

The Effect of Increased Compulsory School-leaving Age on the Teenage Fertility of Roma Women, a Disadvantaged Ethnic Minority

Anna Adamecz-Völgyi

*Central European University, Budapest Institute,
National Bank of Hungary*

Joint work with Flóra Samu and Ágota Scharle

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Szirák

Introduction¹

- ▶ we estimate the effect of increasing the CSL age from 16 to 18 on the teenage fertility of Roma women in Hungary
- ▶ teenage fertility is one of the most important channel of the intergenerational transmission of poverty (Bonell, 2014)
 - ▶ lowers academic attainment and labour market attachment rates (Chevalier and Viitanen, 2003)
 - ▶ increases rates of benefit receipt and infant mortality (Fletcher and Wolfe, 2008; Wilson, 2012)
 - ▶ negative effects on the second generation (Paniagua and Walker, 2012)
- ▶ due to high opportunity costs, teenage childbearing is declining in most developed countries
- ▶ however, it is still very high among several disadvantaged ethnic minorities living in developed countries (Mexican women in the US, women of Pakistani and Bangladeshi origin in the UK, Turkish women in Belgium and France, and Roma women in Europe)

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The Puzzle

- ▶ Why is this the case?
 - ▶ fertility differences between ethnic minority and majority women come from social and economic exclusion (Bean and Swicegood, 1985)
 - ▶ the opportunity costs of early childbearing tend to be lower for minority women because their perceived and actual future economic opportunities are constrained anyways
 - ▶ young women may choose motherhood instead of investing in the development of their own human capital because they feel they have little chance of advancement
- ▶ if this is true, economic phenomena and policy tools that reduce high teenage fertility through human capital development among the majority ethnic group of society may work differently in the case of women of disadvantaged ethnic minorities
- ▶ we are interested in the effects of increasing the CSL age among Roma women, a disadvantaged ethnic minority in Hungary

The Effects of Education on Teenage Fertility

- ▶ in general, most papers find that longer schooling reduces teenage fertility (Berthelon and Kruger, 2011; Black et al., 2008; Silles, 2011; Wilson, 2012, Cygan-Rehm and Maeder, 2013; Clark, Geruso and Royer, 2014)
- ▶ McCrary and Royer (2011) find that starting school earlier does not affect teenage pregnancy
- ▶ those finding effects do not agree on the mechanism causing this effect
 - ▶ human capital channel
 - ▶ incapacitation (incarceration) channel
- ▶ we show evidence for a "pure" incapacitation effect
- ▶ we use an RDD strategy and a rich individual level database that allows us to reconstruct the conception time of all known pregnancies
- ▶ we show that Roma teenagers are less likely to get pregnant under the higher CSL age regime during the school year, but not in Christmas and Summer breaks

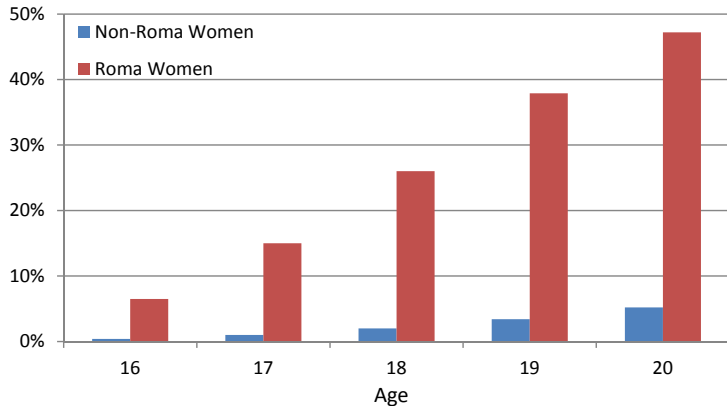
Data

- ▶ 2001 and 2011 Hungarian Census
 - ▶ 100% sample
 - ▶ exact date of birth, gender, place of residence, ethnic marker (Roma or not)
 - ▶ month and year of birth of individuals first five children (independently whether or not they live with them)
 - ▶ No. of completed schoolyears, and the grade for those in school at the time of the Census
- ▶ Vital Statistics database
 - ▶ 100% sample of all types of medical pregnancy-ending events: live births, abortions, miscarriages, still births
 - ▶ exact date of birth of women, place of residence, date of the event, pregnancy week (conception time)
 - ▶ no ethnic markers
- ▶ Linking procedure
 - ▶ linked individually based on variables available in both datasets
 - ▶ duplicates can not be linked, subsample of those living in less than 50-thousand inhabitant settlements
 - ▶ 40% of all Live Statistics events can be linked

Who is Roma in the Hungarian Census?

- ▶ Roma is the largest nationality in Hungary (Habolicsek, 2007: 500-600,000)
- ▶ being Roma is highly correlated with poverty, social exclusion, long term unemployment and poor access to public services, including health and education (Kemény and Janky, 2003; Ladányi and Szelényi, 2002; Kertesi, 2005)
- ▶ Census: ethnic markers come from self-assessment that allows double identity
 - ▶ substantial underreporting, more serious in 2001 (217,000/315,000 Roma people in the 2001/2011 Census)
 - ▶ those reporting themselves as Roma are more likely to live in smaller settlements, to be lower educated, to be unemployed, to live on lower and less stable income than those identified as Roma by others but not by themselves (Tárki, 2012)
 - ▶ underreporting is independent from the CSL age raise [▶ data](#)

The Probability of Motherhood by Age 16-20 Before the Raise

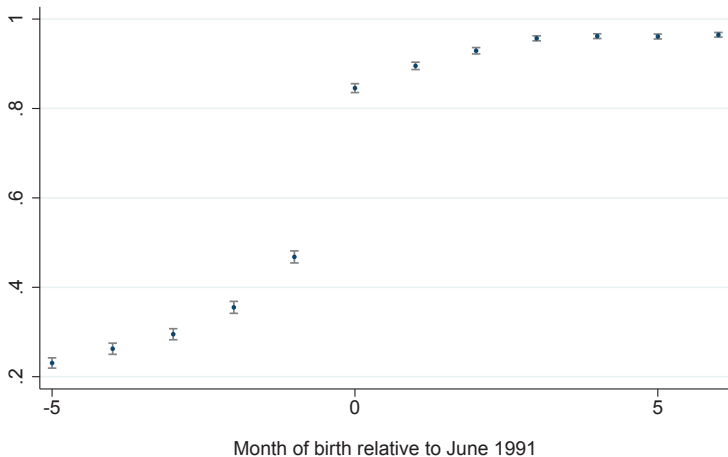


The CSL Age Raise

- ▶ the 1996 Law of Education increased compulsory school-leaving age from 16 to 18
- ▶ introduced in the case of those starting elementary school in Sept 1998
- ▶ age rule of elementary school start: reaching age 6 by May 31
- ▶ relevant cohort: those born in 1991
- ▶ compliance to the age rule: 80% on average in aggregate administrative data
- ▶ the jump in the probability of starting school under the new CSL age at the cutoff is about 0.35

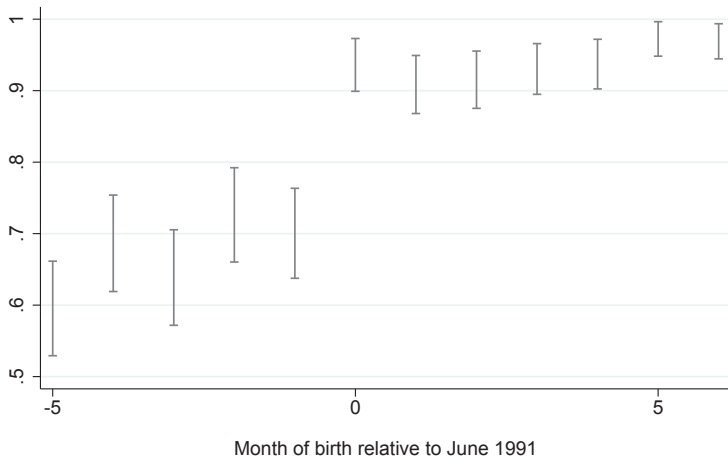
The Probability of Starting School under CSL Age 18, Women

The Probability of Starting School in 1998, All Women



The Probability of Starting School under CSL Age 18, Roma Women

The Probability of Starting School in 1998, Roma Women



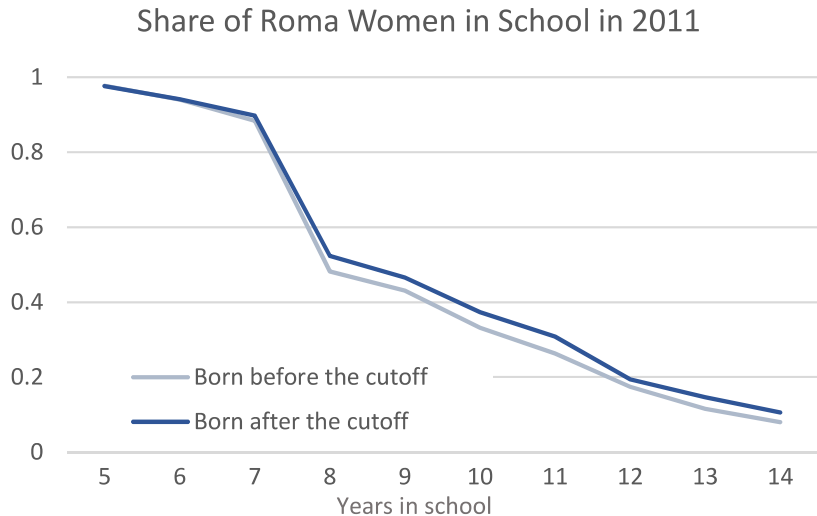
Identification Strategy

- ▶ compliance to the age rule of elementary school start creates a discontinuity in date of birth at June 1, 1991
- ▶ this discontinuity is used as a cutoff in a regression discontinuity design (RDD) strategy
- ▶ fuzzy RDD - intention to treat (ITT) effect
- ▶ 5 identification assumptions
 - ▶ being born right before or right after the cutoff is exogenous (this is relaxed as a robustness check)
 - ▶ exclusion restriction: being born right after the cutoff does not affect fertility decisions if not through increasing the CSL age (again, relaxed as a robustness check)
 - ▶ parents knowing about the legislation change in advance did not manipulate school start (there are no defiers) ▶ data
 - ▶ whether one assessed herself as Roma is not related to the CSL age legislation ▶ data
 - ▶ whether one assessed herself as Roma is not related to teenage pregnancy

Empirical Methods

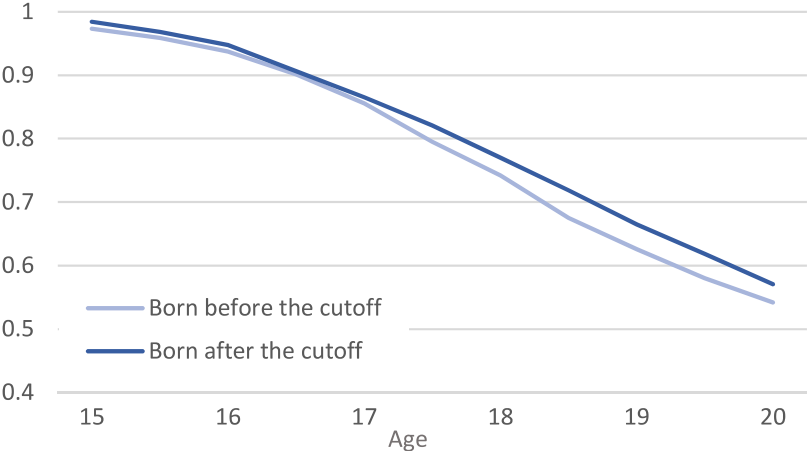
- ▶ nonparametric estimation (Hahn et al, 2001; Imbens and Lemieaux, 2010; McCrary and Royer, 2011; Gulesci and Mayersson, 2015): first degree local polynomial (kernel) regressions of the form
$$y_i = \alpha + \beta_i \text{treated}_i + f(x_i, \text{treated}_i) + \varepsilon_i$$
 - ▶ optimal bandwidth by Calonico, Cattanao and Titiunik (2014)
- ▶ parametric estimation (Acemoglu and Angrist, 2001): 4th order global polynomial regressions of the form
$$y_i = \alpha + \beta_i \text{treated}_i + f(x_i, \text{treated}_i) + \varepsilon_i$$
 - ▶ controlling for year-, month- and day-of-the-week of birth, county and settlement type fixed effects

Effects of Higher CSL Age on Schooling



Effects on Teenage Motherhood among Roma Women

Share of Childless Roma Women



Motherhood Delayed from Ages 16-18 to 18-20

Table 7: Effects on the Probability of First Birth-giving

| Probability of having the first child by age ... | All women | Roma women | Non- Roma women | Ethnicity Unknown |
|--|--|--|--|---|
| 16 | 0.001 (0.002) [50,005] {152.2} | 0.009 (0.020) [2,298] {148.2} | 0.001 (0.001) [51,884] {173.6} | -0.003 (0.011) [2,486] {201.3} |
| 17 | -0.002 (0.001) [60,137] {184.3} | -0.027 (0.020) [3,000] {194.8} | 0.000 (0.002) [53,321] {178.4} | -0.007 (0.011) [2,510] {203.0} |
| 18 | -0.004 (0.002) [65,502] {201.2} | -0.068*** (0.022) [2,906] {188.3} | 0.000 (0.003) [56,700] {190.8} | -0.02** (0.008) [2,545] {206.7} |
| 19 | -0.008 (0.004) [61,070] {187.9} | -0.067** (0.023) [3,015] {195.7} | -0.001 (0.004) [61,000] {205.3} | -0.01 (0.013) [2,100] {168.6} |
| 20 | -0.003 (0.004) [51,619] {157.2} | -0.018 (0.030) [2,633] {169.8} | -0.001 (0.004) [44,611] {148.0} | -0.044** (0.017) [2,438] {197.7} |

The Mechanics of the Effect

Table 8: The Mechanics of the Incapacitation Effect (Roma Women)

| Outcome | Census data | Linked data |
|--|--------------------------------|---------------------------------|
| A. Probability of giving birth by age 18 | -0.066** (0.022) [2,788] | -0.056*** (0.014) [2,327] |
| B. Probability of getting pregnant | -0.066** (0.019) [2,788] | -0.065** (0.021) [2,327] |
| C. Probability of abortion | - | -0.029* (0.016) [2,327] |
| D. Probability of ending pregnancy with abortion | - | -0.089 (0.077) [442] |
| E. Probability of getting pregnant during school years | -0.054** (0.024) [2,788] | -0.054** (0.023) [2,327] |
| F. Probability of getting pregnant during summer breaks | -0.011 (0.015) [2,788] | -0.003 (0.009) [2,327] |
| G. Probability of getting pregnant during Christmas breaks | - | -0.008 (0.007) [2,327] |

Robustness Checks

- ▶ same results with 50-150% versions of the CCT (2014) bandwidth [▶ table](#)
- ▶ no such effects in the year before (1990) and after (1992) [▶ table](#)
- ▶ same results with global polynomial estimation [▶ table](#)

Discussion

- ▶ estimate the effect of increasing the CSL age among women of a disadvantaged ethnic minority
- ▶ we find that being in school mechanically has an incapacitation effect on Roma teenagers
- ▶ analogous result on the effect of education on criminal behaviour of teenagers by Jacob and Lefgren (2003)
- ▶ are these results socially or economically relevant?
 - ▶ newborn babies of mothers aged 18-20 as opposed to 16-18 are slightly more healthy [▶ data](#)
 - ▶ women are more likely to work at any points in their life if they had their first child between ages 18-20 instead of 16-18 [▶ data](#)
- ▶ as far as we know, we are the first ones to document the same-time incapacitation effect of education on teenage pregnancy

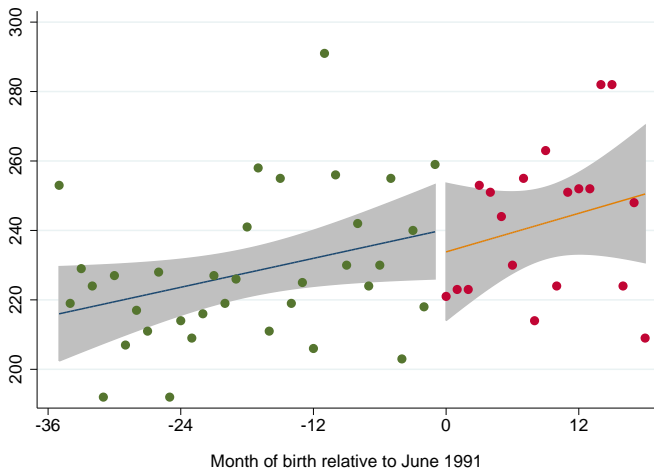
Thank you for your attention!
adamecz_anna@phd.ceu.edu

The Linking Procedure [▶ back](#)

| Events in the Vital Statistics Database | Local linear model | Global polynomial model |
|---|--|--|
| All events | -0.049** (0.014) | -0.009 (0.750) |
| Live birth only | -0.026 (0.668) | 0.032 (0.497) |
| Abortion only | -0.061 (0.319) | -0.084** (0.049) |
| Miscarriage only | -0.098 (0.304) | -0.320 (0.416) |
| Stillbirth only | 0.113 (0.746) | 0.196** (0.037) |
| Sample | Women born within 180 days before or after June 1, 1991 | Women born in 1988-92 |
| Control variables | linear function of the running variable separately below and above the cutoff. | 4th order function of the running variable separately below and above the cutoff; FE: year of birth, month of birth, day of the week at birth, county, settlement type. |

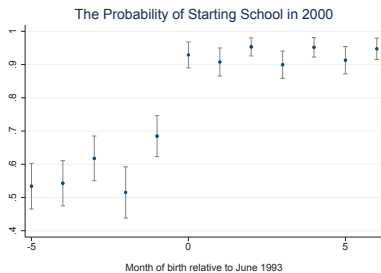
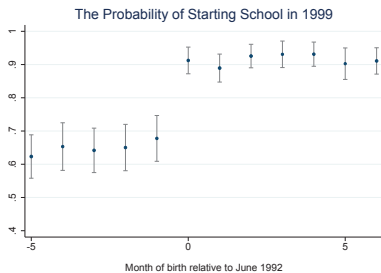
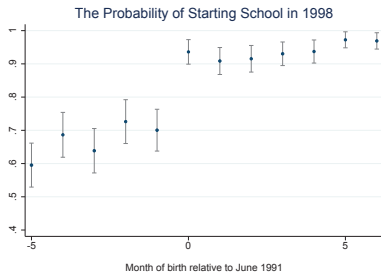
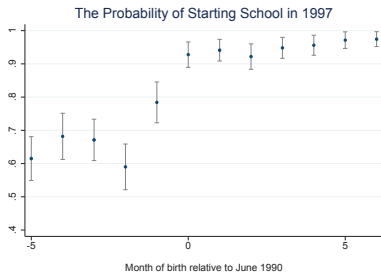
Linear probability models. Left hand side variable: whether observation i in the Vital Statistics database could be linked to the Census. Women living in settlements smaller than 50,000 pax only. Robust p-values clustered by month-and-year-of-birth in parenthesis.

The No. of Roma Women Around the Cutoff [▶ back](#)



Data source: own estimation from the 2011 Hungarian Census. 0 on the x axis refers to being born in June 1991. Linear regression lines estimated separately below and above the cutoff, plotted with 95% confidence intervals. No of individual observations: 263,298.

Compliance to the Age Rule of School Start [▶ back](#)



Effects Estimated with 50-150% of CCT (2014)

Bandwidth [▶ back](#)

Table 9: The Effect of the Legislation Change on the Probability of Giving Birth Using Different Bandwidths, Roma Women

| Version of the CCT bandwidth | Probability of | | | | | |
|------------------------------|--|--|---|--|---|--|
| | giving birth by age 18 (Census data) | giving birth by age 18 (Linked data) | getting pregnant by age 18 (Linked data) | getting pregnant during school years (Linked data) | getting pregnant during summer breaks (Linked data) | getting pregnant during Christmas breaks (Linked data) |
| 50% | -0.042 (0.029) | -0.023 (0.021) | -0.051*** (0.016) | -0.001 (0.017) | -0.008 (0.008) | -0.013* (0.006) |
| 75% | -0.051* (0.025) | -0.048*** (0.009) | -0.041* (0.017) | -0.026 (0.015) | 0.006 (0.009) | -0.012 (0.007) |
| 100% | -0.068*** (0.022) [2,906] {188.3} | -0.051*** (0.012) [2,855] {221.8} | -0.054** (0.018) [2,580] {191.8} | -0.043** (0.017) [2,664] {205.9} | 0.010 (0.009) [4,325] {329.2} | -0.007 (0.006) [2,933] {226.4} |
| 125% | -0.048** (0.022) | -0.041** (0.014) | -0.062*** (0.018) | -0.051** (0.019) | 0.009 (0.009) | -0.008 (0.006) |
| 150% | -0.050** | -0.034** | -0.045** | -0.038* | 0.008 | -0.007 |

Effects of Cutoffs in the Year Before and After [▶ back](#)

Table 10: The Effect of Cutoffs in 1990-1992 (Roma Women)

| Cutoff year | Probability of ... | | | | | |
|-------------|---|---|---|---|--|---|
| | giving birth by age 18 (Census data) | giving birth by age 18 (Linked data) | getting pregnant by age 18 (Linked data) | getting pregnant during school years (Linked data) | getting pregnant during summer breaks (Linked data) | getting pregnant during Christmas breaks (Linked data) |
| 1990 | 0.037 (0.029) | -0.012 (0.013) | 0.005 (0.018) | -0.007 (0.022) | 0.007 (0.011) | 0.005 (0.003) |
| 1991 | -0.066** (0.022) | -0.056*** (0.003) | -0.065** (0.011) | -0.054** (0.039) | -0.003 (0.711) | -0.008 (0.278) |
| 1992 | 0.056 (0.040) | 0.033 (0.033) | -0.005 (0.030) | 0.009 (0.023) | -0.020 (0.018) | 0.005 (0.004) |

Effects Estimated by Global Polynomial Models [▶ back](#)

Table 11: The Effect on the Probability of First Birth-giving (Roma Women, global polynomial models)

| | Probability of ... | | | | | |
|------------------|------------------------------|------------------------------|----------------------------------|--|---|---|
| | giving birth by age 18 | giving birth by age 18 | getting pregnant by age 18 | getting pregnant during school years | getting pregnant during summer breaks | getting pregnant during Christ- mas breaks |
| | (Census data) | (Linked data) | (Linked data) | (Linked data) | (Linked data) | (Linked data) |
| Treatment effect | -0.053*** (0.019) | -0.035** (0.015) | -0.045** (0.018) | -0.047*** (0.015) | 0.007 (0.011) | -0.004 (0.005) |
| No. of obs | 35,386 | 29,521 | 29,521 | 29,521 | 29,521 | 29,521 |

Health Parameters of Newborn Babies of Mothers Aged 16-18 vs. 18-20 [▶ back](#)

Table 12: Health of Babies at Birth

| | All live births in the Live Statistics database | | Live births of Roma Women in the linked data | |
|------------------|---|------------------------------------|--|------------------------------------|
| | Babies whose mothers are age 16-18 | Babies whose mothers are age 18-20 | Babies whose mothers are age 16-18 | Babies whose mothers are age 18-20 |
| Weight | 3,024.74 (5.84) | 3,073.92 (4.89) | 2,981.90 (11.64) | 2,997.70 (11.79) |
| Week of delivery | 38.53 (0.02) | 38.67 (0.02) | 38.56 (0.04) | 38.63 (0.04) |
| APGAR score | 9.63 (0.01) | 9.65 (0.01) | 9.66 (0.02) | 9.68 (0.02) |
| No. of obs. | 7,929 | 12,182 | 1,662 | 1,667 |

Health Parameters of Newborn Babies of Mothers Born Around the Cutoff [▶ back](#)

Table 13: Health of Babies of Mothers Born Around the Cutoff

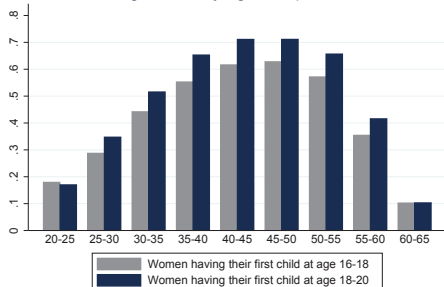
| | All live births in the Live Statistics database | | Live births of Roma Women in the linked data | |
|------------------|---|--|---|--|
| | Babies whose mothers were born before the cutoff | Babies whose mothers were born after the cutoff | Babies whose mothers were born before the cutoff | Babies whose mothers were born after the cutoff |
| Weight | 3061.18 (11.76) | 3040.31 (11.94) | 3000.6 (24.70) | 2993.40 (27.62) |
| Week of delivery | 38.68 (0.04) | 38.60 (0.04) | 38.75 (0.08) | 38.63 (0.10) |
| APGAR score | 9.68 (0.02) | 9.63 (0.02) | 9.66 (0.04) | 9.65 (0.04) |
| No. of obs. | 1,970 | 1,930 | 357 | 317 |

The Share of Working Women Having Their First Child at Ages 16-18 vs. 18-20

[▶ back](#)

Figure 12: Share of Working Women by Age, 2011

Share of Working Women by Age Groups, Non-Roma Women



Share of Working Women by Age Groups, Roma Women

