**Online supplementary material**

**Appendix 1: Descriptive statistics and sensitivity analyses**

**Table S1: Construction of the analytical sample**

|  |  |
| --- | --- |
| Total number of births 1997-2017 | 2,147,903 |
| With complete data on birth outcomes | 2,142,019 |
| + born to employed mothers with data on job displacement due to workplace closure | 1,593,885 |
| + and complete data on covariates | 1,520,473 |
| + born to employed fathers with data on job displacement due to workplace closure | 1,694,312 |
| + and complete data on covariates | 1,602,588 |
| + mother is not single | 1,491,592 |

**Table S2: Birth outcomes before balancing in full sample and complete cases.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | No job displacement – full sample | No job displacement – restricted sample | Job displacement – full sample | Job displacement – restricted sample | Difference – full sample | Difference – restricted sample |
| **Mothers** |  |  |  |  |  |  |
| Birth weight in grams | 3537 | 3543 | 3512 | 3524 | -25 | -19 |
| LBW | 0.0405 | 0.0399 | 0.0448 | 0.0440 | 0.0043 | 0.0041 |
| PTB | 0.0583 | 0.0580 | 0.0616 | 0.0608 | 0.0033 | 0.0028 |
| SGA | 0.0197 | 0.0191 | 0.0218 | 0.0203 | 0.0021 | 0.0012 |
| N | 1,577,237 | 1,506,670 | 16,648 | 13,595 |  |  |
| **Fathers** |  |  |  |  |  |  |
| Birth weight in grams | 3535 | 3549 | 3507 | 3537 | -28 | -12 |
| LBW | 0.0404 | 0.0387 | 0.0438 | 0.0403 | 0.0034 | 0.0016 |
| PTB | 0.0580 | 0.0569 | 0.0622 | 0.0605 | 0.0042 | 0.0036 |
| SGA | 0.0201 | 0.0185 | 0.0224 | 0.0177 | 0.0023 | -0.0008 |
| N | 1,670,200 | 1,474,287 | 24,112 | 17,305 |  |  |

Restricted sample = complete data on all covariates, and for fathers also requires that the mother is not single. Difference = Treated-Control (job displacement - no job displacement).

**Table S3: Summary statistics on reappearing workplace identifiers**

|  |  |  |
| --- | --- | --- |
|  | Number of workplace identifiers | % of total disappearing workplace identifiers |
| Workplace identifier disappears between t and t+1 | 1,501,655 |  |
| Reappears in t+2 | 224,243 | 14,9% |
| Reappears in t+3 | 77,372 | 5,2% |
| Reappears in t+4 | 41,045 | 2,7% |
| Reappears in t+5 | 25,422 | 1,7% |
| Reappears later than t+5 | 57,016 | 3,8% |
| Ever reappears | 425,098 | 28,3% |
| Never reappears | 1,076,557 | 71,7% |

Table shows disappearing workplace identifiers for all years used to analyze parental job loss: 1995-2017. Note that disappearing workplace identifiers include all identifiers that disappear from one year to the next, not only those that are defined as closed according to the stricter definitions used in the main analyses.

**Table S4: Unemployment rate quintiles**

|  |  |  |
| --- | --- | --- |
|  | Regional unemployment rate | Municipal unemployment rate |
| Quintile | Min  | Max | Min | Max  |
| 1 | 1.28 | 2.90 | 0.58 | 2.60 |
| 2 | 2.91 | 3.40 | 2.60 | 3.35 |
| 3 | 3.40 | 4.06 | 3.35 | 4.17 |
| 4 | 4.06 | 4.80 | 4.17 | 5.11 |
| 5 | 4.82 | 12.87 | 5.11 | 12.87 |

Table shows unemployment rates in percent, defined as the total number of unemployed individuals as a proportion of the total population of the region or municipality.

**Table S5. Sensitivity analyses: Effects of parental job displacement on birth outcomes by regional unemployment rate quintile. Unemployment rate terciles instead of quintiles.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Birth weight | LBW | PTB | SGA |
| Mother’s job displacement |  |  |  |  |  |
|  Tercile 1 | CATT | -3.928 | 0.0028 | 0.0016 | -0.0018 |
|  | se | 8.708 | 0.0030 | 0.0035 | 0.0020 |
| Tercile 2 | CATT | -12.779 | 0.0052 | 0.0072 | 0.0020 |
|  | se | 9.914 | 0.0034 | 0.0040 | 0.0023 |
| Tercile 3 | CATT | -8.625 | 0.0024 | 0.0003 | 0.0024 |
|  | se | 8.996 | 0.0031 | 0.0036 | 0.0022 |
| N (treated) |  | 13595 | 13595 | 13595 | 13595 |
| N (controls) |  | 1506670 | 1506670 | 1506670 | 1506670 |
| Father’s job displacement |  |  |  |  |  |
|  Tercile 1 | CATT | 16.670\* | -0.0040 | 0.0010 | -0.0027 |
|  | se | 7.641 | 0.0025 | 0.0031 | 0.0017 |
| Tercile 2 | CATT | -10.141 | -0.0004 | 0.0046 | -0.0014 |
|  | se | 8.356 | 0.0029 | 0.0036 | 0.0021 |
| Tercile 3 | CATT | 2.814 | 0.0006 | -0.0000 | -0.0036\* |
|  | se | 7.981 | 0.0027 | 0.0032 | 0.0017 |
| N (treated) |  | 17305 | 17305 | 17305 | 17305 |
| N (controls) |  | 1474287 | 1474287 | 1474287 | 1474287 |

CATT = Conditional average treatment effect on the treated. se = cluster robust standard error, clustered on mothers. LBW = low birth weight; PTB = preterm birth; SGA = small for gestational age. Birth weight is measured in grams, LBW, PTB and SGA are binary variables, coded 1 when the outcome is observed.\* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

**Table S6. Sensitivity analyses: Effects of parental job displacement on birth outcomes by regional unemployment rate quintile. Unemployment rate septiles instead of quintiles.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Birth weight | LBW | PTB | SGA |
| Mother’s job displacement |  |  |  |  |  |
|  Septile 1 | CATT | -15.027 | 0.0018 | 0.0013 | -0.0004 |
|  | SE | 12.427 | 0.0042 | 0.0051 | 0.0029 |
| Septile 2 | CATT | 13.099 | 0.0036 | -0.0012 | -0.0018 |
|  | SE | 14.580 | 0.0051 | 0.0057 | 0.0033 |
| Septile 3 | CATT | -0.043 | 0.0064 | 0.0074 | -0.0038 |
|  | SE | 14.173 | 0.0050 | 0.0057 | 0.0029 |
| Septile 4 | CATT | -32.023\* | 0.0085 | 0.0069 | 0.0047 |
|  | SE | 15.192 | 0.0054 | 0.0062 | 0.0037 |
| Septile 5 | CATT | -9.897 | 0.0025 | 0.0082 | 0.0033 |
|  | SE | 15.652 | 0.0053 | 0.0064 | 0.0039 |
| Septile 6 | CATT | -13.539 | 0.0011 | -0.0013 | 0.0019 |
|  | SE | 14.763 | 0.0050 | 0.0059 | 0.0036 |
| Septile 7 | CATT | -0.569 | 0.0012 | -0.0004 | 0.0023 |
|  | SE | 12.435 | 0.0042 | 0.0049 | 0.0031 |
| N (treated) |  | 13595 | 13595 | 13595 | 13595 |
| N (controls) |  | 1506670 | 1506670 | 1506670 | 1506670 |
| Father’s job displacement |  |  |  |  |  |
|  Septile 1 | CATT | 19.220 | -0.0051 | -0.0036 | -0.0059\* |
|  | SE | 10.716 | 0.0035 | 0.0042 | 0.0023 |
| Septile 2 | CATT | 27.052\* | -0.0050 | -0.0003 | -0.0023 |
|  | SE | 13.022 | 0.0043 | 0.0052 | 0.0030 |
| Septile 3 | CATT | -3.542 | -0.0032 | 0.0082 | 0.0000 |
|  | SE | 12.180 | 0.0041 | 0.0054 | 0.0030 |
| Septile 4 | CATT | -14.391 | 0.0019 | 0.0075 | -0.0018 |
|  | SE | 12.433 | 0.0044 | 0.0054 | 0.0030 |
| Septile 5 | CATT | -8.029 | 0.0059 | 0.0058 | -0.0005 |
|  | SE | 13.694 | 0.0049 | 0.0057 | 0.0034 |
| Septile 6 | CATT | -7.610 | 0.0010 | -0.0019 | -0.0022 |
|  | SE | 13.207 | 0.0046 | 0.0052 | 0.0030 |
| Septile 7 | CATT | 7.903 | -0.0012 | -0.0000 | -0.0040 |
|  | SE | 11.040 | 0.0037 | 0.0045 | 0.0024 |
| N (treated) |  | 17305 | 17305 | 17305 | 17305 |
| N (controls) |  | 1474287 | 1474287 | 1474287 | 1474287 |

CATT = Conditional average treatment effect on the treated. SE = cluster robust standard error, clustered on mothers. LBW = low birth weight; PTB = preterm birth; SGA = small for gestational age. Birth weight is measured in grams, LBW, PTB and SGA are binary variables, coded 1 when the outcome is observed.\* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

**Table S7: Main results with different functional form specification. Effects of parental job displacement on birth outcomes. Continuous covariates included as categorical.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Birth weight | LBW | PTB | SGA | Birth weight  | LBW | PTB | SGA |
| Mother’s job displacement | ATT | -8.457 | 0.0035 | 0.0028 | 0.0008 |  |  |  |  |
|  | se | 5.212 | 0.0018 | 0.0021 | 0.0012 |  |  |  |  |
| Father’s job displacement | ATT |  |  |  |  | 3.7166 | -0.0012 | 0.0017 | -0.0025\* |
|  | se |  |  |  |  | 4.5304 | 0.0016 | 0.0019 | 0.0011 |
| Sample mean of outcome |  | 3542.85 | 0.0399 | 0.0580 | 0.0191 | 3549.31 | 0.0387 | 0.0569 | 0.0185 |
| N (treated) |  | 13595 | 13595 | 13595 | 13595 | 17305 | 17305 | 17305 | 17305 |
| N (controls) |  | 1506670 | 1506670 | 1506670 | 1506670 | 1474287 | 1474287 | 1474287 | 1474287 |

ATT = Average treatment effect on the treated. SE = cluster robust standard error, clustered on mothers. LBW = low birth weight; PTB = preterm birth; SGA = small for gestational age. Birth weight is measured in grams, LBW, PTB and SGA are binary variables, coded 1 when the outcome is observed.\* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

**Table S8. Effects of parental job displacement on birth outcomes by regional unemployment rate quintile. Continuous covariates included as categorical.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Birth weight | LBW | PTB | SGA |
| Mother’s job displacement |  |  |  |  |  |
|  Quintile 1 | CATT | -4.680 | 0.0019 | 0.0004 | -0.0007 |
|  | SE | 10.850 | 0.0037 | 0.0044 | 0.0025 |
| Quintile 2 | CATT | 0.718 | 0.0048 | 0.0047 | -0.0042 |
|  | SE | 12.006 | 0.0042 | 0.0048 | 0.0026 |
| Quintile 3 | CATT | -17.835 | 0.0058 | 0.0041 | 0.0041 |
|  | SE | 12.974 | 0.0045 | 0.0052 | 0.0032 |
| Quintile 4 | CATT | -14.513 | 0.0021 | 0.0093 | 0.0011 |
|  | SE | 12.940 | 0.0043 | 0.0053 | 0.0031 |
| Quintile 5 | CATT | -7.287 | 0.0029 | -0.0018 | 0.0031 |
|  | SE | 10.951 | 0.0038 | 0.0043 | 0.0028 |
| N (treated) |  | 13595 | 13595 | 13595 | 13595 |
| N (controls) |  | 1506670 | 1506670 | 1506670 | 1506670 |
| Father’s job displacement |  |  |  |  |  |
|  Quintile 1 | CATT | 23.064\* | -0.0060 | -0.0033 | -0.0041\* |
|  | SE | 9.408 | 0.0031 | 0.0037 | 0.0021 |
| Quintile 2 | CATT | 6.803 | -0.0029 | 0.0054 | -0.0018 |
|  | SE | 10.746 | 0.0036 | 0.0045 | 0.0025 |
| Quintile 3 | CATT | -11.656 | 0.0015 | 0.0086 | -0.0024 |
|  | SE | 10.577 | 0.0037 | 0.0046 | 0.0026 |
| Quintile 4 | CATT | -9.406 | 0.0048 | 0.0001 | -0.0029 |
|  | SE | 11.412 | 0.0040 | 0.0046 | 0.0027 |
| Quintile 5 | CATT | 5.825 | -0.0015 | 0.0002 | -0.0019 |
|  | SE | 9.738 | 0.0033 | 0.0040 | 0.0022 |
| N (treated) |  | 17305 | 17305 | 17305 | 17305 |
| N (controls) |  | 1474287 | 1474287 | 1474287 | 1474287 |

CATT = Conditional average treatment effect on the treated. SE = cluster robust standard error, clustered on mothers. LBW = low birth weight; PTB = preterm birth; SGA = small for gestational age. Birth weight is measured in grams, LBW, PTB and SGA are binary variables, coded 1 when the outcome is observed.\* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

**Table S9: Descriptive statistics on outcomes and selected covariates for treatment and control groups before balancing (complete version of Table 1 from the main text).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | **Maternal sample** | **Paternal sample**  |
| **Variable** | **Year** | **Categories** | **Control group** | **Treatment group** | **Control group** | **Treatment group** |
| **Child data** |  |  |  |  |  |  |
| Birth weight | t-0 |  | 3543 | 3524 | 3549 | 3538 |
| LBW | t-0 |  | 0.040 | 0.044 | 0.039 | 0.040 |
| PTB | t-0 |  | 0.058 | 0.061 | 0.057 | 0.061 |
| SGA | t-0 |  | 0.019 | 0.020 | 0.019 | 0.018 |
| Birth order of child | t-0 | 1 | 0.445 | 0.449 |  |  |
|  |  | 2 | 0.380 | 0.367 | 0.396 | 0.379 |
|  |  | 3 | 0.134 | 0.129 | 0.140 | 0.148 |
|  |  | >3 | 0.041 | 0.055 | 0.048 | 0.066 |
| **Parent data** |  |  |  |  |  |  |
| **Focal parent** |  |  |  |  |  |  |
| Age category | t-2 | <21 | 0.034 | 0.065 | 0.011 | 0.015 |
|  |  | 21-25 | 0.199 | 0.250 | 0.123 | 0.134 |
|  |  | 26-30 | 0.387 | 0.347 | 0.329 | 0.312 |
|  |  | 31-35 | 0.285 | 0.246 | 0.322 | 0.308 |
|  |  | 36-40 | 0.088 | 0.083 | 0.151 | 0.154 |
|  |  | >40 | 0.008 | 0.009 | 0.064 | 0.077 |
| Country of birth  | - | Sweden | 0.886 | 0.837 | 0.874 | 0.806 |
|  |  | EU | 0.034 | 0.040 | 0.034 | 0.044 |
|  |  | Other | 0.081 | 0.122 | 0.092 | 0.150 |
| Household status | t-2 | Single | 0.444 | 0.473 | 0.403 | 0.398 |
| Civil status | t-2 | Married | 0.315 | 0.303 | 0.340 | 0.370 |
|  |  | Divorced or widowed | 0.035 | 0.045 | 0.034 | 0.046 |
|  |  | Never married | 0.651 | 0.651 | 0.626 | 0.584 |
| NUTS region | t-2 | 11 | 0.257 | 0.303 | 0.239 | 0.296 |
|  |  | 12 | 0.159 | 0.153 | 0.164 | 0.152 |
|  |  | 21 | 0.084 | 0.067 | 0.087 | 0.065 |
|  |  | 22 | 0.135 | 0.131 | 0.136 | 0.140 |
|  |  | 23 | 0.205 | 0.186 | 0.205 | 0.180 |
|  |  | 31 | 0.074 | 0.078 | 0.078 | 0.077 |
|  |  | 32 | 0.036 | 0.036 | 0.037 | 0.039 |
|  |  | 33 | 0.051 | 0.046 | 0.053 | 0.050 |
| Education level | t-2 | ISCED<3 | 0.073 | 0.149 | 0.094 | 0.156 |
|  |  | ISCED 3-4 | 0.419 | 0.515 | 0.500 | 0.523 |
|  |  | ISCED>4 | 0.508 | 0.336 | 0.406 | 0.321 |
| Registered unemployed | t-2 |  | 0.187 | 0.307 | 0.137 | 0.251 |
| Days registered unemployed | t-2 |  | 12.7 | 25.1 | 12.9 | 27.7 |
| Job loss | t-2 |  | 0.009 | 0.025 | 0.013 | 0.036 |
| Employment status | t-2 | Not employed | 0.044 | 0.094 | 0.023 | 0.059 |
|  |  | Employed | 0.952 | 0.886 | 0.971 | 0.904 |
|  |  | Self-employed | 0.003 | 0.021 | 0.006 | 0.037 |
| Total employment-related income, in SEK | t-2 |  | 182068 | 150142 | 264707 | 223231 |
| Wage earnings, in SEK | t-2 |  | 154089 | 118157 | 252028 | 200251 |
| Business income, in SEK | t-2 |  | 502 | 2715 | 1365 | 6813 |
| Unemployment benefits, in SEK | t-2 |  | 3666 | 6441 | 3449 | 6792 |
| Social assistance, in SEK | t-2 |  | 478 | 1181 | 488 | 1396 |
| Disposable income, in SEK | t-2 |  | 150413 | 130863 | 203431 | 177741 |
| Sickness days | t-2 |  | 6.65 | 8.97 | 3.21 | 4.86 |
| Parental leave days | t-2 |  | 44.34 | 40.33 | 10.37 | 7.80 |
| Industry sector (ISIC code) | t-1 | A | 0.005 | 0.015 | 0.012 | 0.028 |
|  |  | B, C, D, E | 0.091 | 0.061 | 0.244 | 0.108 |
|  |  | F | 0.008 | 0.014 | 0.060 | 0.078 |
|  |  | G, H, I | 0.195 | 0.343 | 0.249 | 0.327 |
|  |  | J | 0.030 | 0.038 | 0.063 | 0.067 |
|  |  | K | 0.032 | 0.022 | 0.031 | 0.022 |
|  |  | L | 0.008 | 0.015 | 0.008 | 0.016 |
|  |  | M, N | 0.206 | 0.256 | 0.190 | 0.265 |
|  |  | O, P, Q | 0.382 | 0.144 | 0.112 | 0.038 |
|  |  | R, S, T, U | 0.043 | 0.092 | 0.031 | 0.052 |
| Age of plant, in years | t-1 |  | 14.1 | 4.9 | 13.6 | 4.6 |
| Age of firm, in years | t-1 |  | 13.1 | 4.1 | 11.3 | 3.4 |
| No. workers at plant | t-1 |  | 531 | 70 | 426 | 40 |
| Regional unemployment rate | t-1 |  | 3.78 | 3.95 | 3.82 | 3.94 |
| **Partner** |  |  |  |  |  |  |
| Age category | t-2 | <21 | 0.012 | 0.023 | 0.034 | 0.048 |
|  |  | 21-25 | 0.120 | 0.159 | 0.208 | 0.226 |
|  |  | 26-30 | 0.325 | 0.310 | 0.388 | 0.368 |
|  |  | 31-35 | 0.323 | 0.290 | 0.279 | 0.266 |
|  |  | 36-40 | 0.153 | 0.141 | 0.084 | 0.084 |
|  |  | >40 | 0.067 | 0.077 | 0.008 | 0.008 |
| Country of birth  |  | Sweden | 0.880 | 0.833 | 0.870 | 0.816 |
|  |  | EU | 0.036 | 0.039 | 0.035 | 0.040 |
|  |  | Other | 0.085 | 0.128 | 0.095 | 0.144 |
| Household status | t-2 | Single | 0.438 | 0.467 | 0.405 | 0.405 |
| Civil status | t-2 | Married | 0.315 | 0.305 | 0.341 | 0.369 |
|  |  | Divorced or widowed | 0.039 | 0.054 | 0.031 | 0.038 |
|  |  | Never married | 0.646 | 0.641 | 0.628 | 0.593 |
| NUTS region | t-2 | 11 | 0.255 | 0.301 | 0.240 | 0.297 |
|  |  | 12 | 0.159 | 0.154 | 0.164 | 0.154 |
|  |  | 21 | 0.084 | 0.067 | 0.087 | 0.064 |
|  |  | 22 | 0.135 | 0.131 | 0.136 | 0.141 |
|  |  | 23 | 0.205 | 0.186 | 0.205 | 0.180 |
|  |  | 31 | 0.074 | 0.079 | 0.078 | 0.077 |
|  |  | 32 | 0.036 | 0.035 | 0.036 | 0.039 |
|  |  | 33 | 0.051 | 0.047 | 0.053 | 0.051 |
| Education level | t-2 | ISCED<3 | 0.099 | 0.147 | 0.083 | 0.132 |
|  |  | ISCED 3-4 | 0.498 | 0.541 | 0.424 | 0.456 |
|  |  | ISCED>4 | 0.402 | 0.312 | 0.493 | 0.412 |
| Registered unemployed | t-2 |  | 0.143 | 0.198 | 0.205 | 0.255 |
| Days registered unemployed | t-2 |  | 14.1 | 20.7 | 15.2 | 20.9 |
| Job loss | t-2 |  | 0.017 | 0.028 | 0.011 | 0.017 |
| Employment status | t-2 | Not employed | 0.045 | 0.076 | 0.093 | 0.143 |
|  |  | Employed | 0.912 | 0.866 | 0.893 | 0.835 |
|  |  | Self-employed | 0.043 | 0.058 | 0.014 | 0.022 |
| Total employment-related income, in SEK | t-2 |  | 256774 | 231522 | 171639 | 155080 |
| Wage earnings, in SEK | t-2 |  | 238509 | 208699 | 140324 | 122150 |
| Business income, in SEK | t-2 |  | 5901 | 8471 | 1656 | 2737 |
| Unemployment benefits, in SEK | t-2 |  | 3773 | 5309 | 4147 | 5096 |
| Social assistance, in SEK | t-2 |  | 538 | 1030 | 577 | 1270 |
| Disposable income, in SEK | t-2 |  | 200072 | 187557 | 143198 | 139070 |
| Sickness days | t-2 |  | 3.9 | 5.4 | 7.7 | 8.3 |
| Parental leave days | t-2 |  | 9.7 | 7.1 | 48.3 | 49.4 |
| Regional unemployment rate | t-1 |  | 3.78 | 3.95 | 3.81 |  3.94 |

 |  |  |  |  |

**Table S10. Descriptive statistics on parents who do and do not experience job displacement. Full sample of parents between 1996 and 2017, not restricted to years around the birth of a child.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Year** | **Maternal sample** | **Paternal sample**  |
| **No job displacement** | **Job displacement** | **No job displacement** | **Job displacement** |
| Registered unemployed | t-1 | 0.198 | 0.286 | 0.171 | 0.288 |
| Registered unemployed | t+1 | 0.182 | 0.379 | 0.149 | 0.390 |
| Days registered unemployed | t-1 | 13 | 23 | 15.7 | 30.6 |
| Days registered unemployed | t+1 | 12 | 33 | 13.9 | 44.7 |
| Total employment-related income, in SEK | t-1 | 145163 | 111202 | 215006 | 166034 |
| Total employment-related income, in SEK | t+1 | 164678 | 118396 | 241944 | 170120 |
| Wage earnings, in SEK | t-1 | 119540 | 86077 | 203149 | 145916 |
| Wage earnings, in SEK | t+1 | 134827 | 81997 | 227997 | 138959 |
| Business income, in SEK | t-1 | 383 | 1779 | 1155 | 4585 |
| Business income, in SEK | t+1 | 531 | 1920 | 1438 | 5865 |
| Unemployment benefits, in SEK | t-1 | 3374 | 5302 | 3728 | 7018 |
| Unemployment benefits, in SEK | t+1 | 3513 | 9177 | 3692 | 12182 |
| Social assistance, in SEK | t-1 | 441 | 1014 | 703 | 2169 |
| Social assistance, in SEK | t+1 | 328 | 1024 | 421 | 1649 |
| Disposable income, in SEK | t-1 | 147488 | 121642 | 201650 | 161837 |
| Disposable income, in SEK | t+1 | 159896 | 124466 | 219187 | 162692 |
| N (person-year observations) |  | 11448306 | 159294 | 12991434 | 212052 |

Notes: t = year of job displacement. Total number of mothers = 1,608,973. Total number of fathers = 1,581,302.

**Appendix 2: Postponement of childbearing as a potential response to job displacements.**

To illustrate that childbearing postponing is not a common response to job losses (excluding a sample selection problem), we estimated models that include all individuals in Sweden who had a biological child and were employed between 1996 and 2017, as well as all workers who worked in the same workplace as these individuals. This is the same sample used to identify job displacements due to workplace closures and covers the majority of all workers in Sweden during the period. We include all person-years in which the individual is employed (i.e. not self-employed or without a job) and thus at risk of experiencing job displacements due to workplace closures.

The focal treatment variable is job displacement due to workplace closure, measured in year t-1. Since in our register extraction available for this study, we do not have data on any covariates besides workplace ID and year for the sample of coworkers, the models only adjust for year and individual fixed effects. We include individual fixed effects using a Mundlak formulation (Mundlak 1978). That is, we mean center job displacement for all individuals in the data, and then calculate the deviation for all person-years from this individual mean. The individual mean is time-invariant and corresponds to a “between effect” (i.e. between individuals), while the deviation from the mean is time varying and corresponds to a “within effect” (i.e. within individuals). The within effect is algebraically equivalent to a fixed effects estimator (Bell & Jones 2015). We use a Mundlak device since the large number of observations (close to 100 million) caused convergence problems for the conditional multinomial logit models.

Note that since we do not have information on the gender of the control group for the analysis of fertility responses, we cannot estimate separate models for women and men. Note also that the multinomial models require categorical dependent variables, meaning that we cannot estimate models with birth weight in gram as an outcome. We estimate multinomial regression models of the following form:

ϒij = $β$0 + $β$1X̄j + $β$2(Xij-1 - X̄j) + $β$3Zj

Where

ϒij = childbearing and birth outcome of individual i in year j. The variable is coded as follows: Outcome 0 = no childbearing in year t; Outcome 1 = childbearing in year t, and the child does not have low birth weight, is not born prematurely or is not small for gestational age (not LBW, PTB or SGA); Outcome 2 = childbearing in year t, and the child has low birth weight, is born prematurely or is small for gestational age (LBW, PTB or SGA).

X̄j = mean of job displacement indicator for individual i

(Xij-1 - X̄j) = deviation from mean of job displacement indicator for individual i in year j-1

Zj = year fixed effects

We estimate the models three times, one for each non-desirable birth outcome (LBW, PTB or SGA). That is, the outcome category “2” changes between LBW, PTB and SGA in the different models. For brevity, we only show results for the within effects (Xij-1 - X̄j), as the “between effects” in the Mundlak device are only meant to pick up unobserved confounding.

**Table S11. Results from a multinomial logit model with Mundlak device for postponement of childbearing as a response to job displacements.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Outcome 1: No childbearing (Base outcome: Childbearing, not LBW, PTB or SGA) | Outcome 2: Childbearing, with LBW, PTB or SGA(Base outcome: Childbearing, not LBW, PTB or SGA) |
| LBW |  |  |  |
| Job displacement (within effect) | AME | 0.00378\*\*\* | -0.00005 |
|  | SE | 0.00017 | 0.00003 |
| PTB |  |  |  |
| Job displacement (within effect) | AME | 0.00377\*\*\* | -0.00009\* |
|  | SE | 0.00017 | 0.00004 |
| SGA |  |  |  |
| Job displacement (within effect) | AME | 0.00379\*\*\* | -0.00000 |
|  | SE | 0.00018 | 0.00002 |
| N (individuals) |  | 7,724,821 |
| N (individuals X years) |  | 98,453,70 |

AME = average marginal effect (calculated from log odds); SE = standard error, clustered on individuals. Data from 1996-2017.

**Table S12. Summary of existing studies on parental job displacement or unemployment and birth outcomes.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Study** | **Treatment, gender and setting** | **Methodology and sibling comparison** | **Results[[1]](#footnote-1)** |
| Dooley and Prause (2005) | Transition from adequate employment to unemployment.Only mothers.USA. | Linear and logistic regression.Only includes singleton first births; no sibling comparison. | 188 grams lower birth weight (p<0.05).1.76 higher odds of low birth weight (p>0.05). |
| Lindo (2011) | Job loss due to plant or business closure or due to being laid off or fired. Only husbands of the child’s mother.USA. | Linear regression with mother fixed effects.No restrictions on the number of siblings.Only compares treated children with younger, untreated siblings. All siblings born after the first displacement are considered to belong to the treatment group | Around 160 grams lower birth weight (p<0.1).[[2]](#footnote-2)1.8 percentage points higher risk of low birth weight (p>0.1). |
| Scharber (2014) | Unemployment. Only mothers.USA. | Linear regression with mother fixed effectsNo restrictions on the number of siblings.Additional analyses of whether transitions into or out from unemployment have symmetrical effects. | 73 grams lower birth weight (p<0.001).2.7 percentage points higher risk of LBW (p<0.01).Transitions into and out from unemployment have symmetrical effects |
| Gailey et al. (2022) | Job displacement due to plant closure. Only fathers.Denmark. | Logistic regression. Only compare the first and second born siblings, and only if the second but not the first is treated. Adjust for the birth outcome of the first sibling by including it as a covariate (i.e. lagged dependent variable approach). Additional analyses using mother fixed effects.  | Main estimates:1.37 higher odds of LBW (p<0.05).1.02 higher odds of preterm birth (p>0.05).Mother fixed effects estimates:1.26 higher odds of LBW (p>0.05).11.5 grams lower birth weight (p>0.05) |
| Högberg et al. (2023) | Unemployment. Both mothers and fathers. Sweden.  | Linear regression with family (siblings share the same mother and father) fixed effects.No restrictions on the number of siblings.Additional analyses of whether transitions into or out from unemployment have symmetrical effects. | Mothers:1.8 grams lower birth weight (p>0.05)0.10 percentage points higher risk of LBW (p>0.05)0.15 percentage points higher risk of preterm birth (p>0.05)0.14 percentage points higher risk of SGA (p<0.05)Fathers:0.7 grams lower birth weight (p>0.05)0.01 percentage points lower risk of LBW (p>0.05)0.05 percentage points lower risk of preterm birth (p>0.05)0.05 percentage points lower risk of LBW (p<0.05)No systematic differences between transitions into or out from unemployment. |

**Appendix 3: Sibling comparisons**

Sibling comparison models can be estimated in different ways, namely first difference approach, lagged dependent variable approach and sibling fixed effects approach.

**First difference approach**: We keep only the first two siblings who share the same mother or father, and exclude all 3rd or higher order births as well as all children with no siblings. In addition, we only keep sibling pairs in which either neither sibling or only the second sibling is treated (= experience parental job displacement), and exclude all sibling pairs in which either both or only the first sibling is treated. In analyses of maternal job displacement, we compare siblings that share the same mother, and in analyses of paternal job displacement siblings that share the same father. Results are similar if we only compare siblings that share the same mother and father (not shown). We calculate the difference between the first-born and the second-born sibling for each respective birth outcome (birth weight in grams, low birth weight, preterm birth and small for gestational age), such that the outcome for the first-born sibling is subtracted from the outcome of the second-born. We then use these differences as the dependent variable in the regression models. Since the dependent variable is now the difference between the first and the second-born sibling, the models are only estimated on a subsample consisting of the second-born siblings. The balanced regression models are otherwise equivalent to those described in the manuscript.

**Lagged dependent variable**: Like in the first difference-approach, we keep only the first two siblings who share the same mother or father, and exclude all 3rd or higher order births as well as all children with no siblings. In addition, we only keep sibling pairs in which either neither sibling or only the second sibling is treated, and exclude all sibling pairs in which either both or only the first sibling is treated. In analyses of maternal job displacement, we compare siblings that share the same mother, and in analyses of paternal job displacement siblings that share the same father. Results are similar if we only compare siblings that share the same mother and father (not shown). We then estimate balanced regression models that are equivalent to those described in the manuscript, but with the exception that the birth outcome of the first sibling is included as a covariate in the model with the birth outcome of the second sibling as the dependent variable.

Both the first difference and the lagged dependent variable approach account for shared confounding by contrasting the birth outcome of the second-born sibling with that of the firstborn sibling. By only comparing treated second-born children with their untreated first-born siblings, they also reduce the risk of bias due to carryover effects (see Sjölander 2022): if job displacements have long-term or scarring effects for the parent, an untreated second-born sibling may not serve as a valid counterfactual for a treated first-born child, since the effect from the first job displacement is felt by the second-born sibling as well. Despite these similarities between the first difference and the lagged dependent variable approach, we present results from both approaches since they rely on partly different assumptions and can generate different results under plausible conditions (i.e. Lord’s paradox; see Lord 1967; see also Allison 1990; Angrist and Pischke 2009; Ding & Li 2019; O'Neill et al. 2016). First differences, or more generally differences-in-differences approaches, tend to generate more unbiased estimates when the parallel trend assumptions holds. That is, the average difference between treated and control sibling pairs would have remained constant in the absence of treatment (parental job loss preceding the birth of the second born sibling). Since we only compare the first two siblings, the parallel trend assumption cannot be tested in this setting. Lagged dependent variable regression tend to generate more unbiased estimates when adjusting for the birth outcome of the first sibling is enough to block all confounding factors and make the treatment assignment for the second born sibling independent of his or her potential birth outcome (Angrist and Pischke 2009). Allison (1990) in addition states that lagged dependent variable regression performs better when the outcome measured at the first measurement point has a causal effect on the outcome measured at the second measurement point, which in this case would mean that the birth outcome of the first-born sibling causally affects the outcome of the second born sibling.

**Sibling fixed effects**: This approach adjusts for shared confounding by including fixed effects for siblings sharing the same mother or father. The sibling (or mother/father/family) fixed effects account for all factors that do not vary across siblings. Unlike the first difference and lagged dependent variable approaches, no restrictions on the number of siblings included are imposed, and the sample is thus the same as the sample used in the main analyses. In addition, no restrictions regarding the temporal order of the treatment are imposed, meaning that the comparison between a younger treated sibling and an older untreated sibling is symmetrical to that between an older treated sibling and a younger untreated sibling. In analyses of maternal job displacement, we use mother fixed effects and compare siblings that share the same mother, and in analyses of paternal job displacement we use father fixed effects and compare siblings that share the same father. Results are similar if we use family fixed effects and only compare siblings that share the same mother and father (not shown). With the exception of mother and father fixed effects, the regression models are otherwise equivalent to those described in the manuscript.

Tables 2 and 3 below summarize the results. For mothers, the results are mostly similar across the four types of model specifications. For two outcomes, LBW and preterm birth, the point estimates are clearly larger for the first difference-approach, and for PTB also somewhat larger for the lagged dependent variable-approach. However, none of these estimates reach statistical significance, and in all cases the 95% confidence intervals overlap with the original estimates (not shown here).

For fathers, the results are a bit more variable. With birth weight in grams as the outcome, the sibling comparison models suggests more positive (i.e. more benign) effects compared to the original estimates, which is significant in the lagged dependent variable model. With PTB and LBW as the outcomes, the sibling comparison models suggests more negative (i.e. more benign) effects. With SGA as the outcome, the sibling comparison models suggests more positive (i.e. more harmful) effects, which are significant in the first difference and fixed effects models. All in all, the sibling comparison models suggests that the results for father’s job displacement are less robust. However, the differences between the original estimates and the sibling comparison models do not systematically go in the same direction. With birth weight in grams, LBW and PTB as the outcomes, the sibling comparison models suggests a more benign effect , while the opposite is true with SGA as the outcome. Thus, while the results for father’s job displacement are less robust, there is no evidnce that the original results are systematically over- or underestimated. Note also that a correction for multiple hypothesis testing (four different outcomes and four different models) would render all estimates non-significant.

**Table S13. Results from sibling comparison models. Results for mother’s job displacement.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Original estimates | First difference | Lagged dependent variable  | Sibling fixed effects |
| Birth weight in grams |  |  |  |  |  |
| Mother’s job displacement | ATT | -6.087 | -3.201 | -2.616 | -4.568 |
|  | SE | 5.463 | 9.737 | 8.534 | 6.763 |
| N (treated) |  | 13595 | 3679 | 3679 | 13595 |
| N (controls) |  | 1506670 | 489828 | 489828 | 1506670 |
| LBW |  |  |  |  |  |
| Mother’s job displacement | ATT | 0.0030 | 0.0053 | 0.0027 | 0.0008 |
|  | SE | 0.0020 | 0.0039 | 0.0031 | 0.0026  |
| N (treated) |  | 13595 | 3679 | 3679 | 13595 |
| N (controls) |  | 1506670 | 489828 | 489828 | 1506670 |
| PTB |  |  |  |  |  |
| Mother’s job displacement | ATT | 0.0021 | 0.0072 | 0.0056 | 0.0024  |
|  | SE | 0.0023 | 0.0047 | 0.0037 | 0.0032 |
| N (treated) |  | 13595 | 3679 | 3679 | 13595 |
| N (controls) |  | 1506670 | 489828 | 489828 | 1506670 |
| SGA |  |  |  |  |  |
| Mother’s job displacement | ATT | 0.0004 | -0.0011 | 0.0008 | -0.0014 |
|  | SE | 0.0012 | 0.0031 | 0.0018 | 0.0019  |
| N (treated) |  | 13595 | 3679 | 3679 | 13595 |
| N (controls) |  | 1506670 | 489828 | 489828 | 1506670 |

**Table S14. Results from sibling comparison models. Results for father’s job displacement.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Original estimates | First difference | Lagged dependent variable  | Sibling fixed effects |
| Birth weight in grams |  |  |  |  |  |
| Father’s job displacement | ATT | 0.208 | 12.832 | 15.804\* | 9.271 |
|  | SE | 4.737 | 8.390 | 7.276 | 5.349 |
| N (treated) |  | 17305 | 4779 | 4779 | 17305 |
| N (controls) |  | 1474287 | 497063 | 497063 | 1474287 |
| LBW |  |  |  |  |  |
| Father’s job displacement | ATT | 0.0001 | -0.0052 | -0.0059\* | -0.0025 |
|  | SE | 0.0017 | 0.0033 | 0.0025 | 0.0021  |
| N (treated) |  | 17305 | 4779 | 4779 | 17305 |
| N (controls) |  | 1474287 | 497063 | 497063 | 1474287 |
| PTB |  |  |  |  |  |
| Father’s job displacement | ATT | 0.0034 | -0.0019 | -0.0022 | 0.0004 |
|  | SE | 0.0020 | 0.0040 | 0.0031 | 0.0026 |
| N (treated) |  | 17305 | 4779 | 4779 | 17305 |
| N (controls) |  | 1474287 | 497063 | 497063 | 1474287 |
| SGA |  |  |  |  |  |
| Father’s job displacement | ATT | -0.0021\* | 0.0047\* | -0.0003 | 0.0029\* |
|  | SE | 0.0010 | 0.0024 | 0.0015 | 0.0015 |
| N (treated) |  | 17305 | 4779 | 4779 | 17305 |
| N (controls) |  | 1474287 | 497063 | 497063 | 1474287 |

**Appendix 3: Justification of covariates as confounders**

An important assumption for estimating (conditional) average treatment effects on the treated ((C)ATT) using entropy balancing combined with regression adjustment on covariates $X\_{i}$ is the conditional independence assumption (CIA), or the assumption of no unmeasured confounding. Although job displacements due to workplace closures should be largely out of the control of individual workers, as they are mostly due to economic reasons, and thus problems of selection into treatment based on individual characteristics should be considerably smaller (Brand, 2015), previous research shows that some workers are more likely to start and stop working in establishments that will close in the future (Fackler et al., 2018; OECD, 2013), and these characteristics may also affect birth outcomes. To support the plausibility of the CIA, we, therefore, adjusted for individual-level covariates that may affect selection into and out of workplaces that may close, as well as regional economic and workplace and firm characteristics that determine the risk of closure and may also indirectly affect birth outcomes. All covariates are listed in Table A1 in the appendix. However, care should be taken in the selection of covariates, as only variables that are hypothesized to affect both job displacement and birth outcomes should be adjusted. In contrast, variables that are hypothesized to be endogenous to treatment, such as the sex of the newborn, should not be adjusted because such bad controls can lead to both overcontrol and endogenous selection bias (Elwert & Winship, 2014). We also avoided adjusting for variables that may only affect the treatment but not the outcome, as they may not only increase the variance of our estimator but also lead to bias amplification of possible unmeasured confounding (Cinelli et al., 2021). Thus, here we justify our choice of covariates as confounders by considering the timing of the covariates (all measured in t-2, except for child characteristics and functional region unemployment rates) relative to the treatment (measured in t-1), theoretical arguments, and previous empirical evidence of their effects on parental job displacement and birth outcomes.

For child characteristics, we matched precisely on birth year t, because period effects around birth, such as economic recessions, not only increase the risk of parental job displacement (OECD, 2013) but can also independently affect child health, although it remains unclear whether these effects are pro- or countercyclical (Catalano, 2011; van den Berg et al., 2020). We also considered birth order, as the number of siblings of an unborn child may influence parental risk of job displacement (Atwell, 1999), for example, through parents' choice of different jobs (e.g., public vs. private sector) (OECD, 2013). At the same time, primiparity is thought to increase negative birth outcomes (Shah, 2010). We included four dummy variables for birth order in year t because there is some evidence of nonlinear relationships between birth order and birth outcomes, with additional negative effects starting at the fourth birth (Valero de Bernabé et al., 2004).

For parental characteristics, we accounted for parental age with six dummy variables. It is hypothesized that higher parental age, particularly higher maternal age, is negatively associated with child health, although it is unclear whether these associations are causal (Goisis et al., 2017; Goisis et al., 2018). Because we only look at parents of childbearing age in our analyses, it is likely that parental age is also negatively associated with the risk of job displacement (OECD, 2013), possibly because younger workers are not yet fully integrated into the labor market and may therefore be overrepresented in workplaces at higher risk of closure (OECD, 2013). We also adjust for the country of birth of the parents, distinguishing three groups: born in Sweden, born in another European country, born in another non-European country. Workers who migrated to Sweden are disadvantaged in their position in the labor market (OECD, 2007) and might therefore be more likely to be employed in workplaces with a higher risk of job displacement. In addition, country of origin has been found to influence birth outcomes (Bollini et al., 2009). In addition, we account for household and marital status by distinguishing between parents who are currently single and different marital statuses (married, divorced or widowed, or never married). Family structure can drive selection into job losses, for example, due to tensions between work and family demands (Attewell, 1999), and has been shown to affect birth outcomes (Buckles & Price, 2013). In addition, we adjust for the region in which parents live (NUTS3, 8-dummies), as regional economies can influence the risk of job displacement (Nyström, 2017) while also negatively affecting birth outcomes, for example, through channels associated with regional economic downturns (Catalano et al., 2011), but also through an uneven distribution of environmental risk factors across regions (Valero de Bernabé et al., 2004). Using the same arguments, we also equalize the treatment and control groups in terms of the more specific measure of regional unemployment rate at the functional region level.

In addition to these sociodemographic characteristics, we take into account the educational and labor market biographies of both parents by adjusting for parental education, parental unemployment (registered unemployment, number of registered unemployment days), previous experience with job displacement, and number of paid sick and parental leaves. We also considered several measures of both parents' financial situation, including total employment-related income (including transfers), total disposable income (net of transfers and taxes), wage income, business income, and any income from unemployment benefits and social assistance. Despite lower selectivity on such indicators of human capital, individual productivity, and performance in job displacements due to workplace closures (Brand, 2015), workers who lose their jobs and those who do not are still known to differ in terms of socioeconomic status and possibly health (Burgard et al., 2007; OECD, 2013; Fallick, 2006; von Wachter, 2010). At the same time, the employment situation and working conditions of parents and especially mothers, as well as their health status, have been shown to influence birth outcomes (Mozurkewich, 2020; Valero de Bernabé et al., 2004). Finally, we adjust for workplace characteristics, including industry sector (10 NACE categories), age of workplace and firm, and firm size, as these factors have been shown to influence the risk of workplace closure (Fackler et al., Fallick, 2006; OECD, 2013; von Wachter, 2010) and, through channels related to firm performance and dynamics (Coad, 2018), working conditions and requirements can indirectly influence birth outcomes (Mozurkewich, 2020).

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1. In most cases, authors report several estimates from different model specifications. We here only report estimates from models with adjustments for confounders but not adjustment for potential mediators. [↑](#footnote-ref-1)
2. Lindo (2011) reports effect estimates on the log scale, and finds in the specification most similar to ours that paternal job loss leads to a 4.7% reduction in average birth weights. Since the overall mean birth weight in the sample is around 3,400 grams, this would imply an effect of around -160 grams. [↑](#footnote-ref-2)