Understanding the Moderating Effect of Job Accessibility on the Relationship Between Racial Segregation and Unemployment: Case Study in Philadelphia

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Introduction

The concept of **'Spatial Mismatch'** described the substantial increase of unemployment in inner city African American communities caused by the diffculity of long-distance commute (Kain, 1968).

Effective use of **Public Transport Services** is essencial in making potential jobs more accessible for dwellers in segregated minority neighborhoods in downtown (Theodosakis, 2018).

Automobile accessibility measured by **car ownership** is proven to be another key component in adjusting the unemployment rate, especially for lower income families (Grengs,2010).

We intend to test the causal relationship between neighborhood segregaton rate and unemployment rate and how could job accessibility act as a moderator between these two factors in the city context of **Philadelphia(dissimilarity index 60.6 in 2020).**

We used **open-sourced data** to measure transport accessibility and construct a hierarchical linear model for this study.

City Context

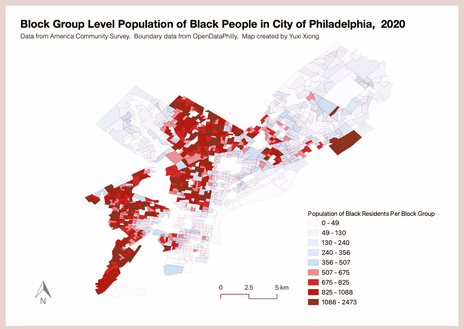

Figure 1:Neighborhood Segregation of African Americans

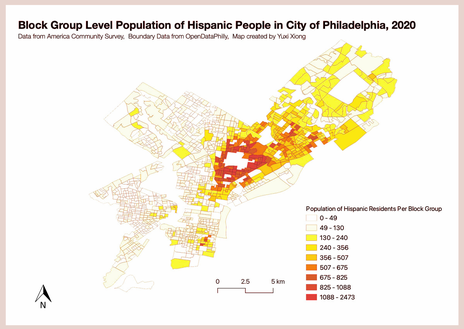

Figure 2:Neighborhood Segregation of Hispanics

African American residents being **42.13%** of the total population in Philadelphia are in the center and southwest regions (Figure 1).

The **14.1% Hispanic** population are highly concentrated in the inner city (Figure 2).

SEPTA public transport services (bus, trolly and railway) are unevenly distributed and underprovided in the center of the city.

Source:SEPTA

15 minute routes 30 minute routes 60 minute routes

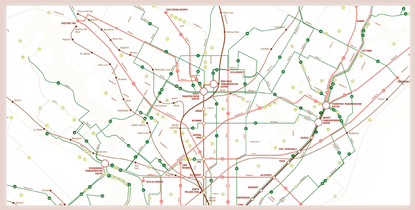

Figure 3:SEPTA service frequency and distribution

Literature Review

Race, Inequality and Job Accessibility
Researchers examined strong positive relationship between both African American and Latino **clustering** and **high unemployment rate**. **Less job accessibility** is also correlated with **racial neighborhood segregation** on a US national level. (Li et.al,2013; Anderson&Galaskiewicz,2021)

Car Ownership and Transport Equity
Studies shown that the **effect of car ownership** on increasing job accessibiliy for African American and Latino people are statistically more significant than for white people, and such effect is the **largest in most segregated cities**. Inner city lower income households also have the **most inelastic need** for automobiles among all socioeconomical groups. (Raphael et al.,2001;Yousefzadeh et al.,2021)

Public Transport as Moderator
Public transit has a small but observable negative indirect effect on unemployment and poverty shown by the model compactness. (Lyon&Ewing, 2021)

Implications

SEGREGATION
1. We've found no evident correlation between segregation and unemployment, however there is a positive relation between dissimiliarity index for both African Americans and Hispanic people and household low-income rate.

2.There's a larger correlation between unemployment in Hispanic neighborhoods and zero automibile ownership than in African American neighborhoods, suggesting a particular need of the Hispanic low-income households on cars.

TRANSPORT
1.Unemployment rates in both segregated neighborhoods are correlated with transit accessibility instead of automobile accessibility.

Methods & Preliminary Findings

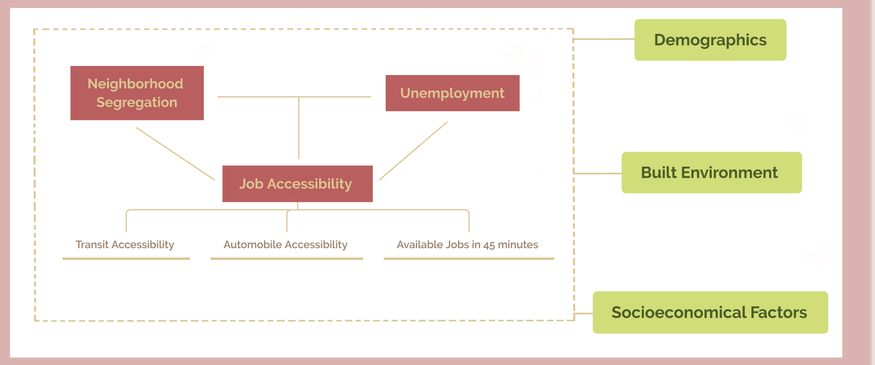

Figure 4:Parsimonious conceptual model

(Percentage of Unemployment)	pct_unemp		
Predictors	*Estimates*	*CI*	*p*
(Intercept)	2.66	2.02 – 3.29	**<0.001**
di hw *(dissimilarity index:Hispanic)*	1.40	-0.43 – 3.23	0.134
auto access idx *(automobile accessibility index)*	1.21	-0.07 – 2.50	0.064
trfreq persqmi *(aggregate frequency of transit service per square mile)*	0.00	0.00 – 0.00	**<0.001**
tr access idx *(transport accessibility index)*	1.82	0.78 – 2.86	**0.001**
trfreq persqmi * tr access idx	-0.00	-0.01 – -0.00	**<0.001**
Observations	3362		
R^2 / R^2 adjusted	0.037 / 0.036		

Figure 5:Summary of a testing linear regression model

We've constructed several linear models to test the correlation between unemployment and selected explanatory variables.

In the shown example, the **frequency of transit**, **transit accessibility index** and the interaction variable remains statistically significant, however the impacts of **dissimilarity rate for Hispanic people** (di hw) and **automobile accessibility index** are not obvious.

2. Based on the residents' dependency on public transport, governmental spending on improving SEPTA services could be a solution to increase the job accessibility.

3. The relationship between automible accessibility and dissimilarity index for African Americans is significant, however the automobile accessibility is not correlated between Hispanic segregation. Further analysis is needed in explaining the different pattern.

4. There are a number of African American segregated block groups lying at the edge of the city without suffcient public transport, subsidy for these particular neighborhoods for encouraging automobile ownership could be an alternative.

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This research is funded by Penn Institute for Urban Research Undergraduate Urban Research Grant Spring 2022.