

Halla, Martin; Zweimüller, Martina

Working Paper

Parental response to early human capital shocks: Evidence from the Chernobyl accident

Working Paper, No. 1402

Provided in Cooperation with:

Johannes Kepler University of Linz, Department of Economics

Suggested Citation: Halla, Martin; Zweimüller, Martina (2014) : Parental response to early human capital shocks: Evidence from the Chernobyl accident, Working Paper, No. 1402, Johannes Kepler University of Linz, Department of Economics, Linz

This Version is available at:

<https://hdl.handle.net/10419/97440>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Web Appendix

A Existing evidence on the effects of the Chernobyl accident on reproductive outcomes

The International Commission on Radiological Protection (ICRP) considers an effective dose of 100 mSv as a threshold for effects after in utero exposure to ionizing radiation, including the induction of cancer. Whether the Chernobyl accident caused any negative health effects on individuals living in European countries is still under debate, despite the much lower radiation dose those individuals were exposed to. (See for example the recent debate in *The Lancet* ([Holt, 2010](#)).)

The existing evidence on the health impact of in utero exposure to the Chernobyl accident (summarized below) is mainly based on epidemiological studies analyzing time trends (across differently exposed regions¹) in the rates of live births, stillbirths, spontaneous (and induced) abortions, infant mortality and perinatal and postnatal outcomes (e.g. pre-term birth, low birth weight, congenital malformations, incidence of specific diseases). Any (short-term) deviations from the long-term trend after the Chernobyl accident are cautiously interpreted as evidence for radiation-related health effects. However, most authors acknowledge the limited power of their studies to detect small effects and emphasize that causal inference is hardly possible based on ecological studies. In light of these limitations, most reviews of the existing evidence conclude that there is no consistent evidence of detrimental effects of the Chernobyl disaster except for an increase in thyroid cancer for individuals exposed in childhood, particularly in Belarus, Ukraine and Russia. (e.g. [Little, 1993](#); [WHO, 2006](#); [UNSCEAR, 2000](#)).

There is some evidence for an increase in the proportion of stillbirths and the early infant (or perinatal) mortality rate after the Chernobyl accident in Germany.² However, these results have been challenged by other studies using German data and studies for other countries (e.g. Finland, Sweden).³ Furthermore, there is no evidence for a significant relationship between the level of fallout and the rate of spontaneous abortions, congenital malformations or other postnatal outcomes (pre-term birth, low birth weight, childhood cancer).⁴ In contrast, there is some evidence for a decrease in the birth rate (independent of the fallout level) 9-11 months after the accident in Sweden, Finland, Norway and Italy and a temporary increase in the rate of induced abortions in Greece, Italy and Sweden.⁵ Both effects may be attributed to the conflicting information in the media and the anxiety of pregnant women in the first month after the Chernobyl accident.

¹However, this is not done in a difference-in-difference framework.

²See, [Lüning *et al.* \(1989\)](#); [Scherb *et al.* \(1999\)](#); [Körblein and Küchenhoff \(1997\)](#); [Scherb *et al.* \(2000\)](#).

³See, [Blettner \(2000\)](#); [Grosche *et al.* \(1997\)](#); [Auvinen *et al.* \(2001\)](#); [Ericson and Kallen \(1994\)](#).

⁴See, [Auvinen *et al.* \(2001\)](#); [Ericson and Kallen \(1994\)](#); [Irgens *et al.* \(1991\)](#); [Haeusler *et al.* \(1992\)](#); [Harjulehto *et al.* \(1989\)](#).

⁵See, [Auvinen *et al.* \(2001\)](#); [Ericson and Kallen \(1994\)](#); [Bertollini *et al.* \(1990\)](#); [Irgens *et al.* \(1991\)](#); [Trichopoulos *et al.* \(1987\)](#). [Haeusler *et al.* \(1992\)](#) find no effect on the counseling rate at pregnancy termination clinics in southern Austria.

References

- HOLT, E. (2010). Debate Over Health Effects of Chernobyl Re-ignited. *The Lancet*, **375** (9724), 1424–1425.
- LITTLE, J. (1993). The Chernobyl Accident, Congenital Anomalies and Other Reproductive Outcomes. *Paediatric and Perinatal Epidemiology*, **7**, 121–151.
- WHO (2006). *Health effects of the Chernobyl accident and special health care programmes*. Report of the UN Chernobyl Forum Expert Group "Health", World Health Organization, Geneva.
- UNSCEAR (2000). *Report to the General Assembly: Sources and Effects of Ionizing Radiation, Vol. II, Annex J*. Unsear 2000 report, United Nations Scientific Committee on the Effects of Atomic Radiation, New York.
- LÜNING, G., SCHMIDT, M., SCHEER, J. and ZIGGEL, H. (1989). Early Infant Mortality in West Germany Before and After Chernobyl. *The Lancet*, **334** (8671), 1081–1083.
- SCHERB, H., WEIGELT, E. and BRÜSKE-HOHLFELD, I. (1999). European Stillbirth Proportions Before and After the Chernobyl Accident. *International Journal of Epidemiology*, **28** (5), 932–940.
- KÖRBLEIN, A. and KÜCHENHOFF, H. (1997). Perinatal mortality in germany following the chernobyl accident. *Radiation and Environmental Biophysics*, **36**, 3–7.
- , — and BRÜSKE-HOHLFELD, I. (2000). Regression Analysis of Time Trends in Perinatal Mortality in Germany, 1980-1993. *Environmental Health Perspectives*, **108** (2), 159–165.
- BLETTNER, M. (2000). European Stillbirth Proportion and Chernobyl. *International Journal of Epidemiology*, **29** (3), 596–599.
- GROSCHKE, B., IRL, C., SCHOETZAU, A. and VAN SANTEN, E. (1997). Perinatal Mortality in Bavaria, Germany, After the Chernobyl Reactor Accident. *Radiation and Environmental Biophysics*, **36**, 129–136.
- AUVINEN, A., VAHTERISTO, M., ARVELA, H., SUOMELA, M., RAHOLA, T., HAKAMA, M. and RYTÖMAA, T. (2001). Chernobyl Fallout and Outcome of Pregnancy in Finland. *Environmental Health Perspectives*, **109** (2), 179–185.
- ERICSON, A. and KALLEN, B. (1994). Pregnancy Outcome in Sweden after the Chernobyl Accident. *Environmental Research*, **67**, 149–159.
- IRGENS, L. M., LIE, R., ULSTEIN, M., JENSEN, T. S., SKJÆRVEN, R., SIVERTSEN, F., REITAN, J. B., STRAND, F., STRAND, T. and SKJELDESTAD, F. E. (1991). Pregnancy Outcome in Norway after Chernobyl. *Biomedicine & Pharmacotherapy*, **45** (6), 233–241.
- HAEUSLER, M. C., BERHOLD, A., SCHOELL, W., HOFER, P. and SCHAFFER, M. (1992). The Influence of the Post-Chernobyl Fallout on Birth Defects and Abortion Rates in Austria. *American Journal of Obstetrics & Gynecology*, **167** (4), 1025–1031.

- HARJULEHTO, T., ARO, T., RITA, H., RYTÖMAA, T. and SAXÉN, L. (1989). The Accident at Chernobyl and Outcome of Pregnancy in Finland. *British Medical Journal*, **298**, 995–997.
- BERTOLLINI, R., LALLO, D. D., MASTROIACOVO, P. and PERUCCI, C. A. (1990). Reduction of Births in Italy after the Chernobyl Accident. *Scandinavian Journal of Work, Environment & Health*, **16** (2), 96–101.
- TRICHOPOULOS, D., ZAVITSANOS, X., KOUTIS, C., DROGARI, P., PROUKAKIS, C. and PETRIDOU, E. (1987). The Victims of Chernobyl in Greece: Induced Abortions After the Accident. *British Medical Journal*, **295**, 1100.

B Descriptives statistics

Table B.1: Average birth outcomes in communities with and without data on ^{137}Cs ground deposition

	Without data (N=73,086)	With data (N=103,531)	Difference
	Mean (S.D.)	Mean (S.D.)	Mean (P-value)
Male birth	51.33 (49.98)	51.24 (49.98)	0.09 (0.71)
Gestation length (in days)	273.54 (12.52)	273.34 (12.60)	0.20 (0.00)
Birth weight (in decagram)	328.12 (53.12)	326.50 (53.27)	1.63 (0.00)
Premature birth (<37 weeks)	5.03 (21.85)	5.11 (22.02)	-0.08 (0.44)
Low birth weight (<2500 g)	5.52 (22.84)	5.87 (23.50)	-0.35 (0.00)
Apgar score (10 min. after birth)	8.79 (1.24)	8.72 (1.23)	0.07 (0.00)
Apgar score (5 min. after birth)	9.70 (0.80)	9.68 (0.83)	0.02 (0.00)
Apgar score (1 min. after birth)	9.90 (0.54)	9.90 (0.56)	0.01 (0.05)

This table presents average birth outcomes for mothers in communities for which data on ^{137}Cs ground deposition is available (column 2) and communities for which we have no measure of the contamination level at the community level (column 1). The figures are based on birth cohort 0, which was conceived between 08/1984 and 08/1985 and born before the accident. In parentheses standard deviations are reported. Column 3 presents the difference along with the p-value. Estimations are based on individual-level data from the *Austrian Birth Register* before making any restrictions as explained in Section 3.2 of the paper.

C Additional estimation output

C.1 Estimation output for birth cohort I

Table C.1.1: Radiation effects on prenatal culling for birth cohort I

	LOW SES				HIGHER SES			
	Mean	37 kBq	42 kBq	47 kBq	Mean	37 kBq	42 kBq	47 kBq
Live birth								
Live birth rate ^a	3.031	-0.044 (0.040)	-0.083* (0.047)	-0.093 (0.058)	8.918	0.036 (0.086)	0.083 (0.102)	-0.003 (0.125)
Stillbirth								
<i>Prob</i> (Stillbirth) ^b	0.005	0.000 (0.003)	0.001 (0.004)	0.001 (0.004)	0.004	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)
Fetal death								
Proxy: <i>Prob</i> (male) ^c	0.510	0.009 (0.022)	0.012 (0.026)	0.010 (0.033)	0.514	-0.006 (0.013)	-0.005 (0.017)	0.002 (0.021)

This table summarizes estimation results based on community-level data (first row) and individual-level data (second and third row) from the *Austrian Birth Register* and the *Austrian Death Register* covering births conceived between 08/1984 and 07/1987. Each entry represents a separate regression, where the dependent variable is indicated in the first column, and shows the estimated coefficient for treated units from *BCI*. This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample. ^a The dependent variable is equal to the number of live births per 1,000 female inhabitants aged between 15 and 39 years of age in 1981 (in the respective education group) divided by the respective sample mean. ^b The dependent variable is equal to one if the child is a stillbirth and zero if the child is a live birth. ^c The dependent variable is equal to one if the child is male, and zero otherwise.

Table C.1.2: Radiation effects on postnatal culling for birth cohort I

	LOW SES			HIGHER SES				
	Mean	37 kBq	42 kBq	47 kBq	Mean	37 kBq	42 kBq	47 kBq
Alive after 24 hours	0.993	-0.001 (0.004)	-0.001 (0.004)	-0.004 (0.005)	0.995	-0.004* (0.002)	-0.004 (0.003)	-0.007* (0.004)
Alive after 7 days	0.990	-0.001 (0.005)	-0.003 (0.005)	-0.003 (0.007)	0.992	-0.004 (0.003)	-0.005* (0.003)	-0.010** (0.004)
Alive after 1 month	0.988	-0.003 (0.005)	-0.001 (0.006)	-0.003 (0.007)	0.991	-0.004 (0.003)	-0.006* (0.003)	-0.009** (0.004)
Alive after 1 year	0.983	-0.004 (0.006)	-0.004 (0.007)	-0.004 (0.008)	0.988	-0.003 (0.003)	-0.006 (0.004)	-0.010* (0.005)

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Death Register* covering births conceived between 08/1984 and 07/1987. The dependent variable is equal to one if the child is still alive after the respective time period after birth. Each entry represents a separate regression, where the dependent variable is indicated in the first column, and shows the estimated coefficient for treated units from BC_I . This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample.

Table C.1.3: Radiation effects on health at birth of birth cohort I

	LOW SES			HIGHER SES				
	Mean	37 kBq	42 kBq	47 kBq	Mean	37 kBq	42 kBq	47 kBq
Premature birth^a								
Culling & scarring	0.056	0.006 (0.011)	-0.001 (0.012)	-0.001 (0.014)	0.047	-0.005 (0.006)	-0.004 (0.007)	-0.007 (0.008)
Low birth weight^b								
Culling & scarring	0.066	0.017 (0.012)	0.014 (0.015)	0.013 (0.017)	0.054	-0.011 (0.007)	-0.007 (0.008)	-0.003 (0.009)
Apgar score^c								
Culling & scarring	9.870	-0.010 (0.029)	-0.004 (0.032)	-0.001 (0.043)	9.897	-0.027 (0.019)	-0.054 ^{**} (0.022)	-0.076 ^{**} (0.028)
Maternity leave (post)^d								
Culling & scarring	62.79	0.569 (0.502)	0.552 (0.561)	0.500 (0.677)	62.59	-0.119 (0.282)	0.016 (0.336)	-0.158 (0.387)

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* covering births conceived between 08/1984 and 07/1987. Each entry represents a separate regression, where the dependent variable is indicated in the first column, and shows the estimated coefficient for treated units from *BCI*. This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample. ^a The dependent variable is equal to one if the gestation period is below 37 weeks, and zero otherwise. ^b The dependent variable is equal to one if the birth weight is lower than 2,500 grams, and zero otherwise. ^c The dependent variable is equal to the Apgar score after ten minutes. ^d The dependent variable is equal to the number of days on maternity leave after birth of the pivotal child.

Table C.1.4: Radiation effects on fertility of families from birth cohort I

	Low SES				HIGHER SES			
	Mean	37 kBq	42 kBq	47 kBq	Mean	37 kBq	42 kBq	47 kBq
2 yrs after	0.120	-0.015 (0.016)	0.005 (0.018)	0.005 (0.022)	0.121	-0.000 (0.008)	-0.010 (0.009)	-0.008 (0.011)
4 yrs after	0.304	-0.018 (0.023)	-0.008 (0.029)	-0.034 (0.034)	0.334	0.024* (0.013)	0.009 (0.016)	0.018 (0.019)
6 yrs after	0.438	-0.051** (0.026)	-0.042 (0.033)	-0.066 (0.041)	0.465	0.011 (0.016)	-0.004 (0.019)	-0.005 (0.022)
8 yrs after	0.537	-0.053* (0.030)	-0.046 (0.037)	-0.080* (0.046)	0.549	0.013 (0.017)	0.003 (0.021)	0.010 (0.025)
10 yrs after	0.604	-0.040 (0.033)	-0.039 (0.040)	-0.065 (0.050)	0.603	0.008 (0.019)	-0.010 (0.022)	0.003 (0.025)
12 yrs after	0.648	-0.055 (0.035)	-0.060 (0.044)	-0.082 (0.056)	0.637	0.006 (0.021)	-0.013 (0.022)	-0.004 (0.026)
14 yrs after	0.678	-0.057 (0.038)	-0.062 (0.046)	-0.095 (0.059)	0.658	0.003 (0.021)	-0.014 (0.023)	-0.005 (0.026)
16 yrs after	0.694	-0.058 (0.038)	-0.069 (0.046)	-0.097 (0.059)	0.671	0.000 (0.022)	-0.017 (0.024)	-0.005 (0.027)
18 yrs after	0.706	-0.059 (0.039)	-0.073 (0.047)	-0.100* (0.059)	0.678	0.002 (0.022)	-0.016 (0.024)	-0.004 (0.027)
20 yrs after	0.712	-0.065* (0.040)	-0.080* (0.048)	-0.105* (0.059)	0.682	0.000 (0.022)	-0.020 (0.024)	-0.009 (0.027)
Obs.		25,145	23,379	22,171		69,775	63,869	60,261

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* covering families with births conceived between 08/1984 and 07/1987. The dependent variable is equal to the number of children born to the mother the respective number of years after the birth of the pivotal child. Each entry represents a separate regression, where the dependent variable is indicated in the first column, and shows the estimated coefficient for treated units from BC_I . This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample.

Table C.1.5: Radiation effects on maternal labor force participation of families from birth cohort I

	Low SES				HIGHER SES			
	Mean	37 kBq	42 kBq	47 kBq	Mean	37 kBq	42 kBq	47 kBq
2 yrs after	0.353	0.027 (0.022)	0.033 (0.023)	0.012 (0.028)	0.383	-0.020 (0.017)	-0.005 (0.017)	0.001 (0.018)
4 yrs after	0.399	0.024 (0.022)	0.036 (0.026)	0.031 (0.033)	0.448	-0.009 (0.015)	0.003 (0.016)	0.008 (0.018)
6 yrs after	0.469	0.031 (0.022)	0.030 (0.024)	0.018 (0.028)	0.515	0.025 (0.017)	0.044*** (0.015)	0.051*** (0.018)
8 yrs after	0.507	0.014 (0.021)	0.016 (0.023)	0.007 (0.026)	0.560	0.012 (0.012)	0.015 (0.015)	0.013 (0.018)
10 yrs after	0.557	0.016 (0.020)	0.010 (0.024)	0.009 (0.030)	0.619	0.016 (0.012)	0.026* (0.014)	0.019 (0.016)
12 yrs after	0.601	0.028 (0.025)	0.025 (0.029)	0.009 (0.036)	0.668	0.014 (0.012)	0.020 (0.015)	0.015 (0.017)
14 yrs after	0.634	0.019 (0.022)	0.011 (0.027)	-0.013 (0.033)	0.710	0.029*** (0.010)	0.024* (0.014)	0.021 (0.016)
16 yrs after	0.665	-0.018 (0.022)	-0.026 (0.023)	-0.036 (0.027)	0.750	0.007 (0.010)	-0.001 (0.014)	-0.007 (0.016)
18 yrs after	0.670	-0.014 (0.024)	-0.018 (0.026)	-0.030 (0.030)	0.766	0.016* (0.009)	0.000 (0.012)	-0.000 (0.015)
20 yrs after	0.663	-0.013 (0.021)	-0.018 (0.024)	-0.027 (0.029)	0.769	0.022** (0.009)	0.010 (0.013)	0.002 (0.015)
Obs.		730,081	678,404	642,351		2,069,920	1,894,956	1,787,448

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* covering births conceived between 08/1984 and 07/1987. The dependent variable is equal to one if the mother is in the labor force in the respective number of years after childbirth. Each entry represents the coefficient for treated units from BC_I interacted with years since the birth of the child (ranging from -9 years before to 21 years after birth). This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample.

Table C.1.6: Children's long-term outcomes: Radiation effects on labor force participation from birth cohort I

	LOW SES				HIGHER SES			
	Mean	37 kBq	42 kBq	47 kBq	Mean	37 kBq	42 kBq	47 kBq
Age 15	0.057	-0.003 (0.014)	-0.001 (0.017)	-0.001 (0.019)	0.025	0.003 (0.005)	0.001 (0.007)	0.001 (0.007)
Age 16	0.475	-0.030 (0.030)	-0.052* (0.031)	-0.032 (0.039)	0.241	-0.027** (0.013)	-0.029* (0.015)	-0.048** (0.019)
Age 17	0.591	-0.042 (0.028)	-0.063** (0.028)	-0.058* (0.032)	0.310	-0.012 (0.014)	-0.017 (0.017)	-0.045** (0.018)
Age 18	0.613	-0.013 (0.024)	-0.012 (0.026)	-0.005 (0.030)	0.326	0.004 (0.015)	0.002 (0.019)	-0.018 (0.020)
Age 19	0.586	-0.012 (0.024)	-0.014 (0.028)	-0.003 (0.031)	0.319	-0.004 (0.016)	-0.009 (0.019)	-0.027 (0.023)
Age 20	0.581	-0.005 (0.024)	0.003 (0.029)	0.016 (0.035)	0.359	-0.008 (0.014)	-0.022 (0.015)	-0.025 (0.016)
Age 21	0.671	-0.015 (0.022)	-0.022 (0.027)	0.011 (0.030)	0.459	-0.022 (0.015)	-0.022 (0.017)	-0.031 (0.019)
Age 22	0.711	0.010 (0.022)	0.004 (0.025)	0.028 (0.028)	0.513	-0.013 (0.013)	-0.008 (0.016)	-0.017 (0.018)
Age 23	0.727	0.031 (0.020)	0.039* (0.023)	0.040 (0.024)	0.553	-0.015 (0.013)	-0.020 (0.016)	-0.024 (0.019)
Age 24	0.736	0.018 (0.022)	0.028 (0.026)	0.038 (0.029)	0.592	-0.011 (0.013)	-0.015 (0.014)	-0.013 (0.018)
Obs.		162,170	150,600	142,310		507,110	463,650	436,920

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* covering births conceived between 08/1984 and 07/1987. The dependent variable is equal to one if the child is in the labor force at the respective age. Each entry represents the coefficient for treated units from BC_t interacted with age. This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample.

Table C.1.7: Children's long-term outcomes: Radiation effects on apprenticeship training & labor income from birth cohort I

	LOW SES			HIGHER SES			
	Mean	37 kBq	42 kBq	47 kBq	37 kBq	42 kBq	47 kBq
Apprenticeship training^a							
Age 16	0.378	-0.036 (0.028)	-0.045 (0.033)	-0.034 (0.043)	-0.003 (0.012)	-0.007 (0.015)	-0.027* (0.016)
Age 17	0.488	-0.038 (0.029)	-0.044 (0.030)	-0.057 (0.035)	-0.002 (0.014)	-0.002 (0.017)	-0.021 (0.020)
Age 18	0.489	-0.031 (0.028)	-0.025 (0.030)	-0.030 (0.034)	0.005 (0.014)	0.002 (0.017)	-0.012 (0.021)
Obs.		162,170	150,600	142,310	507,110	463,650	436,920
Income							
Age 15-23 (wage sum) ^b	9.540	-0.021 (0.158)	-0.031 (0.178)	-0.043 (0.187)	-0.121 (0.126)	-0.119 (0.158)	-0.199 (0.186)
Age 15-23 (total wage sum) ^c	9.708	-0.031 (0.157)	-0.042 (0.177)	-0.043 (0.186)	-0.055 (0.208)	-0.113 (0.257)	0.025 (0.263)
Obs.		16,217	15,060	14,231	50,711	46,365	43,692

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* covering births conceived between 08/1984 and 07/1987. Each entry represents the coefficient for treated units from BC_I interacted with age. This cohort was conceived between 08/1985 and 01/1986 and was between 4 and 9 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors (clustered at the community level) are shown in parentheses. *, **, and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Families with a low socioeconomic status (SES) have mothers with compulsory schooling or less. Families with a higher SES have mothers with any degree higher than compulsory schooling. Means refer to the 37kBq-cutoff sample. ^aThe dependent variable is equal to one if the child is in apprenticeship training at the respective age. ^bThe dependent variable is equal to the sum of the deflated annual labor income between ages 15 and 23 in the main job. ^cThe dependent variable is equal to the sum of the deflated annual labor income between ages 15 and 23 in all jobs.

C.2 Radiation effects (culling & scarring) for birth cohort II

Table C.2.1: Radiation effects (culling & scarring) — fertility^a

	Low SES			
	Mean	37 kBq	42 kBq	47 kBq
2 yrs after	0.120	−0.034 (0.032)	−0.066*** (0.023)	−0.076*** (0.026)
4 yrs after	0.304	−0.034 (0.036)	−0.054 (0.037)	−0.072* (0.042)
6 yrs after	0.438	−0.070 (0.044)	−0.095** (0.048)	−0.108** (0.054)
8 yrs after	0.537	−0.087* (0.049)	−0.109** (0.053)	−0.151** (0.060)
10 yrs after	0.604	−0.073 (0.055)	−0.099 (0.061)	−0.138** (0.069)
12 yrs after	0.648	−0.091 (0.056)	−0.123** (0.061)	−0.159** (0.069)
14 yrs after	0.678	−0.090 (0.058)	−0.126* (0.064)	−0.157** (0.075)
16 yrs after	0.694	−0.103* (0.060)	−0.142** (0.065)	−0.169** (0.076)
18 yrs after	0.706	−0.104* (0.061)	−0.143** (0.067)	−0.165** (0.078)
20 yrs after	0.712	−0.108* (0.061)	−0.149** (0.067)	−0.168** (0.078)
Obs.		25,145	23,379	22,171

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* in the period from 08/1984 through 07/1987. Each entry represents a separate regression, where the dependent variable is indicated in the first column, and shows the estimated coefficient for treated units from BC_{II} . This cohort was conceived between 02/1986 and 04/1986 and was between 0 and 3 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Means refer to the 37kBq-cutoff sample. ^a The dependent variable is equal to the number of children born to the mother the respective number of years after the birth of the pivotal child.

Table C.2.2: Radiation effects (culling & scarring)—maternal labor force participation^a

	Low SES			
	Mean	37 kBq	42 kBq	47 kBq
2 yrs after	0.353	0.003 (0.032)	0.014 (0.033)	0.001 (0.042)
4 yrs after	0.399	0.031 (0.033)	0.041 (0.038)	0.046 (0.048)
6 yrs after	0.469	0.060 (0.039)	0.077** (0.035)	0.061 (0.041)
8 yrs after	0.507	0.017 (0.034)	0.024 (0.035)	0.031 (0.040)
10 yrs after	0.557	-0.011 (0.037)	0.003 (0.039)	0.002 (0.047)
12 yrs after	0.601	0.070* (0.037)	0.091** (0.038)	0.076* (0.044)
14 yrs after	0.634	0.023 (0.029)	0.045 (0.035)	0.043 (0.038)
16 yrs after	0.665	0.013 (0.027)	0.021 (0.033)	0.029 (0.037)
18 yrs after	0.670	0.051* (0.030)	0.061 (0.037)	0.063 (0.044)
20 yrs after	0.663	0.059** (0.027)	0.053 (0.032)	0.064* (0.039)
Obs.		730,081	678,404	642,351

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* in the period from 08/1984 through 07/1987. Each entry represents the coefficient for treated units from the BC_{II} interacted with years since the birth of the child (ranging from 9 years before to 21 years after birth). This cohort was conceived between 02/1986 and 04/1986 and was between 0 and 3 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Means refer to the 37kBq-cutoff sample. ^a The dependent variable is equal to one if the mother participates in the labor force in the respective number of years after childbirth.

Table C.2.3: Radiation effects (culling & scarring) — labor force participation^a

	Low SES			
	Mean	37 kBq	42 kBq	47 kBq
Age 15	0.056	-0.015 (0.010)	-0.025** (0.011)	-0.025** (0.012)
Age 16	0.475	-0.068** (0.032)	-0.080** (0.040)	-0.087* (0.044)
Age 17	0.591	-0.065* (0.036)	-0.100** (0.040)	-0.101** (0.043)
Age 18	0.614	-0.070* (0.041)	-0.093** (0.040)	-0.086* (0.046)
Age 19	0.586	-0.055 (0.036)	-0.073* (0.039)	-0.051 (0.042)
Age 20	0.582	-0.099*** (0.038)	-0.131*** (0.040)	-0.107** (0.045)
Age 21	0.671	-0.022 (0.035)	-0.034 (0.041)	-0.020 (0.047)
Age 22	0.710	-0.065* (0.035)	-0.086** (0.041)	-0.095* (0.048)
Age 23	0.727	-0.058* (0.033)	-0.066* (0.037)	-0.089** (0.044)
Obs.		162,170	150,600	142,310

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* in the period from 08/1984 through 07/1987. Each entry represents the coefficient for treated units from the BC_{II} interacted with age. This cohort was conceived between 02/1986 and 04/1986 and was between 0 and 3 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Means refer to the 37kBq-cutoff sample. ^a The dependent variable is equal to one if the child participates in the labor force at the respective age.

Table C.2.4: Radiation effects (culling & scarring)—apprenticeship training & income

	Low SES			
	Mean	37 kBq	42 kBq	47 kBq
Apprenticeship training^a				
Age 16	0.378	−0.041 (0.033)	−0.039 (0.039)	−0.056 (0.043)
Age 17	0.488	−0.081** (0.033)	−0.080** (0.040)	−0.094** (0.043)
Age 18	0.489	−0.035 (0.036)	−0.034 (0.042)	−0.024 (0.046)
Obs.		162,170	150,600	142,310
Income^a				
Age 15-23 (wage sum)	9.540	−0.512 (0.326)	−0.725** (0.332)	−0.925** (0.396)
Age 15-23 (total wage sum)	9.708	−0.531 (0.328)	−0.752** (0.333)	−0.953** (0.397)
Obs.		16,217	15,060	14,231

This table summarizes estimation results based on individual-level data from the *Austrian Birth Register* and the *Austrian Social Security Database* in the period from 08/1984 through 07/1987. Each entry represents the coefficient for treated units from BC_{II} interacted with age. This cohort was conceived between 02/1986 and 04/1986 and was between 0 and 3 months post conception at the time of the accident. Each specification controls for community, conception-year, and conception-month fixed-effects. Method of estimation is a least squares. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent. Means refer to the 37kBq-cutoff sample. ^a The dependent variable is equal to one if the child is in apprenticeship training at the respective age. ^b The dependent variable is equal to the sum of the deflated annual labor income between ages 15 and 23 in the main job. ^c The dependent variable is equal to the sum of the deflated annual labor income between ages 15 and 23 in all jobs.