A Long Ride to Work: Job Access and the Potential Impact of Ride-Hailing in the Pittsburgh Area

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Job access affects both employers looking for workers with the right skillsets and job seekers looking for the best job. Yet data shows that for the average transit rider, jobs are increasingly out of reach, whether measured by proximity or commute time.[1] The following analysis describes job access—defined here as the ability for workers to get to jobs in a tolerable commute time via public transit—for residents of Allegheny County, Pennsylvania, home to the city of Pittsburgh and numerous other cities, boroughs, and townships. The analysis also explores one possible avenue for increasing residents' job access: supplementing existing transit routes with ride-hailing services (e.g., Lyft and Uber).

Key findings

• **Residents of Allegheny County are more likely to use public transit and less likely to have long commute times than residents of other regional counties of its size or the nation as a whole.** Still, approximately 20 percent of transit commuters in Allegheny County experience a commute time of greater than 60 minutes each way **(Table 1A)**. Notably, as is the case in many places across the country, that share has grown as commute times get longer, not shorter **(Table 1B)**.

• **Jobs are least accessible for workers with a high school degree or less and for jobs paying less than $1,250 per month (Tables 2 and 3).** In Allegheny County, just 10 percent of jobs are located within a 60-minute transit commute of workers with a high school degree or less, compared to 13 percent for those who have a bachelor's degree or more. Jobs are least accessible in industries such as manufacturing, retail, transportation, and construction **(Table 4)**.

• **Four of the top 10 employment centers each have access to less than 5 percent of the county's workforce within a 60-minute transit commute (Table 5).** One of those employment centers, Carnot-Moon, has the highest concentration of low-skill jobs of any major job hub. Downtown Pittsburgh and Wilkinsburg, accessible to 16 and 15 percent of the region's workforce, respectively, are the most accessible employment centers within a 60-minute commute.

• **If transit routes were supplemented with another form of transit such as a ride-hailing service, job access within a 90-minute commute would increase substantially, but we see no disproportionate benefit to low-wage workers.** Job access within a 90-minute commute would increase from about 30 percent to 44 percent for Allegheny County residents. Inner-ring suburbs and outlying parts of the county, such as West View, would benefit the most from the additional service (See **Map 2A**). In some places, cost aside, more than 200,000 workers would gain access to jobs in the region **(Figure 4)**; however, differential access rates, or the difference between commute times with ride-hailing and without ride-hailing, tend to favor workers with higher wages and higher educational levels.

Introduction

Job access, referred to broadly as connecting people and jobs and analyzed here by commute times, is important for the economic well-being of individuals and communities alike. Job access affects both employers who are looking for talent and residents whose ability to get to and retain a job today is an important lifeline for their future prosperity. Depending how one measures job access—by proximity to jobs, proximity to public transit, or commute times—existing research commonly links job access to individuals' economic outcomes (employment, wages).[2] Shorter commute times are also associated with greater economic mobility across generations.[3] Job access is particularly important for poorer residents, as they are more likely to use public transit.[4]

Given that the time traveled between home and work is a barrier to economic success for many people, we explore ride-hailing as one solution that may lead to improved public transit access for the Pittsburgh-area workforce; in particular, we focus on those with lower education and wage levels.

This analysis neither endorses nor discourages ride-hailing as a way to improve job access for Allegheny County residents. Rather, it is intended to build upon and inform existing discussions about new or creative ways to improve job access in our communities in the short- and long-term, given the changing nature of work, the adoption of smart technologies, and the availability of shared mobility services.

Background

The importance of job access in the Pittsburgh area was elevated by the formation of the Regional Transportation Alliance of Southwest Pennsylvania in 2015. This business-led coalition was formed by the Allegheny Conference on Community Development to assess the region's transportation network and to promote solutions for increasing connectivity among people and jobs in the region.[5] According to a survey that the Alliance conducted to identify the biggest transportation challenges in the region, nearly 60 percent of respondents from Allegheny County pointed to expanding transit service as the best way to address current transportation challenges. In particular, expanding transit service was ranked as a more important investment than roads and highways, on-demand services, bike lanes, and pedestrian walkways.

Based on general data trends, transit commuting in Allegheny County is fairly robust. The share of commuters in Allegheny County that commute by transit (10 percent) is almost double that of the nation (5 percent) and at least twice the share of its regional peers: Cuyahoga County representing the Cleveland area (5 percent), Hamilton County representing the Cincinnati area (4 percent), and Franklin County representing the Columbus area (3 percent) (**Table 1A**). Allegheny County transit riders also enjoy shorter commutes (39 minutes) than those of the nation (49 minutes) and of its regional peers (47, 45, 41 minutes, respectively). In a recent ranking of transit quality, Allegheny County placed in the top tercile (45 of 135) of similar-sized counties.[6] The city of Pittsburgh, specifically, has emphasized the promotion and coordination of various modes of transportation such as biking, walking, and bus rapid transit (BRT) with a focus on equity.[7]

Table 1A. Transit Commuting Trends, 2012/2016

	Commuters who use public transit (%)	Residents whose transit commute is ≥ 60 minutes (%)	Average transit commute time (min)
United States	5.4	37.3	49.3
Pennsylvania	5.8	30.4	46.1
Ohio	1.7	29.9	43.5
Select counties (primary city)			
Allegheny County (Pittsburgh, PA)	**9.6**	**19.8**	**39.4**
Cuyahoga County (Cleveland, OH)	5.2	34.7	46.9
Franklin County (Columbus, OH)	3.1	25.2	40.7
Hamilton County (Cincinnati, OH)	3.9	30.4	45.2

Source: 2012/16 ACS 5-year estimates, US Census Bureau. Includes workers who are 16 and older who did not work from home.

Still, 20 percent of Allegheny County's transit riders have a commute that is more than 60 minutes each way—that is about 11,000 of the county's 56,000 riders, and that share has grown over the past 10 years, in line with the nation as a whole (**Table 1B**).[8] In the Pittsburgh metro area between 2000 and 2012, residents of high-poverty neighborhoods experienced a 10 percent decline in the number of nearby jobs.[9]

To improve job access for residents, one might consider two approaches: create incentives for employers and workers to locate closer together and enhance the availability and timeliness of transportation options.[10] This analysis focuses on the latter.

To better understand potential transportation options, we explore the use of shared mobility to increase job access for workers. One shared mobility option, supplementing commutes with ride-hailing services, has been tested with specific populations in other midsize metropolitan areas such as Dayton and Cleveland.[11] Here, we explore the potential impact of ride-hailing on access for residents in the Pittsburgh area (Allegheny County) and on employers' access to a more regional workforce.

Table 1B. Change in Transit Commuting Trends during the Past Decade

	Commuters who use public transit (percentage points)	Residents whose transit commute is ≥ 60 minutes (percentage points)	Average transit commute time (min)
United States	0.2	1.9	1.5
Pennsylvania	0.3	2.3	0.6
Ohio	–0.2	4.7	3.1
Select counties (primary city)			
Allegheny County (Pittsburgh, PA)	**–0.9**	**2.8**	**2.0**
Cuyahoga County (Cleveland, OH)	–1.2	4.8	2.3
Franklin County (Columbus, OH)	0.2	5.4	3.2
Hamilton County (Cincinnati, OH)	–1.2	7.9	6.0

Source: 2005/9 to 2012/16 ACS 5-year estimates, US Census Bureau. Includes workers who are 16 and older who did not work from home.

More about shared mobility

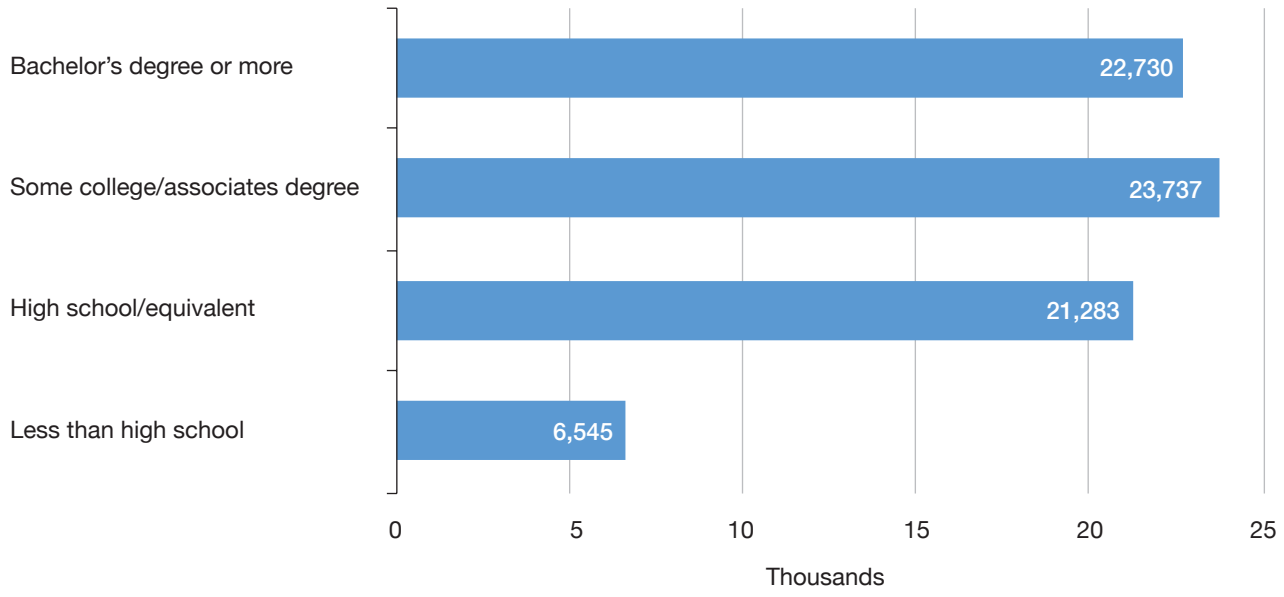
Shared mobility is a term used to describe transportation services that are shared among users, most often in the context of technology-enabled services such as ride-hailing (e.g., Uber and Lyft) and car sharing (e.g., Zipcar and car2go), but it also includes traditional services such as fixed-route mass transit and non-motorized transportation services such as bike-sharing. For this report, shared mobility refers primarily to ride-hailing services. Technology and an increasing interest in shared mobility are changing the way we get around our cities, including how people get to jobs. These changes present both opportunities and challenges.[12] One opportunity is the potential to increase job access for high-need users of public transportation that do not have access to an automobile (e.g., the poor, elderly, and disabled). Shared mobility also presents an opportunity for public transit organizations to partner with ride-hailing services to reduce first-mile/last-mile barriers for transit commuters, specifically. A significant barrier to finding sustainable employment for an individual can be the distance the nearest transit stop is located from a person's home (the first mile) or the distance from a transit stop to a potential employer (the last mile). Of course, there are a range of challenges in addressing the issues above because of the finite resources public transit systems have and the variety of risks involved with trying something new (e.g., user adaptation, regulatory adherence, reliance on credit cards or electronic transfers, congestion). See the *Shared-Use Mobility Reference Guide* for more information.

Findings

The analysis follows in three parts: workers' access to jobs by education and wage levels, workers' access to jobs by industry, and the percent of the labor force accessible to major employment centers. The results of our analysis are reported at two commute-time thresholds: 60 minutes and 90 minutes. These thresholds are meant to represent the maximum tolerable commute times, not ideal commute times. While a 60-minute or 90-minute commute may seem intolerable to many, that is the experience of one in five transit commuters in Allegheny County (**Table 1A**).

Across each of these categories, we describe the potential impact of ride-hailing services on commute times, if ride-hailing services were to supplement the Port Authority of Allegheny County's (PAAC) fixed-route transit network.[13]

Figure 1. Additional Jobs Accessible within 90 Minutes because of Ride-Hailing, by Educational Attainment*



*Minor discrepancies because of rounding
Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 30 and older in Allegheny County.

Table 2. Job Accessibility by Educational Attainment, Transit-Only vs. Transit + Ride-Hailing

	60-minute commute				90-minute commute			
	Transit-only		Transit + Ride-hailing		Transit-only		Transit + Ride-hailing	
	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)
Less than high school	4,903	10.1	6,451	13.3	13,737	28.4	20,281	42.1
High school/equivalent	15,867	10.1	20,919	13.3	44,140	28.0	65,423	41.8
Some college/assoc degree	19,295	10.9	24,856	14.1	52,892	30.0	76,630	43.7
Bachelor's degree or more	21,787	12.7	26,842	15.7	57,443	33.6	80,172	47.3
Total	61,852	11.2	79,068	14.3	168,211	30.4	242,506	43.8

Source: Authors' analysis of employment data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 30 and older in Allegheny County.

Job access by workforce characteristics

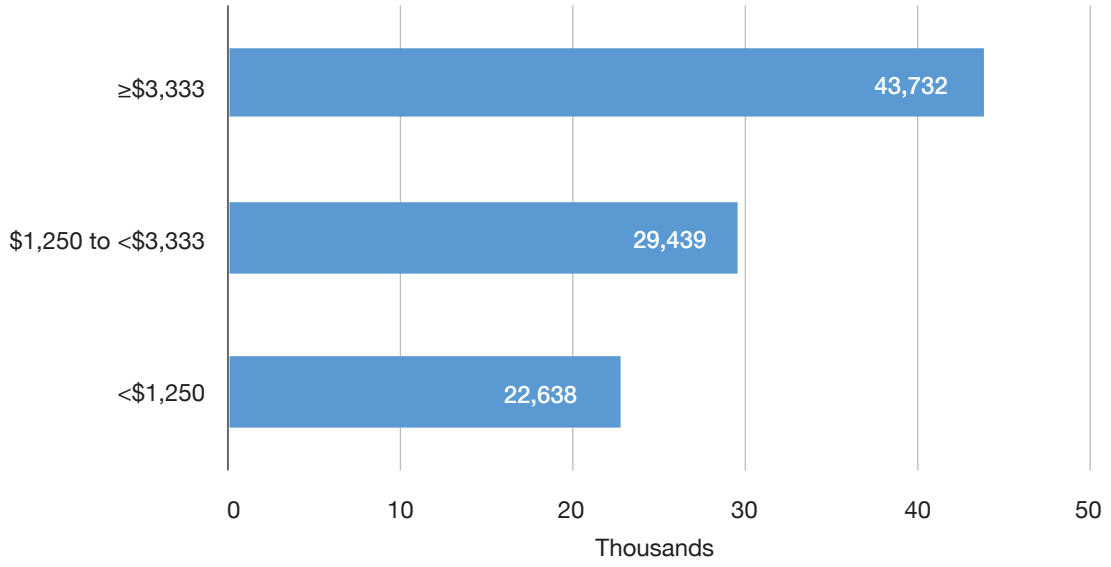
Jobs that require less education and pay lower wages are the least accessible within a 60- or 90-minute commute by transit (**Figure 1** and **Table 2**). Just 10 percent of jobs in Allegheny County are accessible to those with a high school degree or less, and only 9 percent of the jobs paying less than $1,250 per month are reachable within a 60-minute transit commute (**Figure 2** and **Table 3**).

While the addition of ride-hailing significantly increases job accessibility across every education and wage level, the gains are larger, in aggregate, for workers with higher education and wages. For example, adding a ride-hailing service to existing transit options would make an additional 5,600 low-wage jobs and 9,700 higher-wage jobs accessible within a 60-minute commute; for commutes up to 90 minutes, ride-hailing would increase accessibility by about 23,000 low-wage jobs and 44,000 higher-wage jobs, respectively.[14]

Job access by industry

To better understand the characteristics of employers in the region, we analyze their accessibility to county residents based on industry. Jobs in finance and education are most accessible, while jobs related to transportation and manufacturing are least accessible.

Figure 2. Additional Jobs Accessible within 90 Minutes because of Ride-Hailing, by Monthly Wage Level*



*Minor discrepancies because of rounding
Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 16 and older in Allegheny County.

Table 3. Job Accessibility by Wage Level, Transit-Only vs. Transit + Ride-Hailing

Monthly earnings	60-minute commute				90-minute commute			
	Transit-only		Transit + Ride-hailing		Transit-only		Transit + Ride-hailing	
	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)
<$1,250	14,365	9.1	19,988	12.6	41,170	26.0	63,808	40.5
$1,250 to < $3,333	22,527	10.4	29,524	13.6	62,757	28.9	92,196	42.7
≥ $3,333	41,164	12.3	50,853	15.2	109,277	32.7	153,009	46.1
Total	78,057	11.0	100,365	14.1	213,203	30.0	309,013	43.5

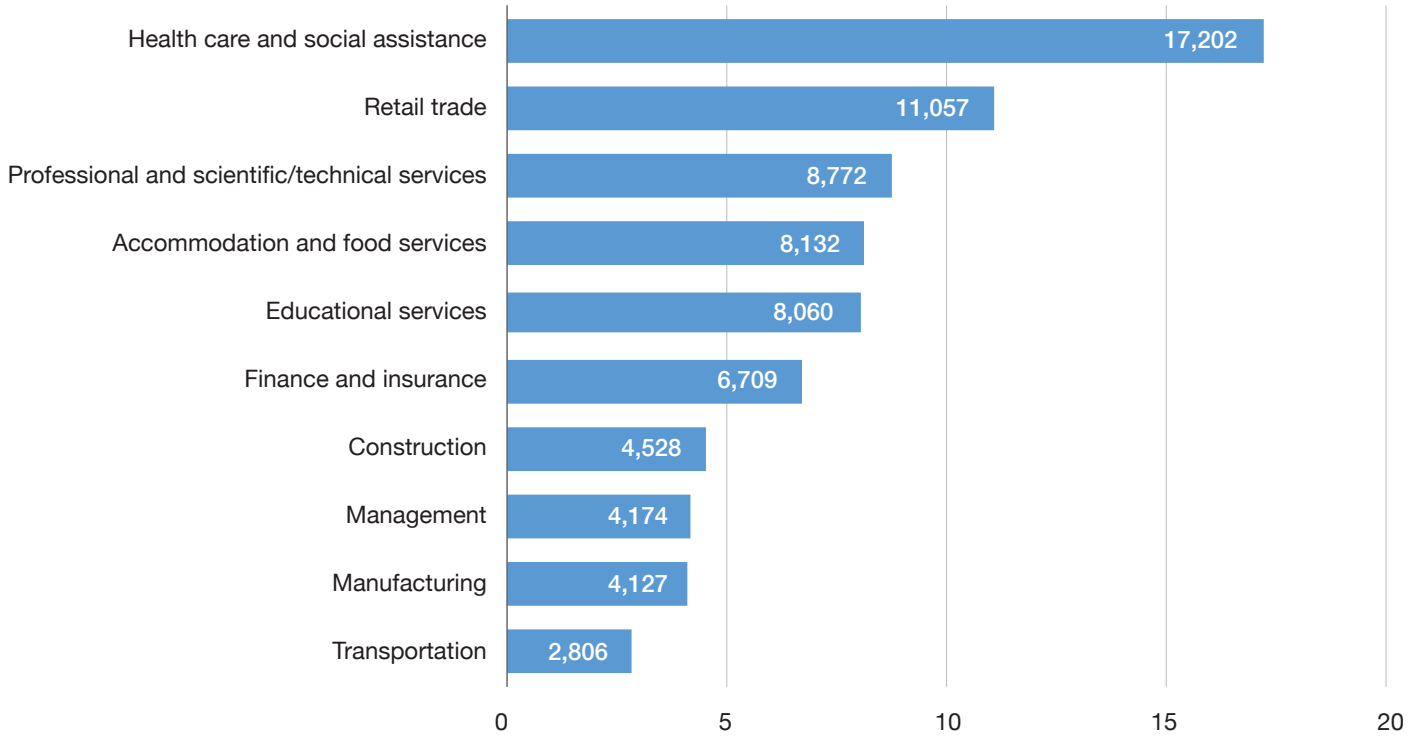
Source: Authors' analysis of employment data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 16 and older in Allegheny County.

The addition of ride-hailing makes jobs in the healthcare and retail sectors substantially more accessible in absolute number, with about 4,000 healthcare jobs and 3,000 retail jobs added at the 60-minute threshold and 17,000 healthcare jobs and 11,000 retail jobs added at the 90-minute threshold, respectively (**Figure 3, Table 4**). Though similarly sized, the finance, professional services, food service, and education sectors are impacted far less, presumably because their more urban concentration places them nearer to transit stops to begin with. Measured by access rates alone, the construction and management sectors experience slightly larger gains in access at the 90-minute threshold (about 16 percentage points each) than do industries such as manufacturing (11 percentage points). Still, introducing a ride-hailing service would make an additional 4,000 manufacturing jobs accessible by transit within 90 minutes.

Access to employment centers

Map 1 shows the areas of Allegheny County within a commute time of 60 minutes that would benefit the most from the addition of a ride-hailing service. While job accessibility increases throughout many neighborhoods in the city of Pittsburgh, inner-ring suburbs to the south and west of Pittsburgh and outlying parts of the county, such as Bethel Park,

Figure 3. Additional Jobs Accessible within 90 Minutes because of Ride-Hailing, by Industry*



**Minor discrepancies because of rounding*
Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 16 and older in Allegheny County.

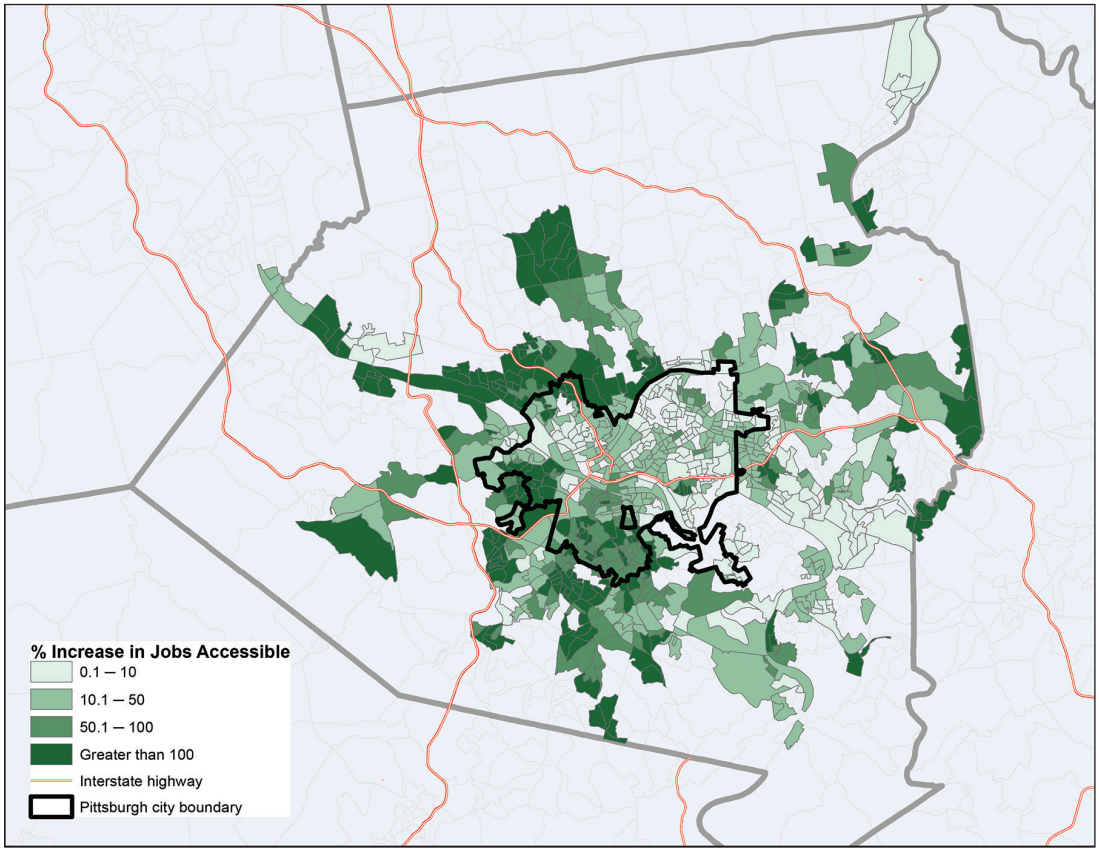
Table 4. Job Accessibility by 10 Largest Industries in Allegheny County, Transit-only vs. Transit + Ride-hailing

	60-minute commute				90-minute commute			
	Transit-only		Transit + Ride-hailing		Transit-only		Transit + Ride-hailing	
	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)	Total accessible jobs	Access rate (%)
Health care and social assistance	14,653	11.4	18,809	14.7	40,731	31.7	57,933	45.4
Retail trade	4,654	6.2	7,427	9.9	14,536	19.4	25,593	34.3
Professional and scientific/technical services	7,662	11.9	9,855	15.3	20,766	32.3	29,539	46.7
Accommodation and food services	6,294	10.4	8,300	13.8	17,551	29.1	25,683	42.8
Educational services	8,835	14.3	10,161	16.5	22,577	36.5	30,637	49.9
Finance and insurance	10,456	20.8	11,960	23.8	24,508	48.8	31,217	63.8
Manufacturing	2,060	5.6	2,962	8.1	6,734	18.3	10,860	29.6
Management	4,044	12.7	4,917	15.5	10,476	33.1	14,650	48.5
Construction	1,803	6.3	3,060	10.7	5,970	20.8	10,498	36.7
Transportation	1,108	5.0	1,605	7.3	3,437	15.6	6,244	28.5
All industries (Total)	78,057	11.0	100,365	14.1	213,203	30.0	309,013	43.5

Source: Authors' analysis of employment data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 16 and older in Allegheny County.

would stand to gain the most. On average, the gains in jobs within a 90-minute commute would be significant. Thirty percent of jobs in Allegheny County are accessible by transit only; adding ride-hailing would increase that number to 44 percent, adding about 100,000 jobs within a 90-minute commute (**Tables 3** and 4). For commute times within 60 minutes, jobs gained by adding ride-hailing are less impressive; the access rate improves from 11 percent to 14 percent, adding about 22,000 jobs within a 60-minute commute.

Map 1. Increase in Jobs Accessible with Addition of Ride-Hailing Service, Allegheny County



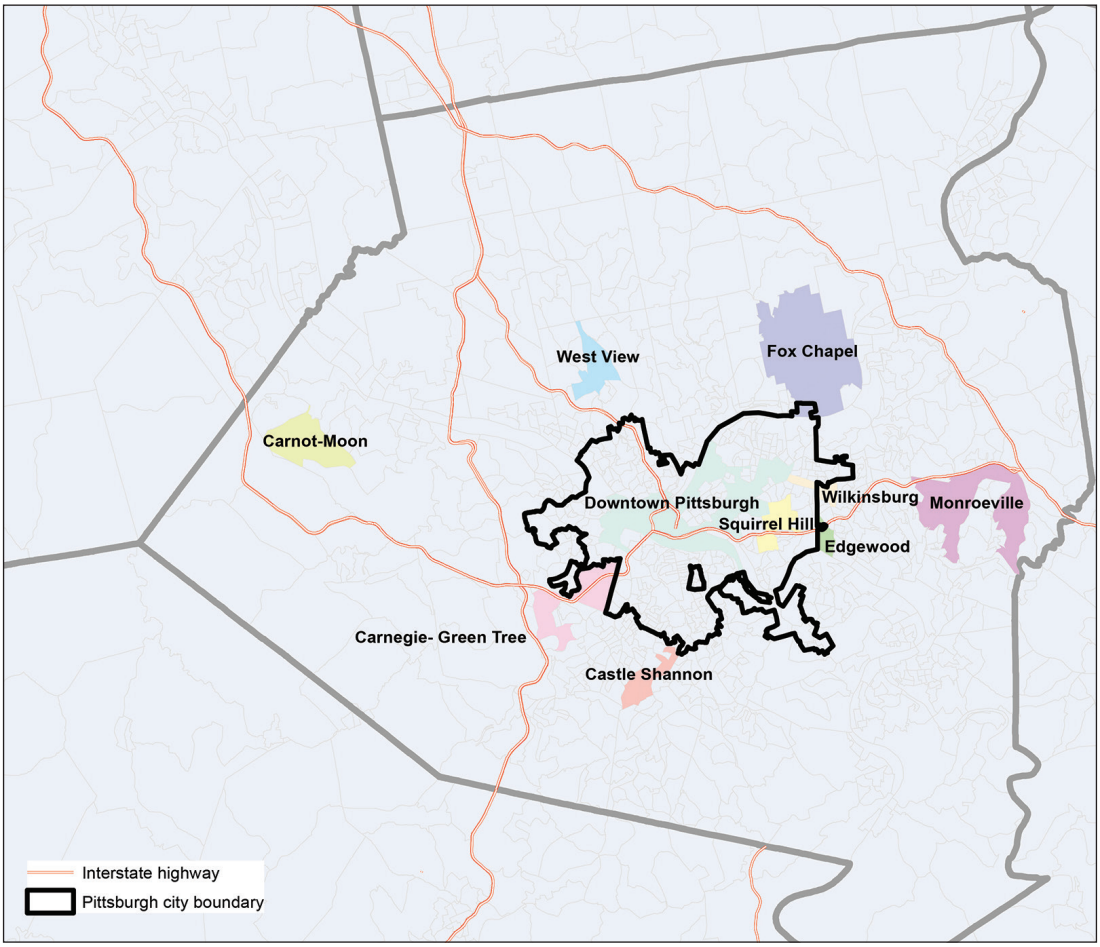
Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.

Ultimately, the breadth and impact of any ride-hailing program on commuters depends on how well it is designed. For example, the intent of a first-mile/last-mile program is to better connect neighborhoods just beyond the existing transit service areas to transit.[15] Many commuters just beyond the existing transit service area will still have relatively long commutes even after reaching the fixed-route transit system via a ride-hailing vehicle. Put simply, adding a ride-hailing service to supplement existing transit routes may do a good job of making previously inaccessible trips (transit commutes longer than 90 minutes) marginally accessible (transit commutes between 60 and 90 minutes); the program does not, however, tend to make marginally accessible trips moderately accessible (transit commutes between 30 and 60 minutes). Alternatively, if ride-hailing services were provided to and from every PAAC stop rather than just those in the periphery, we would likely see a larger gain in jobs accessible in a 60-minute commute time.

Employers' access to the regional workforce

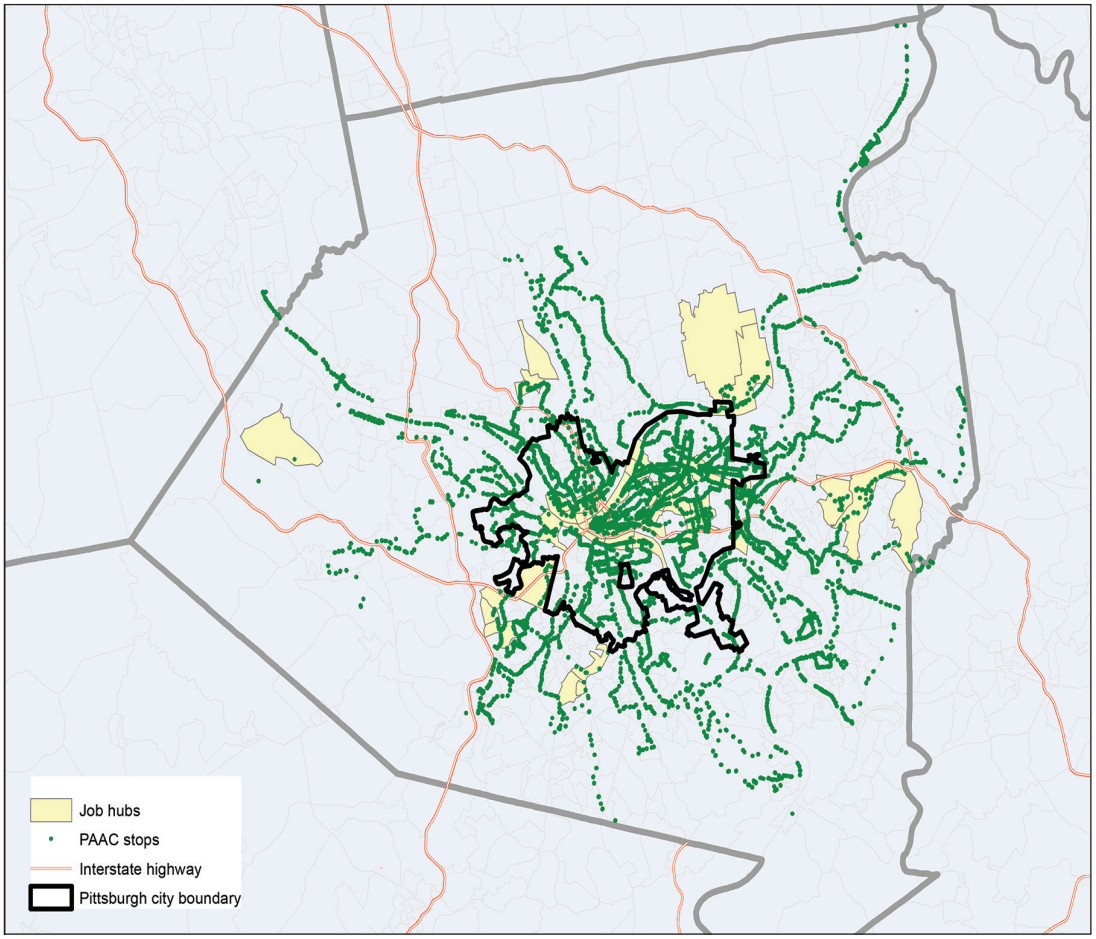
Next, we shift from looking at the number of jobs that workers are able to access to the number of workers that employers are able to reach. To illustrate this, we assess commute times to and from the county's major employment centers using the existing PAAC transit network (see **Maps 2A** and **2B**).[16] **Map 2A** identifies the 10 top employment centers and **Map 2B** overlays existing PAAC stops. Zooming in on specific geographies in this way helps identify opportunities for targeted investment to areas with a high concentration of jobs but relatively few transit connections. This is particularly important for employment centers where low-skill jobs are disproportionately concentrated. Additionally, it identifies opportunities for county and/or business and civic leaders to leverage existing infrastructure in the county's most dynamic districts.

Map 2A. Top 10 Employment Centers in Allegheny County



Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.

Map 2B. Transit Stops, Port Authority of Allegheny County (PAAC)



Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015 and PAAC's General Transit Feed Specification files.

Table 5. Worker Accessibility by Top 10 Employment Centers, Transit-only vs. Transit + Ride-hailing

			60-minute commute				90-minute commute			
			Transit-only		Transit + Ride-hailing		Transit-only		Transit + Ride-hailing	
	Total jobs	Low-skill job concentration (%)	Total accessible workers	Access rate (%)	Total accessible workers	Access rate (%)	Total accessible workers	Access rate (%)	Total accessible workers	Access rate (%)
1. Downtown Pittsburgh	231,873	25.4	106,770	16.2	146,949	22.3	260,229	39.5	383,147	58.1
2. Fox Chapel	22,436	26.8	7,896	1.2	28,602	4.3	78,857	12.0	227,677	34.5
3. Monroeville	20,178	27.7	11,936	1.8	43,616	6.6	49,989	7.6	140,017	21.2
4. Carnegie-Green Tree	17,455	29.1	55,760	8.5	105,147	16.0	250,236	38.0	363,736	55.2
5. Carnot-Moon*	9,809	32.7	0	0.0	6,831	1.0	0	0.0	95,118	14.4
6. West View	8,221	24.6	5,068	0.8	124,138	18.8	15,574	2.4	376,425	57.1
7. Squirrel Hill	5,594	24.9	81,198	12.3	84,135	12.8	162,753	24.7	220,889	33.5
8. Castle Shannon*	4,212	31.1	62,700	9.5	144,225	21.9	122,931	18.7	355,174	53.9
9. Wilkinsburg*	3,673	31.5	95,734	14.5	133,648	20.3	276,069	41.9	400,596	60.8
10. Edgewood*	2,258	31.7	69,214	10.5	89,431	13.6	241,111	36.6	366,397	55.6

Source: Authors' analysis of employment data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 16 and older in Allegheny County.
*Low-skill job concentration greater than 30%; at least 30 percent of the jobs here require no more education than a high school degree.

We find that 4 of the top 10 employment centers each have access to less than 5 percent of the county's workforce within 60 minutes: Fox Chapel, Monroeville, Carnot-Moon, and West View. In contrast, each of the top two employment centers, downtown Pittsburgh and Wilkinsburg, have access to about 15 percent of the workforce within 60 minutes. (**Table 5**).[17]

As one would imagine, a much larger share of the workforce can be reached when the commute time extends to 90 minutes; still, not 1 of the top 10 employment centers is able to reach the majority of the available workforce via existing transit routes inside of 90 minutes.

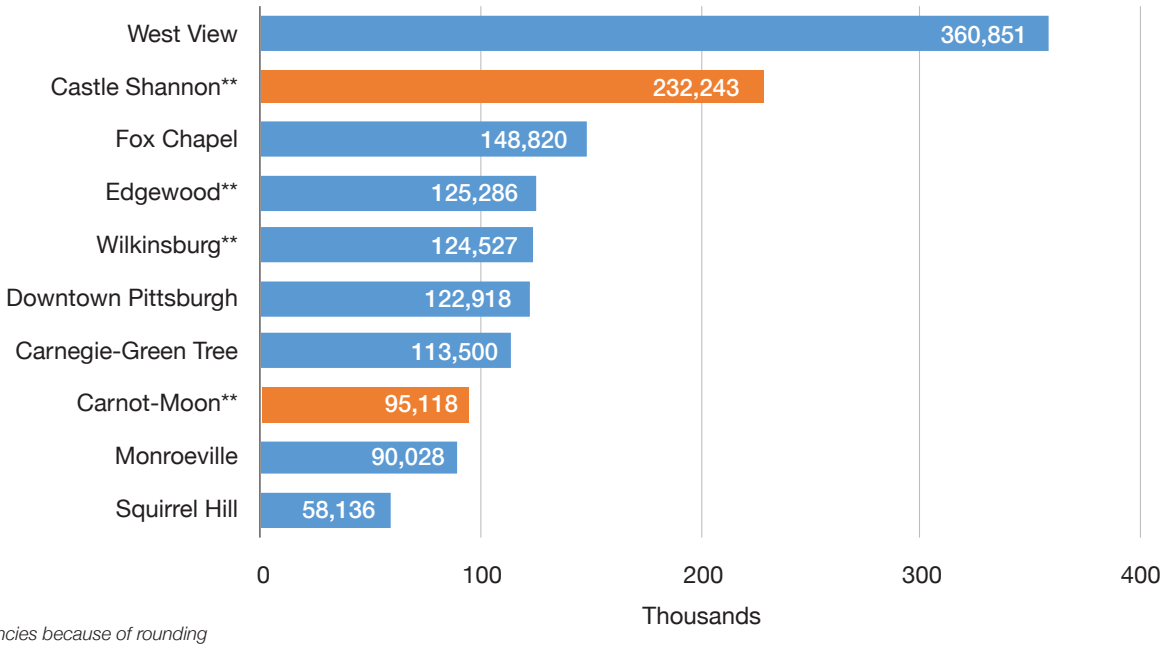
Allegheny County's transit situation is similar to what we found in recent analyses of Northeast Ohio: targeted strategies and investment are needed to better connect these areas to potential workers, focusing on the largest suburban employment centers with the lowest access rates and highest concentration of low-skill jobs.[18] This will require innovative thinking given barriers common to large suburban corporate campuses or office complexes, which make access by transit harder. Nevertheless, these challenges can be overcome with improvements to transit and/or services such as business-sponsored circulator routes to accommodate last-mile travel.

During rush hour, PAAC's G3 Moon Flyer runs every 15 minutes from Liberty Avenue and William Penn Place in downtown Pittsburgh to the University Boulevard Park-and-Ride in Carnot-Moon, with a travel time of about 36 minutes. However, because the University Boulevard Park-and-Ride is located just off of I-376, commuters cannot reach the area in Carnot-Moon where most of the jobs are without additional transit service.

When thinking about the potential application of a ride-hailing service in Allegheny County, Carnot-Moon stands out (**Table 5** and **Figure 4**). It has the highest concentration of low-skill jobs of the top 10 employment centers (33 percent); this means that one in three jobs there requires no more education than a high school degree. If ride-hailing were added there, almost 100,000 additional workers would have access to jobs within 90 minutes; these jobs are not accessible by public transit otherwise.

Of neighborhoods that have the highest concentration of low-skill jobs, Castle Station would also experience relatively large gains in access to workers—more than 200,000 workers at the 90-minute commute time—if ride-hailing services were added (**Table 5** and **Figure 4**). Edgewood and Wilkinsburg, the other

Figure 4. Additional Workforce Accessible in 90 Minutes with the Addition of Ride-Hailing*



**Minor discrepancies because of rounding*
***Low-skill job concentration greater than 30%; at least 30 percent of the jobs here require no more education than a high school degree.*
Source: Authors' analysis of data from LEHD Origin-Destination Employment Statistics, US Census Bureau 2015.
Note: Based on total jobs for workers 16 and older in Allegheny County.

two employment centers with a high percentage of low-skill jobs, would also gain access to more than 100,000 additional workers each, but those neighborhoods already benefit from a higher access rate with transit alone.

Westview would see the largest benefits in aggregate, reaching about 360,000 more workers in 90 minutes. Approximately one of every four jobs here could be considered low-skill.

Policy Implications

Ride-hailing services such as Lyft and Uber offer the possibility to connect thousands more workers to jobs in Allegheny County. Ride-hailing is particularly beneficial for those with the longest commute times, and the services may offer a viable complement to public transportation for residents who work in the county's periphery. Should city or county stakeholders partner with a ride-hailing service as part of an integrated plan to fuse shared mobility and the public transit network, it could be a creative solution to a pressing need. For a partnership to be successful, however, it would require PAAC and community stakeholders to adapt to changing market conditions, be realistic about the sustainability of the program, and be dedicated to long-term solutions that either bring jobs and workers closer together, or enhance availability and timeliness of public transit for low-wage workers. In short, while the addition of ride-hailing services can be a useful tool to improve job access for Allegheny County residents in the short term, the following points merit further consideration.

1. **In order to benefit low-wage workers, investments would need to be geographically targeted and equitably distributed.** Low-skill and low-paying jobs are the hardest to get to. Low-wage workers utilizing transit—with or without ride-hailing services, whether at 60 or at 90 minutes—have the least amount of access to jobs in Allegheny County. Although ride-hailing services would make more jobs accessible, such lengthy commutes mean that low-wage workers, particularly those dependent on public transit, do not work within a reasonable distance from where they live. For a ride-hailing program to be inclusive of low-income communities, it would need to be geographically targeted (e.g., at employment centers with high concentrations of low-skill workers or in areas with disproportionately high shares of low-income residents). In this scenario, one could make the case that the cost burden should be shared across private and public sectors alike given the mutual benefit.

   Additional accommodations may be required given that ride-hailing apps require a smart phone and a bank or credit card to have an account. In Allegheny County, approximately 5 percent of households do not have bank accounts.[19] Offering subsidized rides, or the option to use preloaded cards, can eliminate the barrier of workers' not having a bank account while also providing them a less costly commute. Phone-request lines can also be instituted, if needed.[20] Practices such as these can lead to a more equitable policy.

   In the absence of targeted programming, benefits of ride-hailing may disproportionately accrue to those who already have the means to use alternative modes of transit or have a broader range of options about where they live and work.

2. **Investments in ride-hailing are most impactful near employment centers and/or at the periphery of existing transit networks.** Particularly given resource constraints (unexplored here), any partnership between local government and a ride-hailing program should occur where it will impact the most people and businesses. PAAC's budget, like most public transit organizations' budgets, is heavily dependent upon government funding, and cuts or changes to state or federal budgets have an impact on the service provided to riders.[21] During the Great Recession in 2011, federal budget constraints forced PAAC to cut transit service by 35 percent, lay off more than 500 employees, and increase fares.[22] PAAC likely does not have the funding to subsidize rides from all transit stops all of the time, but they can strategically partner with employers to help sponsor ride-hailing services at discrete times and locations to improve employers' access to a skilled workforce and workers' access to jobs.[23] Based on the findings of this analysis, investments in subsidized rides for stops that are near employment centers or that reduce commute times to less than 90 minutes would likely see the greatest return on investment.

3. Experimentation and collaboration is important for innovation. Ride-hailing companies are not a viable option for the sole purpose of commuting to work, but public transit can leverage the popularity and accessibility of ride-hailing to improve service—at least in the short-term. Currently, PAAC services are utilized primarily for commuting, while the majority of ride-hailing services are utilized for recreational or social events.[24] The two platforms are not direct competitors and can complement each other. While the late-night transit service has experienced a decrease in ridership, the system overall has been able to sustain its ridership despite the introduction of such services to the market in 2014.[25]

Transit agencies have the opportunity to leverage data from ride-hailing to provide real-time insights on commuter behavior and make better decisions about infrastructure investments, from traffic signals and bus routes to ticketless digital payment systems and flat-rate subscriptions that cover multiple modes of transportation. According to a recent study, by 2025, cities that deploy smart mobility applications could cut commuting times 15–20 percent on average.[26] These changes can improve key quality of life indicators, including, but not limited to, commute times. Adoption of, or partnerships with firms on the frontlines of, technological innovation can not only make daily commutes faster and less frustrating, but it can provoke important conversations about long-term efficiency and resource allocation.

Job access affects people's daily commutes and the success and effectiveness of businesses; both matter to the long-term health of Allegheny County's residents and economy. While local budgets may be constrained, localities have opportunities to experiment with new technologies and tap new markets. These innovations will not only help the community realize its economic potential, but help individuals get to and retain jobs that will be important for their own financial futures and that of the next generation.

Based on our analysis, a strategic partnership between transit and ride-hailing services could have a positive impact on job access across all skill and wage levels in Allegheny County. However, low-wage workers still face the longest commutes, and, as such, policymakers should give consideration to how certain aspects of a potential transit and ride-hailing partnership could be designed to promote equity more broadly.

Methodology

The data used for this analysis was obtained from the US Census Bureau's LEHD Origin-Destination Employment Statistics (LODES) and the PAAC's General Transit Feed Specification (GTFS) files. The LODES data provides information on the number of jobs, while the PAAC GTFS files provide data on the transit network stops. The model we used in this analysis was developed by combining these two datasets and creating custom GTFS files for a network with ride-hailing stops and PAAC stops.

PAAC's GTFS files are used to model the service area extent of Allegheny County's fixed-route transit system. The GTFS platform was developed by Google and is a machine-readable version of a transit agency's service schedule, which is used to power Google Maps Transit. Most transit agencies now maintain their own GTFS files and submit periodic updates to Google in order to make their transit schedules discoverable on Google Maps.[27]

The PAAC GTFS files were loaded to ESRI's ArcGIS Network Analyst. One can then estimate transit travel times between an origin census block group and a destination census tract—assuming they are covered by the PAAC network (see PAAC stops in **Map 2B**)—in a way similar to that of retrieving transit directions between two locations via Google Maps. A census block group is an eligible transit trip origin if its population-weighted centroid is within .75 miles of a transit stop (measured by network distance). Similarly, a census tract is an eligible transit trip destination if its job-weighted centroid is within .75 miles of a transit stop. For each origin and destination pair, the travel time between the two locations is estimated according to the fastest route available during the weekday prime rush hour commute period: 6:00 am to 9:00 am.

Data on the number of jobs at the census block level is obtained from the US Census Bureau and aggregated to the tract level.[28] Based on transit travel times estimated as described above, it is possible to estimate the number of jobs accessible by transit within 60 minutes, for example, from every

census block group in Allegheny County. To obtain a countywide or citywide metric, the population-weighted average of the number of jobs accessible from each block group is estimated across the relevant geography.

In order to model a ride-hailing network that provides service to select transit stops, custom GTFS files were created for which a ride-hailing stop was placed respectively at the population- and job-weighted centroid of every block group within .75 and 2.5 miles of a PAAC stop. Every five minutes, a ride-hailing vehicle is available to travel from each ride-hailing stop to any PAAC stop within 2.5 miles. Similarly, every five minutes, a ride-hailing vehicle is available to travel from a PAAC stop to any ride-hailing stop within 2.5 miles. In this way, a service such as Lyft or Uber provides approximate first-mile/last-mile services to and from neighborhoods and workplaces just beyond the reach of the PAAC transit network. The five-minute service headways are meant to simulate the average time it might take a person to hail a ride via their phone.

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[1] Authors' analysis of 2005/9 and 2012/16 5-year American Community Survey data. See also Elizabeth Kneebone and Natalie Holmes.2015. *The Growing Distance between People and Jobs in Metropolitan America*. Brookings, Washington D.C.

[2] Jin, Jangik and Kurt Paulsen. 2018. "Does Accessibility Matter? Understanding the Effect of Job Accessibility on Labor Market Outcomes." Urban Studies: 55(1), 91–115.
Tyndall, Justin. 2015. "Waiting for the R Train: Public Transportation and Employment." Urban Studies: 54(2), 520–537.
Holzer, Harry J., John M. Quigley, and Steven Raphael. 2003. "Public Transit and the Spatial Distribution of Minority Employment: Evidence from a Natural Experiment." Journal of Policy Analysis and Management: 22(3), 415–441.
Immergluck, Daniel. 1998. "Job Proximity and the Urban Employment Problem: Do Suitable Nearby Jobs Improve Neighbourhood Employment Rates?" Urban Studies: 35(12), 2359–2368.

[3] Chetty, Raj, Patrick Kline, and Emmanuel Saez. 2014. "Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States." Quarterly Journal of Economics: 129(4). 1553–1623.

[4] Anderson, Monica. 2016. "Who Relies on Public Transit in the U.S." Pew Research Center, April 7.

[5] Allegheny Conference on Community Development (ACCD) is a civic organization that works with public and private organizations to improve the economy in Southwest Pennsylvania. Between 2015 and 2017, the ACCD prioritized improving infrastructure and transportation networks within the 10-county region. See www.alleghenyconference.org.

[6] Center for Neighborhood Technology (CNT) defines six transit categories including transit quality. Transit quality refers to frequency of service throughout the day (including weekend and evening hours) and connections to key activity centers (e.g., jobs, schools, healthcare). AllTransit performance metrics can be found at http://Alltransit.cnt.org/overview-of-metrics, updated January 2018 and accessed May 2018.

[7] Pittsburgh's resilience strategy, launched in March of 2017, focuses a number of its initiatives on creating equal opportunity for all residents. See also *Pittsburgh Equity Indicators: A Baseline Measurement for Enhancing Equity in Pittsburgh*, released July 2018 in partnership with Rand Corporation, 100 Resilience Cities, Rockefeller Foundation, and City University of New York. Its purpose is to identify disparities in access among different populations.

[8] Recent data from the ACS show that the trend of longer commutes may be reversing in Allegheny County starting about 2014, but more data are needed to definitively support this trend, giving that the data available are based on rolling averages.

[9] Nearby jobs is defined as the number of jobs that are within a typical commute distance from the center point of that tract. Typical commute distances are based on the median commute distance in each metro area. See Elizabeth Kneebone and Natalie Holmes. 2015. *The Growing Distance between People and Jobs in Metropolitan America*. Brookings, Washington D.C.

[10] For a discussion of the importance of transit access on city productivity, see Schlomo Angel and Alejandro Blei. 2015. *Commuting and Spatial Structure of American Cities*. Marron Institute of Urban Management.

[11] In 2017, the Greater Dayton RTA announced a partnership with Lyft to provide fully subsidized Lyft rides between select bus stops to complement the transit network. In Cleveland, the RTA is piloting the use of Lyft as a potential alternative to on-demand or scheduled paratransit service. Similar partnerships have emerged in large and small cities nationally in recent years with mixed reviews. (Lyft, for example, cites partnerships with various local transit agencies in a recent blog.) See also *Partners in Transit*, a comprehensive review of 29 partnerships between transportation network companies and public agencies published in August 2018. It is still not known how much or in what ways ride-hailing services increase job access when combined with a transit network.

[12] For an overview of the many challenges and opportunities presented by changing transportation patterns, see *TNCs Today: A Profile of San Francisco Transportation Network Company Activity and Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City*.

[13] PAAC is the primary transit agency in Allegheny County.

[14] A low-wage job, classified here as $1,250 per month, is roughly equivalent to a full-time (40 hours per week) job paid at Pennsylvania's minimum wage of $7.25 per hour in 2018, or the current federal minimum wage.

[15] The study may depart from standard definitions of first-mile/last-mile service (see Methodology).

[16] This indicates the share of workers accessible to employers via a transit commute of 90 minutes or less. Similar to our study of Northeast Ohio in 2015, we use top employment centers identified by the Center for Neighborhood Technology's BUILT in Cleveland study, which identified adjacent census block groups in the region with employment density of more than seven jobs per acre.

[17] An employment center is identified as a census tract that contains contiguous block groups with at least seven jobs per acre.

[18] Barkley, Brett and Alexandre Gomes Pereira. 2015. *A Long Ride to Work: Job Access and Public Transportation in Northeast Ohio*. Federal Reserve Bank of Cleveland.
Pacetti, Emily, Cecile Murray, and Sam Hartman. 2015. *The Geography of Jobs: The Increasing Distance between Jobs and Workers in Northeast Ohio and Why It Matters for Growth*. Fund for Our Economic Future.

[19] Prosperity Now estimates of 2015 FDIC and ACS data. See http://scorecard.prosperitynow.org/data-by-location#county/42003.

[20] In the Dayton, Ohio, and Lyft partnership, the Greater Dayton RTA subsidizes the Lyft ride for select stops. In order to remove the barrier associated with the Lyft app's requiring a smart phone, customers can also request a ride via a standard phone call. See Navera, Tristan. 2017. "RTA Partnering with Lyft to Increase Service." *Dayton Business Journal* (June 1). Similarly, Cleveland RTA's potential partnership with Lyft to substitute traditional paratransit service that serves many elderly and people with disabilities, has needed to explore payment options such as preloaded debit cards for those that do not have access to a credit card, or a dial-in phone line for those do not have a smart phone.

[21] As of FY2018, government funding makes up 74 percent of the operating revenue in PAAC's budget. See http://www.portauthority.org/paac/Portals/capital/budgetbooks/BudgetBook2018.pdf.

[22] *Pittsburgh Business Times*. 2010. "Port Authority Cuts Routes, Jobs." (November 24).

[23] For examples of such collaboration, see The Institute for Public Policy & Economic Development at Wilkes University. 2017. *Northeast Pennsylvania Equitable Transit Study* and corresponding guidebook *Linking Employment and Transportation: A Resource Guide of Employers* by the Federal Reserve Bank of Philadelphia.

[24] Shared-Use Mobility Center. 2016. *Shared Mobility and the Transformation of Public Transit*. (March).

[25] Krauss, Margaret. 2017. "Ride-hailing's Uneven Effect on Pennsylvania Transit Agencies," WESA (July 31).

[26] McKinsey Global Institute. 2018. Smart Cities: Digital Solutions for a More Livable Future (June).

[27] PAAC's GTFS files can be downloaded from the agency's website. Transit agencies in Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland Counties are not included in this analysis because their GTFS files are not publicly available. For metrics that include these agencies (e.g., that account for express routes from downtown Pittsburgh to outlying counties), see alltransit.cnt.org. Note, job accessibility metrics from this report are not directly comparable to job accessibility metrics on alltransit.cnt.org given that this report utilizes GTFS files from only PAAC.

[28] Data on jobs/employment at the census block level is available through the US Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) program. This analysis utilizes the LEHD Origin-Destination Employment Statistics (LODES) work-area characteristics file.