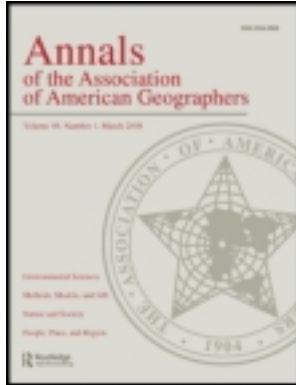


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# The Uneven Geography of Racial and Ethnic Wage Inequality: Specifying Local Labor Market Effects

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This article extends research on intermetropolitan and regional wage inequality through an investigation of the uneven geography of racial and ethnic wage inequality across metropolitan labor markets. Prior geographic studies largely restricted analysis of the source of intermetropolitan wage disparities to differences in industrial structure. The study described in this article further expands the analysis of labor market effects by conceptually describing and empirically analyzing the effects of three significant racial labor market institutions: public employment, unionization, and the penal system. I investigate these effects as part of a more extensive analysis of how local labor market structure—comprised of industrial mix, demographic composition, and institutional and regulatory arrangements—matters in mediating racial wage inequality. I use data from the 2000 U.S. Census and multilevel methods to analyze the wage differentials of African American and native- and foreign-born Latino men relative to whites across 186 U.S. metropolitan areas. Local labor market structure mediates different types of racial wage inequality in distinct ways: Regulatory context matters most for the relative wages of African Americans; both regulatory context and industrial mix influence the relative wages of native-born Latinos; and industrial composition matters most for the relative wages of foreign-born Latinos. Against these broad patterns of difference, not all effects—especially regulatory and institutional effects—are singularly group specific. Unionization shores up wages for both white and black high school-educated workers and mitigates racial wage inequality. Higher minimum wage rates boost the relative wages of high school-educated whites and native-born Latinos. *Key Words:* *geographic inequality, immigration, local labor market, racial inequality, racial wage gap.*

本文调查在大都市的劳动力市场中，种族和民族工资不平等的不均匀地理，从而促进对国际大都市和区域工资不平等问题的研究。在此之前的地理研究在很大程度上把大城市之间工资差距的根源分析限制在产业结构的差异上。本文中所述的研究，通过概念化地描述和实证分析三个显著的种族劳动力市场机构，即公共就业，工会，和刑罚制度的影响，进一步拓展了对劳动力市场的影响分析。我把这些影响作为一个更广泛的分析的一部分，它分析由产业结构，人口构成，和监管的体制和排列所组成的，本地劳工市场的结构对调解种族工资不平等的影响。我使用 2000 年美国人口普查数据和多层方法分析跨越 186 个美国大都市地区的非裔美国人以及本土和外国出生的拉丁裔男子相对于白人的工资差别。本地劳工市场的结构以不同的方式介导不同类型的种族工资不平等：监管环境对非裔美国人的相对工资最为重要；监管环境和产业结构影响土生土长的拉美裔的相对工资；产业构对外国出生的拉丁裔的相对工资是最重要的。不同于这些差别的广泛模式，不是所有的影响，尤其是管理和体制的影响，是明显针对某种族组的。工会化使受过高中教育的白人和黑人工人的工资双方上涨，并缓解了种族间的工资不平等。较高的最低工资率提高了受过高中教育的白人和本土出生的拉美裔的相对工资。*关键词：地域不平等，移民，当地劳动力市场，种族不平等，种族的工资差距。*

Este artículo amplía la investigación sobre la inequidad del salario inter metropolitano y regional mediante una investigación de la geografía irregular de la inequidad del salario racial y étnico en los mercados de trabajo metropolitanos. Estudios geográficos anteriores mayormente restringieron sus análisis de las disparidades de salario inter metropolitano a las diferencias en la estructura industrial. El estudio descrito en este artículo profundiza el análisis de los efectos del mercado de fuerza laboral describiendo conceptualmente y analizando empíricamente los efectos en tres instituciones significativas en el mercado laboral racial: empleo público, unionización, y el sistema penal. Investigo estos efectos como parte de un análisis más extensivo de cómo la estructura del mercado laboral local—formado por la mezcla industrial, composición demográfica, y arreglos institucionales y regulatorios— importa en la mediación de la desigualdad en el salario racial. Uso información del censo de EE.UU del 2000 y métodos multinivel para analizar las diferencias de salario de afroamericanos y nativos—y nacidos en el extranjero— hombres latinos en relación con los blancos en 186 áreas metropolitanas de EE.UU. La estructura del mercado laboral local media los diferentes tipos de desigualdad en los salarios raciales en distintas formas: el contexto regulatorio importa más para los salarios relativos de los africano americanos; el contexto regulatorio y

la mezcla industrial influyen los salarios relativos de los nacidos nativos latinos; y una composición industrial importa más para los salarios relativos de los latinos nacidos en el extranjero. Contra estos grandes patrones de diferencia, no todos los efectos—especialmente regulatorios e institucionales—son singulares a grupos específicos. La unionización eleva los salarios tanto para los trabajadores blancos como para los negros que hayan terminado la educación secundaria y mitiga la desigualdad del salario racial. La tasa de salarios mínimos es más alta en los salarios de los blancos y de los latinos nativos que han terminado educación secundaria. *Palabras clave: inequidad geográfica, inmigración, mercado de trabajo local, inequidad racial, diferencia de salario racial.*

Inequality among American workers increased dramatically during the last decades of the twentieth century. Accelerating most rapidly during the 1980s, wage differences by education, age, occupation, and race all widened substantially (Bound and Freeman 1992; L. Katz and Murphy 1992). Most American workers, especially minorities and the less educated, fared no better during the boom years of the 1990s: Wage inequality continued to rise, although less steeply (Autor, Katz, and Kearney 2005). By century's end, labor market inequality was at its highest level since the Great Depression, and racial and ethnic wage inequality persisted as an intractable feature of U.S. employment.

A limited body of geographic research has contributed to the documentation or explanation of these economic trends and their geographic variability. A handful of studies examined the spatial unevenness of income inequality across states (Levernier, Partridge, and Rickman 1995; Morrill 2000), metropolitan regions (Chakravorty 1996; Madden 2000), and counties (Levernier, Rickman, and Partridge 1998). Fewer studies examined the geographic variability of wage inequality (exceptions include Odland and Ellis 2001; Drennan 2005). To my knowledge, only a handful of geographic studies examined racial and ethnic wage inequality (i.e., Ellis 2001; Goodwin-White 2008; Wang 2008). Yet, as these and past studies demonstrate, the geographic variability of wage inequality reflects fundamental geographic processes—uneven development, agglomeration economies, regional restructuring, migration and demographic change, local institutional norms and practices—that likely exacerbate or ameliorate wage inequality among workers (Peet 1983; Storper and Walker 1989; Peck 1996).

Through the 1970s and 1980s, regional wage disparities were the subject of robust debate among geographers and scholars generally (e.g., Goldfarb and Yezer 1976; Clark and Ballard 1981; Dickie and Gerking 1987). Geographic studies focused on interregional and intermetropolitan wage disparities as “both an expression of spatially uneven patterns of industrialization and a stimulus to shifts in the location of economic activity” (Angel and Mitchell 1991, 124).

Explanations of wage disparities emphasized differences in the industrial regimes of regional economies; for example, high wages in the north central United States resulted from its concentration of unionized, capital-intensive industries, whereas low wages in the South were a consequence of its concentration of nonunion, labor-intensive production systems. Geographers underscored the significance of these disparities for firm location strategies and restructuring processes, exemplified by the strategic relocation of firms from high-wage to low-wage regions in response to increased global competition and decreased union power (Bluestone and Harrison 1982; Peet 1983).

During the 1990s, scholarly focus shifted both in scale and orientation as geographers refined their conceptual and empirical analyses of the local labor market (e.g., Hanson and Pratt 1992; McClafferty and Preston 1992; Peck 1996). Intraurban empirical analyses dominated the study of labor markets as geographers sought to identify the highly localized routines and practices that shape employment outcomes. Correspondingly, wage studies focused nearly exclusively on intraurban differentials (e.g., central city vs. suburban; commute time). Although theoretical treatments of the local labor market continued to accent many of the features of the labor market that inhere at a more macro scale, such as industrial structure, empirical analyses of regional or intermetropolitan wage differentials largely fell off the research agenda. Geographers have returned only recently to this line of inquiry.

The study described in this article reengages these questions through an investigation of the uneven geography of racial wage inequality across metropolitan labor markets. Conceptually and empirically, this study represents an ecumenical effort to bridge the quantitative thrust of the earlier geographic studies on regional wage disparities and their singular focus on industrial structure with a more multifaceted rendering of local labor market context derived from the theoretical insights of institutional and regulation approaches to the local labor market. Conceptually, I articulate a theoretical framework that identifies racial labor market institutional projects at work within local labor

markets to broaden extant specifications of regulatory context. Empirically, I analyze three conspicuous examples of such racial projects—public employment, unionization, and the penal system—as part of a more extensive analysis of how local labor market structure matters in mediating racial wage inequality.

The study employs data from the 2000 U.S. Census and multilevel methods to analyze the wage differentials of African American and native- and foreign-born Latino men relative to whites across 186 U.S. metropolitan areas. By leveraging variability across metropolitan labor markets to identify and measure the specific effects of local context on racial inequality, the study described in this article contributes to the “identification of labor market characteristics and local and regional institutions that maintain wages for different types of workers” (Rigby and Breau 2008, 937).

## Patterns and Explanations of Racial Inequality

Racial inequality trends are exemplified by black–white disparities. In broad sweep, the male black–white wage gap decreased between 1940 and 1980 by 29 percentage points (measured by weekly wages), increased during the 1980s, and remained relatively unchanged through the 1990s, with whites earning, on average, 30 percent more than blacks per hour (J. P. Smith and Welch 1989; Western and Pettit 2005). Although the relative earnings of young black men increased slightly through the 1990s, these gains, like their post-1964 antecedents, were mitigated by high rates of joblessness and incarceration among lower skilled black men (Butler and Heckman 1977; Western and Pettit 2005). Similar trends characterize inequality experienced by other ethnic and racial groups (Morales and Bonilla 1993). In short, racial wage inequality remains a stubborn and persistent feature of the American labor market, despite occasional progress (Darity and Myers 1998).

Explanations of rising wage inequality among all workers since 1980 emphasize shifts in the supply and demand of skills in the labor market along with the erosion of labor market institutions such as unions and the minimum wage (Freeman and Katz 1994; Card and DiNardo 2002). Deindustrialization explanations invoke many of these same mechanisms and figure prominently in accounts of increasing black disadvantage generally (W. J. Wilson 1987) and of increasing black–white wage inequality specifically (Bound and Freeman

1992). Studies of the latter accent the sharp drop in unionization due to the loss of unionized manufacturing jobs, especially in the Midwest (Bound and Freeman 1992). Other accounts of racial wage inequality stress government interventions, such as the erosion of affirmative action policies during the 1980s, rather than industrial change as the most significant contributor to increasing racial wage inequality (Stainback, Robinson, and Tomaskovic-Devey 2005; Sites and Parks 2011).

Racially differentiated patterns of labor force attachment also influence racial wage inequality. First described by Butler and Heckman (1977) with respect to joblessness and recently expanded by Western and colleagues (Western and Beckett 1999; Western and Pettit 2005) with respect to incarceration, racial wage inequality has been shown to be sensitive to the absence of black men from the labor market. As a result, recent improvements in observed black–white wage inequality are partly an artifact of high rates of black joblessness and incarceration.

These explanations derive primarily from studies of national-level data that occlude subnational variation and patterns of racial wage inequality. The bulk of the extant literature that does examine subnational patterns of geographic variability comes not from geographers but from sociologists, who emphasize the racial composition of a local population as a key determinant of racial wage inequality. This body of research builds on Blalock’s (1956) visibility-discrimination hypothesis that posits higher levels of racism and inequality in cities with larger minority populations: The higher the perceived threat of these minorities, the more potent the discriminatory effects against them. Studies consistently have found a positive correlation between the size of a metropolitan region’s non-white population and racial–ethnic inequality (Blalock 1956; Tienda and Lii 1987; Huffman and Cohen 2004).

Recent sociological studies engage a more comprehensive analysis of local structural effects on multiple types of racial wage inequality. The work of McCall (2001a, 2001b) has been especially generative in this regard. In an analysis across 181 metropolitan labor markets, McCall (2001b) compared “older” explanations of racial wage inequality, such as local labor market demographics and industrialization, with “newer” explanations, such as technological change and labor market flexibility. She found that manufacturing employment and unionization remain the most significant mediators of black–white inequality; immigration has the greatest effect on the relative wages of Asians and Latinos with no effect on the relative wages of black

men; and newer explanations of inequality exert weak effects on racial wage gaps.

## Local Labor Markets and Spatial Wage Differentials

Geographic approaches to the local labor market—principally, that labor markets are spatially constituted domains of economic, political, and social activity—emphasize the geographic contingency and local embeddedness of labor market processes and outcomes, including wages (Storper and Walker 1989; Hanson and Pratt 1992; Peck 1996). Two central tenets undergird this research. First, individual employment outcomes are not solely determined by human capital but also by the structural conditions of the local labor market. Second, markets tend to remain at disequilibrium—they do not clear, and they do not clear across geography. Thus, labor market outcomes are differentiated locally and geographically. By contrast, neoclassical models rest exclusively on demand and supply factors and the assumption that markets adjust, or clear, at equilibrium between these two factors.

Institutionalist and regulation approaches predominate in the geographic research on the local labor market (Martin and Morrison 2003). Social institutionalist approaches emphasize the ways in which local social networks, routines, and conventions shape labor market processes and contribute to socially and geographically differentiated employment outcomes. Feminist geographers have contributed most prodigiously to this perspective, identifying the ways in which localized social arrangements of home and community influence the social organization of work (e.g., Hanson and Pratt 1992). Expanding on the institutionalist approach, regulation theorists stress the ways that broader sets of social relations (e.g., politics, policy, legal systems) intersect with local community norms and expectations to give shape to specific capital–labor arrangements. From the regulation perspective, local labor markets function as everyday sites of socio-political regulation and as local instantiations of broader political economy regimes (e.g., Peck 1996).

In recent decades, the rich body of empirical research that has emerged within the geographic literature on local labor markets has taken as its primary focus employment outcomes other than wages, such as joblessness, underemployment, or occupational and industrial segregation (e.g., Hanson and Pratt 1992;

Wyly 1999; Parks 2004; Ellis, Wright, and Parks 2007; Wang 2010). Of the minority of studies that do address wages, most examine intraurban spatial wage differentials, such as the differences between central city and suburban wages, often in tests of the monocentric wage gradient model (Madden 1985; Carlson and Persky 1999). Tests of the spatial mismatch hypothesis usually model employment, rather than wages, as an outcome but often include earnings as an independent variable (e.g., McClafferty and Preston 1992). Other studies focus on changing wage returns over time within a local labor market. A recent study by Rigby and Breaux (2008) analyzed regional restructuring effects on wages within Los Angeles and found that increased foreign trade reduces the wages of less skilled workers. Studies of this type, however, do not investigate the *spatially* variable effects of factors such as trade on wage inequality.

Whether variation in wages and wage inequality manifests at the scale of the metropolitan region poses significant theoretical and empirical questions. If variation between metropolitan regions is small beyond that explained by differences in supply and demand, then noncompetitive wage-setting mechanisms emphasized by institutionalist and regulation conceptions of the local labor market are of nominal consequence at this scale. Yet many of these mechanisms are tied to attributes accented by regional models of metropolitan development, such as agglomeration externalities, interregional migration and demographic change, regional institutional arrangements and policy configurations, and regional industrial regimes and growth trajectories—all processes that inhere at a scale more macro than the intraurban scale (e.g., Saxenian 1994; Storper 1997; Scott 1998). Earlier geographic studies on wage disparities (e.g., Angel and Mitchell 1991) were focused primarily on regional and intermetropolitan disparities as indicators of uneven regional development and the restructuring of regional industrial regimes.

Further, the principles and practices of federalism, as well as the highly decentralized nature of U.S. labor relations, ensure that the regulatory context that bears on employment and wages varies geographically within the United States at the metropolitan and state levels (e.g., Nelson 1999; Fitzpatrick, Perine, and Dutton 2009). Minimum wage policy is a classic example. States are empowered to establish their own minimum wages effective above the federal minimum rate. In 1999, eight states and the District of Columbia all had minimum wage rates above the federal minimum of \$5.15 per hour (Nelson 1999).

Recently, a few geographic studies have returned to the question of regional and intermetropolitan differences in levels of wage inequality. Odland and Ellis (2001) analyzed changes in earnings inequality during the 1980s among young white men across forty-three of the largest metropolitan labor markets. They found that differences in wage premiums by skill varied across metropolitan labor markets and that much of this geographic variation stemmed from factors above and beyond shifts in supply and demand. Specifically, Odland and Ellis (2001) found that most of the growth in inequality resulted from changes in earnings within sectors, especially in industries and regional markets where the relative wages of less-educated young men had been highest in 1979. They argued that these results reflect the deterioration of locally embedded nonmarket wage premiums that had been available previously to these workers.

Using a similar approach, Ellis (2001) analyzed the shift in the native-born/foreign-born wage gap between 1980 and 1990 across five of the largest immigrant-receiving U.S. cities and found that local wage structures mediate inequality between immigrants and the native-born. Goodwin-White (2008) compared the relative wage distributions of immigrants, the adult children of immigrants, and the U.S.-born between 1990 and 2000 in New York City, Los Angeles, and the United States as a whole. After controlling for education, Goodwin-White (2008) found that the change in a group's relative position in the wage distribution—a measure of economic mobility—varies by group and depends on the context of the local labor market. For example, the relative wage disadvantage of immigrant Latinos decreased in Los Angeles through the 1990s but increased in New York.

Wang (2008) analyzed the effects of residential segregation and labor market segmentation on the wages of native-born whites, native-born blacks, foreign-born Hispanics, and foreign-born Asians across multiple U.S. labor markets. She found that higher levels of racial residential segregation depress native-born black earnings but boost earnings among the other groups and that “all racial and gender groups would benefit from a labour market that is more evenly distributed among ethnic minorities” (Wang 2008, 839).

These studies provide evidence of locally specific wage-setting mechanisms at the metropolitan scale but, Wang (2008) excepted, stop short of specifying exactly which local labor market characteristics influence wages and how. Odland and Ellis (2001) and Ellis (2001) restricted their analysis of the sources of

changing wage inequality to changes in wage structures within and between sectors. Similarly, Goodwin-White (2008) focused on differing wage distributions and changes to these wage distributions across local labor markets. With few exceptions, geographers have largely neglected to exploit the variability among local labor markets created by uneven development and local regulatory contexts to ascertain the specific effects of local labor market structure on wage inequality.

## Expanding the Scope of Racial Institutional Effects

By connecting insights about labor market embeddedness from geographers to theoretical frameworks of racial formation (Omi and Winant 1994) and institutional orders (King and Smith 2005), I conceptualize *racial labor market institutional projects* as a key mechanism by which local labor markets as sites of social and political regulation produce and mediate racial inequality. This approach seeks to identify and consolidate the range of processes that generate racial labor market inequalities as embedded within systems of racial hierarchy but also within efforts that contest and challenge these systems. In formulating this concept, I build on the notion of labor market institutions as collective, noneconomic influences on labor market outcomes and on Omi and Winant's (1994) depiction of racial formation as generated, in part, by “racial projects.” My approach also draws on theoretical frameworks developed by scholars of race across a number of disciplines (e.g., Miles 1982; Wacquant 2001; King and Smith 2005; Gilmore 2007). In this article, I focus on public employment, unionization, and the penal system as conspicuous examples of racial projects within the labor market given their robust historical development or pronounced contemporary impacts on racial patterns of inequality. Of geographic import, these racial labor market institutional projects manifest and exert their influence primarily at the local and metropolitan scale.

As a first point of departure, I utilize the labor economists' term, *labor market institutions*, to describe “systems of laws, norms, or conventions resulting from *collective* choice and providing constraints or incentives that alter *individual* choices over labor and pay” (Boeri and van Ours 2008, 3, emphasis in original). Much of the geographic scholarship on local labor markets identifies similar institutional influences, highlighting

their socio-spatial dimensions (e.g., Hanson and Pratt 1992). My approach builds on this tradition, although I deliberately develop my theoretical framework more narrowly to highlight and explicate specific racial processes.

As a second point of departure, I conceive of some labor market institutions as *racial projects*. Central to the process of “racial formation,” Omi and Winant (1994, 56) defined a racial project as “simultaneously an interpretation, representation, or explanation of racial dynamics, and an effort to reorganize and redistribute resources along particular racial lines.” *Racial labor market institutional projects* represent the collective, nonmarket efforts of their participants to interpret, organize, and redistribute labor market opportunities and outcomes along racial lines. As King and Smith (2005) emphasized in their depiction of “racial institutional orders,” these participants include not only the perpetrators of racial injustices within the labor market but also those who have struggled against these injustices. Thus, participants of racial labor market institutional projects are not confined to employers, individual workers, and the state but also include collective worker organizations, other intermediary organizations, and civil society members such as antiracist activists (e.g., Gilmore 2007). These racial projects are multiple, some functioning as legacies of inherited norms and conventions and others as more active efforts to change persistent racial patterns of labor market process and outcome.

Although racial labor market institutional projects can be racist and racializing (Miles 1982), they are not inherently so. Sometimes they represent nonracist “transformative egalitarian” efforts or agendas (King and Smith 2005, 75). As defined by Omi and Winant (1994, 71), a *racist racial project* “creates or reproduces structures of domination based on essentialist categories of race” (emphasis in original). Such a definition focuses on “the ‘work’ essentialism does for domination” (71) and allows distinction between racial awareness and racist essentialism. When the goal of a particular racial project is democratization of resources or opportunities, not domination, then such a project is not racist. Thus, racial labor market institutional projects that employ racial awareness to redress structural inequalities function as egalitarian, nonracist efforts that challenge historical patterns of racial economic domination. Unionization and public employment function primarily as two such racial labor market institutional projects. By sharp contrast, the contemporary penal system functions as a racist project.

## Unionization

Unionization has played a critical role in reducing racial inequality throughout the second half of the twentieth century, a racially egalitarian function it continues to perform in the contemporary postindustrial economy (Zeitlin and Weyher 2001; Schmitt 2008). Although unionization benefits workers overall (Levy and Temin 2007), it benefits workers of color most. Not only have unionization rates been highest among African Americans for several decades (Schmitt 2008) but the union wage premium continues to be highest for African American and Latino workers (Freeman and Medoff 1984; Yates 2009). Historically, higher levels of unionization within both manufacturing and public employment (both niche industries for blacks) have contributed significantly to reducing levels of black–white wage inequality. Yet the benefits of unionization extend beyond these usual industrial suspects: Recently, these benefits have been found to be highest among African American workers in low-wage occupations (Schmitt 2008).

These union benefits constitute the outcomes of a racial labor market institutional project involving, and often initiated by, black workers—a historical trajectory that includes the organizing campaigns of the Brotherhood of Sleeping Car Porters under the leadership of A. Philip Randolph, the campaigns of civil rights unionism, and contemporary racial justice efforts among the largest service sector unions in the United States (Korstad 2003; Rustin 2003). More than any other racial–ethnic group, African American workers repeatedly express the greatest desire and willingness to join unions (Freeman and Rogers 1999). Even when forced into segregated locals, blacks actively sought union representation and struggled to remake race within the House of Labor as a crucial step in the long march to racial economic justice (Drake and Cayton 1962; Warren 2010). A similar trajectory of labor activism marks the experience of Latinos and Asian Pacific Islanders, from the labor activism of Filipino, Chinese, Japanese, and Mexican farm and sugar plantation workers to contemporary labor organizing efforts in industries with large numbers of workers of color, such as the garment, hotel, and health care industries (Abbott 1971; Daniel 1981; Wong 2000; Vargas 2005).

Given the localized structure of labor relations, unionization among workers of color has important consequences for local, metropolitan configurations of racial inequality. Primarily due to federal rules that govern collective bargaining, geographic unevenness is a

built-in feature of the U.S. system of labor relations (Herod 1991). With few exceptions, unions must bargain individual contracts workplace by workplace, a requirement that shapes the very nature of the labor movement itself. Union “locals” tend to map onto local metropolitan boundaries, an organizational feature that reflects the localized nature of collective bargaining in conjunction with the spatial division of labor. Union efforts are also embedded within, and reflect, local racial ideologies and their contests (Korstad 2003). Thus, unionization, as a racial labor market institutional project, is a critical aspect of metropolitan labor market dynamics, and union effects, such as higher wage premiums among workers of color, bear significantly on patterns of metropolitan racial wage inequality. For example, McCall (2001b) found that metropolitan labor markets with higher levels of unionization had significantly lower levels of racial wage inequality, reflecting both the direct and indirect effects of unionization on local labor markets.

### Public Employment

Although rarely remarked on in Fordist and post-Fordist accounts of urban restructuring, a significant body of empirical research indicates that employment within the high-wage, unionized *public* sector contributed significantly to black upward mobility in the postwar decades (e.g., Freeman 1976; Waldinger 1996; M. B. Katz, Stern, and Fader 2005). Studies on data from the 1960s onward have consistently found that similarly skilled blacks across all educational levels and occupational statuses have earned higher wages in the public sector than in the private sector, despite shrinking wage differentials in recent decades (Freeman 1976; Zipp 1994). Like other groups, less educated blacks (those without a college degree) have profited most from public employment (Poterba and Rueben 1994). Lastly, racial wage inequality has been less pronounced within the public sector (Freeman 1976; D. A. Smith 1980). Although this trend reversed during the 1980s among federal employees, racial wage inequality has continued to decline steadily among state and municipal employees (Zipp 1994).

Over the last thirty years, the public sector has emerged as African Americans’ most pronounced employment niche; in major U.S. cities such as Chicago, blacks historically have been concentrated more in public employment than in any other sector, including manufacturing (Lim 2001; Parks 2011). Rather than simply conceiving of the public sector as an “ethnic

niche,” produced and maintained in ways similar to other group niches, understanding the historical legacy of public employment as a racial labor market institutional project recognizes the political efforts of African Americans themselves to secure public employment, one deeply embedded in the trajectory of racial politics that pivots centrally on political collective action and state response (Eisinger 1982a; Parks 2011). As a result, public employment stands as a significant dimension of the broader struggle to alter the social meaning of race within the United States by “opening up’ the state” (Omi and Winant 1994, 81). As racial minorities made successful inroads into mainstream politics in the postwar era, they made the state the primary target of their efforts to institute racial democracy—in this case, the opening up and distribution of public jobs to blacks.

Tactically, the import of public employment for black economic progress and racial equity stems, in part, from the political utilization of the public sector’s “social equity function” (Lobao and Hooks 2003, 520). In its capacity as an employer, government can directly hire and set wages according to social agenda goals, such as inequality reduction and other nonmarket considerations, as it did aggressively during the 1960s and 1970s as part of civil rights reform (Brown and Erie 1981; M. B. Katz, Stern, and Fader 2005).

Higher unionization rates also account for the public sector’s higher wages and more generous benefits (Card 2001). In 2008, nearly 37 percent of all government employees belonged to a union compared to 7.6 percent in the private sector (Zipperer 2009); however, public sector employment and unionization do not necessarily go hand-in-hand. The legal right of public employees to bargain collectively varies by state (Freeman and Ichniowski 1988; Gould 2004). Thus, the union premium of public employment differs considerably across labor markets.

The effects of public employment are likely highly variable across localities for two additional reasons. First, whereas municipal employment is geographically dispersed, federal and state employment tends to concentrate in political centers of power such as in state capitals and regional hubs. Second, the racial effects of public employment likely vary with respect to the political power of racial groups. U.S. politicians have long exercised their role as public employers to accommodate new voting blocs, through both explicit patronage systems and less explicit social mandates (Brown and Erie 1981; Eisinger 1982a, 1982b). Historical trends would predict a similar path for other minority groups, such as Latinos (Sisneros 1993). Whether a link between



black politics and public employment and the racial equity effects of such employment persist in the purported “postracial” political environment remain untested empirical questions.

### Penal System

The substantial increase in incarceration and its racial disproportionality over the past two decades has generated a sizable and “coercive reallocation of labor” along racial lines that reflects the growing influence of U.S. criminal justice policy as a state policy-driven racial labor market institutional project (Western and Beckett 1999, 1054). Due to the adoption of more punitive criminal justice policy, such as the war on drugs and the passage of zero-tolerance crime laws, incarceration rates skyrocketed through the 1980s and 1990s. Simultaneously, the racial disparity in incarceration widened dramatically as African American men bore the brunt of these policy changes (Wacquant 2001; Gilmore 2007). In 1995, 49 percent of the U.S. prison population was black (Western and Beckett 1999).

Incarceration targets younger, less-skilled workers of color. As a result, the multiple employment effects of jail time—lost jobs, lost labor market experience—disproportionately affect those already most disadvantaged by existing labor market inequalities. Additionally, the racializing experience of incarceration—the conflation of criminality with essentialist representations of race—now carries into other sectors of social engagement (e.g., the labor market), further entrenching patterns and practices of racial domination and injustice beyond prison walls (Wacquant 2001). Peck and Theodore (2008), for example, documented the persistent difficulties ex-felons face when attempting to secure even the lowest wage employment. By perpetuating and reconstituting racial hierarchies in emphatic, essentialist fashion, the penal system functions as a racist and, in Wacquant’s (2001, 95) terminology “peculiar,” racial labor market institutional project.

The insidious effects of the “racialized displacement” wrought by the penal system (Price 2010, 153) influence labor market inequality in more oblique, but significant, ways. Literal displacement from the labor market begets a statistical displacement with salient policy implications. Because the incarcerated are not counted in the official labor market data used to identify and legitimate patterns of racial inequality, disproportionately high levels of incarceration among black men have been shown to artificially lower statistical levels of black–white inequality in unemployment and wages.

For example, standard measures of racial wage inequality do not account for the absence of relatively lower earning black men from the labor market as a result of incarceration. Statistically, excluding these lower earners inflates the black average wage and produces an artificially lower black–white wage gap (Western and Pettit 2005). But although the perverse short-term effect of incarceration is to (artificially) lower racial labor market inequality, the long-term effects of incarceration deepen racial patterns of labor market inequality (Western and Beckett 1999; Wacquant 2001; Peck and Theodore 2008).

Because the penal system functions as a predominantly local racial labor market institutional project, these short- and long-term effects generate geographically uneven patterns of racial inequality. General tendencies in national criminal justice policy manifest in locally contingent ways given the decentralized nature of the criminal justice system—from police precincts, to local judges, to state law (e.g., California’s “Three Strikes” law), to local activists (Gilmore 2007). The uneven geography of incarceration’s “racial disproportionality,” for example, is particularly pronounced (Wacquant 2001, 115). In 1994, blacks in Washington, DC, were 35 times more likely than whites to be jailed compared to 8.5 times nationally, the most extreme racial disparity in the United States. In ten of the thirty-eight states where the black–white gap had grown, blacks were more than 10 times likely as whites to be incarcerated (Wacquant 2001).

### Local Labor Market Effects on Racial Wage Differentials

These racial labor market institutions function as part of a more comprehensive set of characteristics that make up the local labor market. Although these characteristics are multifaceted and complex, I group them into three general categories: industrial mix, demographic composition, and institutional and regulatory context. Racial labor market institutions are included in the last category. I analyze these multiple components of local labor market structure simultaneously to adjudicate between the relative effects of each on different types of racial and ethnic wage inequality.

#### Industrial Mix

Contemporary political economy accounts of Fordism and post-Fordism highlight the role of high-wage, unionized industrial employment as instrumental

to the generalized economic prosperity and low inequality that characterized the post-World War II era. The loss of this employment through deindustrialization and the concomitant restructuring of production regimes that have accompanied the rise of the service sector have yielded greater economic insecurity for workers and increased levels of inequality within the workforce. Old Fordist production regimes still predominate in many regions, although in a weaker state than in decades past. In other regions, the postindustrial economy prevails in many guises, whether in the form of new service regimes of global cities (Sassen 1998) or the highly segmented labor markets of the new technology regions (Benner 2002).

To capture the primary industrial components of these political economy explanations and their geographic unevenness, I include measures of a region's industrial mix as proxies for dominant production regimes. I include the size of the durable and nondurable manufacturing sectors to test if the historic effects of manufacturing still hold at the dawn of the twenty-first century. Previous empirical evidence points to the mitigating effect of manufacturing on black-white inequality (Bound and Freeman 1992). Similar effects might hold for all forms of racial inequality. More recent studies indicate that this effect is specific to durable manufacturing (McCall 2001b). Given the movement of Latino workers into lower wage, light manufacturing jobs through the 1980s and 1990s (Scott 1996), I include a measure of nondurable manufacturing employment to test whether this form of manufacturing exacerbates wage inequality between both native- and foreign-born Latinos and whites.

Evidence indicates that nonwhite workers are relegated to secondary labor market positions that predominate within the service sector (Mollenkopf and Castells 1991). I include multiple measures of the service economy to test for racial inequality effects under varieties of postindustrialism: (1) a measure of the financial and producer services associated with global city regimes (the finance, insurance, and real estate [FIRE] sectors; Sassen 1991); (2) a measure of technology services (e.g., engineering, computer systems design, scientific research) emphasized in accounts of the new economy (e.g., Benner 2002); and (3) a measure of low-end services made up of sectors with concentrations of labor-intensive, low-wage jobs that offer little opportunity for advancement (Appelbaum, Bernhardt, and Murnane 2003), such as temporary employment, security, landscaping, waste management, child care, traveler accommodation, food service, nail salons, and

private household services (see Note 10 for specific industry codes).

### Demographic Composition

I include a measure of black concentration (percentage of a region's residential population that is African American) to examine whether the relationship between size of a local black population and racial wage inequality continues to hold in 2000 (Huffman and Cohen 2004). I do not expect black concentration to influence other forms of racial wage inequality beyond black-white inequality. (I tested for black concentration as a nonlinear effect but did not find its squared term significant in any models.)

A large literature exists that examines the effects of immigration on African American employment. Studies that employ a measure of immigrant population density have not found a negative correlation between the size of the immigrant population and African American men's wages (Enchautegui 1995; Butcher 1998; McCall 2001b). Other studies that employ a measure of immigrant growth within particular skill groups have identified negative wage effects for African Americans (Howell and Mueller 2000; Borjas, Grogger, and Hanson 2006). If foreign-born Latinos compete with African Americans but not with whites for jobs, then a higher concentration of immigrants in a metropolitan region might increase black-white wage inequality. Alternatively, if immigrants push African Americans up the job hierarchy (Rosenfeld and Tienda 1996; Lim 2001), then a higher concentration of immigrants in the workforce could improve the relative earnings of African Americans, decreasing black-white inequality or imparting no negative effect.

Immigrant density is likely most relevant to the relative earnings of immigrant workers. Studies have shown that immigrants compete most directly with other immigrants, such that immigration pushes down immigrant wages (Altonji and Card 1991; McCall 2001b). In this situation, immigration might increase inequality between whites and immigrant Latinos. The effect of immigrant density on the relative earnings of native-born Latinos could be either positive or negative. If foreign-born Latinos compete with native-born Latinos on the basis of ethnicity, then the effect would be negative. If immigrant Latinos push native-born Latinos up the job hierarchy, especially given the English fluency of the latter group, then the effect would be positive. Alternatively, these workers might be sufficiently segregated from one another

in the local labor market that immigrant density has no effect on the relative earnings of native-born Latinos.

### Regulatory and Institutional Context

I use union density (percentage of workers covered by a union contract), the minimum wage, the incarceration rate, and public employment as proxies for regulatory context. Unionization and the minimum wage are robust proxies for regulatory context as one of the primary results of deregulation has been the reduction of unionization rates and the erosion of the real minimum wage (Freeman 2007). As discussed earlier, both incarceration rates and public employment represent indirect forms of state regulatory intervention in the labor market.

Further, unionization, incarceration, and public employment serve as three cases of racial labor market institutional projects at work within local labor markets. Unionization has been associated with higher racial wage differentials and lower levels of black–white inequality. Because African American workers have higher unionization rates than do whites or Latinos, I expect that the unionization effect will be most pronounced for black workers (Schmitt 2008). Due to the disproportionately high incarceration rate among black men compared to both whites and Latinos (Western and Pettit 2005; Johnson and Raphael 2009), I expect that the incarceration rate will have a positive influence on the relative wages of black men (artificially lowering black–white inequality) but not for other groups. I would expect labor markets with higher concentrations of public employment to have lower levels of racial inequality, especially black–white inequality, given the public sector’s historic role as an egalitarian racial labor market institution resulting from practices such as more effective antidiscrimination enforcement and equitable pay.

Lastly, the minimum wage might positively influence racial wage differentials given the higher concentration of workers of color in low-wage jobs; however, minimum wage rates have recently been so low as to fall below all but the very lowest market wages. Further, many immigrants are employed in unregulated jobs—jobs in the informal sector or in industries that experience high levels of wage and hour violations (Bernhardt, McGrath, and DeFilippis 2007). Subsequently, the minimum wage might exert weak or no effects on these workers’ wages.

### Data and Methods

My analysis centers on four questions: (1) Does racial wage inequality vary geographically across metropolitan labor markets? (2) Does racial wage inequality vary for different racial and ethnic groups? (3) How does local labor market structure mediate racial wage inequality? (4) How does local labor market structure mediate racial wage inequality differently for different racial–ethnic groups?

The data I employ to answer these questions come from the 2000 Census Public Use Micro Sample. I include men<sup>1</sup> in the civilian workforce from 186 U.S. labor markets,<sup>2</sup> ages twenty-five to sixty-four,<sup>3</sup> who are not self-employed and earn between \$1 and \$250 per hour.<sup>4</sup> I focus on the hourly wages of three racial–ethnic groups relative to native-born, non-Hispanic white men: native-born, non-Hispanic blacks, native-born Latinos, and foreign-born Latinos. These pairings provide me with a comparison of racial and ethnic differences in wage inequality holding nativity constant (blacks and native-born Latinos), a nativity comparison holding ethnicity constant (native- and foreign-born Latinos), and a black–immigrant comparison (a comparison of long-standing interest in both U.S. academic and public debate). I included Latinos as the non-black minority comparison because they are the largest minority group in the United States after African Americans and the largest pan-ethnic immigrant group. Although multiple racial and ethnic variations in the spatial patterns of wage inequality are important subjects of inquiry in a multiracial and multiethnic society such as the United States, the constraints of a single-article treatment demand comparative parsimony.<sup>5</sup> All of my wage inequality measures are relative to native-born whites, the most economically advantaged racial group in the United States.

Table 1 provides a first look at racial wage inequality and its geographic variance. The median hourly wage gap is highest between native-born whites and

**Table 1.** Median racial wage gaps across 186 metropolitan regions, 1999

Type of racial gap	Median (\$)	Quantile		Range (\$)
		75% (\$)	25% (\$)	
Native-born black/white	3.82	4.81	2.73	14.66
Native-born Latino/white	1.96	2.98	0.78	20.71
Foreign-born Latino/white	3.98	5.43	2.46	27.17

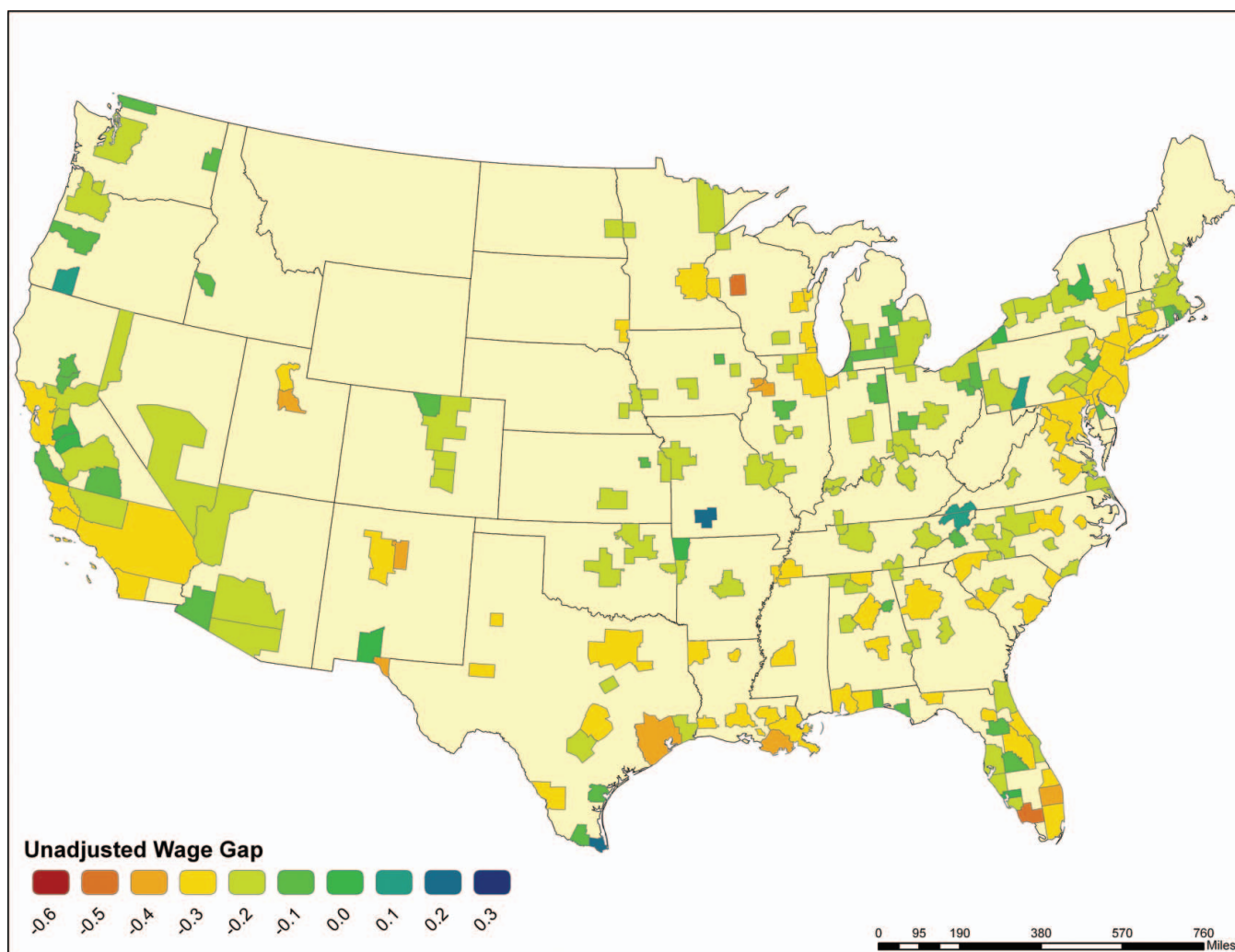


Figure 1. Unadjusted wage gap between native-born white and native-born black men, 1999. (Color figure available online.)

foreign-born Latinos at \$3.98 but is closely followed by the median gap between native-born whites and African Americans at \$3.82. The median gap is lowest between native-born whites and native-born Latinos at \$1.96. The quantile and range statistics reveal that these racial wage gaps vary across metropolitan labor markets—in some markets, the racial wage gap is relatively high; in others, relatively low. The median wage gap between native-born whites and immigrant Latinos varies the greatest: The range is \$27.17 across the 186 metropolitan labor markets, compared to \$20.71 for the black–white gap and \$14.66 for the native-born Latino–white gap. The quantile statistics also provide a good sense of the geographic variability in racial wage gaps. For example, the wage gap between native-born whites and immigrant Latinos is greater than \$5.43 in labor markets in the upper quantile of the distribution and lower than \$2.46 in markets in the lowest quantile.

Figures 1, 2, and 3 illustrate the intermetropolitan variability in the unadjusted wage gaps between white and black men (Figure 1), white and native-born Latino men (Figure 2), and white and immigrant Latino men (Figure 3). I calculated these unadjusted wage gaps by running separate regressions for each of the 186 metropolitan regions that include only racial and ethnic dummies as independent variables and logged hourly wage as the dependent variable. Maps display the regression coefficients for these racial and ethnic dummies: A coefficient of  $-0.2$  indicates that blacks (Latinos) earn approximately 20 percent less than whites in that labor market.

These three types of racial wage inequality follow roughly similar geographic patterns, although racial and ethnic variation is observable. Generally, inequality is highest in the largest metropolitan regions, such as New York, Los Angeles, Chicago, the San Francisco Bay

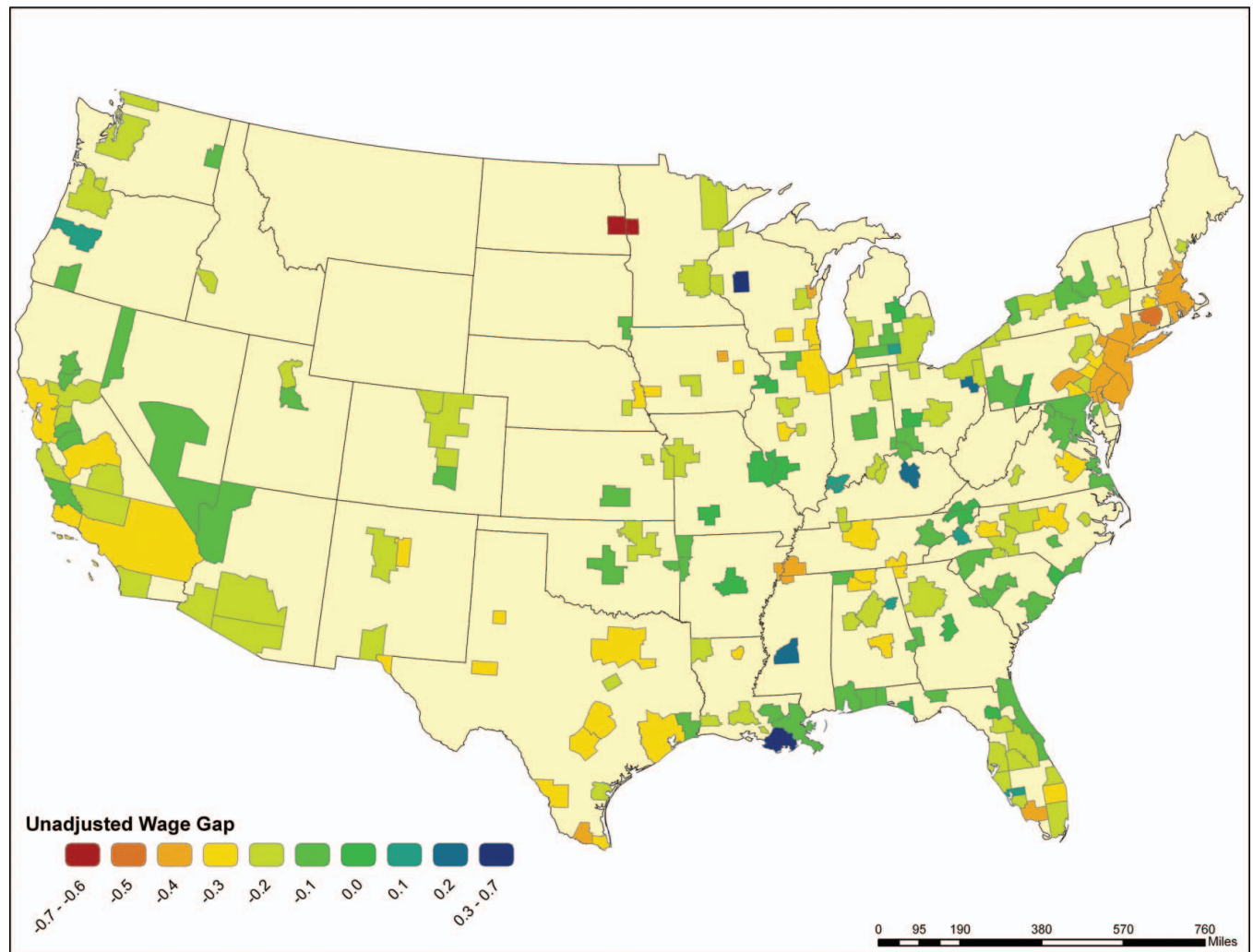


Figure 2. Unadjusted wage gap between native-born white and native-born Latino men, 1999. (Color figure available online.)

Area, Houston, and the entire metropolitan Northeast corridor. Inequality is also higher throughout the South, especially in New South labor markets such as Raleigh–Durham–Chapel Hill, North Carolina.

What if this geographic variation in racial wage inequality is primarily, if not solely, due to within-region differences? I ran a second set of regressions for each metropolitan region that included individual-level controls (education, experience, marital status, hours worked; see Table 2 for definitions) and mapped these adjusted wage gaps in Figures 4 through 6. As expected, differences in human capital and population age structures narrow the variability in racial wage inequality across regions. Yet significant geographic variability persists. The extent to which local labor market structure accounts for some of this variability is a question I take up in the following section.<sup>6</sup>

### Modeling Local Labor Market Effects

Although geographers emphasize local context and the locally contingent nature of employment outcomes (the “local” of local labor market studies), few geographic studies leverage the variability of geographic unevenness to specify the impact of local context. Capturing these local effects depends on a methodology suitable to the task of adjusting for individual-level differences between workers, such as level of education, in tests of regional-level differences. Individual-level wage regressions that include aggregate measures of local labor market context and adjust for clustering effects offer one way forward; however, advocates of multilevel modeling techniques raise two concerns. First, the nesting of workers within a region produces within-group homogeneity that violates the assumption of



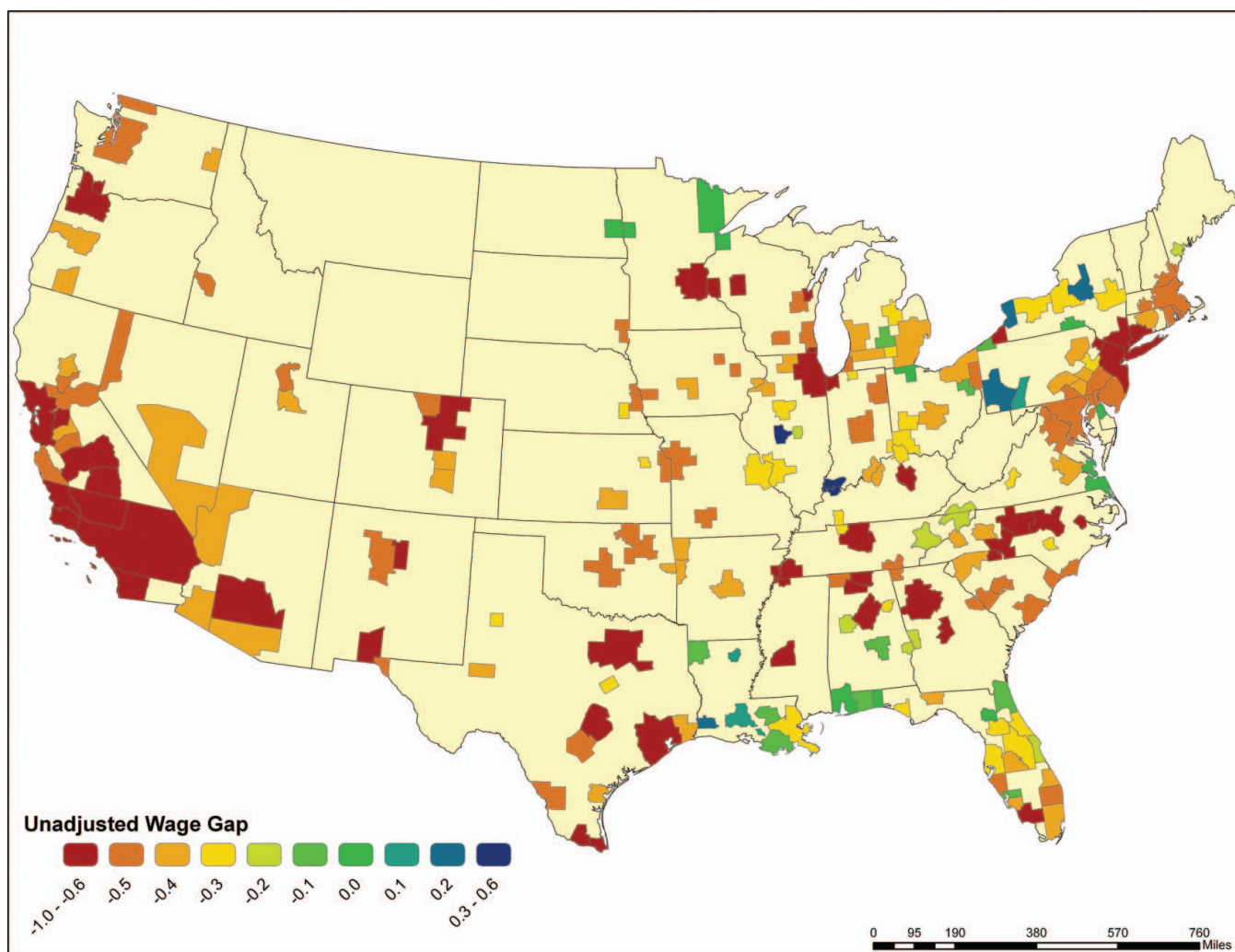


Figure 3. Unadjusted wage gap between native-born white and foreign-born Latino men, 1999. (Color figure available online.)

independence between observations. When contextual-level variables are included as characteristics of individuals (in the same ordinary least squares [OLS] model), tests of significance employ too many degrees of freedom for these contextual effects. This leads to deflated standard errors and a risk of overstating the statistical significance of contextual effects. Second, modeling cross-level interactions (e.g., how the effect of an individual characteristic might depend on context) can prove cumbersome in OLS and often go overlooked, especially when the number of variables is large. Multilevel modeling provides a streamlined approach to accommodating and analyzing such cross-level interactions, as well as accurate tests of significance for nested data (Bryk and Raudenbush 1992).

I utilize a multilevel model to correct for correlation errors among workers within the same labor market and to explicitly account for within-labor market differences

when testing for effects *between* labor markets—the mediating effects of labor market structure on racial wage inequality that is my primary interest. Thus, mine is a two-level model with individual data at level 1 and labor market data at level 2.

At the individual level, I model hourly wages as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1ij}(\text{NBblack}) + \beta_{2ij}(\text{NBlatino}) + \beta_{3ij}(\text{FBlatino}) + \beta_{4ij}X_{1ij} + \dots + \beta_{mj}X_{mj} + \epsilon_{ij}, \quad (1)$$

where  $Y_{ij}$  is the logged hourly wage of person  $i$  in labor market  $j$ . Because all of the level 1 continuous independent variables are grand-mean centered except the race and ethnicity and education dummies, the model intercept,  $\beta_{0j}$ , equals the average logged hourly wage of

**Table 2.** Variable definitions

LNWAGE	Logged hourly wage
Level 1	
LSSH	Less than high school education
HSGRAD	High school graduate
SOMECOLL	Some college
COLL	College graduate
MARRIED	Married (1 = yes)
DISABLE	Disabled (1 = yes)
EXP	Work experience (age – years of education – 6)
EXP2	Work experience squared
HRSWRK	Usual hours worked per week
Level 2	
LNRESPOP	Resident population (logged)
FEMPLP	Female labor force participation rate
UNEMP	Unemployment rate
NEWMIG	Percentage new residents (within last 5 years)
P90P10	Wage polarization (90th percentile/10th percentile)
UNION	Unionization rate
MALEJAIL	Male incarceration rate
MINWAGE	Minimum wage
SERVICE	Percentage service employment
LOWSERV	Percentage low-end service employment
MANUF	Percentage manufacturing
DURABLE	Percentage durable manufacturing employment
PUBLIC	Percentage public employment
BLKRES	Percentage population black
FBRES	Percentage population immigrant
FBRES2	Percentage population immigrant squared

high-school-educated whites, at the mean of all other variables, across all labor markets. Racial wage gaps are estimated by the regression coefficients on the race and ethnicity variables,  $\beta_{1ij}$ ,  $\beta_{2ij}$ , and  $\beta_{3ij}$ . I include a set of individual controls,  $X_{1ij} \dots X_{mj}$ , and their associated individual-level regression coefficients,  $\beta_{4ij} \dots \beta_{mj}$ . Finally,  $r_{ij}$  is the level 1 error term and  $\sigma^2$  is the variance of  $r_{ij}$ , the level 1 variance. I define all level 1 variables in Table 2.

Variation across labor markets in wages and racial wage gaps is estimated in a level 2 model (Equations 2–6) by allowing the level 1 intercept and the level 1 race and ethnicity coefficients to vary across labor markets (a random intercept and random slopes model); all other level 1 coefficients are constrained to have the same effect across labor markets. That is, this model estimates the *spatial* variation in wages and in racial wage inequality across U.S. labor markets. I estimate the level 2 model as follows:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_{1j} + \dots + \gamma_{0s}W_{sj} + \mu_{0j}, \quad (2)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}W_{1j} + \dots + \gamma_{1s}W_{sj} + \mu_{1j}, \quad (3)$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}W_{1j} + \dots + \gamma_{2s}W_{sj} + \mu_{2j}, \quad (4)$$

$$\beta_{3j} = \gamma_{30} + \gamma_{31}W_{1j} + \dots + \gamma_{3s}W_{sj} + \mu_{3j}, \quad (5)$$

$$\beta_{mj} = \gamma_j. \quad (6)$$

Because I grand-mean center all level 1 independent variables except the race and ethnicity and the education dummies,  $\gamma_{00}$  equals the individually adjusted average hourly wage (logged) of white high school graduates at the mean of all other individual-level variables across all labor markets when all level 2 variables are set to zero ( $\beta_{0j} = \gamma_{00}$ ). Similarly,  $\gamma_{10}$ ,  $\gamma_{20}$ ,  $\gamma_{30}$  equal the racial wage gaps of high school–educated workers (e.g.,  $\gamma_{10}$  equals the difference in the black wage from the white wage). A separate error term is estimated for the intercept and each racial wage gap, indicated by  $\mu_{0j}$ ,  $\mu_{1j}$ ,  $\mu_{2j}$ , and  $\mu_{3j}$ , that accounts for labor market-to-labor market variability in the white wage and racial wage gaps. The effects of the level 1 control variables do not vary across labor markets; thus,  $\gamma_j$  represents the fixed effects  $\beta_{mj}$  across all labor markets.

The model estimates not only how much wages and racial wage gaps vary across local labor markets (e.g.,  $\beta_{1j} = \gamma_{10} + \mu_{1j}$ , when all level 2 variables are set to zero) but also how local labor market characteristics mediate racial wage inequality. These local labor market characteristics, such as percentage black and union density, are included as a set of level 2 variables,  $W_{1j} \dots W_{sj}$  (each centered at its grand mean), for each labor market  $j$ . I define these variables in Table 2 and discuss them in more detail later. Means of these variables across the 186 labor markets are given in Table 3. In the full model, when all level 1 and level 2 independent variables are grand-mean centered except the race and ethnicity and education dummies, the random race and ethnicity coefficients— $\beta_{1j}$ ,  $\beta_{2j}$ ,  $\beta_{3j}$ —equal the fully adjusted racial and ethnic wage gaps; for example, the random coefficient,  $\beta_{1j}$ , in Equation 3 equals the individually adjusted difference in the average hourly wage of high school–educated blacks from whites across all labor markets, further adjusted for average local labor market effects.

Multilevel models are inherently fully interacted models. In this case, each of the local labor market variables— $W_{1j} \dots W_{sj}$ —should be understood as an interaction term with the intercept and race and ethnicity coefficients. Thus, the coefficient terms associated with  $W_{1j} \dots W_{sj}$  represent the effect of local labor market conditions on the individually adjusted racial and ethnic wage gaps. For example, if  $\gamma_{1s}$  for union density is

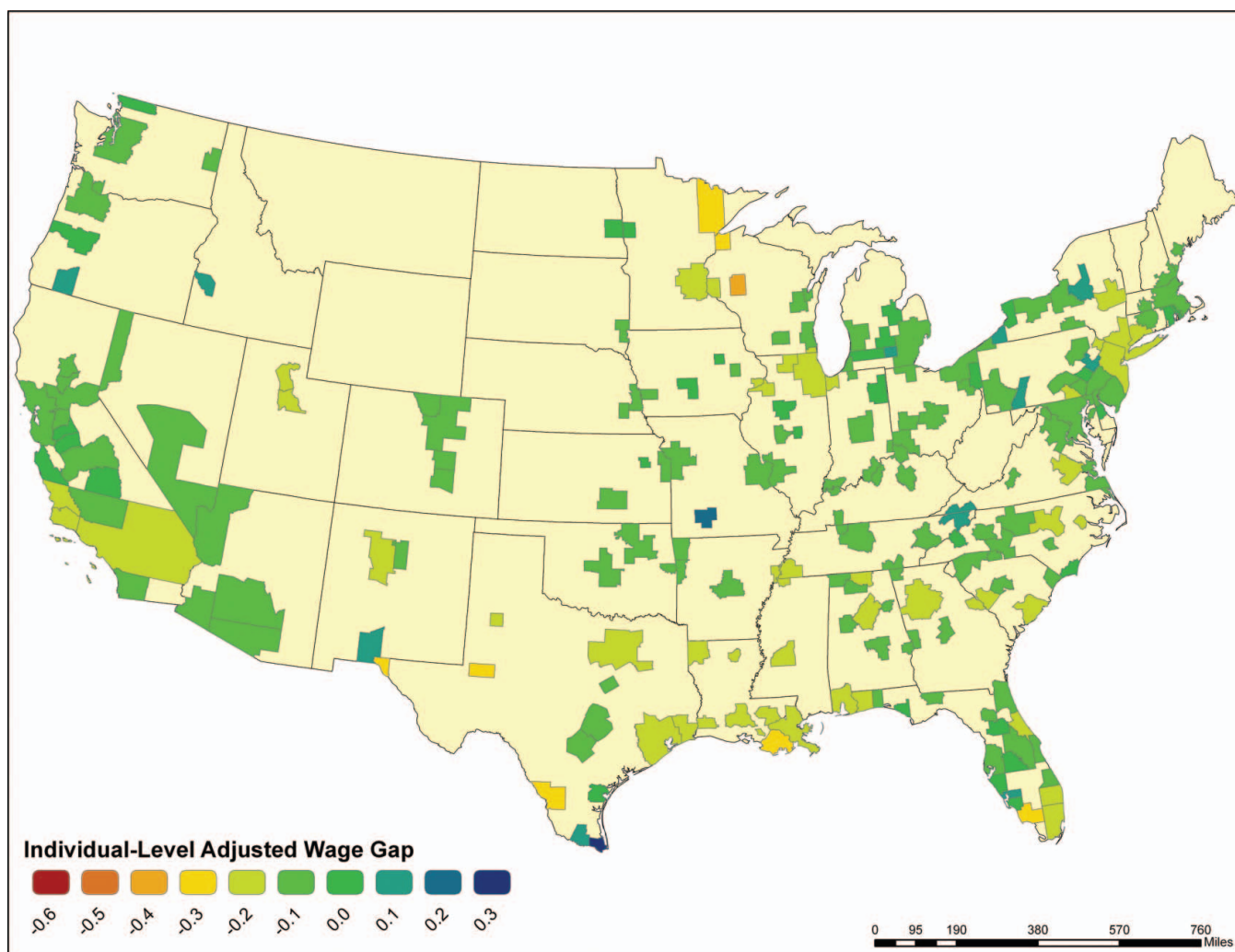


Figure 4. Adjusted wage gap between native-born white and native-born black men, 1999. (Color figure available online.)

positive, then black–white wage inequality is less severe when union density is higher. These are the coefficients of central interest to my study and those that I report in my results. Individual-level results are available from the author by request.

Local labor market structure includes measures of a local labor market’s regulatory context, industrial mix, and demographic composition. Measures of regulatory context include unionization,<sup>7</sup> the incarceration rate,<sup>8</sup> the minimum wage,<sup>9</sup> and percentage of public sector employment. Measures of industrial mix include the percentage of FIRE, technology services, low-end services,<sup>10</sup> and durable and nondurable manufacturing employment. Measures of demographic composition include proportion of the population native-born black, immigrant, and immigrant squared. Controls include a measure of absolute population size, the unemployment rate as a measure of short-term economic strength,

the percentage population of new residents (within the last five years) as a measure of longer-term economic strength (Huffman and Cohen 2004), and a measure of overall wage polarization. This last measure is of interest in its own right, but given the focus of this study and the constraints of a single article, I include it as a control to capture polarizing effects in a local labor market above and beyond those associated with the specific factors I identify in the model.

## Model Results

The bottom panel of Table 4 provides the variance components for the race and ethnicity slopes ( $\gamma_{10}$ ,  $\gamma_{20}$ ,  $\gamma_{30}$ , the racial wage gaps) across three different models that predict the raw unadjusted spatial wage gaps (Model 0), the individual-level adjusted wage gaps (Model 1), and the fully adjusted wage gaps (Model 2,



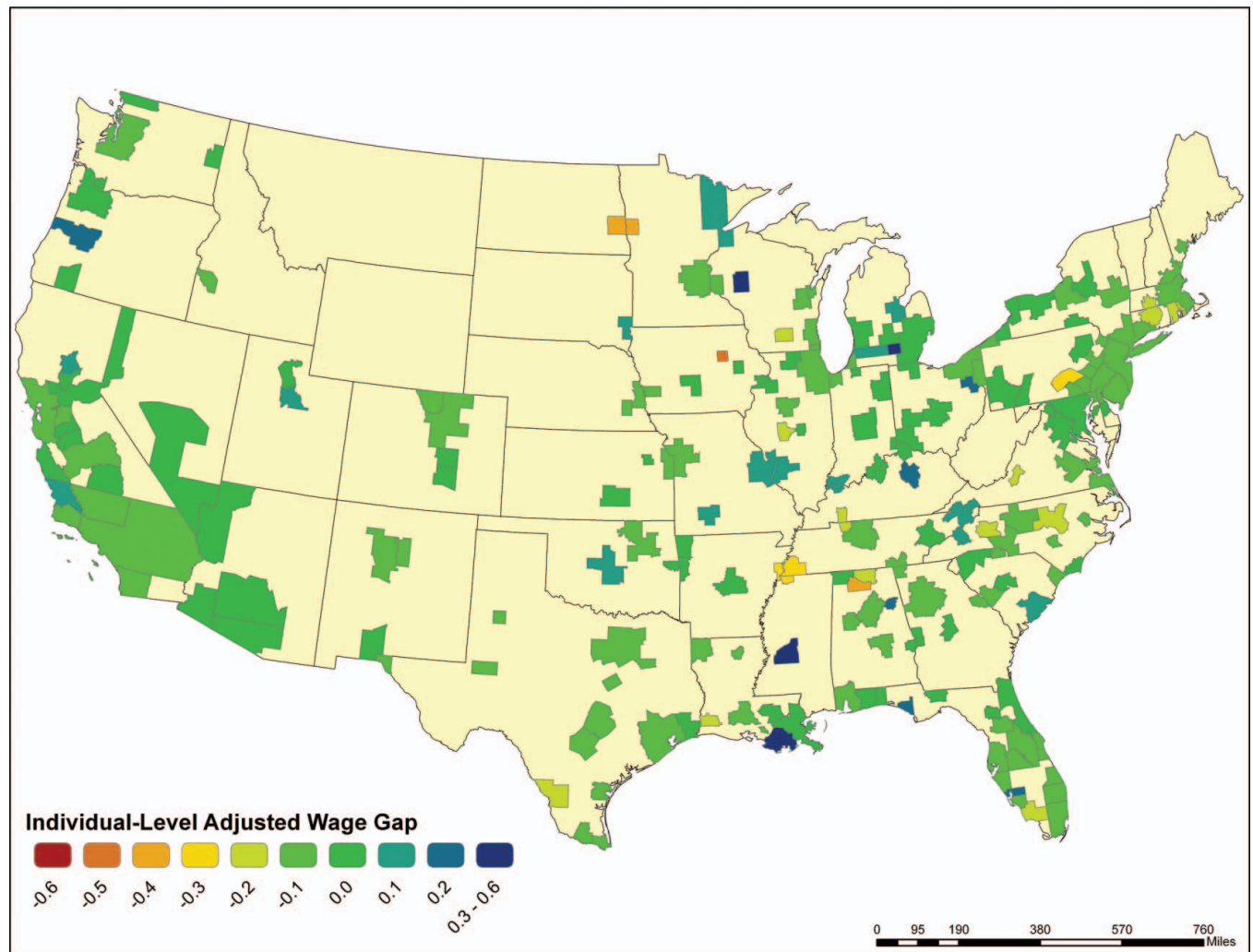


Figure 5. Adjusted wage gap between native-born white and native-born Latino men, 1999. (Color figure available online.)

individual controls plus labor market effects). Shrinkage in variance across the models points to the significance of both individual characteristics and local labor market structure in explaining differences in racial wage inequality across U.S. metropolitan regions. For the purpose of this article, I am most interested in the results contained in the final column of the lower panel of Table 4. These indicate that local labor market conditions explain spatial variance in racial wage inequality above and beyond differences in local workforce characteristics (e.g., education levels, age structures).

The results of the fully adjusted model indicate how local labor market structure matters. These level 2 coefficients and standard errors are given in Table 5.<sup>11</sup> The race and ethnicity intercepts ( $\gamma_{10}$ ,  $\gamma_{20}$ ,  $\gamma_{30}$ —the INTRCPT2 terms in Table 5) are the mean weighted racial wage gaps across the 186 metropolitan regions, adjusted

for differences in individual worker characteristics. All are negative and statistically significant: Native-born blacks earn approximately 15 percent less than native-born whites, native-born Latinos earn nearly 10 percent less, and foreign-born Latinos earn nearly 25 percent less. The coefficient terms for each of the local labor market variables are the race and ethnicity and local labor market interaction terms. That is, these coefficient terms indicate whether, and to what degree, local labor market conditions mediate racial wage inequality (by either increasing or decreasing the size of the racial wage gap; e.g.,  $\gamma_{10} + \gamma_{1s}$ ). Differences in the significance and size of the local labor market interaction terms specify how local labor market structure mediates different types of racial wage inequality differently.

Overall, the results illustrate the variegated effects of labor market structure on different types of racial

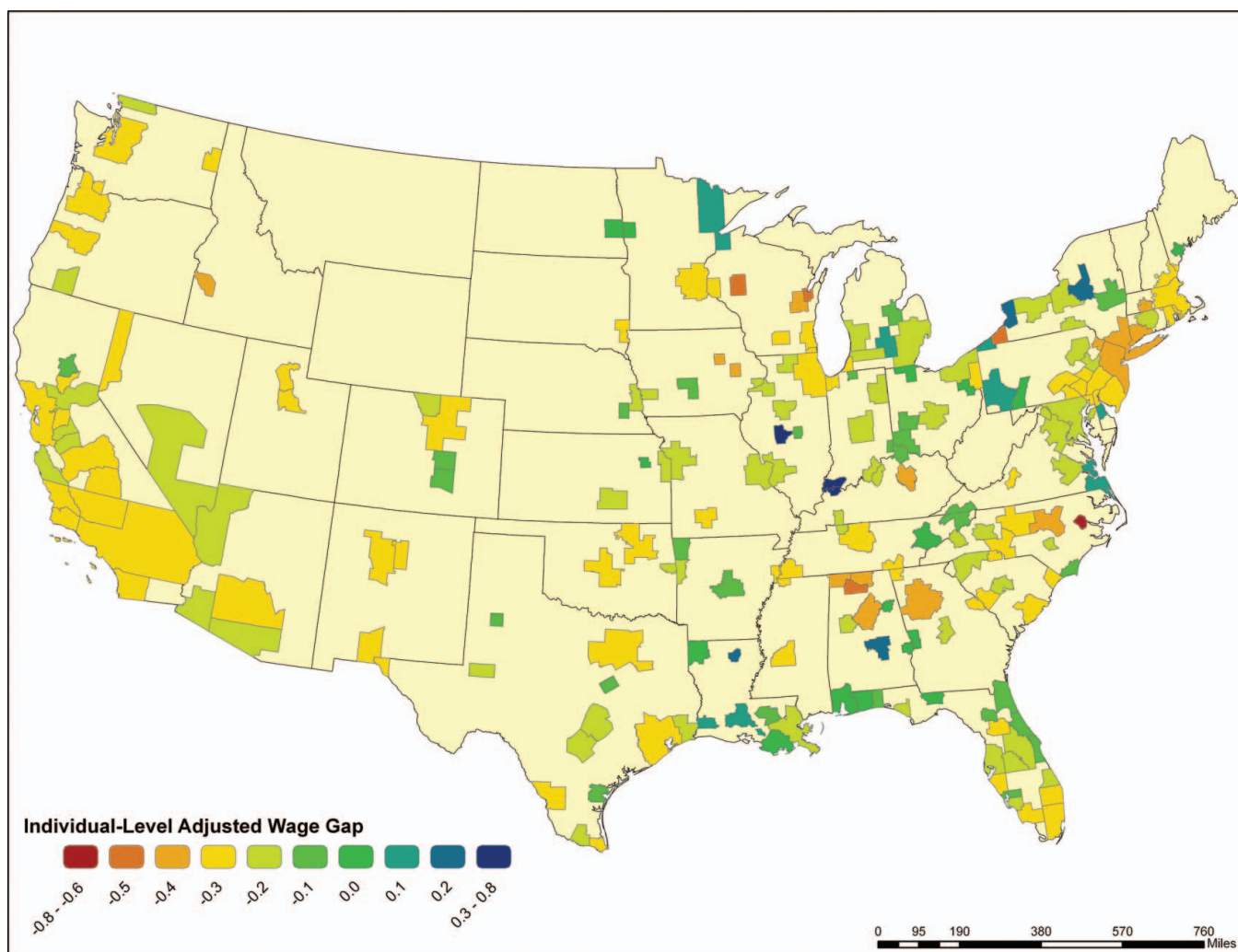


Figure 6. Adjusted wage gap between native-born white and foreign-born Latino men, 1999. (Color figure available online.)

wage inequality. Although the effects of demographic composition are similar across the groups, the effects of regulatory context and industrial mix differ. In general, regulatory context exerts the most influence on relative black wages and measures of industrial composition have no effect. Both regulatory context and industrial mix influence the relative wages of native-born Latinos. Measures of industrial composition but not regulatory context influence the relative wages of foreign-born Latinos.

### Regulatory Context

Two of the four measures of regulatory context are statistically significant for native-born black wages: unionization and the male incarceration rate (minimum wage and public employment are not significant). Both effects are positive; that is, they increase black

relative wages and decrease racial wage inequality. The union effect underscores the continuing significance of unionization in fostering racial equity in employment. Further, my results show that unionization decreases black–white inequality by raising wages for *both* whites and blacks, although relatively more so for blacks.

The positive effect of the male incarceration rate, specific to black relative wages, reflects the documented influence of incarceration on black–white wage inequality: In labor markets with higher rates of male incarceration, black–white wage inequality is lower. Because current incarceration patterns have the effect of removing a substantial number of relatively lower earning black men from the labor market, the removal of these workers' wages from the lower tail of the wage distribution skews the black wage distribution upward, reducing the mean black–white wage gap. The insignificant effect of the minimum wage for

**Table 3.** Descriptive statistics, individual and labor market variables

	Means by group			
	Native-born white	Native-born black	Native-born Latino	Foreign-born Latino
LSHS	0.067	0.143	0.204	0.565
HSGRAD	0.242	0.317	0.284	0.186
SOMECOLL	0.313	0.352	0.334	0.153
COLL	0.378	0.189	0.178	0.096
MARRIED	0.681	0.528	0.601	0.692
DISABLE	0.084	0.168	0.149	0.222
EXP	21.670	21.487	19.620	22.004
EXP2	573.998	564.565	490.247	595.607
HRSWRK	44.893	42.415	43.063	42.650
UNEMP	0.058	0.060	0.068	0.068
LNRESPOP	14.648	14.853	14.986	15.432
UNION	0.158	0.146	0.151	0.155
P90P10	4.620	4.732	5.012	5.132
MALEJAIL	0.018	0.018	0.018	0.018
BLKRES	0.126	0.183	0.093	0.105
FBRES	0.116	0.119	0.188	0.221
FBRES2	0.021	0.022	0.044	0.058
MINWAGE	5.239	5.211	5.325	5.382
LOWSERV	0.137	0.138	0.147	0.148
MANUF	0.138	0.129	0.119	0.123
SERVICE	0.472	0.479	0.481	0.475
NEWMIG	0.159	0.155	0.166	0.162
PUBLIC	0.141	0.149	0.149	0.140
FEMPLP	0.706	0.700	0.671	0.670
DURABLE	0.109	0.099	0.094	0.095
N	1,119,314	137,367	83,321	127,299
% of sample	76.28	9.36	5.68	8.68
Total				
Level 1 N	147,301			
Level 2 N	186			

African Americans might be related to this statistical incarceration effect: If the minimum wage has the most influence on the lower tail of the wage distribution, these lower wage earners are missing to a greater degree from the native-born black sample.

I found no significant effect of public employment on the relative wages of native-born blacks. Although the public sector might no longer impart relative wage boosts to black men, the size of the black public sector workforce might not be large enough to influence overall racial wage inequality, as Carrington, McCue, and Pierce (1996) found in a national study. Alternatively, the racially equalizing effect of public employment might be reflected in an unexpected way: through the significant, negative effect on relative white wages. In an analysis of intermetropolitan wage inequality us-

**Table 4.** Predicted mean racial wage gaps across 186 metropolitan regions, 1999

Type of racial gap	Model 0: No controls	Model 1: Individual controls	Model 2: Individual + labor market controls
Native-born black/white	-0.267 (0.006)	-0.151 (0.004)	-0.1471 (0.0049)
Native-born Latino/white	-0.239 (0.008)	-0.101 (0.005)	-0.0983 (0.0060)
Foreign-born Latino/white	-0.477 (0.012)	-0.263 (0.007)	-0.2488 (0.0087)
Variance component			
Intercept	0.01315	0.00869	0.00186
Native-born black slope	0.00426	0.00187	0.00089
Native-born Latino slope	0.0072	0.00237	0.00115
Foreign-born Latino slope	0.02017	0.00608	0.00336

Note: These are coefficients for models run in the software program HLM. Robust *t* statistics in parentheses.

Model 0: race-ethnicity dummies only ( $\beta_{1ij}$ ,  $\beta_{2ij}$ ,  $\beta_{3ij}$ ).

Model 1: race-ethnicity dummies plus individual controls ( $\beta_{1ij}$ ,  $\beta_{2ij}$ ,  $\beta_{3ij}$  from Equation 1).

Model 2: race-ethnicity dummies plus individual and labor market controls ( $\gamma_{10}$ ,  $\gamma_{20}$ ,  $\gamma_{30}$  from Equations 3–5).

ing 2000 data, Volscho and Fullerton (2005) found that government employment reduces overall wage inequality. Thus, public employment might minimize overall wage inequality but not necessarily racial wage inequality. This finding deserves more extensive verification and examination beyond the constraints of this article, especially in light of recent evidence that black men might be losing their foothold in public employment (Parks 2011).

The minimum wage exerts a significant positive effect on the relative wages of native-born Latinos—the only group for which it does. The lack of a minimum wage effect for immigrant Latinos is notable given the higher rate of immigrant employment in low-wage work but likely stems from immigrants' concentration in sectors that thwart regulatory attempts most aggressively, especially through violations of wage and hour laws (Bernhardt, McGrath, and DeFilippis 2007). By contrast, native-born Latinos are likely better able to secure employment in regulated jobs covered by the minimum wage. As incarceration rates among the young native-born Latino population rise (Rumbaut et al. 2006) and as native-born Latinos make inroads to public employment (Sisneros 1993), future analyses could identify

**Table 5.** Wage effects of local labor market conditions, 1999

	Logged hourly wage			
	Native-born white	Native-born black	Native-born Latino	Foreign-born Latino
INTRCPT2	2.4774** (0.0050)	-0.1473** (0.0050)	-0.0987** (0.0060)	-0.2487** (0.0089)
LNRESPOP	0.0142** (0.0060)	0.0005 (0.0052)	0.0045 (0.0075)	-0.0040 (0.0110)
UNEMP	-1.5967** (0.3457)	0.3645 (0.4250)	0.1063 (0.4072)	1.5575** (0.6381)
NEWMIG	0.0190 (0.0560)	0.1163** (0.0469)	0.0940** (0.0536)	-0.0282 (0.0771)
BLKRES	0.3790** (0.0487)	-0.1459** (0.0508)	-0.0712 (0.0827)	-0.0838 (0.0975)
FBRES	1.3104** (0.1963)	-0.1734 (0.2033)	-0.8142** (0.2389)	-1.7381** (0.3387)
FBRES2	-2.3941** (0.5410)	0.1258 (0.3837)	1.3758** (0.5112)	3.2492** (0.6894)
UNION	0.4724** (0.0598)	0.1681** (0.0668)	0.1151 (0.0844)	0.0325 (0.1190)
P90P10	0.0518** (0.0152)	-0.0487** (0.0133)	-0.0192 (0.0159)	-0.0519** (0.0240)
MALEJAIL	0.1423 (0.1846)	0.4290** (0.2159)	0.0931 (0.4146)	-0.1739 (0.4345)
MINWAGE	0.0546** (0.0282)	0.0259 (0.0216)	0.0770** (0.0203)	-0.0274 (0.0308)
PUBLIC	-0.5045** (0.0982)	0.0570 (0.1198)	0.1635 (0.1527)	0.0314 (0.2274)
FIRE	-0.0962 (0.3096)	0.1302 (0.2490)	-0.6564* (0.4005)	0.0544 (0.5112)
TECHSERV	1.1705** (0.3789)	-0.2699 (0.3984)	-0.1078 (0.4655)	0.1778 (0.7942)
LOWSERV	-1.1580** (0.3274)	0.1957 (0.2761)	1.0965** (0.3204)	1.1797** (0.4231)
DURABLE	-0.0583 (0.1588)	0.1520 (0.1389)	0.1160 (0.1814)	0.1912 (0.2474)
NONDUR	0.3063 (0.2017)	0.0139 (0.1903)	-0.1399 (0.2811)	-0.9956** (0.4057)

Note: Robust *t* statistics in parentheses.

\*Significant at the 0.10 level.

\*\*Significant at the 0.05 level.

significant incarceration effects, public employment effects, or both.

In addition to the minimum wage, no other measures of regulatory context influence the relative wages of immigrant Latinos. Lower rates of incarceration, or the deportation of immigrants with criminal records, likely explains the insignificant incarceration effect. Similarly, rules barring nonnaturalized immigrants from many kinds of public employment likely explain the absence of a public employment effect. The lack of a

unionization effect might indicate low rates of unionization in lower wage service jobs where immigrants concentrate; however, this effect might change in analyses of post-2000 data given that the most aggressive unionization campaigns of the last fifteen years have been in service sector industries with high concentrations of immigrants (Milkman 2000).

### Industrial Composition

I found no significant effects of industrial composition on relative black wages, including durable manufacturing. This finding differs notably from McCall's (2001b) results showing a strong positive effect of durable manufacturing on black wages (a diminishing effect on black-white inequality) and likely indicates changes to the wage structure within durable manufacturing between 1990 and 2000. The lack of a significant racially differential effect on black wages indicates that blacks are no better or worse off than whites and might reflect the stronger relative position of blacks in 1990 in durable manufacturing that forestalled racially disproportionate declines even as all wages eroded.

Two measures of industrial composition are significant for native-born Latinos: concentration of low-end services and FIRE sector employment. The positive effect of low-end services, an effect identified for immigrant Latinos as well, is particularly striking and somewhat perplexing (a positive effect decreases racial wage inequality). This finding does not accord with a global city scenario in which cities with high concentrations of low-end services exacerbate inequality. The positive differential effect for native-born Latinos might indicate their positions as managers and owners of businesses that supply these low-end services. Wages in these sectors are low generally, but jobs higher up the occupational hierarchy might confer advantages to native-born Latinos due, in part, to their higher levels of education, native English ability, or both. This explanation, however, does not account for the same effect identified for immigrant Latinos. The mitigating effect of low-end services on both these types of racial wage inequality might say more about the lower wages of high school-educated, native-born whites in labor markets with higher densities of low-end services (a statistically significant negative effect) than about higher wages among Latinos.

By contrast, the nominally significant negative effect of FIRE for native-born Latinos accords with a global city scenario. The lack of a significant effect for immigrant Latinos, however, renders this explanation

unsatisfactory. More research is necessary to substantiate further these industrial compositional effects, but these results indicate that concentrations of high-end FIRE services do not necessarily proxy dual labor market processes that impart negative wage differentials for immigrant workers.

Industrial composition is a more relevant influence on levels of wage inequality among immigrant Latinos than native-born blacks or Latinos. The effect of durable manufacturing is statistically insignificant, but nondurable manufacturing exerts a significant wage penalty—likely the result of immigrant Latinos' relatively greater concentration in lower wage light manufacturing jobs (Scott 1996). Size of the low-end service sector positively influences the relative wages of immigrant Latinos. This finding differs strikingly from explanations of immigrants' lower wages that result from postindustrial service economies, especially in Sunbelt or global cities with large immigrant populations. In part, this positive effect might reflect the benefits of employment in ethnic enclave service economies that accrue to male immigrant workers. Alternatively, the low-end service sector's mitigating effect on racial wage inequality might derive from the lower wages of whites (the effect for native-born whites is significant and negative).

Lastly, I find no significant differential effect of technology services for immigrant Latinos; however, the effect is statistically significant and positive for native-born whites, indicating that high school-educated workers might do better in markets with higher levels of technology employment—an effect shared by all groups given the absence of any racially or ethnically differential effects.

### Demographic Composition

In accord with decades of research that substantiates the same relationship, I find that the size of the black population lowers the relative wages of blacks. For both native- and foreign-born Latinos, the net relative effect of immigrant composition and its squared term is decreasingly negative as the population percentage of immigrants rises and, at the inflection point, becomes increasingly positive. Given the range of data, or the real values of immigrant composition across the 186 metropolitan regions, at no point does the net effect of immigrant composition become positive. The immigrant composition wage penalty is greater for foreign-born Latinos than for native-born Latinos and reaches its maximum (the inflection point) in metropolitan re-

gions that are 27 percent immigrant ( $-0.232$  log points), after which point the effect becomes increasingly positive (less negative). The largest value of immigrant density in the data is 40 percent; at this value, the relative immigrant composition wage penalty for immigrant Latinos is  $-0.175$  log points.

The immigrant composition wage penalty is smaller, but still negative, for native-born Latinos, reaching its maximum in metropolitan regions that are 30 percent immigrant ( $-0.120$  log points). The effect then becomes increasingly positive and shrinks to  $-0.106$  log points in metropolitan regions with populations that are 40 percent immigrant. To summarize, the immigrant composition wage penalty is most severe in metropolitan regions with middle levels of immigration and less severe for both native- and foreign-born Latinos in metropolitan regions with smaller and larger relative immigrant populations.

This finding accords with other studies that show that immigrants compete most directly with other immigrants, especially in segmented labor markets. The nonlinear effect of immigrant composition, however, has rarely been tested. Both Blalock's (1956) visibility discrimination hypothesis and the ethnic enclave hypothesis (K. L. Wilson and Portes 1980) predict such an effect. Blalock's hypothesis predicts that as a subordinate group's size increases, discrimination intensifies as the dominant group perceives increased competition over scarce resources. At some point, however, the subordinate group grows to sufficient size to counter the negative effects of discrimination. Similarly, the ethnic enclave hypothesis predicts that when the immigrant population reaches a certain critical capacity, it can generate its own employment opportunities through the ethnic enclave, which serves to counter the negative wage effects of discrimination in the open labor market.

The negative immigrant composition effect for native-born Latinos likely indicates that native- and foreign-born Latinos compete with one another in the labor market, although the competition effect is less severe for native-born Latinos. Employers might discriminate on the basis of ethnicity, indiscriminately lumping native-born Latinos with immigrant Latinos, but the less severe wage penalty indicates that native-born Latinos have options available to them beyond those available to immigrant Latinos.

I find no effect of immigrant composition on black wages and thus no support for the hypothesis that immigrants drive down the wages of native-born black workers. Native-born whites benefit from the

presence of immigrants in the population (the effect of immigrant composition is positive). Given the inclusion of industry mix measures and the lack of evidence supporting global city scenarios, these findings indicate that demography matters independently of economic structure. For whites, a relative advantage in immigrant-dense labor markets might indicate the advantage conferred on those at the front of the hiring queue who face little competition. Conversely, immigrants in immigrant-dense cities face the disadvantage of intense competition for spots in their hiring queues.

## Conclusion

Once a mainstay of geographic inquiry, questions of regional and intermetropolitan wage disparities have only recently returned to geographers' attention. Although research during the 1990s on local labor markets revealed the ways in which local norms and regulatory context mattered for employment outcomes such as wages, extant studies rarely have leveraged intermetropolitan variability to specify which local conditions mediate wage differentials and how. Given the more regional character of many institutional factors, such as industrial relations regimes, the metropolitan scale provides a strategic research scale at which to identify such effects. Conceptually and empirically, this study represents an ecumenical effort to bridge the quantitative thrust of earlier geographic studies on regional wage disparities and their singular focus on industrial structure with a more complex and multifaceted rendering of local context derived from the theoretical insights of institutional and regulation approaches to the local labor market.

The theoretical framework developed in this article conceptualizes the operation of racial institutional labor market projects to explicate local regulatory factors that most significantly influence racial wage differentials. This approach identifies the range of processes that generate racial labor market inequalities not only embedded within systems of racial hierarchy but also within efforts that contest and challenge these systems. Specifically, racial labor market institutional projects represent the collective, nonmarket efforts of their participants to interpret, organize, and redistribute labor market opportunities and outcomes along racial lines. The empirical record indicates that, for African Americans in particular, racial employment inequality has been strongly influenced by these racial projects

in the form of political and institutional forces such as government policy related to discrimination, wages, employment, and incarceration, along with union and social movement activities. These various findings, taken together, emphasize politics, policy, and racial discrimination rather than economic restructuring effects as the most significant determinants of racial wage differentials (Sites and Parks 2011).

This study examined the effects of three significant racial labor market institutions—public employment, unionization, and the penal system—heretofore examined separately in studies of racial wage inequality or not at all in the geographic literature. I investigated these effects as part of a more extensive analysis of how local labor market structure—made up of industrial mix, demographic composition, and institutional and regulatory arrangements—matters in mediating racial wage inequality.

Employing data from the 2000 U.S. Census and multilevel methods, the study described in this article analyzed the wage differentials of African American and native- and foreign-born Latino men relative to whites across 186 U.S. metropolitan areas. Rather than simply stating that structural processes are contingent, such a methodological approach enables the researcher to make geographic unevenness legible and to assess what structural conditions matter where and how—a chief motivation of this article.

In general, the results of this study indicate that regulatory context (e.g., unionization and incarceration) matters most for the relative wages of African Americans; both regulatory context and industrial mix influence the relative wages of native-born Latinos; and industrial composition (e.g., nondurable manufacturing and low-end services) matters most for the relative wages of foreign-born Latinos. Notably, the influence of racial labor market institutional projects—whether egalitarian or racist—matters significantly for the economic outcomes of African American workers. These findings underscore that black–white inequality in the United States continues to be most dependent on political and institutional forces.

Taken together, this study's findings reveal the capacity of varied local combinations of economic structure, government policy, and industrial relations to reconfigure labor market conditions in ways that significantly influence different types of racial wage inequality differently. These multiple “configurations of inequality,” as McCall (2001a) has described them, hold simultaneously in the same local labor markets. This finding will not strike geographers as surprising, but it does



complicate policy choices, as it belies the particularism of some interventions—what helps one group does not necessarily help others in similar fashion.

It should be noted that not all effects, especially regulatory and institutional effects, are singularly group specific. For example, the findings here clearly point to the critical role of unionization in shoring up wages for *both* white and black high school–educated workers while mitigating racial wage inequality. Future studies might detect a similar effect for Latino workers if union density in their industries of concentration grows, as it has done in recent years. Similarly, I find that higher minimum wage rates boost the relative wages of high school–educated whites and native-born Latinos. Again, future studies might detect a similar effect for immigrant Latinos if political efforts to reign in unregulated work succeed.

Both unionization and minimum wage rates increasingly reflect local and political regulatory climates. Although national legislation that shores up worker protections in U.S. labor law would significantly improve the likelihood of increased unionization levels, localities have been at the forefront of making changes to their immediate regulatory environments that are more conducive to unionization, such as making card-check/neutrality agreements mandatory for new development, passing labor peace statutes, or establishing public sector collective bargaining (Wells 2002; Sachs 2007; Warren 2010). The results of this study indicate that such policy initiatives would be particularly beneficial to African American workers in these localities. Similar local efforts have spurred changes in state and local minimum wage policies (Luce 2004; Sonn 2005). The comparative examination of how such political and regulatory efforts contribute to the geographic variability of racial wage inequality offers a promising line of future research that would further expand our knowledge about the specific ways in which local context matters for economic inequality.

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## Notes

1. I include men only to focus on differing patterns of race, ethnicity, and nativity. Because gender shapes the labor

market to such a great degree (Parks 2010), it demands additional theoretical and empirical explication beyond the main focus of this article.

2. I utilize the largest metropolitan unit available in the census data to best capture metropolitan regional effects. If a metropolitan region is classified as a Consolidated Metropolitan Statistical Area (CMSA), I treat the CMSA as a single metropolitan area. All other metropolitan areas are metropolitan statistical areas.
3. The male wage earners included in my sample are in their prime working years, a standard sample selection procedure in wage analyses. Because the volatility of the youth labor market and more erratic nature of work among older workers can considerably skew wage distributions, these sample restrictions provide a more conservative estimate of levels of wage inequality.
4. Because I examine wages, not earnings, I do not include the self-employed. Self-employment operates under fundamentally different rules and regulations in the United States and represents an altogether different market segment from wage work. Employment regulations and labor market institutions, such as minimum wage rates, antidiscrimination laws, and unionization, do not apply to self-employed individuals. Further, theoretical accounts of the labor market, from neoclassical economics to Marxist theory, conceive of self-employment and non-self-employment in fundamentally different ways (e.g., self-employed individuals are also owners of their means of production and thus their earnings reflect a return on labor and capital; wages of non-self-employed workers reflect a return on labor only).
5. National origin is an important differentiating characteristic within the immigrant population yet might be less relevant than nativity and pan-ethnicity for wage studies if employers discriminate primarily on the basis of ascriptive characteristics and language. Given that the majority of immigrant Latinos in the United States is Mexican (65 percent of my sample) and the severe cell size restrictions that would be imposed by subsetting my sample by national origin, I limit my analysis to the pan-ethnic category of foreign-born Latinos.
6. A detailed description of map patterns is available on request from the author.
7. The unionization rate is the percentage of workers covered by a union contract. Unionization data come from the Current Population Survey and are compiled at the CMSA level by Hirsch and Macpherson (2003). My labor market sample of 186 derives from this data set: I utilize the maximum number of labor markets from the Public Use Microdata Sample for which CPS data on unionization were available.
8. Following Johnson and Raphael (2009), I use the percentage of males residing in nonmilitary group quarters as a proxy for the male incarceration rate. See Raphael (2005) for a comparison of this census estimate with data from the Bureau of Justice Statistics that shows the suitability of this census measure as a proxy for the incarceration rate.
9. Several metropolitan areas cover states with different minimum wages or are located in states that changed their minimum wage part way through 1999. For these metropolitan areas, I calculate weighted averages to

determine an annual minimum wage for the entire population. States with a minimum wage higher than the federal rate in 1999 include Alaska, California, Connecticut, the District of Columbia, Hawaii, Massachusetts, Oregon, Vermont, and Washington. For states that had lower minimum wages than the federal minimum, I applied the federal minimum wage. Information on state minimum wages comes from Nelson (1999) and U.S. Department of Labor (2008).

10. FIRE employment includes census industry codes 687–726. New technology sectors include technical services such as engineering, computer systems design, and scientific research and design services (census industry codes = 729, 738, 739, 746). The following industries proxy for the degree to which the service sector within a particular metropolitan region is concentrated in lower paying sectors: administrative and support services, such as employment services, business support services, security services, landscaping, and waste management; child care; traveler accommodation and food services; other services except public administration, such as nail salons, dry cleaning, and private household services (census industry codes = 758–785, 847, 866–915, 929).
11. Full model results are available on request from the author.

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