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Using LODES Data to Localize Economic Development Investments

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The Goal

- Create a one-page summary for state legislators to highlight the impact of tax abatements in their district.
- Communicate the impact of abatements on workers in a local context.
- Iterate this methodology across 63 legislative districts in the state.

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The Challenge

- Tax abatements are awarded to businesses, with a localized presence at worksites which may not be distributed evenly across legislative districts.
- Unemployment Insurance wage records do not have the worksite where individuals are employed.
- Even with data localized by worksite, we want to show the impact on the workers who commute to a worksite to show the impact on even more residential legislative districts.

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Solution: Using the LODES data from LEHD

- We cannot track individuals from place of work to residence.
- LODES allows us to look at the broad movement of individuals to create estimates of impacts by residence using impacts by place of work.
- Using public records from tax abatement applications we can identify addresses of employers who received abatements.
- Using R, we iterate this process and apply it to every district.

R Code: Geocoding Addresses

```
# Get Employment data

abated <- read_excel("Abated Companies with Addresses.xlsx") %>%
  clean_names() %>%
  mutate(full_addr = paste(address_1,city,state,zip, sep = ", "))


# Use tidygeocoder
results2 <- geocode_combine(abated,
                            queries = list(
                              list(method = 'census'),
                              list(method = 'osm')
                            ),
                            global_params = list(address = "full_addr"),
                            cascade = TRUE)

fwrite(results2, "Abatement File.csv")
```

- We used *tidygeocoder* to iteratively check addresses using the Census and Open Street Map geodocers, followed by a manual review.

R Code: Accessing LODES Data

```
# Get LODES data
url <- "https://lehd.ces.census.gov/data/lodes/LODES8/nv/od/nv_od_main_JT00_2022.csv.gz"
xwalk_url <- "https://lehd.ces.census.gov/data/lodes/LODES8/nv/nv_xwalk.csv.gz"

# Read the .gz file directly into a data frame
data <- read_csv(gzcon(url(url)), col_types = cols(.default = "c"))
geo_xwalk <- read_csv(gzcon(url(xwalk_url)), col_types = cols(.default = "c"))

lodes_data <- data %>%
  mutate(across(starts_with("S"), as.numeric))

lodes_wsum <- lodes_data %>%
  group_by(w_geocode) %>%
  summarize(across(starts_with("S"),sum, .names="total_{.col}"))

lodes_shares <- lodes_data %>%
  left_join(lodes_wsum, by = "w_geocode") %>%
  select(w_geocode:S000,total_S000) %>%
  mutate(h_share = S000/total_S000) %>%
  left_join(geo_xwalk, by = c("h_geocode" = "tabblk2020"))
```

- We read in the LODES8 data file for Nevada and crosswalk and calculate shares of employment in places of residence based on the **w_geocode**, then join to the crosswalk.

Aside: the LODES crosswalk!

- When we started, I was prepared to make this process much more convoluted, using interpolations to spread data by tracts or other larger regions to state legislative districts.
- But it turned out, I didn't need to do any of that. The LODES crosswalk already has the legislative district boundaries I needed – once I had mapped a location's Census Block, the crosswalk gave me everything I needed.

R Code: Share of Employment from Work Block to District

```
work_to_ad <- lodes_shares %>%
  group_by(w_geocode, stsldlname) %>%
  summarize(S000 = sum(S000),
            total_S000 = max(total_S000),
            check_S000 = mean(total_S000)) %>%
  mutate(share = S000/total_S000)

work_to_sd <- lodes_shares %>%
  group_by(w_geocode, stslduname) %>%
  summarize(S000 = sum(S000),
            total_S000 = max(total_S000),
            check_S000 = mean(total_S000)) %>%
  mutate(share = S000/total_S000)
```

- We take the joined data and aggregate the destination shares to show the share of workers from a geocoded work location Census Block to each Assembly District (lower legislative house) and Senate District (upper legislative house).

R Code: Getting Census Shapefiles

```
nv_blocks <- blocks(state = "NV") %>%
  select(GEOID20)

lower_districts <- state_legislative_districts(state="NV", house="lower")
upper_districts <- state_legislative_districts(state="NV", house="upper")
```

- We use the *tigris* R package to pull three sets of shapefiles: Census blocks (to do point-in-polygon matches for worksites), Lower Legislative Districts and Upper Legislative Districts to create maps of the results.

R Code: Aggregate application and QCEW employment

```
abated_manual <- read_csv("Abated Companies with Addresses (Manual Coordinates v 2025.01.02).csv") %>%
  clean_names() %>%
  mutate(full_addr = paste(address_1,city,state,zip, sep = ", ")) %>%
  left_join(qcew_ein_summary, by = c("ein"="Ein", "run")) %>%
  mutate(aaw = totalwage/employment)

# Distribute Abated employment based on LODES data

abated_employ <- abated_manual %>%
  filter(!is.na(lat)) %>%
  st_as_sf(coords = c("long", "lat"), crs = 4326) %>%
  st_transform(df_sf, crs = st_crs(nv_blocks)) %>%
  st_join(nv_blocks, join = st_within)

abated_by_block <- abated_employ %>%
  st_drop_geometry() %>%
  group_by(GEOID20) %>%
  summarize(app_employment = sum(number_of_employees, na.rm = TRUE),
            bo_employment = sum(number_of_employees_buildout, na.rm = TRUE),
            qcew_employment = sum(employment, na.rm = TRUE),
            app_ahw = sum(number_of_employees*average_wage, na.rm = TRUE)/sum(number_of_employees, na.rm = TRUE),
            qcew_aaw = if_else(qcew_employment ==0, NA, sum(totalwage, na.rm = TRUE)/qcew_employment))
```

- We use the QCEW detail data to pull current employment and wages by employer ID, use latitude and longitude to identify Census Block, then aggregate employer data by Census Block.

R Code: Distribute work-based aggregates to residence

```
abated_AD_xwalk <- abated_by_block %>%
  left_join(work_to_ad %>% select(w_geocode, stsldlname, share), by = c("GEOID20" = "w_geocode")) %>%
  mutate(app_dist_work = app_employment*share,
         bo_dist_work = bo_employment*share,
         qcew_dist_work = qcew_employment*share
         ) %>%
  group_by(stsldlname) %>%
  summarize(tot_app_employment = sum(app_dist_work),
            tot_bo_employment = sum(bo_dist_work),
            tot_qcew_employment = sum(qcew_dist_work),
            app_ahw = sum(app_dist_work*app_ahw)/sum(app_dist_work),
            qcew_aaw = sum(qcew_dist_work*qcew_aaw, na.rm = TRUE)/sum(qcew_dist_work)) %>%
  mutate(tot_app_employment = round(tot_app_employment),
         tot_bo_employment = round(tot_bo_employment),
         tot_qcew_employment = round(tot_qcew_employment),
         app_ahw = round(app_ahw, digits = 2),
         qcew_aaw = round(qcew_aaw, digits = 0),
         NAMELSAD = str_remove_all(stsldlname, ", NV"),
         NAMELSAD = paste0("State ",NAMELSAD)) %>%
  filter(!is.na(tot_app_employment))
```

- With employment totals by Census Block, we use our work-to-district crosswalk to distribute estimated employment shares to the legislative districts by house.

R Code: Mapping and Reporting

```
ml_map <- maplibre(
  bounds = abated_map_lower
  )

ml_map %>%
  add_fill_layer(
    id = "ld_employment",
    source = abated_map_lower,
    fill_color = interpolate(
      column = "tot_qcew_employment",
      values = c(min(abated_map_lower$tot_qcew_employment),max(abated_map_lower$tot_qcew_employment)),
      stops = c("#eeeeee", "blue")
    ),
    fill_opacity = 0.8
  ) %>%
  add_legend(
    layer_id = "ld_employment",
    legend_title = "QCEW Employment",
    values = c(min(abated_map_lower$tot_qcew_employment),max(abated_map_lower$tot_qcew_employment)),
    colors = c("#eeeeee", "blue"),
    position = "bottom-left"
  ) %>%
```

- For the mapping, we use the *mapgl* package to create an interactive map, using various metrics to create shaded fill layers. This was then run in a QMD document to create a self-contained HTML file.

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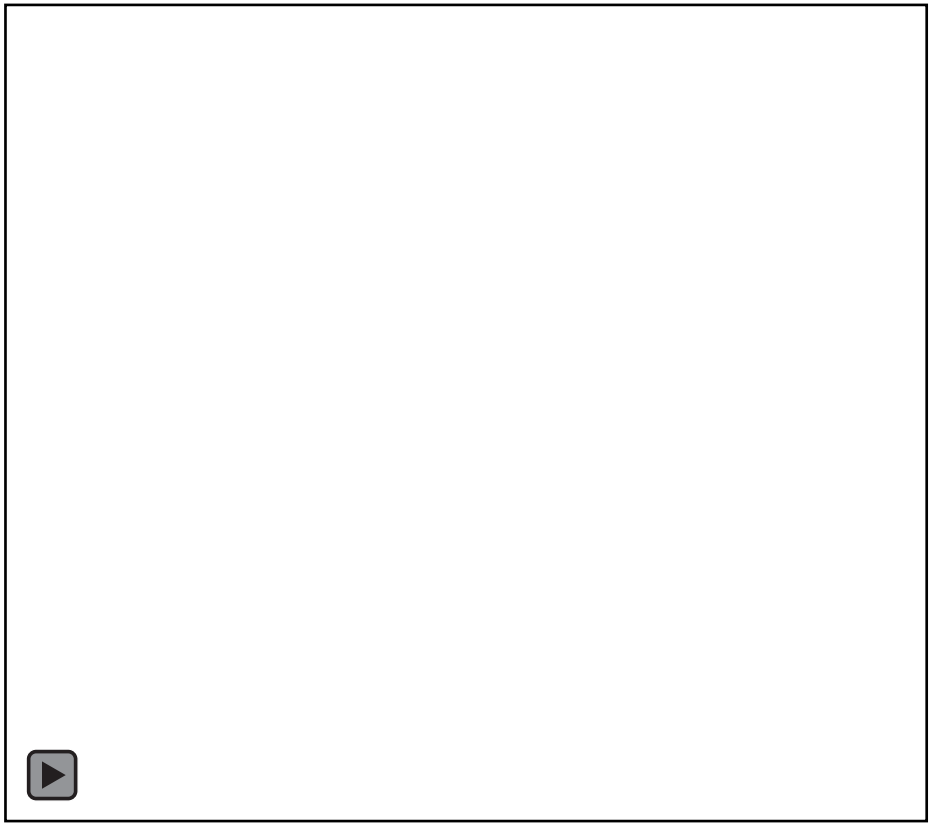
The Results!

- For mapping, we use the *mapgl* package to create an interactive map, using various metrics to create shaded fill layers. This was then run in a QMD document to create a self-contained HTML file.



https://nevadaworkforce.com/_docs/Other-Publications/Employment-at-Abated-Companies

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After-Action Review

- R made it easy to consume the native .gz compressed files hosted by the Census Bureau
- The LODES geography crosswalk greatly simplified the process of aggregating by residence – instead of an interpolation or spatial analysis, we simply aggregated by the provided data.
- Once the data was all calculated, providing either a district-by-district summary (for GOED), or a statewide overview (for our website) was simple data visualization.