | / |

……………… (22 more combinations of conditions without empirical cases) ………………

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | 0 (100%) | / | / | / | / |

Theoretical assumptions: all conditions should contribute to the outcome when they are present.

Complex solution: R12\*~R1\*~R10\*~I1 + E5\*~R1\*~R10\*~I1 + E5\*~R10\*R12\*~I1 + R1\*~R10\*~R12\*E5\*I1 (coverage 0.75; consistency 0.89).

Parsimonious solution: R10 + E5 + ~R1\*~I1 + R12\*~I1 + R12\*~R1 + R1\*~R12\*I1 (coverage 0.92; consistency 0.84).

Table AB3 *Combination 38 (5 year-time-lag): intermediate solution*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Solution terms* | *Raw coverage* | *Unique coverage* | *Consistency* | *Cases covered* |
| E5 | 0.71 | 0.31 | 0.85 | Eng (0.86, 0.95); Fin (0.86, 0.77); Gre (0.65, 0.76); Ire (0.65, 0.98); Nor (1, 0.91); Swe (0.65, 0.98) |
| R12\*~R1 | 0.38 | 0.00 | 0.94 | Den (0.65, 0.93); Fin (0.68, 0.77); Ned (0.65, 0.77) |
| R12\*~I1 | 0.56 | 0.04 | 0.89 | Den (0.65, 0.93); Fin (0.78, 0.77); Ned (0.65, 0.77); Nor (0.61, 0.91); Swe (0.95, 0.98) |

Solution coverage (proportion of membership explained by all paths identiﬁed): 0.871314

Solution consistency (‘how closely a perfect subset relation is approximated’) (Ragin 2008, 44): 0.856390

Raw coverage: proportion of memberships in the outcome explained by a single path.

Unique coverage: ‘proportion of memberships in the outcome explained solely by each individual solution term’ (Ragin 2008, 86).

Empirically contradictory cases are shown in bold.

This robustness check strongly demonstrated that R12 and E5 matter (by assuming an almost immediate effect of the newly adopted instruments, similar to the results of the analysis we conducted in the paper). The presence of three solution terms rather than two – as in the best combination that emerged in the paper – simply shows that the presence of R12 requires the absence of specific other conditions to work; at the same time, it emerges that E5 in this combination also includes three Nordic countries. These two differences do not undermine the combination chosen in the paper but demonstrate an observation that was clearly underlined in the paper, especially in the discussion and conclusion: that the actual condition can be the last step in a specific sequence of choices.

Figure AB1 *The ‘best policy mix’ (5 year-time-lag): final XY plot*



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1. We use the direct method of calibration (Ragin 2008, 85): once qualitative anchors have been chosen, QCA software applies a logarithmic function and attributes fuzzy values to the remaining cases. [↑](#footnote-ref-1)
2. For the sake of transparency, as Thiem (2016) suggests, we also present both the complex solution and the parsimonious solution. [↑](#footnote-ref-2)