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ECONOMIC
GROWTH &
MOBILITY
PROJECT

Accessing Economic Opportunity

Public Transit, Job Access, and
Equitable Economic Development in Three Medium-Sized Regions

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Introduction

For low-income residents unable to afford a car, inadequate public transportation can be a barrier to finding and maintaining employment. In a previous Federal Reserve Bank of Philadelphia study (DeMaria, 2018), the author examined the availability of public transportation and its impact on job access in northeastern Pennsylvania. The report highlighted strategies for public transit agencies working to improve bus systems and job access in their regions, noting the neighborhoods with the greatest regional job access were places where one could transfer between bus routes and across transit systems.

While a number of studies have examined public transit and job access in the context of the largest metropolitan areas (Tomer, Kneebone, Puentes, and Berube, 2011; Tomer, 2012; Owen and Murphy, 2018), fewer studies have focused on public transit and job access in medium-sized metropolitan areas, where the sustainability of fixed-route public transit is challenged by less dense residential and employment patterns. In this study, we examine variations in public transit and job access across three medium-sized regions in the Mid-Atlantic region: York County, Pennsylvania; northeastern Pennsylvania (NEPA); and Atlantic County, New Jersey.[1] In addition, we identify employment centers and consider the percent of regional populations that can access each employment center, drawing attention to the interaction between land use and transportation in determining job access for transit-dependent residents.

Our research demonstrates how patterns of employment and public transit affect job access. Economic development practitioners and private firms alike can play an important role in driving equitable economic development by considering the extent to which prospective employees can access new employment locations. For example, they can encourage businesses growth in locations that local talent can already access by transit. Additionally, they can coordinate the expansion of access to existing employment centers that offer opportunity employment, used here to describe decent-paying jobs for residents without a four-year college degree. Business location decisions that proactively consider transit connectivity benefit both job seekers and employers by making it easier to find talent in tighter labor markets and connecting workers unable to access economic opportunity.

Our findings include the following:

1. A smaller share of residents in York County (37 percent) have access to transit than do residents in NEPA (71 percent) and

Atlantic County (73 percent). In all three regions, residents in low- and moderate-income (LMI) neighborhoods have greater access to transit than residents overall.
2. The share of opportunity employment within a 15-minute walk of a transit stop in York County (65 percent) is less than the share in NEPA (73 percent) and Atlantic County (84 percent).
3. The average resident in Atlantic County has access to a much larger share of regional opportunity employment via transit (30 percent) than does the average resident in York County (7 percent) and NEPA (12 percent).
4. Employment is more concentrated in Atlantic County than in the other two regions. Whereas about the same percent of total regional employment is found in employment centers in York County (51 percent) and NEPA (53 percent), the figure is markedly higher in Atlantic County (60 percent).
5. In all three regions, the employment centers with the greatest share of access by prime-age (25 to 54 years old) residents or residents living in LMI neighborhoods are not always the largest employment centers.

Background

The confluence of several major developments in the 20th and early 21st centuries has transformed the location of employment and who can access jobs in metropolitan areas. The development of interregional highways and commuter rails from cities to outlying suburbs and the proliferation of the automobile encouraged residence in suburban communities (Jackson 1985; Cervero, 1988). However, the economic opportunities that emerged in suburban communities were inaccessible to low-income workers, particularly communities of color living in urban areas (Rothstein, 2017), producing a spatial mismatch between inner-city residents and suburban job opportunities (Holzer, 1991). The industries that experienced the greatest degree of decentralization between 1986 and 2006 — i.e., transportation, finance, utilities, real estate, and construction (Kneebone, 2009) — also frequently coincide with the industries offering jobs that pay a decent wage and do not require a four-year college degree, as we demonstrate below.

In this context, transportation poses a barrier to employment for workers unable to afford a car because it limits one's job search radius and makes access to jobs in certain locations infeasible. Recent interviews with transit-dependent residents in NEPA highlighted that work is the hardest destination to reach, not only because of insufficient bus trip frequency or hours of operation but also because of the location of bus routes (Institute for Public Policy & Economic Development, 2017). Furthermore, the challenges of finding and commuting to work are arguably more pronounced in less densely populated areas, where activities are more dispersed (Dabson, 2018).

Given these mobility challenges, to what extent does access to transportation promote improved employment outcomes?

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[1] York County and Atlantic County compose the entirety of the York-Hanover, PA and Atlantic City-Hammonton, NJ metropolitan statistical areas, respectively. The Scranton–Wilkes-Barre–Hazleton, PA metropolitan statistical area includes Lackawanna, Luzerne, and Wyoming counties. Except where otherwise mentioned, northeastern Pennsylvania refers to only Lackawanna and Luzerne counties.

One study followed 466 public assistance recipients in Alameda County, CA, for three years in the early 1990s and found that obtaining a car significantly increased the odds of finding employment and leaving public assistance; there was also a positive, albeit small, effect of living near transit, even after controlling for car ownership (Cervero, Sandoval, and Landis, 2002). A later study examined the impact of car access on program and employment status among a large sample of public assistance recipients in Tennessee who were surveyed across four successive survey waves. The authors found that for respondents unemployed during the first survey wave, having a car during the first wave increased the probability of gaining employment and leaving public assistance in the fourth wave by 8 percentage points (Gurley and Bruce, 2005). While they found no significant effect on hours worked per week, they did find improvements in hourly wages, suggesting that enhanced geographic mobility promoted finding higher-paying jobs. Interestingly, although about a third of those surveyed gained access to a car during the study period, an almost equal share lost access during the same period.

There is evidence that a distinct share of households do not have access to a car and that an even larger share do not have stable access to a car in the medium term. According to 2017 American Community Survey 1-Year Estimates, 6 percent of households in York County, 11 percent of households in NEPA, and 17 percent of households in Atlantic County did not have access to a car. Using the nationally representative Panel Study of Income Dynamics (PSID), researchers determined that 46 percent of families in poverty reported transitioning into or out of car ownership at least once across seven survey waves from 1999 to 2011; families living in poverty for at least half of the seven waves reported even higher rates (51 percent) of transitioning into or out of car ownership (Klein and Smart, 2017).

The impermanence of car ownership is not surprising when considering the cost associated with this particular asset. Transportation costs represent the second largest category of household expenditures. Families in the bottom income quintile spend approximately 15 percent of their annual income on transportation expenditures (U.S. Department of Transportation Bureau of Transportation Statistics, 2017). The possibility of one's car breaking down and requiring a repair poses an additional threat to the economic security and job stability of low-income households, a sentiment expressed in interviews with residents of northeastern Pennsylvania (Institute for Public Policy & Economic Development, 2017). Lower-income families often experience income volatility from month to month (Morduch and Schneider, 2013), and about 41 percent of the general population would be unable to make a cash payment for an unexpected expense of $400 (Board of Governors of the Federal Reserve System, 2018). For some low-income families, public transit may serve as a more reliable and economically feasible transportation option.

The benefits of a robust public transportation system extend to regional economies.[2] In a study of medium-sized counties in the Midwest between 1998 and 2010, Faulk and Hicks (2016) find that the size of a county's bus transit systems (as measured by per capita operating expenditures) is significantly associated with lower employee turnover rates of 2 to 5 percentage points. More recent research has attempted to identify a causal relationship between public transit and employment outcomes. In 2013, flooding in New York City caused by Hurricane Sandy required the closure of the Montague Street Tunnel used by the R Train. Tyndall (2017) found that the unemployment rate in surrounding neighborhoods increased significantly in the aftermath of the transit disruption.

In this report, we examine differences in access to transit, access to jobs, and access to employment centers across three medium-sized metropolitan areas. In the following sections, we seek to answer the following questions.

1. In which industries is opportunity employment most prevalent, and what is the spatial distribution of opportunity employment?
2. To what extent are public transit options located near where residents live and work?
3. What percent of regional opportunity employment is accessible by transit within a reasonable commute time?
4. How accessible are employment centers to their region's labor force?

Methods

There is great variation in how scholars define transit access and job accessibility. Our approach to defining these concepts is inspired by Tomer, Kneebone, Puentes, and Berube's (2011) study of job access in the 100 largest metros and Barkley and Gomes-Pereira's (2015) study of public transportation and job access in northeast Ohio. In this section, we briefly describe the concepts and measures presented in this paper, reserving a more detailed description for the appendix.

The ability to commute to a job is necessary for stable employment, but it is insufficient if a prospective employee lacks the necessary credentials to obtain the job. In order to consider skills matching between workers and jobs, we examine access to opportunity employment as well as total employment. Adapted from Wardrip, Fee, Nelson, and Andreason (2015), opportunity employment is employment that does not require a four-year college degree and pays above the national annual median wage, once adjusted for local differences in price levels. In 2015, these are jobs that pay above $34,824 in York County, Pennsylvania; above $33,304 in northeastern Pennsylvania; and above $38,046 in Atlantic County, New Jersey. Opportunity

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[2] Barkley (2017) provides a concise review of the literature relating public transit and regional economic outcomes.

employment accounts for about 26 percent of regional employment in York County, 25 percent of employment in NEPA, and 21 percent of employment in Atlantic County.

Residential and job proximity to transit were measured by finding the walking distance along street segments between each census block and the nearest transit stop. A collection of neighboring census blocks constitutes a block group, which we refer to as a neighborhood and for which ancillary economic and demographic information is available. If at least half of the residents in a block group live within one-quarter of a mile of a transit stop, the neighborhood is considered to have five-minute access to transit. If at least half of the residents in a block group live within three-quarters of a mile of a transit stop, the neighborhood is considered to have 15-minute access to transit. These times assume a comfortable walking speed of three miles per hour.

We calculate access to employment by finding the percentage of regional jobs a resident can reach within 60 minutes, walking no more than 20 minutes total, between 6:00 a.m. and 9:00 a.m. on a typical weekday morning, when service is generally at peak frequency. For those working second or third shifts, weekends, or overtime, decreased service during off-peak hours can inhibit access to workplaces. To the extent that transit is most available on weekday mornings, transit access to work will be more limited at other times of day than is indicated in this analysis.

To identify employment centers, we perform a locally weighted regression of each neighborhood's employment density on the distance between the neighborhood and its county's corresponding central business district (i.e., York city, Scranton, Wilkes-Barre, and Atlantic City). We identify neighborhoods with a significantly greater employment density than predicted by the model and amalgamate these neighborhoods when they share a boundary of at least a quarter mile. Finally, we select employment centers that meet a certain minimum total employment threshold, which varies based on the level of employment in the county.

The share of the population that can access each employment center is determined by considering the neighborhoods that can access each center within a 60-minute commute, allowing for no more than 20 minutes of walking, on a typical weekday morning. We calculate the share of prime-age residents (25 to 54 years old) and residents of LMI neighborhoods that can reach each neighborhood included in an employment center. We then take the employment-weighted average of these shares for the constituent neighborhoods of each center.

Findings

Opportunity Employment
Educational attainment and skills match play a large role in the jobs for which individuals can compete. In a competitive jobs market, workers contend with at least two pivotal challenges: getting to and from work and having the skills necessary to
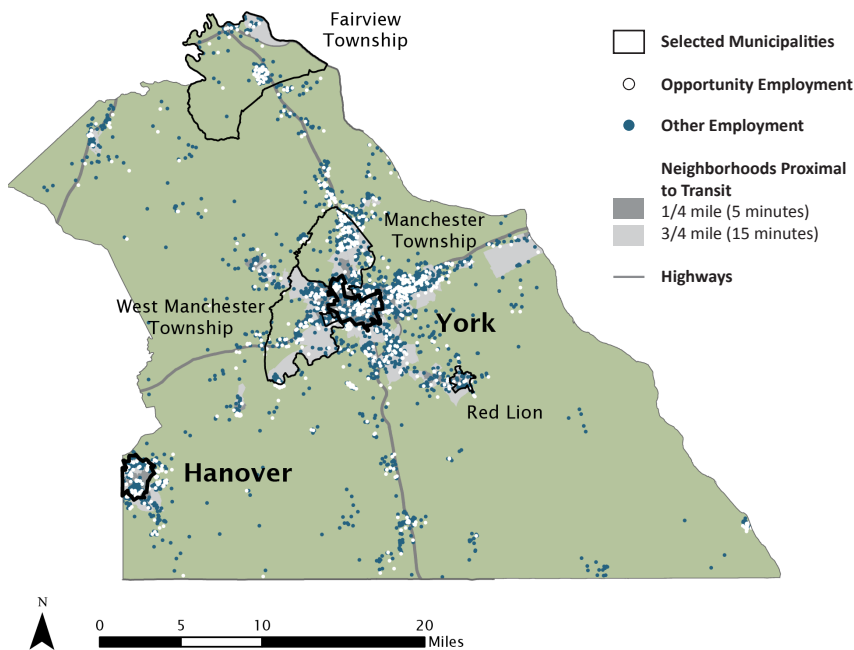
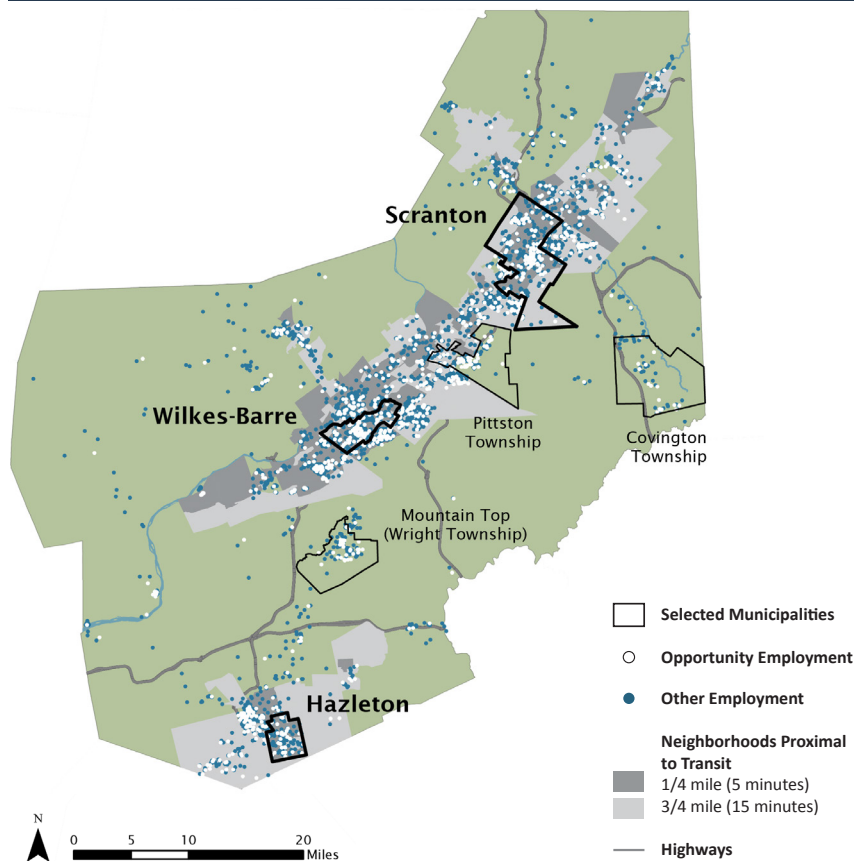| Figure 1. Opportunity Employment in York County, Northeastern Pennsylvania, and Atlantic County			
Industry	**York County**	**Northeastern Pennsylvania**	**Atlantic County**
Accommodation and Food Services	1,549	2,278	4,277
Administrative and Support and Waste Management and Remediation Services	2,057	3,324	901
Agriculture, Forestry, Fishing and Hunting	81	24	93
Arts, Entertainment, and Recreation	247	298	256
Construction	4,605	3,707	2,689
Educational Services	652	1,022	872
Finance and Insurance	631	1,921	379
Health Care and Social Assistance	4,115	7,148	3,017
Information	421	1,201	260
Management of Companies and Enterprises	739	512	122
Manufacturing	11,986	8,896	512
Mining	167	300	10
Other Services (Except Public Administration)	1,622	1,491	593
Professional, Scientific, and Technical Services	878	1,108	618
Public Administration	1,634	2,736	2,771
Real Estate and Rental and Leasing	406	438	332
Retail Trade	4,507	6,181	2,658
Transportation and Warehousing	3,841	7,180	1,010
Utilities	652	1,085	598
Wholesale Trade	2,351	3,567	886
Total Opportunity Employment	**43,142**	**54,419**	**22,852**

Note: Shading indicates the industries in each region with the largest quantity of opportunity employment. Opportunity employment estimates by industry do not sum to total because of rounding.

Sources: Authors' calculations using 2011–2015 American Community Survey (ACS) Public Use Microdata Sample (PUMS) 5-Year Estimates, Bureau of Economic Analysis (BEA) Regional Price Parities (RPPs) (2011–2015), and Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LEHD LODES) (2015)

Figure 2a. Neighborhood Access to Public Transit and the Location of Employment in York County

Legend:
- ☐ Selected Municipalities
- ○ Opportunity Employment
- ● Other Employment

Neighborhoods Proximal to Transit
- 1/4 mile (5 minutes)
- 3/4 mile (15 minutes)
- —— Highways

Figure 2b. Neighborhood Access to Public Transit and the Location of Employment in Northeastern Pennsylvania

Legend:
- ☐ Selected Municipalities
- ○ Opportunity Employment
- ● Other Employment

Neighborhoods Proximal to Transit
- 1/4 mile (5 minutes)
- 3/4 mile (15 minutes)
- —— Highways

obtain and maintain a good job.[3] With the understanding that a large segment of jobs are unavailable to those with lower levels of educational attainment, we focus our transit access analysis on opportunity employment.

The quantity of opportunity employment by industry is presented for York County, NEPA, and Atlantic County in Figure 1. In York County, opportunity employment is greatest in manufacturing, construction, and retail trade. The industries with the largest quantity of opportunity employment in NEPA are manufacturing, transportation and warehousing, and health care and social assistance. Atlantic County industries with the largest quantity of opportunity employment include accommodation and food services, health care and social assistance, and public administration.
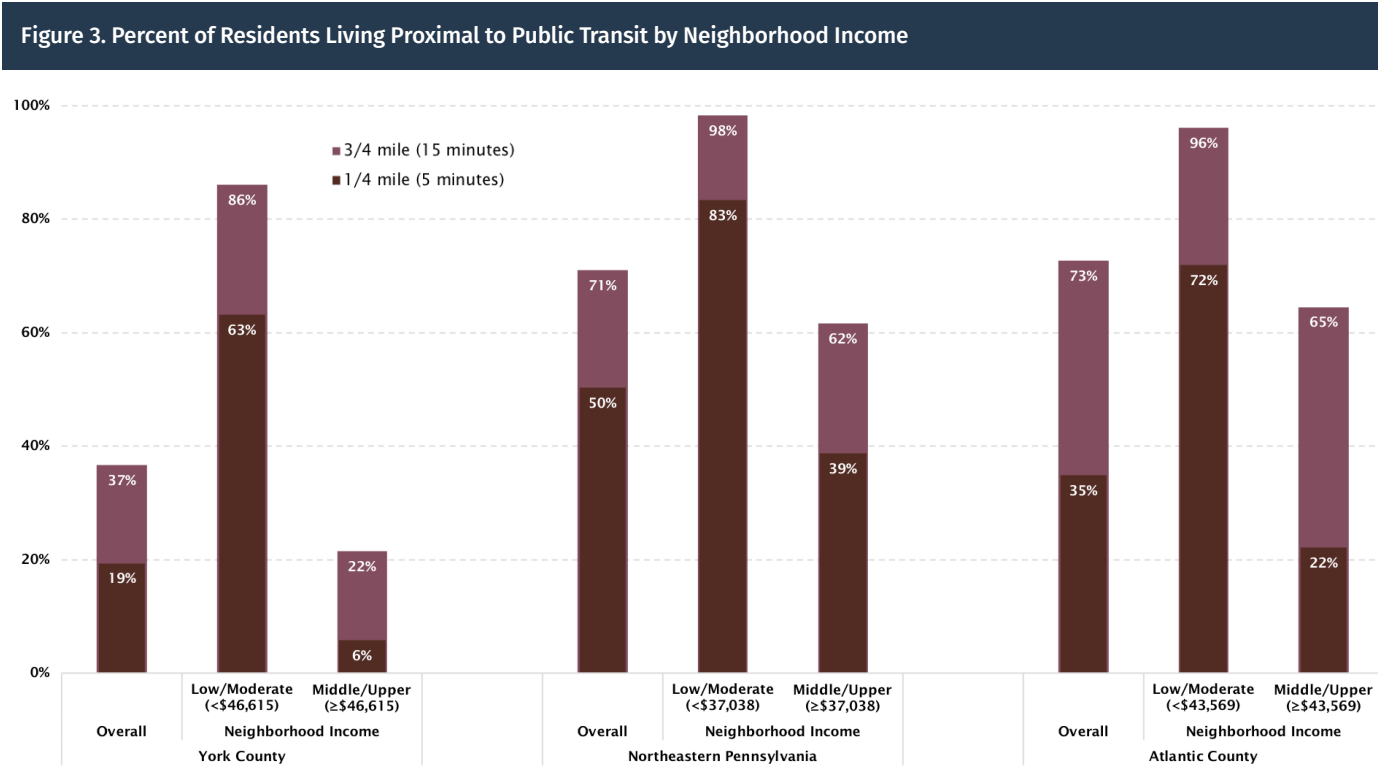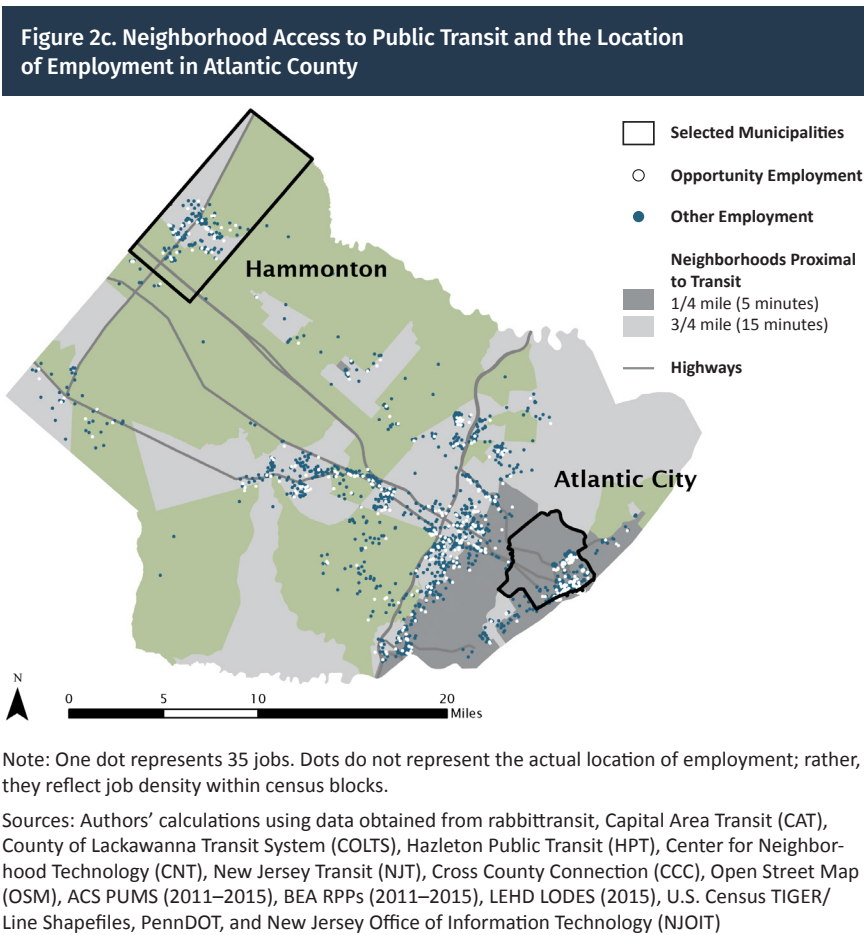
Residential Access to Transit

To examine regional differences in access to transit, we identify neighborhoods where residents can walk to a transit stop within five or 15 minutes. The spatial patterns exhibited indicate transit access is highest in urbanized areas, including along radial highway routes in each region (Figure 2). In York County, transit access is concentrated in York city and Hanover and Red Lion boroughs (Figure 2a). These municipalities are also the urbanized, more densely populated parts of York County. Transit access extends outward from the urban centers to additional neighborhoods adjacent to U.S. Route 30 and Interstate 83. NEPA and Atlantic County display similar spatial patterns. In NEPA, transit access is greatest in the cities of Scranton, Wilkes-Barre, and Hazleton, but transit is less accessible in neighborhoods proximal to Interstate 81 and U.S. Route 6 (Figure 2b). Access to transit in Atlantic County is greatest in Atlantic City and in adjacent inland neighborhoods, extending along the Atlantic City Rail Line, U.S. Route 30, and U.S. Route 40 (Figure 2c).

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[3] In the York–Hanover, Scranton–Wilkes-Barre–Hazleton, and Atlantic City-Hammonton MSAs, the unemployment rate for individuals aged 25 to 64 with a high school diploma or equivalent (4.4 percent, 5.0 percent, and 12.4 percent, respectively) consistently exceeded the rate for those with a four-year college degree or higher (2.3 percent, 1.9 percent, and 2.4 percent, respectively), according to 2017 American Community Survey 1-Year Estimates.

To quantify the observed spatial patterns, we calculate the percent of residents with five- and 15-minute access to transit (Figure 3). Slightly more than one-third of York County residents have 15-minute access to transit (37 percent), the lowest among the three regions. A substantially greater share of residents have access to transit in NEPA (71 percent) and Atlantic County (73 percent). Interestingly, the difference between the percent of residents with five- and 15-minute access is greatest in Atlantic County. One possible explanation for this finding is that a sizeable portion of the residential neighborhoods along the White Horse Pike and along Ventnor Avenue extend back from the bus routes on these major corridors, thereby requiring a greater walk to transit.

To examine differences in transit equity across the three regions, we disaggregate transit access by neighborhood income (Figure 3). We find that in each region, a higher percentage of residents in LMI neighborhoods live proximal to transit than do residents overall. Although the majority of residents in York County live outside of a walkable distance

Figure 2c. Neighborhood Access to Public Transit and the Location of Employment in Atlantic County

Note: One dot represents 35 jobs. Dots do not represent the actual location of employment; rather, they reflect job density within census blocks.

Sources: Authors' calculations using data obtained from rabbittransit, Capital Area Transit (CAT), County of Lackawanna Transit System (COLTS), Hazleton Public Transit (HPT), Center for Neighborhood Technology (CNT), New Jersey Transit (NJT), Cross County Connection (CCC), Open Street Map (OSM), ACS PUMS (2011–2015), BEA RPPs (2011–2015), LEHD LODES (2015), U.S. Census TIGER/Line Shapefiles, PennDOT, and New Jersey Office of Information Technology (NJOIT)

Figure 3. Percent of Residents Living Proximal to Public Transit by Neighborhood Income

Sources: Authors' calculations using data obtained from rabbittransit, CAT, COLTS, HPT, CNT, NJT, CCC, OSM, and ACS 5-Year Estimates (2011–2015)
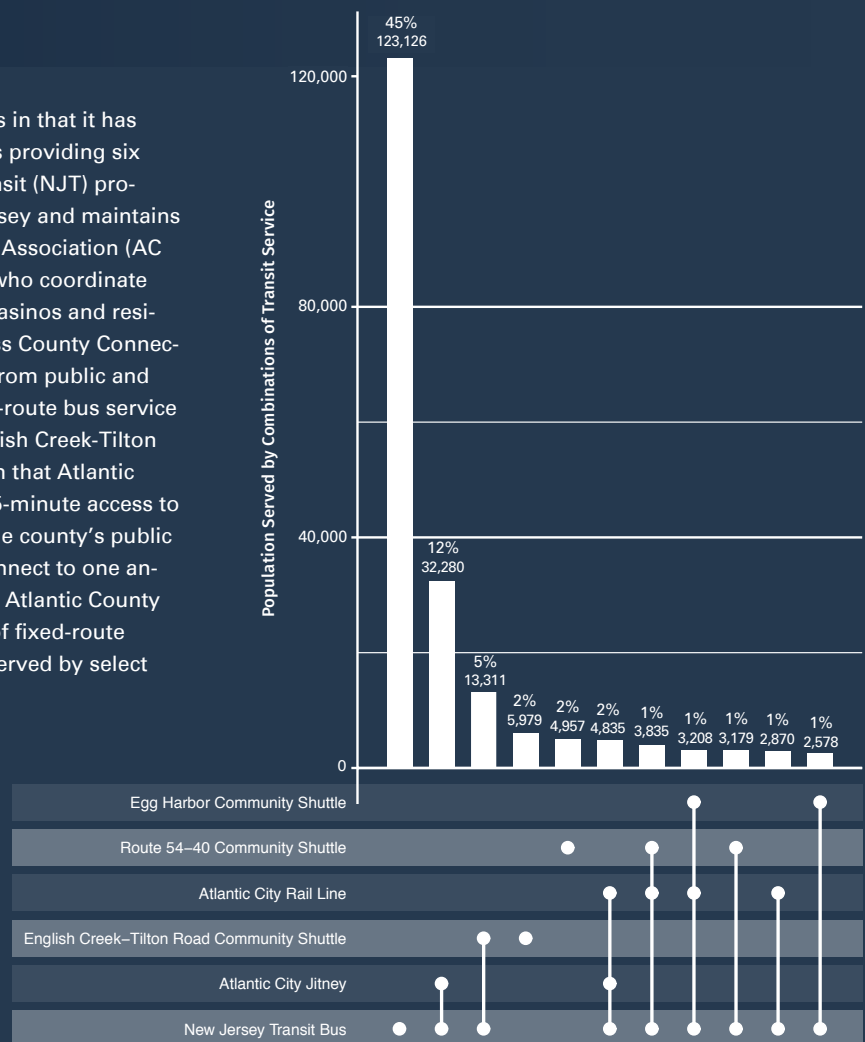
Box 1. The Integration of Public Transit in Atlantic County

Atlantic County is unique among the three regions in that it has three entities of different organizational structures providing six fixed-route services to residents. New Jersey Transit (NJT) provides fixed-route bus service throughout New Jersey and maintains the Atlantic City Rail Line. The Atlantic City Jitney Association (AC Jitney) is an association of private jitney owners who coordinate high-frequency, fixed-route service between the casinos and residential neighborhoods along Pacific Avenue. Cross County Connection (CCC) is a nonprofit organization that draws from public and private funding streams to provide selective fixed-route bus service in Atlantic County, including the Egg Harbor, English Creek-Tilton Road, and Route 54–40 community shuttles. Given that Atlantic County has the greatest share of residents with 15-minute access to transit, it is worth exploring the extent to which the county's public transit options serve distinct communities and connect to one another. Figure B1 shows the percent of residents in Atlantic County that are served exclusively by each combination of fixed-route service, and Figure B2 identifies neighborhoods served by select combinations of available options.

The greatest portion of Atlantic County residents (45 percent) are served solely by New Jersey Transit bus. The second-greatest share of residents (12 percent) are served by both New Jersey Transit bus and the Atlantic City Jitney. The third-largest share of county residents (5 percent) have access to transit from the combination of New Jersey Transit bus and the English Creek-Tilton Road community shuttle.

The existence of neighborhoods served exclusively by the English Creek-Tilton Road and Route 54–40 community shuttles

Figure B1. Percentage of Atlantic County Residents with 15-Minute Access to Transit Provided by Combination of Public Transit Service

Note: The bar percentages sum to 73 percent, the share of Atlantic County residents with 15-minute access to transit.

Sources: Authors' calculations using data obtained from NJT, CCC, OSM, and ACS 5-Year Estimates (2011–2015); see Lex et al. (2014) for information on this visualization technique

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of a transit stop, 86 percent of residents in LMI neighborhoods in the county have access to transit. An even higher percent of NEPA (98 percent) and Atlantic County (96 percent) residents in LMI neighborhoods live within 15 minutes of a transit stop. These neighborhoods are frequently located in those regions' urbanized areas, where transit service is densest.

In Box 1, we explore further the multiple public transit options in Atlantic County and the extent to which their integration provides access to transit in more outlying neighborhoods.
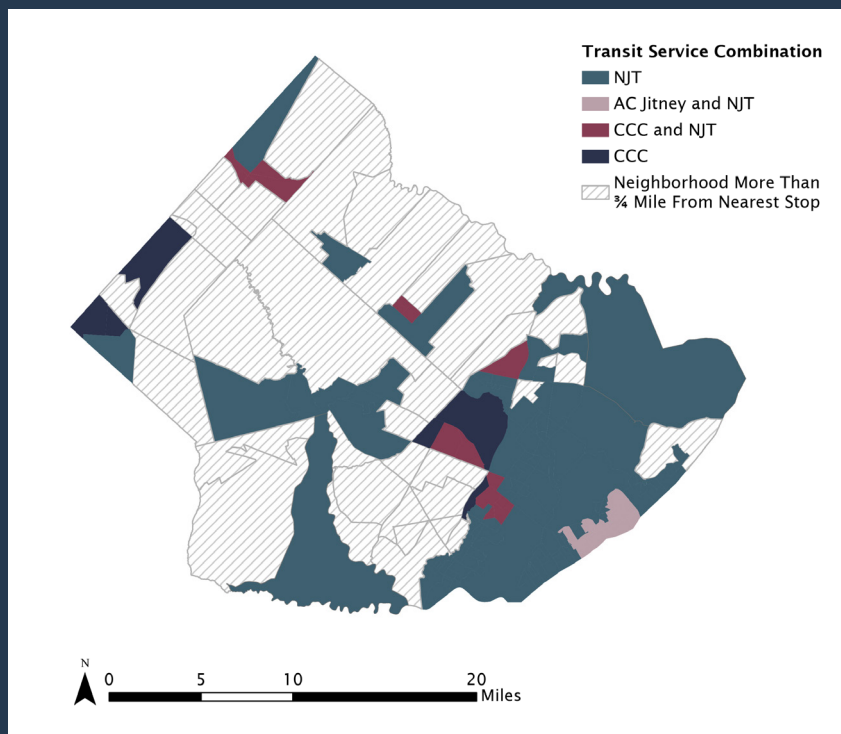
Job Proximity to Transit

We apply the same proximity analysis to the location of jobs relative to transit stops to find the share of jobs proximal to transit. In each region, opportunity employment is nearly as accessible by local transit services as is employment overall (Figure 4). In York County, 65 percent of opportunity employment and 67 percent of total employment are located within a 15-minute walk of a transit stop. The estimates are higher in NEPA (73 percent and 76 percent, respectively) and higher still in Atlantic County (84 percent and 86 percent, respectively). This indicates that the

indicates that the shuttles play an important role in serving the county's otherwise disconnected populations. Furthermore, there has also been an intentional effort to connect these shuttles to the New Jersey Transit network, as shown by the population served by a combination of New Jersey Transit bus and rail and the Egg Harbor, English Creek-Tilton Road, and Route 54–40 community shuttles. As a result, 9 percent of county residents are served by both New Jersey Transit and CCC. This analysis highlights how coordinated public transit systems can work in tandem to connect a region.

Figure B2. Neighborhoods with 15-Minute Access to Transit by Combination of Public Transit Service Providers

Sources: Authors' calculations using data obtained from NJT, CCC, OSM, ACS 5-Year Estimates (2011–2015), and U.S. Census TIGER/Line Shapefiles
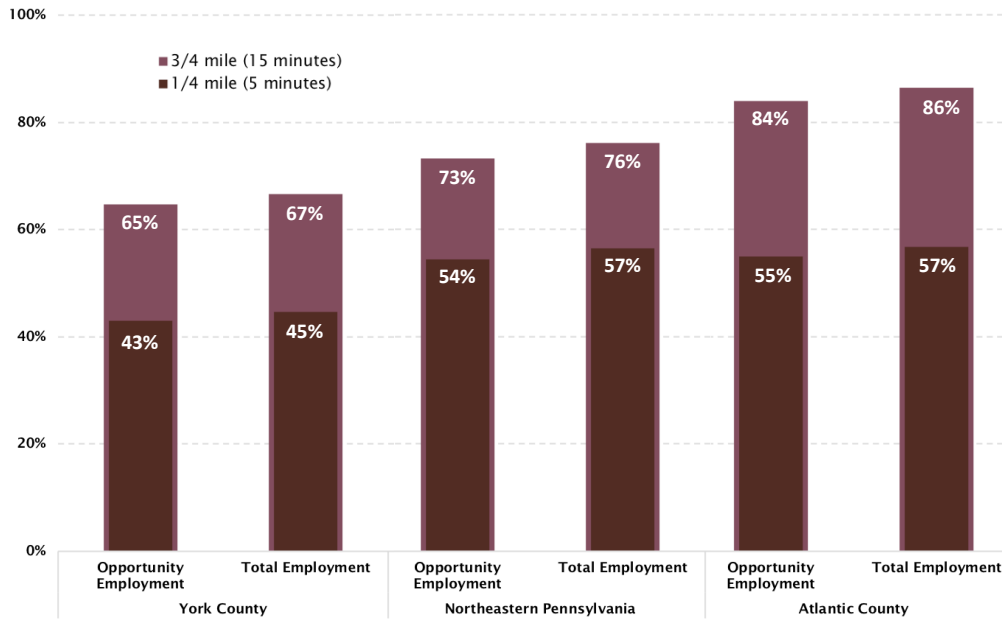
The average resident in York County can access 7 percent of opportunity employment within a 60-minute weekday morning commute, while the average resident in NEPA and Atlantic County has access to 12 percent and 30 percent, respectively.

To better understand differences in access to opportunity employment within regions, we classified neighborhoods according to the percent of regional opportunity employment accessible by transit: low access (less than 8 percent), middle access (between 8 and 27.5 percent), and high access (greater than 27.5 percent). As Figure 5 shows, a majority (74 percent) of residents overall in York County have low access to opportunity employment, a majority (55 percent) of NEPA residents overall have middle access to opportunity employment, and a majority (53 percent) of Atlantic County residents overall have high access to opportunity employment. However, in all three regions, access to opportunity employment is greater in LMI neighborhoods than in middle- and upper-income (MUI) neighborhoods. In fact, the percent of residents with middle and high access to opportunity employment in LMI neighborhoods exceeds that in MUI neighborhoods by 57 percentage points in York, 33 percentage points in NEPA, and 38 percentage points in Atlantic County.

We find that, within each region, the economic and demographic composition of low-access neighborhoods differs from that of high-access neighborhoods. The neighborhoods with low access to opportunity employment are generally dispersed outside the urban core of each county (Figure 6). Many of these neighborhoods are MUI, have high levels of educational attainment, and have predominantly white resident populations. Moreover, the vast majority of households in low-access neighborhoods in York County (94 percent), NEPA (95 percent), and Atlantic County (96 percent), on average, have access to a car (2015 ACS 5-Year Estimates). In contrast, the neighborhoods with high access to opportunity employment are concentrated in and around the urban core of each county. These neighborhoods are predominantly LMI, have relatively lower

spatial distribution of opportunity employment does not differ substantially from the spatial distribution of other employment.

Connecting Residents to Regional Jobs
The proximity of a transit stop to one's residence does not guarantee high access to opportunity employment. To consider neighborhood access to opportunity employment, we calculate the percent of regional opportunity employment that one can access within a 60-minute commute, requiring no more than 20 minutes of walking.

Figure 4. Percent of Employment Proximal to Transit in York County, Northeastern Pennsylvania, and Atlantic County

Legend:
- 3/4 mile (15 minutes)
- 1/4 mile (5 minutes)

York County:
- Opportunity Employment: 43% / 65%
- Total Employment: 45% / 67%

Northeastern Pennsylvania:
- Opportunity Employment: 54% / 73%
- Total Employment: 57% / 76%

Atlantic County:
- Opportunity Employment: 55% / 84%
- Total Employment: 57% / 86%

Sources: Authors' calculations using data obtained from rabbittransit, CAT, COLTS, HPT, CNT, NJT, CCC, OSM, ACS PUMS (2011–2015), BEA RPPs (2011–2015), and LEHD LODES (2015)
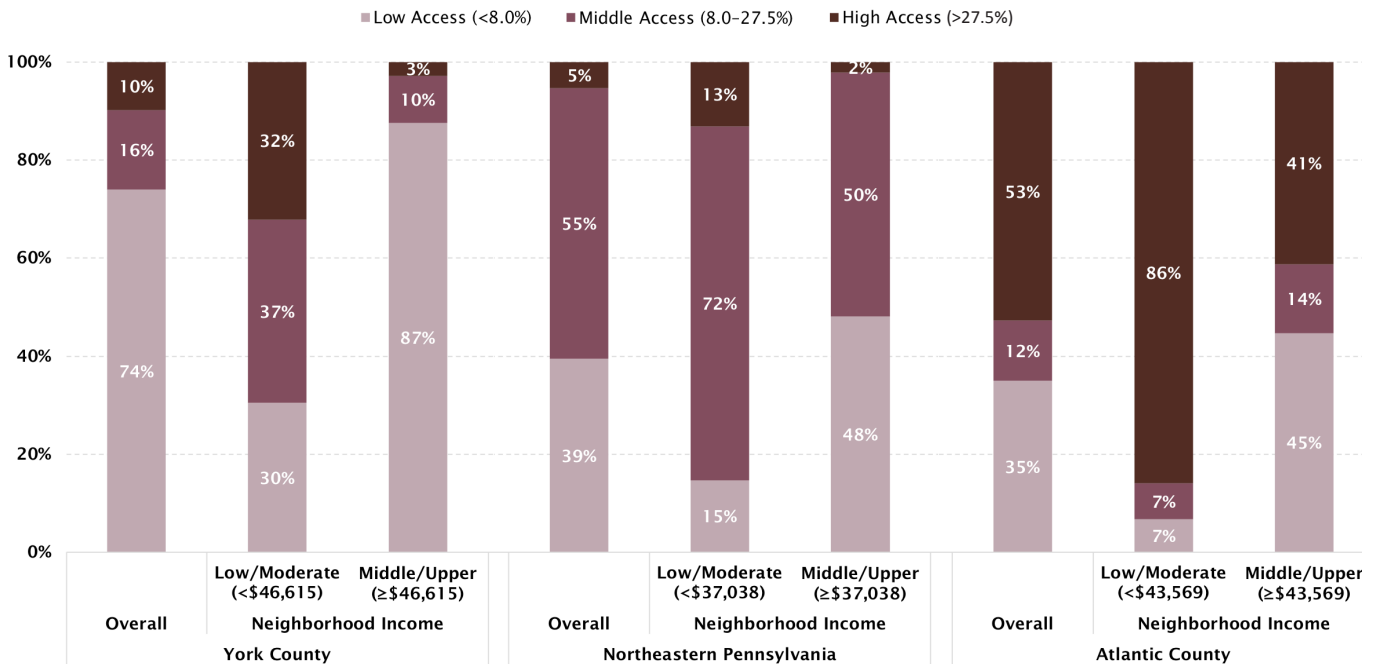
levels of educational attainment, and are relatively more racially and ethnically diverse. Nearly one-quarter of households in high-access neighborhoods, on average, do not have access to a car: 23 percent in York County, 25 percent in NEPA, and 25 percent in Atlantic County (2015 ACS 5-Year Estimates).

However, there exist a smaller number of LMI neighborhoods with low access to opportunity employment (Figure 6). In York County and NEPA, 10 percent of residents with low access live in LMI neighborhoods; in Atlantic County, the estimate is 5 percent. These represent places where the expansion of public transit might be considered.

Figure 5. Percent of Residents by Neighborhood Income with Low, Middle, and High Access to Regional Opportunity Employment

Legend:
- Low Access (<8.0%)
- Middle Access (8.0–27.5%)
- High Access (>27.5%)

York County:
- Overall: 74% / 16% / 10%
- Low/Moderate (<$46,615): 30% / 37% / 32%
- Middle/Upper (≥$46,615): 87% / 10% / 3%

Northeastern Pennsylvania:
- Overall: 39% / 55% / 5%
- Low/Moderate (<$37,038): 15% / 72% / 13%
- Middle/Upper (≥$37,038): 48% / 50% / 2%

Atlantic County:
- Overall: 35% / 12% / 53%
- Low/Moderate (<$43,569): 7% / 7% / 86%
- Middle/Upper (≥$43,569): 45% / 14% / 41%

Note: Percentages may not sum to 100 percent because of rounding.

Sources: Authors' calculations using data obtained from rabbittransit, CAT, COLTS, HPT, CNT, NJT, CCC, OSM, ACS PUMS (2011–2015), BEA RPPs (2011–2015), and LEHD LODES (2015)

Access to Employment Centers

Identifying LMI neighborhoods with low job access is important when factoring equity into the consideration of service expansion scenarios. However, understanding which areas have already high access can be important for private sector stakeholders, urban planners, and economic development practitioners considering locations for future employment growth. Within each study region, it is worth asking the interrelated questions: Where are jobs most concentrated, and what share of each region's population can access these employment centers? We identified nine employment centers in York, 12 in NEPA, and seven in Atlantic County (Figure 7). Three noteworthy patterns emerge by comparing employment centers in each region.

First, total employment is more concentrated in Atlantic County than in York County and NEPA. Because the definition of employment centers was applied consistently across the three regions, differences in the share of total regional employment located in employment centers indicates different degrees of employment decentralization. Whereas about the same percent of total regional employment is found in employment centers in York County (51 percent) and NEPA (53 percent), a more sizeable portion of total regional employment is located in employment centers in Atlantic County (60 percent).

The location of the largest employment centers provides additional nuance (Figure 8). Only in Atlantic County is the largest employment center centrally located in the downtown of a major city in the region. In contrast, the two York city employment centers are the sixth- and seventh-largest centers by total employment in York County. Scranton and Wilkes-Barre/Kingston are the second- and third-largest centers by total employment in NEPA. Together, these findings suggest employment decentralization is more substantial in York County and NEPA than in Atlantic County.

Second, the largest employment centers are not always the centers most accessible by prime-age residents and residents of LMI neighborhoods. This is most evident in York County, where the five largest employment

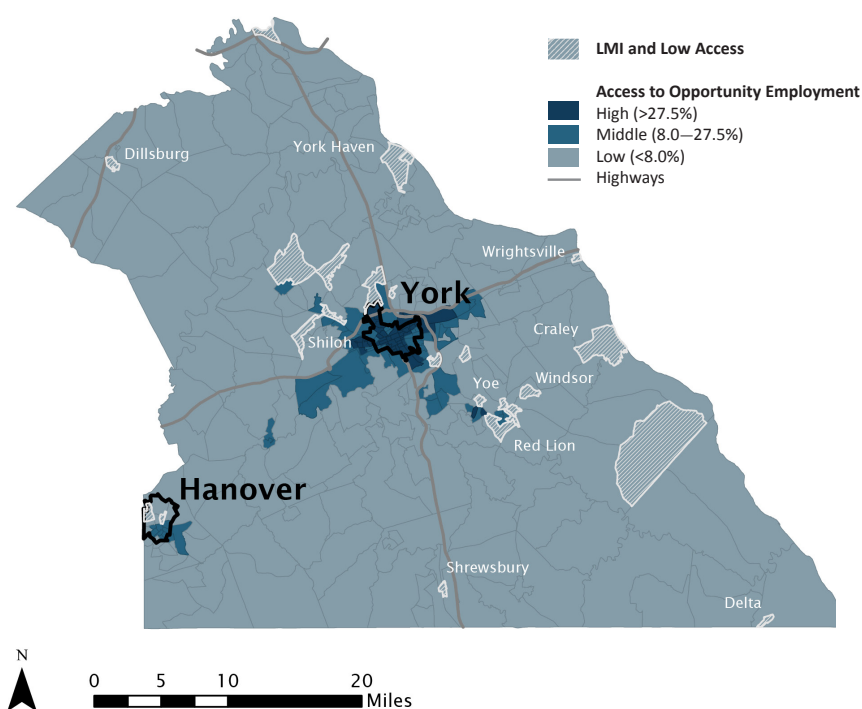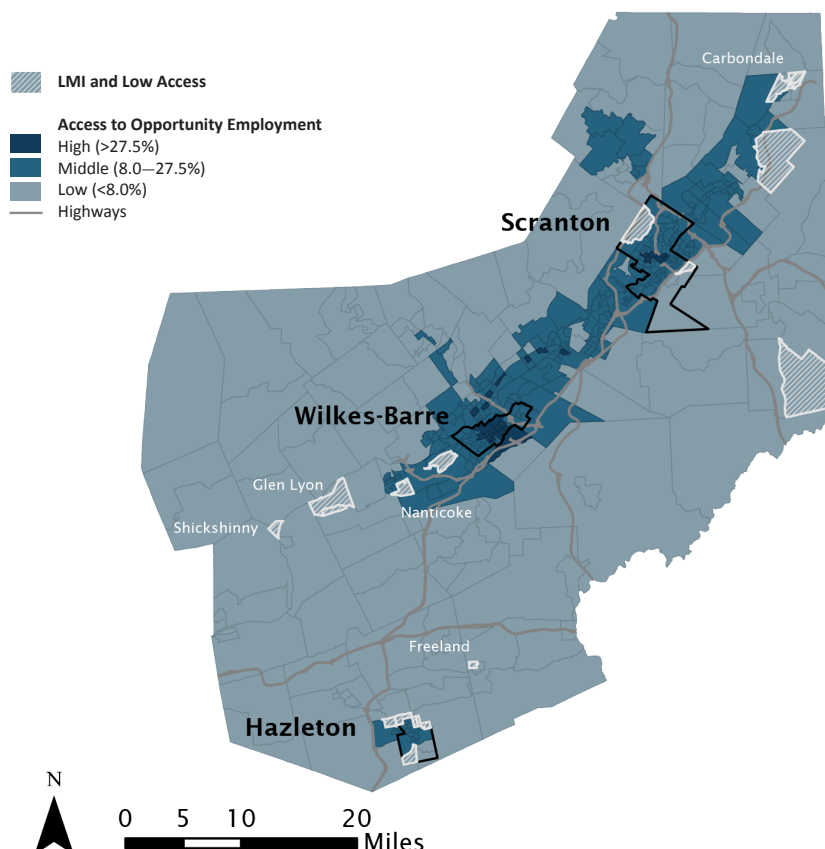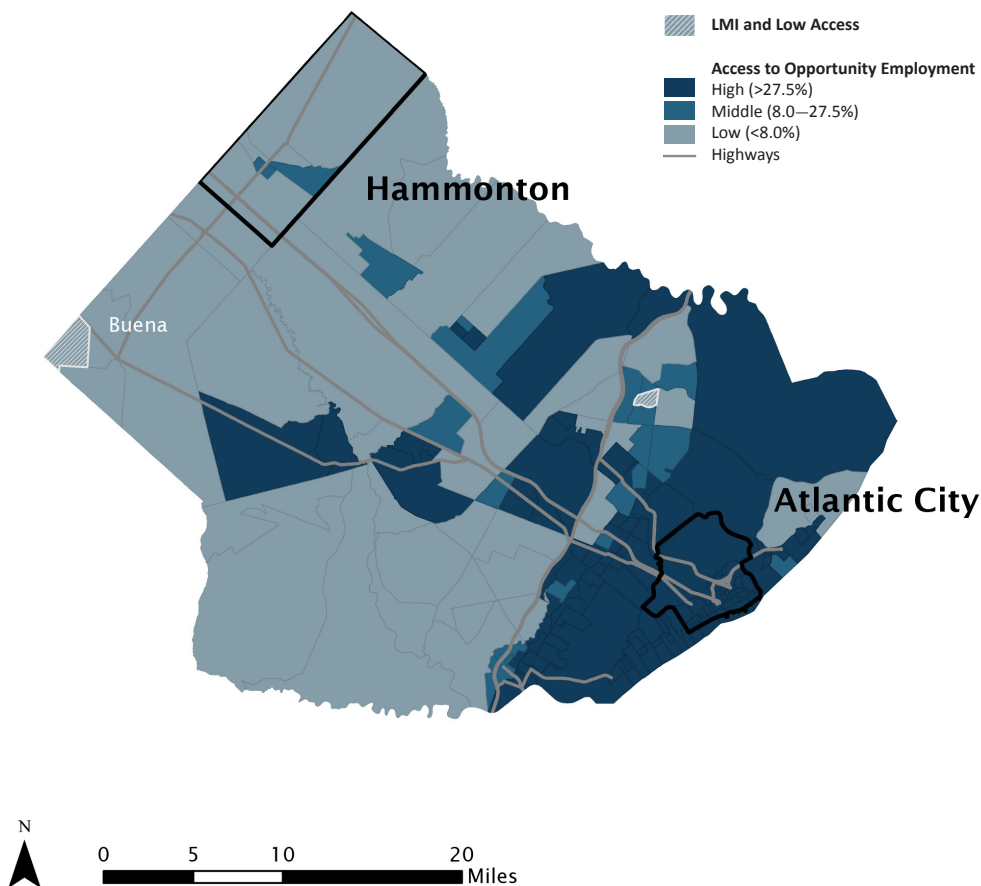**Figure 6a. Neighborhood Access to Opportunity Employment in York County**

Figure 6b. Neighborhood Access to Opportunity Employment in Northeastern Pennsylvania

Figure 6c. Neighborhood Access to Opportunity Employment in Atlantic County

Hammonton

Buena

Atlantic City

LMI and Low Access

Access to Opportunity Employment
High (>27.5%)
Middle (8.0—27.5%)
Low (<8.0%)
Highways

N

0 5 10 20 Miles

Sources: Authors' calculations using data obtained from rabbittransit, CAT, COLTS, HPT, CNT, NJT, CCC, OSM, ACS PUMS (2011–2015), BEA RPPs (2011–2015), LEHD LODES (2015), U.S. Census TIGER/Line Shapefiles, PennDOT, and NJOIT

on average, but the same is true for only 23 percent of prime-age residents. It is also evident for the Marina District in Atlantic County, where 65 percent of residents in LMI neighborhoods have access but only 27 percent of prime-age residents do. A plausible explanation is that in all three regions, LMI neighborhoods tend to be located in transit-dense, urbanized areas, whereas prime-age residents live throughout each region.

Discussion and Policy Implications

Transformative economies achieve economic growth by encouraging the new participation of people previously disconnected from the economy (Brophy, Weissbourd, and Beideman, 2017). They have the potential to create economic growth from which more are able to benefit. Public policy designed to promote regional growth and the economic mobility of LMI households requires engaging the economic structures that enable participation in the economy.

Our analysis of public transit and job access in three medium-sized regions reveals how the structure of land use and public transit shape the ability of people to access economic opportunity. Differences in the spatial concentration of employment and public transportation networks contribute to the finding that the average resident in Atlantic County can access a much greater share of regional opportunity employment (30 percent) than can the average resident in York County (7 percent) and NEPA (12 percent). These factors also contribute to the finding that the largest employment centers are not always the most accessible by transit.

Our research underscores the importance of considering the transit accessibility of both existing and burgeoning employment centers. In making site selection decisions, businesses perform a complex calculus requiring optimizing supply chains, maximizing access to markets, and competing for regional talent. The ability of transit-dependent residents to reach places of employment is a consideration with implications for both firms and workers.
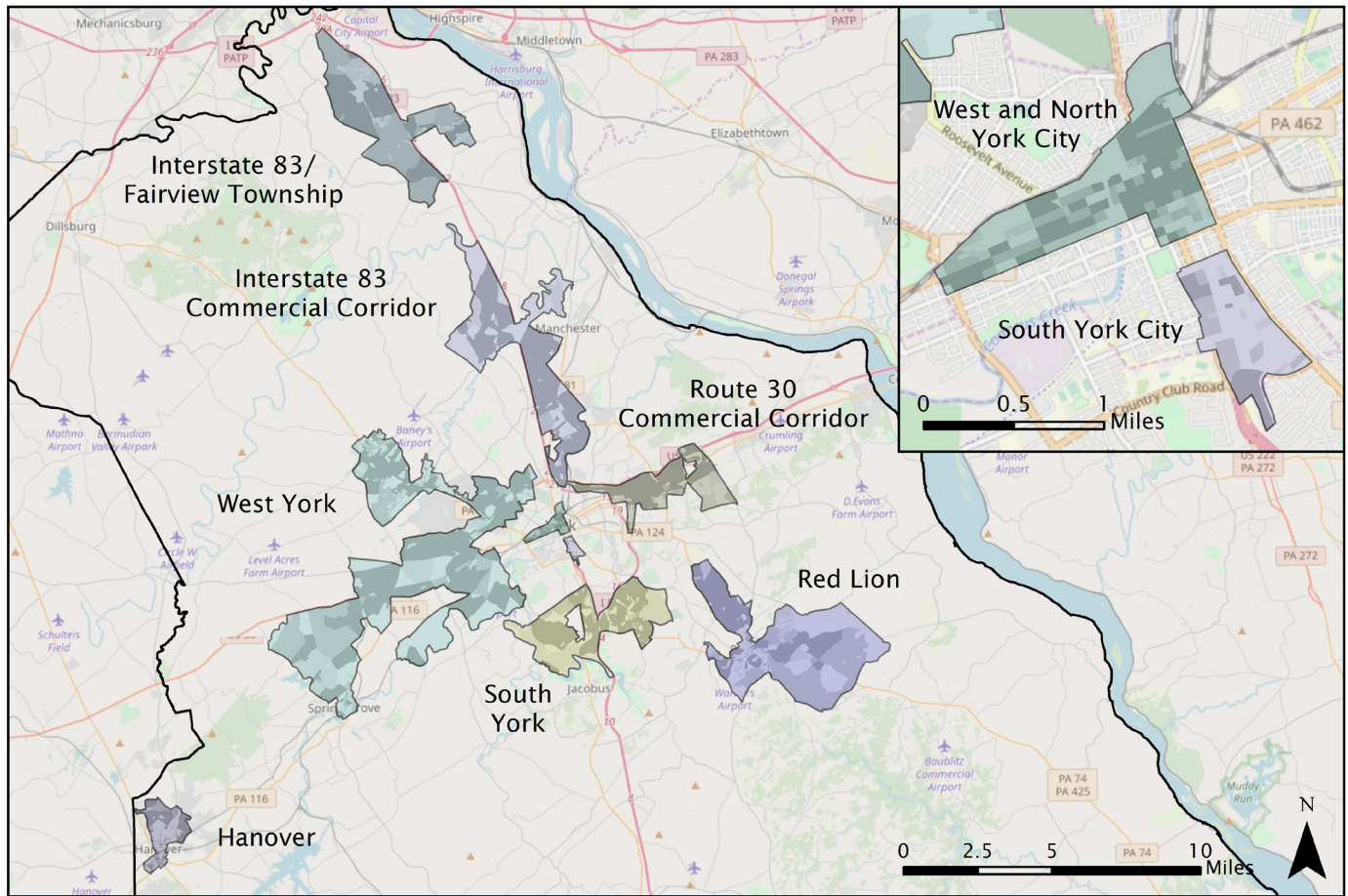
centers are each accessible by less than 10 percent of prime-age residents. This is explained by the fact that the centers with the greatest access by prime-age residents are also frequently situated in the downtowns of the major cities in each region, where the central transportation hubs are located. In a similar study, researchers identified the 10 largest employment centers in the greater Pittsburgh area and found that six of these 10 are accessible by less than 10 percent of all workers (Barkley, Garr Pacetti, and Bailey, 2018).

Third, employment center access by residents in LMI neighborhoods is generally greater than access by prime-age residents. This distinction is perhaps most evident in west and north York city; 61 percent of residents in LMI neighborhoods have access

Figure 7. Access to Employment Centers in York County, Northeastern Pennsylvania, and Atlantic County

Employment Center	Employment	Percent of County Employment	Average Share of Prime-Age Residents with Access	Average Share of Residents of Low- and Moderate-Income Neighbor-hoods with Access
York County				
West York	18,552	11%	9%	25%
Route 30 Commercial Corridor	16,124	10%	6%	18%
Interstate 83 Commercial Corridor	11,480	7%	4%	13%
South York	8,161	5%	3%	7%
Hanover	8,025	5%	4%	7%
West and North York City	7,418	4%	23%	61%
South York City	5,708	3%	18%	54%
Interstate 83/Fairview Township	5,283	3%	0%	0%
Red Lion	4,074	2%	2%	7%
Total Center Employment	**84,825**	**51%**		
Northeastern Pennsylvania				
Plains/Wilkes-Barre Townships	20,754	9%	6%	11%
Scranton	18,666	8%	29%	39%
Wilkes-Barre/Kingston	18,643	8%	28%	40%
Nanticoke/Hanover	11,167	5%	13%	25%
Dunmore	7,872	4%	7%	13%
Greater Hazleton	7,591	3%	4%	9%
Dickson City/North Scranton	7,433	3%	6%	11%
Greater Pittston	6,012	3%	17%	27%
Dallas	5,203	2%	5%	6%
Clarks Summit/Scott	5,105	2%	8%	13%
Jessup/Archbald/Jermyn/Mayfield	4,380	2%	2%	3%
West Scranton	4,097	2%	15%	23%
Total Center Employment	**116,923**	**53%**		
Atlantic County				
Boardwalk District	22,888	21%	57%	88%
Black Horse Pike Commercial Corridor	9,538	9%	18%	38%
Route 40/Tilton Road	8,857	8%	35%	63%
Marina District	7,014	7%	27%	65%
Route 9/Somers Point	6,539	6%	38%	70%
Galloway	5,313	5%	9%	16%
Hammonton	4,293	4%	6%	5%
Total Center Employment	**64,442**	**60%**		

Notes: Shading indicates, for each region, the three largest centers and the three centers with greatest access. The percent of opportunity employment located in the employment centers in York County (52 percent), NEPA (48 percent), and Atlantic County (56 percent) is nearly equal to the percent of total employment in each region's employment centers. We also calculated the average share of residents with less than a four-year college degree with access to each employment center and found the results to be nearly identical to those obtained from the analysis of access for prime-age residents.

Sources: Authors' calculations using data obtained from rabbittransit, CAT, COLTS, HPT, CNT, NJT, CCC, OSM, ACS PUMS (2011–2015), BEA RPPs (2011–2015), and LEHD LODES (2015)

Note: Shading within employment centers depicts places of concentrated employment.

Sources: Authors' calculations using data obtained from LEHD LODES (2015) and U.S. Census TIGER/Line Shapefiles

Local residents who are unable to afford a car struggle with having a limited area from which they can search for and obtain work. Likewise, the inability to fill open positions, which can be exacerbated by inadequate transportation, can result in costs to firms that are difficult to quantify (Cappelli, 2012). Ultimately, a shortage of workers is a detriment to the productivity of an individual firm; if this problem is common in a local economy, it is reasonable to believe that regional economic growth could be impeded, as well. To that end, the benefits derived from private investments, like those encouraged in Qualified Opportunity Zones,[4] will not be fully realized if LMI residents are unable to

access jobs at those sites. Economic development practitioners and private firms have the potential to further equitable economic development in their regions by considering the transit accessibility of future employment centers, among other factors, when determining the location of future employment growth.

In York County, innovative partnerships connecting transit-dependent workers to jobs are already underway. In one pilot program, private firms and the public transit agency have aligned shift schedules with bus timetables to promote equitable access to employment for disconnected workers (Borek, 2018). More generally, partnerships between public transit agencies and private firms have the potential to expand employment access for transit-dependent workers, especially where existing employment centers are concerned. Community outreach can then increase

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[4] In 2018, the U.S. Treasury, based on nominations from state governments, designated Qualified Opportunity Zones across the country in which investors can defer capital gains taxes on eligible investments. More information on the Opportunity Zone program can be found at https://www.irs.gov/newsroom/treasury-irs-issue-proposed-regulations-on-new-opportunity-zone-tax-incentive.

awareness of new and existing transportation options for residents who may be unaware of the services in their neighborhood.

The research presented here explores differences in neighborhood access to opportunity employment and the accessibility of employment centers in each region. Land use and public transit are interrelated, and economic development practitioners have the potential to promote economic growth and mobility for their regions. Considering the extent to which local talent can access areas of growing employment and targeting transportation network improvements to better serve existing employment centers are two strategies for realizing the benefits of transformative economies.

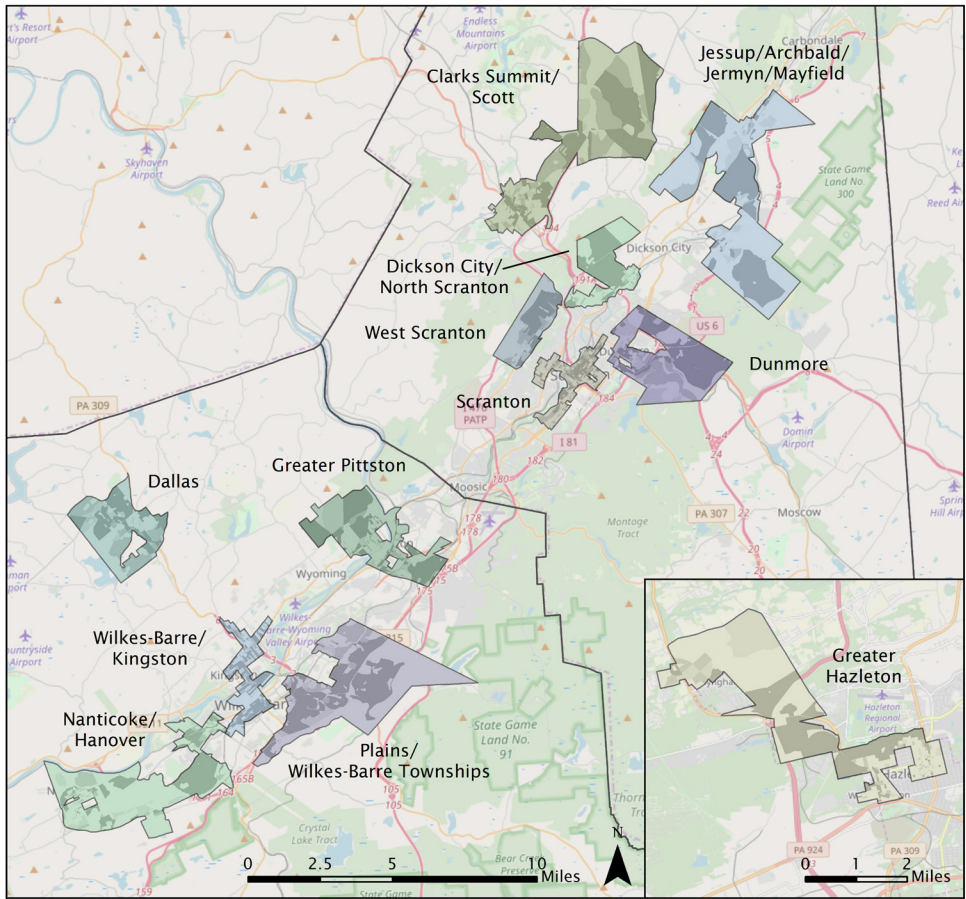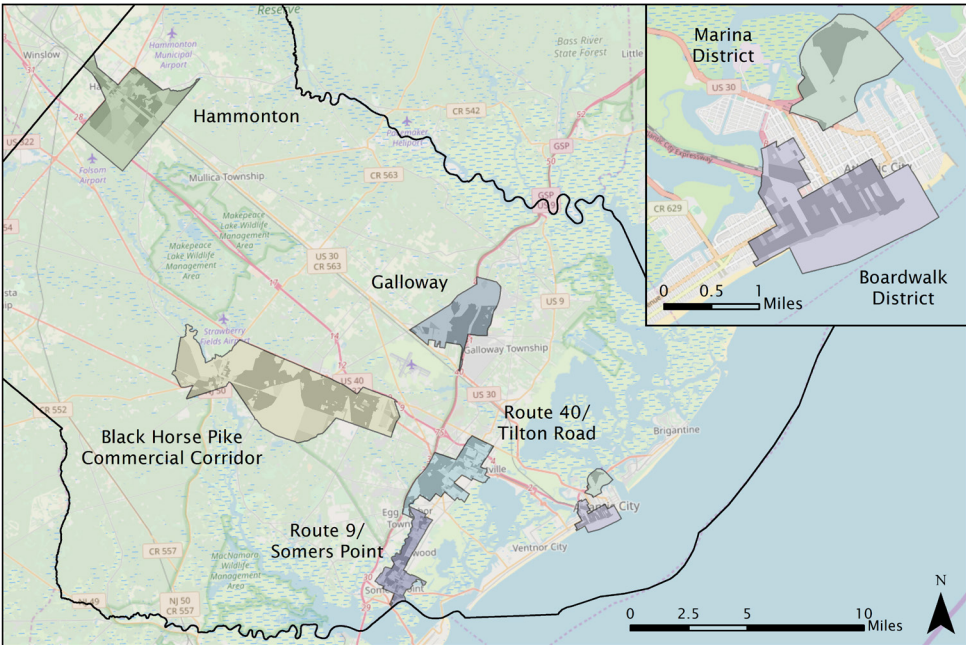Figure 8b. Employment Centers in Northeastern Pennsylvania

Figure 8c. Employment Centers in Atlantic County

Appendix

Opportunity Employment and Total Employment

In order to determine the quantity of opportunity employment within each industry, we began with an analysis of the 2011–2015 American Community Survey (ACS) Public Use Microdata Sample (PUMS). This sample contains responses from approximately 5 percent of U.S. households and includes detailed fields on individuals' employment status, industry of employment, wages, hours worked per week, weeks worked per year, and educational attainment. We subsetted the sample to include only respondents between the ages of 16 and 40 employed in Pennsylvania (for York County and NEPA) or southern New Jersey (for Atlantic County) who were not currently enrolled in school, worked 50–52 weeks in the past year, and worked 35–60 hours in a regular week. We restricted the age of respondents in the sample to ensure the estimate of opportunity employment was not upwardly biased by older workers who entered the workforce at a time when four-year college degrees were not as prevalent and whose earnings reflected a lifetime's worth of experience. As a result, the included respondents were more recent entrants to the labor force. Once the sample was restricted, we identified respondents (1) with less than a four-year college degree and (2) earning more than the national annual median wage, adjusted for cost of living across metropolitan statistical areas. We performed cost of living adjustments using the Bureau of Economic Analysis's (BEA) 2011–2015 Regional Price Parities (RPPs) for metropolitan statistical areas in Pennsylvania and New Jersey and for nonmetropolitan areas in Pennsylvania.[5] For each industry, we calculated the share of workers meeting these criteria as a percentage of all workers in the industry.

In order to assess the spatial distribution of opportunity employment within regions, we multiplied each industry's opportunity employment share by the corresponding primary job count for each industry in every census block. Employment data are from the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) program's Origin-Destination Employment Statistics (LODES) dataset.[6] LEHD LODES draws from state unemployment insurance filings and federal government civilian employment records, and for a worker with multiple jobs, the primary job refers to the one that generates the highest wages.[7]

Transit and Road Files

In order to examine access to jobs using public transit, we used General Transit Feed Specification (GTFS) files for transit agencies active in each region. A GTFS is a collection of files that together provides the full picture of routes, trips, stop times, stop locations, and days of operation of fixed-route transit services. In NEPA, we used GTFS files for the County of Lackawanna Transit System (COLTS), the Luzerne County Transportation Authority (LCTA), and Hazleton Public Transit (HPT). While we obtained a GTFS file from all three transit agencies in NEPA, we chose to use the agency-provided file only for COLTS and HPT; we used a GTFS file for LCTA that was created by the Center for Neighborhood Technology. In York County, we used GTFS files from rabbittransit and Capital Area Transit (CAT). In Atlantic County, we used GTFS files from New Jersey Transit (NJT) and Cross County Connection (CCC). No GTFS file existed for fixed-route service provided by the Atlantic City Jitney Association. We relied on information obtained through personal correspondence with the association to construct a GTFS file representing the main jitney route. The GTFS files used for the analysis in NEPA reflect the bus networks as they existed in October 2017. The GTFS files used to model the rabbittransit and CAT bus networks reflect the systems as they were in June and July 2018, respectively. The GTFS files used for the analysis in Atlantic County reflect bus networks as they existed in July 2018. The proximity and job access analyses use only bus trips (and all associated stops) for which at least one stop is scheduled between 6:00 a.m. and 9:00 a.m. on a typical weekday.

We incorporated Open Street Map (OSM) roads data to model road and pedestrian segments. The OSM data for NEPA were downloaded on September 2, 2017, and the OSM data for York County and Atlantic County were downloaded on August 1, 2018.

Proximity Analysis

To calculate the percent of residents and jobs proximal to transit, we built a network dataset of road and pedestrian segments for York, Lackawanna, Luzerne, and Atlantic counties. Using ESRI's

5 U.S. Department of Commerce Bureau of Economic Analysis, "Real Personal Income for States and Metropolitan Areas, 2015," news release, June 22, 2017, available at https://www.bea.gov/newsreleases/regional/rpp/rpp_newsrelease.htm.

6 U.S. Census Bureau. *2015 LEHD Origin-Destination Employment Statistics Data (LODES 7.3)*, Washington, D.C.: Census Bureau, https://lehd.ces.census.gov/data/#lodes.

7 It is impossible to distinguish between full-time and part-time jobs in the LEHD LODES data set. As a result, this analysis may overstate opportunity employment because the opportunity employment shares are based on an analysis of full-time workers. These shares are applied to all primary jobs, some of which are not full-time jobs.

ArcGIS Network Analyst extension, we calculated the network distance from each census block in each region to the nearest transit stop. If at least 50 percent of the residents of census blocks within a census block group were within one-quarter of a mile of a transit stop, the census block group was considered to have five-minute access to transit. Similarly, if at least 50 percent of the residents of census blocks within a census block group were within three-quarters of a mile of a transit stop, the census block group was considered to have 15-minute access to transit. These times assume a reasonable walking speed of three miles per hour.

Job Access

To measure job access, we built a multimodal network data set of transit, road, and pedestrian segments. We employed the "Add GTFS to a Network Dataset" toolbox, developed by ESRI engineer Melinda Morang, to bring the GTFS files into the ArcGIS environment and to incorporate them into the network dataset.[8] Using the network dataset and the Network Analyst extension, we calculated an origin-destination cost matrix (OD cost matrix), which reported the fastest commute time between each census block group (origin) and census block (destination) in each region. The OD cost matrix also reported for each commute time the amount of time spent walking. In this model, pedestrians were not able to walk along limited-access highways. We again assumed a walking speed of three miles per hour, and a special transit evaluator developed by Melinda Morang enabled the model to read bus schedules and make routing decisions accordingly. Because bus service is variable across the course of the day, we ran the OD cost matrix analysis every five minutes between 6:00 a.m. and 8:00 a.m. on October 17, 2017, in NEPA and on September 12, 2018, in York and Atlantic counties. We selected these dates to represent transit availability on a typical weekday morning. Next, for each region, we compiled the resulting 25 matrices into a single file and selected the quickest time for each origin-destination pair, eliminating those with a commute time greater than 60 minutes or a walk time greater than 20 minutes. The resulting file portrays, for each census block group (origin), a 60-minute transit access zone within which a person could travel using transit and arrive at work no later than 9:00 a.m., the end of the morning commute window. Using this definition of access, we calculated the percent of regional opportunity employment that each block group could access. To produce regional figures, we took the population-weighted average of the block group access percentages.

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8   The toolbox and helpful supporting documentation are available at http://esri.github.io/public-transit-tools/AddGTFStoaNetworkDataset.html.

Employment Centers

Reviewing the literature, we discovered previous attempts to identify employment centers using researcher-selected thresholds of employment density and total employment for individual census units and conglomerates of units (Giuliano and Small, 1991). In order to reduce researcher subjectivity in the identification of employment centers, we employed a modified version of methods developed in McMillen (2001) and McMillen and Smith (2003). First, we performed a locally weighted regression of the log-transformed employment density of each census block group on both the north-south and east-west distances from each block group to the metro area's central business district (CBD). We manually identified CBDs by examining maps of employment density, and subsequently located CBDs by the Atlantic City Rail Terminal, the York County Court House, the Marketplace at Steamtown in Scranton, and the Public Square in Wilkes-Barre. The locally weighted regressions estimated individual job density gradients around each block group in the four counties. For each model, we chose a smoothing parameter, or the number of neighboring block groups used in estimating the employment density gradients, by selecting the parameter that yielded the lowest model Akaike Information Criterion (AIC). The models produced estimated log-transformed employment densities for each block group. Block groups for which the observed log-transformed employment density was significantly greater than the predicted density at the 10 percent significance level were considered candidate centers. Next, we imported the candidate centers into ArcGIS and created conglomerates of the centers (i.e., block groups) where candidates shared a boundary of at least a quarter mile — the same contiguity rule used in Giuliano and Small (1991). Finally, following the practice introduced in Lv, Zheng, Zhou, and Zhang (2017), we restricted the final employment centers to those with total employment greater than 10 divided by the square root of the county's employment base. This ratio allowed us to use an absolute total employment threshold that varied by the region's employment base. These total employment thresholds were 4,062 in York County, 2,986 in Lackawanna County, 3,643 in Luzerne County, and 3,264 in Atlantic County. These corresponded with 2.46 percent of the employment base in York County, 3.35 percent in Lackawanna County, 2.74 percent in Luzerne County, and 3.06 percent in Atlantic County.

Access to Employment Centers

In order to measure access to the employment centers, we collapsed the OD cost matrices obtained in the access to jobs analysis to block group-to-block group relationships. In doing so, for each origin block group, we determined the percent of

Appendix

the destination block group's jobs that were accessible in a 60-minute commute, with no more than 20 minutes allowed for walking. If the origin block group was able to access at least half of the jobs in the destination block group, then residents in the origin block group were deemed to have access to jobs in the destination block group. We then aggregated the number of prime-age residents (25 to 54) and residents in LMI neighborhoods in all the origin block groups that could access each destination block group. We obtained the percent of regional populations that could access each destination block group by dividing the sum of the populations that could access each destination block group by regional totals of those populations. Finally, to calculate a composite access percentage for each employment center, we took the employment-weighted average of the access percentages for each center's constituent block groups.

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