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What Do We (Not) Know About Quantitatively Gifted Pupils? The Czech Republic in International Comparison²

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Summary

- The importance of gifted individuals in society and the need to enable them to realize their talents. Individuals gifted with exceptional intellectual abilities push the boundaries of science and technology through discoveries in research or the development of new technologies. They contribute significantly to economic growth. However, their abilities are not always utilized. Often, their talents remain unrecognized by others, and even by themselves. Additionally, some groups of gifted individuals face obstacles in daily life that prevent them from developing their talent. Therefore, it is important to identify talent early in childhood, and provide opportunities for the gifted to develop their talent, and use their abilities for the benefit of themselves and society.
- We present new findings on quantitatively gifted students in European countries, with a focus on the Czech Republic. This study provides a detailed mapping of the situation of quantitatively gifted students aged approximately 10 and 15 in European countries, with an emphasis on the Czech Republic. We compare the characteristics of the gifted, the environment in which they grow up, their perceived quality of life, attitudes, relationship to school, and educational aspirations. Within the Czech Republic, we also compare quantitatively gifted students with other students. At the same time, we identify and discuss barriers that may hinder the gifted in developing their talent.

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- We identify quantitatively gifted individuals based on the results of a test focused on logical reasoning in a mathematical context. We use data from the international surveys TIMSS 2019 (for 4th graders) and PISA 2018 (for 15 year olds), which allow us to estimate the proportion of quantitatively gifted students at a given age on a representative sample of students and schools in the given country. Since the data do not offer standard diagnostic tools used by educational-psychology specialists, we estimate quantitative giftedness based on students' results in those parts of the mathematics test that focus on logical reasoning in a mathematical context. Therefore, our definition should be seen as a proxy method for identifying quantitatively gifted individuals, based on the best possible information available in the data. We discuss its potential shortcomings in detail at the end of the study.
- Among 4th-grade students **in the Czech Republic, we identify 10.2% as quantitatively gifted, and** among 15-year-olds, **we find 12.7%, of which 3.1% are exceptionally gifted.** In the TIMSS 2019 survey, we are able to identify a group of quantitatively gifted 4th-grade students (approximately 10 years old). In the PISA 2018 survey, we can further distinguish between above-averagely and exceptionally quantitatively gifted students among the 15-year-olds. Thus, in the Czech Republic, we identify 10.2% of quantitatively gifted students in the TIMSS 2019 sample of 4,692 students. In the PISA 2018 sample of 7,016 students, we find 12.7% to be quantitatively gifted, of which 3.1% are exceptionally gifted.
- We find significantly more quantitatively gifted students than official statistics indicate. Our findings cannot be compared directly with official statistics on the proportion of gifted students in the Czech Republic. The definition of giftedness in this study differs from the official definition outlined in the Czech decree, and not just by focusing only on the quantitative component of giftedness. Nevertheless, the two definitions are very closely related. The proportions of quantitatively gifted students that we identify, however, significantly exceed those in the official statistics, which indicate only 0.2% of gifted students and 0.1% of exceptionally gifted students in elementary schools. The report by the Czech School Inspectorate also notes the seriously underestimated proportion of gifted students in elementary schools as gifted and less than 0.1% as exceptionally gifted, but even these numbers are considered to be severely underestimated.
- We do not find significant differences in quantitative giftedness according to gender in our data; in contrast with official statistics that report significantly fewer gifted girls than boys. The insufficient identification of gifted students in the Czech Republic is particularly pronounced for girls. School reports record only 25% of girls among the elementary students identified as gifted and 26% among those identified as exceptionally gifted. According to international expert literature, however, we should not observe significant gender differences in intellect. This is also confirmed by the results of this study. For 4th-grade students in the Czech Republic, we observe 42% of girls among the quantitatively gifted, and for 15-year-old students, the proportion of quantitatively-gifted boys and girls is balanced. In the group of exceptionally quantitatively-gifted 15-year-old students, the proportion of girls in the Czech Republic is slightly lower, at 37%. Almost half of European countries show no differences in the proportion of boys and girls even in this group.
- The degree of quantitative giftedness of students is closely related to their family **background.** In the Czech Republic, the relationship between family background and the occurrence of quantitative giftedness is one of the strongest in all monitored countries. From all the characteristics available in the data, the highest level of parental education,

material security of the household, and overall socio-economic status of the family play by far the greatest role in the probability of quantitative giftedness of a given student. Such a strong conditionality of quantitative giftedness by family background has either not been found in other countries or only to a much lesser extent. Therefore, we believe that the low proportion of giftedness among disadvantaged groups of students in the Czech Republic cannot be explained solely by insufficient genetic endowment. Upbringing, home environment, access to resources, and more frequent failure to recognize giftedness among those students also play a crucial role.

- Up to a third of quantitatively gifted students grow up in disadvantaged conditions. Among quantitatively gifted 4th-grade students in the Czech Republic, 30% do not have a parent with a university education, and 48% do not have sufficient resources for home learning. Similarly-disadvantaged family environments are also found among gifted 15-year-old students. For the exceptionally gifted, we observe 29% of students with parents without a university education. For the above-averagely gifted (students who are gifted, but not exceptionally so) this increases to 44%. Regarding their socio-economic background, reflecting also the material equipment of the household, 16% of exceptionally gifted students have below-average conditions, and this rises to 26% for above-averagely gifted students. A significant portion of quantitatively gifted students in the Czech Republic thus grows up in conditions that are not ideal for the development of their giftedness. Whether it is in material resources, intellectual stimulation, or access to information, these students are disadvantaged compared to other quantitatively gifted students, which can then hinder the full development of their talent.
- Their own education shapes parents' aspirations for the future education of their gifted children. Up to 16% of parents of quantitatively gifted 4th-grade students in the Czech Republic do not expect their child to achieve a university education. This non-recognition of giftedness in children or the non-perception of the need for its development through further education is significantly more common among parents with lower education. While 91% of university-educated parents in the Czech Republic expect their quantitatively gifted children to obtain a university degree, for parents with only secondary education the percentage is just 67%. The aspirations of quantitatively gifted 15-year-old students themselves exceed the aspirations of parents of gifted 4th-grade students. For the 15-year-olds, 96% of exception-ally gifted students in the Czech Republic expect to obtain a university degree. Among the above-averagely gifted students, 91% have these ambitions.
- Quantitatively gifted students are more often satisfied with school and life, but not all of them. Quantitatively gifted 4th-grade students in the Czech Republic more often have a positive attitude towards school than other students, although compared to other European countries, it is one of the smallest shares. They are also less exposed to bullying: 76% of the gifted in the Czech Republic have hardly encountered bullying in the past year. Similarly, quantitatively gifted 15-year-old students in the Czech Republic are also more satisfied with life than their peers. Nevertheless, approximately 15% of the gifted students are dissatisfied with life. Girls and students from poorer socio-economic backgrounds are more likely to be among this group. The dissatisfied are more likely to be girls and students from poorer socio-economic backgrounds. We assume that these students face poorer conditions for the development of their giftedness and are therefore in greater need of support.

- **Based on our results, we recommend improving the identification of gifted students in the Czech Republic and targeted support for specific risk groups.** We propose a universal system of identification of giftedness directly in schools, which would ensure fairer and more systematic recognition of the gifted. We point out the need to pay special attention to girls and students from disadvantaged backgrounds, where the risk of non-recognition of giftedness is higher. In the case of girls, this may be, for example, due to entrenched stereotypes that can lead to their abilities being overlooked, to insufficient identification and to an under-reported share of gifted girls in official data. Targeted support for students from disadvantaged backgrounds should include not only ensuring sufficient resources for the development of giftedness but also information for parents and teachers. Awareness and early intervention are key to compensating for adverse factors and ensuring equal access for all gifted students to the development of their giftedness.
- The proportion of quantitatively gifted students we identify in the Czech Republic is a lower bound. The findings presented in this study concern quantitatively gifted students identified using internationally comparable mathematics tests within the TIMSS and PISA surveys. However, the samples analysed likely also include quantitatively gifted students whose tests did not reveal their giftedness and were thus incorrectly classified as non-gifted students. Therefore, the proportion of quantitatively gifted students we identify must be interpreted as the lower bound of the true share of the gifted. There are many reasons why the giftedness of some students may not be revealed by mathematics tests that we use for identification. In the discussion following the presentation of our results, we explain under what circumstances the tests may fail to identify quantitative giftedness, which types of students it may occur to more frequently, and what biases it may lead to in some of our results.