

Online Supplement

Online Appendix A: Tables and Figures

Table A1: Descriptive Statistics

| | Min | Max | Mean | Std. Dev. |
|---|------|--------|--------|-----------|
| <i>Tenure (days)</i> | 0 | 18,090 | 654 | 1,494 |
| <i>Turnover</i> | 0 | 1 | 0.03 | 0.16 |
| <i>Weekly Hours</i> | 0 | 99.75 | 23.32 | 11.09 |
| <i>Weekly Hours²^a</i> | 0 | 9,950 | 666.90 | 538.01 |
| <i>Overtime Hours^b</i> | 0 | 59.75 | 0.84 | 2.01 |
| <i>Coworker Variability</i> | 0 | 0.996 | 0.63 | 0.12 |
| <i>Inflation</i> | 0.30 | 2.90 | 1.78 | 0.50 |
| <i>Patient to CNA Ratio</i> | 0.66 | 117.00 | 10.17 | 3.88 |
| <i>% Beds Occupied</i> | 6.85 | 100 | 84.99 | 13.14 |
| <i>% 4 Hour Moves</i> | 0 | 98.90 | 35.36 | 26.87 |
| <i>% Full-Time Turnover</i> | 0 | 66.67 | 0.34 | 5.42 |
| <i>% Hours Full-Time</i> | 0 | 94.96 | 39.15 | 14.84 |
| <i>% Hours Per Diem</i> | 0 | 65.83 | 6.34 | 6.35 |
| <i>% Part-Time Turnover</i> | 0 | 78.12 | 2.61 | 4.99 |
| <i>% Unemployment</i> | 1.50 | 13.90 | 4.15 | 1.56 |
| <i>Revenue (millions)</i> | 0.32 | 10.64 | 3.87 | 1.69 |
| <i>SD Weekly Hours</i> | 0 | 52.75 | 9.02 | 4.42 |
| <i>SD Overtime Hours^b</i> | 0 | 47.08 | 1.40 | 2.26 |

For clarity, all stats are presented in their untransformed versions.

Variables are presented at the CNA-week level, which is our unit of analysis.

Inflation is at the facility-month level, and revenue is at the facility-year level.

Analyzed values are mean-centered then standardized.

^a *Weekly Hours²* is first mean-centered then squared.

^b Variable only used in post-hoc analysis.

Table A2: Correlation Matrix

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| (1) <i>Tenure</i> | 1 | | | | | | | | | |
| (2) <i>Turnover/week</i> | -0.04* | 1 | | | | | | | | |
| (3) <i>Weekly Hours</i> | 0.00 | -0.02* | 1 | | | | | | | |
| (4) <i>Overtime Hours</i> | -0.04* | -0.01* | 0.56* | 1 | | | | | | |
| (5) <i>Co-Worker Variability</i> | -0.01* | -0.03* | 0.17* | 0.13* | 1 | | | | | |
| (6) <i>Inflation</i> | 0.01* | 0.00 | 0.01* | 0.00 | 0.03* | 1 | | | | |
| (7) <i>Patient to CNA Ratio</i> | 0.03* | 0.00 | 0.06* | 0.04* | 0.28* | 0.00 | 1 | | | |
| (8) <i>% Beds Occupied</i> | 0.03* | -0.01* | -0.05* | 0.00 | 0.05* | -0.01* | 0.08* | 1 | | |
| (9) <i>% 4 Hour Moves</i> | 0.07* | 0.00* | 0.13* | 0.13* | 0.16* | 0.00 | 0.28* | -0.01* | 1 | |
| (10) <i>% Full-Time Turnover</i> | 0.06* | 0.00 | -0.02* | -0.01* | 0.19* | 0.00 | 0.04* | 0.01* | -0.02* | 1 |
| (11) <i>% Hours Full-Time</i> | 0.05* | 0.01* | 0.05* | 0.00 | -0.21* | 0.02* | -0.22* | 0.01* | 0.03* | -0.04* |
| (12) <i>% Hours Per Diem</i> | -0.06* | 0.00 | -0.11* | -0.04* | 0.10* | -0.02* | -0.05* | 0.20* | -0.15* | 0.04* |
| (13) <i>% Part-Time Turnover</i> | 0.17* | -0.01* | -0.03* | 0.00* | 0.37* | 0.05* | 0.04* | -0.03* | -0.08* | 0.37* |
| (14) <i>% Unemployment</i> | -0.03* | 0.00 | 0.07* | 0.04* | -0.05* | 0.08* | 0.01* | -0.08* | 0.03* | -0.09* |
| (15) <i>Revenue</i> | 0.00 | -0.01* | 0.02* | 0.03* | -0.01* | 0.04* | 0.00 | 0.04* | 0.01* | -0.01* |
| (16) <i>SD Weekly Hours</i> | -0.07* | 0.00 | 0.19* | 0.35* | 0.41* | 0.03* | 0.08* | 0.01* | 0.10* | 0.10* |
| (17) <i>Overtime Hours</i> | -0.04* | -0.01* | 0.56* | 0.60* | 0.13* | 0.00 | 0.04* | 0.00 | 0.13* | -0.01* |
| (18) <i>SD Overtime Hours</i> | -0.06* | -0.01* | 0.58* | 0.82* | 0.21* | -0.05* | 0.06* | 0.00 | 0.12* | 0.03* |

| | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
|---|--------|--------|--------|--------|-------|-------|-------|------|
| (11) <i>% Hours Full-Time</i> | 1 | | | | | | | |
| (12) <i>% Hours Per Diem</i> | -0.22* | 1 | | | | | | |
| (13) <i>% Part-Time Turnover</i> | 0.02* | 0.00 | 1 | | | | | |
| (14) <i>% Unemployment</i> | 0.05* | -0.13* | -0.01* | 1 | | | | |
| (15) <i>Revenue</i> | 0.00 | 0.00 | -0.02* | -0.02* | 1 | | | |
| (16) <i>SD Weekly Hours</i> | 0.01* | 0.00 | 0.26* | 0.00 | 0.00 | 1 | | |
| (17) <i>Overtime Hours^a</i> | 0.00 | -0.04* | 0.00 | 0.04* | 0.00 | 0.35* | 1 | |
| (18) <i>SD Overtime Hours^a</i> | 0.02* | -0.04* | 0.10* | 0.04* | 0.01* | 0.55* | 0.82* | 1 |

Correlations are based on the mean-centered and standardized values used in the analysis.

^a Variable only used in post-hoc analysis. * p<0.05.

Table A3: Coworker Variability Measure Comparisons

| Variable (1) | Citation (2) | Context (3) | Level of aggregation (4) | Level of outcome (5) | Type of overlap (6) |
|------------------------------------|---------------------------|-------------------------------|-----------------------------|-------------------------|------------------------|
| <i>Team Familiarity</i> | Reagans et al. 2005 | Surgeries | Team | Team | Event |
| <i>Team Familiarity</i> | Huckman & Staats 2011 | Software development projects | Team | Team | Event |
| <i>Team Familiarity Dispersion</i> | Avgerinos & Gokpinar 2017 | Surgeries | Team | Team | Event |
| <i>Prior Partner Exposure</i> | Aksin et al 2021 | Ambulance runs | Individual | Team | Event |
| <i>Coworker Variability</i> | This paper | Nursing home shifts | Individual | Individual | Hours |

Table A4: Cox Model Hazard of a Turnover: Moving Averages

| | 4-week | 4-week with Interaction | 12-week | 12-week with Interaction | Full period | Full period with Interaction |
|--|--------------------|----------------------------|--------------------|--------------------------------|-------------------|------------------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Inflation</i> | 0.01 (0.03) | 0.01 (0.03) | -0.00 (0.02) | -0.00 (0.02) | -0.01 (0.04) | -0.01 (0.03) |
| <i>Patient to CNA Ratio</i> | -0.02 (0.02) | -0.04* (0.02) | -0.07** (0.02) | -0.08*** (0.02) | -0.05** (0.02) | -0.07** (0.02) |
| <i>% Beds Occupied</i> | 0.07 (0.05) | 0.06 (0.05) | 0.07 (0.05) | 0.07 (0.05) | 0.09 (0.05) | 0.08 (0.05) |
| <i>% 4 Hour Moves</i> | 0.06** (0.02) | 0.06** (0.02) | 0.05* (0.02) | 0.05* (0.02) | -0.00 (0.02) | 0.00 (0.02) |
| <i>% Full-Time Turnover</i> | 0.01 (0.01) | 0.01 (0.01) | -0.01 (0.02) | -0.01 (0.02) | -0.01 (0.02) | -0.00 (0.02) |
| <i>% Hours Full-Time</i> | 0.04 (0.03) | 0.05+ (0.03) | 0.05+ (0.03) | 0.05+ (0.03) | 0.06* (0.03) | 0.06** (0.02) |
| <i>% Hours Per Diem</i> | 0.03 (0.02) | 0.02 (0.02) | 0.00 (0.02) | -0.00 (0.02) | -0.04 (0.03) | -0.04 (0.03) |
| <i>% Part-Time Turnover</i> | 0.06*** (0.01) | 0.06*** (0.01) | 0.08** (0.03) | 0.08*** (0.02) | 0.01 (0.03) | -0.00 (0.03) |
| <i>% Unemployment</i> | -0.02 (0.06) | -0.01 (0.06) | 0.00 (0.05) | 0.00 (0.05) | 0.01 (0.06) | 0.01 (0.05) |
| <i>Revenue</i> | 0.00 (0.14) | 0.00 (0.14) | -0.01 (0.09) | -0.01 (0.09) | -0.02 (0.08) | -0.01 (0.07) |
| <i>SD Weekly Hours</i> | 0.37*** (0.02) | 0.38*** (0.02) | 0.32*** (0.03) | 0.33*** (0.03) | 0.17*** (0.03) | 0.18*** (0.03) |
| <i>Weekly Hours</i> | -0.42*** (0.03) | -0.43*** (0.03) | -0.19*** (0.03) | -0.18*** (0.03) | -0.13** (0.03) | -0.12*** (0.03) |
| <i>Weekly Hours²</i> | 0.15** (0.05) | 0.08 (0.05) | 0.12*** (0.03) | 0.12*** (0.03) | 0.10*** (0.02) | 0.09*** (0.03) |
| <i>Coworker Variability</i> | 0.09*** (0.03) | 0.18*** (0.04) | 0.19*** (0.04) | 0.23*** (0.04) | 0.29*** (0.04) | 0.36*** (0.05) |
| <i>Coworker Variability x Weekly Hours</i> | | 0.07*** (0.02) | | 0.10*** (0.02) | | 0.11*** (0.02) |
| <i>Coworker Variability x Weekly Hours²</i> | | 0.02* (0.01) | | 0.03** (0.01) | | 0.03** (0.01) |
| Observations | 190,257 | 190,257 | 182,945 | 182,945 | 195,225 | 195,225 |
| chi2 | 1.69e6 | 1.82e6 | 7.51e6 | 1.98e7 | 1.53e7 | 1.61e7 |

Standard errors in parentheses. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

26 month, 6,221 CNA and 4 facility fixed effects included, not shown in all models

Table A5: Cox Hazard of a Turnover: Coworker Variability Quartiles

| | First Quartile (1) | Second Quartile (2) | Third Quartile (3) | Fourth Quartile (4) |
|---------------------------------|--------------------------|---------------------------|--------------------------|---------------------------|
| <i>Inflation</i> | -0.05 (0.04) | -0.03 (0.04) | -0.01 (0.04) | 0.01 (0.04) |
| <i>Patient to CNA Ratio</i> | -0.17*** (0.05) | -0.11* (0.05) | -0.01 (0.04) | 0.09* (0.04) |
| <i>% Beds Occupied</i> | 0.12* (0.06) | 0.16** (0.07) | 0.23** (0.10) | 0.28** (0.12) |
| <i>% 4 Hour Moves</i> | 0.10** (0.04) | 0.08* (0.04) | 0.05 (0.04) | 0.02 (0.05) |
| <i>% Full-Time Turnover</i> | 0.01 (0.07) | 0.01 (0.07) | 0.02 (0.06) | 0.02 (0.06) |
| <i>% Hours Full-Time</i> | -0.01 (0.06) | 0.01 (0.07) | 0.01 (0.07) | 0.02 (0.08) |
| <i>% Hours Per Diem</i> | -0.04 (0.05) | -0.03 (0.05) | -0.03 (0.05) | -0.03 (0.06) |
| <i>% Part-Time Turnover</i> | 0.27*** (0.06) | 0.14** (0.05) | -0.12** (0.05) | -0.17** (0.06) |
| <i>% Unemployment</i> | 0.07 (0.10) | 0.07 (0.09) | 0.07 (0.10) | 0.06 (0.08) |
| <i>Revenue</i> | -0.02 (0.04) | -0.02 (0.04) | -0.01 (0.04) | 0.00 (0.04) |
| <i>SD Weekly Hours</i> | 0.46*** (0.04) | 0.43*** (0.05) | 0.32*** (0.04) | 0.23*** (0.06) |
| <i>Weekly Hours</i> | -0.31*** (0.05) | -0.25*** (0.05) | 0.22*** (0.05) | 0.28*** (0.06) |
| <i>Weekly Hours²</i> | 0.08* (0.04) | 0.10* (0.05) | 0.22*** (0.06) | 0.39*** (0.06) |
| Observations | 46,981 | 46,981 | 46,981 | 46,981 |
| chi2 | 4.33e6 | 7.84e6 | 7.96e6 | 6.54e6 |

Standard errors in parentheses. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

226 month, 6,221 CNA and 4 facility fixed effects included, not shown in all models

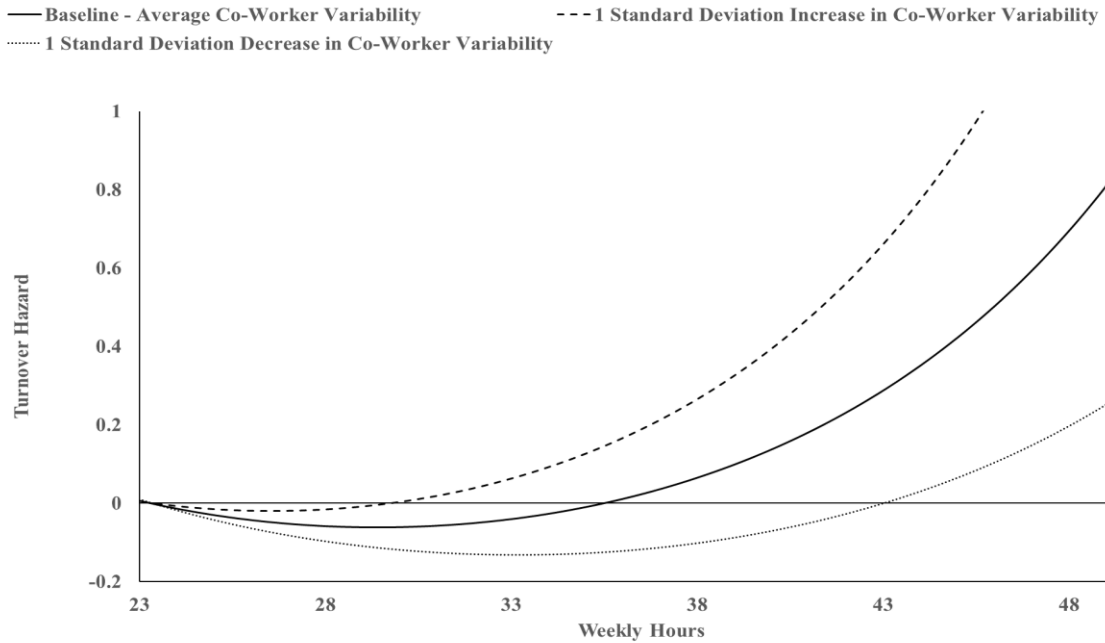
Table A6: Cox Model Hazard of a Turnover: Overtime-Related Variables

| | (1) | (2) | (3) | (4) |
|--|-------------------|--------------------|--------------------|--------------------|
| <i>Inflation</i> | -0.02 (0.05) | -0.01 (0.04) | -0.01 (0.04) | -0.01 (0.04) |
| <i>Patient to CNA Ratio</i> | -0.04 (0.03) | -0.05** (0.02) | -0.05* (0.02) | -0.08** (0.02) |
| <i>% Beds Occupied</i> | 0.11* (0.05) | 0.09 (0.06) | 0.08 (0.06) | 0.10+ (0.06) |
| <i>% 4 Hour Moves</i> | 0.04* (0.02) | 0.04 (0.03) | -0.00 (0.02) | 0.01 (0.02) |
| <i>% Full-Time Turnover</i> | -0.00 (0.02) | -0.00 (0.02) | -0.01 (0.02) | -0.01 (0.02) |
| <i>% Hours Full-Time</i> | 0.05 (0.03) | 0.06* (0.03) | 0.05* (0.03) | 0.06* (0.03) |
| <i>% Hours Per Diem</i> | -0.02 (0.02) | -0.03 (0.03) | -0.04 (0.03) | -0.04 (0.03) |
| <i>% Part-Time Turnover</i> | 0.08** (0.03) | 0.09*** (0.03) | 0.01 (0.03) | 0.00 (0.03) |
| <i>% Unemployment</i> | -0.00 (0.06) | 0.01 (0.06) | 0.01 (0.06) | 0.01 (0.05) |
| <i>Revenue</i> | 0.00 (0.08) | -0.01 (0.10) | 0.00 (0.10) | 0.00 (0.10) |
| <i>SD Weekly Hours</i> | 0.32*** (0.04) | 0.33*** (0.03) | 0.34*** (0.03) | 0.35*** (0.03) |
| <i>SD Overtime Hours</i> | 0.10+ (0.05) | 0.11* (0.05) | 0.11* (0.05) | 0.10+ (0.05) |
| <i>Weekly Hours</i> | | -0.19*** (0.03) | -0.20*** (0.03) | -0.23*** (0.03) |
| <i>Weekly Hours²</i> | | 0.20*** (0.03) | 0.19*** (0.03) | 0.21*** (0.03) |
| <i>Overtime Hours</i> | | -0.12* (0.06) | -0.14* (0.07) | -0.13+ (0.07) |
| <i>Coworker Variability</i> | | | 0.29*** (0.04) | 0.28*** (0.03) |
| <i>Coworker Variability x Weekly Hours</i> | | | | 0.09*** (0.02) |
| <i>Coworker Variability x Weekly Hours²</i> | | | | 0.03** (0.01) |
| <i>Coworker Variability x Overtime Hours</i> | | | | 0.02 (0.05) |
| Observations | 187,925 | 187,925 | 187,925 | 187,925 |
| chi2 | 6.67e6 | 1.82e7 | 1.45e7 | 1.61e7 |

Standard errors in parentheses. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

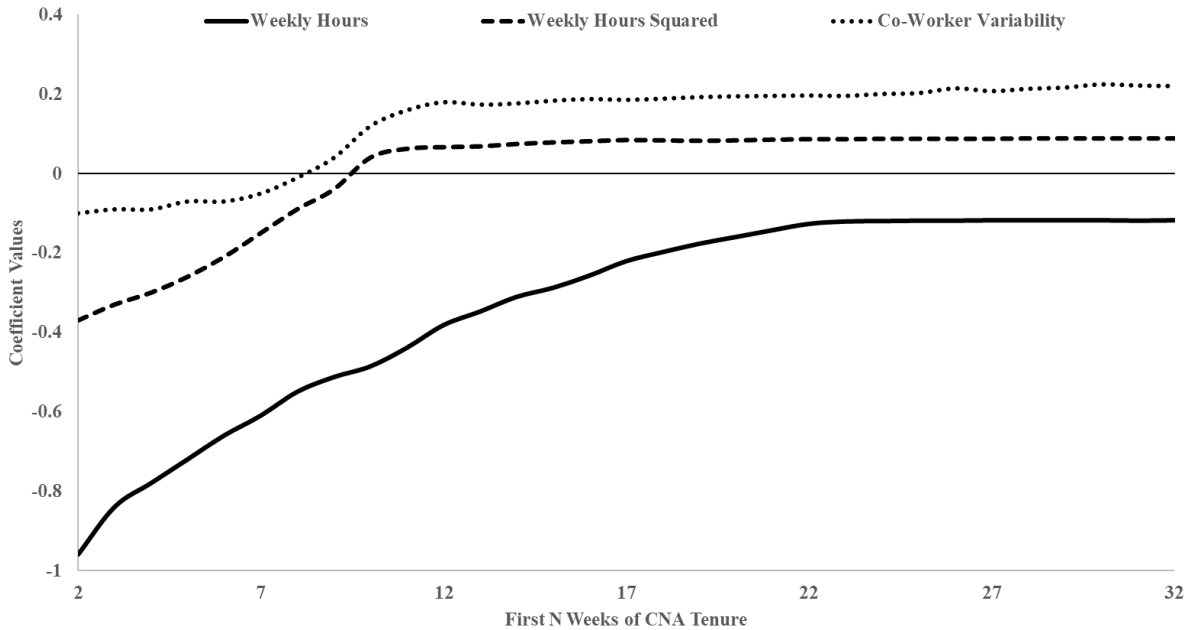
26 month, 6,221 CNA and 4 facility fixed effects included, not shown in all models

Figure A1: Turnover Hazard By Weekly Hours



Notes for Figure A1: The turnover at each value of *Weekly Hours* between 23 and 50 hours. The horizontal line represents the reference hazard when working 23.32 hours per week, our sample average. Hazard values above that line represent increased turnover, while those below the line represent decreased turnover.

Figure A2: Early Tenure Subsample Coefficients



Notes for Figure A2: *Weekly Hours* is significant in all subsamples. *Weekly Hours*² is significant at $p < 0.05$ for all subsamples except for the 8-, 10- and 12-week subsamples. *Co-Worker Variability* is significant at $p < 0.05$ for all subsamples from week 14 on, and not significant for all subsamples prior to week 10.

Appendix Table A7: Turnover Hazard by Weekly Hours

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|-------|-------|
| <i>Weekly Hours</i> | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| Turnover Hazard | 1.41 | 1.31 | 1.22 | 1.13 | 1.04 | 0.95 | 0.87 | 0.79 | 0.72 | 0.65 | 0.58 | 0.51 | 0.45 | 0.40 | 0.34 | 0.29 | 0.24 | 0.20 | 0.16 | 0.12 | 0.09 | 0.06 | 0.03 | 0.01 | -0.01 | -0.03 |
| <i>Weekly Hours</i> | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| Turnover Hazard | -0.04 | -0.05 | -0.06 | -0.06 | -0.06 | -0.06 | -0.05 | -0.04 | -0.03 | -0.01 | 0.01 | 0.04 | 0.06 | 0.09 | 0.13 | 0.17 | 0.21 | 0.25 | 0.30 | 0.35 | 0.41 | 0.47 | 0.53 | 0.59 | 0.66 | 0.73 |
| <i>Weekly Hours</i> | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 |
| Turnover Hazard | 0.81 | 0.89 | 0.97 | 1.06 | 1.15 | 1.24 | 1.33 | 1.43 | 1.54 | 1.64 | 1.75 | 1.87 | 1.98 | 2.10 | 2.23 | 2.35 | 2.48 | 2.62 | 2.75 | 2.89 | 3.04 | 3.18 | 3.33 | 3.49 | 3.65 | 3.81 |
| <i>Weekly Hours</i> | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 99.75 | | | |
| Turnover Hazard | 3.97 | 4.14 | 4.31 | 4.48 | 4.66 | 4.84 | 5.03 | 5.22 | 5.41 | 5.60 | 5.80 | 6.00 | 6.21 | 6.42 | 6.63 | 6.85 | 7.06 | 7.29 | 7.51 | 7.74 | 7.97 | 8.21 | 8.39 | | | |

Appendix Table A8: First N Week Subsample Analysis, Independent Variable Coefficients

| | | | | | | | | | |
|----------------------------------|----------|----------|----------|--------------------|----------|-------------------|----------|----------|----------|
| Week | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| <i>Weekly Hours</i> | -1.07*** | -0.76*** | -0.61*** | -0.49*** | -0.38*** | -0.33*** | -0.32*** | -0.31*** | -0.31*** |
| <i>Weekly Hours</i> ² | -0.37*** | -0.25*** | -0.13** | -0.06 ⁺ | 0.02 | 0.05 | 0.08* | 0.11** | 0.14*** |
| <i>Coworker Variability</i> | -0.13 | -0.11 | -0.04 | 0.02 | 0.06 | 0.09 ⁺ | 0.12* | 0.14** | 0.16** |

⁺ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Facility, year and CNA fixed effects included for all models.

Control variables included for all models.

Online Appendix B: Co-Worker Variability

In this appendix we provide a hypothetical panel of shifts for our focal CNA (Alice) as well as the number of hours that overlapped with three other CNAs (Bob, Claire and Dave). We then calculate *Coworker Variability* showing the outcome of various steps throughout the process to get to the final measure.

Table B1: Coworker Variability component calculations

| Shift (k) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Shift Duration in hours, d_k | | | | | | | | | | |
| Alice | 6 | 4 | 8 | 6 | 8 | 4 | 4 | 6 | 8 | 10 |
| Cumulative Hours Through the Current Shift in hours, D_k | | | | | | | | | | |
| Alice | 6 | 10 | 18 | 24 | 32 | 36 | 40 | 46 | 54 | 64 |
| Shift Overlap (Between Other CNAs and Alice, In Hours), o_{jk} | | | | | | | | | | |
| Bob | 3 | 4 | 0 | 2 | 4 | 0 | 0 | 6 | 2 | 6 |
| Claire | 6 | 2 | 8 | 6 | 0 | 4 | 4 | 0 | 4 | 0 |
| Dave | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 4 | 6 | 2 |
| Cumulative Overlap Through the Current Shift, P_{jk} | | | | | | | | | | |
| Bob | 3 | 7 | 7 | 9 | 13 | 13 | 13 | 19 | 21 | 27 |
| Claire | 6 | 8 | 16 | 22 | 22 | 26 | 30 | 30 | 34 | 34 |
| Dave | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 10 | 16 | 18 |
| Proportion of Non-Overlap in Previous Shifts $\left(\frac{D_{k-1}-P_{j,k-1}}{D_{k-1}}\right)$ | | | | | | | | | | |
| Bob | undefined | 0.500 | 0.300 | 0.611 | 0.625 | 0.594 | 0.639 | 0.675 | 0.587 | 0.611 |
| Claire | undefined | 0.000 | 0.200 | 0.111 | 0.083 | 0.313 | 0.278 | 0.250 | 0.348 | 0.370 |
| Dave | undefined | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.944 | 0.850 | 0.787 | 0.704 |
| Weighted Average of Non-Overlap (\tilde{c}_k), where \tilde{c}_0 is defined as 0 | | | | | | | | | | |
| Alice | 0 | 0.333 | 0.200 | 0.236 | 0.625 | 0.542 | 0.611 | 0.745 | 0.605 | 0.634 |
| Coworker Variability (C), calculated only including shifts up to the current shift | | | | | | | | | | |
| Alice | 0 | 0.133 | 0.163 | 0.181 | 0.292 | 0.320 | 0.349 | 0.401 | 0.431 | 0.463 |

Example calculations:

During Alice's 4th shift, the proportion of non-overlap through the 3rd shift with Claire is: $\frac{18-16}{18} = 0.111$. Bob and Dave have $\frac{18-7}{18} = 0.611$ and $\frac{18-0}{18} = 1$, respectively. During Alice's 4th shift her overlap with Bob is 2 hours, with Claire is 6 hours and with Dave is 0 hours. The sum product of the current overlap with the non-overlap through the prior shift is therefore $2 * 0.611 + 6 * 0.111 + 0 * 1 = 1.888$. This value is divided by the total overlap in the 4th shift (2 hours + 6 hours + 0 hours = 8 hours) to get \tilde{c}_4 , which is 0.236. Finally, *Coworker Variability* is then calculated as the \tilde{c}_k for each shift times each shift's duration, and that value is then divided by the total shift duration. That is $C = (0 * 6 + 0.333 * 4 + 0.200 * 8 + 0.236 * 6) / (6 + 4 + 8 + 6) = 0.181$ up through the 4th shift.