Beyond the Binary: Non-binary Students in a European Country Comparison and Methodological Considerations on Surveying Gender

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Abstract Gender is a complex variable that is no longer understood as a binary construct. It is a constant task of social science to critically question variables and survey instruments and to close the gap between theory and empiricism. Thus, higher education research must also design the measurement of gender in such a way that gender-inclusive and theoretically valid results can be gained. To date, trans and inter students have hardly been included in the analyses of European higher education research. This paper presents the first European comparative analysis of non-binary students based on the EUROSTUDENT VII microdata set published in 2023 (Cuppen, 2023). This dataset covers 17 countries of which eight include information on more than fe(male) students. Bivariate-descriptive as well as multivariate analyses based on these eight countries show that students with a non-binary gender indication are more likely to be affected by psychological stress and financial difficulties across countries and are more often considering dropping out of their studies. Thus, non-binary students belong to the group of vulnerable and disadvantaged students whose inclusion is claimed to be essential in the "Principles and Guidelines to Strengthen the Social Dimension of Higher Education" (Advisory Group 1 on Social Dimension, 2020) for the European Higher Education Area (EHEA). The methodological obstacles encountered during the research process are used to reify the criticism of the operationalisation of gender in quantitative research. Finally, possibilities for improved gender measurement are discussed. Accordingly, the paper provides answers to two research questions: (1) In which aspects does the study and life situation differ between students with a non-binary gender indication and those with a female or male gender indication in an international comparison? (2) How can a gender-sensitive and research-practical set of gender questions be implemented in student surveys?

Keywords EUROSTUDENT · Non-binary gender · Mental health · Dropout · Gender mesurements

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1 Introduction

The conventional construction of gender in social sciences typically simplifies human beings into two categories: men and women. Accordingly, all people can be classified into one of these categories, and the task of social research is to investigate the differences between these two groups. But the social world is much more complex in reality.

Similar to earlier feminist perspectives in regard to the construction of women as subordinate to men, a queer-feminist perspective exposes the binary categorisation of gender as a powerful, socially constructed order that limits individuals beyond conventional norms and deprives people of opportunities to live—or even to survive as recognised subjects (Butler, 2004). In most cultures, people with a certain "biological makeup" (Morgenroth et al., 2021, p. 731) are still expected to develop either a female or a male body, identify as a woman or a man and behave according to female or male stereotypes. This reveals what is described in queer-feminist theory as heteronormative hegemony (Ludwig, 2011), a concept that also criticises the notion that gender is a binary construct and differences between women and men are inherently natural.[1]

In recent years, this critical perspective has gradually influenced legal frameworks, medical practices, language usage, and everyday situations, creating space for individuals existing beyond the categories of man and woman. Consequently, empirical social sciences face the challenge of expanding their gender categories to encompass intersex and transgender individuals in their analyses.[2] While there has been contemplation on this matter for more than 25 years (Sumerau et al., 2017), the actual implementation in research practices is slow and comes with unresolved challenges. So, there is also a need for improvement in European higher education research, both in the inclusion of intersex and transgender students in the analyses and in the methodology of data collection on gender.

To fill in the gaps, this article reports the results of the first international comparative analysis of the study and living conditions of students with a non-binary gender indication across European countries (Dau, 2023). The analysis is based on the microdata obtained from the EUROSTUDENT VII project, in which data from student

[1] "Heteronormativity organizes a set of beliefs, social practices, and relationships of identity that presume heterosexuality *and* enforce **binary gender** norms." (Staley, 2022, p. 250, emphasis in original).

[2] While people are described as cisgender if their sex assigned at birth (female/male) matches their current gender identity (usually translated as woman/man), individuals are described as transgender if their sex assigned at birth differs from their current gender identity or expression. Transgender people can identify with binary (women/men) and non-binary gender categories. Intersex is used as a (self-)description of people with bodily characteristics that do not clearly correspond to the cultural-medical norms of male or female, and they may use different terms for their gender identity. Transgender and intersex people are sometimes also referred to as gender minorities. Not to be confused with terms for sexual minorities based on sexual desire, such as gay, lesbian, bisexual or asexual (see also for an overview of various basic terms here: European Commission, Directorate-General for Justice, 2012).

surveys of European countries are processed and collected for internationally comparable analyses. Finally, the methodological challenges of collecting data on gender are briefly discussed, and a proposal for a new question design is made. The paper, therefore, addresses two questions:

1. In which aspects does the study and life situation of students with a non-binary gender indication differ from those with a female or male gender indication in an international comparison?
2. How can a gender-sensitive and research-practical question about the respondent's gender be implemented in student surveys?

2 State of Research

A quantitative analysis of individuals with a non-binary gender identity encounters an initial challenge due to the limited estimates available regarding their proportion in the general population, which is made more difficult by the lack of standardised counting methods. Some estimates are based solely on bodily visible characteristics (often defined by the term *sex*), while other counts also include the gender identity of individuals in everyday life. One of the reasons for this is that an official registration as non-binary is/was only possible for people with medically confirmed non-binary sexual characteristics so that solely intersexuality is documented in the official statistics. Furthermore, even within medical literature, there is disagreement about which physical characteristics categorise a person as neither 'fully' male nor 'clearly' female because "sex is given by our position in a multidimensional graph (in which the axes represent genotypic sex, gonadal sex, phenotypic sex, and hormonal sex)" (Cresti et al., 2018, p. 562). A frequently quoted estimate of the proportion of intersex people, which includes physical variation at the chromosomal, hormonal, or anatomical level, is around 1.7% of live births (Blackless et al., 2000; Preves, 2002). Moreover, variations in sex characteristics can be present from birth or develop later during puberty. However, these numbers do not include those whose physical characteristics align with the medical definition of female or male but who identify as (non-binary) transgender. But current sources capturing the lived and expressed gender identity are scarce and country-specific. Studies in the United States estimate that approximately 0.6% of adults and adolescents self-identify as transgender (Herman, Flores & O'Neill, 2022). A study among Brazilian adults estimates a prevalence of 0.7% transgender and 1.2% non-binary individuals (Spizzirri et al., 2021), while a study for the United Kingdom estimates a proportion of 1% gender variant people in the general population (GIRES, 2011). Thus, it is reasonable to assume a proportion of up to 2% transgender and intersex individuals in the overall population, though the distribution within the European student population may vary, but for which no official population data is currently available.

The socio-cultural perception, acceptance, and legal reality of people with non-binary gender and/or transgender are very different around the world.[3] Existing studies show that there is more acceptance of these representations and corresponding rights in many European countries but this is also accompanied by political backlash, hate crimes and discriminatory laws, even within a country (European Commission. Directorate General for Justice and Consumers, 2019; ILGA-Europe, 2024; LGBTI Survey Data Explorer, 2024). What can be stated, however, is that the protection of the human rights of transgender people is still insufficient in most countries (Dicklitch-Nelson & Rahman, 2022). In addition to the lack of legal inclusion, the lack of social acceptance of transgender and intersex people is also reflected in particular challenges and frequent forms of discrimination that some studies have found (European Union Agency for Fundamental Rights, 2020; Grant et al., 2011; James et al., 2016; Kasprowski et al., 2021; de Vries et al., 2020).[4] The available information suggests that transgender and intersex people often appear to face mental health problems, such as depression and anxiety, and are exposed to stigmatisation (Bradley, 2020; Zeeman & Aranda, 2020). Individuals with intersex variations also report physical and psychological impacts of medical and surgical treatments, often carried out at birth or during childhood (Blackless et al., 2000; European Union Agency for Fundamental Rights, 2020). Moreover, in the intersex and transgender population, school dropouts and increased levels of suicidal ideation or attempts are frequently observed (Herman et al., 2019; Jones, 2016; McBride, 2021). For European countries, it has been demonstrated that more than half of the intersex and transgender respondents in the LGBTI Survey (European Union Agency for Fundamental Rights, 2020) reported difficulties in making ends meet financially. Reasons for this include higher unemployment rates due to discrimination in the labour market based on their gender expression or transition process (European Union Agency for Fundamental Rights, 2014; de Vries et al., 2020). In summary, existing research findings show that transgender and intersex people often have difficulties with their health and a precarious socio-economic status.

For the situation of students identifying as intersex and transgender in Europe, predominantly critical discussions, field reports, and some recommendations for recognising transgender students at universities exist. For the USA, Beemyn (2019) published the anthology *Trans Students Book*, which provides insightful summaries

[3] The Trans Rights Indicator (TRIP) can be used to track differences in legislation on gender minorities at a global level from 2000 to 2020. The creator of TRIP (Williamson, 2023) has also made a comparison between the existing rights on sexual orientation and those on gender minorities and found that their legal situation and their experiences of discrimination cannot be equated—with rights of gender minorities mostly being worse. Exceptions are countries such as Pakistan and India, which are known for allowing (also non-binary) "gender marker changes once individuals satisfied the prohibitive requirements" (ibid., p. 11), but the rights of lesbians, gays and bisexuals are less legally protected there.

[4] While some of the studies cited compared the experiences of transgender or intersex people with cisgender people (Kasprowski et al., 2021; de Vries et al., 2020), some only compared experiences of discrimination among LGBTI populations (European Union Agency for Fundamental Rights, 2020), and most documented the different discrimination experiences faced by certain gender minority groups (Bradley, 2020; Grant et al., 2011; Herman et al., 2019; Zeeman and Aranda, 2020).

of a range of recent and older studies on transgender and intersex students but also claims that more nuanced research is still needed. However, based on the existing results, it can be observed that transgender and intersex students frequently experience verbal, physical, and sexual assaults. A study conducted in 2009 in England, Wales, and Northern Ireland, for example, reveals that transgender students often experience discrimination in various forms (Valentine & Wood, 2009). For instance, they may avoid using binary-coded restrooms due to fear of verbal or physical attacks and worry about not being addressed with the correct pronouns or names, which increases the likelihood of involuntary disclosure and potential bullying (ibid.). Subsequently, this leads to "stress or loss of confidence, and self-exclusion from specific spaces within the university" (ibid., p. 2), thereby raising the likelihood of skipping classes or abandoning their studies altogether. Furthermore, Garvey and Dolan (2021) illustrate how cis-normativity[5] negatively impacts the academic success of queer and transgender students, primarily drawing on results from US-American students. They state that the academic success of intersex and transgender students is impaired by verbal and physical attacks and stigmatisation in the academic environment, resulting in a sense of exclusion. Moreover, they also mention a lack of financial support from their families as a disadvantage that seems to affect transgender students more often (Rehr & Regan, 2022). This is mainly due to the fact that parents often reject their transgender children and reduce financial support services for this reason (Garvey & Dolan, 2021; Goldberg et al., 2019b; Valentine & Wood, 2009). Garvey and Dolan (2021) also report that experiences of discrimination faced by transgender students result from infrastructural constraints or administrative obstacles, as well as a lack of representation (and role models) in teaching and research.

Overall, the studies and recommendations for action recurrently identify certain areas in which transgender and intersex students encounter discrimination. These are: (a) infrastructural barriers such as binary organised sanitary facilities, changing rooms or accommodation for students; (b) administrative requirements such as registration in university administrative systems; (c) communication in various speaking situations, e.g., during lessons; and (d) representation in research and teaching.

Drawing on the results of the barriers faced by transgender and intersex persons in general and the existing results on non-binary students, it can be stated that those who identify as intersex and transgender are more frequently affected by psychological stress, experiences of discrimination and financial insecurity. Therefore, the hypotheses have emerged that a European country comparison will also show that non-binary students are more affected by

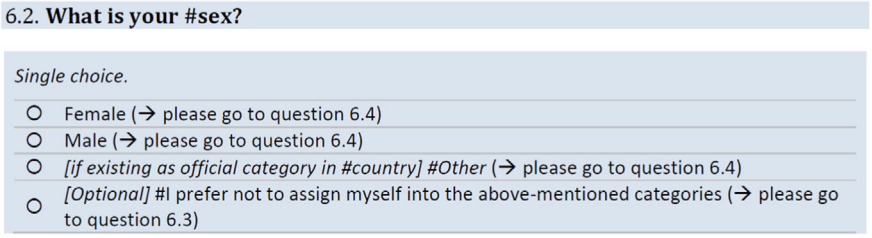
(1) mental health problems,
(2) financial difficulties,
(3) and rate their study situation worse than students in the female or male gender category.

[5] Cis-normativity refers to the idea that all people are (binary) cisgender and that physical sex characteristics determine gender identity and gender expression (see also Lindqvist et al., 2021).

3 Methods

To understand how the results presented in the next section were attained, this section describes how the sex/gender characteristic was collected for the project (see Fig. 1). This also gives an insight into the methodological challenges involved in analysing non-binary students.

The hash # in the question text "What is your #sex?" indicates that the researchers should use the official wording for sex which is common in the higher education statistics of their respective countries. As the English language reveals, the term sex or gender alone results in different theoretical understandings of gender.[6] Therefore, a first ambiguity in the operationalisation used is that it leaves room for interpretation as to which understanding of gender is being surveyed. Hence, respondents cannot conclude if their officially registered sex entry or gender identity is surveyed.[7] Secondly, the response categories are also vaguely formulated, e.g., it remains open what exactly is meant by "Other". In particular, "I prefer not to assign myself" is a 'black box', as several interpretations are possible here. So, on the one hand, it might be that the respondents with a non-binary gender identity cannot or do not want to identify with the term "Other",[8] and "I prefer not to assign myself to


6.2. **What is your #sex?**

Single choice.

- ○ Female (→ please go to question 6.4)
- ○ Male (→ please go to question 6.4)
- ○ *[if existing as official category in #country] #Other* (→ please go to question 6.4)
- ○ *[Optional]* #I prefer not to assign myself into the above-mentioned categories (→ please go to question 6.3)

Fig. 1 Formulation of the sex/gender question for the EUROSTUDENT VII project. *Source* EUROSTUDENT Questionnaire (IHS & DZHW, 2019)

[6] A much discussed and well-known distinction in early feminist debates is that between sex and gender, whereby sex often refers to the physical differences between male and female bodies and gender to social attributions and personal identification. One concern of feminist theory was and is to criticise the fact that conclusions are often drawn from physical characteristics to character traits, which are therefore considered natural and unchangeable. In addition, Judith Butler (1990) is known for having emphasised that what is socially understood as sex is also socially constructed.

[7] The officially registered sex entry usually reflects the assignment made at birth based on the physically visible sexual characteristics at that time. Gender identity can be divided into felt gender identity, externally perceivable gender expression, and one can more or less conform to normative gender role expectations. If only sex/gender (or the country-specific formulation) is used without a short explanatory text, the common understanding is questioned. Here, Queer Theory points out that gender has different dimensions that can diverge.

[8] Because "Other" can be read as a negatively formulated umbrella term for a deviation from the norm of the binary gender. This is when the concept of *Othering* takes place: " […] a practice which may reinforce and reproduce subordination by defining who differs from the norm" (Johnson et al., 2004 in Lindqvist et al., 2021).

the above-mentioned categories" suits them better. On the other hand, it is equally conceivable that respondents solely choose the fourth category because they want greater anonymisation in the questionnaire. Due to these uncertainties in the operationalisation, the two non-binary gender categories are considered separately in the analysis.

The EUROSTUDENT VII microdata set covers 17 countries of which only eight include information on more than female and male students (see Table 1). For the analysis, four countries have been grouped together due to insufficient case numbers in the non-binary gender category ($n < 30$). This resulted in a total of five country categories for the international comparison (Austria, Finland, Ireland, the Netherlands, and the grouped country variable consisting of Croatia, Lithuania, Luxembourg, and Slovenia).

For the first investigation, bivariate descriptive analyses were carried out using cross-tabulations of the sex/gender variable and a wide range of variables that provide an explorative overview of the study and life situation of students with a non-binary gender indication. Six topics were covered, namely socio-demographic and higher education characteristics, their health, financial, and employment situation, and their assessment of different aspects of their study situation compared to female and male students. In a first step, *intra*national significant differences between non-binary and binary students within each country have been identified. The identification of clear, i.e., significant differences relied on confidence intervals instead of conventional significance tests such as the Chi^2 test. That is because the latter quickly runs towards zero due to the high case numbers in the female and male categories (see Table 1) and thus tends towards type I alpha errors (false positive) (Lin et al., 2013). Ultimately, an *inter*national trend was identified only if non-binary students in at least four of the five countries differed significantly from male *and* female students, i.e. the confidence intervals did not overlap with those of the non-binary categories. This seemed to be the most promising and statistically rigorous way to deal with the challenges posed by the different case numbers in the gender categories or low case numbers in the non-binary categories. In the second stage, multivariate logistic regressions were run to analyse the effect of the sex/gender indication on the three hypotheses (see page 249) in comparison to other predictors. Overall, despite the ambiguous wording of the gender question and statistical challenges, the results were very clear in some areas.

Table 1 Frequency table of weighted case numbers by sex/gender indication (only countries with case numbers in at least one non-binary gender category)

What is your #sex?	Austria	Croatia	Finland	Ireland	Lithuania	Luxembourg	Netherlands	Slovenia	Total	Total (%)
Female	22,155	1,045	3,716	10,333	1,887	389	8,286	1,209	49,020	53
Male	18,615	771	3,188	9,354	1,447	321	7,832	879	42,407	46
Other	86		30						116	0.1
I prefer not to assign myself	1,080	24	73	213	22	9	157	24	1,602	1.7
Total	41,936	1,840	7,007	19,900	3,356	719	16,275	2,112	93,145	100

Empty cells: Category not included in the national questionnaire
Source Weighted data, EUROSTUDENT VII Micro Data, Cuppen et al. (2023)

4 Key Findings

This section reports the results considered cross-national trends from the exploratory bivariate descriptive analyses followed by a brief contextualisation of the hypotheses by drawing on the results of the multivariate analyses and findings from the literature. The following cross-national trends were observed[9]:

- In all countries, students with a non-binary gender indication state more frequently that their parents are financially not well-off (at all).[10]
- In all countries, non-binary students are many times more likely to study subjects in the ISCED field of study "Arts and Humanities".
- In all countries, non-binary students are more frequently affected by at least one health problem (depending on the country, up to four times more frequently than students with a female/male gender indication). Mental health problems are far more often reported by students with a non-binary gender indication (twice to six times as often, see Fig. 2). Another long-standing health problem (not further specified in the questionnaire) is also reported twice to four times more frequently across countries.
- Non-binary students in four countries (all except Ireland) are around 10–20% points more likely to report financial difficulties (see Fig. 3). In these four countries, non-binary students also state that they are unable to pay an unexpected bill (neither themselves nor can they count on support from others).
- In three countries, non-binary students are more likely to seriously consider dropping out of university and in two countries, they are more often unsure about this (see Fig. 4). Furthermore, non-binary students in all countries are more likely to consider changing their study programme than students in the female or male gender categories.
- In all countries, non-binary students state more frequently that they get along less well with teaching staff.
- In all countries, non-binary students state less frequently that they have much contact with their fellow students.
- In four countries, non-binary students are more often dissatisfied with the learning support provided by their universities.
- In all countries, non-binary students are less likely to recommend their study programme to others.

Overall, students with the non-binary gender indication "Other" and "I prefer not to assign myself" are very similar in all aspects analysed. In addition to these clear

[9] This paper is a summary of an extensive research project (Dau, 2023), which is why the results are presented in this condensed form. A cross-national trend means that at least four of the five countries analysed showed significant differences between non-binary and binary students for the same characteristic.

[10] This result reflects the students' assessment of their parents' financial affluence on a 5-point scale from "not at all well-off" to "very well-off".

cross-national trends, some tendencies across several countries exist.[11] Tendencies among non-binary students are, for example, that they rate the higher education infrastructure less favourably, are more likely to feel that teachers are not interested in what students have to say, indicate less often to feel that they belong in higher education, and are more likely to have completed their schooling abroad (i.e., to be international students). At the same time, they show no or only rarely cross-national differences in some key characteristics compared to students with a binary gender indication, such as age or their primary source of income, the extent of employment alongside their studies, the time intensity of study, the assessment of their own performance compared to fellow students or their intention to study one day.

To put these observable results into an explanatory context, at least three hypotheses (that could be identified as cross-national trends) were analysed using logistic regressions. In a comparison of several substantiated factors, a non-binary gender indication seems to have a strong effect on the probability of mental health problems occurring (see Fig. 5). For the probability of having financial difficulties (see Fig. 6) and intention to drop out of higher education (see Fig. 7), a non-binary gender does not increase the probability of occurrence as much as other factors, and other variables are much more helpful for prediction.

But how can this relatively strong structural connection between a non-binary gender indication and a mental health burden be interpreted? Firstly, the regression model for mental health among students has a low explanatory power overall (McFadden $r^2 = 0.07$). This means that there are other explanatory factors behind this relation that could not be included in the model because relevant variables are missing in the data set. For the connection between gender and mental health problems, it is particularly important to emphasise that this result can be explained by societal factors. It is not sex/gender per se that is responsible for the high prevalence but rather socio-cultural factors resulting from the experience of living with a non-binary gender.

Due to the imprecise operationalisation of the question on sex/gender (the wording of the response categories and the wording of the question, see Chap. 3), it is strictly speaking not theoretically flawless to draw conclusions about intersex and transgender students from respondents with non-binary gender information. Nevertheless, the empirical results on these gender categories are consistent with the results found in the literature on transgender and intersex students. This includes, above all, the result on the increased impact of psychological stress. It is known in theory and from other research that people with non-conforming gender experiences are often affected by exclusion, stigmatisation, and discrimination in their everyday (student) lives. Several studies describe this socio-cultural, psychological context as "minority stress" (Bockting et al., 2013; Tankersley et al., 2021; Williams, 1992). For this model, the non-binary gender specification can, therefore, be interpreted as a proxy

[11] Tendency means either that non-binary students are similar in one aspect across at least four of the five countries analysed, but not all differences are significant (i.e., not clear enough) or that only three of five countries show significant differences between non-binary and binary students.

for experiences of discrimination and points to a complex relationship that cannot be explained with quantitative social science data alone. The current state of research shows that intersex and transgender students are often confronted with stigmatisation and violent attacks in a world that denies their existence. But such experiences could not be depicted in the model. Moreover, it should be borne in mind that the surveys took place before the COVID-19 pandemic, and studies show that mental health has deteriorated among students as a result of the COVID-19 pandemic (Chen & Lucock, 2022; Holm-Hadulla et al., 2021; Vötter, 2021). All of this provides a motivational basis for further research.

As described, a non-binary gender indication does not appear to be predictive of the presence of financial difficulties (see Fig. 6). According to the calculated regression model, the parents' financial situation appears to have a major influence on the existence of financial difficulties among students in comparison to other characteristics. The descriptive analysis shows that non-binary students also frequently indicate that their parents are financially not well-off, which may explain a part of the higher prevalence of financial difficulties among them (see page 253). Another reason cited in the literature is the often-strained relationship between parents and intersex and transgender students, which leads to them not providing financial support if they reject the children's gender-non-conforming identity (Garvey & Dolan, 2021; Goldberg et al., 2019b; Rehr & Regan, 2022; Valentine & Wood, 2009). This argument gains weight given that, according to the regression model, the parents' financial situation primarily determines the students' financial situation. This context may partly explain why non-binary students are more frequently affected by financial difficulties, as the descriptive analyses show. However, this model also has a low explanatory power overall (McFadden $r^2 = 0.08$). This indicates that there are more complex relationships behind the phenomenon that need to be analysed using other data and a variety of methods.

Likewise, a non-binary gender indication alone makes no significant contribution to explaining an increased probability of dropping out of university (see Fig. 7). However, the higher prevalence of intention to drop out among non-binary students can also be explained by the fact that they are often found in categories that generally make dropping out more likely. The descriptive results show that non-binary students are less likely to feel a sense of belonging to the academic world and are less likely to recommend their study programme to others. These aspects, in turn, have the strongest influence on the intention to drop out of university in the model calculated. The descriptive results also show that non-binary students are more likely to be found in other less influential but nevertheless explanatory factors for an increased probability of dropping out. These include having little contact with other students, getting along less well with lecturers, having financial difficulties or health problems. In contrast, the age structure among non-binary students is not different from that of binary students, and they rate their academic performance just as highly or are employed just as often as female and male students. Therefore, the increased intention to drop out seems to be more caused by university-related characteristics. This means that a worse experience in higher education settings can be interpreted as an explanation for the increased intention to drop out among non-binary students.

In summary, it can be said that the literature and the current state of research as well as the combination of bivariate-descriptive analyses with multivariate methods converge towards similar conclusions. It is also clear that the quantitative methods have their limits and cannot explain these multifaceted interrelationships on their own, especially if little is known about the object of investigation. Multidisciplinary knowledge and intersectional approaches as well as qualitative methodology would make a constructive contribution to explain the presented results. However, the insights generated by this research can provide the basis for further hypotheses that can be tested with improved surveying on gender and other research designs.

5 Implications for Higher Education Policies

The "Principles and Guidelines to Strengthen the Social Dimension of Higher Education" (Advisory Group 1 on Social Dimension, 2020) for the European Higher Education Area (EHEA) aim to promote the inclusion, equality, and diversity of vulnerable, disadvantaged, and underrepresented students. Intersex and transgender students are underrepresented in higher education research and policy, as mentioned above. They are also among the most vulnerable students because they are more exposed to the risk of discrimination: "[…] people who continually occupy a space of non-conformity—as many non-binary people do—may also continually occupy a position of vulnerability." (Frohard-Dourlent et al., 2017, p. 4). The results of this study also show that they are among the most disadvantaged students because they are often burdened by health problems and financial difficulties. This means there is an urgent need for focused higher education policy interventions for this group of students based on internationally established guidelines.

Several recommendations for improving the study situation of transgender and intersex students can be derived from the results of the study on non-binary students presented here in combination with literature and studies from other sources (Beemyn & Rankin, 2019; Garvey & Dolan, 2021; Goldberg et al., 2019a; Lawrence & Mckendry, 2019; McBrien et al., 2022; Park, 2016; Wanti et al., 2022). An overview can be found in Table 2. The groups targeted by the national equity policies for universities (if existing at all in a country) are just as varied as the institutions responsible for implementing those policies in each country (Salmi, 2018). The table can, therefore, only provide a rough breakdown between the university and government levels, which may not always fit the national context.

Some examples are measures that could be implemented with little to no financial cost but can be essential for transgender and intersex students' sense of belonging like using gender-neutral language. Furthermore, "non-monetary instruments [which increase] the students' chances of success in their academic career rather than just eliminating financial barriers" (Salmi, 2018, p. 34), like outreach and bridge programmes that are "early interventions and collaborative partnerships between universities and schools" (ibid.), can facilitate access to higher education for gender non-conforming persons, as studies also show that many of those have already

Table 2 Suggestions for improving the study situation for non-binary students at the university and governmental level of measures

University level	Governmental level
Adopt internal documents (policies and protocols) that explicitly consider gender identity and gender expression	Allow registration with a self-chosen pronoun and name at universities
Employment and involvement of intersex and transgender academic staff in teaching and researching and the development of measures	Involvement of intersex and transgender academic staff in the development of measures
Promote contact points and student associations for gender-non-conforming people to find like-minded people and advice	Support adjustments in the infrastructure like sanitary facilities, changing rooms, accommodation for intersex and transgender students and university staff
Set up psychological counselling centres whose staff are trained to deal with gender-related questions and LGBTQIA concerns	Offer and facilitate financial support for low-cost psychotherapeutic treatments for students
Develop transgender-inclusive curricula in research and teaching	More scholarships to students affected by gender-based stigmatisation (regardless of the parents' income)
Use of gender-neutral pronouns or ask for self-chosen pronouns in spoken and written interactions (e.g., teachers should avoid reading lists of names out loud or using only examples of men and women in teaching content). Do not assume the gender of a person only by physical appearance	
Request or conduct workshops, events and other educational programs that promote awareness, recognition, and inclusion of transgender and intersex people (which could also be visible on the websites of the universities)	

dropped out of school due to experiences of discrimination (see Chap. 2). Likewise, retention programmes that include psychological counselling as well as academic advising prove to be helpful for marginalised groups in general (ibid.). Recognising that experiences of discrimination based on gender non-conformity can contribute to the risk of mental health problems in students, psychological counselling centres can be set up whose staff are trained to deal with gender-related concerns, LGBTQIA issues, and mental health problems related to discrimination. The analyses also show that university-related characteristics such as a lack of a sense of belonging or strained teacher-student relationships are decisive factors that cause gender non-conforming students to drop out of their studies more frequently. Therefore, more awareness, recognition, and inclusion of these groups in teaching and research would appear to be helpful steps. The empirical analyses and the literature also indicate that peer

groups (or interest groups) and specific contact points at universities can be particularly helpful for gender non-conforming individuals. Additionally, if financial difficulties among transgender and intersex students are also due to a strained parent–child relationship, more scholarships can be offered to students affected by gender-based stigmatisation regardless of the parents' income. Health impairments also have an impact on the financial situation, with the results suggesting that offering low-cost psychotherapeutic support can be a helpful combination. The COVID-19 pandemic has also shown the general need for this.

Furthermore, specific measures that contribute to inclusion, greater acceptance, and representation of gender non-conforming students include allowing registration with a self-chosen pronoun and name, making infrastructural adjustments (sanitary facilities, changing rooms, accommodation), integrating or implementing gender-sensitive knowledge into teaching content, offering educational programmes for students and staff, and employing intersex and transgender individuals as teaching staff, as well as involving them in the development of measures.[12] The existence and concerns of these groups must also be integrated into higher education policy guidelines. Finally, it is emphasised how important the adequate inclusion of intersex and transgender students in higher education research is and that improved survey methods are necessary for this.

6 Measurement of Gender in Large Student Surveys

Finally, this section presents a proposal for operationalising the gender question in large student surveys based on the methodological critique of other research (Bauer et al., 2017; Diethold et al., 2023; Frohard-Dourlent et al., 2017; Garvey, 2019; Lindqvist et al., 2021; Muschalik et al., 2021; National Academies of Sciences, Engineering, and Medicine, 2022). To conduct a research-practical, theoretically valid, and inclusive survey of the gender variable, at least the following aspects should be considered:

- When designing the intended research project, it is important to determine at the beginning which aspects of gender are of interest and aim to provide an unambiguous understanding of gender. For example, is the research interest more focused on medical-physical characteristics, performed gender roles and associated expectations, lived gender expression, or felt gender identity of people?
- According to the research interest, the question text and response categories must be coherent (e.g., the question text often asks for gender identity, but only the medical categories female/male are offered as response options).

[12] An overview of some country-specific differences in the rights of LGBTI people and examples for improving their study situation with concrete measures that have already been implemented can be found in the policy paper of UNESCO and IGLYO (2021).

- The question design must be comprehensible for the respondents and should not provoke respondents to cancel the questionnaire (e.g., people who reject gender diversity should also be considered when formulating the question). At the same time, discrimination through too few response categories or degrading formulations must be avoided.
- Since the response options should be distinguishable, inclusive, and not too complex, question modes that allow multiple responses are sometimes suitable to fulfil these requirements but, in turn, often require subsequent hierarchisation for analysis into one category by the researcher, which should be avoided. This is an example of the need to also consider a suitable survey mode.
- Currently, no standardised solution for the missing reference statistics on non-binary gender individuals exists, and alternative approaches for representative weighting procedures must be considered.[13] Additionally, the question text and the response categories should allow for a comparison with official data to weight the survey data representatively.

A three-step query is proposed to cover as many aspects as possible, knowing that this suggestion cannot meet all needs but serves as a basis for discussion:

The first step would be to clearly ask for the officially registered gender entry, whereby a reference text should make the purpose of the question clear (this is the comparability with official statistics). In the second step, the correspondence between the officially registered sex/gender entry and one's own gender identity would be asked, which can be answered with a simple yes/no. One of the aims of this mode is to prevent respondents who do not (or do not want to) understand the question about gender identity from cancelling the survey.

In the next step, people who have previously selected "No" would be asked about their self-chosen gender designation, with an open response field available. Research suggests that this offers some advantages over fixed gender categories.

1. *[Mandatory]* **With which sex are you officially registered at the university?**
   Explanation text: This question is for statistical reasons. Your self-attributed gender is asked by the next question.
   Response options: Categories of the official gender markers
2. **Does the registered sex match your gender identity?**
   Response options: Yes/No
3. *[If No was selected]* **Which gender do you currently identify with?**
   Response option: Open field.

[13] In social science, weighting is the process of calculating factors (weights) for each respondent that reflect whether their personal characteristics are over- or under-represented in the survey compared to the overall target population. This requires officially registered data on the 'real' quantities in the population, but there are currently no valid official statistics for transgender and intersex students. It would be conceivable, for example, to create a separate weight for non-binary people, which can be estimated from the literature and other surveys, instead of assigning them one of the binary weights or not including them in the analyses at all.

Overall, for a gender-sensitive, theoretically precise, and yet practicable data collection, several aspects must be considered, and the variant of data collection strongly depends on the overall design of the research and the research interest. It should be noted that some contradictions must be overcome to be able to research with quantitative methods on marginalised groups. From the perspective of critical quantitative research, marginalised and under-researched groups should be included in the data analyses and reporting of the results, even without a perfect solution, so that initial results can be obtained and a basis exists on which the survey methods can be further developed (Garvey et al., 2019). In any case, it must be noted that it is not the gender-non-conforming persons who are the problem but the survey methods that do not allow their reality of life to be reflected in the analyses.

Appendix

See Figs. 2, 3, 4, 5 and 6.

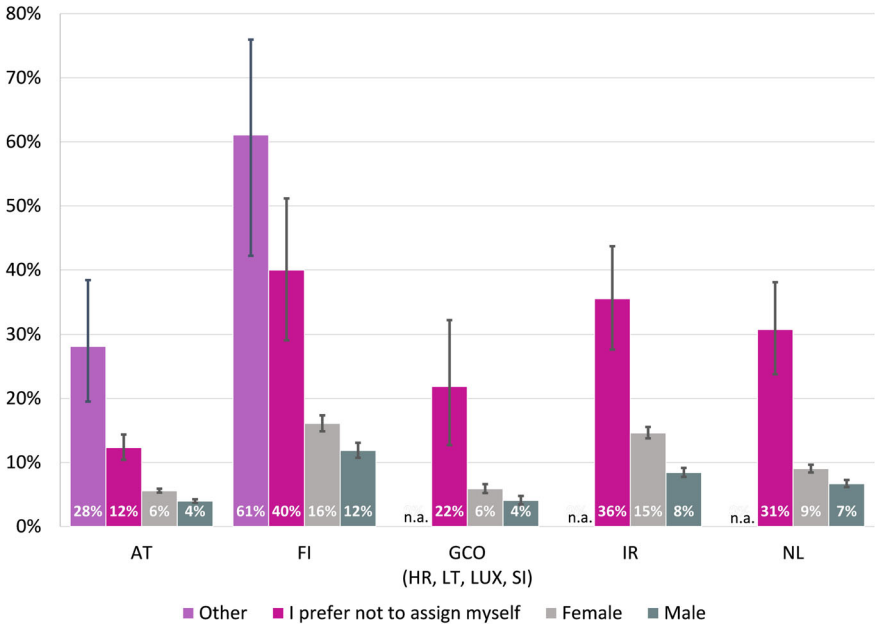


Fig. 2 Proportion of students with a mental health problem by sex/ gender and country with 95% confidence intervals (axis section 80%). If the confidence intervals do not overlap, there are significant differences between the groups. Wide spreads of the confidence intervals exist due to low case numbers. N.A.: not available as there is no response category "Other" in these countries. AT: Austria, FI: Finland, GCO: Grouped countries (Croatia, Lithuania, Luxembourg, Slovenia), IR: Ireland, NL: Netherlands. *Source* Own calculations with weighted data (Dau, 2023) based on EUROSTUDENT VII micro data (Cuppen et al., 2023)

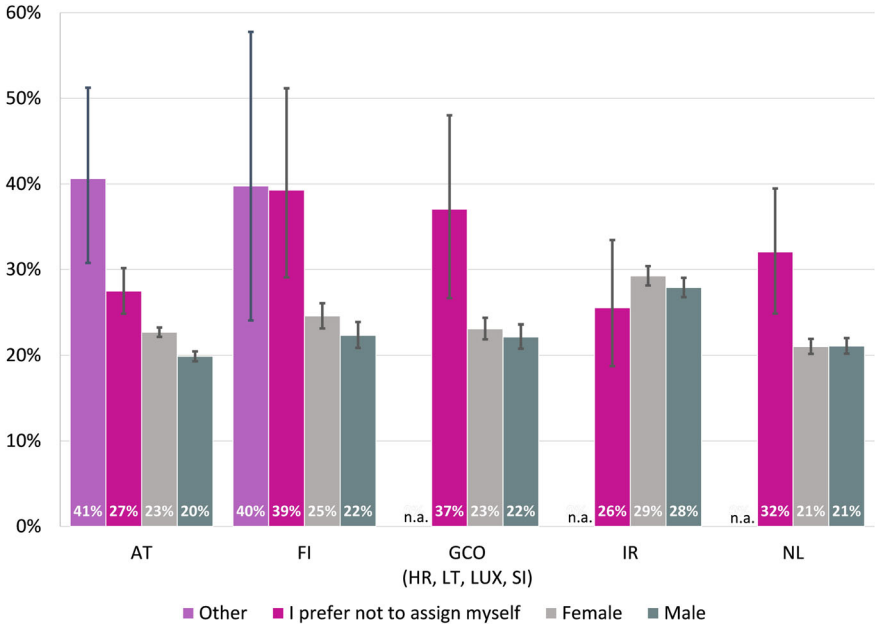


Fig. 3 Proportion of students with financial difficulties by sex/ gender and country with 95% confidence intervals (axis section 60%). If the confidence intervals do not overlap, there are significant differences between the groups. Wide spreads of the confidence intervals exist due to low case numbers. N.A.: not available as there is no response category "Other" in these countries. AT: Austria, FI: Finland, GCO: Grouped countries (Croatia, Lithuania, Luxembourg, Slovenia), IR: Ireland, NL: Netherlands. *Source* Own calculations with weighted data (Dau, 2023) based on EUROSTUDENT VII micro data (Cuppen et al., 2023)

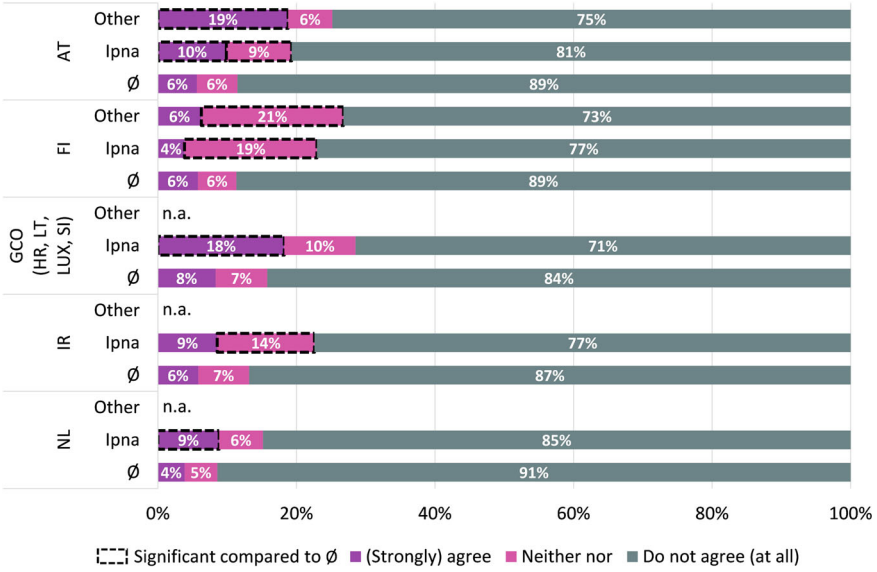


Fig. 4 Intention to drop out of higher education by sex/ gender and country (agreement with the statement "I am seriously thinking of completely abandoning my higher education studies"). The response options were recoded from a 5-point scale to a 3-point scale. The response categories "1 + 2 (strongly) agree" and "3 neither nor" with a black dotted border indicate a significant difference to the average. Due to the much higher number of cases in the gender categories "female" and "male", the average value is almost identical to that of all students in the binary gender categories and expresses their response behaviour. Ipna: "I prefer not to assign myself". If the confidence intervals do not overlap, there are significant differences between the groups. Wide spreads of the confidence intervals exist due to low case numbers. N.A.: not available as there is no response category "Other" in these countries. AT: Austria, FI: Finland, GCO: Grouped countries (Croatia, Lithuania, Luxembourg, Slovenia), IR: Ireland, NL: Netherlands. Totals > 100% result from rounding differences. *Source* Own calculations with weighted data (Dau, 2023) based on EUROSTUDENT VII micro data (Cuppen et al., 2023)

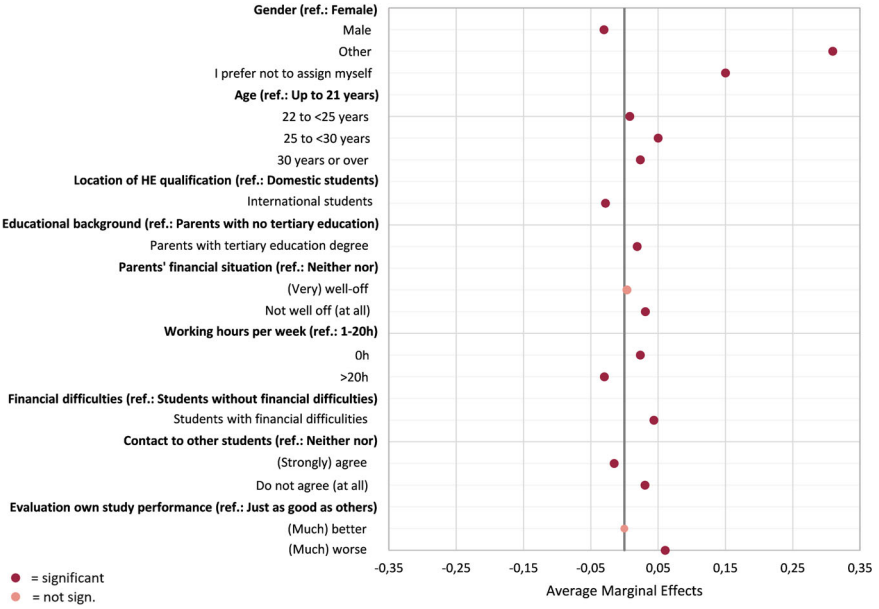


Fig. 5 Logistic regression model "Mental health" with Average Marginal Effects (axis section ± 35% points). Dependent variable: mental health problem (1 = Yes, 0 = No). If a value lies to the right of the reference line (value 0), the Average Marginal Effect is positive, i.e. this characteristic increases the probability of a mental health problem and vice versa. The further away the marker is from the reference line, the greater the effect. N = 54,808 (all analysed countries included). Pseudo-r2 (McFadden) = 0.07. Significant = p-value < 0.05. Dark: Significant. Light: Not significant. *Source* Own calculations with weighted data (Dau, 2023) based on EUROSTUDENT VII micro data (Cuppen et al., 2023)

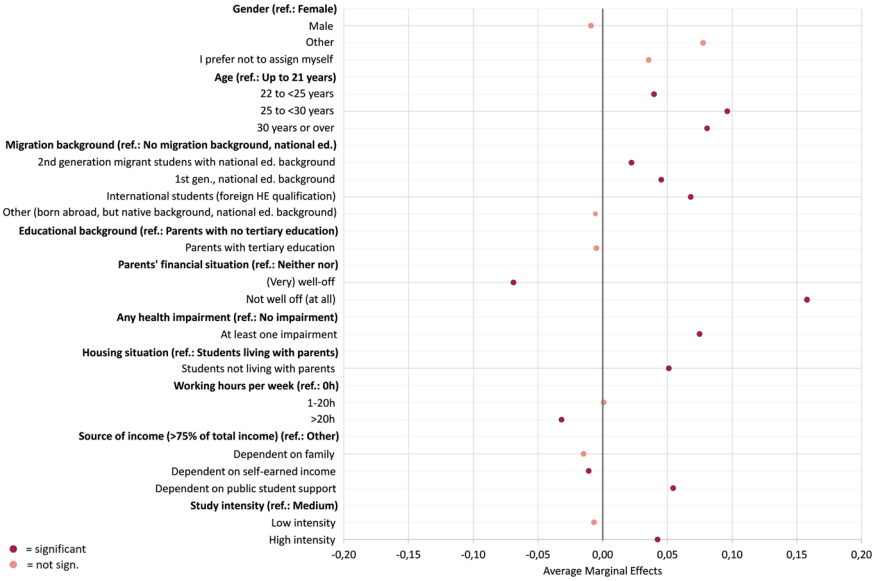


Fig. 6 Logistic regression model "Financial difficulties" with Average Marginal Effects (axis section ± 20% points). Dependent variable: financial difficulties (1 = Yes, 0 = No). If a value lies to the right of the reference line (value 0), the Average Marginal Effect is positive, i.e. this characteristic increases the probability of having financial difficulties and vice versa. The further away the marker is from the reference line, the greater the effect. N = 41,762 (all analysed countries included). Pseudo-r2 (McFadden) = 0.08. Significant = p-value < 0.05. Dark: Significant. Light: Not significant *Source* Own calculations with weighted data (Dau, 2023) based on EUROSTUDENT VII micro data (Cuppen et al., 2023)

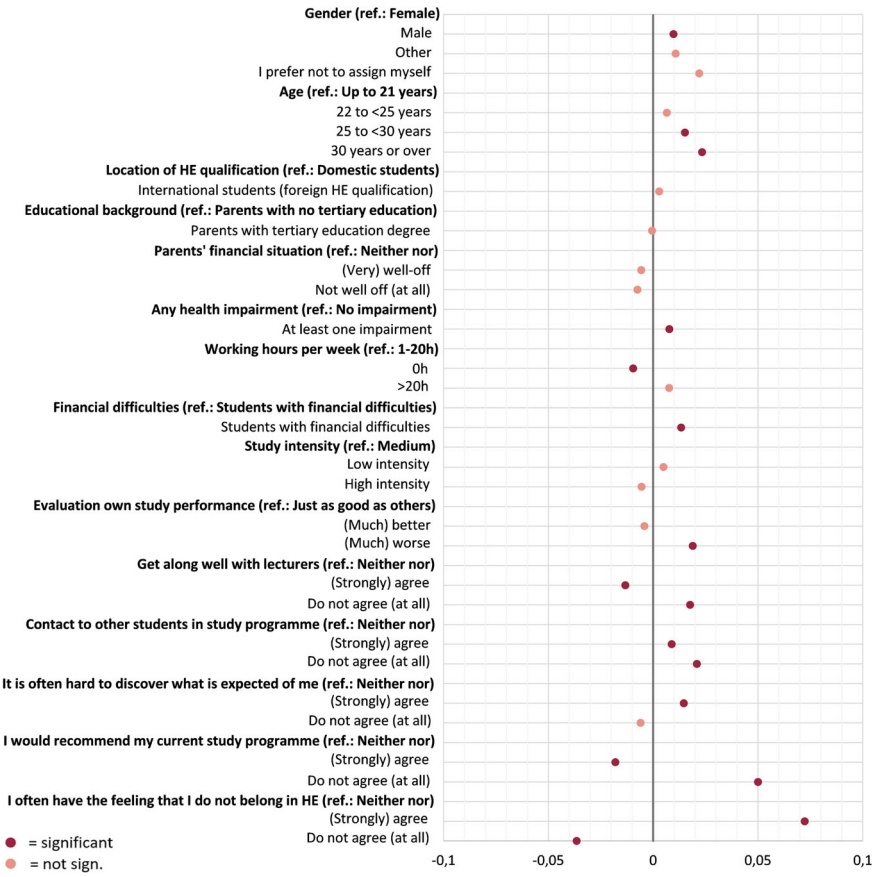


Fig. 7 Logistic regression model "Intention to drop out of higher education" with Average Marginal Effects (axis section ± 10% points). Dependent variable: dropout intention (1 = Yes, 0 = No). If a value lies to the right of the reference line (value 0), the Average Marginal Effect is positive, i.e. this characteristic increases the probability of an intention to drop out and vice versa. The further away the marker is from the reference line, the greater the effect. N = 36,731 (all analysed countries included). Pseudo-r2 (McFadden) = 0.26. Significant = p-value < 0.05. Dark: Significant. Light: Not significant. *Source* Own calculations with weighted data (Dau, 2023) based on EUROSTUDENT VII micro data (Cuppen et al., 2023)

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