BLS - QCEW - Example

Datasets

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Preamble

```
rm(list = ls())
pklist <- c("tidyverse", "choroplethr", "choroplethrMaps")
source("https://fgeerolf.github.io/datasets/load-packages.R")
options(tibble.print_max = 100)
```

List of Codes - Links

SIC-based (1975-2000)

Industry: https://data.bls.gov/cew/doc/titles/industry/sic_industry_titles.htm
Areas: https://data.bls.gov/cew/doc/titles/area/sic_area_titles.htm

Ownership: https://data.bls.gov/cew/doc/titles/ownership/sic_ownership_titles.htm
Size Classes: https://data.bls.gov/cew/doc/titles/size/sic_size_titles.htm
Aggregation: https://data.bls.gov/cew/doc/titles/agglevel/sic_agglevel_titles.htm

NAICS-based (1990-2018)

Industry: https://data.bls.gov/cew/doc/titles/industry/industry_titles.htm
Areas: https://data.bls.gov/cew/doc/titles/area/area_titles.htm
Ownership: https://data.bls.gov/cew/doc/titles/ownership/ownership_titles.htm
Size Classes: https://data.bls.gov/cew/doc/titles/size/size_titles.htm
Aggregation: https://data.bls.gov/cew/doc/titles/agglevel/agglevel_titles.htm

List of Codes - Files

SIC-based (1975-2000)

NAICS-based (1990-2018)

Aggregation

```
load("aggregation.RData")
aggregation %>%
  as.tibble
```

```
# # A tibble: 56 x 2
#    agglvl_code agglvl_title
#          <int> <fct>
#  1          10 National, Total Covered
#  2          11 National, Total -- by ownership sector
#  3          12 National, by Domain -- by ownership sector
#  4          13 National, by Supersector -- by ownership sector
#  5          14 National, NAICS Sector -- by ownership sector
#  6          15 National, NAICS 3-digit -- by ownership sector
#  7          16 National, NAICS 4-digit -- by ownership sector
#  8          17 National, NAICS 5-digit -- by ownership sector
#  9          18 National, NAICS 6-digit -- by ownership sector
# 10          21 National, Private, total, by establishment size class
# 11          22 National, Private, Domain, by establishment size class
# 12          23 National, Private, by Supersector, by establishment size c~
# 13          24 National, Private, NAICS Sector, by establishment size cla~
# 14          25 National, Private, NAICS 3-digit, by establishment size cl~
# 15          26 National, Private, NAICS 4-digit, by establishment size cl~
# 16          27 National, Private, NAICS 5-digit, by establishment size cl~
# 17          28 National, Private, NAICS 6-digit, by establishment size cl~
# 18          30 CMSA or CSA, Total Covered
# 19          40 MSA, Total Covered
# 20          41 MSA, Total -- by ownership sector
# 21          42 MSA, by Domain -- by ownership sector
# 22          43 MSA, by Supersector -- by ownership sector
# 23          44 MSA, NAICS Sector -- by ownership sector
# 24          45 MSA, NAICS 3-digit -- by ownership sector
# 25          46 MSA, NAICS 4-digit -- by ownership sector
```

```
# 26          47 MSA, NAICS 5-digit -- by ownership sector
# 27          48 MSA, NAICS 6-digit -- by ownership sector
# 28          50 State, Total Covered
# 29          51 State, Total -- by ownership sector
# 30          52 State, by Domain -- by ownership sector
# 31          53 State, by Supersector -- by ownership sector
# 32          54 State, NAICS Sector -- by ownership sector
# 33          55 State, NAICS 3-digit -- by ownership sector
# 34          56 State, NAICS 4-digit -- by ownership sector
# 35          57 State, NAICS 5-digit -- by ownership sector
# 36          58 State, NAICS 6-digit -- by ownership sector
# 37          61 State, Private, total, by establishment size class
# 38          62 State, Private, Domain, by establishment size class
# 39          63 State, Private, by Supersector, by establishment size class
# 40          64 State, Private, NAICS Sector, by establishment size class
# 41          70 County, Total Covered
# 42          71 County, Total -- by ownership sector
# 43          72 County, by Domain -- by ownership sector
# 44          73 County, by Supersector -- by ownership sector
# 45          74 County, NAICS Sector -- by ownership sector
# 46          75 County, NAICS 3-digit -- by ownership sector
# 47          76 County, NAICS 4-digit -- by ownership sector
# 48          77 County, NAICS 5-digit -- by ownership sector
# 49          78 County, NAICS 6-digit -- by ownership sector
# 50          80 MicroSA, Total Covered
# 51          91 Total, all U.S. MSAs
# 52          92 Total, all U.S. CMSAs or all U.S. CSAs
# 53          93 Total, all U.S. non-MSA counties
# 54          94 Total U.I. Covered (U.S.)
# 55          95 Total Government (U.S.)
# 56          96 Total Government, by State
```

FIPS

```
load("fips.RData")
fips %>%
  as.tibble %>%
  head(20)
```

```
# # A tibble: 20 x 2
#    area_fips area_title
#    <fct>     <fct>
#  1 US000     U.S. TOTAL
#  2 USCMS     U.S. Combined Statistical Areas (combined)
#  3 USMSA     U.S. Metropolitan Statistical Areas (combined)
#  4 USNMS     U.S. Nonmetropolitan Area Counties (combined)
#  5 01000     Alabama -- Statewide
#  6 01001     Autauga County, Alabama
#  7 01003     Baldwin County, Alabama
#  8 01005     Barbour County, Alabama
#  9 01007     Bibb County, Alabama
# 10 01009     Blount County, Alabama
# 11 01011     Bullock County, Alabama
# 12 01013     Butler County, Alabama
# 13 01015     Calhoun County, Alabama
```

```
# 14 01017     Chambers County, Alabama
# 15 01019     Cherokee County, Alabama
# 16 01021     Chilton County, Alabama
# 17 01023     Choctaw County, Alabama
# 18 01025     Clarke County, Alabama
# 19 01027     Clay County, Alabama
# 20 01029     Cleburne County, Alabama
```

Industry

```
load("industry.RData")
industry %>%
  as.tibble %>% head
```

```
# # A tibble: 6 x 2
#   industry_code industry_title
#   <fct>         <fct>
# 1 10            10 Total, all industries
# 2 101           101 Goods-producing
# 3 1011          1011 Natural resources and mining
# 4 1012          1012 Construction
# 5 1013          1013 Manufacturing
# 6 102           102 Service-providing
```

Ownership

```
load("ownership.RData")
ownership %>%
  as.tibble
```

```
# # A tibble: 8 x 2
#   own_code own_title
#      <int> <fct>
# 1        0 Total Covered
# 2        1 Federal Government
# 3        2 State Government
# 4        3 Local Government
# 5        4 International Government
# 6        5 Private
# 7        8 Total Government
# 8        9 Total U.I. Covered (Excludes Federal Government)
```

Size

```
load("size.RData")
size %>%
  as.tibble %>% head
```

```
# # A tibble: 6 x 2
#   size_code size_title
#       <int> <fct>
# 1         0 All establishment sizes
# 2         1 Fewer than 5 employees per establishment
# 3         2 5 to 9 employees per establishment
# 4         3 10 to 19 employees per establishment
# 5         4 20 to 49 employees per establishment
# 6         5 50 to 99 employees per establishment
```

Layouts

SIC-based (1975-2000)

Here is the layout for SIC years (1975-2000)

```
load("sic.layout.RData")
```

Loading now the first characters of the description:

```
sic.layout %>%
  select(field_name, field_description) %>%
  as.tibble
```

```
# # A tibble: 21 x 2
#    field_name        field_description
#    <fct>             <fct>
#  1 area_fips         5-character FIPS code
#  2 own_code          "1-digit Ownership code          "
#  3 industry_code     10-character Industry Code (SIC) (Max 10 characters)
#  4 agglvl_code       2-digit aggregation level code
#  5 size_code         1-digit size code
#  6 year              4-digit year
#  7 qtr               1-character quarter (always A for annual)
#  8 disclosure_code   1-character disclosure code (either ' '(blank) or 'N~
#  9 area_title        Multi-character area title associated with the area'~
# 10 own_title         Multi-character ownership title associated with the ~
# 11 industry_title    Multi-character industry title associated with the i~
# 12 agglvl_title      Multi-character aggregation title associated with th~
# 13 size_title        Multi-character size title associated with the size ~
# 14 qtrly_estabs_cou~ Count of establishments for a given quarter
# 15 month1_emplvl     Employment level for the first month of a given quar~
# 16 month2_emplvl     Employment level for the second month of a given qua~
# 17 month3_emplvl     Employment level for the third month of a  given qua~
# 18 total_qtrly_wages Total wages for a given quarter
# 19 taxable_qtrly_wa~ Taxable wages for a given quarter
# 20 qtrly_contributi~ Quarterly contributions for a given quarter
# 21 avg_wkly_wage     Average weekly wage for a given quarter
```

NAICS-based (1990-2018)

Here is the layout for NAICS years (1990-2018)

```
load("naics.layout.RData")
```

Loading now the first characters of the description:

```
naics.layout %>%
  select(field_name, field_description) %>%
  as.tibble
```

```
# # A tibble: 47 x 2
#    field_name             field_description
#    <fct>                  <fct>
#  1 area_fips              5-character FIPS code
#  2 own_code               1-character ownership code
```

```
#  3 industry_code          6-character Industry Code (NAICS, SuperSector)
#  4 agglvl_code            2-character aggregation level code
#  5 size_code              1-character size code
#  6 year                   4-character year
#  7 qtr                    1-character quarter (always A for annual)
#  8 disclosure_code        1-character disclosure code (either ' '(blank) ~
#  9 area_title             Multi-character area title associated with the ~
# 10 own_title              Multi-character ownership title associated with~
# 11 industry_title         Multi-character industry title associated with ~
# 12 agglvl_title           Multi-character aggregation title associated wi~
# 13 size_title             Multi-character size title associated with the ~
# 14 qtrly_estabs           Count of establishments for a given quarter
# 15 month1_emplvl          Employment level for the first month of a given~
# 16 month2_emplvl          Employment level for the second month of a give~
# 17 month3_emplvl          Employment level for the third month of a  give~
# 18 total_qtrly_wages      Total wages for a given quarter
# 19 taxable_qtrly_wages    Taxable wages for a given quarter
# 20 qtrly_contributions    Quarterly contributions for a given quarter
# 21 avg_wkly_wage          Average weekly wage for a given quarter
# 22 lq_disclosure_code     1-character location-quotient disclosure code (~
# 23 lq_qtrly_estabs        Location quotient of the quarterly establishmen~
# 24 lq_month1_emplvl       Location quotient of the emloyment level for th~
# 25 lq_month2_emplvl       Location quotient of the emloyment level for th~
# 26 lq_month3_emplvl       Location quotient of the emloyment level for th~
# 27 lq_total_qtrly_wages   Location quotient of the total wages for a give~
# 28 lq_taxable_qtrly_wages Location quotient of the total taxable wages fo~
# 29 lq_qtrly_contributions Location quotient of the total contributions fo~
# 30 lq_avg_wkly_wage       Location quotient of the average weekly wage fo~
# 31 oty_disclosure_code    1-character over-the-year disclosure code (eith~
# 32 oty_qtrly_estabs_chg   Over-the-year change in the count of establishm~
# 33 oty_qtrly_estabs_pct_~ Over-the-year percent change in the count of es~
# 34 oty_month1_emplvl_chg  Over-the-year change in the first month's emplo~
# 35 oty_month1_emplvl_pct~ Over-the-year percent change in the first month~
# 36 oty_month2_emplvl_chg  Over-the-year change in the second month's empl~
# 37 oty_month2_emplvl_pct~ Over-the-year percent change in the second mont~
# 38 oty_month3_emplvl_chg  Over-the-year change in the third month's emplo~
# 39 oty_month3_emplvl_pct~ Over-the-year percent change in the third month~
# 40 oty_total_qtrly_wages~ Over-the-year change in total quarterly wages f~
# 41 oty_total_qtrly_wages~ Over-the-year percent change in total quarterly~
# 42 oty_taxable_qtrly_wag~ Over-the-year change in taxable quarterly wages~
# 43 oty_taxable_qtrly_wag~ Over-the-year percent change in taxable quarter~
# 44 oty_qtrly_contributio~ Over-the-year change in quarterly contributions~
# 45 oty_qtrly_contributio~ Over-the-year percent change in quarterly contr~
# 46 oty_avg_wkly_wage_chg  Over-the-year change in average weekly wage for~
# 47 oty_avg_wkly_wage_pct~ Over-the-year percent change in average weekly ~
```

Classifications NAICS - SIC

Crosswalk

```
load("naics.sic.crosswalk.RData")
naics.sic.crosswalk %>%
```

```
  mutate_all(funs(substr(., 1, 35))) %>%
  head
```

```
#    naics                       naics.title  sic
# 1 111110                  Soybean Farming  0116
# 2 111120 Oilseed (except Soybean) Farming 0119
# 3 111130         Dry Pea and Bean Farming 0119
# 4 111140                     Wheat Farming 0111
# 5 111150                      Corn Farming 0115
# 6 111150                      Corn Farming 0119
#                             sic.title
# 1                            Soybeans
# 2 Cash Grains, NEC (oilseed farming,
# 3 Cash Grains, NEC (dry pea and bean
# 4                                Wheat
# 5                                 Corn
# 6  Cash Grains, NEC (popcorn farming)
```

2-digit NAICS

```
load("naics.codes.RData")
naics.codes %>%
  filter(nchar(naics) == 2) %>%
  as.tibble
```

```
# # A tibble: 17 x 2
#    naics naics.title
#    <chr> <chr>
#  1 11    Agriculture, Forestry, Fishing and Hunting
#  2 21    Mining, Quarrying, and Oil and Gas Extraction
#  3 22    Utilities
#  4 23    Construction
#  5 42    Wholesale Trade
#  6 51    Information
#  7 52    Finance and Insurance
#  8 53    Real Estate and Rental and Leasing
#  9 54    Professional, Scientific, and Technical Services
# 10 55    Management of Companies and Enterprises
# 11 56    Administrative and Support and Waste Management and Remediation ~
# 12 61    Educational Services
# 13 62    Health Care and Social Assistance
# 14 71    Arts, Entertainment, and Recreation
# 15 72    Accommodation and Food Services
# 16 81    Other Services (except Public Administration)
# 17 92    Public Administration
```

3-digit NAICS

```
naics.codes %>%
  filter(nchar(naics) %in% c(2,3)) %>%
  as.tibble
```

```
# # A tibble: 116 x 2
#    naics naics.title
#    <chr> <chr>
#  1 11    Agriculture, Forestry, Fishing and Hunting
#  2 111   Crop Production
#  3 112   Animal Production
#  4 113   Forestry and Logging
#  5 114   Fishing, Hunting and Trapping
#  6 115   Support Activities for Agriculture and Forestry
#  7 21    Mining, Quarrying, and Oil and Gas Extraction
#  8 211   Oil and Gas Extraction
#  9 212   Mining (except Oil and Gas)
# 10 213   Support Activities for Mining
# # ... with 106 more rows
```

Examples

First loading NAICS 1990, 2010, 2015...

```
load("naics.1990.RData")
load("naics.2010.RData")
load("naics.2015.RData")
```

NAICS: State-level, 2-digit (agglvl = 54), Private (own = 5)

```
naics.2010.54 <- naics.2010 %>%
  filter(agglvl_code == 54, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste %>% as.numeric /1000,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.2015.54 <- naics.2015 %>%
  filter(agglvl_code == 54, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
```

```
  mutate(area_fips = area_fips %>% paste %>% as.numeric / 1000,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.2010.54 %>%
  as.tibble %>% head
```

```
# # A tibble: 6 x 4
#   area_fips industry_code yearmonth  empl
#       <dbl> <fct>             <dbl> <int>
# 1         1 11                2010  11600
# 2         1 11                2010. 11513
# 3         1 11                2010. 11828
# 4         1 11                2010. 12068
# 5         1 11                2010. 12047
# 6         1 11                2010. 12026
```

```
naics.2015.54 %>%
  as.tibble %>% head
```

```
# # A tibble: 6 x 4
#   area_fips industry_code yearmonth  empl
#       <dbl> <fct>             <dbl> <int>
# 1         1 11                2015  11523
# 2         1 11                2015. 11697
# 3         1 11                2015. 11735
# 4         1 11                2015. 11593
# 5         1 11                2015. 11858
# 6         1 11                2015. 11903
```

In 1990:

```
naics.1990.54 <- naics.1990 %>%
  filter(agglvl_code == 54, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste %>% as.numeric /1000,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble
```

2 digit shares:

```
naics.1990.54 %>%
  filter(yearmonth == 1990) %>%
  group_by(industry_code) %>%
  summarise(empl = sum(empl)) %>%
  ungroup %>%
  mutate(share.1990 = round(100*empl/sum(empl), 2)) %>%
  select(-empl) %>%
```

```
  left_join(naics.2015.54 %>%
              filter(yearmonth == 2015) %>%
              group_by(industry_code) %>%
              summarise(empl = sum(empl)) %>%
              ungroup %>%
              mutate(share.2015 = round(100*empl/sum(empl), 2)) %>%
              select(-empl),
            by = "industry_code") %>%
  left_join(naics.codes %>%
              rename(industry_code = naics, industry_title = naics.title),
            by = "industry_code") %>%
  select(industry_code, industry_title, share.1990, share.2015)
```

```
# Warning: Column `industry_code` joining factors with different levels,
# coercing to character vector
```

```
# # A tibble: 19 x 4
#    industry_code industry_title                       share.1990 share.2015
#    <chr>         <chr>                                     <dbl>      <dbl>
#  1 11            Agriculture, Forestry, Fishing and~       1          0.95
#  2 21            Mining, Quarrying, and Oil and Gas~       0.72       0.73
#  3 22            Utilities                                 0.83       0.48
#  4 23            Construction                              5.51       5.12
#  5 31-33         Manufacturing                            20.0       10.6
#  6 42            Wholesale Trade                           5.77       5.03
#  7 44-45         Retail Trade                             15.2       13.4
#  8 48-49         Transportation and Warehousing            3.46       3.93
#  9 51            Information                               3.09       2.36
# 10 52            Finance and Insurance                     5.68       4.93
# 11 53            Real Estate and Rental and Leasing        1.9        1.76
# 12 54            Professional, Scientific, and Tech~       5.38       7.37
# 13 55            Management of Companies and Enterp~       1.14       1.89
# 14 56            Administrative and Support and Was~       4.83       7.29
# 15 61            Educational Services                      1.51       2.31
# 16 62            Health Care and Social Assistance        10.2       15.7
# 17 71            Arts, Entertainment, and Recreation       1.5        1.64
# 18 72            Accommodation and Food Services           8.46      10.7
# 19 81            Other Services (except Public Admi~       3.81       3.62
```

NAICS: County-level, 2-digit (agglvl=74), Private (own=5)

```
naics.2010.74 <- naics.2010 %>%
  filter(agglvl_code == 74, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste %>% as.numeric,
```

```
        industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.2015.74 <- naics.2015 %>%
  filter(agglvl_code == 74, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste %>% as.numeric,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.2010.74 %>% head
```

```
# # A tibble: 6 x 4
#   area_fips industry_code yearmonth  empl
#       <dbl> <fct>             <dbl> <int>
# 1      1001 11                2010    157
# 2      1001 11                2010.   156
# 3      1001 11                2010.   160
# 4      1001 11                2010.   151
# 5      1001 11                2010.   152
# 6      1001 11                2010.   152
```

```
naics.2015.74 %>% head
```

```
# # A tibble: 6 x 4
#   area_fips industry_code yearmonth  empl
#       <dbl> <fct>             <dbl> <int>
# 1      1001 11                2015    124
# 2      1001 11                2015.   121
# 3      1001 11                2015.   123
# 4      1001 11                2015.   123
# 5      1001 11                2015.   113
# 6      1001 11                2015.   129
```

NAICS: MSA-level, 2-digit (agglvl=44), Private (own=5)

```
naics.2010.44 <- naics.2010 %>%
  filter(agglvl_code == 44, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
```

```
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.2015.44 <- naics.2015 %>%
  filter(agglvl_code == 44, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.2010.44 %>%
  head
```

```
# # A tibble: 6 x 4
#   area_fips industry_code yearmonth  empl
#   <chr>     <fct>             <dbl> <int>
# 1 C1018     11                2010    274
# 2 C1018     11                2010.   242
# 3 C1018     11                2010.   239
# 4 C1018     11                2010.   231
# 5 C1018     11                2010.   238
# 6 C1018     11                2010.   245
```

```
naics.2015.44 %>%
  head
```

```
# # A tibble: 6 x 4
#   area_fips industry_code yearmonth  empl
#   <chr>     <fct>             <dbl> <int>
# 1 C1018     11                2015    272
# 2 C1018     11                2015.   234
# 3 C1018     11                2015.   230
# 4 C1018     11                2015.   251
# 5 C1018     11                2015.   237
# 6 C1018     11                2015.   249
```

NAICS: 3 digit shares

3 digit shares:

```
naics.2015.55 <- naics.2015 %>%
  filter(agglvl_code == 55, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
```

```
        month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste %>% as.numeric / 1000,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.1990.55 <- naics.1990 %>%
  filter(agglvl_code == 55, own_code == 5) %>%
  select(area_fips, industry_code, year, qtr,
         month1_emplvl, month2_emplvl, month3_emplvl) %>%
  gather(month, empl, month1_emplvl, month2_emplvl, month3_emplvl) %>%
  mutate(month = month %>% substr(6, 6) %>% as.numeric,
         month = (qtr - 1)*3 + month,
         yearmonth = year + (month - 1)/12) %>%
  select(-month, -year, -qtr) %>%
  arrange(area_fips, industry_code, yearmonth) %>%
  select(area_fips, industry_code, yearmonth, empl) %>%
  mutate(area_fips = area_fips %>% paste %>% as.numeric / 1000,
         industry_code = industry_code %>% paste %>% factor) %>%
  as.tibble

naics.1990.55 %>%
  filter(yearmonth == 1990) %>%
  group_by(industry_code) %>%
  summarise(empl = sum(empl)) %>%
  ungroup %>%
  mutate(share.1990 = round(100*empl/sum(empl), 2)) %>%
  select(-empl) %>%
  left_join(naics.2015.55 %>%
              filter(yearmonth == 2015) %>%
              group_by(industry_code) %>%
              summarise(empl = sum(empl)) %>%
              ungroup %>%
              mutate(share.2015 = round(100*empl/sum(empl), 2)) %>%
              select(-empl),
            by = "industry_code") %>%
  left_join(naics.codes %>%
              rename(industry_code = naics, industry_title = naics.title),
            by = "industry_code") %>%
  select(industry_code, industry_title, share.1990, share.2015)
```

```
# Warning: Column `industry_code` joining factors with different levels,
# coercing to character vector
```

```
# # A tibble: 91 x 4
#    industry_code industry_title                       share.1990 share.2015
#    <chr>         <chr>                                     <dbl>      <dbl>
#  1 111           Crop Production                            0.47        0.4
```

```
#  2 112          Animal Production                       0.17        0.21
#  3 113          Forestry and Logging                    0.09        0.05
#  4 114          Fishing, Hunting and Trapping           0.01        0.01
#  5 115          Support Activities for Agriculture~     0.26        0.28
#  6 211          Oil and Gas Extraction                  0.21        0.17
#  7 212          Mining (except Oil and Gas)             0.32        0.17
#  8 213          Support Activities for Mining           0.18        0.39
#  9 221          Utilities                               0.83        0.48
# 10 236          Construction of Buildings               1.47        1.17
# 11 237          Heavy and Civil Engineering Constr~     0.81        0.71
# 12 238          Specialty Trade Contractors             3.25        3.26
# 13 311          Food Manufacturing                      1.68        1.29
# 14 312          Beverage and Tobacco Product Manuf~     0.25        0.18
# 15 313          Textile Mills                           0.56        0.1
# 16 314          Textile Product Mills                   0.25        0.1
# 17 315          Apparel Manufacturing                   1.12        0.12
# 18 316          Leather and Allied Product Manufac~     0.15        0.03
# 19 321          Wood Product Manufacturing              0.6         0.32
# 20 322          Paper Manufacturing                     0.73        0.32
# 21 323          Printing and Related Support Activ~     0.94        0.39
# 22 324          Petroleum and Coal Products Manufa~     0.17        0.09
# 23 325          Chemical Manufacturing                  1.17        0.71
# 24 326          Plastics and Rubber Products Manuf~     0.87        0.59
# 25 327          Nonmetallic Mineral Product Manufa~     0.59        0.33
# 26 331          Primary Metal Manufacturing             0.76        0.34
# 27 332          Fabricated Metal Product Manufactu~     1.8         1.27
# 28 333          Machinery Manufacturing                 1.6         0.98
# 29 334          Computer and Electronic Product Ma~     2.17        0.91
# 30 335          Electrical Equipment, Appliance, a~     0.71        0.33
# 31 336          Transportation Equipment Manufactu~     2.37        1.37
# 32 337          Furniture and Related Product Manu~     0.73        0.32
# 33 339          Miscellaneous Manufacturing             0.8         0.51
# 34 423          Merchant Wholesalers, Durable Goods     2.91        2.52
# 35 424          Merchant Wholesalers, Nondurable G~     1.89        1.74
# 36 425          Wholesale Electronic Markets and A~     0.99        0.77
# 37 441          Motor Vehicle and Parts Dealers         1.72        1.63
# 38 442          Furniture and Home Furnishings Sto~     0.5         0.4
# 39 443          Electronics and Appliance Stores        0.46        0.46
# 40 444          Building Material and Garden Equip~     0.99        1.02
# 41 445          Food and Beverage Stores                3           2.63
# 42 446          Health and Personal Care Stores         0.91        0.9
# 43 447          Gasoline Stations                       1.12        0.77
# 44 448          Clothing and Clothing Accessories ~     1.57        1.18
# 45 451          Sporting Goods, Hobby, Book, and M~     0.63        0.55
# 46 452          General Merchandise Stores              3.02        2.72
# 47 453          Miscellaneous Store Retailers           0.83        0.7
# 48 454          Nonstore Retailers                      0.54        0.43
# 49 481          Air Transportation                      0.52        0.39
# 50 483          Water Transportation                    0.06        0.06
# 51 484          Truck Transportation                    1.26        1.22
# 52 485          Transit and Ground Passenger Trans~     0.33        0.41
# 53 486          Pipeline Transportation                 0.07        0.04
# 54 487          Scenic and Sightseeing Transportat~     0.02        0.02
# 55 488          Support Activities for Transportat~     0.42        0.55
```

```
# 56 491          Postal Service                          0          0
# 57 492          Couriers and Messengers                 0.38       0.54
# 58 493          Warehousing and Storage                 0.35       0.68
# 59 511          Publishing Industries (except Inte~     0.97       0.63
# 60 512          Motion Picture and Sound Recording~     0.32       0.33
# 61 515          Broadcasting (except Internet)          0.32       0.24
# 62 516          <NA>                                    0.01      NA
# 63 517          Telecommunications                      1.13       0.71
# 64 518          Data Processing, Hosting and Relat~     0.3        0.25
# 65 519          Other Information Services              0.04       0.2
# 66 521          Monetary Authorities-Central Bank       0          0
# 67 522          Credit Intermediation and Related ~     2.87       2.22
# 68 523          Securities, Commodity Contracts, a~     0.56       0.76
# 69 524          Insurance Carriers and Related Act~     2.14       1.92
# 70 525          Funds, Trusts, and Other Financial~     0.02       0
# 71 531          Real Estate                             1.28       1.29
# 72 532          Rental and Leasing Services             0.570      0.45
# 73 533          Lessors of Nonfinancial Intangible~     0.02       0.02
# 74 541          Professional, Scientific, and Tech~     5.4        7.37
# 75 551          Management of Companies and Enterp~     1.15       1.89
# 76 561          Administrative and Support Services     4.56       6.95
# 77 562          Waste Management and Remediation S~     0.290      0.34
# 78 611          Educational Services                    1.51       2.31
# 79 621          Ambulatory Health Care Services         3.23       5.83
# 80 622          Hospitals                               3.72       4.14
# 81 623          Nursing and Residential Care Facil~     2.08       2.82
# 82 624          Social Assistance                       1.18       2.91
# 83 711          Performing Arts, Spectator Sports,~     0.64       0.35
# 84 712          Museums, Historical Sites, and Sim~     0.07       0.12
# 85 713          Amusement, Gambling, and Recreatio~     0.8        1.18
# 86 721          Accommodation                           1.71       1.58
# 87 722          Food Services and Drinking Places       6.7        9.12
# 88 811          Repair and Maintenance                  1.14       1.08
# 89 812          Personal and Laundry Services           1.25       1.18
# 90 813          Religious, Grantmaking, Civic, Pro~     1.13       1.13
# 91 814          Private Households                      0.3        0.24
```

SIC: County-level

SIC Industry titles:

https://data.bls.gov/cew/doc/titles/industry/sic_industry_titles.htm

SIC Aggregation levels:

https://data.bls.gov/cew/doc/titles/agglevel/sic_agglevel_titles.htm

26 is SIC Total covered

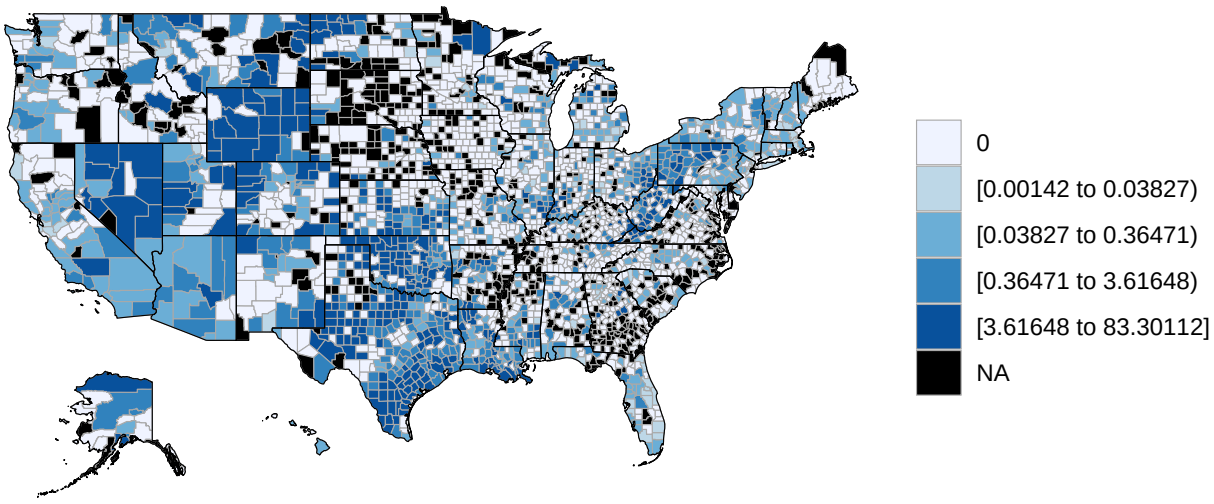
```
load("sic.1989.RData")

extract <- sic.1989 %>%
  filter(area_fips == "01001") %>%
  head
```

```
sic.1989 %>%
  filter(agglvl_code == 26) %>%
  head
```

```
##   area_fips own_code industry_code agglvl_code size_code year qtr
## 1     01001        0        SIC_0Z          26         0 1989   1
## 2     01001        0        SIC_0Z          26         0 1989   2
## 3     01001        0        SIC_0Z          26         0 1989   3
## 4     01001        0        SIC_0Z          26         0 1989   4
## 5     01003        0        SIC_0Z          26         0 1989   1
## 6     01003        0        SIC_0Z          26         0 1989   2
##   disclosure_code qtrly_estabs_count month1_emplvl month2_emplvl
## 1                                596          7736          7632
## 2                                601          7817          7833
## 3                                602          7851          7708
## 4                                615          7732          7848
## 5                               2308         24357         24608
## 6                               2299         26437         27184
##   month3_emplvl total_qtrly_wages taxable_qtrly_wages qtrly_contributions
## 1          7779          34914355             23847194              223343
## 2          7957          34891527             13228402              157184
## 3          7752          34243442              8104488              109830
## 4          7887          35402860              5592723               79441
## 5         25343          86536452             60450566              891341
## 6         27738          94040863             47736101              760803
##   avg_wkly_wage
## 1           348
## 2           341
## 3           338
## 4           348
## 5           268
## 6           266
```

County Choropleth Map - Industry Code: 21

```
naics.2015.74 %>%
  filter(yearmonth == 2015) %>%
  select(-yearmonth) %>%
  group_by(area_fips) %>%
  mutate(empl_total = sum(empl),
         empl_share = 100*empl / empl_total) %>%
  filter(industry_code == "21") %>%
  select(region = area_fips, value = empl_share) %>%
  county_choropleth(.)
```



Computing Environment

```
Sys.time()
```

```
## [1] "2018-09-26 10:24:11 PDT"
```

```
sessionInfo()
```

```
## R version 3.5.1 (2018-07-02)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS High Sierra 10.13.6
##
## Matrix products: default
## BLAS: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] bindrcpp_0.2.2        choroplethrMaps_1.0.1 choroplethr_3.6.3
##  [4] acs_2.1.3             XML_3.98-1.16         forcats_0.3.0
##  [7] stringr_1.3.1         dplyr_0.7.6           purrr_0.2.5
## [10] readr_1.1.1           tidyr_0.8.1           tibble_1.4.2
## [13] ggplot2_3.0.0         tidyverse_1.2.1
##
## loaded via a namespace (and not attached):
##  [1] nlme_3.1-137        sf_0.6-3            lubridate_1.7.4
##  [4] RColorBrewer_1.1-2  httr_1.3.1          rprojroot_1.3-2
##  [7] tools_3.5.1         backports_1.1.2     utf8_1.1.4
## [10] rgdal_1.3-4         R6_2.2.2            rpart_4.1-13
## [13] spData_0.2.9.3      Hmisc_4.1-1         DBI_1.0.0
## [16] lazyeval_0.2.1      colorspace_1.3-2    nnet_7.3-12
```

```
## [19] withr_2.1.2         sp_1.3-1            tidyselect_0.2.4
## [22] gridExtra_2.3       compiler_3.5.1      cli_1.0.0
## [25] rvest_0.3.2         htmlTable_1.12      xml2_1.2.0
## [28] labeling_0.3        scales_1.0.0        checkmate_1.8.5
## [31] classInt_0.2-3      rappdirs_0.3.1      digest_0.6.15
## [34] foreign_0.8-70      rmarkdown_1.10      base64enc_0.1-3
## [37] jpeg_0.1-8          pkgconfig_2.0.2     htmltools_0.3.6
## [40] maps_3.3.0          htmlwidgets_1.2     rlang_0.2.2
## [43] readxl_1.1.0        rstudioapi_0.7      bindr_0.1.1
## [46] jsonlite_1.5        acepack_1.4.1       magrittr_1.5
## [49] Formula_1.2-3       geosphere_1.5-7     Matrix_1.2-14
## [52] fansi_0.3.0         Rcpp_0.12.18        munsell_0.5.0
## [55] proto_1.0.0         stringi_1.2.4       yaml_2.2.0
## [58] RJSONIO_1.3-0       plyr_1.8.4          grid_3.5.1
## [61] maptools_0.9-3      WDI_2.5             crayon_1.3.4
## [64] lattice_0.20-35     haven_1.1.2         splines_3.5.1
## [67] mapproj_1.2.6       hms_0.4.2           knitr_1.20
## [70] pillar_1.3.0        uuid_0.1-2          rjson_0.2.20
## [73] reshape2_1.4.3      glue_1.3.0          evaluate_0.11
## [76] latticeExtra_0.6-28 data.table_1.11.4   modelr_0.1.2
## [79] png_0.1-7           RgoogleMaps_1.4.2   cellranger_1.1.0
## [82] gtable_0.2.0        assertthat_0.2.0    broom_0.5.0
## [85] e1071_1.7-0         class_7.3-14        survival_2.42-3
## [88] tigris_0.7          units_0.6-0         cluster_2.0.7-1
## [91] ggmap_2.6.1
```