BLS - QCEW - Example

Datasets

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Contents

Preamble

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

Layouts

NAICS (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 ~
```

SIC (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
```

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
```

List of codes

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
```

Examples

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

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

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:

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

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
```

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

options(tibble.print_max = Inf)

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
```

County Cloropleth Map - Industry Code: 21

```
empl.share.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(fips = area_fips, empl_share) %>%
  as.tibble

empl.share.21 %>%
  head
```

```
# # A tibble: 6 x 2
# # Groups:   fips [6]
#    fips empl_share
#   <dbl>      <dbl>
# 1  1001      0.876
# 2  1003      0.107
# 3  1005      3.48
# 4  1007      0
# 5  1009      0
# 6  1015      0
```

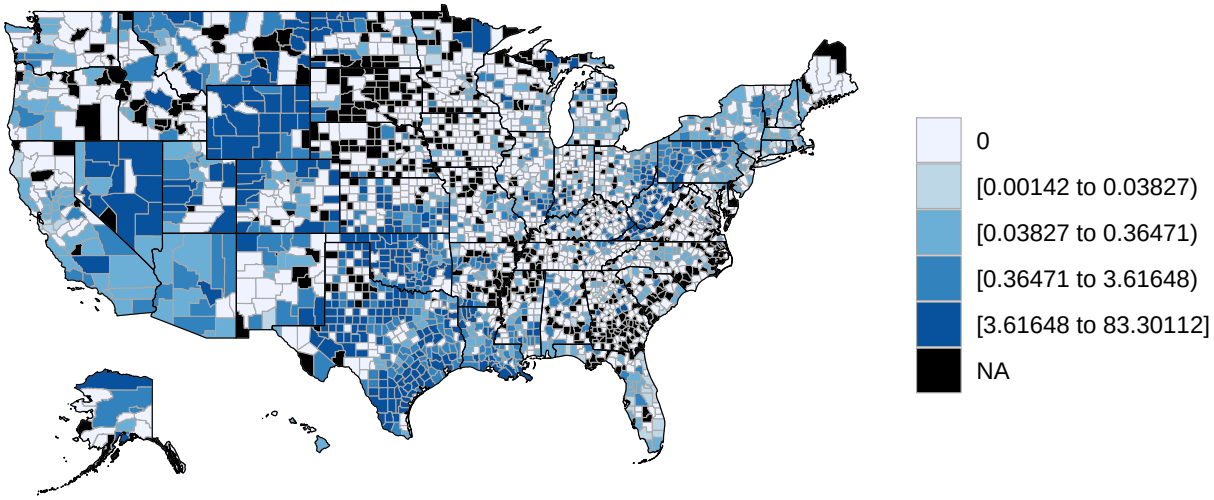
```
empl.share.21 %>%
  select(region = fips, value = empl_share) %>%
  county_choropleth(.)
```

```
## Warning in super$initialize(map.df, user.df): Your data.frame contains the
## following regions which are not mappable: 1999, 2999, 4999, 5999, 6999,
## 8999, 9999, 12999, 13999, 16999, 17999, 18999, 20999, 21999, 22999, 23999,
## 24999, 25999, 26999, 27999, 28999, 29999, 30999, 31999, 32999, 33999,
## 34999, 35999, 36999, 37999, 38999, 39999, 40999, 41999, 42999, 44999,
## 45999, 46999, 47999, 48999, 51999, 53999, 54999, 55999, 56999, 72003,
```

```
## 72011, 72013, 72017, 72021, 72023, 72025, 72029, 72031, 72035, 72039,
## 72057, 72061, 72063, 72067, 72069, 72071, 72075, 72085, 72111, 72113,
## 72125, 72127, 72129, 72139, 72145, 72151, 78010
```

```
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 16067, 27091, 27099, 27105, 16081, 17005, 28009, 28011, 28021,
## 28053, 23007, 13239, 27077, 45031, 47033, 47041, 23015, 23023, 31149,
## 31151, 31173, 39149, 47077, 47083, 47087, 47095, 47101, 47109, 47111,
## 47137, 18059, 48045, 34033, 30055, 38005, 38029, 38037, 38039, 38047,
## 18115, 26003, 26027, 31007, 31011, 18183, 31013, 31051, 31057, 19009,
## 31075, 35019, 35021, 47161, 19021, 47177, 45061, 45065, 45071, 26043,
## 19031, 17131, 31081, 31099, 31115, 28097, 41021, 41027, 26095, 28141,
## 28143, 29007, 29023, 29041, 26071, 26131, 26135, 29061, 37013, 2105, 45085,
## 45089, 46023, 46039, 46045, 17175, 46059, 27003, 27043, 27059, 37041,
## 37047, 37061, 37075, 37083, 27063, 27069, 29105, 29125, 29153, 37095,
## 37139, 37143, 42101, 13129, 48017, 13131, 29171, 29181, 29197, 37163,
## 37169, 44001, 45001, 45017, 45023, 46065, 46069, 13175, 46075, 46085,
## 46097, 46101, 46113, 46115, 46121, 46127, 30015, 30023, 31129, 31141,
## 13201, 17127, 2150, 13199, 13205, 13209, 13229, 13225, 13235, 13267, 20187,
## 21201, 21207, 21217, 13243, 21239, 13253, 21011, 17137, 13265, 17153,
## 17177, 13277, 13279, 13293, 21039, 21041, 21057, 21079, 2164, 48301, 51840,
## 53001, 53017, 53023, 51600, 50003, 51019, 51045, 51049, 20127, 51091,
## 51119, 51057, 51115, 21007, 21037, 21061, 21081, 37187, 38041, 38069,
## 38087, 38095, 51009, 51035, 1027, 1041, 1091, 21181, 20203, 19147, 19165,
## 12129, 13011, 13027, 21187, 13033, 13039, 13061, 8011, 8027, 27071, 27087,
## 27107, 27143, 27159, 28043, 21219, 1013, 1019, 21229, 13007, 13035, 13065,
## 45033, 47075, 13085, 13099, 26059, 46025, 46037, 46049, 46057, 46077, 1063,
## 21003, 12047, 12077, 5037, 5039, 29115, 29121, 29173, 46107, 46119, 40057,
## 5117, 13315, 15005, 16039, 16063, 17017, 31127, 31179, 21063, 41061, 13083,
## 21087, 13111, 5095, 17045, 18119, 35011, 31001, 31005, 31017, 31041, 31059,
## 31069, 31077, 21137, 1105, 21143, 19025, 31107, 28081, 28123, 28133, 28145,
## 29015, 29049, 48119, 48205, 48269, 48279, 19047, 13143, 19055, 13237,
## 13249, 19063, 37073, 19067, 37123, 37145, 51127, 51515, 51590, 51620,
## 51680, 51740, 51830, 13259, 13271, 13283, 37173, 55078, 56015, 2060, 21215,
## 48101, 48345, 51137, 51139, 51169, 51181, 55037, 55057, 19181, 51580,
## 51610, 51640, 51678, 51685, 51730, 51750, 55077, 55085, 55091, 53069,
## 27073, 12037, 12065, 27083, 8115, 20153, 22065, 5021, 27113, 19071, 19097,
## 19109, 19133, 27121, 19173, 19185, 27135, 27155, 28027, 19117, 37079,
## 28055, 23003, 38021, 28105, 28003, 28013, 47023, 38051, 28017, 17083,
## 47053, 23013, 26001, 41025, 31165, 30079, 29005, 45013, 30103, 38085,
## 36047, 41055, 41057, 41063, 29107, 47097, 48377, 36079, 48443, 31021,
## 46071, 46089, 46105, 31049, 31061, 29063, 29069, 37029, 37031, 29133,
## 29143, 24039, 35023, 45057, 36085, 46021, 37177, 24510, 26053, 46027,
## 46031, 27021, 30011, 30033, 30045, 31131, 25019, 31091, 31103, 28093,
## 27031, 27049, 37137, 37155, 30061, 10003, 5041, 5069, 5077, 16087, 18023,
## 2282, 5107, 26085, 13145, 13161, 13167, 13179, 17171, 13287, 13299, 21105,
## 54063, 51071, 51077, 51089, 51093, 13305, 48155, 51131, 51149, 51159,
## 51175, 51193, 51570, 51630, 51650, 51735, 31113, 37043, 47169, 46073,
## 1109, 5127, 38083, 31065, 28135, 55001, 13017, 37185, 20149, 13251, 27019,
## 13273, 20199, 21213, 21223, 27029, 20061, 20089, 27051, 21023, 54031,
## 51001, 29195, 31135, 31159, 31163, 8025, 31183, 32009, 31009, 31073, 31097,
## 31117, 8047, 28115, 28117, 29001, 29033, 29075, 37017, 37091, 37103, 37117,
## 37165, 39065, 39097, 37197, 38045, 38091, 39039, 13001, 39047, 35028,
## 36123, 13029, 42087, 45005, 13043, 45009, 45027, 47031, 47045, 13055,
```

```
## 47069, 47081, 45049, 45053, 45075, 46003, 46007, 46017, 13071, 46055,
## 46095, 46111, 46137, 41069, 48011, 48191, 48263, 51141, 51157, 51187,
## 51530, 51540, 51595, 51670, 51775, 51820, 55115, 8105, 8111, 55003, 55007,
## 49031, 51017, 51111, 51113, 1029, 1031, 1037, 1061, 1067, 2220, 2230, 6003,
## 1131, 1011, 6049, 12055, 6103, 6015, 2013, 6031, 13069, 13081, 2270, 13093,
## 13095, 13101, 13109, 13119, 12089, 13023, 5001, 13053, 10005, 11001, 12003,
## 2275, 12029, 5019, 12041, 12043, 12045, 5043, 5017, 5025, 16003, 5093,
## 5099, 5071, 5137, 13321, 5003, 16077, 5101, 18149, 18159, 18161, 18077,
## 18101, 5129, 16023, 16033, 16053, 13309, 18013, 18045, 13147, 13155, 13159,
## 13173, 16015, 21123, 21135, 16021, 21171, 13181, 19075, 19077, 19089,
## 19093, 16051, 19171, 13211
```



Computing Environment

```
Sys.time()
```

```
## [1] "2018-09-25 08:15:20 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
```