Online Appendices

Online appendices for "Peer Effects in Program Participation" by Gordon B. Dahl, Katrine V. Løken, and Magne Mogstad

Online Appendix A: Tables and Figures

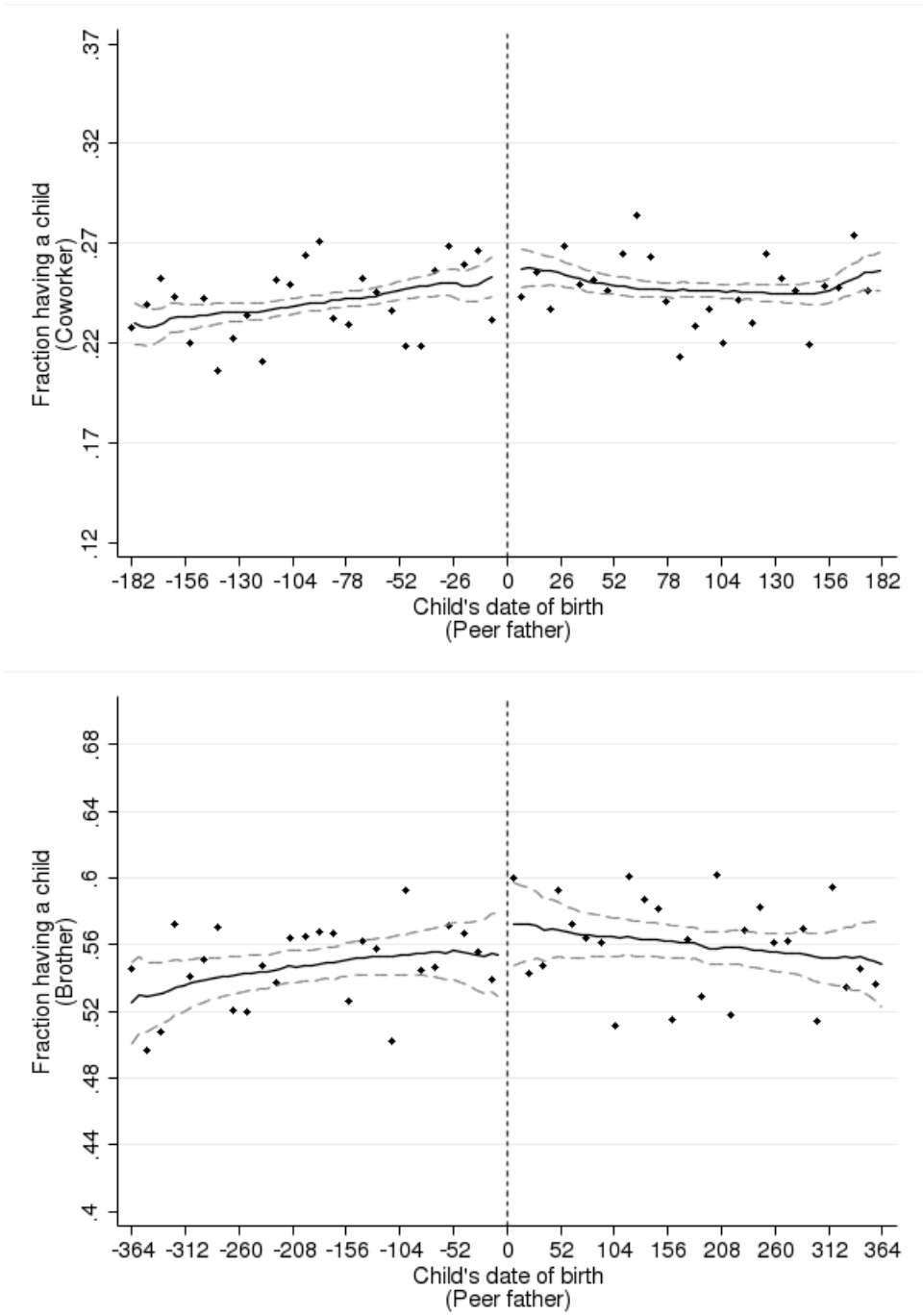

Figure A.1. Coworker's and brother's fertility.

Notes: The top graph is for coworkers and the bottom graph is for brothers. Each observation is the average number of children born to coworkers/brothers in a bin, based on the birthdate of the peer father's child. The top graph uses one week bins, the bottom graph uses two week bins. The plotted local linear regression lines are based on daily, individual-level data. Dashed vertical lines denote the reform cutoff of April 1, 1993, which has been normalized to zero.

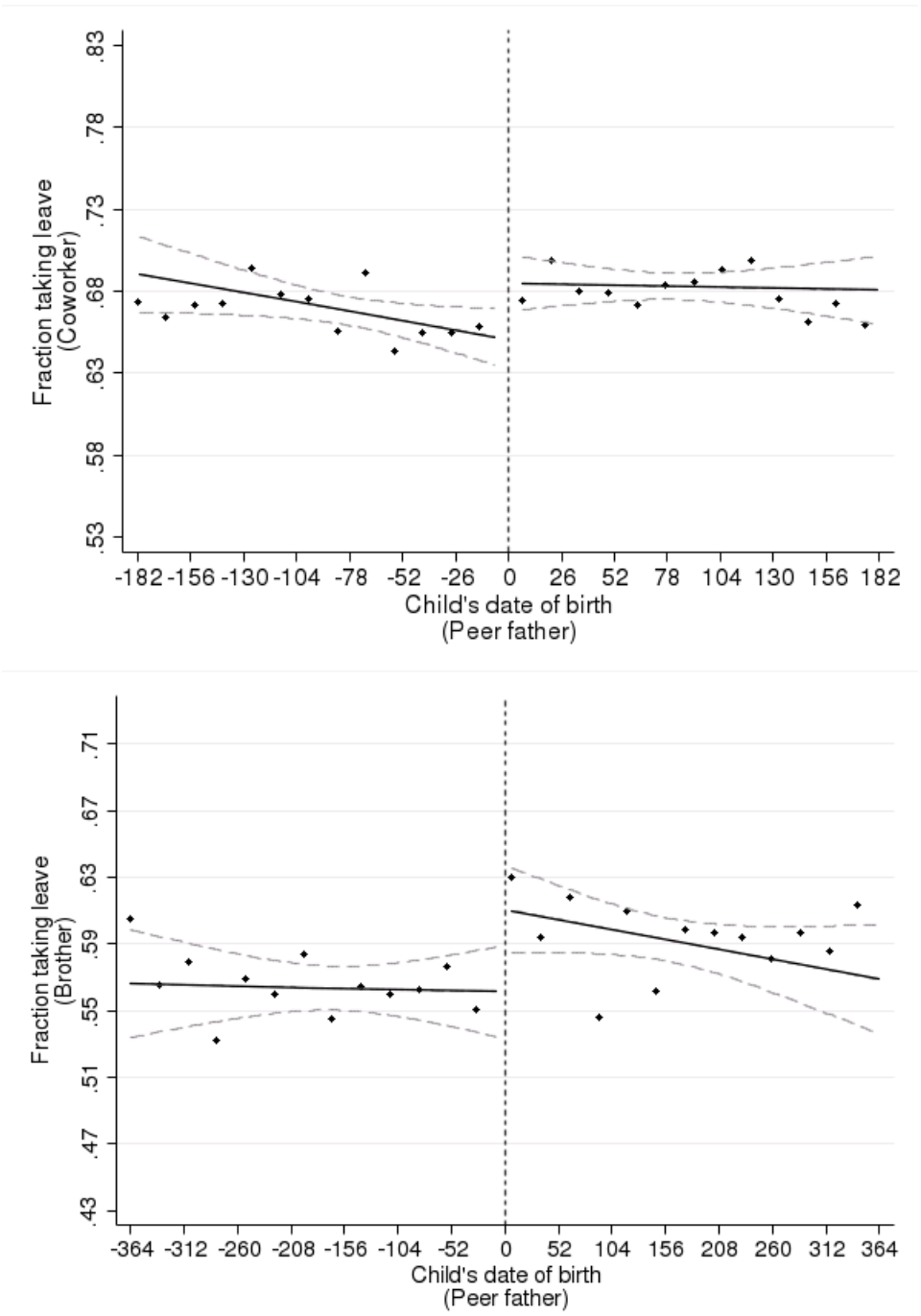

Figure A.2. Coworker's and brother's leave take up using wider bins.

Notes: Each observation is the average number of coworkers taking paternity leave in two-week bins (top panel) or brothers taking paternity leave in four-week bins (bottom panel), based on the birthdate of the peer father's child. Dashed vertical lines denote the reform cutoff of April 1, 1993, which has been normalized to zero.

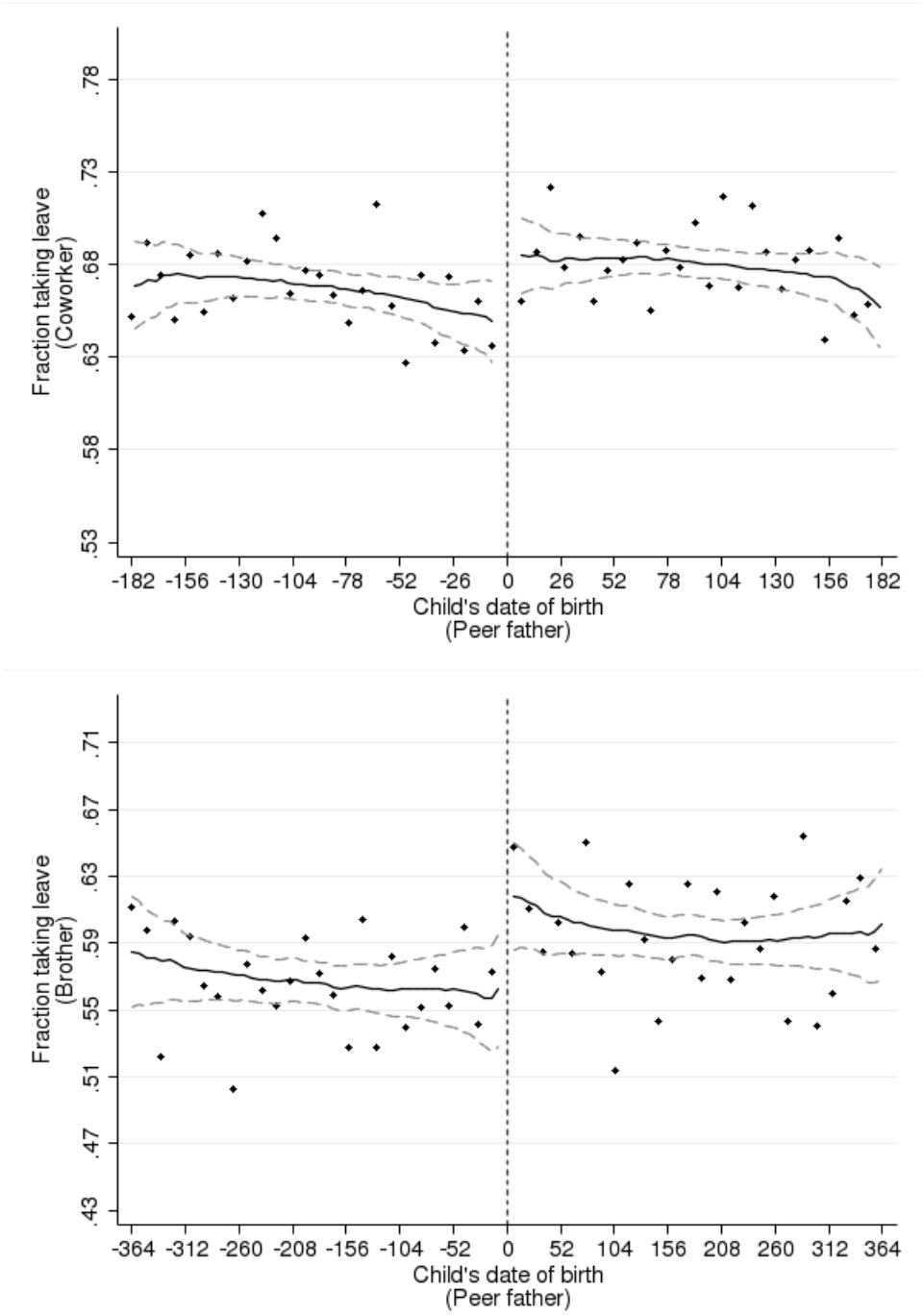

Figure A.3. Local linear regression graphs for coworker's and brother's leave.

Notes: The plotted local linear regression lines are based on daily, individual-level data. The top graph is for coworkers and the bottom graph is for brothers. For comparison, dots for the average number of coworkers/brothers taking paternity leave in one week intervals (coworkers) and two week intervals (brothers) are also included in the figure, based on the birthdate of the peer father's child. Dashed vertical lines denote the reform cutoff of April 1, 1993, which has been normalized to zero. See notes to Table A.6.

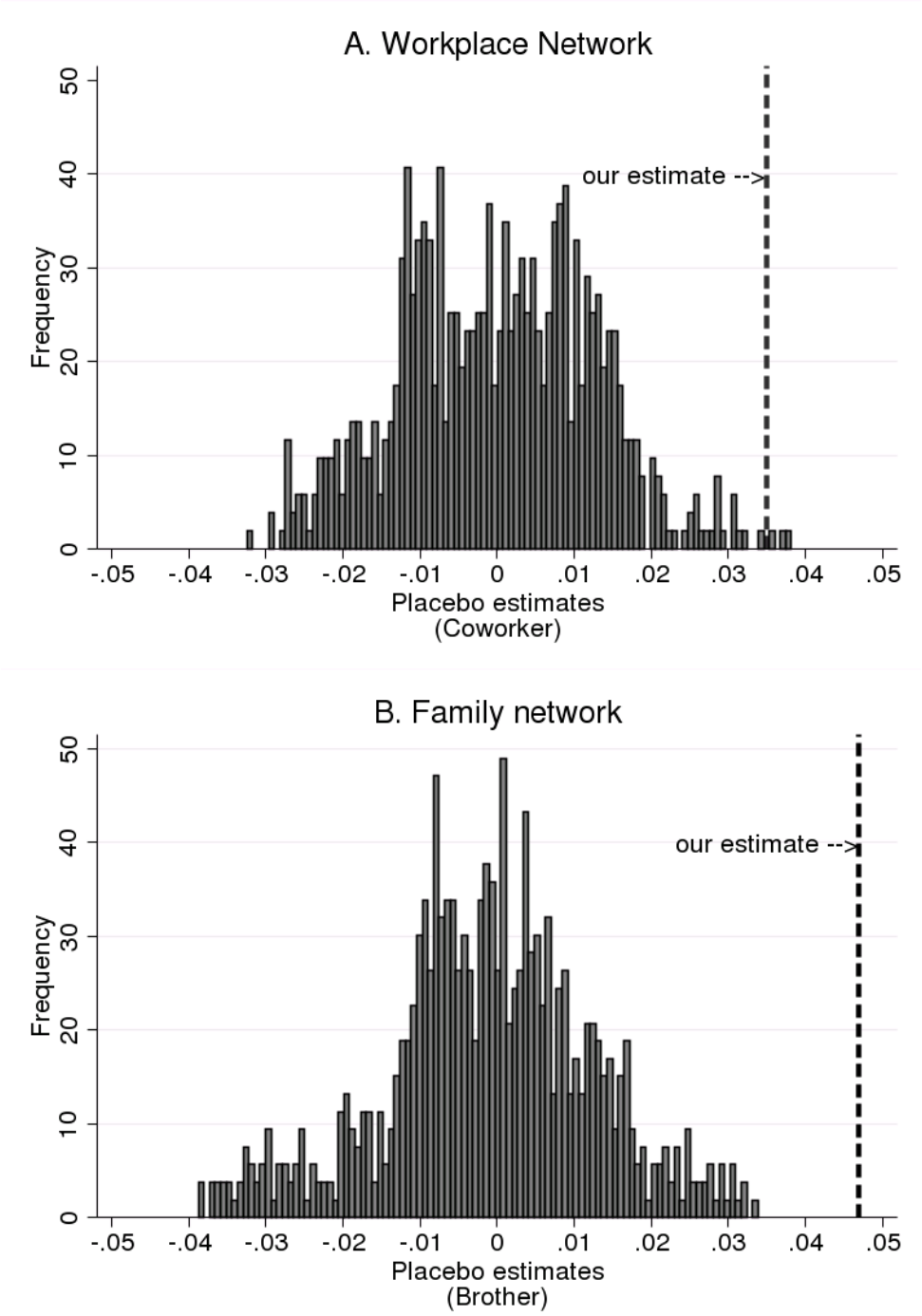

Figure A.4. Placebo estimates of the peer effect.

Notes: Each placebo estimate first assigns a window around a false reform date, and then uses an RD to estimate a reduced form peer effect. There are 730 estimates for each graph (2 years of estimates), where each estimate increases the false reform date by one day. Note the placebo estimates are not independent of each other, as the samples overlap.

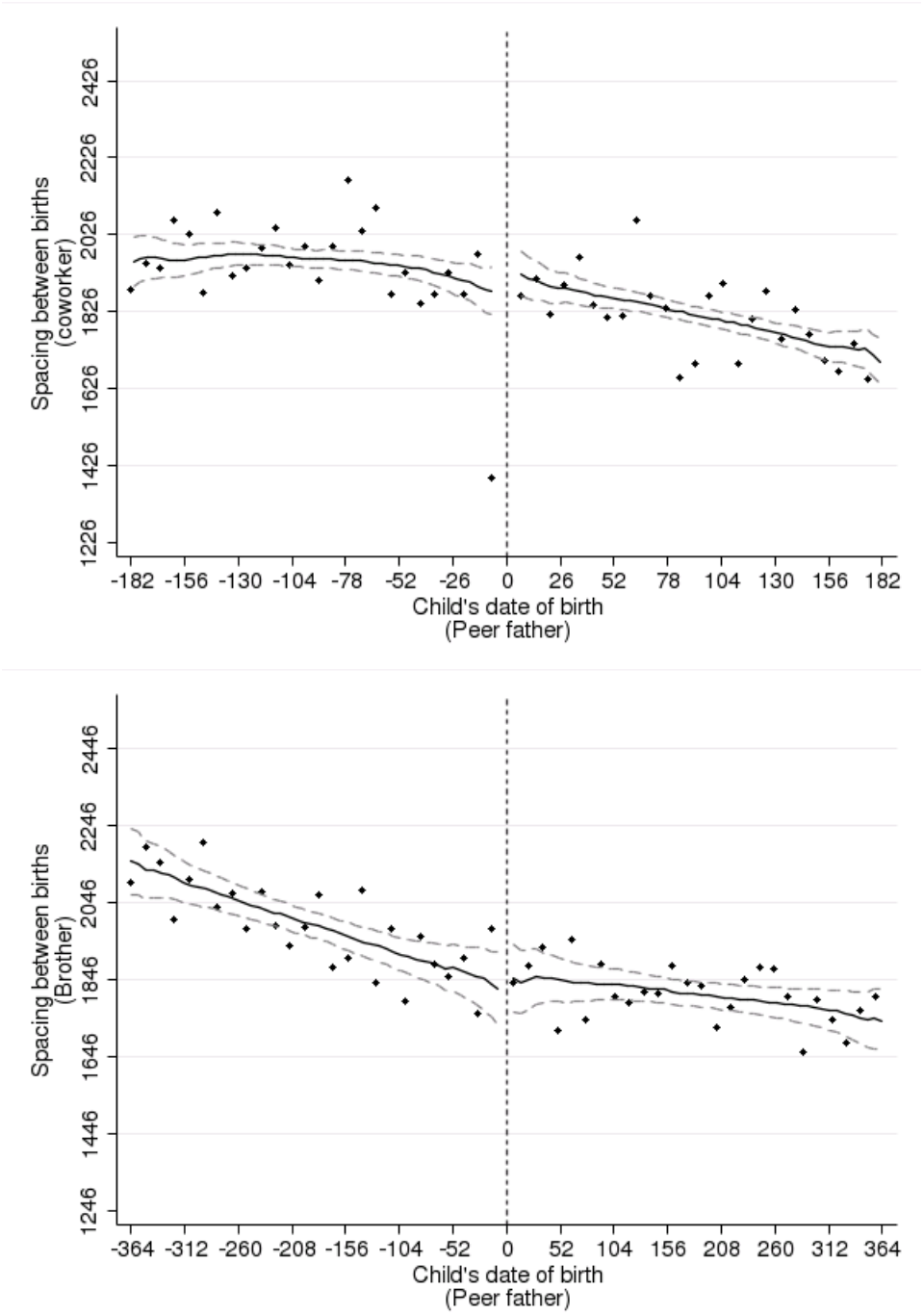

Figure A.5. Spacing between the coworker's/brother's and the peer father's births.

Notes: The top graph is for coworkers and the bottom graph is for brothers. Each observation is the average number of days between births to a coworker/brother and the peer father in a bin. The top graph uses one week bins, the bottom graph uses two week bins. The plotted local linear regression lines are based on daily, individual-level data. Dashed vertical lines denotes the reform cutoff; the reform cutoff date of April 1, 1993 has been normalized to zero.

Table A.1. Descriptive statistics for fathers in the workplace and family networks.

	One year window		Two year window	
Father	Coworker sample	All fathers	Brother sample	All fathers
characteristics	(1)	(2)	(3)	(4)
Some college	.23	.28	.26	.27
	(.42)	(.44)	(.44)	(.45)
Age at birth	31.3	31.9	28.9	31.9
	(5.4)	(5.5)	(4.0)	(5.5)
Married	.45	.48	.39	.48
	(.50)	(.50)	(.49)	(.50)
Child a girl	.50	.49	.49	.49
	(.50)	(.50)	(.50)	(.50)
Number of children	2.7	2.8	2.7	2.8
	(1.98)	(1.04)	(1.92)	(2.03)
N	7,504	38,958	10,823	81,913

Notes: Column (1) is our estimation sample of reform-window fathers in firms which have just one birth within 6 months on either side of the reform, and who also have a coworker whose first child is born after the father and after the reform. Column (2) is a comparison sample of all eligible fathers in Norway in the corresponding one year window. Column (3) is our estimation sample of reform-window fathers who have brothers, where the brother has a first child after the father and after the reform. Column (4) is a comparison sample of all eligible fathers in Norway in the corresponding two year window. There are 50, 134, 23, and 285 missing observations for the married variable and 166, 805, 68, and 1,684 missing observations for the some college variable in columns (1), (2), (3), and (4), respectively.

Table A.2. Timing of fertility around the reform window of April 1, 1993.

Birthdate of child	Coefficient
March 4 - 10, 1993	1.44
	(4.58)
March 11 - 17, 1993	2.21
	(4.58)
March 18 - 24, 1993	-3.05
	(4.58)
March 25 - 31, 1993	-9.92**
	(4.58)
April 1 - 7, 1993 (first week post reform)	10.72**
	(4.58)
April 8-14, 1993	4.27
	(4.58)
April 15-21, 1993	2.74
	(4.58)
April 22-28, 1993	2.10
	(4.58)
N	5,479

Notes: This table tests for strategic timing of birth by regressing the birthdate of the child on dummies for one week intervals before and after the reform date of April 1, 1993. Control variables include day of week, month, and year dummies, as well as 365 day of year dummies. To increase precision, for this regression we use all births to fathers eligible for any type of parental leave in Norway between 1992 and 2006, and not just those in the family or workplace networks. On average, there are 840 births per week to eligible fathers in all of Norway. Standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01.

Table A.3. RD estimates for direct effects of the April 1, 1993 reform on parental characteristics.

	Workplace network (1)	Family network (2)
1. Father has some college	.034	-.011
	(.030)	(.016)
	[.22]	[.25]
	26,178	12,340
2. Mother has some college	-.015	.007
	(.031)	(.017)
	[.28]	[.28]
	26,502	12,240
3. Father's age at birth	-.375	-.106
	(.371)	(.164)
	[31.2]	[28.8]
	26,851	12,495
4. Mother's age at birth	-.521	-.091
	(.340)	(.167)
	[28.7]	[27.1]
	26,851	12,491
5. Marital status at birth	-.036	.001
	(.035)	(.019)
	[.44]	[.39]
	26,708	12,495
6. Child is a girl	-.010	-.001
	(.035)	(.019)
	[.48]	[.49]
	26,427	22,262
7. Father's firm size	-4.5	–
	(5.0)	–
	[45.1]	–
	26,851	–
8. Father predicted to be eligible	.033	.020
	(.027)	(.015)
	[.78]	[.70]
	34,385	17,696

Notes: Regressions use daily data, include linear trends in birth day on each side of the discontinuity, and employ triangular weights. Sample restrictions and control variables are the same as those in Table 1. Standard errors in parentheses, clustered by firm in column (1) and by extended family in column (2). Comparison mean in brackets based on peer fathers with births in the pre-reform window. Number of observations reported below the comparison means. *p<0.10, **p<0.05, ***p<0.01.

Table A.4. Specification checks for coworker and brother peer effects.

	First stage (1)	Reduced form (2)	Second stage (3)	N (4)
A. Workplace network				
Baseline	.317***	.034**	.109**	26,851
	(.026)	(.013)	(.043)	
No Controls	.318***	.034**	.106***	26,851
	(.024)	(.012)	(.040)	
No triangular weights	.313***	.033**	.105***	26,851
	(.024)	(.013)	(.040)	
Quadratic trends	.321***	.043**	.134**	26,851
	(.041)	(.021)	(.068)	
Cubic trends	.298***	.050	.168	26,851
	(.062)	(.032)	(.111)	
No donut	.323***	.024*	.074*	27,856
	(.024)	(.013)	(.040)	
Two week donut	.311***	.042***	.135***	25,736
	(.028)	(.015)	(.050)	
Ineligibles included	.247***	.033***	.133***	34,749
	(.021)	(.012)	(.049)	
Cluster s.e.'s on day of birth	.317***	.035***	.110***	26,851
	(.026)	(.013)	(.043)	
B. Family network				
Baseline	.304***	.047**	.153**	12,495
	(.014)	(.020)	(.065)	
No controls	.303***	.046***	.152***	12,495
	(.013)	(.018)	(.059)	
No triangular weights	.301***	.043**	.143***	12,495
	(.013)	(.018)	(.060)	
Quadratic trends	.319***	.062**	.193**	12,495
	(.021)	(.030)	(.094)	
Cubic trends	.329***	.080*	.245**	12,495
	(.029)	(.042)	(.129)	
No donut	.308***	.043**	.141**	12,779
	(.013)	(.019)	(.061)	
Two week donut	.303***	.042**	.138**	12,204
	(.015)	(.021)	(.068)	
Ineligibles included	.220***	.043***	.197***	17,835
	(.011)	(.017)	(.075)	
Cluster s.e.'s on day of birth	.304***	.047**	.153***	12,495
	(.014)	(.020)	(.066)	

Notes: Specifications mirror the baseline specifications in Table 1. Standard errors clustered by firm in panel A and by family in panel B. *p<0.10, **p<0.05, ***p<0.01.

Table A.5. Window robustness checks for coworker and brother peer effects.

Window	First stage (1)	Reduced form (2)	Second stage (3)	N (4)
		Panel A: Workplace network		
90 days	.312***	.043**	.138**	14,069
	(.036)	(.018)	(.060)	
135 days	.320***	.035**	.109**	20,498
	(.028)	(.015)	(.047)	
180 days (baseline)	.317***	.034**	.109**	26,851
	(.026)	(.013)	(.043)	
		Panel B: Family network		
180 days	.318***	.063**	.198**	6,083
	(.020)	(.029)	(.091)	
275 days	.309***	.053**	.171**	9,179
	(.016)	(.023)	(.074)	
365 days (baseline)	.304***	.047**	.153**	12,495
	(.014)	(.020)	(.065)	

Notes: Specifications mirror the baseline specifications described in Table 1, changing the window size on each side of the reform. Standard errors clustered by firm in panel A and by family in panel B. *p<0.10, **p<0.05, ***p<0.01.

Table A.6. Local linear regression estimates for coworker and brother peer effects.

Bandwidth	First stage (1)	Reduced form (2)	Second stage (3)	N (4)
		Panel A: Workplace network		
60 days	.317***	.045*	.141*	9,030
	(.047)	(.024)	(.085)	
90 days	.313***	.042**	.134**	13,939
	(.037)	(.018)	(.063)	
120 days	.306***	.039**	.128**	18,055
	(.030)	(.016)	(.056)	
159 days	.316***	.032**	.101**	23,596
	(.026)	(.014)	(.045)	
		Panel B: Family network		
120 days	.316***	.066**	.208**	4,079
	(.025)	(.033)	(.104)	
180 days	.312***	.050*	.160*	6,052
	(.020)	(.027)	(.083)	
240 days	.307***	.052**	.170**	8,104
	(.017)	(.023)	(.071)	
341 days	.303***	.046**	.152**	11,487
	(.014)	(.019)	(.063)	

Notes: Samples mirror the baseline samples described in Table 1. Estimates based on local linear regressions with a uniform kernel with no control variables included. N is based on the number of observations in the bandwidth. The optimal bandwidths based on Imbens and Kalyanaraman (2012) are used in the last row of each panel. Bootstrap standard errors, clustered by firm in panel A and by family in panel B, based on 2,000 replications in parentheses. *p<0.10, **p<0.05, ***p<0.01.

Table A.7. Regression discontinuity estimates for direct effects of the reform on other outcomes.

	Total Years Employed (max=12)			Total Earnings (12 year annuity)			GPA of	Married	# kids
	Father	Mother	Ratio F/M	Father	Mother	Ratio F/M	child	(in 2006)	(in 2006)
	(1)	(2)	(3)	(3)	(4)	(6)	(7)	(8)	(9)
	-.006	-.038	-.001	-6,261	-2,032	-.000	.003	.004	.005
	(.031)	(.043)	(.002)	(3,793)	(1,636)	(.003)	(.019)	(.007)	(.007)
	[11.5]	[10.6]	[.47]	[356,707]	[195,871]	[.37]	[4.10]	[.67]	[2.6]
N	81,794	81,794	81,794	81,794	81,794	81,794	79,076	81,794	80,762

Notes: Specification uses daily data, includes linear trends in birth day on each side of the discontinuity, and employs triangular weights. Sample includes all fathers with a child of any parity born within one year of the reform who are eligible to take any type of parental leave. Employment in a year defined by whether an individual's earnings exceed the "substantial gainful activity" level (approximately NOK 72,900 in the year 2010 or $12,500), total earnings defined as the sum of annual gross earnings (including self-employment earnings) annuitized over 12 years, GPA of child defined as the average of the exam scores taken at the end of compulsory lower secondary school (scores ranges from one to six) normalized to be mean zero and standard deviation one, married is a dummy variable which equals 1 if the parents are still married in 2006, and # kids is total fertility as of 2006. Standard errors clustered by family in parentheses. Comparison mean in brackets.*p<0.10, **p<0.05, ***p<0.01.

Table A.8. Additional Workplace Estimates.

Workplace Characteristic	First stage (1)	Reduced form (2)	Second stage (3)	N (4)
1. Coworkers with start dates	.235***	.059**	.251**	6,841
within one year of each other	(.032)	(.027)	(.120)	
Coworkers with start dates	.340***	.024	.071	20,010
more than one year apart	(.029)	(.015)	(.045)	
2. Firm size < 30	.313***	.042**	.135**	14,301
	(.026)	(.018)	(.059)	
Firm size ≥ 30	.319***	.021	.065	12,550
	(.047)	(.020)	(.061)	

Notes: Specifications mirror those in Table 1. Sample size can vary across subgroups due to missing values. Standard errors clustered by firm. *p<0.10, **p<0.05, ***p<0.01.

Online Appendix B: Decay Estimation

This appendix describes how the decay-adjusted estimates in Section VI are calculated. As explained in the paper, we exploit the fact that coworker 2 does not experience a snowball effect as there are no intermediate births in between him and the peer father (coworker 1). Hence, any change over time in the estimated peer effect for coworker 2 can be attributed to decay.

We first run a preliminary RD regression using the subsample of coworker 2 observations. Specifically, we take the subsample of coworker 2 observations and augment equation (5) to include a polynomial in the spacing between the birth date of the peer father's and coworker 2's child, s, and an interaction term between these polynomial terms and the reform cutoff. Using a third order polynomial for spacing,

$$\begin{aligned} y_{2g} = \quad & \gamma_2 + 1[t \geq c](h_l(t-c) + \pi) + 1[t < c]h_r(c-t) \\ & + \psi_1 s + \psi_2 s^2 + \psi_3 s^3 + \delta_1 1[t \geq c]s + \delta_2 1[t \geq c]s^2 + \delta_3 1[t \geq c]s^3 + u_{2g} \end{aligned}$$

Estimation of this regression mirrors the baseline RD specification in Table 1. The estimated interaction coefficients are $\hat{\delta}_1$=.023 (s.e.=.054), $\hat{\delta}_2$=-.008 (s.e.=.014), and $\hat{\delta}_3$=.0004 (s.e.=.0010), with a joint F-statistic of 2.73 (p-value=.064).

The top graph in Online Appendix Figure B.1 plots the depreciation rate over time based on these estimated interaction terms. The graph plots depreciation for cubic and quartic polynomials. Focusing on the cubic specification, the peer effect appreciates for the first 1.8 years before starting to decline again, with the depreciation term not becoming negative until approximately 3.8 years. As explained in the paper, this pattern makes sense once one realizes when fathers take leave from their firm. The bottom graph in Online Appendix Figure B.1 plots the histogram which shows the distribution of coworker 2 observations based on the spacing between the peer father's child and coworker 2's child. Online Appendix Figure B.2 plots what the decay function would look like if it were three-fourths or half as large as the one we actually use;, these are used for the sensitivity analysis reported in the paper.

The second step is to calculate the average spacing between the birth date of the peer father's and each order coworker's child. These are labeled as s_2, s_3, s_4 and s_5.

The third step is to calculate the decay rates as $r_j = \frac{\hat{\delta_1}}{\hat{\pi}} s_j + \frac{\hat{\delta_2}}{\hat{\pi}} s_j^2 + \frac{\hat{\delta_3}}{\hat{\pi}} s_j^3$. Note the estimated coefficients from the preliminary RD regression based on the coworker 2 sample are used to identify the decay rates for all order coworkers, and not just coworker 2.

The four symbols in Online Appendix Figure B.1 plot the average spacing, s_j, and

depreciation rates, r_j, for each of the j coworker groups. The values for these four coordinates are reported in the main text; the average depreciation rates are used to calculate the decay adjusted reduced form estimates for each coworker group. While estimated depreciation exceeds 100% after about 6.3 years in the figure, it is important to remember that this is the region of the data where we do not have many observations in our coworker 2 sample (see bottom panel of Online Appendix Figure B.1). Moreover, none of the estimated depreciation rates used in the analysis are in this region.

The decay-adjusted snowball estimates are then calculated by dividing the reduced form peer effect estimates in column 1 of Table 4 by $1 + r_j$ for each group j.

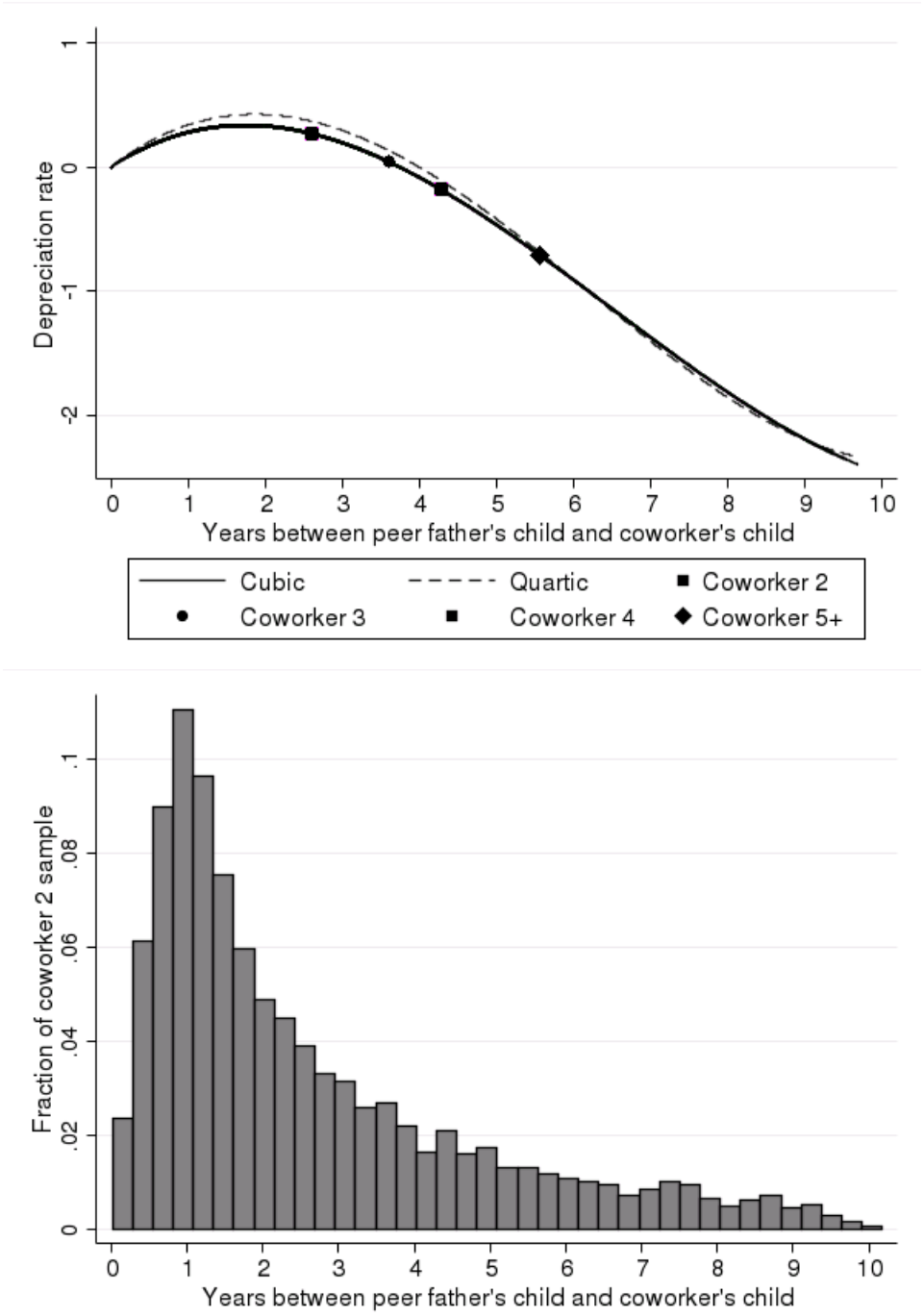

Figure B.1. Decay in the estimated peer effect over time.

Notes: The top graph shows estimated decay for different order polynomials based on the subsample of coworker 2 observations (i.e., the first coworker to have a birth after the peer father). The four symbols plot the average spacing and implied depreciation rates for each coworker group. The bottom graph shows the distribution of coworker 2 observations based on the spacing between the peer father's child and coworker 2's child.

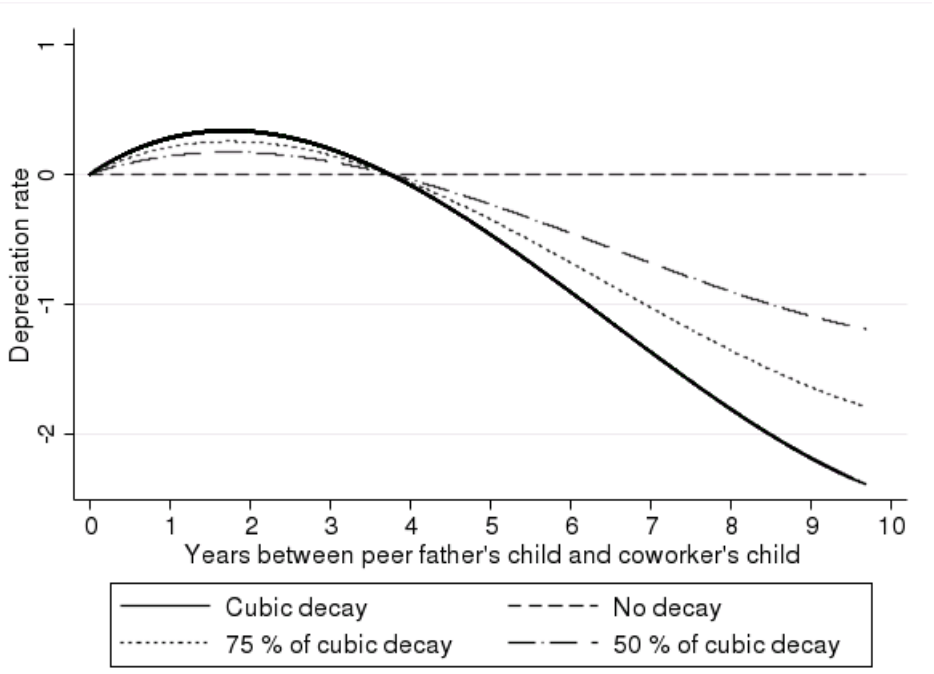

Figure B.2. Flatter decay functions for sensitivity analysis.