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Faculty of Science
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Cohort approach on educational data of the Czech Republic: Massification of tertiary education and its impact on education attainment

Content

» tertiary education

- > Trow's characteristic of tertiary education systems
- > data availability and analysis of situation in the Czech Republic
- > development in last 25 years

» impact on education attainment of population

- > results from 1991, 2001 and 2011 Censuses
- > forecasting method
- > results – changes in education attainment of population of the Czech Republic to 2050



Research question

» „Looking **forward**, it is apparent that the Czech tertiary system is approaching **a mass system of education** – but with persisting inequality.“ (OECD. 2006. Thematic Review of Tertiary Education. Czech Republic – Country Note.)

» Is this result of OECD experts true?

- > we has started our analyses in 2009
- > hypothesis: The Czech tertiary system broke the line between elite and mass system (Trow 1973, 2005; Brennan, 2004; etc.) before the beginning of new millennium.
- > research question: What will happen in the future if we combine the rapid expansion of our tertiary system with decreasing total fertility rate in '90s?



Czech tertiary education system

- » to 1995: only public (23) and state (4) universities; almost all studies were „long masters“ (5–6 years long)
 - > ISCED-97 levels 5A and 6 or ISCED 2011 levels 64, 74 and 84
- » from 1996: institutions of higher professional education were established (around 180)
 - > ISCED-97 level 5B or ISCED 2011 level 65, very small part of tertiary system – around 7 % of students
- » from 1998: new Higher Education Act (possibility to establish a private university) and start of the Bologna process (BA-MA-PhD)
 - > 4 private universities in 1999; comparing with 45 in 2012



Trow's classification of tertiary systems

- » American sociologist Martin Trow classified tertiary education systems into three forms – elite, mass and universal (first publication in 1973) by percentage of age group with access to tertiary education
- » those systems have a different role in the society:
 - > 1. elite – shaping the mind and character of a ruling class; preparation for elite roles (0–15 % of cohort has access to tertiary education);
 - > 2. mass – transmission of skills and preparation for a broader range of technical and economic elite roles (15–50 % of cohort has access to tertiary education);
 - > 3. universal – adaptation of the 'whole population' to rapid social and technological change (50+ % of cohort has access to tertiary education).



Data analysis

- » based on analysing of two entry rates calculated from individual data
 1. entry rate based on cohort analysis
 2. net entry rate (based on transversal analysis)
- » net entry rate is an indicator widely used in international comparison (for example annual OECD publication Education at a Glance)
- » in the Czech Republic individual data has been collected only for university students since 2001, for students at higher professional schools from 2010



Entry rate based on cohort analysis

$$\sum_{i=0}^{y-z} \frac{ENTR(y-i)t-i}{POP(y-i)t-i} \cdot 100 \%$$

- » $ENTR(y-i)t-i$... number of enrolled for the first time aged „ $y-i$ “ in the year „ $t-i$ “
- » $POP(y-i)t-i$... population aged „ $y-i$ “ in the year „ $t-i$ “
- » y ... maximal age taken to the analysis
- » z ... minimal age taken to the analysis
- » t ... time



Net entry rate

$$\sum \frac{NENTa}{POP_a} \cdot 100 \%$$

- » *NENTa* ... number of enrolled to the tertiary education for the first time aged „a“
- » *POP_a* ... population aged „a“



Net Entry Rate and Entry Rate based on Cohort Analysis (CZE, first entry at university)

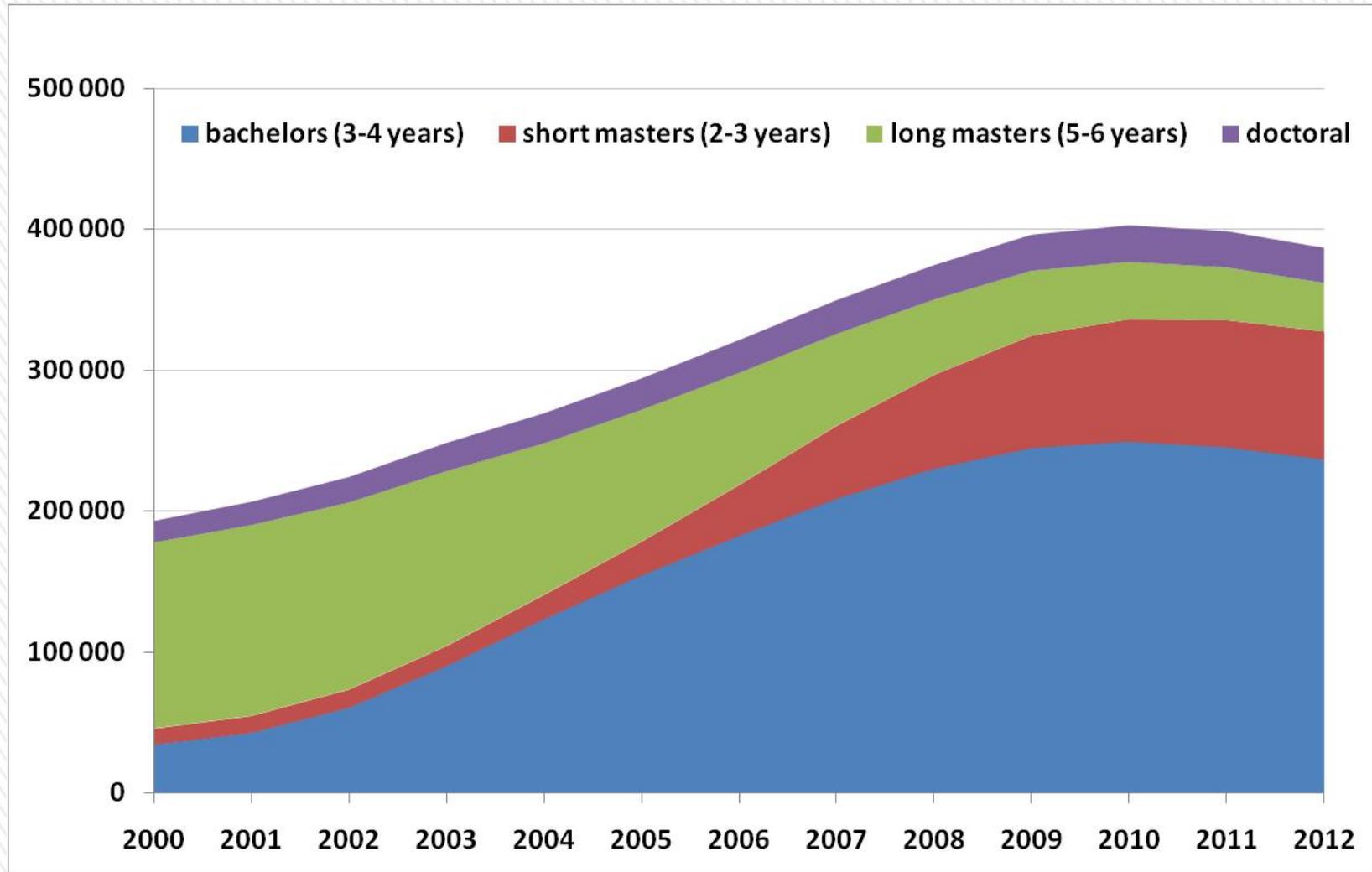
Age \ Year	Year																Entry rate based on cohort analysis
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
17	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	
18	6,3%	7,0%	7,6%	7,7%	3,3%	1,2%	0,3%	0,4%	0,5%	0,6%	0,7%	0,7%	0,9%	0,9%	0,9%	1,1%	
19	6,1%	7,1%	8,2%	9,1%	12,2%	12,3%	14,6%	16,5%	17,5%	18,9%	19,7%	20,5%	21,0%	21,5%	20,7%	20,6%	
20	2,7%	2,9%	3,2%	4,5%	7,9%	10,5%	12,5%	13,9%	15,5%	16,5%	17,2%	17,8%	18,8%	19,5%	19,5%	20,0%	
21	1,7%	1,6%	1,4%	2,8%	1,6%	2,7%	3,0%	3,2%	3,6%	3,6%	3,7%	3,8%	3,9%	3,9%	4,2%	4,2%	46,2%
22	1,5%	1,2%	0,9%	1,9%	1,1%	1,2%	1,4%	1,5%	1,6%	1,8%	1,8%	2,0%	2,0%	2,0%	1,9%	1,9%	
23	1,0%	0,8%	0,6%	1,4%	0,8%	0,9%	0,9%	1,0%	1,2%	1,3%	1,4%	1,5%	1,5%	1,4%	1,3%	1,3%	
24	0,6%	0,5%	0,5%	1,0%	0,6%	0,7%	0,7%	0,8%	0,9%	0,9%	1,0%	1,0%	1,0%	0,9%	0,8%	0,7%	
25	0,3%	0,3%	0,4%	0,6%	0,5%	0,5%	0,6%	0,6%	0,7%	0,7%	0,8%	0,8%	0,8%	0,7%	0,6%	0,5%	45,1%
26	0,2%	0,3%	0,3%	0,3%	0,4%	0,4%	0,5%	0,6%	0,5%	0,6%	0,7%	0,7%	0,6%	0,5%	0,5%	0,4%	
27	0,2%	0,2%	0,2%	0,2%	0,4%	0,4%	0,4%	0,5%	0,5%	0,6%	0,6%	0,6%	0,6%	0,5%	0,4%	0,3%	
28	0,1%	0,2%	0,2%	0,1%	0,3%	0,3%	0,4%	0,5%	0,5%	0,6%	0,6%	0,6%	0,5%	0,5%	0,4%	0,3%	
29	0,1%	0,1%	0,1%	0,2%	0,3%	0,3%	0,4%	0,4%	0,4%	0,5%	0,6%	0,6%	0,5%	0,4%	0,4%	0,3%	
30-34	0,1%	0,1%	0,1%	0,2%	0,2%	0,2%	0,3%	0,4%	0,4%	0,5%	0,5%	0,6%	0,5%	0,4%	0,4%	0,3%	26,6%
35-39	0,1%	0,1%	0,1%	0,1%	0,1%	0,2%	0,2%	0,3%	0,3%	0,4%	0,4%	0,5%	0,5%	0,4%	0,4%	0,3%	
40-59	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	
Net entry rate	21,8%	23,4%	25,0%	31,3%	31,5%	34,2%	39,4%	44,7%	48,8%	52,8%	56,1%	58,5%	59,9%	59,5%	57,7%	56,6%	

Czech tertiary education – development in last 25 years

- » before the Velvet revolution in 1989 the Czech tertiary system was strictly elite, according to the Trow's definition (around 10 % of population had a possibility to entry the system and around 9 % of population has graduated)
- » during '90s the transition from elite to mass tertiary system started, with relatively constant speed
- » at the beginning of the new millennium rapid expansion began that led to the transition from mass to universal tertiary system



Number of students at universities in the Czech Republic – development after the year 2000



Tertiary education graduates

- » analysis of data about graduates showed that there was a relatively stable probability that student which enrolled university will graduate in the future (72–75 % in the 2001–2008 period)
- » so we can expect that in case of around 60 % of cohort entering tertiary education, circa 45 % of this cohort should graduate
- » it is expected to lead to the significant changes of education attainment structure of the Czech population



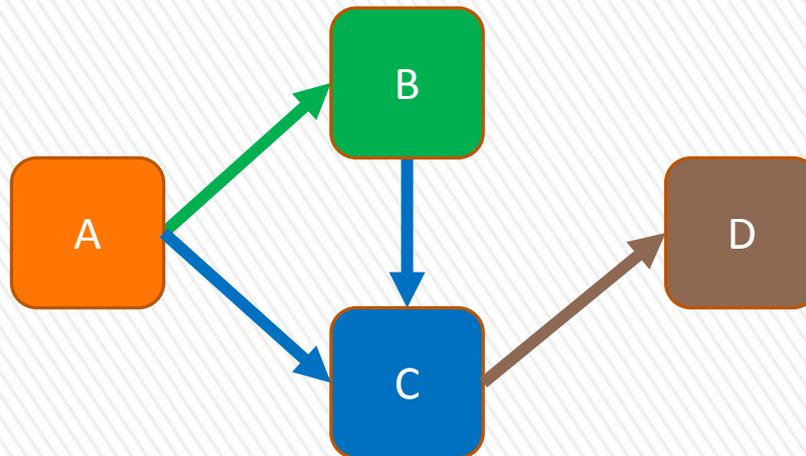
Education attainment

- » **Census 1991** – only 8.5 % of population aged 25+ had tertiary education (compare with age group 25–29, where 12.5 % of population had tertiary education)
- » **Census 2001** – 11.6 % of population aged over 25+ had tertiary education (in age group 25–29 12.2 % of population had tertiary education)
- » **Census 2011** – 15.2 % of population aged 25+ had tertiary education (still one of the lowest value in the EU), but the situation of population aged 25–29 was extremely different – 27.1 % had tertiary education



Education attainment forecast

- » multi-state model
- » states and possible transitions among them
 - > A: lower secondary (basic) education
 - > B: upper secondary education without access to tertiary level
 - > C: upper secondary education with access to tertiary level
 - > D: tertiary education



Forecasting method

- » according to the Labour Force Surveys, in the Czech Republic there is only 0.2 % of population without education, so we can expect that whole population has at least basic education
- » for all possible transitions (A-B, A-C, B-C and C-D) we have a separate matrix with probabilities of transition which are based on development and forecast of graduates by single age from all levels of education in the Czech Republic (various methods, depends on data availability)



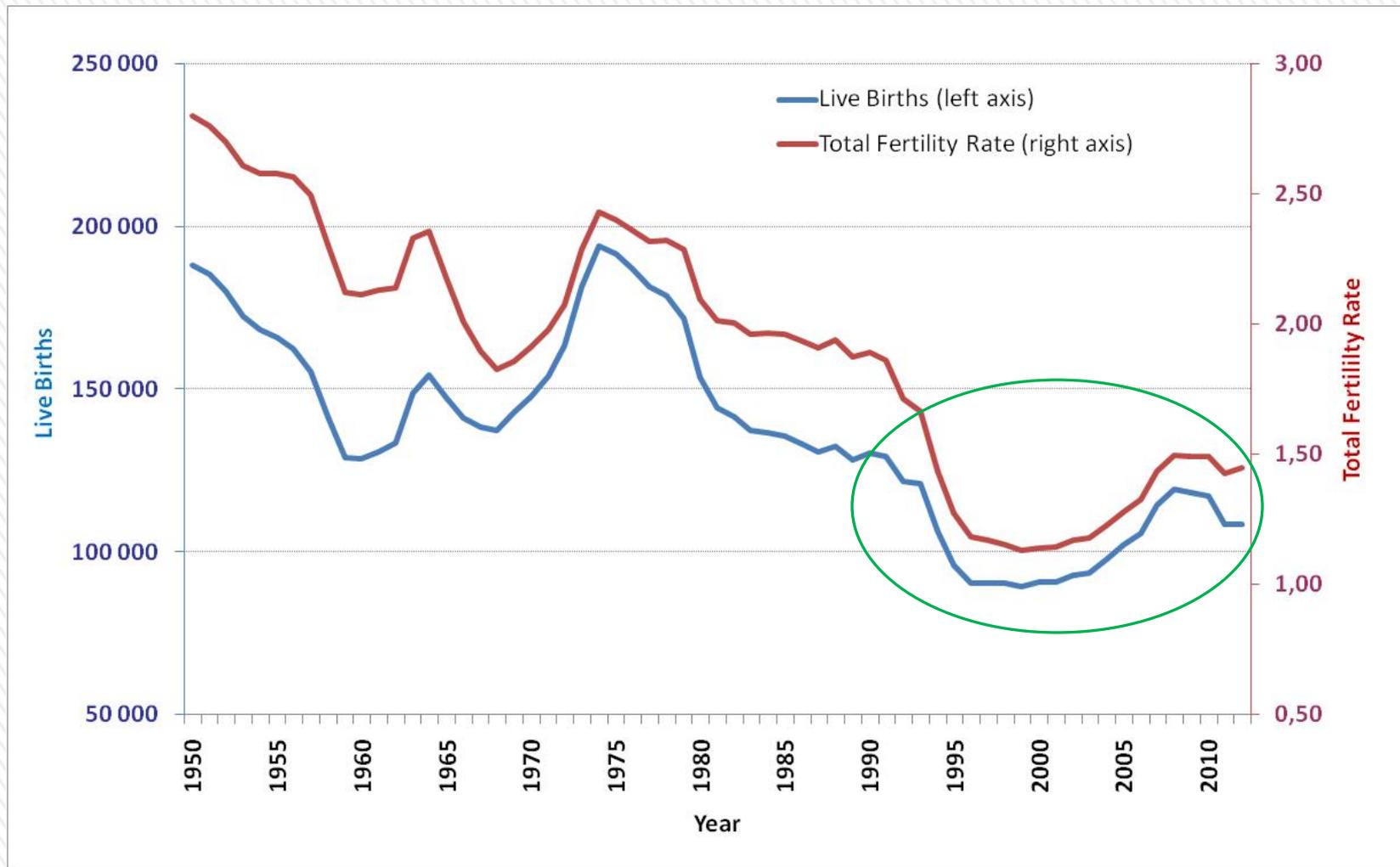
Forecasting method

- » part of the matrix for transition from upper secondary education with access to tertiary (C) to tertiary education (D)

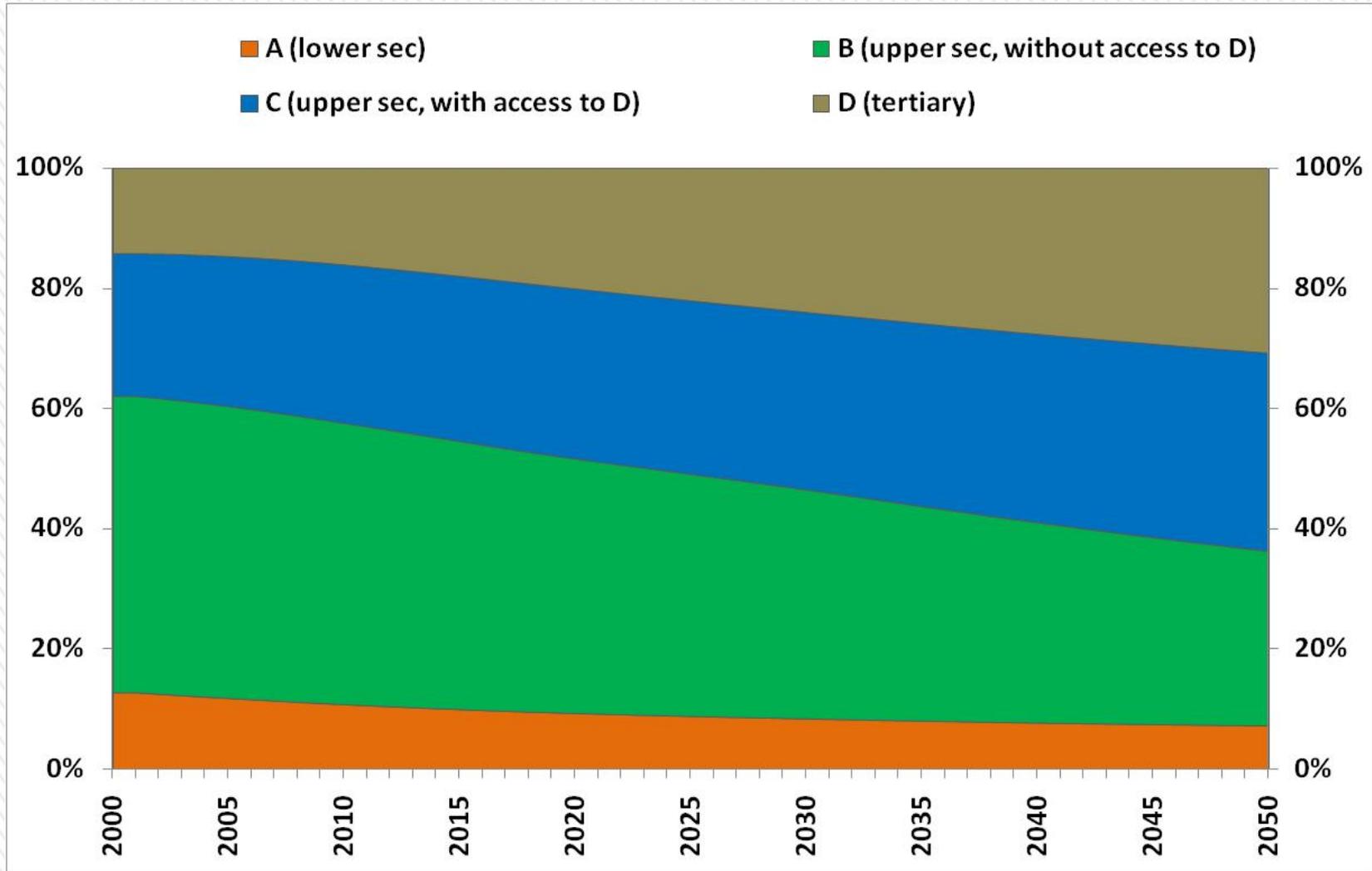
Transition C → D	States							
Age	Age 19 - C	Age 19 - D	Age 20 - C	Age 20 - D	Age 21 - C	Age 21 - D	Age 22 - C	Age 22 - D
19	0	0	$P_{C,C}(19)$	$P_{C,D}(19)$	0	0	0	0
20	0	0	0	0	$P_{C,C}(20)$	$P_{C,D}(20)$	0	0
21	0	0	0	0	0	0	$P_{C,C}(21)$	$P_{C,D}(21)$



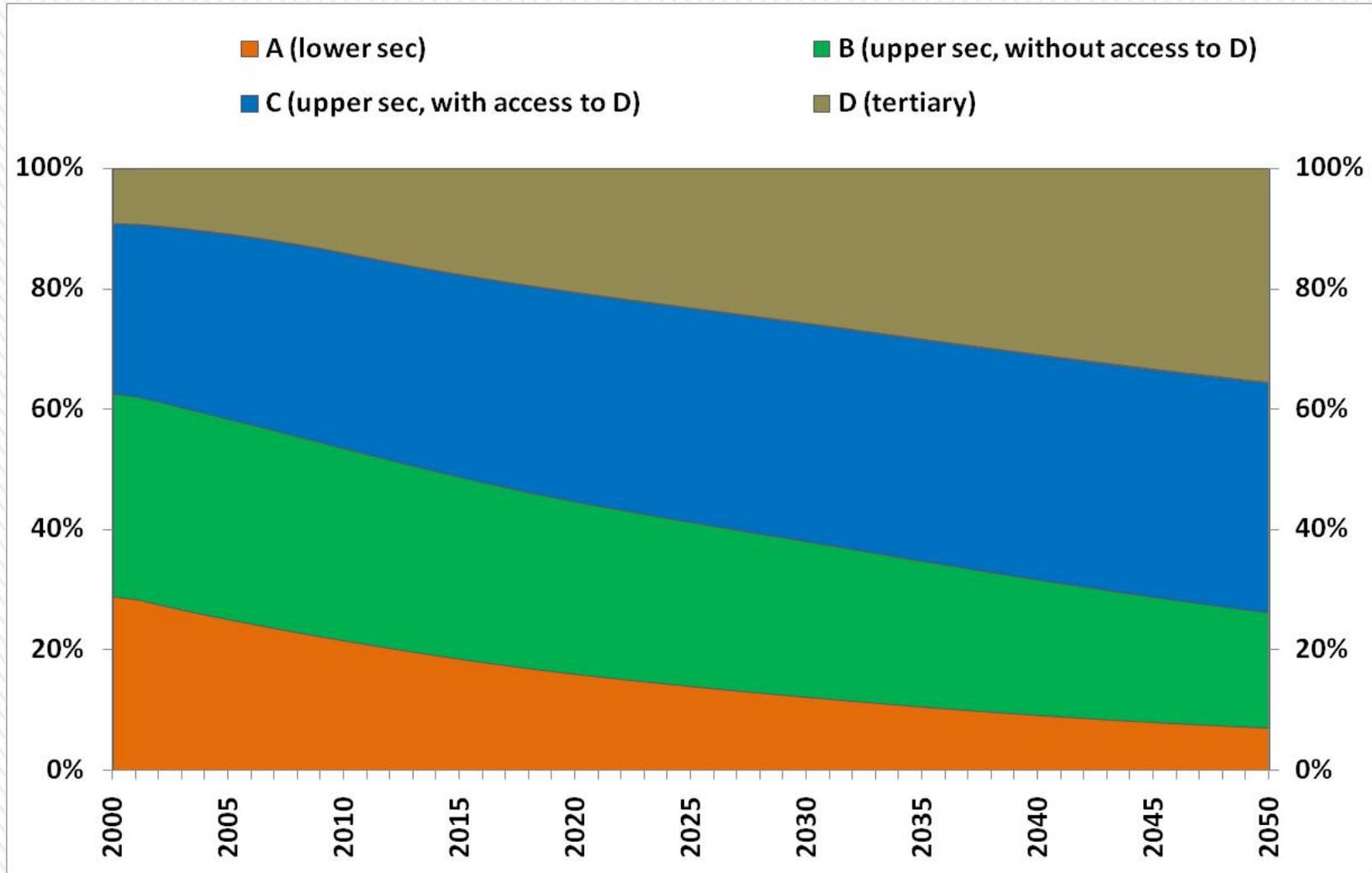
Demographic development in the Czech Republic from '50s



Education attainment forecast – men aged 25+, development to 2050



Education attainment forecast – women aged 25+, development to 2050



Conclusions (1/2)

- » Czech tertiary system changed from elite to mass in the middle of '90s and from mass to universal in the end of the first decade of the new millennium (based on the comparison of transversal and cohort data) → the result of OECD experts was wrong
- » this rapid change brings with it a number of serious problems
 - > financing
 - > quality of students
 - > quality of academic staff
 - > management and environment of tertiary institutions



Conclusions (2/2)

- » expansion of tertiary education lead to significant improvement of education attainment of the Czech population
- » comparing 11.6 % in 2001 and 15.2 % in 2011 of tertiary educated people aged 25+, our middle scenario shows that it could be around $\frac{1}{3}$ of population aged 25+ with tertiary education in 2050
- » we can expect that this situation should lead to many changes in society



Thank you for your attention ... 😊

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