



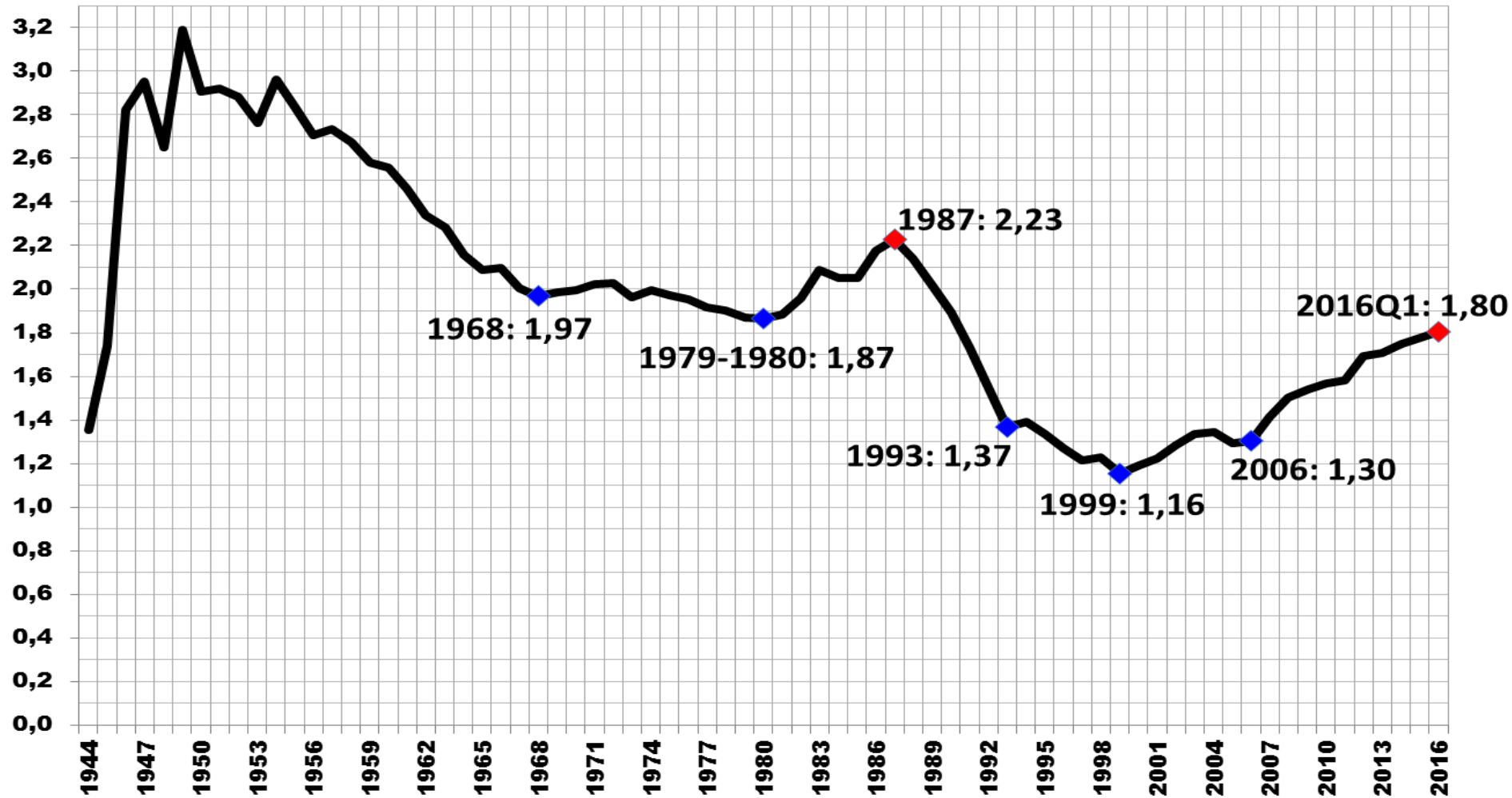
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# **Projecting Future Fertility in Russia: using cohort approach together with the idea of the Second Demographic Transition**

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## Total Fertility Rate (TFR), Russia, 1944 - 2016Q1





## Fertility rates (TFR) in Russia: HUGE fluctuations in the past:

**1987 – 1999: -48%**

**1999 – 2016Q1: +56%**

**NO ANY PROJECTION IN THE PAST COULD PREDICT THIS EVEN CLOSE**

***Challenge: how to predict?***

Period indicators, such as TFRT (Total Fertility Rate for all birth orders combined), are UNRELIABLE and UNSUITABLE for using in projection.

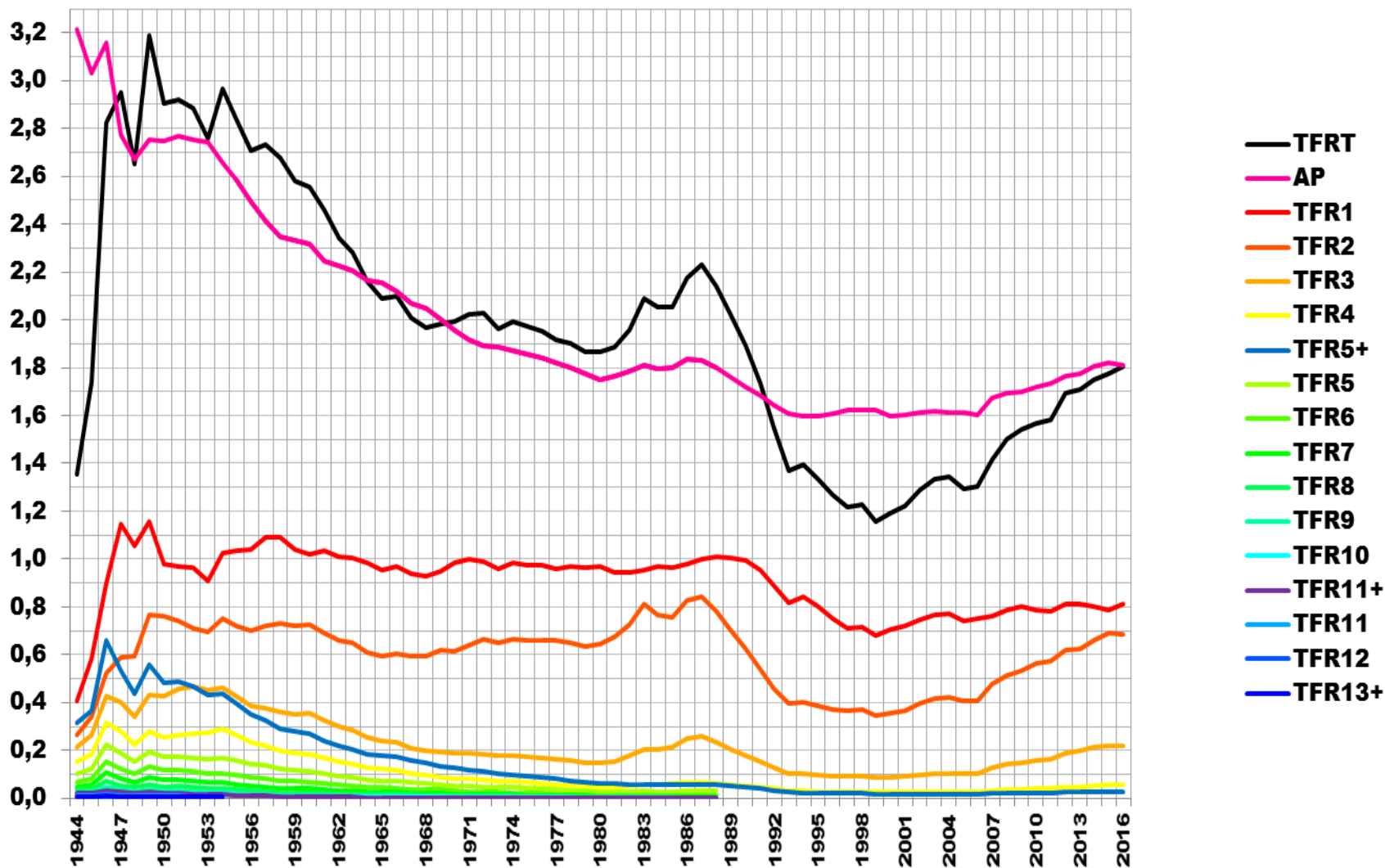
Average Parity (AP), calculated with Age-Specific Fertility Rates (ASFR) for each birth order, shows much less fluctuations.

Russia didn't have complete information about births by order from 1999 till 2012. All data for this period is extrapolated based on partially available data from 2/3 of regions.

Average Parity DOES NOT show any indication of childlessness rate so COHORT approach is needed.



## Total and birth order fertility vs. average parity, Russia, 1944 - 2016Q1





# Using Cohort approach:

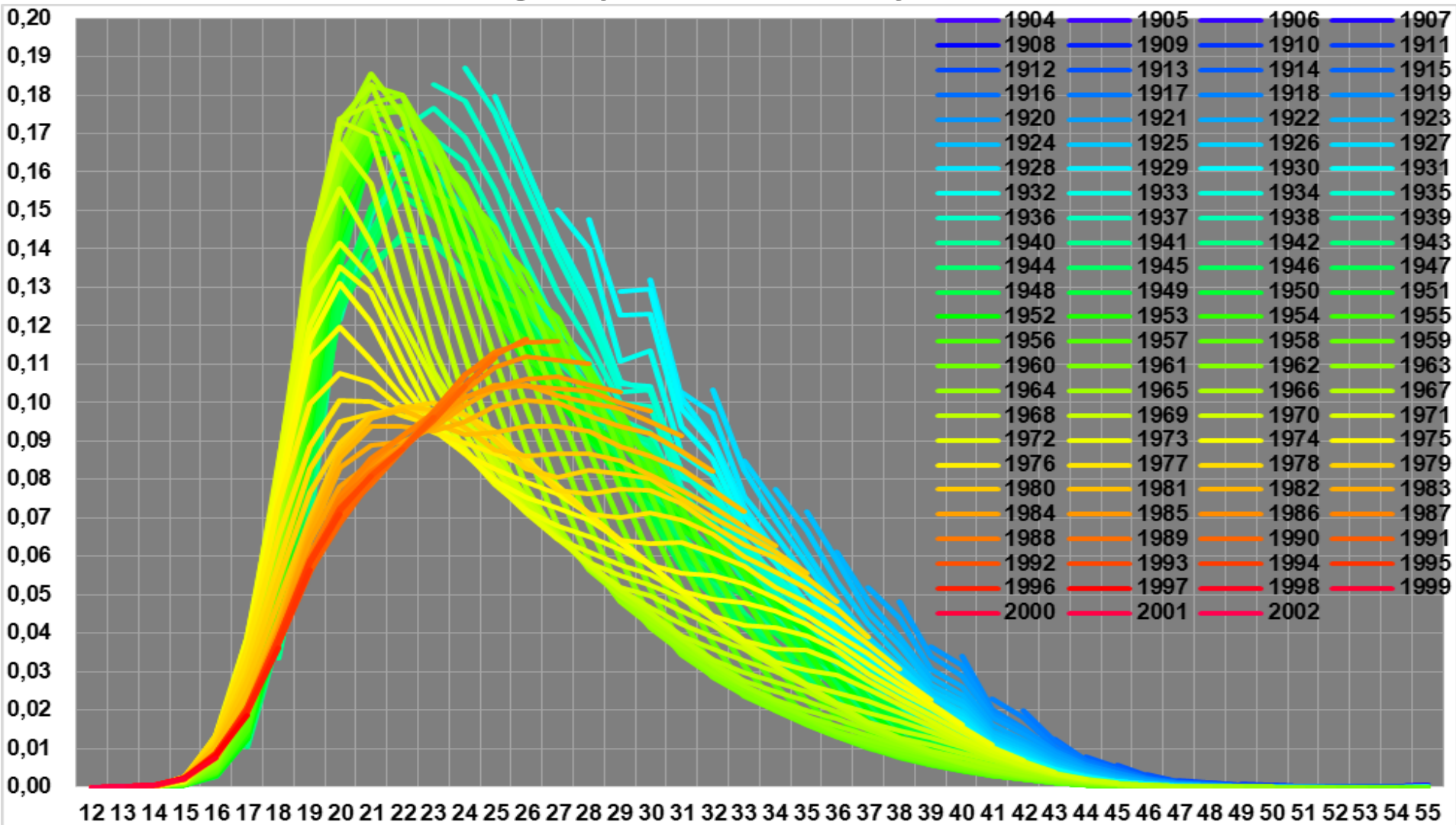
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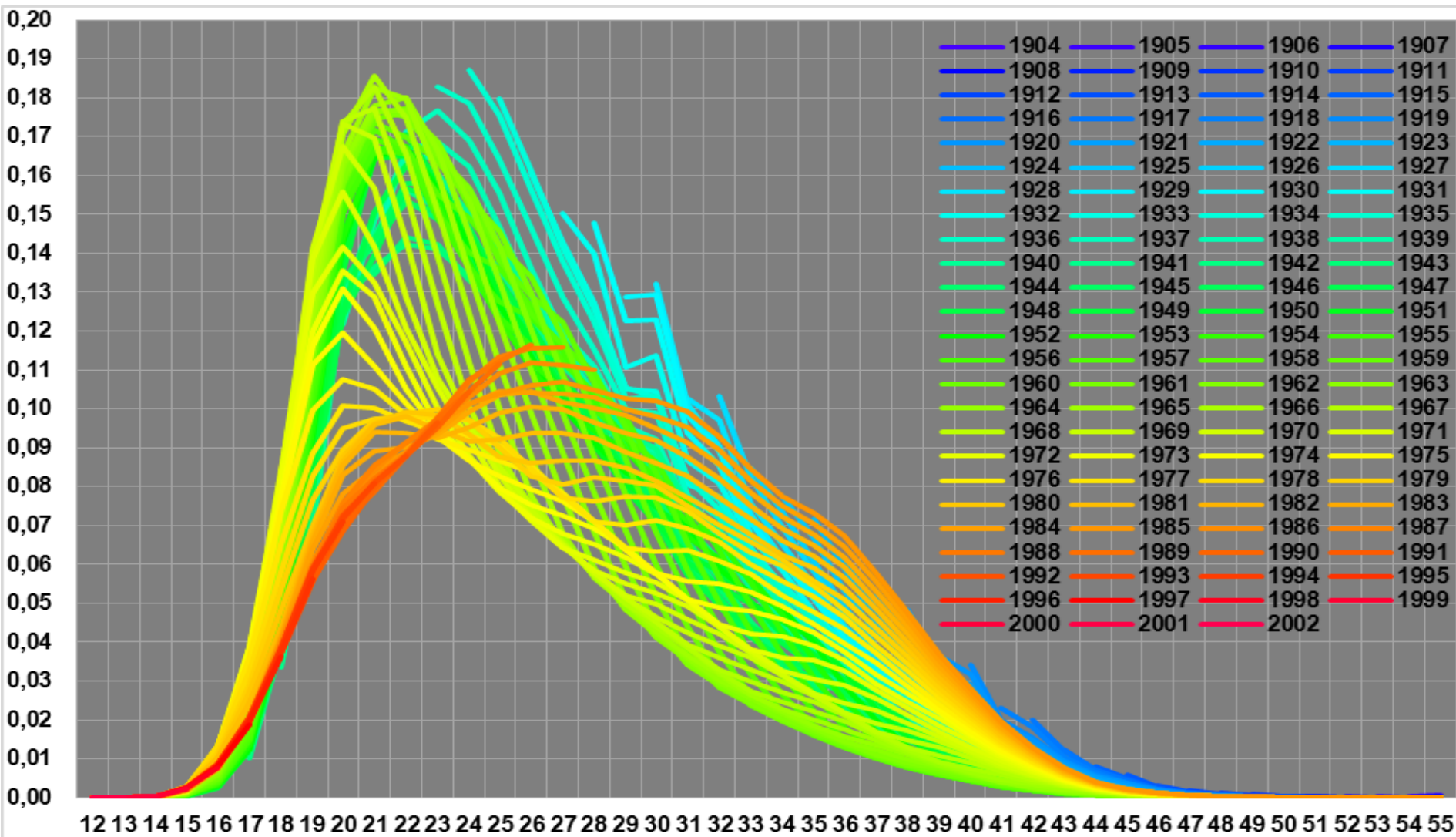


# Evolution of cohort age-specific fertility distribution in Russia



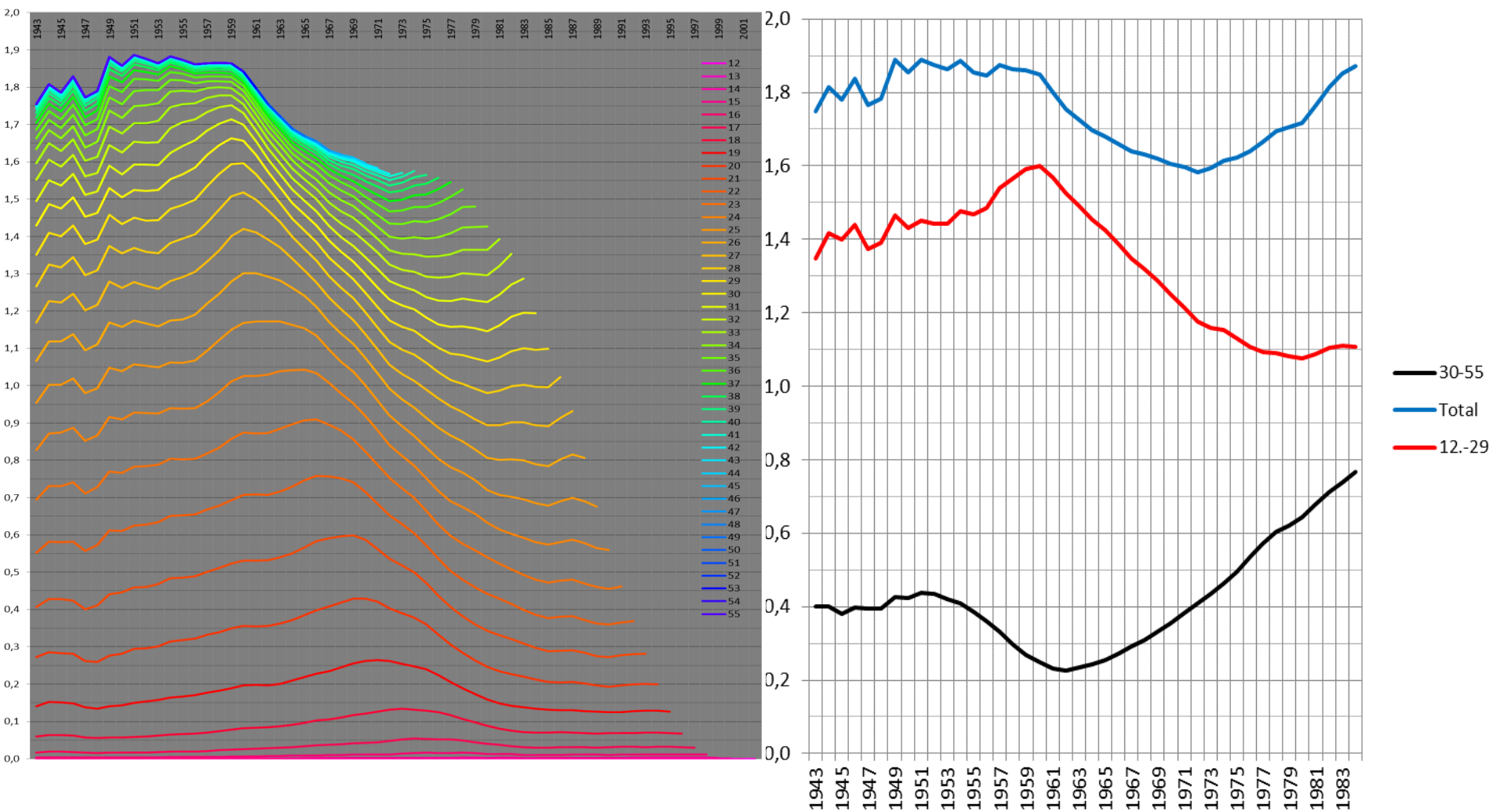


# Linear projection of cohort age-specific fertility distribution in Russia





## Accumulated cohort fertility in Russia by age, before and after 30







**Accumulated cohort measures show much less fluctuations, but need to be projected also.**

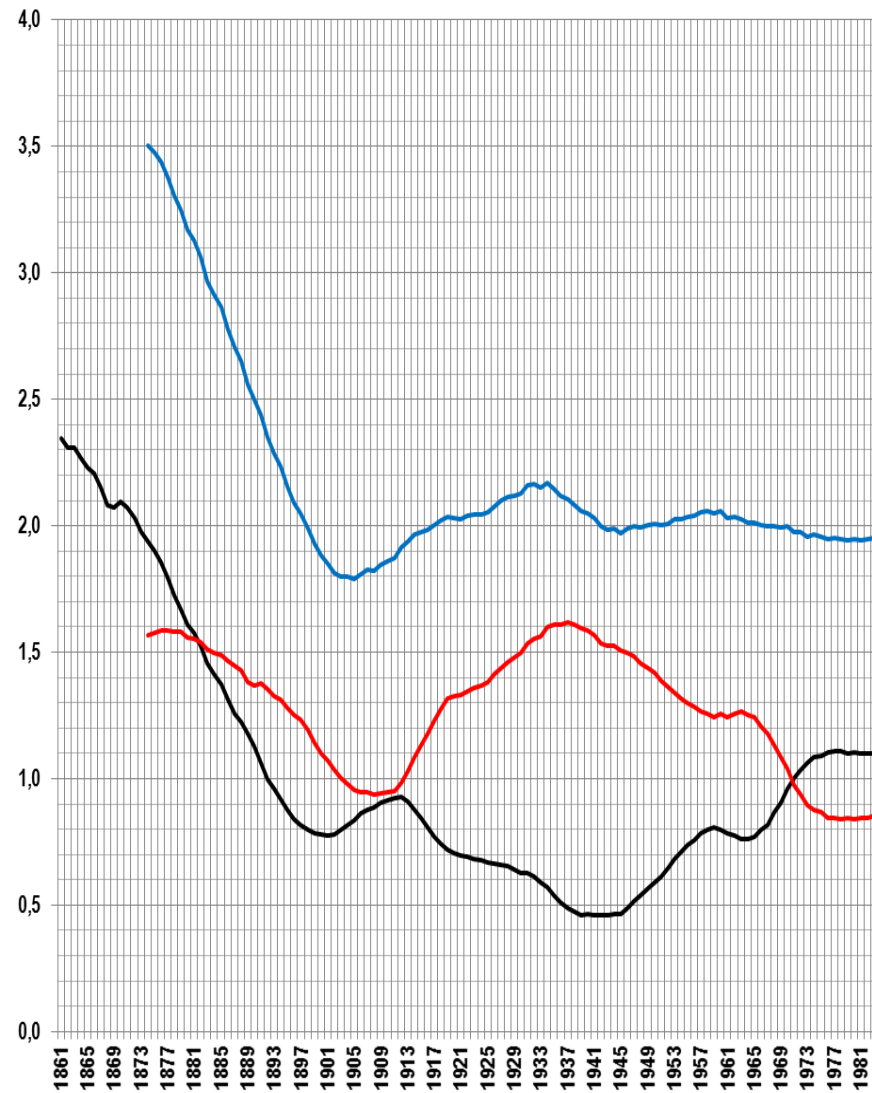
**The focus is on the fertility at age 30+, because “younger” fertility (age 29 or less) is already known.**

**Notice the growth of “older” fertility (age 30+). This is the universal pattern for all developed countries, but the process started at different points (cohorts).**

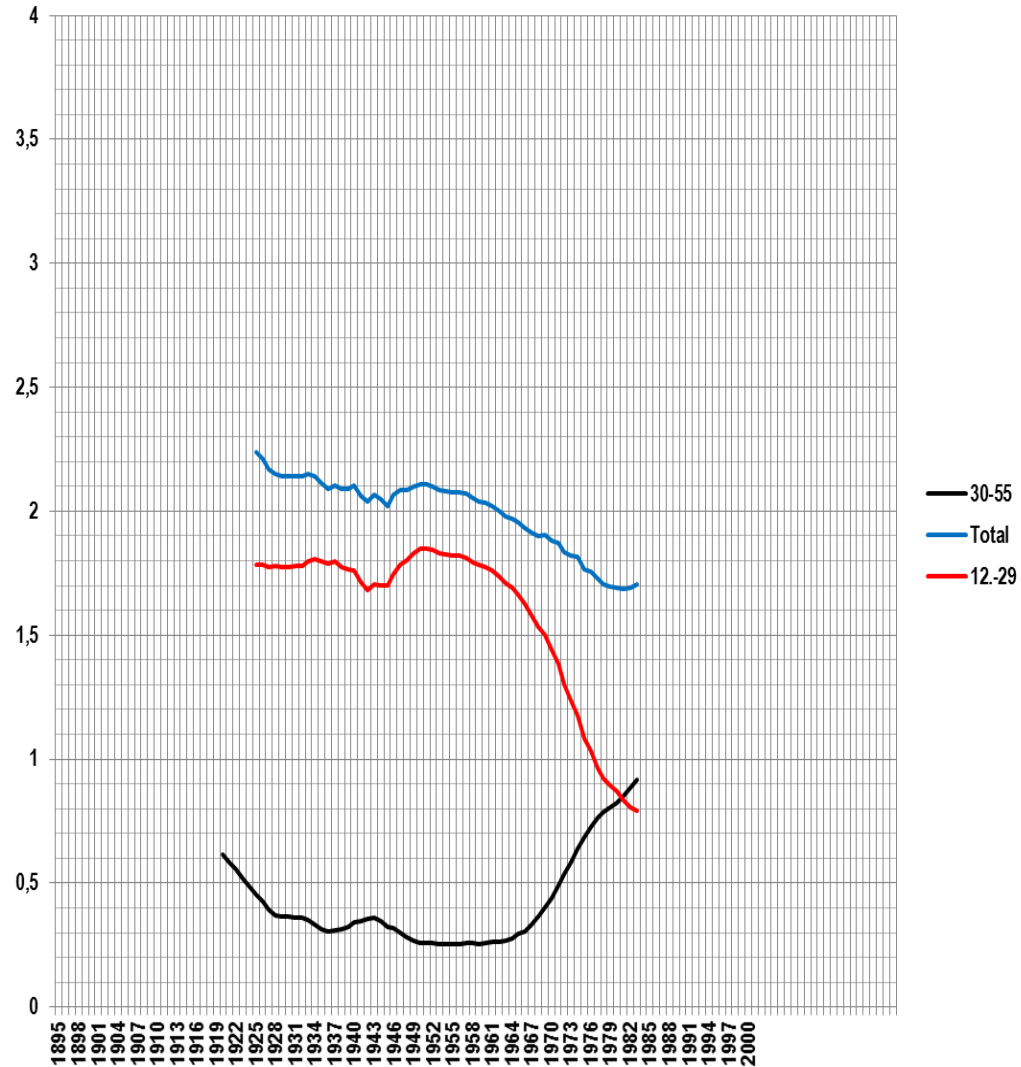
**The growth of “older” fertility usually reflects the decreasing of “younger” fertility in same cohorts of women.**



Sweden female cohort fertility

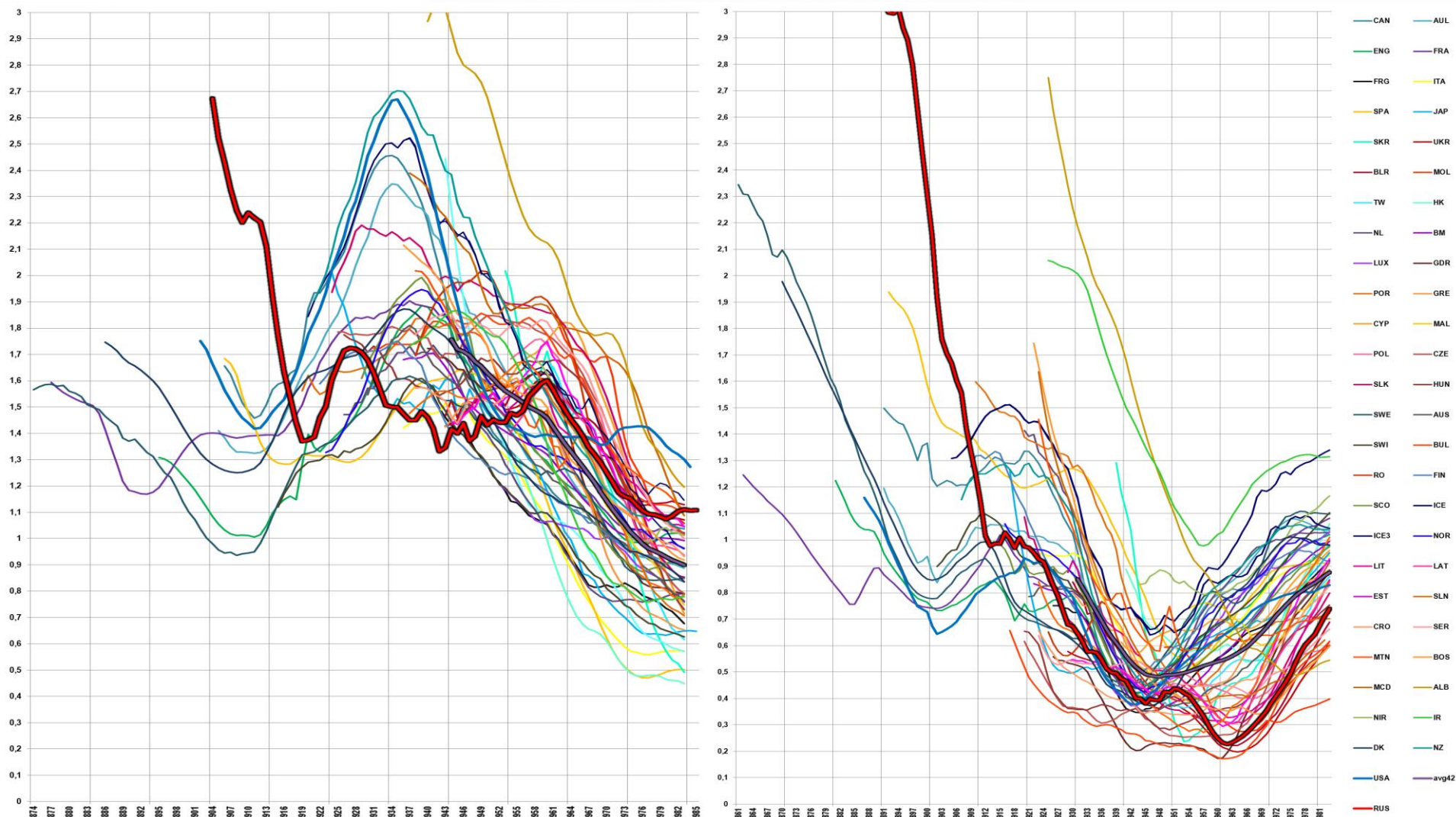


Czech republic female cohort fertility





## Cohort fertility before (left) and after (right) reaching age 30 in developed countries





## **Second Demographic Transition (SDT)**

**Origin of the concept emerged in 1986 (R. Lesthaeghe, D. Van de Kaa)**

### **Features:**

- lower fertility (initially)**
- LATER marriage and fertility (fertility aging and births postponement)**
- more births out of wedlock (higher extramarital fertility)**
- different life cycle trajectories**
- higher childlessness**

**Since that time the concept of the SDT grew into a kind of brand under which many different hypotheses have been introduced.**

**The point of interest for current study is the AGING of FERTILITY**



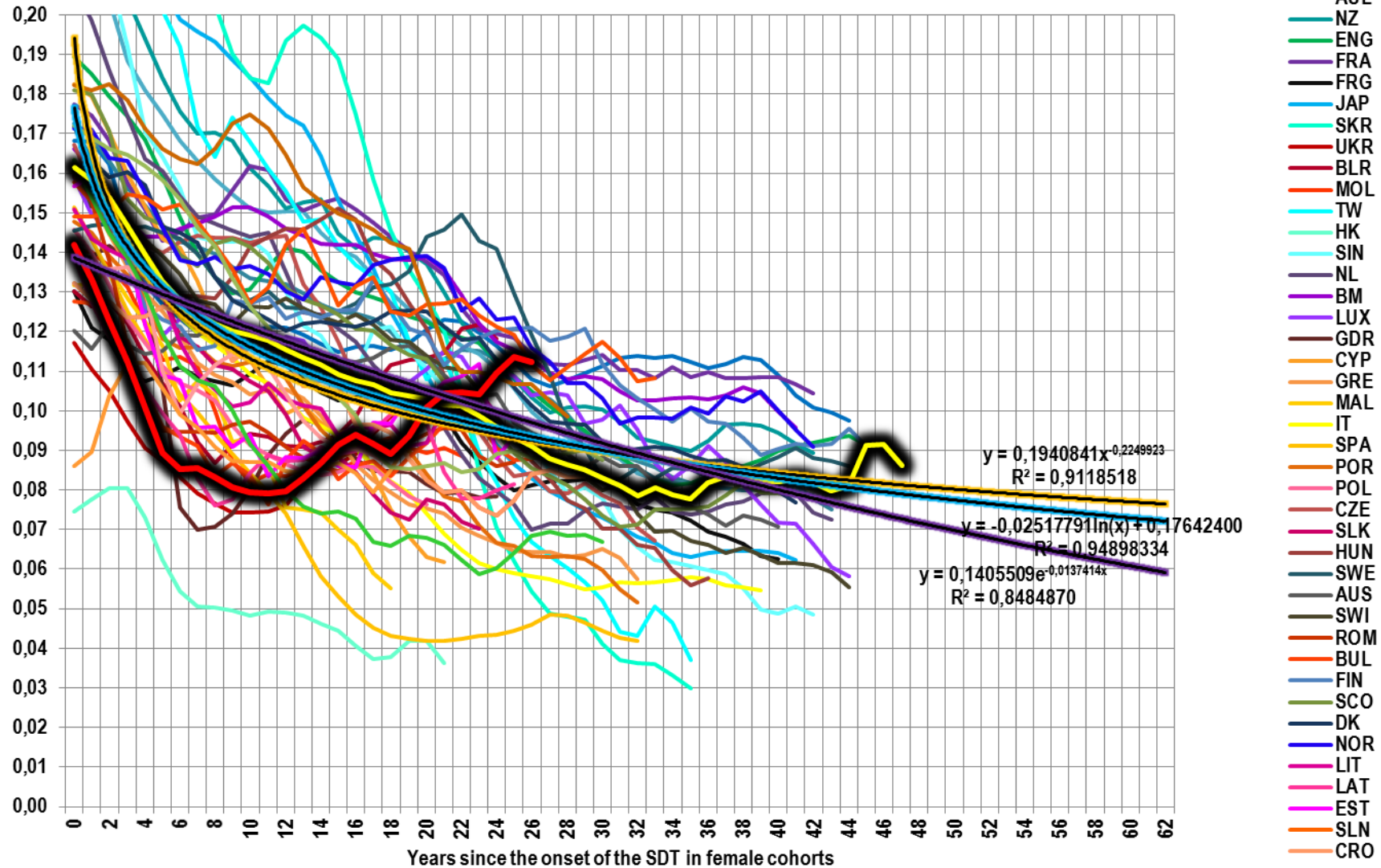


# Timeline of the start of fertility aging in developed countries

Cohort	Avg. age reaches minimum for the last time			Fertility 30+ reaches minimum			Fertility 30- reaches last maximum		
1934							Canada	Australia	
1935							USA	Finland	New Zealand
1936							Denmark		
1937							Austria	Sweden	France
1938								Iceland	
1939	Finland						England&Wh	Scotland	Switzerland
1940	USA			Finland				Portugal	Norway
1941	Canada						Netherlands	Belgium	
1942	Australia			Canada	England&Wales				
1943	Switzerland			USA	Switzerland	Sweden	Luxembourg		
1944	England&Wales	Sweden	Denmark	Netherlands	W.Germany	Netherlands	Australia		
1945	Belgium	France	Norway	Scotland	Norway	Belgium	France	Japan	New Zealand
1946	Scotland	W.Germany	Japan	Iceland	Denmark	Iceland		Singapore	
1947	Austria	Italy	New Zealand	Chile	Austria				
1948	Montenegro			Italy					
1949									
1950				Hungary			Romania		
1951	Bosnia&Herzegovina						Czech rep.		
1952							Greece		
1953	Serbia			Czech rep.	S.Korea	Taiwan	Montenegro		
1954	Croatia			Greece	Croatia				
1955	Hungary	Spain		Spain	Portugal				
1956	Ireland	Greece							
1957	Czech rep.	Portugal	Slovenia	N.Ireland	Ireland	Slovenia			
1958				Macedonia			Croatia	Slovenia	
1959							Bulgaria		
1960	E.Germany			E.Germany			Belarus		
1961	Estonia			Bulgaria	Estonia		E.Germany	Ukraine	Lithuania
1962				Russia	Lithuania	Romania	Russia	Estonia	Latvia
1963				Slovakia	Latvia				Poland
1964	Bulgaria	Romania	Latvia	Cyprus	Ukraine	Belarus	Cyprus	Armenia	Serbia
1965	Slovakia	Russia	Poland		Cyprus	Moldova			
1966	Ukraine			Hong Kong					
1967	Belarus			Poland	Serbia				
1968	Lithuania			Bosnia&Herz	Armenia				
1969				Malta	Chile				
1970									
1971	Moldova	Armenia	Brazil						
1972	Albania			Brazil					
1973									
1974	Costa Rica								
1975									
1976				Albania					

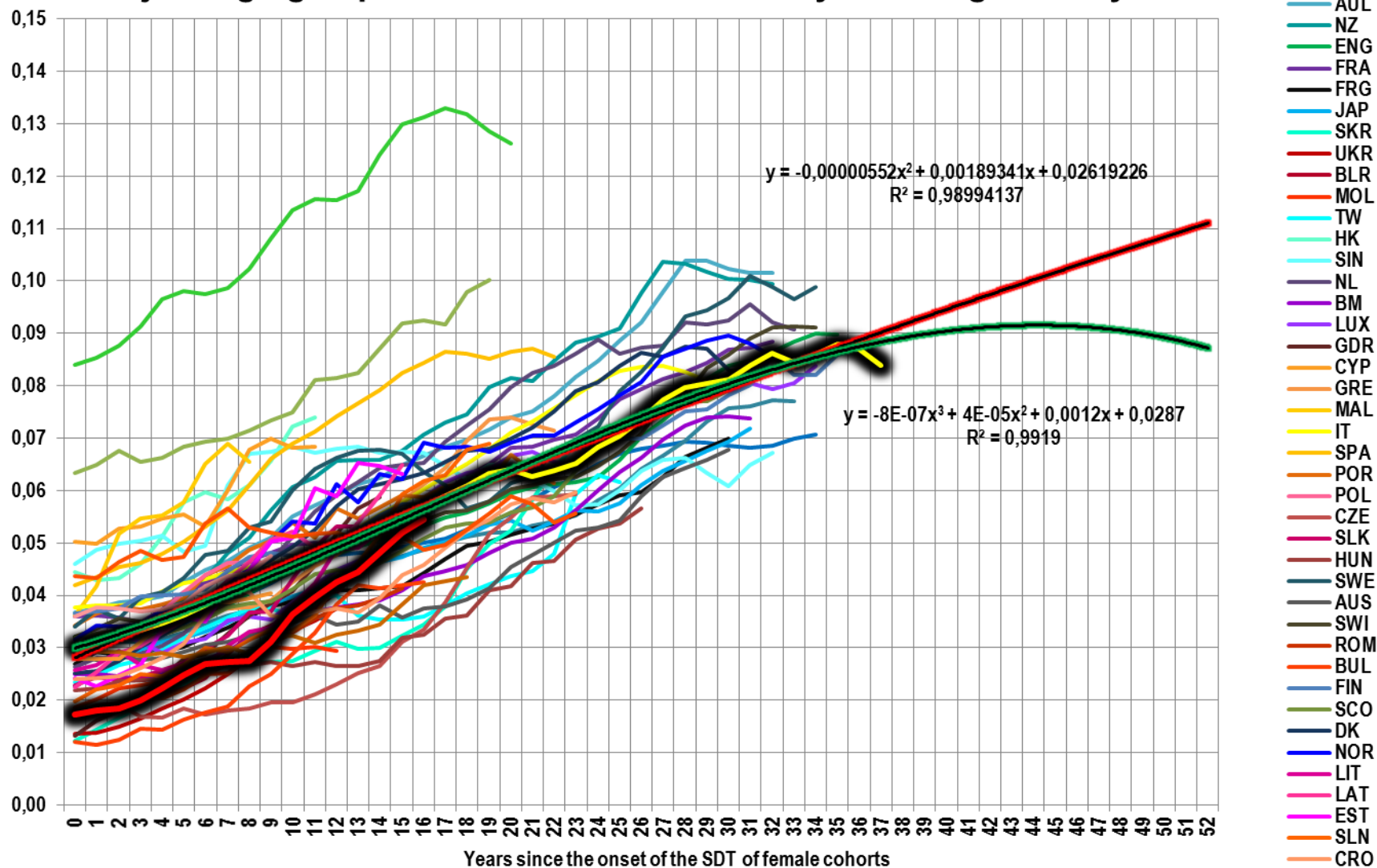


## Projecting age-specific female cohort fertility at the age of 25 years



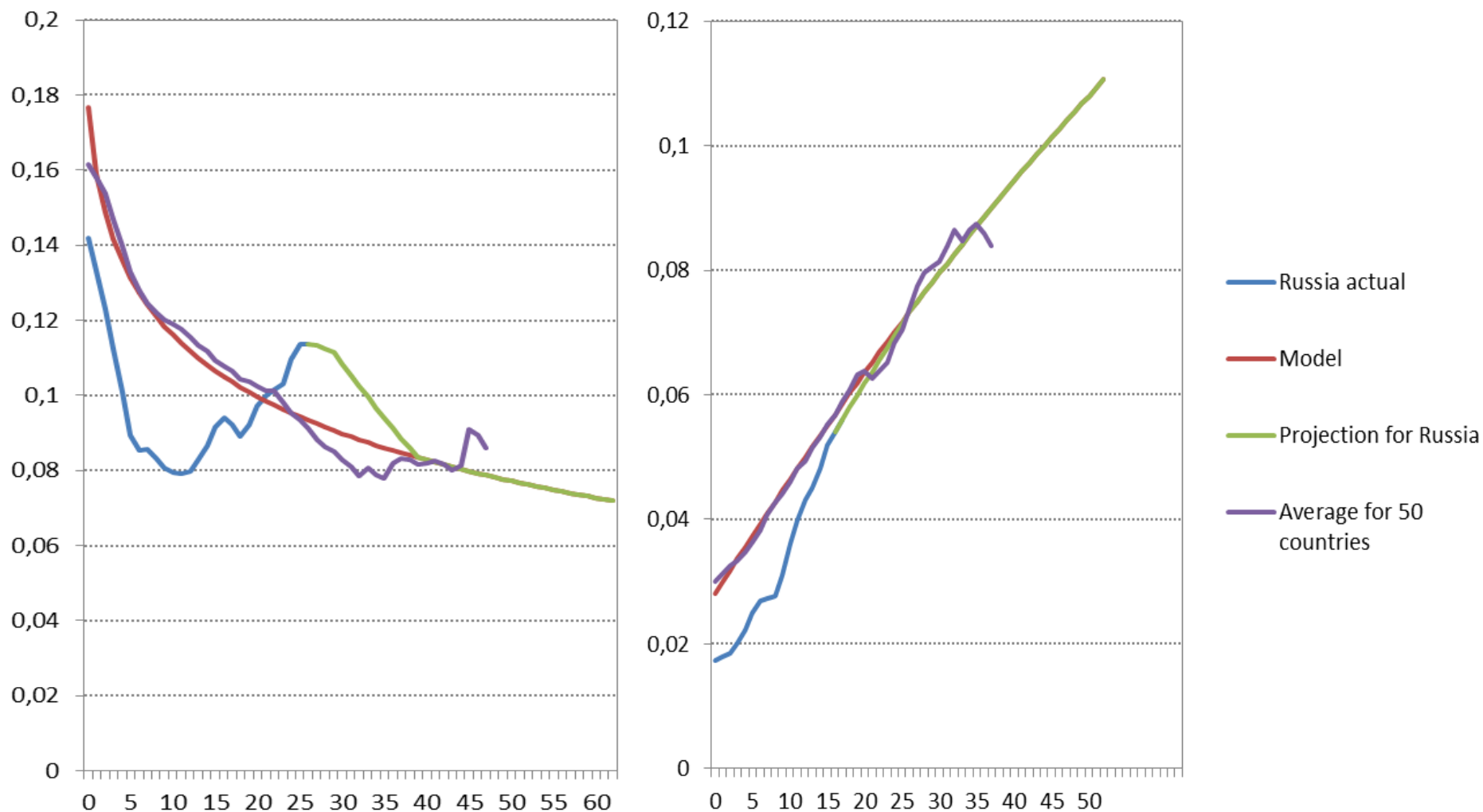


## Projecting age-specific female cohort fertility at the age of 35 years





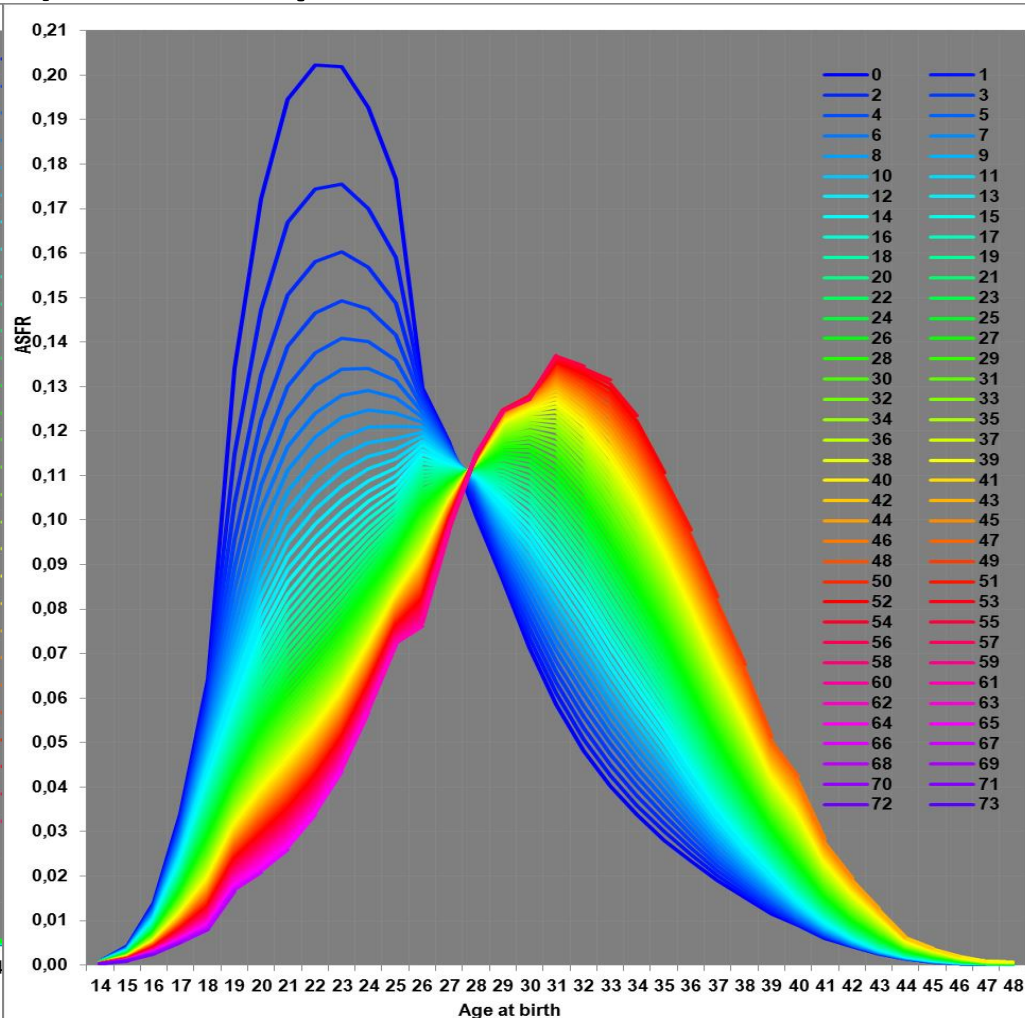
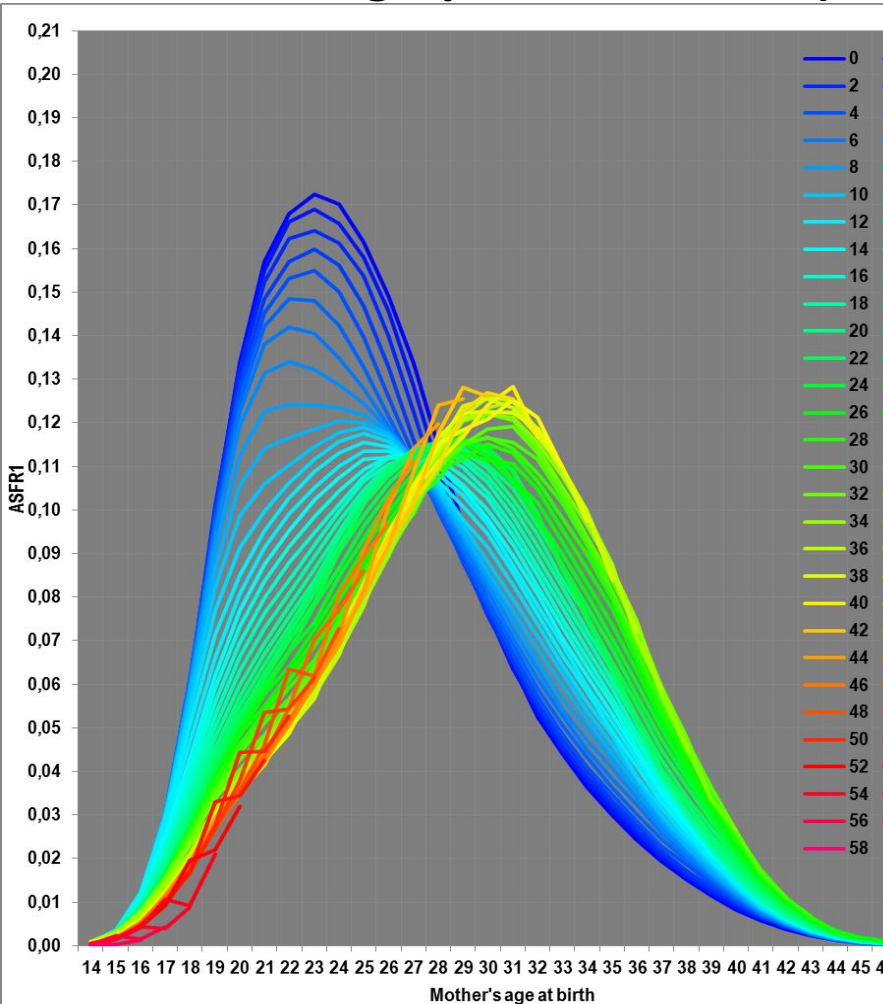
## Cohort fertility projection for age 25 (left) and 35 (right) in Russia





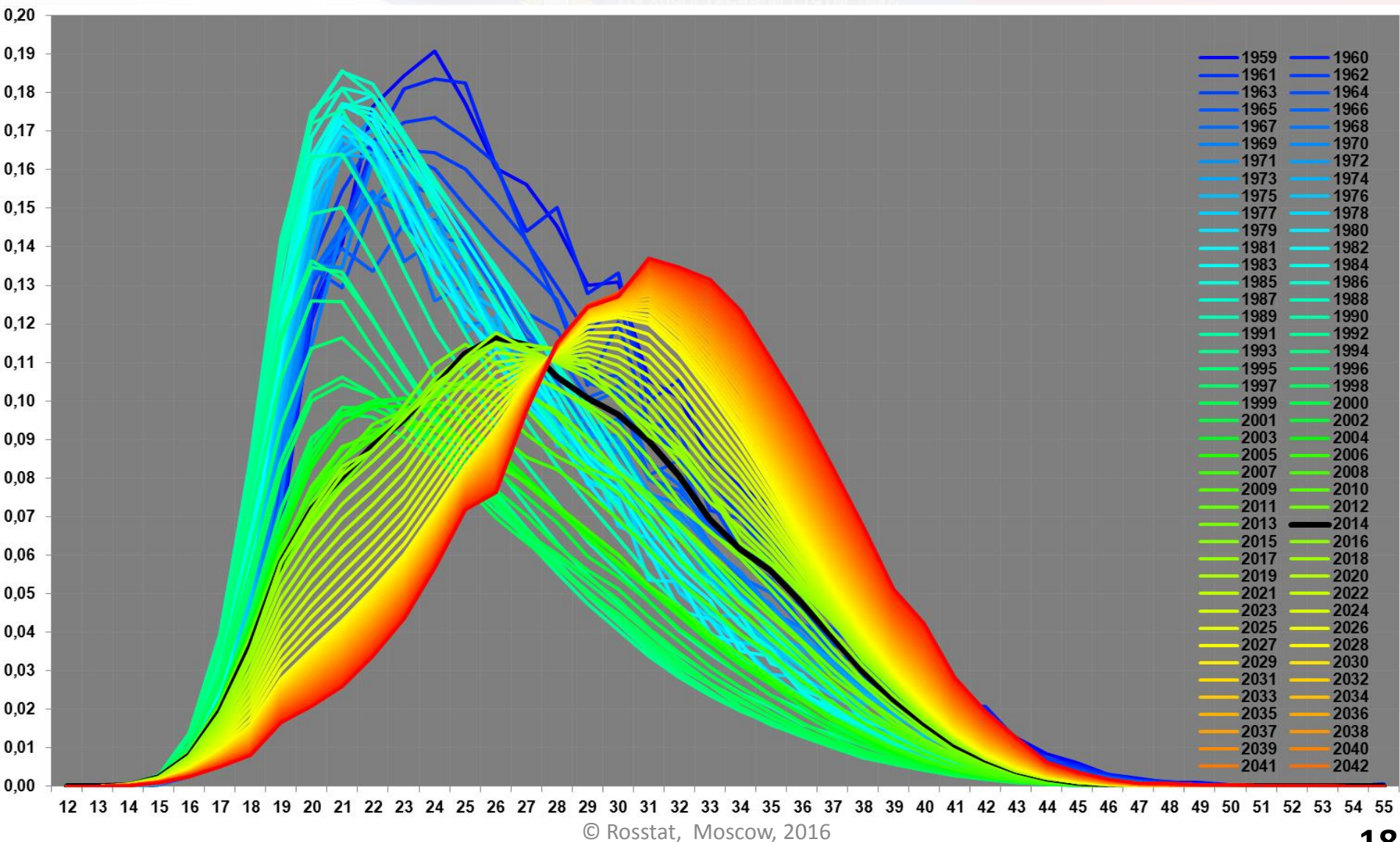


## Evolution of average (unweighted) fertility function since the onset of the Second Demographic Transition (SDT) in developed countries and its model



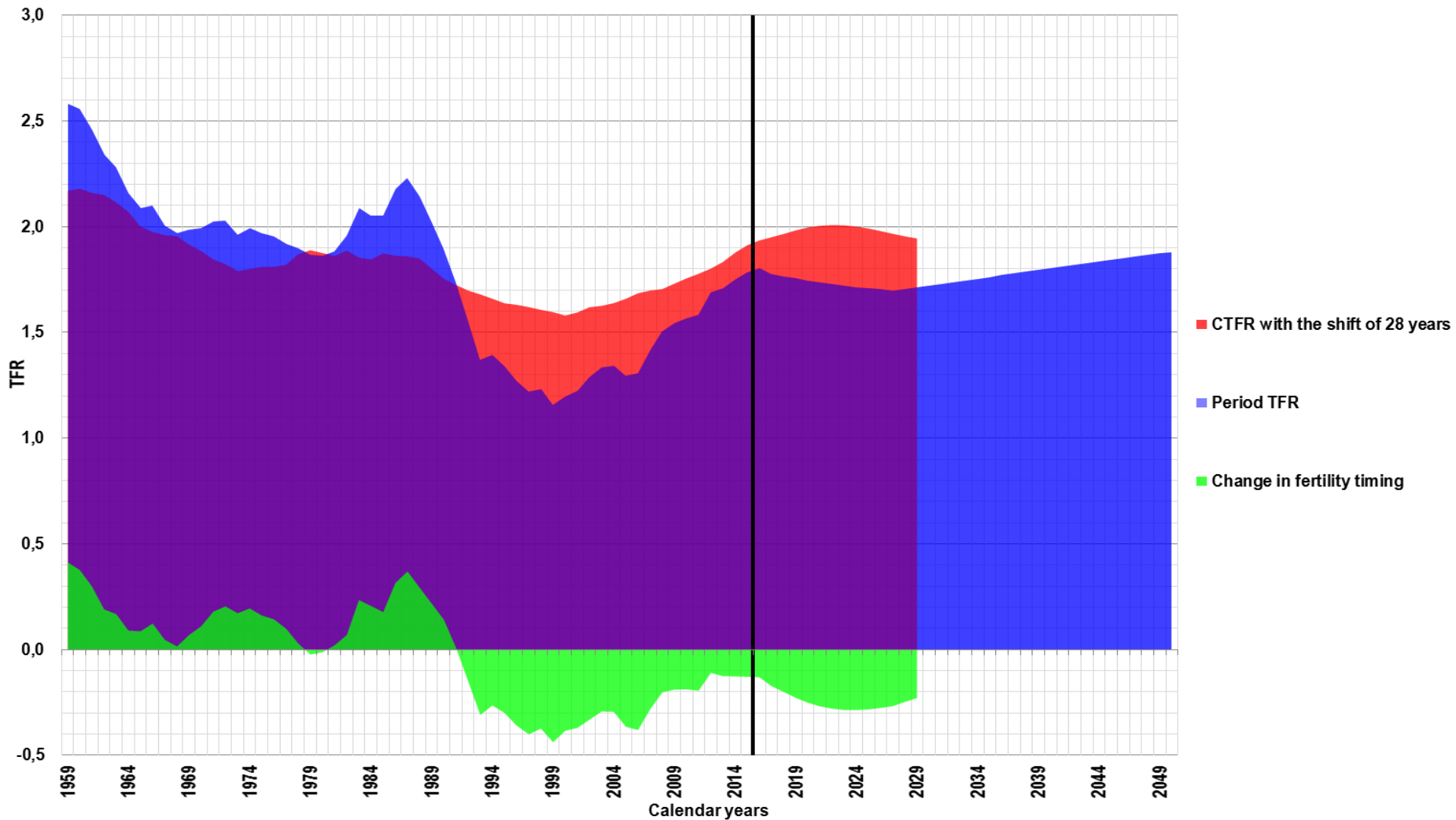


## Resulted cohort fertility age function projection for Russia (MIDDLE scenario with FAST fertility aging)





## Comparison between period and cohort fertility projection for Russia (MIDDLE scenario with FAST fertility aging)







## **LOW scenario with SLOW fertility aging hypothesis**

**Differences between MIDDLE and LOW scenarios in calculation:**

- 1. PERIOD indices used instead of COHORT, so NO SHIFT in time between countries**
- 2. Using period indices allowed to WEIGHT countries by different birth characteristics:**
  - a) Period TFR (age 12 - 55)**
  - b) Period TFR relative change between 2003 and 2013 (age 12 - 29)**
  - c) Mean Age at Birth (MAB)**
  - d) Excess Kurtosis of the age-fertility function**
- 3. In order to weight correctly, maximum possible historic deviations of listed 4 parameters have been used. For PTFR (12-55) 2 variants have been used.**
- 4. RELATIVE difference between Russia and every country by each parameter has been calculated.**
- 5. Resulted OVERALL difference between Russia and every country (LIKEHOOD) has been calculated.**
- 6. Resulted list of most like countries:**

**Ukraine, Belarus, Romania, Bulgaria, Lithuania, Slovenia, Latvia, Moldova, Bosnia, England.**



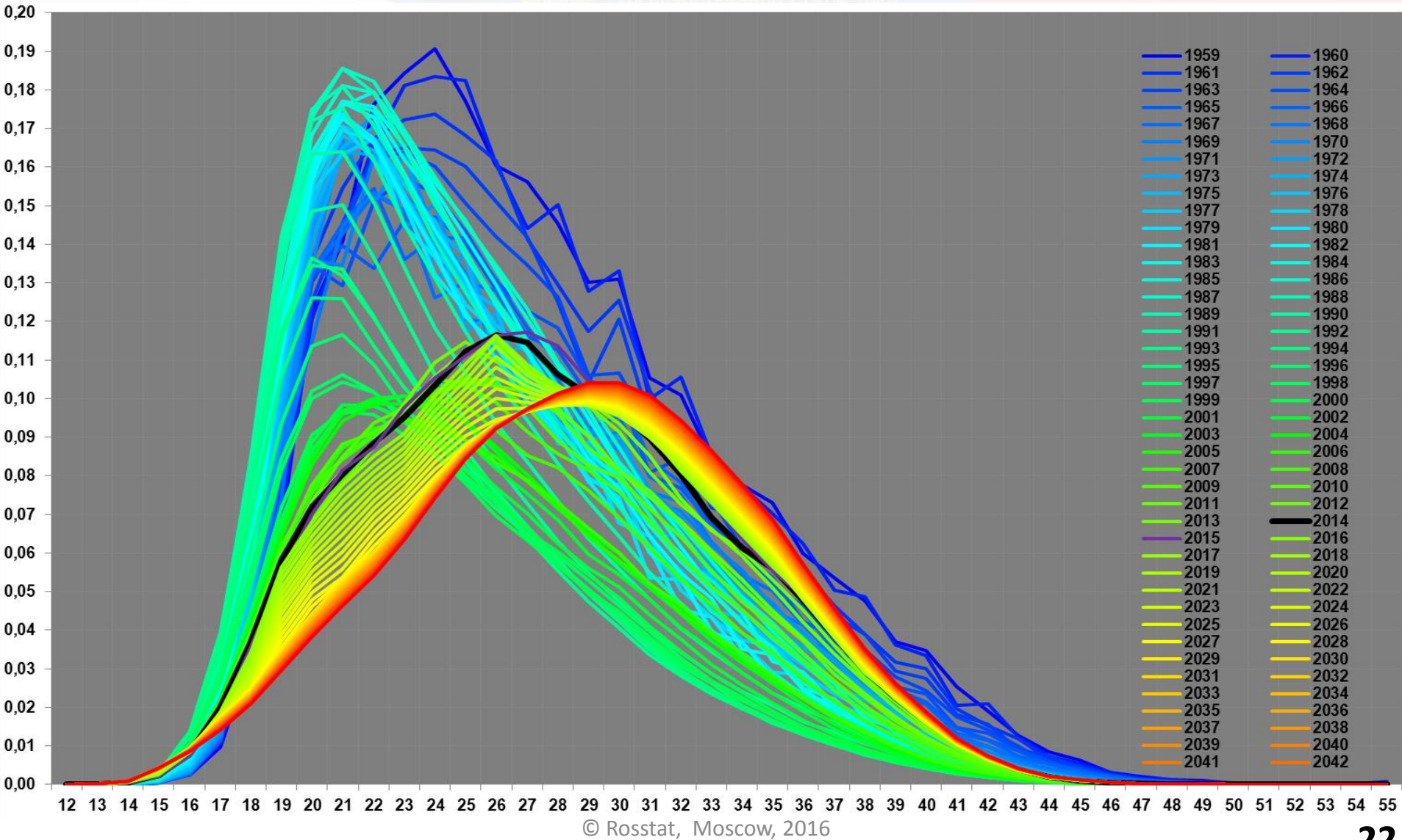


## Comparison between Russia and other developed countries using selected parameters and deviations calculation

Country	TFR-29-	TFR30+	MAB	ExKurt	TFR	Change TFR-30	TFR dev.	MAB dev.	ExKurt dev.	Change TFR-30 dev.	Dist.	W.	ran
USA	1,064	0,793	28,81	-1,52	1,857	-18,36%	2,54%	9,84%	-5,31%	-46,66%	0,480	4,33	
Canada	0,738	0,884	30,49	-0,82	1,622	-11,54%	-1,45%	29,69%	12,05%	-35,08%	0,475	4,43	
Australia	0,844	1,073	30,60	-1,00	1,916	-3,19%	3,54%	31,04%	7,63%	-20,91%	0,384	6,79	
New Zealand	0,946	1,007	30,01	-1,43	1,953	-6,55%	4,16%	23,98%	-3,19%	-26,62%	0,362	7,63	
England & Wales	0,915	0,932	29,94	-1,41	1,847	-4,74%	2,37%	23,20%	-2,55%	-23,54%	0,332	9,06	10
Scotland	0,781	0,832	29,98	-1,28	1,613	-9,38%	-1,60%	23,67%	0,71%	-31,42%	0,394	6,45	
Northern Ireland	0,907	1,042	30,22	-0,89	1,949	-5,05%	4,10%	26,56%	10,31%	-24,06%	0,375	7,10	
Ireland	0,713	1,226	31,60	-1,01	1,939	-11,80%	3,92%	42,77%	7,36%	-35,52%	0,562	3,16	
Iceland	0,935	0,998	30,37	-1,24	1,933	-15,53%	3,82%	28,27%	1,51%	-41,85%	0,507	3,90	
Norway	0,837	0,945	30,46	-0,82	1,782	-12,32%	1,26%	29,30%	11,94%	-36,40%	0,482	4,30	
Sweden	0,818	1,072	30,90	-0,88	1,890	-1,45%	3,10%	34,51%	10,46%	-17,97%	0,404	6,12	
Finland	0,817	0,931	30,45	-0,95	1,747	-10,70%	0,67%	29,23%	8,73%	-33,66%	0,454	4,84	
Denmark	0,729	0,940	30,84	-0,44	1,669	-17,19%	-0,66%	33,82%	21,36%	-44,67%	0,600	2,78	
Netherlands	0,706	0,968	30,93	-0,45	1,674	-10,30%	-0,57%	34,84%	21,11%	-32,98%	0,524	3,64	
Western Germany	0,608	0,843	30,93	-1,05	1,451	-17,91%	-4,35%	34,84%	6,33%	-45,89%	0,581	2,96	
Eastern Germany	0,760	0,740	29,73	-0,96	1,500	-7,33%	-3,52%	20,69%	8,65%	-27,94%	0,360	7,72	
Austria	0,684	0,753	30,27	-1,03	1,436	-16,87%	-4,61%	27,11%	6,83%	-44,12%	0,524	3,64	
Switzerland	0,566	0,949	31,59	-0,81	1,515	-14,25%	-3,27%	42,63%	12,31%	-39,68%	0,596	2,81	
Luxembourg	0,627	0,922	31,30	-0,93	1,549	-24,39%	-2,69%	39,31%	9,31%	-56,87%	0,698	2,05	
Belgium	0,886	0,872	30,08	-0,54	1,757	-8,97%	0,84%	24,90%	18,85%	-30,71%	0,438	5,21	
France	0,971	1,008	30,25	-0,86	1,978	-5,69%	4,59%	26,87%	11,09%	-25,15%	0,387	6,67	
Portugal	0,551	0,663	30,39	-0,91	1,214	-31,12%	-8,38%	28,49%	9,82%	-68,29%	0,751	1,77	
Spain	0,452	0,835	31,71	-0,73	1,287	-12,23%	-7,14%	44,04%	14,16%	-36,25%	0,592	2,85	
Italy	0,548	0,841	31,36	-1,07	1,390	-1,08%	-5,40%	39,99%	5,71%	-17,34%	0,443	5,10	
Malta	0,623	0,792	30,48	-0,43	1,415	-31,14%	-4,96%	29,61%	21,64%	-68,33%	0,777	1,66	
Greece	0,552	0,738	30,87	-0,80	1,290	-19,34%	-7,09%	34,19%	12,58%	-48,31%	0,609	2,69	
Cyprus	0,572	0,702	30,78	-0,68	1,274	-34,80%	-7,36%	33,17%	15,57%	-74,54%	0,834	1,44	
Albania	1,274	0,534	27,47	-0,70	1,807	-10,04%	1,69%	-5,91%	15,08%	-32,53%	0,364	7,55	
Macedonia	0,932	0,554	28,32	-0,99	1,486	-29,90%	-3,77%	4,09%	7,92%	-66,23%	0,669	2,23	
Montenegro	1,009	0,708	29,05	-1,08	1,717	-15,26%	0,16%	12,66%	5,52%	-41,40%	0,436	5,25	
Bosnia & Herzegovina	0,827	0,503	28,63	-0,72	1,331	-5,48%	-6,40%	7,69%	14,55%	-24,80%	0,304	10,79	9
Serbia	0,845	0,585	28,67	-1,20	1,429	-24,74%	-4,72%	8,16%	2,53%	-57,47%	0,583	2,94	
Croatia	0,765	0,712	29,74	-0,91	1,478	-17,65%	-3,90%	20,79%	9,88%	-45,45%	0,511	3,83	
Slovenia	0,780	0,775	30,09	-0,65	1,555	8,10%	-2,60%	25,01%	16,20%	-1,76%	0,300	11,14	6
Hungary	0,684	0,661	29,54	-0,93	1,344	-17,23%	-6,16%	18,50%	9,23%	-44,74%	0,497	4,05	
Czech Republic	0,724	0,732	29,85	-0,43	1,456	-10,16%	-4,27%	22,17%	21,81%	-32,75%	0,454	4,86	
Slovakia	0,762	0,579	28,77	-1,04	1,340	-10,28%	-6,24%	9,44%	6,52%	-32,94%	0,354	7,96	
Poland	0,733	0,523	28,95	-0,84	1,256	-11,78%	-7,66%	11,51%	11,52%	-35,49%	0,398	6,31	
Lithuania	0,915	0,672	29,15	-0,52	1,587	0,32%	-2,05%	13,85%	19,47%	-14,97%	0,283	12,52	5
Latvia	0,866	0,649	29,07	-1,18	1,515	-6,58%	-3,26%	12,99%	3,15%	-26,66%	0,300	11,11	7
Estonia	0,819	0,703	29,53	-1,21	1,521	-11,03%	-3,17%	18,34%	2,34%	-34,22%	0,390	6,57	
Bulgaria	0,997	0,487	27,11	-1,49	1,484	1,69%	-3,80%	-10,25%	-4,67%	-12,64%	0,173	33,22	4
Romania	1,016	0,499	27,27	-1,39	1,515	1,51%	-3,27%	-8,30%	-2,02%	-12,95%	0,159	39,79	3
Moldova	0,878	0,345	26,94	-1,06	1,223	-5,86%	-8,23%	-12,27%	6,18%	-25,44%	0,301	11,07	8
Ukraine	1,037	0,468	27,34	-1,23	1,506	10,45%	-3,43%	-7,50%	1,85%	2,22%	0,087	130,92	1
Belarus	1,117	0,551	27,79	-1,06	1,668	14,78%	-0,68%	-2,20%	6,17%	9,57%	0,116	74,12	2
RUSSIA	1,107	0,601	27,97	-1,30	1,708	9,14%	0,00%	0,00%	0,00%	0,00%	0,000		
Japan	0,607	0,819	30,96	-0,78	1,427	-8,11%	-4,77%	35,30%	12,98%	-29,25%	0,479	4,36	
South Korea	0,409	0,778	31,44	0,73	1,187	-40,58%	8,84%	40,92%	50,59%	-84,34%	1,069	0,88	
Taiwan	0,430	0,635	31,03	-0,43	1,065	-44,17%	-10,91%	36,09%	21,71%	-90,43%	1,004	0,99	
Hong Kong	0,380	0,743	31,94	-0,61	1,123	-15,89%	-9,91%	46,78%	17,28%	-42,46%	0,662	2,28	
Singapore	0,471	0,716	31,36	-0,48	1,187	-22,28%	-8,83%	39,98%	20,55%	-53,30%	0,703	2,02	

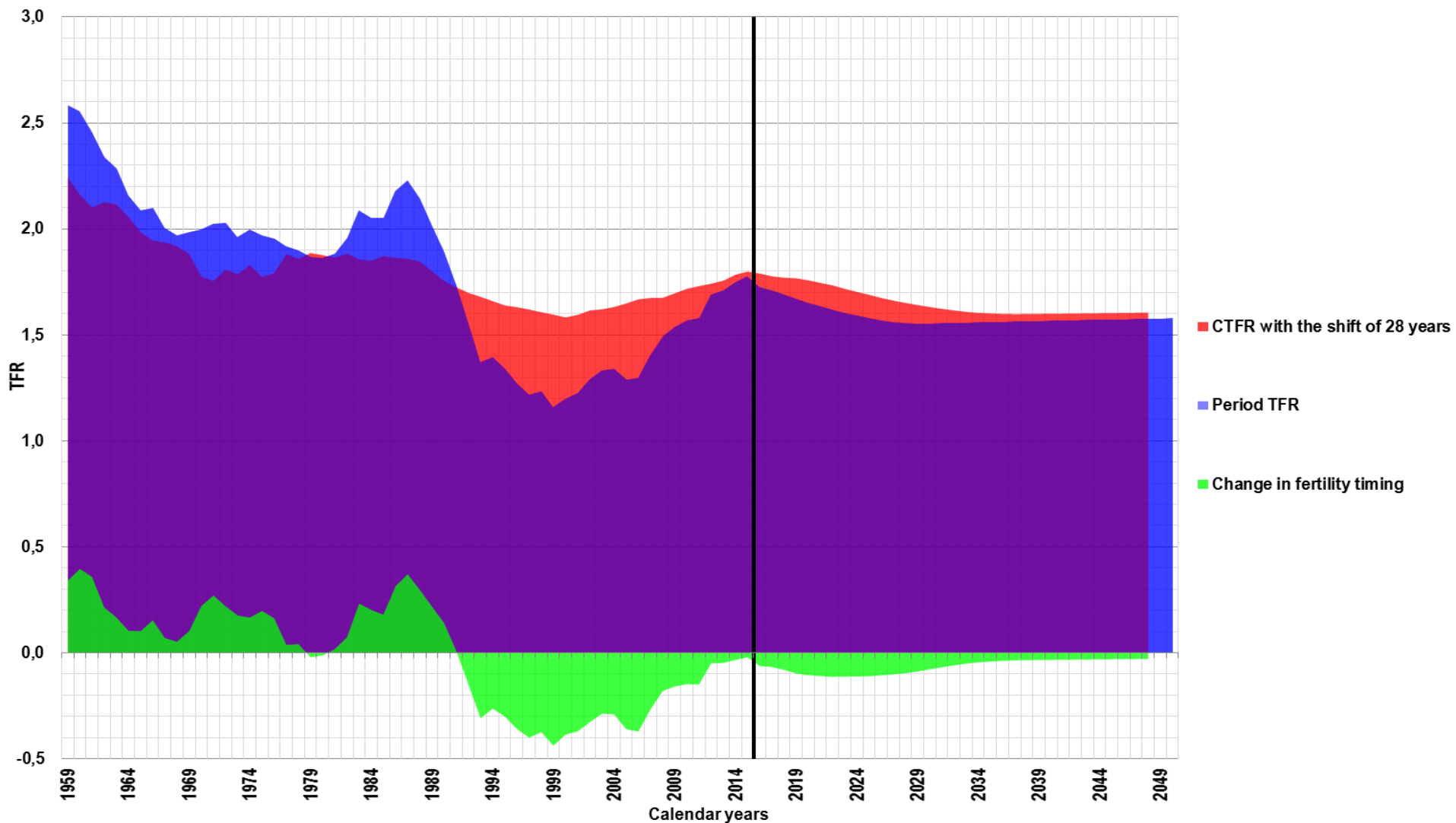


## Resulted cohort fertility age function projection for Russia (LOW scenario with SLOW fertility aging)





## Comparison between period and cohort fertility projection for Russia (LOW scenario with SLOW fertility aging)





## **HIGH scenario with AVERAGE fertility aging hypothesis**

**A combination of MIDDLE and LOW scenarios calculated as follows:**

**Among 2 sets of Age-Specific Fertility Rates (ASFR's) highest values have been used**

**The result is:**

**“Younger” fertility (age 12-29) falls slowly, like in LOW scenario;**

**“Older” fertility (age 30-55) rises fast, like in MIDDLE scenario.**

**Patterns were identical for the LAST 16 YEARS.**

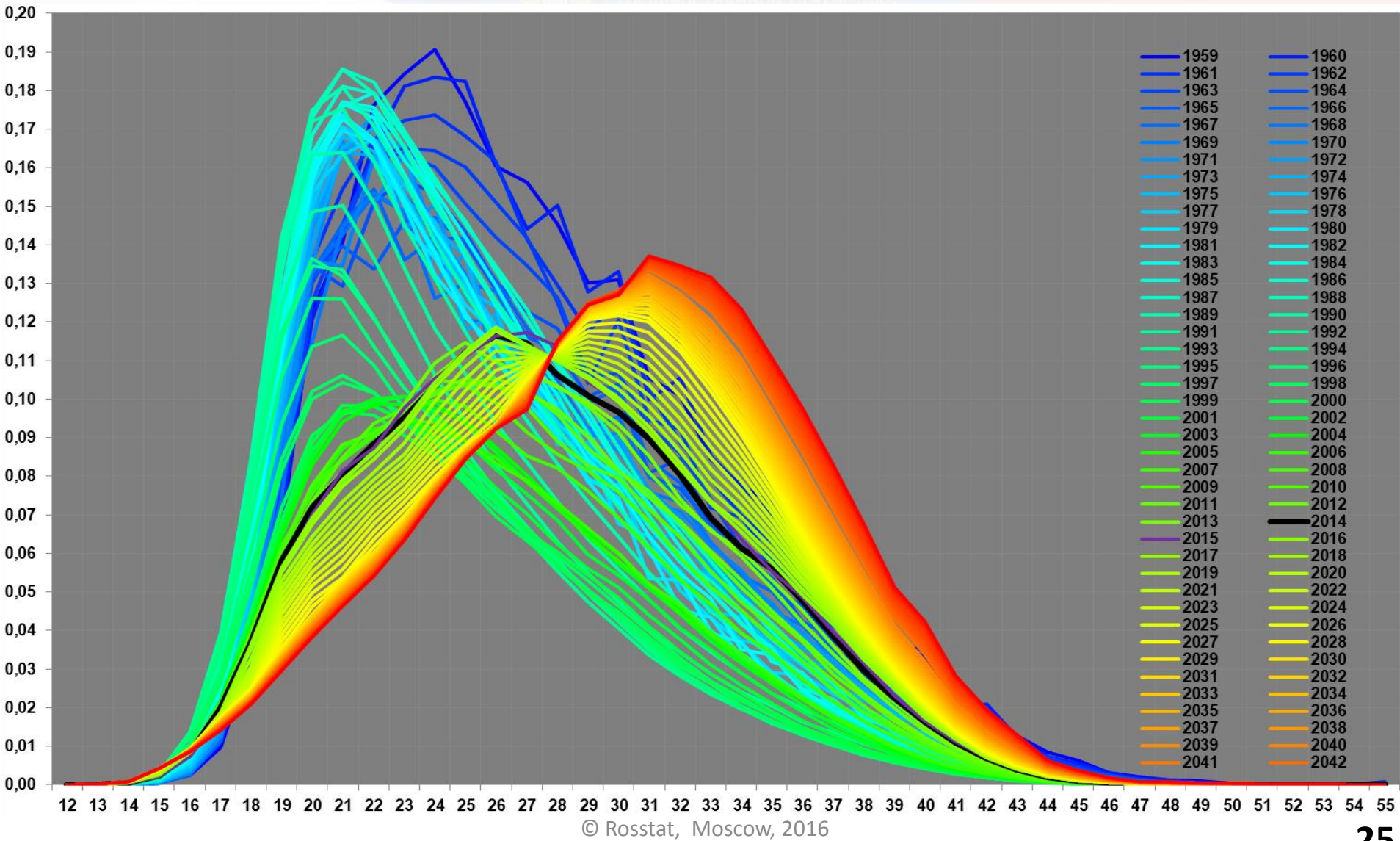
**The conclusion is:**

**It's the MOST LIKELY SCENARIO for NEAREST FUTURE**



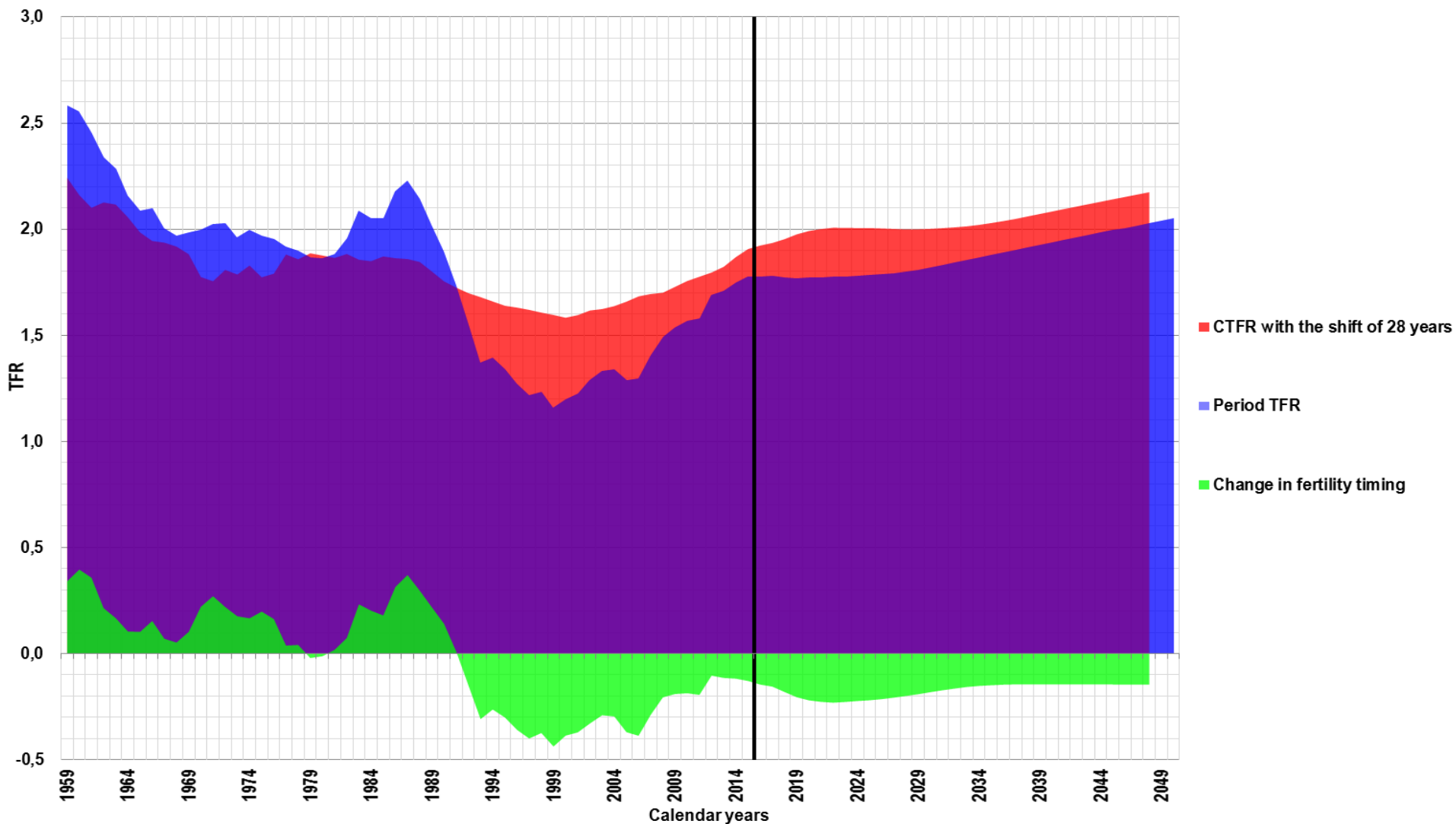


## Resulted cohort fertility age function projection for Russia (HIGH scenario with MODERATE fertility aging)





## Comparison between period and cohort fertility projection for Russia (HIGH scenario with MODERATE fertility aging)





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# Thank you for your attention!