

Online Appendix for *Business Licensing Trajectories around Mixed-Use Housing Construction: Evidence from Chicago*

This Online Appendix provides supporting materials and technical details for “Business Licensing Trajectories around Mixed-Use Housing Construction: Evidence from Chicago.” Appendix Section [A1](#) describes how I identify mixed-use housing sites from permit records. Appendix Section [A2](#) describes the event-study estimator, local-area construction, and stock/flow outcome construction. Appendix Section [A3](#) describes the license-category classification and validation. Appendix Section [A4](#) reports additional category-specific event-study figures using alternative distance cutoffs. Appendix Section [A5](#) reports overlapping-buffer robustness checks.

A1 Identifying Mixed-Use Housing Sites

I identify mixed-use housing sites using City of Chicago building permit records (City of Chicago Data Portal, 2026). I begin with permit records containing valid addresses and coordinates, then filter to permits concerning sites with at least 3 residential units. I then classify a record as mixed-use only when its combined permit text fields (including work description, permit type, work type, and permit condition) contain both residential-related terms (for example, apartment, dwelling, residential, or multifamily terms) and commercial or mixed-use terms (for example, mixed-use, retail, commercial, office, restaurant, mercantile, storefront, or ground-floor commercial terms). Requiring residential-related terms alongside commercial terms is intended to screen out permits that mention nonresidential terms only incidentally (e.g., a leasing office in an apartment complex without other commercial units). I also restrict the sample to new construction, so renovations, conversions, and adaptive-reuse projects are flagged separately and excluded.

For each candidate site, I retain available permit identifiers, address, latitude and longitude,

reported residential units, construction type, permit type, and work description. When several permit records share a site—identified by parcel-identifier list, or by address when the parcel list is missing—I collapse them to a single site center and date the site by the earliest permit issue year among them, so that repeated filings at one project do not create duplicate sites. The resulting data set contains 523 mixed-use site records and 513 unique local site centers.

A measurement caveat concerns treatment timing. As explained in the main text, I date each site by its building permit issue year because data on certificate-of-occupancy dates are not consistently available across sites. Permit issuance typically precedes the start of construction, which in turn precedes completion and occupancy, and the length of these lags varies with project size, financing, and the approval process. Event time is therefore measured relative to authorization rather than building completion, so the event-year-zero coefficient bundles any anticipatory response by nearby businesses, activity during the construction period, and early occupancy for faster projects. For the same reason, I read the estimates as licensing trajectories around mixed-use permit years rather than as the effect of a building opening, and I do not interpret any single event year as the moment a building begins operating.

A2 Event-Study Estimator

I estimate the main event-study models using the robust difference-in-differences estimator proposed by Gardner et al. (2025). The unit of observation is a local area by year. I define a local area as a distance buffer around a unique mixed-use address-coordinate center. The main specification uses a 0.25-mile buffer around these centers. I also estimate results using 0.15- and 0.35-mile buffers.

Let Y_{at} denote a business-licensing outcome in local area a and year t . Let G_a denote the first mixed-use permit year observed within the relevant buffer. The event-study specification is:

$$Y_{at} = \alpha_a + \gamma_t + \sum_{\substack{k=-4 \\ k \neq -1}}^3 \beta_k \mathbf{1}\{t - G_a = k\} + u_{at}. \quad (\text{A.1})$$

The omitted event year is -1 . The first stage residualizes outcomes using local-area and year

fixed effects. The second stage estimates event-time coefficients for years -4 through 3 , using not-yet-treated observations for comparison. Standard errors are clustered at the local-area level. Because all local areas are centered on mixed-use sites, the comparison group consists of areas whose mixed-use permit years occur later in the sample window.

The event-study design is useful for tracking licensing trajectories around staggered mixed-use permit years. A causal interpretation would require treated local areas to have followed the same licensing trajectory as not-yet-treated areas after accounting for local-area and year fixed effects. I therefore report pre-treatment event-study coefficients and a pre-period diagnostic that tests joint equality of the displayed pre-period coefficients to zero. The main text focuses on the 0.25-mile estimates because this cutoff balances a narrow definition of nearby business activity with enough local licensing activity to support estimation.

Local-area buffers can overlap. When more than one mixed-use site falls within a local area's buffer, I assign the first mixed-use permit year in that buffer as G_a . This means nearby later sites can contribute to the same local-area treatment history, while business locations can be counted in more than one local-area panel when buffers overlap. Appendix Table A1 reports a robustness check that drops later-permitted mixed-use centers located within 0.25 miles of an earlier-permitted center.

For the stock/flow decomposition, I use business-location identifiers rather than raw license filing types. Active business locations are locations with at least one active license interval in a given year. Entries are locations observed in their first active panel year, excluding 2002 because those locations may have been active before the panel starts. Exits are locations observed in their last active panel year, excluding 2025 because those locations may remain active after the panel ends.

A3 License Categories and Validation

I classify licenses into four groups: food and drink, retail, entertainment and leisure, and local services. The classification uses regular-expression matches on license descriptions, business activity fields, license codes, and business activity identifiers. The categories are not mutually exclusive. A license record that matches more than one category can contribute to more than

one category-specific panel, and a business location with multiple active license records can appear in multiple category counts in a given year. The aggregate active-business-location outcome is constructed separately from all valid business-location identifiers and is not the sum of the category outcomes.

The category definitions are intended to capture broad neighborhood-serving commercial activity rather than mutually exclusive industry sectors. Food and drink includes restaurants, cafes, bakeries, groceries, catering, taverns, liquor, and related food or beverage terms, while excluding explicit non-food license descriptions. Retail includes retail, general merchandise, apparel, tobacco, resale, stores, and sale-of-goods terms. Entertainment and leisure includes amusement, entertainment, performance, theater, music, dance, nightclub, recreation, sports, and venue terms. Local services includes personal services, repair, offices, vehicle-related services, parking, fuel, laundry, child services, pharmacies, and related service terms. I do not separately identify chain establishments, home-based businesses, or professional offices beyond the information contained in the license records; the same valid-coordinate and active-interval rules apply throughout.

As a validation check for the food and drink category, I compare the classified food/drink license records with Chicago food-inspection records. This check finds 42,101 exact license-number matches and 10,396 normalized address matches between the two sources, with a median coordinate distance of zero miles among exact license-number matches.

A4 Additional Category Results

The main text reports category-specific event-study estimates using the preferred 0.25-mile cutoff. Figures [A1](#) and [A2](#) report analogous estimates using 0.15- and 0.35-mile cutoffs. These figures are intended to show whether the category-specific patterns are sensitive to the definition of nearby business activity.

A5 Overlap Robustness

Table [A1](#) reports estimates after dropping later-permitted mixed-use centers within 0.25 miles of an earlier-permitted center, which retains only the earliest-permitted center in each overlapping cluster and removes 301 of the 513 local areas. This check reduces overlapping treatment areas while preserving the local buffer interpretation used in the main analysis. All estimates remain positive: the aggregate active-location and business-location entry estimates are similar in magnitude to the main specification, whereas the retail and local-services category estimates attenuate substantially, indicating that part of the category-specific pattern reflects overlapping nearby sites.

References

City of Chicago Data Portal (2026). Building permits. <https://data.cityofchicago.org/>. Accessed May 26, 2026.

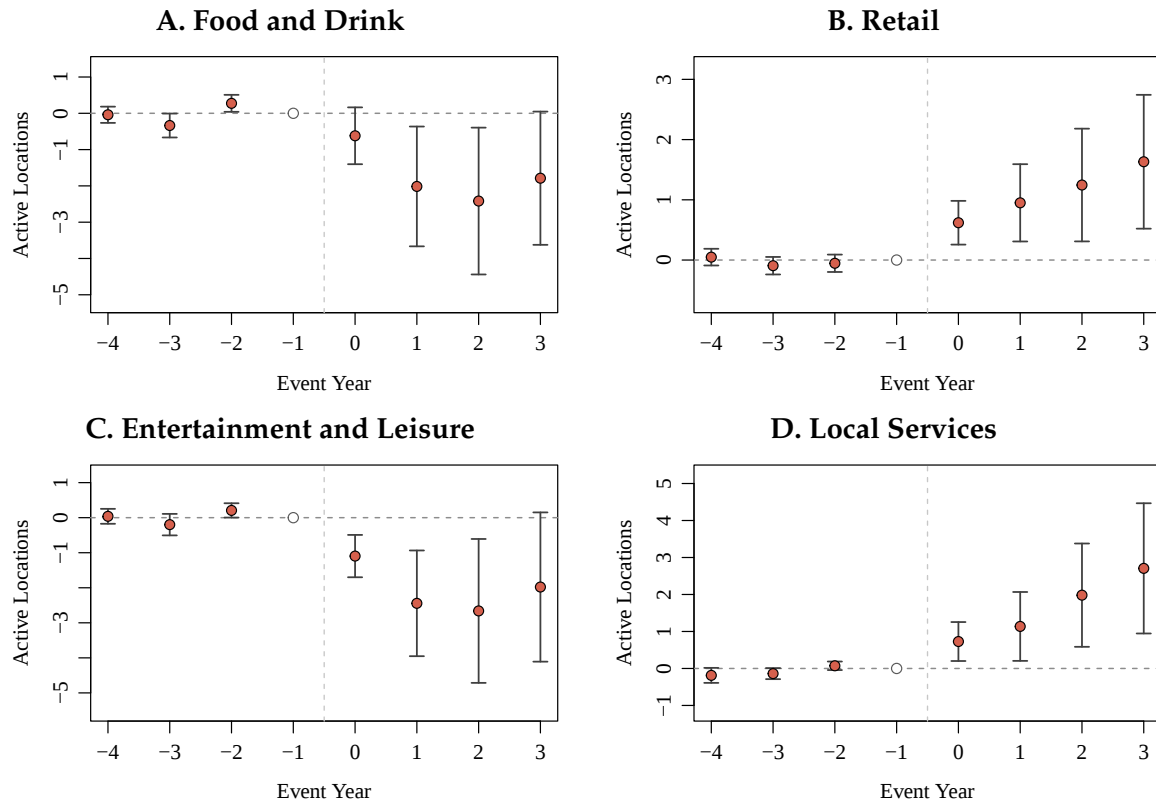
Gardner, J., Thakral, N., To, L. T., and Yap, L. (2025). Two-stage differences in differences. Working paper, University of Mississippi, Department of Economics.

Table A1: *Overlapping-Buffer Robustness, 0.25-Mile Cutoff*

Outcome	Main Estimate	Drop Later Overlapping Centers	Centers Dropped
Active business locations	6.72 (2.72)	7.59 (2.90)	301
Business-location entries	2.92 (1.37)	2.82 (1.39)	301
Business-location exits	0.09 (1.57)	1.89 (1.35)	301
Food and drink	4.46 (1.23)	3.97 (1.25)	301
Retail	4.93 (1.11)	2.75 (0.66)	301
Entertainment and leisure	1.00 (0.81)	1.02 (0.75)	301
Local services	3.96 (1.28)	0.81 (0.44)	301

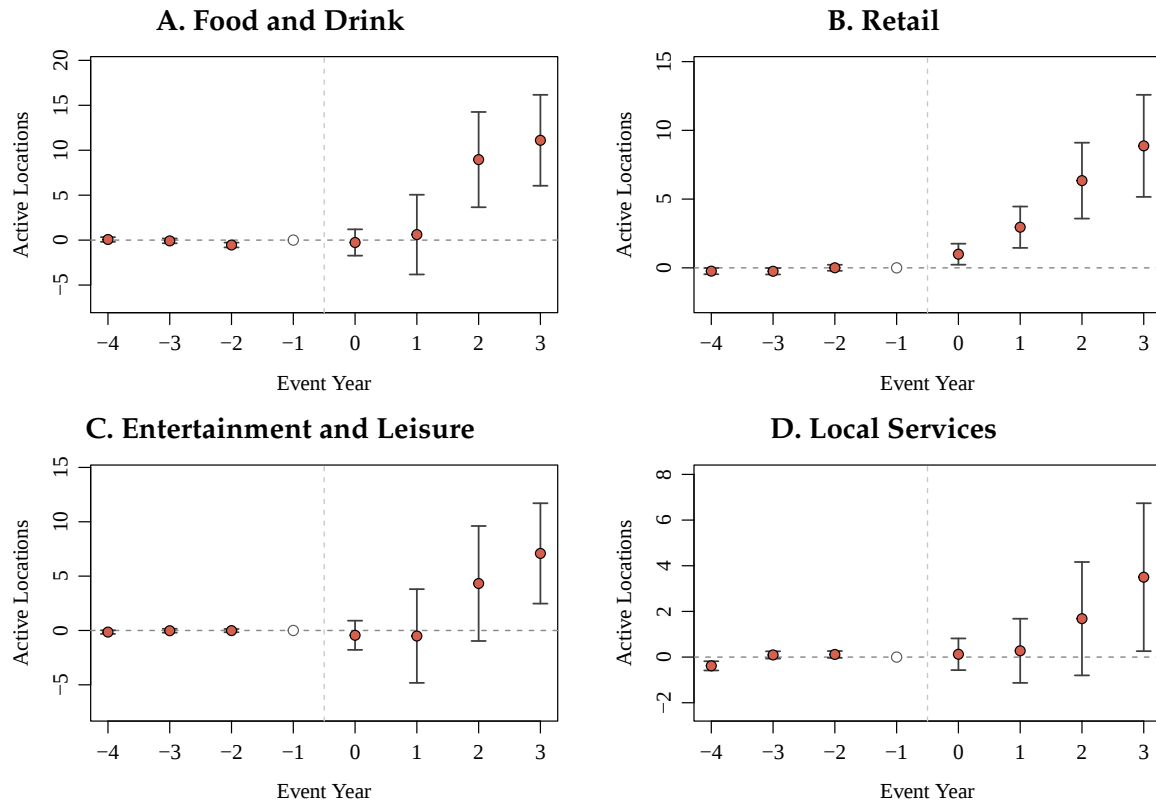
Notes: This table reports average post-permit estimates for event years 0 through 3 using the preferred 0.25-mile cutoff. The robustness column drops later-permitted mixed-use centers within 0.25 miles of an earlier-permitted center. Standard errors clustered at the local-area level are reported in parentheses.

Figure A1: *Mixed-Use Construction and Business Licensing by Category, 0.15-Mile Cutoff*



Notes: This figure reports event-study estimates for active licensed business locations by license category using a 0.15-mile cutoff. Event year -1 is omitted. Event time is measured relative to the mixed-use permit year. Standard errors are clustered at the local-area level with 95% confidence intervals around each point estimate.

Figure A2: *Mixed-Use Construction and Business Licensing by Category, 0.35-Mile Cutoff*



Notes: This figure reports event-study estimates for active licensed business locations by license category using a 0.35-mile cutoff. Event year -1 is omitted. Event time is measured relative to the mixed-use permit year. Standard errors are clustered at the local-area level with 95% confidence intervals around each point estimate.