

# Mapping Commuting Patterns in Philadelphia

## Using Census LODES Data

January 2023 | Sam Fraley

As one of the largest metropolitan areas in the United States, the Philadelphia region has a diverse regional economy fueled by worker mobility. Encompassing three states and eleven counties, workers travel up to x miles to work. The US census conducts a LEHD survey to produce the LODES data set, which contains home and work locations for commuters at the census block level. Using this data, we aim to map and quantify the commuting patterns in Philadelphia. Understanding where people are commuting to can better inform where businesses and service providers decide to locate, along with the strategic investment of training programs.

### Data & Methods

The LODES data set contains data on jobs for every combination of resident and workplace census blocks in each metro area. The data includes total jobs, along with demographics such as age bins, income bins, and industry sector for jobs. We follow the approach of Evans (2017) in cleaning and structuring the exported LODES data by first aggregating to the census tract level. We look only at commuters inside of the metro area, so those who live in the metro and commute out or commute in from a different metro area are excluded.

After constructing the multiline features that represent home and work destinations for commuters, we vary the map symbology by worker count. Each line represents 20 workers, so commute paths with more than 20 workers will have multiple lines and thus appear darker. We use this method to construct an interactive dashboard in ArcGIS Online, allowing users to select a commute path via table and see dynamic graphs for each of the demographic bins.

Because data is presented as a home and work tract, we can use GEOIDs to further aggregate our data to the county level, and thus compare the commute patterns and demographics of the different counties in the MSA. Table 1 provides a simple breakdown of total commuters that have a home tract in each county, and the share of these commuters that have a work destination inside and outside of the county.

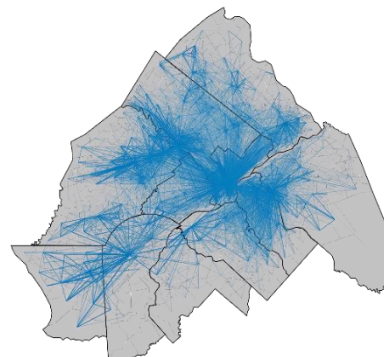


Figure 1 Mapping home-work destination commuter lines

In total, our analysis captures **over 4.5 million** jobs of commuters that represented over an **estimated 900,000** combinations of resident-work place locations across the metro area. Philadelphia County had both the most resident and workplace jobs, with 8,500 different commute lines having resident locations in Philadelphia County and 10,400 having workplace locations in Philadelphia County.

## **Breaking Down Commute Patterns**

We can use our constructed commute lines and their demographic bins to calculate difference in inflow/outflow, and break this down slightly by age, income, and industry. We first look at the total jobs by home residence and workplace residence for each county:

Table 1 breaks down jobs by county of employment by workers who live in the same county they are employed in, and those who live in a different county. Philadelphia County by far has the highest total jobs present in this analysis at roughly 525,000. However, Montgomery County has the most jobs filled by residents of another county (those who commute into the county) at about 55%.

**Table 1: Percent of All Jobs That Are Filled by Commuters,**

County of Employment	Total Jobs	% Jobs Filled by Residents of Another County
Montgomery County	385,000	55%
Gloucester County	70,000	54%
Delaware County	169,000	53%
Salem County	12,000	52%
Burlington County	129,000	50%
Camden County	137,000	50%
Chester County	180,000	48%
Philadelphia County	525,000	44%
Bucks County	192,000	44%
Cecil County	17,000	34%
New Castle County	214,000	24%

LODES data provides breakdowns of age, income, and industry for each job. We use the home and work destinations for each job to determine the share of a total demographic are filled by commuters for each county. Tables 2-X provide breakdowns of the total job count for each demographic, along with the share of these total jobs that are filled by residents of another county.

## Workers Aged 29 and Younger

Over 470,000 of jobs in the metro area are filled by workers aged 29 and younger, accounting for roughly 1 in 5 of all jobs. Philadelphia County by far has the largest total jobs filled by these young workers. While there are only 19,000 jobs filled by young workers in Gloucester County, these jobs make up about 27% of all jobs in the county (Table X).

In terms of commuting, Gloucester and Bucks County have the highest portion commuter jobs filled by young workers. These two counties have over 23% of commuter jobs filled by workers aged 29 and younger, whereas Salem and Philadelphia County both have less than 19%. While it may seem counterintuitive that there are fewer young commuters into Philadelphia, it might make sense as more younger workers may simply relocate and live in the city.

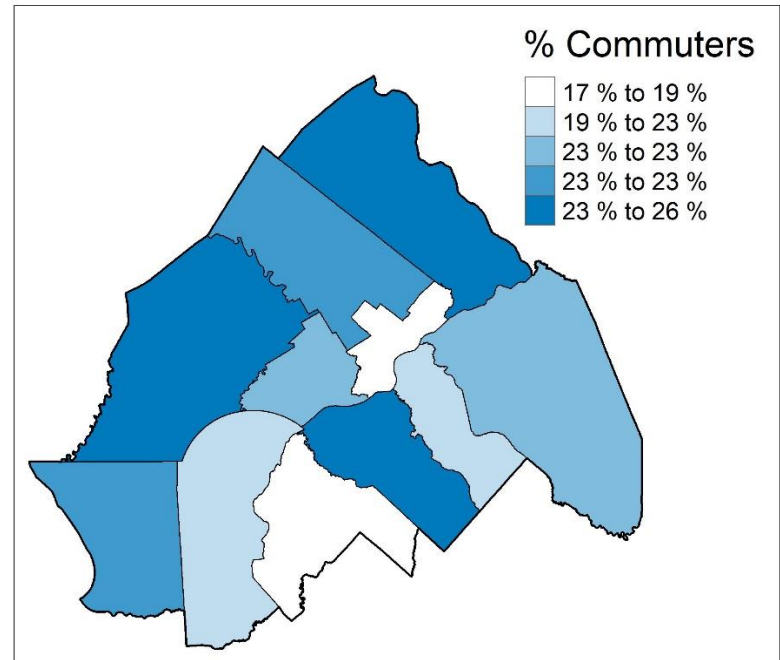


Figure 2: Share of All Commuters That Are Aged 29 and Younger

County of Employment	Young Worker Jobs	Share
Gloucester County	19,000	27%
Cecil County	4,000	27%
Camden County	33,000	24%
Bucks County	46,000	24%
Philadelphia County	124,000	24%
Burlington County	30,000	23%
Delaware County	39,000	23%
New Castle County	49,000	23%
Chester County	41,000	23%
Montgomery County	84,000	22%
Salem County	2,000	19%

Table 2: Jobs Filled by Workers Aged 29 and Younger

## Workers Aged 55 and Older

Jobs filled by workers aged 55 and older make up about a quarter of all jobs in the metro, a slightly larger share than those filled by young workers.

While Philadelphia County again had the largest total workers in this age bin, it had the smallest share at only about 22%. In contrast, almost 1 in 3 jobs in Salem County were filled by workers aged 55 and older.

Workers in this age bin may be further along in their career and possibly considering retirement, both of which could inform their decision on where to live relative to work. We find that Philadelphia County has a large share of commuters in this age bin, probably as older workers choose to relocate to the suburbs while remaining employed in the city.

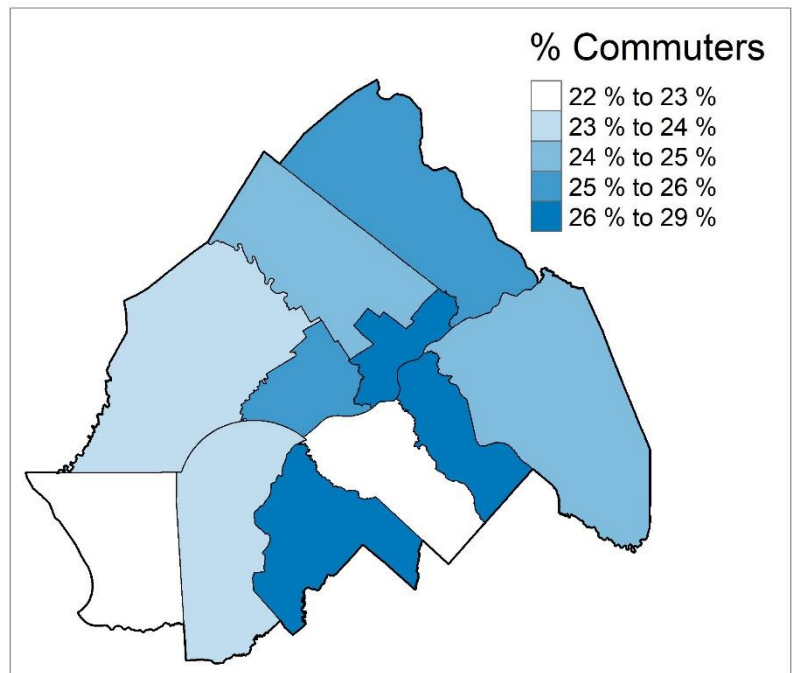


Figure 3: Share of All Commuters That Are Aged 55 and Older

County of Employment	Older Worker Jobs	Share
Salem County	4,000	33%
Bucks County	54,000	28%
Delaware County	45,000	27%
Burlington County	34,000	26%
Montgomery County	100,000	26%
Chester County	46,000	26%
Camden County	35,000	26%
Gloucester County	17,000	24%
Cecil County	4,000	24%
New Castle County	50,000	23%
Philadelphia County	118,000	22%

Table 3: Jobs Filled by Workers Aged 55 and Older

## Very Low Income

The income bins from LODES data break down jobs by monthly earnings, with the lowest being jobs paying less than \$1,250 a month (or \$15,000 annual gross pay). These represent extremely low-income jobs, and they make up about 17% of all jobs in the metro area. While Philadelphia has the most jobs in this income bin (about 82,000), it has one of the lowest shares of jobs in this income bracket (Table X).

While commuting for a job this low income may not seem to make sense, it does happen across the MSA. Gloucester and Bucks County have the highest share of commuters in this income bin, both almost at 18%. New Castle and Philadelphia County have the lowest share of very low-income commuters, with below 12% of commuters in these counties earning less than \$1,250 a month.

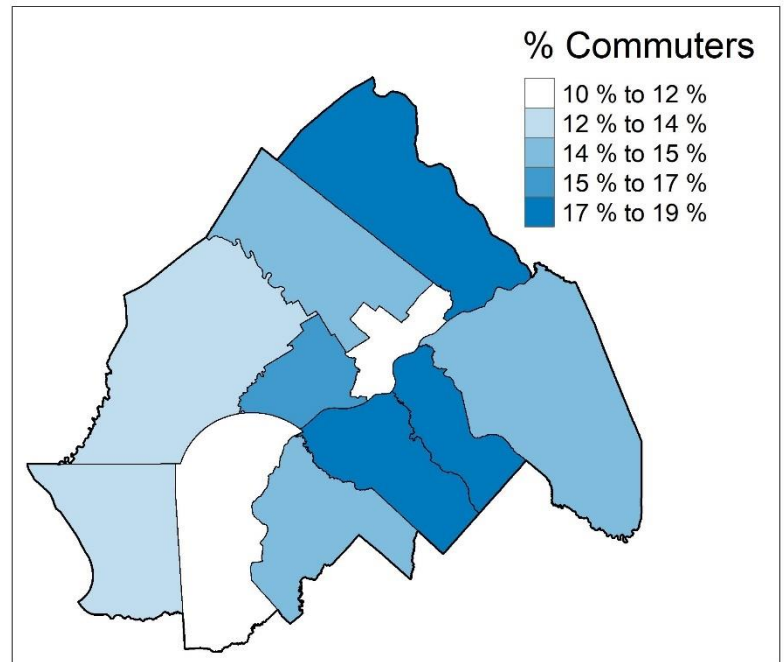


Figure 4: Share of All Commuters That Earn Less Than \$1,250 a Month

County of Employment	Very Low-Income Jobs	Share of All Jobs
Gloucester County	15,000	21%
Bucks County	39,000	20%
Camden County	27,000	20%
Delaware County	32,000	19%
Cecil County	3,000	18%
Burlington County	22,000	17%
Salem County	2,000	17%
New Castle County	35,000	16%
Philadelphia County	82,000	16%
Chester County	28,000	16%
Montgomery County	59,000	15%

Table 4: Jobs Filled by Workers Earning \$1,250 a Month or Less

## Goods Producing Industry Sectors

According to the Bureau of Labor Statistics, the Goods Producing industry super sector contains occupations in natural resources & mining, construction, and manufacturing. Jobs in this super sector make up about 13% of MSA jobs in the analysis, with the majority being located in Montgomery County. While Philadelphia County had the third highest total Goods Producing jobs, it had the lowest share at only 6%.

Just over 44% of all commuter jobs in Cecil County worked in Goods Producing industry sectors, by far the highest share of the 11 counties. Salem and Gloucester counties were the next highest shares, but they had only 23% and 21% of their commuter jobs in Goods Producing sectors respectively. Goods Producing jobs are thus primarily located in Montgomery, Bucks and Philadelphia counties, but make up larger share of commuters in Cecil, Salem, and Gloucester counties.

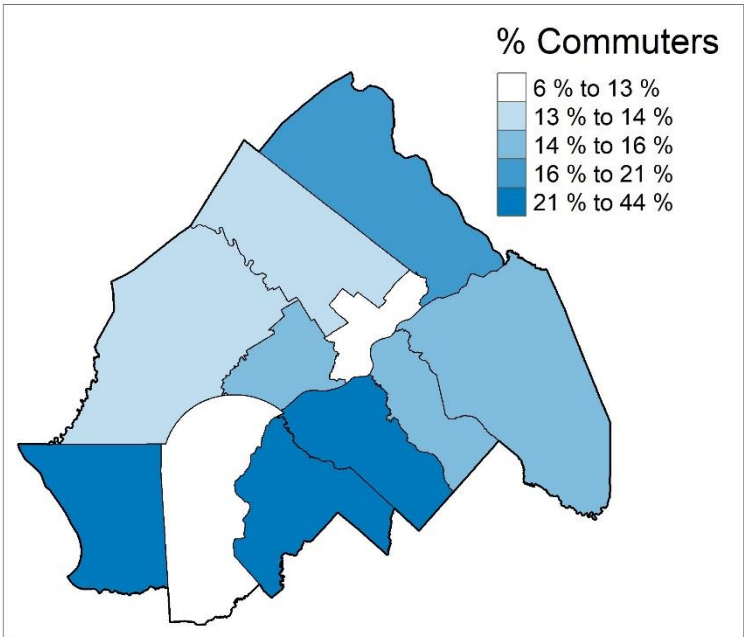


Figure 5: Share of All Commuters That Are in Goods Producing Industry Sectors

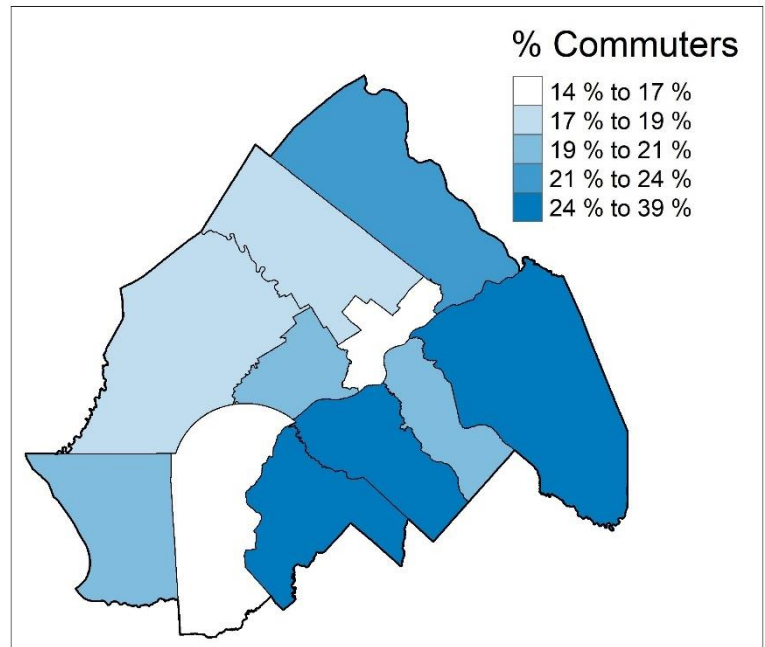
County of Employment	Goods Producing Jobs	Share of Total Jobs
Cecil County	5,000	29%
Salem County	3,000	25%
Gloucester County	14,000	20%
Bucks County	37,000	19%
Burlington County	20,000	16%
Camden County	21,000	15%
Montgomery County	58,000	15%
Chester County	27,000	15%
Delaware County	24,000	14%
New Castle County	23,000	11%
Philadelphia County	30,000	6%

Table 5: Jobs Filled by Workers in Goods Producing Industry Sectors

## Trade, Transportation and Utilities Super Sectors

Trade, Transportation and Utilities super sectors consist of occupations in service providing industries and are grouped into two sectors: retail and manufacturing trade. These jobs make up about 19% of metro jobs in our analysis, primarily being in Philadelphia, Montgomery, and Bucks Counties.

These jobs contribute more to total commuting jobs in Salem, Gloucester, and Burlington counties, where they make up about 40%, 36% and 24% of total commuters respectively. Philadelphia and New Castle counties have less of their commuter jobs in these industries, both being at or below 15%. While Montgomery County had the most local jobs being filled by commuters, only 18% of these commuter jobs were in Trade, Transportation and Utilities sectors.



**Figure 6: Share of All Commuters That Are in Trade, Transportation and Utilities Super Sectors**

County of Employment	Trade, Transportation & Utilities Jobs	Share
Salem County	12,000	33%
Gloucester County	70,000	33%
Burlington County	129,000	25%
Cecil County	17,000	24%
Bucks County	192,000	22%
Camden County	137,000	20%
Montgomery County	385,000	18%
New Castle County	214,000	18%
Delaware County	169,000	18%
Chester County	180,000	17%
Philadelphia County	525,000	15%

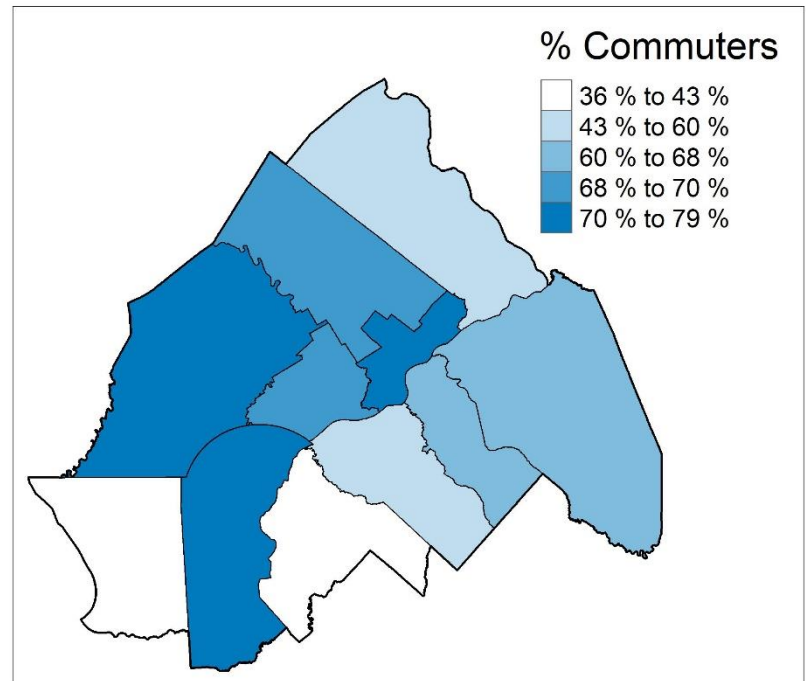
**Table 6: Jobs Filled by Workers in Trade, Transportation and Utilities Super Sectors**



## All Other Service Industry Sectors

Lastly, All Other Service Industry sectors are those not in wholesale or retail trade sectors. This is one of the largest super sectors, making up almost 68% of all metro jobs in our analysis. In contrast to the other industry super sectors, Philadelphia by far had the largest share of jobs in All Other Service Industry sectors at about 80%. Counties that had high share of Goods Producing and Trade, Transportation & Utilities sector jobs had much lower shares of All Other Service Industry sector jobs.

While Philadelphia County consistently has had a lower share of commuter jobs across other metrics, All Other Service Industry sector jobs made up the largest share of Philadelphia commuters compared to other counties. About 78% of jobs filled by commuters into Philadelphia were in these industry sectors, compared to under 40% for Salem and Cecil counties. This highlights the variation in economies across the metro region, where counties like Philadelphia are home to other service industry jobs like hospitality, compared to the more wholesale and retail trade dominant counties like Salem and Cecil.



**Figure 7: Share of All Commuter Jobs That Are In All Other Service Industry Sectors**

County of Employment	All Other Service Jobs	Share of All Jobs
Philadelphia County	418,000	80%
New Castle County	153,000	71%
Delaware County	116,000	69%
Chester County	121,000	67%
Montgomery County	258,000	67%
Camden County	88,000	64%
Burlington County	77,000	60%
Bucks County	112,000	58%
Gloucester County	33,000	47%
Salem County	5,000	42%
Cecil County	7,000	41%

**Table 7: Jobs Filled by Workers in All Other Service Industry Sectors**



## **Conclusion & Future Research**

The Philadelphia metro area is a diverse regional economy that is home to over 6 million individuals, many of whom live and work in different neighborhoods and counties. Measuring worker mobility and commute patterns is an important step in determining worker flows across the county and is important for policy makers to consider as they target strategic workforce investment programs. In our analysis, we find the share of local jobs filled by commuters varies across the counties that make up the metro area and is further varied when we consider various demographic breakdowns. The Philadelphia metro area is home to businesses that operate across a wide range of industries, and their decision on where to locate will impact where workers decide to live and commute. Being home to Center City and the largest county, our analysis shows that Philadelphia is home to a large work force, but also brings in commuters from the surrounding counties. Specifically, Philadelphia is the place of employment for many commuters in the service industry, compared to retail or commercial trade.

This analysis provides just a snapshot on how the LODS Origin-Destination data can be used to measure commuting in the region. Further research can be done to better explain the inflow and outflows of both jobs and residents in each county, and this analysis could also be broken down to the census tract level. In addition, as future data becomes available, this methodology could be applied to updated 2021 data. Comparing 2019 to 2021 LODS data will be extremely informative in measuring how commuting changed after the COVID-19 pandemic and help policy makers better understand how workers responded to economic slowdowns and the rise of remote work in the last almost three years.

## Bibliography

Evans, Thea. "Visualizing Commuting Patterns Using Public Lodes Data - Census.gov." *LEHD*, 2017, <https://lehd.ces.census.gov/doc/workshop/2017/Presentations/TheaEvans.pdf>.