

Online Appendix for: Business Formation: A Tale of Two Recessions

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APPENDIX

Applications and Transitions Data: The data for all business application series (BA, HBA, WBA) are obtained from the public domain Business Formation Statistics (BFS). The BFS publishes quarterly data on business applications, as well as realized (BF4Q) and projected (PBF4Q) transitions. Starting soon after the onset of the COVID-19 Recession, the BFS began releasing weekly data on business applications at the national, regional, and state level. In our analysis, we use the public domain weekly BFS business application data. Since actual and projected transitions are only available at a quarterly frequency in the public domain BFS, the actual and projected transitions and transition rates reported in this paper are based on the integration of the BFS and Longitudinal Business Database (LBD) micro data, as described in the main text. In addition, we used the newly redesigned LBD in this process which enabled us to project transitions for 2019 and 2020 based on actual transitions through 2018.

Projecting Transitions: The empirical model used to predict transitions is described in detail in Bayard et al. (2018). Briefly, the projections are based on a linear probability model (LPM), which relates observed transitions of business applications to employer businesses in the LBD to a rich set of predictors from the EIN application form. The variables include indicators of the business start date, type of entity, industry, limited liability status, reason for applying, and wage date. The model also controls for location (state), week of application submission within the year, presence of prior EIN, and whether the application indicates a trade name, an executor’s name, or a distinct business address. The covariates of the empirical model also include a rich set of interactions between industry, wage date, type of entity, and reason for applying. Figure 6 of Bayard et al. (2018) shows that projected transitions track actual transitions closely, both within and out of sample.

Crisis and Reference Periods: For the reference period (or normal time benchmark) for the Great Recession, we use 2006 to avoid any overlap between the crisis and reference periods between weeks 0 and 52. For the COVID-19 Recession, at the time the projection model was estimated, BFS data were available through the week ending October 3, 2020 (which is 30 weeks after the start of the crisis period). Since the BFS currently releases new data weekly, in the main text and appendix figures we use applications through the week ending December 19, 2020 in our analysis. The estimates in the figures for 40 weeks after the crisis period reflect the two week period that ends December 19, 2020.

Growth Rate Calculation: For the analysis, we compute growth rates for cumulative applications and transitions using the DHS (Davis, Haltiwanger and Schuh (1996)) growth rate, defined as $(X_{cw} - X_{rw}) / (0.5 * (X_{cw} + X_{rw}))$ for variable X , where r is the

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reference period, c is the crisis period and w is the week through which X has been calculated. The DHS growth rate is a second order approximation of the log first difference and accommodates zeroes.

Weighting: In the main text, we report application-weighted (or transition-weighted) regression results, where the weights are the relevant state-level DHS denominator. In unreported results, we estimated both population-weighted and unweighted regressions. These regressions yield results very similar to those reported in the main text.

Startup and Non-employer Statistics: The discussion in the main text of the decline in actual new employer startups draws from the [Business Dynamic Statistics](#). Further analysis of the decline in employer startups during the Great Recession can be found in [Decker et al. \(2014\)](#) and [Davis and Haltiwanger \(2019\)](#). The discussion in the main text on the importance of non-employers draws from [Davis et al. \(2009\)](#) and the [2018 Non-employer Statistics](#). [Davis et al. \(2009\)](#) find that more than ten percent of EIN non-employers ultimately transition to employer businesses. Most of these transitions occur at least one year after the non-employer business started. Consequently, such transitions are not included in the application transition rates discussed in the main text.

Additional Figures: Figures A1-A3 are analogous to Figures 1-3, but without normalizing the week 0 difference to zero.¹ Figure A4 depicts the growth rate of cumulative high-propensity business applications (HBA) and non high-propensity business applications (non-HBA) in the crisis relative to the reference period, without normalizing week 0 to zero. As discussed in [Bayard et al. \(2018\)](#), non-HBA have a very low probability of transiting to employer businesses in the next 4 quarters (less than 3%), while HBA have a 27% transition rate. HBA are those applications that have either (i) planned wages, (ii) are an application for a corporation, or (iii) are in small number of industries that have notably higher transition rates. These characteristics are among those used in the much richer LPM model to project transitions of applications to employer businesses. HBA are intended as a transparent way to classify applications on core characteristics.

Figure A1 shows that there is a much larger gap at week 0 between applications and transitions in the Great Recession (Figure A1a) compared to the COVID-19 Recession (Figure A1b). Indeed, in the Great Recession, the gap is large and negative, while in the COVID-19 Recession the gap is smaller and positive. For the Great Recession, this means that the growth rate in applications from reference week 0 to crisis week 0 is close to zero, while the analogous growth rate for transitions is very negative. This large negative gap, observed during the Great Recession, is consistent with the large negative decline in the transition rate in Figure A2a in week 0. Importantly, these patterns indicate that the transition rate declined before the Lehman collapse (between 2006 and 2008). Consequently, our inference of the decline in transitions during the Great Recession being mostly due to the decline in applications refers specifically to the post-Lehman period. To help understand the pre-Lehman decline in the transition rate, a few additional findings are relevant. First, from the BFS, the composition of applications changed significantly in 2007 even before the beginning of the recession in December 2007. In January 2007, the share of applications that are HBA is 62% and WBA is 38%. In November 2007, these shares are 51% and 25% respectively. These compositional changes imply a significant decline in the transition rate pre Great Recession which is consistent with the patterns in Figure 6 of [Bayard et al. \(2018\)](#). The latter shows both actual and projected transitions declined substantially in 2007 pre Great Recession. In the main text we intentionally abstract from these pre Great Recession changes in applications and transitions as this reflects lower frequency factors underlying the well-known negative trend in employer startups in the U.S.

¹In practice, we run the same regressions, but rather than reporting the coefficients and 95% confidence interval of the distance from week 0 dummies, we report the predictive margins and their 95% confidence interval evaluated at the distance from week 0 dummies.

that accelerated in the post-2000 period. As discussed in the main text, we abstract from these trend effects by focusing on deviations from week 0.

In contrast, in the COVID-19 Recession, the transition rate at week 0 in 2020 is slightly higher than in week 0 in 2019. There are not sizable pre-recession trend effects in 2019 compared to early 2020. Figure A3 shows similar patterns to Figure A1 for the WBA and non-WBA during both recessions. Importantly, during the COVID-19 Recession, both WBA and non-WBA show marked increases by week 40 in 2020, relative to 2019.

For the COVID-19 Recession, Figure A4 shows that cumulative HBA are 17% higher by week 40 in 2020, relative to 2019. It is instructive to compare this increase of 17% in HBA to the 25% increase in overall applications in Figure A1. This difference is consistent with our finding that during the COVID-19 Recession, the transition rate has declined as the share of HBA in overall applications has declined. However, HBA are increasing substantially in 2020, relative to 2019, which implies that employer startups are likely to be higher in 2020 than in 2019. At the same time, as discussed in the main text, the increase in employer startups is likely to be smaller than suggested by the overall increase in business applications.

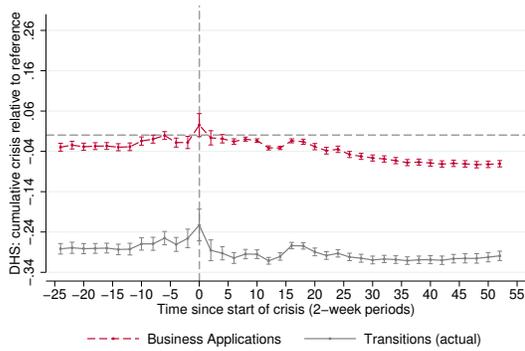


Figure A1a: Great Recession — Applications and Transitions (non-normalized)

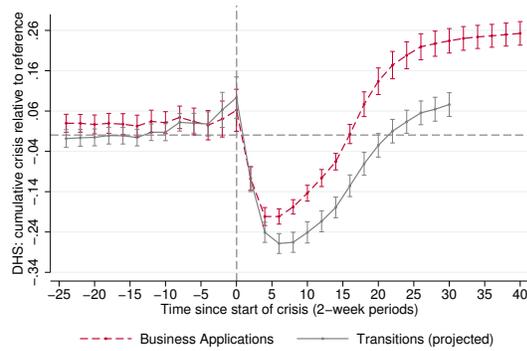


Figure A1b: COVID — Applications and Transitions (non-normalized)

FIGURE A1. BUSINESS APPLICATIONS AND TRANSITIONS (NON-NORMALIZED)

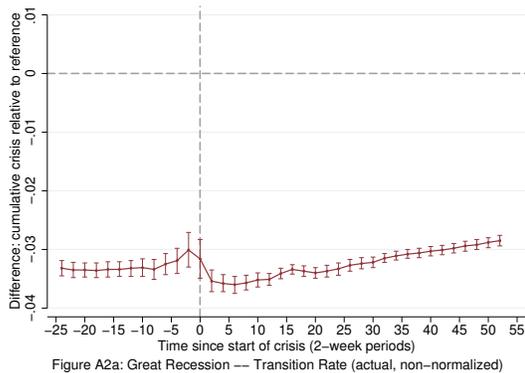


Figure A2a: Great Recession — Transition Rate (actual, non-normalized)

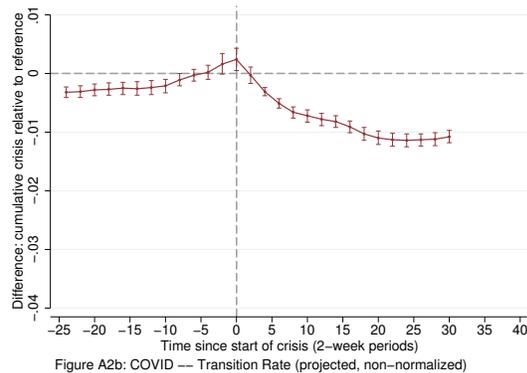


Figure A2b: COVID — Transition Rate (projected, non-normalized)

FIGURE A2. TRANSITION RATES (NON-NORMALIZED)

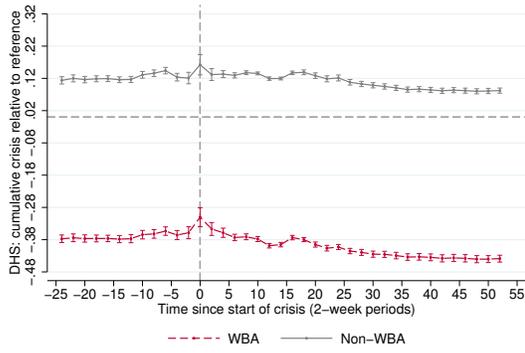


Figure 3a: Great Recession -- WBA vs. non-WBA (non-normalized)

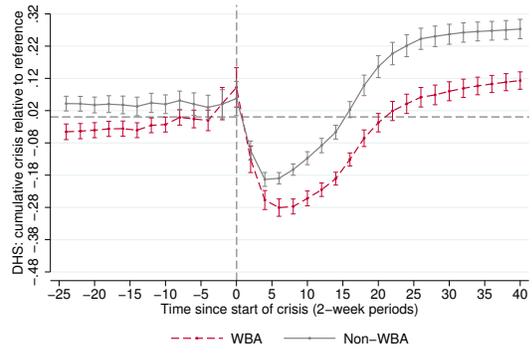


Figure 3b: COVID -- WBA vs. non-WBA (non-normalized)

FIGURE A3. WBA VERSUS NON-WBA (NON-NORMALIZED)

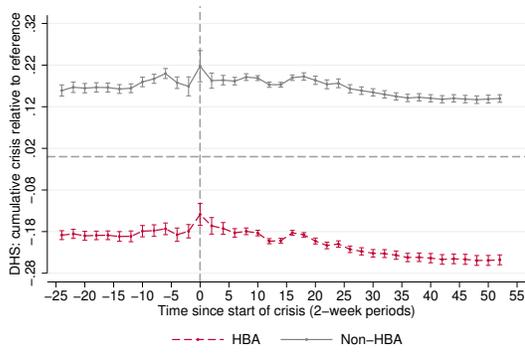


Figure A4a: Great Recession -- HBA vs. non-HBA (non-normalized)

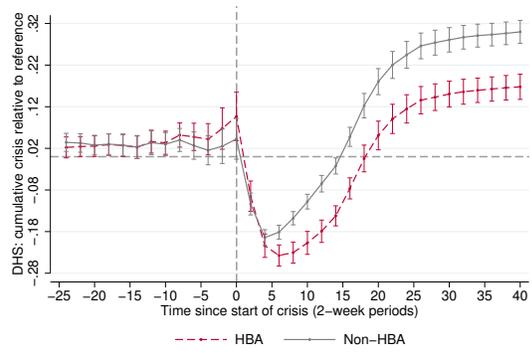


Figure A4b: COVID -- HBA vs. non-HBA (non-normalized)

FIGURE A4. HBA VERSUS NON-HBA (NON-NORMALIZED)

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