Assessing the Impact of Systemic Inequality on Racial Income Inequality in Metropolitan Labor Markets

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ABSTRACT

Key indicators of racial economic inequality, the wage gap and the wealth gap, far from improving, have actually worsened over the past 50 years (Wilson and Rogers 2016, Shapiro 2017). A systems approach, in which racial inequality is understood as a consequence of a system comprised of a set of dynamically related subsystems, or domains, such as segregation (Reskin 2012) may help explain economic inequality between blacks and whites by more accurately capturing the complex interdependence of racial structures that operate in tandem to sustain racial inequality and shedding light on why it persists. This project develops a structural approach to more precisely assess the systemic nature of racial inequality and its impact on economic inequality. It utilizes a novel, longitudinal dataset of structural characteristics of metro areas to measure simultaneously the impact of multiple domains of racial structural inequality on racial income inequality from 1970-2017: residential segregation, school segregation, wealth, incarceration and policing, joblessness, occupational segregation, racial attitudes, minimum wage, political ideology and unionization. I use structural equation modeling to model interrelationships among these structural characteristics to assess how they interact to produce and maintain racial income inequality between 1970 and 2017.

The wage gap between whites and blacks has been increasing since 1979, while at the same time racial disparities in educational attainment and test scores have been *decreasing* (Wilson and Rodgers 2016; Vanneman 2009). A study partitioning the source of the racial wage gap into explained and unexplained found that the portion explained by individual characteristics such as education has decreased in the past 30 years, while the portion of the gap left unexplained has *grown* in the same time period (Cajner et al. 2017). These gaps have led researchers to investigate structural or systemic sources of racial economic inequality.

In a systems framework racial inequality is understood as a consequence of a system comprised of a set of dynamically related subsystems, or domains, such as segregation (Reskin 2012). Residential and school segregation remain at or near levels that existed at the height of overt racial discrimination of the pre-civil rights era (Krysan and Crowder 2017, Orfield and Frankenberg 2014). These domains interact dynamically with one another, reinforcing one another's effects over time and increasing the system's stability and effectiveness. This systems approach may help explain economic inequality between blacks and whites by more accurately capturing the complex interdependence of racial structures that operate in tandem to sustain racial economic inequality, and shedding light on why it persists.

This project develops a structural approach to more precisely assess the systemic nature of racial inequality and its impact on economic inequality. This project utilizes a novel, longitudinal database of structural characteristics of metro areas to measure simultaneously the impact of multiple domains of racial structural inequality on persistent racial economic inequality 1970-2017: residential segregation, school segregation, wealth, incarceration and policing, joblessness, occupational segregation, racial attitudes, minimum wage, political ideology and unionization. I use structural equation modeling (SEM) to examine the impact of the structural factors on black/white income inequality as a system. SEM allows researchers to model complex relationships among the independent variables by simultaneously modelling multiple outcomes at the same time in a system of equations, capturing the complexity of systemic discrimination. The analyses assess how the structural domains interact to produce and maintain racial income inequality between 1970 and 2017, whether these interrelationships change over time, and whether there is a lag effect of structural inequality, in which structural dimensions in 1970 explain racial income inequality in 2017.

By examining variations in these patterns across metro areas, the analyses will ascertain how these dynamics operate in metro areas with different characteristics to provide clarity and actionable data for local policymakers and advocacy organizations to address this inequality. Specifically, if segregation creates wage disparities via educational disparities in northern and Midwest cities, whereas southern cities have more direct effects of racial attitudes and labor market discrimination that produce income inequality, then the policy responses will look substantially different. By precisely identifying the specific pathway among the structures that produces disparities among across metropolitan areas, this work can help policymakers devise region-specific policies that more effectively address this inequality.

To examine the systemic underpinnings of black/white income inequality, I use a systems approach. Reskin (2012) describes racial inequality as a set of dynamically related subsystems (or domains) in which: disparities exist in every subsystem and systematically favor certain groups, disparities across subsystems are mutually reinforcing, and discrimination serves as a source of the disparities. In an interdependent system where the sub-components are dependent on one another to function, (i.e. an ecosystem), we cannot know the full effects of one dimension without understanding how it is acted upon by other sub-components. Tilly's (1998) notion of durable inequality echoes this assertion. He argues inequality cannot be understood by studying just one group, but its relationship to its counterpart, or categorical pair. Differences among individuals are actually a consequence of categorical *organization.* These categorical distinctions adapt and emulate across various social and economic institutions, gaining strength and becoming entrenched.

Below I briefly discuss the domains of racial inequality system that are investigated in this study and why I expect they will influence black/white income inequality.

Segregation is one of the chief structures underlying racial inequality. Residential segregation remains near levels that existed at the height of overt racial discrimination of the pre-civil rights era (Krysan and Crowder 2018). Residential segregation enables the unequal distribution of resources, like quality housing, access to jobs, and lower exposure to pollutants and toxic environments, disadvantaging minorities and channeling more of these resources to predominantly white communities (Dickerson 2007, Turney et al 2012, Iceland et al 2013). School segregation has returned to levels nearing those that prompted Brown vs. Board of Education in 1954. Research that finds that poor white children attend better schools than black middle-class children (Rosenbaum and Friedman 2007) point to the stratifying systems of race overlapping class specifically within an ostensibly race-neutral factor, education.

Racial disparities in wealth are one of the starkest measures of racial economic inequality. Wealth disparities between blacks and whites have quadrupled *since* the 1990s (Pew Research Center 2014). Racial disparities in wealth, or net assets, capture resources that standard income measures do not--resources that offer protection in crises like a major illness or a sudden layoff from work. Because of this protective function, net assets are often referred to as a private safety net (Shapiro, 2017).

Incarceration and persistent joblessness are two structures that severely handicap income for blacks in particular and play a role in shaping racial income inequality. The hyper-incarceration of black men in particular has been shown to play a role in their unique and persistent joblessness and explain a significant portion of their wage disparity with white men (Pettit 2012, Western and Pettit 2004). Finally, the chronic, disproportionately high rates of joblessness among blacks create the most severe form of resource deprivation. Joblessness creates the most vulnerable condition by exposing people to poverty, homelessness, unsafe environments, stress, and limiting access to institutions and resources that create opportunity. Additionally, two other structural factors, higher levels of unionization and minimum wage, are both known to increase wages for blacks and reduce racial wage inequality (Wilson and Rodgers 2016).

Most of these structural factors have been studied before, but most often in isolation, not in concert with each other, or across time. There are notable exceptions in which researchers have found empirical connections between two of the structures. Quillian's research on the effect of residential segregation on racial educational disparities is one such example. Shedd's study on the school-to-prison pipeline adds to the literature linking racialized dynamics within schools to the incarceration system. Pager's work documenting employers' perceptions of incarceration for black men on their employment outcomes has lent considerable insight into those two dimensions. Dickerson vonLockette (2010) has found associations between residential segregation on employment and labor market inequality. Conley has looked extensively at the association between racial wealth inequality and a variety of socioeconomic outcomes.

The literature on racial income inequality is largely shaped by research on wage inequality and wealth inequality. The literature to explain racial wage inequality encompasses macro-structural and micro-individual theoretical and empirical approaches. A bulk of the literature is chiefly concerned with identifying characteristics of individuals and occupations, industries, and jobs to explain wage inequality (Grodsky and Pager 2001). A large part of that literature has emphasized human capital differentials to explain wage gaps. However, individual-level human capital inputs like education did not fully explain the increase in the gap. Black male college graduates started the 1980s with less than a 10 percent disadvantage relative to white male college graduates and end with almost a 20 percent deficit in 2015. Moreover, the gap is worse at the top of the occupation/wage distribution; that is the racial wage gap is highest for college graduates and those at the highest occupational status (Wilson and Rodgers 2016, Huffman and Cohen 2004).

Other explanations focus on the overall wage structure of the labor market to better understand wage inequality. For example, Juhn et al. (1993) found that changes in wage determinants, education levels and experience reduced the black–white men's wage gap, whereas changes in the returns on education and experience enlarged the gap by a similar amount. Structural reasons such as the retreat from anti-discrimination laws and affirmative action during the 1980s, deterioration in the manufacturing sector, and a decline in union representation have been cited as causes of the wage gap (Bound and Freeman 1992, Wilson and Rodgers 2016).

Relatedly, the occupational segregation approach emphasizes the importance of occupational position and mobility in the labor market (Hout 1984). Blacks and Latinos are overrepresented jobs at the bottom of the wage and job distributions; these jobs experience substantial wage rigidity (Kristal, Cohen, and Navot 2018). Catanzarite (2002) found the clustering of Latinos in occupational niches depresses wages in those occupations. However, most of these explanations for racial wage inequality do not look to racial structural inequality to explain racial wage inequality.

The multi-layered dataset utilized in this study allows for the examination of the systemic nature of racial inequality by assessing the impact of the structural factors on black/white income inequality as a system. This approach, combined with the longitudinal analysis over time may shed light on why racial inequality *persists*. Additionally, the analytic approach focuses on examining the underlying causes of *group* inequality. While there is a predominance of studying variation among individuals (and controlling for racial status), I argue a group-level analysis is better-suited to accurately assess racial disparities, which are inherently group differences. This better captures the structural inequality inherent in the race discrimination system theory (Reskin 2012).

The dataset includes individual and metropolitan-level characteristics from 1970, 1980, 1990, 2000, 2010, and 2017 for 213 US metro areas. The metropolitan-level racial structural factors include: Metropolitan-level residential segregation dissimilarity indices, school segregation data (dissimilarity indices), net assets (wealth), ratio of arrest rates by race, occupational segregation, joblessness, black/white income ratio, political ideology, minimum wage rate, unionization, policing levels, and racial resentment.

The chief dataset for this project is constructed from the 1970, 1980, 1990, 2000, 2010 US decennial Census accessed through the *Integrated Public Use Microdata Series (*IPUMS). The data includes individual, group, and metropolitan-level characteristics. This study time period covers what is known as the post-industrial era, a period of significant social and economic change particularly with regard to racial inequality. To this core dataset racial structural factors measures are added from the following sources. Metropolitan-level residential segregation dissimilarity indices will be merged from Census data analyzed and published by the Housing and Household Economics Statistics (HHES) Division of the U.S. Census Bureau and the Spatial Structures in the Social Sciences Center (S4 Center) at Brown University (1960-2010). The school segregation data (dissimilarity indices) are also drawn from the S4 Center (1970-2010). To incorporate wealth to the core dataset, we impute net assets from the Survey of Consumer Finances (1963-2010)) using the propensity matching (Kum and Masterson 2010). Data on arrest rates by race for each metro area are extracted from the FBI's Uniform Crime Reports (1960-2010). Gini indices are used to measure inequality and are constructed from the Census household data. Because of varying data availability over the years, the 1970 and 2010 models contain slightly different groups of variables. Further description of the measures is in the chart below; the summary statistics for the measures can be found in the appendix.

Metropolitan Measures

metropolitan residential segregation	census tract dissimilarity indices for the metro area
school segregation	dissimilarity indices of schools in the metro area
net assets	household net assets imputed using Survey of Consumer Finances data
arrest rates by race	ratio of black arrest rate to black arrest rate
occupational segregation	dissimilarity index of occupations in the metro area
joblessness	percent of black men who are either unemployed or not in the labor force
black/white income inequality	ratio of mean black/white household income
political ideology	state citizen and government ideology measures (Berry et al 1998)
minimum wage rate	wage rate set for the metro area or state
unionization	percent of workers covered by union contract
policing levels	metropolitan expenditures on policing

racial attitudes	state-level racial resentment score based on survey of racial attitudes

ANALYTIC STRATEGY

The analyses evaluate whether racial structural inequality explains black/white income inequality at the *group* level using *group-level* measures of economic inequality by race as outcome variables in multivariate analyses. First, I use fixed-effects analysis to determine if variation in these group-level measures of inequality varies over time as a result of over-time changes in the structural factors. Fixed-effects analysis measure the effects of change over time in the independent variables on change in the group inequality changes over time. Then, I use structural equation modeling (SEM) to examine the impact of the structural factors on black/white income inequality as a system. SEM allows researchers to simultaneously model multiple outcomes at the same time. It can fit a model with complex relationships among the variables by computing indirect and direct associations. It allows the researcher to simultaneously model multiple outcomes at the same time in a system of equation—similar to simultaneous equation modeling. However, linear regression models like simultaneous equation modeling, only estimate the relationship between each independent variable and the outcome variable. SEM allows us to estimate the associations among the independent variables, which shows both direct and indirect effects of the variables on the outcome variables. The flexible model specification in SEM allows researcher to test for multiple interrelationships and multicollinearity such as those inherent in systemic discrimination (indirect and direct relationships). By combining multiple indicators of constructs into latent constructs, it improves our ability to better measure systemic discrimination increasing precision, rather than leaving that error in the residuals.

$$x_i = \lambda_{ij}L_j + \epsilon_{ij}$$

where x_i for $i = 1 \dots N$ are the N observed variables, L_j for $j = 1 \dots m$ are the m latent variables (or factors), and λ_{ij} contains the jth factor's loading on the ith observed variable. Also, herein ϵ_{ij} contains either the common variance associated with a given factor or the common variance *and* the unique variance depending on what analyses are employed. In the model, estimates of λ_{ij} and ϵ_{ij} are obtained that minimize the difference between the as-measured variances in the observed x_i and those predicted by the model.

RESULTS

To get a sense of how racial and economic inequality trended during the study time period, Figure 1 shows a disparity measure of white/black household income over time. The trend graphs show that income disparities between whites and blacks have remained fairly stable during the post-industrial era (1960-2010). At the same time, wealth disparities (net assets) grew

during that same time period (Figure 2). The disparity briefly fell as a result of the Great Recession, but post-2010 (not shown) re-expanded.

Table 1 examines correlations among the structural factors in 2010 for a broad look at the interrelationships between the factors. Notable associations include: black/white income ratio (inequality) and wealth, school and residential segregation, the black/white arrest ratio and wealth, and residential and occupational segregation. The persistence of these relationships among these structural factors over a fifty-year time period points to the intransigence of these structures of inequality. It is unsurprising, then, that black/white economic inequality itself persists. Moreover, the structural factors seem highly interconnected given the number of associations revealed; this points to the particularly systemic nature of racial inequality. Next, we turn to multivariate models to examine causality between the structural factors and black/white inequality.

To address the first research question--determine the interrelationships among the dimensions to get a sense of how they work together--I conducted an exploratory factor analysis using principal components factor analysis. This is the preliminary step in structural equation modeling. It identifies the associations among the structural dimensions factors, determining which work together. For the exploratory factor analysis, I use principal components factor analysis which is a series of correlations which estimates the variance of a potentially related set of measures to determine if and to what extent they co-explain the variance of a factor, or in the SEM vernacular, a latent variable. The goal is to examine a different way to measure racial inequality to capture the complex and structural underpinnings of racial inequality in the U.S, and then examine the effects of the factors in combination with each other on racial economic inequality.

Table 2: Factor Loadings from Factor Analysis of Structural Measures in 1970 and 2017

	2017		1970	
	Factor 1	Factor 2	Factor 1	Factor 2
Educ w/b ratio	.44		.48	
Income ratio	.64		.58	
Joblessness				
Wealth ratio				
Occupational segregation	-.47		.39	
Res segregation	.97			.48
School segregation	.78		.64	.55
Arrest Ratio	-.31			
Police employ			.67	
Political Ideology		.93	.58	.48
Racial Resentment		-.78		
Min wage		.76		.76
unionization		.73		

The two factors in Table 2 that emerged from the 2017 structural measures are as follows:

Factor 1: Political ideology, unionization, minimum wage, racial resentment, and the arrests ratio. I refer to this as the policy factor.

Factor 2: Residential segregation, school segregation, ratio of white/black educational attainment, ratio of white/black household income, occupational segregation. I refer to this as the segregation factor.

These clusters of dimensions in 2017 align well with theory and prior research on structural racial inequality. The interdependence of various types of segregation has been shown previously (Dickerson vonLockette and Spriggs 2016), as well as the relationships between segregation and employment and education outcomes (Dickerson 2007). The connection between political ideology and support for policies that support (more or less) racial equity makes sense conceptually as well.

In 1970, the factors that emerged from the structural measures are as follows:

Factor 1: school segregation, ratio of white/black educational attainment, ratio of white/black household income, occupational segregation, political ideology, police employment. I refer to this as the comprehensive factor.

Factor 2: residential segregation, school segregation, political ideology, minimum wage. I refer to this as the segregation/policy factor.

The fact that different factors emerge in 1970 versus 2017 is interesting. The interactions among the structural dimensions changed between these two time periods, which speaks to the dynamic nature of structural racial inequality.

I used the associations revealed in these factors to inform a structural equation model which models their impact on the black/white income disparity in 2017. Figure 3 shows the results of the full model for 2017. This is a path analysis model, which lays out the paths of association among the structural dimensions. Residential segregation is associated with school segregation which then affects the white/black education ratio, which then affects the white/black income ratio, revealing both indirect and direct effects of the dimensions on the racial income ratio. Additionally, the levels of policing employment in a metropolitan area affect black male joblessness which then affects the white/black income ratio. In another part of the model, political ideology affects the minimum wage, which then affects the income ratio.

This approach to modeling systemic racial inequality allows us to unpack the complexity of the systemic nature of inequality. It captures the interdependence of the structural dimensions and illustrates the difficulty in isolating the impacts of one dimension. For example, the phenomenon of the school-to-prison-pipeline makes more sense if we understand educational inequality as part of a larger system of racial inequality.

We would expect variation in the associations among these dimensions over time and across place. In future work I plan to examine these associations in different years, as well as develop an index of structural racial inequality for each metropolitan area that can be used to better understand the local dynamics of metro areas. Additionally, an examination of variation of these patterns across different regions of the US would be useful. This structural modelling approach can be used to explain a variety of outcomes as structural inequality is at the root of many racial disparities (health, education, incarceration etc.).

Table 3 shows the fixed effects analysis of the white/black household income ratio (1970-2010). Fixed effects analysis assesses whether changes in the structural factors over time explain changes in this ratio within metropolitan areas over time. It offers another way to assess whether

there have been significant changes in the race system. School segregation is significantly associated with changes in the white/black income ratio. As the level of segregation increases, so does the white/black income ratio; that is, the disparity between white and black household incomes is higher favoring white households. Joblessness is negatively associated with the racial disparity in income. A higher education ratio, where whites have more years of education than blacks is positively associated with greater incomes for whites. As occupational segregation increases over time so does the black/white ratio, favoring whites. The same effect is found for minimum wage. Given the intercorrelations among the factors, these models are a conservative test of these effects; moreover, fixed effects itself is a stringent test.

These analyses reveal the complex nature of this system of racial inequality. There are interdependencies among the structures, and persistence in many of the effects over time, but also evidence that the system is dynamic as some of the associations change.

CONCLUSION

This systems approach may help explain economic inequality between blacks and whites by more accurately capturing the complex interdependence of racial structures that operate in tandem to sustain racial inequality. This study offers a more comprehensive way to measure racial inequality, and a new approach to assessing systemic discrimination's role in creating overall inequality. The simultaneous consideration of factors comprising racial structural inequality may reveal deeper inequality, and potentially different at-risk populations via different pathways to disadvantage, not revealed by income or education (common SES predictors) alone.

Implications of the potential findings of the proposed research include the identification of new mechanisms driving disparities, and a shift from solely individual-level policy prescriptions to a systemic approach that addresses structural disadvantage built into the opportunity system in the U.S. This systems approach may help explain economic inequality between blacks and whites by more accurately capturing the complex interdependence of racial structures that operate in tandem to sustain racial inequality: the fundamental dynamics underlying why it persists. If the system is designed to maintain stasis and stability, and to do so effectively, then interventions need to be *disruptive*.

The metropolitan-level analysis of racial inequality used here suggests that policy at the local level may more effectively target these dynamics of inequality in the local economy where it is constructed. The importance of community development policy as well as attention to variation in regional policy is evident here. The silos of policymaking built into federal and state agencies designed to address solitary problems (housing, education, employment, etc.) are limited in their ability to address a complex problem composed of multiple domains. Interagency coordination becomes a chief strategy in beginning to undermine these structures of inequality.

These analyses also offer a cautionary tale regarding race-neutral policymaking. Policy approaches that subsume race inequality within class inequality often serve as a basis for policy designed to combat inequality, resulting in a shift toward universal, race-neutral strategies for class-based need, and away from race-based policy. Findings from this study may speak to the effectiveness of policy approaches such as this.

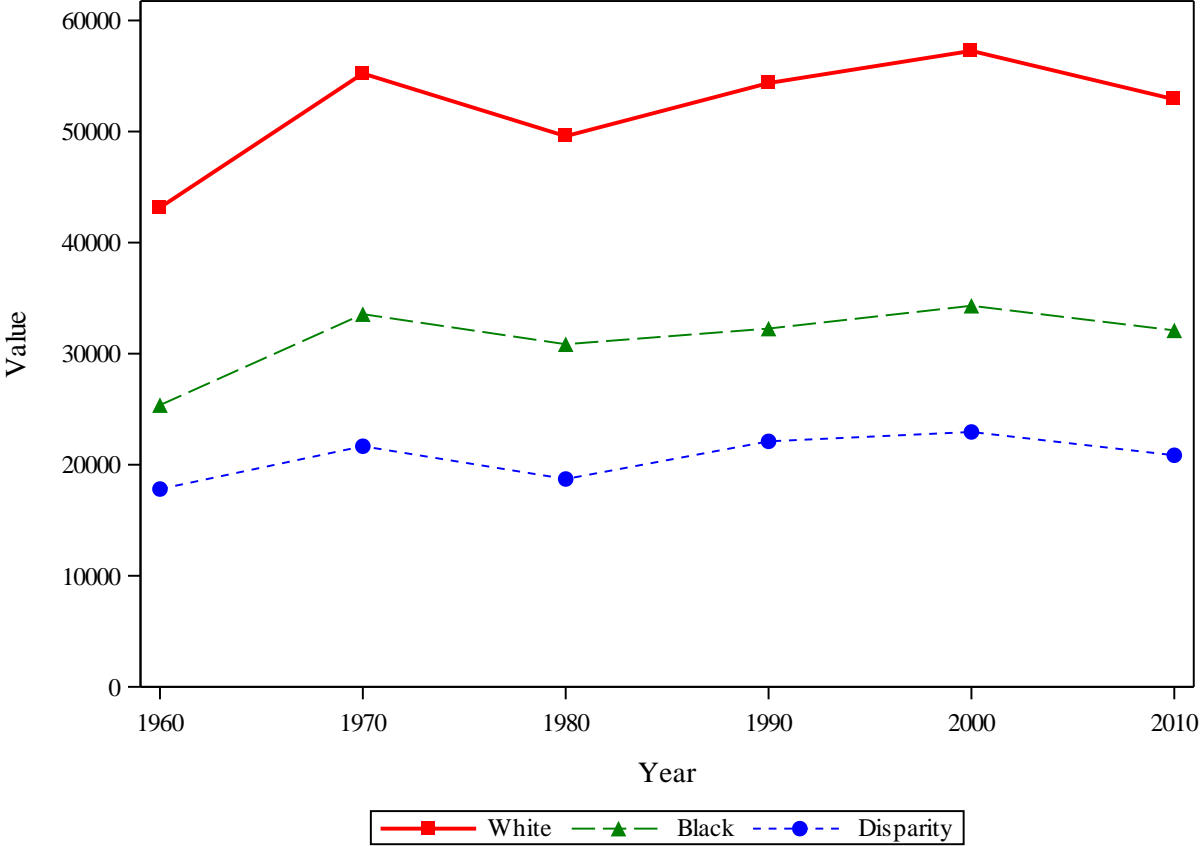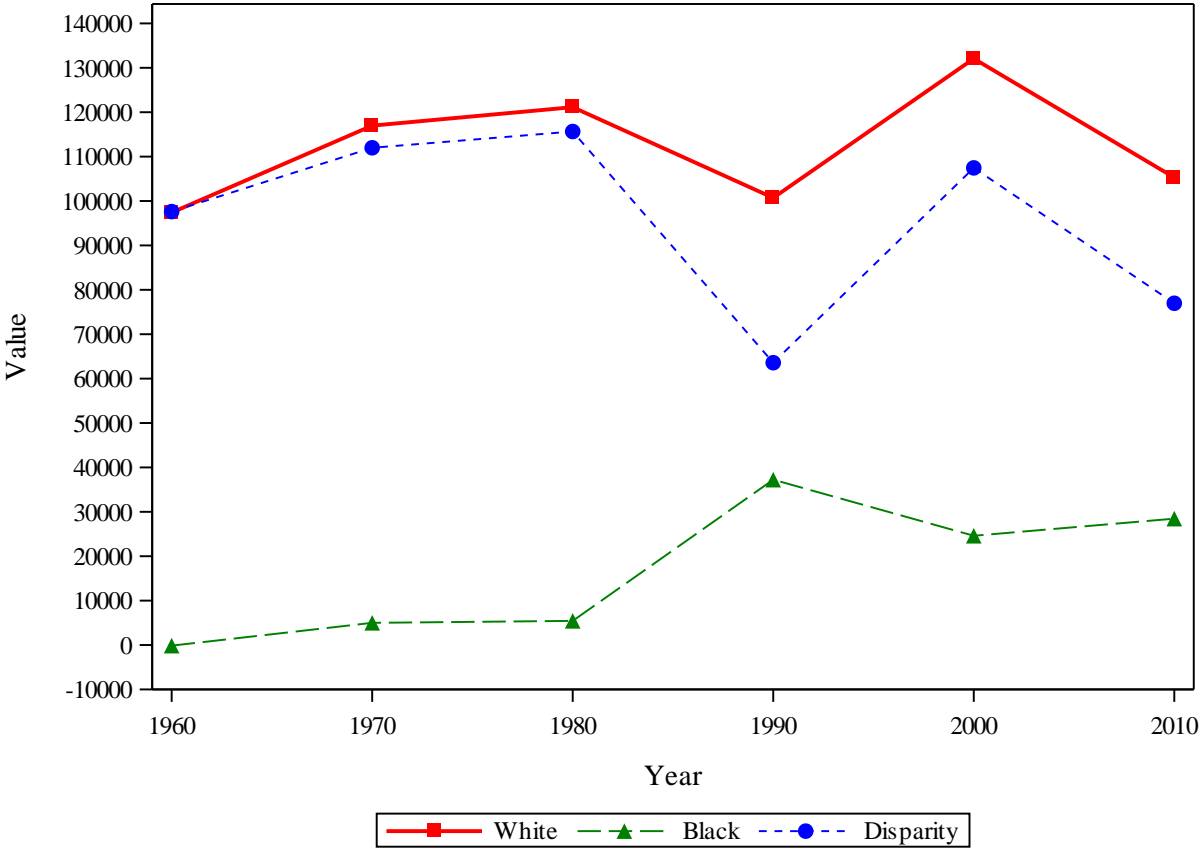**Figure 1: White and Black House Income Disparity 1960-2010**

Figure 2. Black/White Net Worth, 1960-2010

TABLE 1
**MEANS, STANDARD DEVIATIONS, AND CORRELATIONS**

Variables	Mean	Std.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Income ratio	1.80	0.93	1.00											
(2) Education ratio	1.17	0.15	0.37	1.00										
(3) Net assets ratio	6.15	24.75	0.46	0.31	1.00									
(4) Residential segregation	49.00	13.32	0.12	0.32	-0.18	1.00								
(5) School Segregation	53.62	13.67	0.20	0.35	-0.08	0.88	1.00							
(6) Occupational segregation	0.40	0.13	0.19	-0.10	0.28	-0.56	-0.56	1.00						
(7) Arrests ratio	8.96	23.29	0.10	-0.01	0.48	-0.29	-0.17	0.28	1.00					
(8) Jobless ratio	0.88	0.24	-0.33	-0.14	-0.24	-0.24	-0.25	0.13	-0.07	1.00				
(9) Political ideology	48.52	15.34	0.03	0.06	0.00	0.03	0.03	0.24	-0.12	-0.04	1.00			
(10) Min. wage	6.44	1.02	-0.13	-0.07	-0.19	0.05	0.01	0.02	-0.14	0.09	0.39	1.00		
(11) Unionization			0.08	-0.01	0.02	0.10	0.10	0.20	-0.01	0.01	0.44	0.41	1.00	
(12) Racial resentment			0.01	0.17	0.02	0.29	0.22	-0.24	-0.05	-0.05	-0.42	-0.22	-0.42	1.00

TABLE 3
FIXED EFFECTS 1960-2010

Variables	Coef.	Std. Err.
Educ ratio	0.56**	(.16)
Net assets ratio	0.00	(.00)
Res segregation	0.00	(.00)
School segregation	.01**	(.00)
Arrests ratio	.00**	(.00)
Jobless ratio	-.57**	(.08)
Political ideology	.00	(.00)
Occupational segregation	1.37**	(.24)
Min. wage	.047**	(.01)

**p<0.01, *p<0.05

Figure 3: Structural Equation Model of Racial Structural Factors on Black/White Income Ratio, 2017
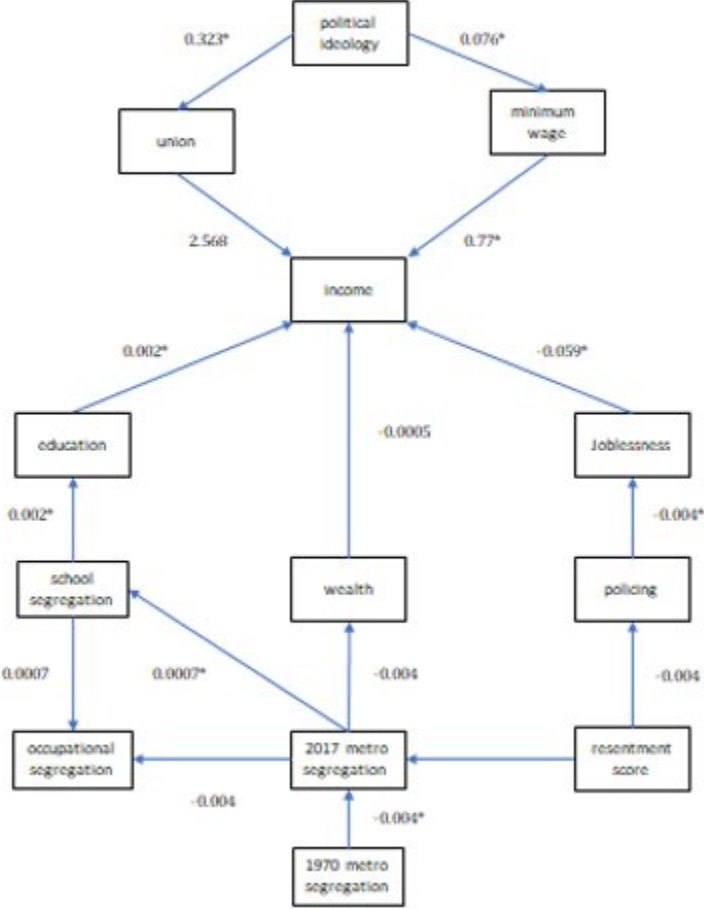
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Appendix

Summary Statistics of Measures

Variables	Obs	Mean	Std. Dev.	Min	Max
Education w/b ratio	221	1.186	0.087	0.969	1.694
Income w/b ratio	221	1.815	0.344	0.606	2.909
Joblessness black mean	221	0.451	0.078	0.220	0.854
Wealth w/b ratio	221	35.449	278.819	-6.830	4144.667
occ_race	221	0.301	0.093	0.175	0.718
metro dissimilarity	217	49.380	13.442	18.268	79.611
school dissimilarity	214	54.412	14.092	23.558	82.063
Arrests w/b ratio	180	7.941	16.332	0.310	139.912
Ideology citizens	221	55.301	12.945	23.981	97.002
Ideology institutions	221	40.655	18.355	18.113	69.948
resentment	221	0.632	0.024	0.583	0.705
minimum wage	221	8.444	1.409	2.000	12.240
union	190	11.960	6.900	0.800	37.300