Essays on the Politics of Diversity in Modern America: A Causal Inference Approach

By
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A dissertation submitted in partial satisfaction of the requirements for the degree of Doctor of Philosophy in Political Science in the Graduate Division of the University of California, Berkeley

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Professor Jasjeet Sekhon
Professor Kevin Quinn

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Lefteris Jason Anastasopoulos
Abstract

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Using methods of causal inference, computational social science and careful qualitative analysis, this thesis examines the roles that race and gender play in three key areas of modern American political life: political polarization, immigration policy and political participation.

In the first essay entitled “The Big Sort(s): Diversity, White Flight and Polarization in Neighborhoods and Cities,” I develop the Migration-Flight-Polarization (MFP) hypothesis to explain how changes in diversity brought about by internal migration and immigration hold the key to understanding the connection between residential choice decisions and geographic polarization along partisan and ideological lines. Using an original agent-based modeling simulation and Hurricane Katrina evacuee data collected from schools and neighborhoods in Houston, Texas, I demonstrate that changes in diversity and “white flight” responses to these changes are responsible for the growing partisan divide in Houston neighborhoods and the City of Houston as a whole.

My second essay entitled “Not in My Backyard: The Effect of Immigrant Race and Proximity on Immigration Policy Preferences,” examines the extent to which immigrant race and proximity to a respondent informs immigration policy opinion. Using a survey experiment which employs blurry images of a fictional undocumented Mexican immigrant and respondent Internet Protocol addresses, I randomly manipulate immigrant skin tone and perceived distance between respondents and the immigrant. I find that the effect of race on immigration policy opinion depends upon the perceived distance between the immigrant and respondents. When respondents believe that the immigrant lives nearby, the darker immigrant elicits more anti-immigration responses to immigration policy questions. Conversely, when no immigrant location is provided, the darker immigrant elicits greater pro-immigration responses to the same questions. I also find that attitude polarization on immigration
policy increases when respondents believe that the immigrant lives near them. These findings help explain the paradoxical divide between support for pro-immigration policies at the national level and anti-immigration policies at the state level.

My third essay with Morris Levy entitled “Estimating the Gender Penalty in the House: A Regression Discontinuity Approach,” brings a novel regression discontinuity design to bear on the question of whether net voter bias against female candidates for office can help explain the limited growth of female election to the House of Representatives. Using house primary vote share as a forcing variable, we estimate the causal effect of a major party nominee’s gender on that candidate’s general election vote share. Our period of study encompasses all Congressional elections since 1982. Our findings suggest that female Republican candidates that barely win two-person House primaries against males receive a substantial boost in general election vote share. A similar effect among female winners of close Democratic primaries is not found.
To my wife Ligia, my parents, Petros and Francine and my brothers Tony, Angelo and Sasha.
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I am very grateful to the Travers Department of Political Science, the National Science Foundation and the Berkeley Empirical Legal Studies program for their generous financial support. I am also very grateful to Jack Citrin and wonderful staff at the Institute of Governmental Studies for providing me with a stimulating intellectual environment to thrive in. For their support and for providing the inspiration for this dissertation, I owe a big debt of gratitude to Sean Gailmard, Eric Schickler and Gabriel Lenz. I would also like to thank Jasjeet Sekhon, Rodney Hero and Taeku Lee for their helpful comments and suggestions. For providing me with Hurricane Katrina evacuee data, I would like to thank Rick Wilson of Rice University and Scott Imberman of Michigan State University.

For making graduate school a “fun” experience and for providing many years of emotional and intellectual support, I would like to thank my graduate school colleagues and friends John Brooks, Aaron Chalfin, Theocharis Grigoriadis, Rengyee Lee, Morris Levy and Mahendra Prasad. Finally, I would like to thank John Trumpbour of Harvard Law School whose mentorship and advice has guided me throughout my academic career.
1 The Big Sort(s): Diversity, White Flight and Polarization in Neighborhoods and Cities

1.1 Introduction

In the early decades of the 20th century, the prospect of economic opportunity drew Southern blacks and European migrants to America’s northern and western cities. Starting around 1910, frustrated with the violence, oppressive racism and lack of economic opportunity available in their birthplace, Southern blacks began a mass exodus which came to be known as the First Great Migration, to northern cities such as Detroit, Chicago, and New York. At around the same time, drawn by tales of economic opportunity and prosperity, poor immigrants from Eastern and Southern Europe flooded cities along the eastern seaboard to begin a new life as Americans.

These migrants and immigrants shaped the cultural, political and economic fabric of northern cities in countless ways. Of the most immediate changes were shifts in inner city demographic composition. As inner cities became more diverse, suburban development with the aid of interstate highways expanded and whites began to settle into more racially and ethnically homogeneous communities on the urban fringe. (Boustan 2010; Cutler, Glaeser and Vigdor 1999; Duncan and Duncan 1957; Fligstein 1981; Jackson 1985; Nall 2012; Tolnay 2003) One of the first micro-behavioral accounts of this phenomenon, which came to be known as “white flight,” was Schelling’s (1971) model of neighborhood segregation. Schelling (1971) demonstrated that patterns of inner city/suburb spatial segregation can emerge even if whites tolerate substantial levels diversity. Since the publication of Schelling’s seminal paper, much effort has been devoted to assessing the validity of his model while the political consequences of the inner city/suburban divide have remain unexamined.

In this paper, I develop a theory in which political ideology serves as the basis for diversity preferences and demonstrate how geographic polarization along partisan and ideological lines is an emergent property of dynamic relocation decisions based on these preferences. This occurs via two channels: (1) spatial partisan composition changes stemming from increases in neighborhood diversity and; (2) spatially-determined generational replacement subsequent to these partisan composition changes. I then test this theory by assessing the impact of African-American migration as the result of Hurricane Katrina on the Houston metropolitan area.
1.2 Theory

1.2.1 Introduction

Scholarship assessing demographic changes brought about by increases in diversity from the 1970s onward has consistently demonstrated that the introduction of diverse migrants into communities has resulted in white displacement and segregation along racial and ethnic lines (Boustan 2010; Card, Mas and Rothstein 2008; Cutler, Glaeser and Vigdor 1999; Duncan and Duncan 1957; Fligstein 1981; Jackson 1985; Tolnay 2003). The behavioral underpinnings of this phenomenon were first explained by Schelling (1971), whose model suggested that even if individuals are very tolerant of out-groups patterns of segregation can emerge when they make decisions about where to live based upon the distribution of other ethnic or racial groups surrounding them.

In Schelling’s model, inter-group tolerance is the same for all members of a group. For example, all majority group members prefer that at least 50% of the households surrounding them be composed of majority group members while minority group members may all prefer that at least 25% of the households surrounding them contain minority group members. Given most levels of tolerance between 0% and 100%, Schelling (1971) shows that, beginning with an integrated area, an equilibrium where agents no longer desire to move is one in which areas become segregated and homogeneous.

Figure 1 is an example of the Schelling model in action. When two groups of individuals are tolerant, preferring that at least 50% of their neighbors be from their group, a pattern of spatial segregation emerges as agents relocate to satisfy their preferences.

While the Schelling model provides a simple and elegant account of how city and neighborhood segregation can emerge, it does not address two important questions: (1) where do tolerance preferences come from?; and (2) what would an equilibrium look like if groups of agents had distributions over tolerance preferences? ¹ As will be discussed below, answers to these questions are the key to understanding how changes in diversity can lead to polarization within metropolitan areas and larger geographic regions.

In the modified Schelling model and simulations discussed below, I show that if tolerance preferences are a function of political ideology and follow a normal distribution within groups of individuals, geographic polarization along partisan and

¹Until recently (Grauwin, Goffette-Nagot and Jensen 2012), there has been no analytic solution proposed for the Schelling model. As a result new equilibria are entirely possibly if parameters are changed.
Figure 1: Dynamic Schelling Model Simulation with Tolerance for Different Neighbors = 50%
Source: http://ccl.northwestern.edu/netlogo/models/run.cgi?Segregation.734.460

Figure 2: Outline of Migration-Flight-Polarization (MFP) Theory
ideological lines is the end result of sorting processes set into motion by increases in diversity.

Figure 2 provides a broad outline of this theory. Starting with individual preferences, I argue that political ideology is correlated with tolerance preferences for neighbors. As a result, when a large demographic shift causes an increase in neighborhood diversity, a residential sorting is triggered. Less tolerant, ideologically conservative individuals relocate in response to increases in neighborhood diversity, while more tolerant, ideologically liberal individuals remain. This sorting process is the engine driving geographic polarization as ideologically conservative “movers” and liberal “stayers” cluster together. This pattern of polarization persists in a path-dependent manner as the result of subsequent generational replacement, even in the absence of additional migration events.

1.2.2 Model Behavioral Premises

The central argument of this paper is that increases in neighborhood ethnic and racial heterogeneity (diversity) lead to increases in neighborhood ideological homogeneity and polarization of urban areas along partisan and ideological lines. This argument relies upon two assumptions: (1) individuals tolerate diversity, but tend to prefer neighbors similar to themselves and; (2) tolerance is a function of several factors, but political ideology and “social distance” between the individual’s group and other groups are among the most important. The first assumption is a restatement of agent behavior discussed in Schelling’s original model while the second extends this model to account for variation in tolerance for diversity between individuals.

To the best of the author’s knowledge, however, this literature has not linked tolerance preferences to political ideology in any meaningful way. Below I present two analyses of survey data from 1994 and 1963 which clearly demonstrate that preferences for neighborhood racial and ethnic diversity are strongly linked to political ideology, more so than practically any other individual trait.

The first analysis is drawn from the Multi-City Study of Urban Inequality which was conducted in Atlanta, Boston, Detroit and Los Angeles between 1992 and 1994 (ICPSR Study 2535). As part of this study, respondents were asked questions about their preferences for neighborhood diversity.

White respondents, specifically, were presented with five cards in sequential order shown in Figure 3. Each card consists of three hypothetical neighborhoods with a certain level of racial and ethnic diversity. The respondent is asked to imagine him or herself as residing or intending to reside in the house at the center of each neighborhood. Card 1 represents an all white neighborhood, Card 2 represents neighborhoods
with 7% non-white minority residents, Card 3 represents neighborhoods with 20% non-white minority residents, Card 4 represents neighborhoods with 33% non-white minority residents and Card 5 represents a majority-minority neighborhood with 53% non-white minority residents.

After being shown each card, respondents were asked questions about their level of comfort with the neighborhoods presented and, if they felt uncomfortable in any of the neighborhoods, whether they would try to move out. To determine the extent to which political ideology is related to tolerance for diversity, I ran a series of logistic regressions using two dependent variables: 1) comfort levels for each set of neighborhoods presented (7%, 20%, 33% and 53% non-white minority neighborhoods) and; 2) given discomfort, whether a respondent would move if they lived in a similar neighborhood. The independent variable of interest is political ideology on a 1-7 scale with 1 = Extremely Liberal and 7 = Extremely Conservative.

The general form of the logistic regression model is:

---

2After being shown each of the cards respondents were asked “How comfortable would you feel in this situation: Would you say you would feel very comfortable, somewhat comfortable, somewhat uncomfortable, or very uncomfortable?” In the logistic regressions discussed, the variable was coded 1 if respondents indicated “somewhat uncomfortable” or “very uncomfortable” and 0 otherwise.
Figure 4: White Respondent Ideology v. Predicted Probability of Discomfort in Each of the Four Neighborhoods N = 2407

\[ Y = \alpha + \beta \text{Ideology} + \Gamma \mathbf{X} + c_j + \epsilon \]  

In the equation above, \( Y \) is a binary dependent variable (comfort/will move out), \( \text{Ideology} \) is the political ideology of the respondent, \( \mathbf{X} \) is a matrix of respondent characteristics which includes respondent age, sex, years of education, family income and whether the interviewer was white and \( c_j \) are city fixed effects.

Figure 4 is a plot of the predicted probability of respondent discomfort versus respondent ideology from four logistic regressions. When the neighborhood consists of only 7% minority residents, discomfort does not seem to be related to political ideology. However, as the hypothetical minority population becomes larger, greater ideological conservatism very strongly predicts probability of discomfort with the steepest curve occurring in the neighborhood with the highest minority proportion.
Indeed, political ideology is the strongest predictor of discomfort levels in every neighborhood above 7% minority. Figure 5 displays this finding visually with a plot of odds ratios and 95% confidence intervals from the logistic regression in which the dependent variable is comfort in a 53% minority neighborhood.

The information presented above clearly suggests that political ideology is intimately tied to tolerance preferences. However, since the mechanism which ties diversity to polarization depends upon an exodus of more conservative residents as a result of increases in diversity, individuals that are more ideologically conservative must also be more willing to move out of their neighborhood when diversity increases substantially. While such an assumption may at first appear to be self-evident, it

---

3The only variable with a higher odds ratio than political ideology is interviewer race, which was omitted from this chart since the ideological Schelling theory mentioned above relates entirely to characteristics of the individual.
is entirely possible that more ideologically conservative individuals, despite having lower tolerance for neighborhood diversity, may also be less willing to move despite changes in diversity.

In order to address this concern, an additional logistic regression was performed using, as a dependent variable, a question asking respondents whether they would move if their neighborhood looked like either of the hypothetical neighborhoods presented in cards 1, 2, 3 or 4.

A plot of the predicted probabilities from this logistic regression versus respondent ideology make it abundantly clear that greater ideological conservatism is strongly related to increased probability that a respondent will relocate as the result of an increase in neighborhood diversity.

A Gallup Poll of adults taken in 1963 lends further support to the notion that
tolerance preferences are tied to political ideology. In this survey, respondents were asked “Would you move if colored people came to your neighborhood in great numbers?” and could respond “Yes, Definitely” “Might Do” or “No”.

Table 1 presents the odds ratios from four logistic regressions where the dependent variable is equal to one if respondents indicated “Yes, Definitely” or “Might Do” and zero if they said “No.” The independent variable is Republican party identification. Before introducing any person-level covariates or region or state fixed-effects, Republicans were 1.76 times as likely to agree that they would move if many blacks moved into their neighborhood. Once age, sex, occupation, income, church attendance, number of children, rural/urban status, region fixed effects and state fixed-effects are accounted for, however, non-Southern white Republicans are more than twice as likely to move (Odds Ratio = 2.07) as non-Southern white Democrats if many blacks came into their neighborhood.

### 1.2.3 Relocation Dynamics and the Schelling Model

The behavioral premises described above provide the basis for relocation decisions that agents make in the model and simulations presented in the next section. Since the model is an extension of Schelling’s (1971) I present a brief description of his model and explain how I expand upon it below.

Using a checkerboard to represent a geographic area and pieces with different shapes (a “+” or an “O”) to represent households of different races, Schelling (1971) demonstrated that segregation emerges as the result of dynamic relocation behavior. Each group of +s and Os have fixed preferences for the percentage of neighbors of a different type. +s, for example, may prefer that at least 50% of their neighbors also be +s while Os might prefer that at least 75% of their neighbors also be Os. If the tolerance of a + or O is exceeded as the result of the distribution of pieces

<table>
<thead>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>Odds Ratio</td>
<td>1.76***</td>
<td>1.75***</td>
<td>1.90***</td>
<td>2.07***</td>
</tr>
<tr>
<td>p</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>N</td>
<td>1985</td>
<td>1985</td>
<td>1968</td>
<td>1959</td>
</tr>
<tr>
<td>Region FE</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>State FE</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Covariates</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1: Logistic Regression Odds Ratios: Move if Many Blacks Came to Neighborhood? (Non-South Whites)
directly surrounding it, it moves to the nearest space which satisfies its tolerance preferences. For example, if the population surrounding a $+$ is comprised of 60% Os, the $+$’s tolerance is exceeded (assuming that its tolerance is 50%) and it moves to the nearest area containing fewer than 50% Os. Pieces move sequentially and the process continues until equilibrium when all are satisfied with their current location.

Since equilibria resulting from relocation decisions in the Schelling model are the result of simulations rather than closed form solutions, minor tweaks of the model’s assumptions which can render it more realistic may at the same time result in non-segregated equilibria. For example, Schelling’s model assumes that 1) tolerance for one’s neighbors is distributed constantly across populations and; 2) that agents choose to relocate based only upon distance from their starting point and minimal tolerance thresholds. In the model and dynamic simulations discussed in the next section, I modify these assumptions to account for more realistic behavior and demonstrate that segregated equilibria continue to emerge.

1.2.4 Model Setup: Neighbor Tolerance and Political Ideology

The model presented below establishes agent behavioral rules which determine responses to changes in neighborhood diversity in subsequent simulations. I first formalize agent behavioral rules discussed above and then simulate responses to increases in diversity using an original dynamic agent-based simulation algorithm. In the simulation, neighborhoods $a_n$, are geographically bounded spaces within a larger urban space $A$. Agents that reside in these neighborhoods have preferences according to the two behavioral premises discussed above: (1) they are generally tolerant, but tend to prefer neighbors similar to themselves and; (2) their degree of tolerance is determined by their political ideology and “social distance” between themselves and others in the surrounding area.

Decisions to relocate are based upon premises (1) and (2) above, $\eta$, a measure of tolerance for the proportion of minorities in the surrounding area and $m$ the proportion of minorities in their surrounding area. According to behavioral premise (2), tolerance $\eta$ is a function of political ideology, $I$, and “social distance” $D$ between the agent and the minority group(s) surrounding her:
\[ \eta_i = \sqrt{I_i - D_i} \]

\[ D_i = \sqrt{\sum_{k=1}^{K} \sum_{j=1}^{J} \rho_{ji} (E[\alpha_{jk}] - \alpha_{ji})^2} \]

\[ 0 < D_i < I_i < 1 \]

In the equations above, higher values of ideology \( I_i \) correspond to greater ideological liberalism while higher values of \( D_i \) correspond to greater “social distance” between the individual and an out-group. In the model, political ideology plays a central role in the determination of tolerance for neighborhood diversity, thus \( D_i < I_i \).

Social distance is a measure of characteristics which differ between an individual and an out-group that takes into account the importance an individual gives to each characteristic. Mathematically, it is the normalized difference between \( E[\alpha_{jk}] \), the average \( j^{th} \) attribute of group \( k \), and \( \alpha_{ji} \), the \( j^{th} \) attribute of the individual. The distance on each attribute \( \alpha_j \) is weighed by \( \rho_{ji} \in (0,1) \) where \( \sum_j \rho_{ji} = 1 \), which measures the importance that an individual gives to each attribute (Shayo 2008). For the purposes of this model, these attributes and weights are fixed for each individual\(^4\).

An agent’s utility for diversity in their neighborhood \( U^D_i(m, \eta_i) \) is a function of tolerance preferences and neighborhood minority population:

\[ U^D_i(m, \eta_i) = \eta_i m - m^2 = (\sqrt{I_i - D_i})m - m^2 \]

\[ 0 \leq m \leq 1 \]

\[ 0 < \eta_i < 1 \]

\[ 0 < D_i < I_i < 1 \]

Plots of \( U^D \) v. \( m \) with different values of political ideology and social distance in Figure 7 show that the utility an agent derives from neighborhood diversity varies with agent political ideology and out-group social distance. It is clear from Figure 7 that, all else equal, higher values of political ideology suggest higher levels

\(^4\) While it is certainly possible that the weight \( \rho_{ji} \) an individual gives to these attributes may realistically change along with demographic changes, for the sake of simplicity in my simulations, these considerations will be addressed separately in future research. An example of this type of phenomenon might be if people become more intolerant of hearing Spanish as the Spanish-speaking population increases due to immigration.
I_i = 0.1, 0.3, 0.5, 0.7 , D_i = 0.05

$\frac{\partial U_i^D}{\partial m^*_i}$

$m^*_i = \frac{\eta_i}{2}$

Since $0 < \eta_i < 1$, the ideal proportion minority is always less than 50%, suggesting that agents are tolerant and enjoy diversity, but generally prefer neighbors similar to themselves.

### 1.2.5 Moving Decisions Responding to Changes in Diversity

At any time $t$, agents make decisions about whether to move from a neighborhood based upon their preferences for diversity. Since this paper is concerned with how individuals respond to changes in diversity, I introduce agent beliefs about whether
their neighborhood will “tip” (T) and become entirely majority-minority in the future
\( m_{at+1} = 1 \) based upon the current area minority population \( m_{at} \) and the agent’s
diversity ideal point \( m_i^* \):

\[
P[T|m_{at} = m] = P[m_{at+1} = 1|m_{at} = m] = \begin{cases} 
  c + \epsilon & \text{if } m_{at} > m_i^* \\
  c & \text{if } m_{at} \leq m_i^* 
\end{cases} \quad 0 < \epsilon << c < 1
\]

Beliefs captured by \( P[T|m_{at} = m] \) reflect agent fears that others similar to them-

selves will exit the area if diversity exceeds their ideal point, \( m_i^* \). When the minority
population exceeds the agent’s diversity ideal point, she believes that the area is only

slightly more likely to tip \( c + \epsilon \), than if the minority population is below her ideal
point. As will be shown below, these beliefs about tipping induce agents to move
out of the area when the minority population exceeds their ideal point.

Incorporating these beliefs into a dynamic model, expected utility for neighbor-
hood diversity at any given time \( t \) becomes:

\[
EU^D_{at} = P[T|m_{at} = m]U^D(T) + (1 - P[T|m_{at} = m])U^D(T') \quad (5)
\]

The inclusion of an error term \( \epsilon_a \) to account for fixed area factors such as schools,
amenities, housing prices etc. finally gives us the expected utility for residing in an
area at any given time:

\[
EU^R_{at} = EU^D_{at} + \epsilon_a = P[T|m_{at} = m]U^D(T) + (1 - P[T|m_{at} = m])U^D(T') + \epsilon_a \quad (6)
\]

We are now in a position to establish a decision rule for moving in response to
changes in neighborhood diversity using Equation 6. Given preferences for diversity
and beliefs about neighborhood tipping, an agent will choose to move from her
neighborhood if her utility for residing there \( EU^R_{at} \) can be better satisfied elsewhere.

Thus, assuming that area fixed characteristics are the same, a rational agent will
improve her utility by deciding to move in response to changes in diversity when (1)
the minority population in her neighborhood exceeds her ideal point \( m_{at} > m^* \) and;
(2) there is at least one other area for which \( m_{at}' \leq m^* \).

Agents also take into account a cost of moving which is represented by \( \delta_{a,a'} \), the
Euclidean distance between two neighborhoods as measured by their coordinates on
a two dimensional plane:

\[
\delta_{a,a'} = \sqrt{(x_a - x_a')^2 + (y_a - y_a')^2} \quad (7)
\]
If $m_{at} > m_i^*$ and $\exists a' \in A \text{ s.t. } m_{a't} \leq m_i^*$: \[
\begin{cases} 
\text{If } EU_{at}^R < EU_{a't}^R - \delta_{a,a'} & \text{Move from } a \\
\text{Else} & \text{Remain in } a 
\end{cases}
\]

Finally, Equation 8 presents the conditions under which an agent will relocate. If these conditions are met, the agent may still be left with several neighborhoods to choose from. Since the agent desires to have the highest utility for remaining in an area, of the given areas that satisfy Equation 8, she will choose the neighborhood $a' \in A$ which maximizes $EU_{a'}^R - \delta_{a,a'}$. This implies that she will to move to a neighborhood both nearest her, in terms of spatial distance and closest to her neighborhood diversity ideal point.

To summarize, agents are tolerant and tend to prefer some level of area diversity reflected by $U^D$. The utility they derive from neighborhood diversity is determined by two variables: tolerance $\eta_i$ which is in turn determined by ideology $I_i$ and social distance between out-groups $D_i$ and $m$, the minority population of her neighborhood. Agents have ideal levels of diversity $m_i^*$, which are determined entirely by ideology and out-group social distance.

Since agents behave strategically, they have beliefs about how others will respond to changes in the minority population. These beliefs take into account whether a neighborhood will “tip” and other agents will leave conditional upon the minority population in the area at any given time. Beliefs about whether a neighborhood will tip are determined by neighborhood diversity ideal points $m_i^*$. When the neighborhood minority population at any given time is above the agent’s ideal point $m_{at} > m_i^*$, agents fear that tipping is more likely than when it is equal to or below their minority ideal point. These beliefs are incorporated into $EU^D$, the expected utility for neighborhood diversity function. With a minor modification, $EU^D$ provides the expected utility for remaining in the current area $EU^R$.

Given $EU^R$, we discover that, all else equal, agents will move from their neighborhood when the proportion minority surpasses their ideal point $m_{at} > m_i^*$ as long as there are other neighborhoods which are 1) relatively close and 2) contain a proportion minority equal to or below their diversity ideal point $m_{at} \leq m_i^*$. Since there are several areas satisfying these criteria, agents choose the one that is both nearest them and has a minority population closest to their ideal point.

In the next section, I implement the model described above into an original dynamic simulation algorithm which demonstrates how movement among agents with these preferences generates neighborhood ideological homogeneity and urban area polarization along partisan and ideological lines.
### 1.3 Simulation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symbol</th>
<th>Description</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas</td>
<td>$A$</td>
<td>set of simulated neighborhoods.</td>
<td>$A = (a_1, ..., a_N)$</td>
</tr>
<tr>
<td>Agent Ideology</td>
<td>$I_{a_i,t_0}$</td>
<td>Ideology of an agent.</td>
<td>$I_{a_i,t_0} \in (0, 1)$</td>
</tr>
<tr>
<td>Area Ideology</td>
<td>$I_{a,t_0}$</td>
<td>Mean neighborhood ideology.</td>
<td>$I_{a,t_0} \in (0, 1)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$I_{a,t_0} \sim N(\mu_{I_{a,t_0}}, \sigma_{I_{a,t_0}})$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$\hat{\mu}<em>{I</em>{a,t_0}} = \frac{1}{N_a} \sum_{i=1}^{N_a} I_{a_i,t_0}$</td>
</tr>
<tr>
<td>Minoritypop</td>
<td>$B_{a,t_0}$</td>
<td>Neighborhood minority population</td>
<td>$B_{a,t_0} \geq 0$</td>
</tr>
<tr>
<td>SdMinoritypop</td>
<td>$\sigma_{B,t_0}^B$</td>
<td>Between-neighborhood sd of the minority group population.</td>
<td>$\sigma_{B,t_0}^B &gt; 0$</td>
</tr>
<tr>
<td>Majoritypop</td>
<td>$W_{a,t_0}$</td>
<td>Neighborhood majority population</td>
<td>$W_{a,t_0} &gt; B_{a,t_0} \forall a \in A$</td>
</tr>
<tr>
<td>SdMajoritypop</td>
<td>$\sigma_{W,t_0}^W$</td>
<td>Between-neighborhood sd of the majority group population.</td>
<td>$\sigma_{W,t_0}^W &gt; 0$</td>
</tr>
</tbody>
</table>

Table 2: Initial Parameter Values of polsegsim Simulation Algorithm

To explore how distributions of urban political ideology would develop if agents behaved according to the model discussed in the previous section, I designed a dynamic agent-based simulation algorithm in R called PolSegSim. The algorithm generates a set of neighborhoods with two-dimensional spatial coordinates, populates them with minority and non-minority agents that have ideologies and preferences for diversity according to the model in the previous section and then simulates moving behavior over time.

Since the simulation designed to reflect changes in real populations over time, two types of population dynamics are added to the model discussed in the previous section: (1) after each time period, there is a 1% increase in the majority group agent population and a $1/t^2$ “migration shock” increase in area minority population; (2) ideological preferences among new agents reflect those of the area after one round of moving. This is essentially a form of ideological generational replacement.
The **polsegsim** algorithm allows users to input five variables which determine initial characteristics of the **polsegsim** universe. Table 2 describes these inputs which include: 1) the number of areas populated by agents; 2) average majority population of the areas; 3) majority population standard deviation between areas; 4) average minority population of the areas and finally; 5) minority standard deviation between areas. In the simulation, minority and majority populations are homogeneous within groups. The majority group, for example, could be thought of as being all white and the minority group all black.

Neighborhoods are first assigned two-dimensional spatial coordinates from a random uniform distribution and are then populated with a number of majority and minority group agents generated from a random normal distribution with means and standard deviations according to inputs 2, 3, 4 and 5 above. Initial ideology of each neighborhood $I_{a,t_0}$ is a draw from a truncated random normal distribution with $N(\mu^I_{t_0} = 0.5, \sigma^I_{t_0} = 0.1)$. Minority and majority agent ideology within each area $I_{a,t_0}$ are in turn draws from another truncated random normal distribution $N(\mu^I_{a,t_0} = I_{a,t_0}, \sigma^I_{a,t_0} = 0.1)$ with a mean equivalent to the randomly assigned area ideology. Average minority agent ideology within each area is assumed to be three standard deviations higher (+0.3) than average majority agent ideology. Social distance between groups are fixed for each agent at $D_i = 0.1$.

During each time period or moving cycle, agents simultaneously relocate to areas when the expected utility of residing in their current area is less than their expected utility of moving: $EU^R_a < EU^R_{a'} - \delta_{a,a'}$. This generally occurs when the area minority population at any given time exceeds their diversity ideal point $m_{at} > m^*_i$. Once they have decided to move, they choose to move to an area which maximizes $EU^R_{a'} - \delta_{a,a'}$. This will be a candidate area which is both spatially nearest them as calculated by Euclidean coordinate distance and has a minority proportion closest to their diversity ideal point.

As mentioned above, to simulate real population dynamics, after each moving cycle a number of agents are added equivalent to 1% of the majority population and $1/t^2$ of the minority population. The $1/t^2$ increase in the minority population reflects migration shocks in which areas that originally had higher minority populations receive the greatest initial share of minority migration that decreases over time. New minority and majority agent ideologies are draws from a truncated random normal distribution whose mean and standard deviation are the mean and standard

---

5 the distribution is truncated because $0 < I < 1$
6 The only situation in which agents would not move when $m_{at} > m^*_i$ is if they happen to reside in a very isolated area where the Euclidean distance from their current location is greater than the utility gain they expect to gain in any new area, $\delta_{a,a'} > EU^R_{a'} - EU^R_a$
deviation of area ideology after a cycle of moving but before the new agents are added.

Thus, for example, at time $t$ agents decide to move. After they move, new average area ideology is computed $I_{a,t+\frac{1}{2}}$. New majority and minority agents are added to an area whose ideologies are a draw from a random normal distribution with a mean equivalent to $I_{a,t+\frac{1}{2}} = \sum_{i=1}^{N_{a,t+\frac{1}{2}}} \frac{I_{a,t+\frac{1}{2}}}{N_{a,t+\frac{1}{2}}}$ and standard deviation equivalent to $\sigma_{I_{a,t+\frac{1}{2}}}$. Thus, new agents entering the area have ideologies in line with current area ideology after moving.

After each moving cycle, the simulation continues to run until the percent of the population that moves is below 1%. In the simulation conducted below, this occurred after 151 moving cycles.
1.3.1 Initial Values and Demographics

<table>
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<th>Symbol</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
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<td>Neighborhoods</td>
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<td>$N=20$</td>
</tr>
<tr>
<td>Mean Between Neighborhood Ideology</td>
<td>$I_{t_0}$</td>
<td>$\mu_{I_{t_0}} = 0.5$  \ $\sigma_{I_{t_0}} = 0.1$  \ $I_{t_0}$ = rtnorm(n=20,mu =0.5,sd=0.1)</td>
</tr>
<tr>
<td>Minoritypop</td>
<td>$B_{t_0}$</td>
<td>$\mu_{B_{t_0}} = 5$  \ $\sigma_{B_{t_0}} = 5$  \ $B_{t_0}$ = rtnorm(n=20,mu =5,sd=5)</td>
</tr>
<tr>
<td>Majoritypop</td>
<td>$W_{t_0}$</td>
<td>$\mu_{W_{t_0}} = 100$  \ $\sigma_{W_{t_0}} = 10$  \ $W_{t_0}$ = rtnorm(n=20,mu =100,sd=10)</td>
</tr>
</tbody>
</table>

Table 3: Starting Values For Simulation

Table 3 above presents the initial values for the simulation conducted. I begin with 20 neighborhoods containing an average of 100 majority agents and 5 minority agents per neighborhood. The mean majority ideology in each neighborhood is 0.5 with a standard deviation of 0.1 and the mean minority ideology in each neighborhood is 0.8 with a standard deviation of 0.1.

Figure 8 plots maps of the 20 areas in two-dimensional space initially and after 151 moving cycles along with average area ideology and percent minority. Area total population is reflected by point size.
Figure 8: Neighborhoods in 2D Space: Avg. Ideology and Pct. Minority: $t = 0$ and $t = 151$
1.3.2 Simulation Results: Urban Polarization

Figure 9 plots the percent of the population that moves after each time period. As a result of large increases early on, moving increases dramatically during the first few time periods and then begins a steady decline toward zero after approximately 30 moving cycles.

Figure 10 plots average area ideology over time for each of 20 areas. It is clear from this plot that urban area ideology diverges substantially over time as very liberal and moderate areas cluster together. This phenomenon becomes even more striking when comparing the two-dimensional maps of initial ideological and population distributions in Figure 8 (a) and (d). At the beginning of the simulation, nearly all areas are diverse and ideologically moderate. By the end of the simulation, only a few large population neighborhoods remain diverse and ideologically moderate while surrounding areas are comprised almost entirely of minorities and are ideologically extreme.
Urban ideological polarization as the result of residential sorting becomes even more evident when neighborhood segregation and ideological polarization are plotted over time using the interquartile range (75th - 25th%ile) of average neighborhood ideology and percent minority in Figure 11.
Figure 11: Polarization and Segregation Between Neighborhood, $t = 0$ to $t = 151$
1.4 The Big (Katrina) Sort

If the predictions made by the ideological Schelling model and simulations discussed above are accurate, substantial increases in metropolitan area diversity, either as the result of internal migration or immigration, will be accompanied by: 1) relocation or “flight” of more conservative residents of a different race or ethnic background than the incoming migrants; 2) increases in neighborhood/legislative district ideological homogeneity as conservative residents flee and liberal residents remain; and finally 3) an increase in ideological polarization of the metropolitan areas and states receiving migrants as neighborhoods and legislative districts become ideologically segregated and homogeneous.

If these three changes consistently accompany migration and/or immigration events, the ideological Schelling model has two very broad implications for understanding trends in polarization in the United States and an other democratic nations. First, mass immigration of foreigners that differ from the modal native population with regard to race, ethnicity and/or cultural values, will always be accompanied by an increase in ideological polarization of immigrant destination cities and metropolitan areas. Furthermore, if similar processes occur between legislative districts in democratic nations immigration will tend to consistently be accompanied by increases in ideological polarization of the legislature.

Second, internal migration of natives that differ substantially from the modal native population with regard to race, ethnicity and/or cultural values will also increase polarization in a manner similar to immigration. As long as we accept the most rudimentary assumptions of the ideological Schelling model discussed above it is clear why internal migration should result in greater ideological polarization of migrant destination cities. That it may also increase polarization of the legislature on a national scale requires further explanation since internal migration ostensibly only redistributes, rather than increases, diversity within a nation. As I describe in further detail in the concluding section, this is the result of several factors, the most important of which includes path-dependence and lack of sorting incentives for residents of migrant source cities.

Below I use African-American migration resulting from Hurricane Katrina as a natural experiment to test the ideological Schelling model discussed above. I present abundant evidence that increases in diversity resulted in conservative white flight, increases in ideological homogeneity of neighborhoods in Houston and increases in ideological polarization the City of Houston and Harris County, Texas7.

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7The theory will also be tested using immigration in a future paper.
1.4.1 Introduction

While the causes of rising mass and elite level polarization remain unclear, recent scholarship suggests that geographic sorting may be a contributing factor (Nall 2012; Hui 2012; Bishop 2008). Before a more definitive conclusion can be reached, however, several issues with these studies must be addressed. First, they rely upon county-level demographic data and presidential vote share, both of which give rise to inferential limitations.

County level demographic data only captures county-to-county sorting which is one, relatively limited, piece of the sorting puzzle. Furthermore, as Fiorina and Abrams (2012) point out, using presidential vote share to measure the impact of geographic sorting on polarization is problematic in general, since changes in the ideology of candidates confounds the relationship between geographic sorting and polarization. For example, if Democratic and Republican presidential candidates become more ideologically extreme over time for reasons unrelated to geographic sorting, changes in county level voting patterns responding to this may appear to suggest geographic polarization even though they would be due entirely to elite level polarization.

Bishop (2008), for example, defines a “polarized” county as a “landslide county:” one in which either party wins by more than 10% of the party vote share. Using trends in presidential vote share at the county level between 1976 to 2004, he concludes that the percentage of people living in landslide counties has increased by 21.7%. However, when party registration, a measure of partisan preferences which is less likely to be effected by changes in candidate ideology, is used to examine trends in polarization over the same time period, Fiorna and Abrams (2012) discover that the proportion of the American population living in “landslide counties” has actually decreased from 50% in 1976 to about 15% in 2004.

In addition to the problems mentioned above, this literature does not generally address potential reasons why geographic sorting may be accelerating over the years. The exception to this is research conducted by Nall (2012), who argues that the development of the interstate highway system led to greater urban/suburban polarization. As I describe below, however, this research still leaves a few important questions unanswered.

First, while improved access to transportation will enable more sorting, it is unclear why this sorting should necessarily lead to increases in polarization. Indeed, all things equal, better transportation should only allow people that already wanted to move out of urban areas to move further out into the suburbs rather than the urban fringe. Why and how highways prompted white, conservative Republicans to move out into the suburbs while racially diverse, liberal Democrats remained in the
urban core, cannot be explained by easier access to outlying suburban areas which highways provided.

Since transportation enables greater movement, highways and improvements in mass transportation can, at best, explain some acceleration in the rate of polarization. Indeed, it seems unlikely that individuals satisfied with their current residence would want to move because highways provided easier access to new and unknown areas. Rather, as mentioned above, it should prompt those that already wanted to move to relocate further outside the urban core, thus increasing the scale at which polarization occurs, rather than the magnitude. Factors pushing conservatives out of urban core over the latter portion of the 20th and early 21st centuries and pulling more liberal residents into cities cannot be accounted for by better access to transportation alone.

In the theory portion of my paper, I have argued that diversity-increasing migration events and Schelling-type geographic sorting, or “white flight,” responding to these migration events, can account for both increases in racial diversity and liberalty of the urban core while at the same time increasing racial homogeneity and conservatism in outlying suburban areas, both of which result in rising levels of metropolitan area polarization. Below, I provide evidence that changes in polarization along partisan lines can be explained by diversity-increasing migration events and the sorting resulting from them.

First, at lower levels of geography such as neighborhoods, white flight is induced as less tolerant, more conservative individuals move out of diverse neighborhoods and into more racially homogeneous ones. Neighborhoods that become more diverse and their surrounding areas which become less diverse develop into “polarized places” which continue to attract tolerant/diverse/liberal individuals and less tolerant/homogeneous/conservative individuals, respectively. As lower levels of geography become more polarized, polarization at higher levels of geography increases as well. Increases in conservatism resulting from racial threat (Giles and Hertz 1994) may also contribute to this pattern.

In a series of analyses below, I use the exogenous migration shock resulting from Hurricane Katrina as a natural experiment to demonstrate how increases in neighbor-

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8As mentioned above, better access to transportation, all things equal, should increase polarization between the urban core and the suburbs only to the extent that it provides greater access to outlying areas, thus shifting the scale of polarization from the urban core/urban fringe to urban core/suburbs. Such a shift does not imply that polarization is increasing, but rather that the distance between areas that are already polarized and that are polarizing is increasing.

9In the parlance of partial differential equations, these “polarized places” are often called “local attractors” or “segregation traps” which tend to emerge as the result Schelling-type sorting (Banos 2010).
Hood and metropolitan area diversity directly resulted in white flight and increases in polarization along partisan and ideological lines in in the City of Houston and Harris County. Texas.

1.4.2 Hurricane Katrina Migration as a Natural Experiment

Hurricane Katrina was one of the most devastating storms of the past century. On August 29th, 2005 it made landfall on the Louisiana coast and inflicted massive property and structural damage to the city of New Orleans, making it virtually uninhabitable for the next few months. As a result of the storm, the population of New Orleans decreased dramatically as evacuees relocated to cities across the country.

Because of the unique demographics of New Orleans, a city which contains one of the largest concentrations of African-American residents in the county, responses by the federal government to Hurricane Katrina and questions of where to house evacuees whose homes had been destroyed became a politically charged issue. Of major concern were the over 100,000 poor, African-American evacuees unable to evacuate the city prior to the hurricane. Accusations of racism and bad faith decisions on the part of the Bush administration reached a crescendo as popular figures such as hip-hop artist Kanye West declared on national television that “President Bush doesn’t care about black people.”

Of the cities willing to assist Katrina refugees, Houston, Texas led the way by providing temporary shelter to the (mostly black) New Orleans refugees stranded in the New Orleans Superdome and other shelters across Louisiana. According to the Mayor’s office in Houston, the city received a flood of over 100,000 Katrina evacuees during the first few weeks of September, 2005\(^\text{10}\). This rapid and massive population increase has had long term impacts on Houston demographics and culture.

While shelter was meant to be temporary, approximately 90,000 refugees remained in Houston for at least a month after the storm. Figure 12 plots disaster relief applications to FEMA from displaced Louisiana residents. According to these estimates alone, well over 700,000 Louisiana residents were displaced by Hurricanes Katrina and Rita to cities across the country.

American Community Survey household estimates taken from 255 metropolitan areas across the country (Figure 13) also show a dramatic spike in the one-year migration rate of New Orleans residents as a result of Hurricane Katrina, with black migrants comprising the overwhelming majority. Since the Houston metropolitan

Figure 12: Louisiana Resident Counts of Disaster Relief Applications, Dec. 12, 2005. 
Source: Joshua D. Kent, Louisiana State University

Figure 13: Number of Migrants from New Orleans, by Race
American Community Survey Estimates: 2005-2008
area was most dramatically effected by Katrina migrants and has been the focus of many studies over the years, I begin my analysis within Houston neighborhoods (Census block groups and tracts).
1.4.3 White Flight and Ideology in Houston Neighborhoods

To assess the impact of Hurricane Katrina migration on white flight and polarization in Houston neighborhoods, I use two major dependent variables: 1) apartment building counts of Katrina migrants as of October 17th, 2005 aggregated to the Census block group and census tract levels of geography and; 2) Katrina evacuee enrollment in schools within the Houston Independent School District as of September 13, 2005. The apartment building data comes from a Hurricane Katrina census conducted by the Harris County Housing Authority and was graciously provided to me by Professor Rick Wilson of Rice University. Figure 14 plots the distribution of Katrina presence within Harris County Census tracts using this measure. Katrina evacuee enrollment counts within Houston schools was collected by the Houston Independent School District and generously shared with me by Scott Imberman at Michigan State University.

In my model and simulations discussed above, conservative white flight which accompanies increases in neighborhood diversity plays a pivotal role in driving polarization. Using survey data from the Houston Kinder Area Study, school enrollment data within the Houston Independent School District and Census-tract demographic and election data, I find consistent evidence of white flight in response to African-American Katrina migration concentrated almost entirely among more conservative
neighborhoods.

I begin my analysis by exploring changes in white student enrollment within schools located in the Houston Independent School District (HISD) between 2003-2007 (Imberman, Kugler and Sacerdote 2012). Soon after the arrival of Katrina evacuees on September 1st, 2005, the HISD immediately began enrolling their children into Houston area schools. Data containing counts of evacuee enrollment for 284 elementary, middle and high schools within the HISD as of September 13th, 2005 was graciously provided to me by Scott Imberman of Michigan State University and is used to estimate the impact of Katrina evacuee presence on white flight in Houston neighborhoods. This data was merged with U.S. Department of Education data containing enrollment figures by race for the years 2002-2007.

In order to estimate the ideology of neighborhoods in which schools were located, I used average Democratic and Republican presidential vote share in the 2000 general election for precincts within a radius of 3 kilometers from each school. For example, Westside High School is located on 14201 Briar Forest Drive on the western edge of the HISD. In the 2000 presidential election, the average vote share for George W. Bush in precincts within a 3 kilometer radius of Westside High School was 73.5%.

Figure 15 contains plots of change in white student enrollment v. number of Katrina evacuees as of September 13, 2005. Schools are broken down by those located in conservative neighborhoods (those above the HISD median Republican presidential vote share of 31% in 2000) and those located in liberal neighborhoods (those at or below the HISD median Republican presidential vote share in 2000). From the plots above two things become clear. In the more liberal pre-Katrina neighborhood schools, white student enrollment is not effected by the number of Katrina evacuees assigned to that school either two years before (2003-2005) or two years after (2005-2007) Hurricane Katrina.

In the more conservative neighborhood schools, however, a clear relationship between number of Katrina evacuees assigned to the schools and declines in white student enrollment emerges. Because this relationship emerges very shortly after Hurricane Katrina (2005-2007) but not very shortly before Hurricane Katrina, these plots strongly suggest that white enrollment dropped directly as a result of enrollment of Katrina evacuees in schools located within more conservative neighborhoods.

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111This was accomplished by measuring the Haversine distance between each school and each precinct within the city of Houston the longitude and latitude of each, respectively. After this was accomplished, I calculated the average 2000 Democratic and Republican presidential vote share of precincts within 3 km of each school.

12Ideally an attendance zone should be used to construct estimates of school neighborhood ideology. Unfortunately, these archival attendance zones were not available for 2005 in any useable format.
Indeed, these findings allow us to rule out the possibility that the children of Katrina
Evacuees were assigned to schools whose white enrollment was already declining. A series of difference-in-difference regression models also provides strong evidence of white flight only among schools in more conservative neighborhoods:

\[ \Delta White_{t-t-1} = \alpha + \beta_{t-(t-1)} Katrina_{2005} + s_j + \Delta \epsilon_{t-t-1} \]  

(9)

In the equation above \( \Delta White_{t-(t-1)} \) is change in white enrollment in one year intervals between 2002 and 2007, \( Katrina_{2005} \) is the number of Katrina evacuee students as of September 13, 2005 and \( s_j \) are school type fixed effects (elementary, middle, or high school). What we are most interested in here are the \( \beta_{t-(t-1)} \) coefficients from the regressions above which represent the average one-year change in white student enrollment for each Katrina evacuee assigned to the schools.

If the ideological Schelling model discussed above is correct, we would find that \( \beta_{2006-2005} \) and \( \beta_{2007-2006} \) are negative and significant only in the conservative neighborhood schools and only after Hurricane Katrina. This would also lend further support to the argument that an individual’s propensity to flee in response to increases in diversity is closely related to their political ideology.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>( \Delta White_{2002-2003} )</th>
<th>( \Delta White_{2003-2004} )</th>
<th>( \Delta White_{2004-2005} )</th>
<th>( \Delta White_{2005-2006} )</th>
<th>( \Delta White_{2007-2008} )</th>
</tr>
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<tbody>
<tr>
<td>( Katrina_{2005} )</td>
<td>0.0510</td>
<td>-0.0808</td>
<td>0.00148</td>
<td>-0.132***</td>
<td>-0.145***</td>
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<td>(0.122)</td>
<td>(0.100)</td>
<td>(0.00183)</td>
<td>(0.0503)</td>
<td>(0.0388)</td>
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<td>140</td>
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<td>137</td>
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<td>R-squared</td>
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<table>
<thead>
<tr>
<th>VARIABLES</th>
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<th>( \Delta White_{2003-2004} )</th>
<th>( \Delta White_{2004-2005} )</th>
<th>( \Delta White_{2005-2006} )</th>
<th>( \Delta White_{2007-2008} )</th>
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<td>( Katrina_{2005} )</td>
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<td>Observations</td>
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<td>0.451</td>
<td>0.021</td>
<td>0.017</td>
<td>0.080</td>
<td>0.564</td>
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Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Difference-in-Difference Regressions: One-Year Change in White Enrollment v. Number of Katrina Evacuee Students in 2005

The table of regression coefficients presented above provides clear evidence of declines in white enrollment only within conservative neighborhood schools and only after Hurricane Katrina. Indeed, of the 140 conservative neighborhood schools included in the regressions above, there is no relationship between changes in white enrollment and number of Katrina evacuees assigned to those schools in 2005, again suggesting that Katrina evacuees were not assigned to schools whose white enroll-
ment was already decreasing. Shortly after Hurricane Katrina between 2005 and 2006 and 2006 and 2007, however, we find that for roughly every 10 Katrina evacuee students, white enrollment declined by 1 student.

(a) Census Tract Katrina Evacuee Counts
(b) ∆ White Pop., 2000-2010

Figure 16: 2000 Census Tract Maps of Harris County, Texas

Census tract demographic data also provides evidence of conservative white flight. Using a long-differences model, I demonstrate that evacuee presence within tracts in 2005 determines a significant proportion of the decrease in the white population between 2000 and 2010. Before discussing my analyses below, it is instructive to look at maps of the distribution of Katrina evacuees and change in tract white population between 2000 and 2010.

Figures 16a and 16b provide striking evidence of decreases in the white population within tracts containing Katrina evacuees and increases in the white population in neighboring tracts that did not receive any Katrina evacuees.

The long-differences model used to assess the impact of Katrina evacuee presence on change in the white population is:

\[ \Delta White_{pop_i,2010-2000} = \alpha + \beta Evacuee_{i} + \gamma \Delta Tract_{pop_i,2010-2000} + \epsilon_{i,2010-2000} \] (10)

In the equation above, the dependent variable is the change in white population, \( \beta \) represents the average white population decrease for every Katrina evacuee residing in the tract as of October 17, 2005 and \( \Delta Tract_{pop} \), the change in total population between 2000 and 2010 is included to account for changes in movement in and out of tracts over time that may have drawn whites to those tracts. Since this is a long-differences model, tract fixed effects are accounted for.
As I mention above, the ideological Schelling model suggests that conservatives are less racially tolerant. If the model is correct, we would expect to see sharper white population declines in more conservative neighborhoods receiving Katrina evacuees. In order to assess this, I broke down Census tracts by Republican presidential vote share in 2000 and ran four separate long-difference regressions for the most conservative to most liberal Census tracts according to this criteria.

<table>
<thead>
<tr>
<th>% Republican Presidential Vote, 2000</th>
<th>All Tracts</th>
<th>70-100%</th>
<th>50-70%</th>
<th>30-50%</th>
<th>0-30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIABLES</td>
<td>∆Whitepop</td>
<td>∆Whitepop</td>
<td>∆Whitepop</td>
<td>∆Whitepop</td>
<td>∆Whitepop</td>
</tr>
<tr>
<td>Evacuees</td>
<td>-0.909**</td>
<td>-5.241***</td>
<td>-1.414</td>
<td>-0.549**</td>
<td>-0.626***</td>
</tr>
<tr>
<td></td>
<td>(0.351)</td>
<td>(1.942)</td>
<td>(0.956)</td>
<td>(0.265)</td>
<td>(0.136)</td>
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<td>∆Tractpop</td>
<td>0.305***</td>
<td>0.465***</td>
<td>0.0997***</td>
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<td>0.0713**</td>
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<td></td>
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<td>(0.0494)</td>
<td>(0.0295)</td>
<td>(0.0426)</td>
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<td>195</td>
<td>149</td>
<td>120</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.517</td>
<td>0.873</td>
<td>0.165</td>
<td>0.032</td>
<td>0.127</td>
</tr>
</tbody>
</table>

Cluster robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Regression of Change in Census White Population on Katrina Evacuee Counts, 2000-2010

The long-differences coefficients in Table 5 strongly support claims that 1) Katrina evacuee presence resulted in white flight and; 2) conservative whites were far more likely to leave neighborhoods in response to Katrina evacuees moving in. On average, the results above suggest that for every Katrina evacuee that settled in a Census tract, one white person left that tract between 2000 and 2010.

In very conservative neighborhoods (100% to 70% Republican in 2000), however, the rate of white flight was approximately 5-times the average rate within Houston neighborhoods. Indeed, each Katrina evacuee arrival corresponded to a 5-person decrease in the white population. This stands in sharp contrast to the most liberal neighborhoods (0 to 30% Republican in 2000) whose rate of white flight was only about 2/3 of the average ($\beta = -0.626$).
1.4.4 Polarization in Houston and Harris County Neighborhoods

The evidence presented in the previous section unmistakably suggests that the arrival of Katrina evacuees resulted in flight which was concentrated most heavily among white conservatives. According to the ideological Schelling model and the simulations presented above, the processes accompanying flight and increases in diversity should also lead to greater ideological homogeneity within neighborhoods, resulting in geographic polarization of metropolitan areas and other higher levels of geography along partisan lines.

In this section, I use precinct level election returns aggregated to the Census tract level to show that the increase in diversity brought about by Katrina migration increased neighborhood ideological homogeneity and geographic polarization within Harris County and the City of Houston.

![Figure 17](chart.png)

(a) Democratic v. Republican Vote Share
(b) Close Vote Share

Figure 17: Census Tract Political Outcomes, 2002-2010, Presidential and Gubernatorial Party Vote Share

Figure 17a is a plot of mean Democratic and Republican vote share in neighborhoods where Katrina evacuees settled vs. neighborhoods not receiving any Katrina evacuees. Figure 17b is a plot of the percentage of neighborhoods in which Democratic or Republican vote share was within a 10% margin of 50% (40%-60%). Both plots demonstrate a clear trend: after the arrival of Katrina migrants, Harris County and Houston became both more liberal and more polarized, a finding consistent with
the ideological Schelling model and simulations discussed above.

If the polarization shown above is the result of sorting according the ideological Schelling model, we would expect the following changes within conservative neighborhoods (Census-tracts) receiving Katrina evacuees: 1) sharper declines in the white population relative to liberal neighborhoods receiving evacuees and conservative neighborhoods with no evacuees; 2) sharper declines in Republican voting relative to liberal neighborhoods receiving evacuees and conservative neighborhoods with no evacuees. Below I use 2000 and 2010 Census tract demographic data and precinct level gubernatorial vote share data between 2006 and 2010 aggregated to the Census tract to assess the accuracy of those predictions.

To estimate the impact of Katrina evacuee presence on white flight and neighborhood ideology, I first divide Census tracts into “liberal” and “conservative” tracts according to median tract 2004 Republican presidential vote share which was 51%.

![Figure 18](image)

Figure 18: Change in White Population, 2000-2010 v. # of Katrina Refugees (divided by 100)

Figure 18 shows that changes in the white population were far more sensitive to Katrina migration in conservative neighborhoods. Even more striking are the very high levels of white population growth in zero evacuee tracts which contrasts with substantial declines in tracts containing Katrina evacuees.

To further explore this relationship in-depth, I estimated the following long dif-
ferences model:

\[
\Delta Whitepop_{2010-2000} = \alpha + \beta Evacuees_{2005} + \Delta% Black_{2010-2000} + \Delta Population_{2010-2000} + \Delta% Republican_{2006-2002} + \Delta \epsilon_{2010-2000}
\]  

(11)

VARIABLES  \(\Delta Whitepop_{2010-2000}\)  \(\Delta Whitepop_{2010-2000}\)
\hline
Evacuees\(_{2005}\) & -69.22*** & -271.03**  
& (18.72) & (130.76) 
\hline
\(\Delta% Republican\_{2006-2002}\) & -811.66* & 661.48  
& (454.20) & (810.65) 
\hline
\(\Delta% Black\_{2010-2000}\) & -2,082.63*** & -6,240.01***  
& (540.40) & (1,370.09) 
\hline
\(\Delta Population\_{2010-2000}\) & 0.02 & 0.41***  
& (0.02) & (0.05) 
\hline
Constant & -261.85*** & -468.19***  
& (31.04) & (79.43) 
\hline
Observations & 299 & 313  
R-squared & 0.11 & 0.72

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Long Difference Regression of Census Tract \(\Delta Whitepop_{2010-2000}\) on Katrina Evacuee Counts in Liberal vs. Conservative Tracts

Results of the two regressions in Table 6 show the same pattern of sharper decreases in the white population in more conservative neighborhoods even when using different criteria (2004 Republican presidential vote share vs. 2000 Republican presidential vote share) to define liberal and conservative tracts. According to the results above, the white population in conservative tracts declined at a **fourfold higher rate** \((\beta = -271.03)\) than liberal tracts \((\beta = -69.22)\) for every 100 Katrina evacuees present as of October 15, 2005.

\footnote{This is the same model used to estimate the effect of Katrina evacuee presence on Census-tract ideology.}
As mentioned above, the ideological Schelling model predicts that this shift in demographics will also be accompanied by significant changes in neighborhood ideology. Specifically, we expect to find steep declines in Republican vote share in conservative pre-Katrina tracts and more modest declines in liberal pre-Katrina tracts.
The figures this argument. First, in both liberal and conservative tracts, change in gubernatorial vote share between 2002 and 2006 is uncorrelated with the number of Katrina evacuees, suggesting that evacuees were not assigned to tracts whose Republican vote share was already in decline. Indeed, conservative tracts receiving some of the highest numbers of Katrina evacuees also experienced substantial increases in Republican party vote share between 2002-2006. Second, changes in Republican vote share in the post-Katrina gubernatorial elections (2006-2010) clearly show that a strong negative relationship emerged between evacuee presence and tract Republican vote share, with even steeper declines within conservative neighborhoods.

I further explore this relationship by estimating two long-difference models within conservative and liberal tracts:

\[
\Delta\%\text{Republican}_{2010-2006} = \alpha + \beta \text{Evacuees}_{2005} + \Delta\%\text{Black}_{2010-2000} + \Delta\text{Population}_{2010-2000} \\
+ \Delta\%\text{Republican}_{2006-2002} + \Delta\epsilon_{2010-2000}
\]

(12)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>2004 Republican (\leq 51%)</th>
<th>2004 Republican (&gt; 51%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evacuees(_{2005})</td>
<td>-0.006***</td>
<td>-0.008**</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>(\Delta%\text{Republican}_{2006-2002})</td>
<td>-0.295***</td>
<td>-0.063</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.062)</td>
</tr>
<tr>
<td>(\Delta%\text{Black}_{2010-2000})</td>
<td>-0.120***</td>
<td>-0.239***</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>(\Delta\text{Population}_{2010-2000})</td>
<td>-0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.046***</td>
<td>-0.032***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Observations</td>
<td>299</td>
<td>313</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.229</td>
<td>0.081</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Long Difference Regression of Census Tract \(\Delta\%\text{Republican}_{2010-2006}\) on Katrina Evacuee Counts in Liberal vs. Conservative Tracts
Coefficients presented in Table 7 are consistent with the ideological Schelling model and simulations. Even after accounting for changes in Census-tract gubernatorial Republican vote share between 2002 and 2006, % black between 2000 and 2010 and total population between 2000 and 2010, decline in Republican vote share per 100 evacuees remains approximately 30% higher in conservative neighborhoods ($\beta = -0.008$) versus liberal neighborhoods ($\beta = -0.006$).

To ensure that Katrina evacuees were not being assigned to tracts whose Republican vote share was already declining, which would suggest that the results above were part of a continuing trend rather than the result of Katrina migration, I perform a placebo test by replacing change in Republican gubernatorial vote share between 2006 and 2010 in Equation 12 with change in Republican gubernatorial vote share between 2002 and 2006. While the 2006 gubernatorial election occurred shortly after the arrival of Katrina evacuees on November 7, 2006, this one year period should not provide enough time to have substantially altered the demographic and political composition of liberal and conservative tracts.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>2004 Republican $\leq 51%$</th>
<th>2004 Republican $&gt; 51%$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evacuees$_{2005}$</td>
<td>0.001</td>
<td>0.015*</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>$\Delta%{Black}_{2010-2000}$</td>
<td>-0.187***</td>
<td>-0.151***</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>$\Delta{Population}_{2010-2000}$</td>
<td>-0.000***</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.024***</td>
<td>-0.062***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Observations</td>
<td>313</td>
<td>299</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.055</td>
<td>0.084</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Placebo test Regression of $\Delta%{Republican}_{2006-2002}$ on Number of Katrina Evacuees as of October 13th, 2005

The results from the placebo test regressions in Table 8 should diminish any concerns that may exist regarding the selection of Katrina evacuees into Census tracts with declining levels of Republicans. Not only was Republican vote share not
declining in liberal and conservative tracts with Katrina evacuees, to the contrary, Republican vote share appears to have been *on the rise in more conservative tracts* between 2002 and 2006, the very same tracts which experienced even steeper declines in Republican vote share per Katrina evacuee between 2006 and 2010.
1.5 Discussion

The ideological Schelling model has a great deal of potential to explain trends in ideological polarization both within metropolitan areas and in Congress. The model rests on a relatively straightforward non-reversible chain of demographic events catalyzed by non-white in-migration and ending with metropolitan area polarization. This pattern, which has been clearly demonstrated in the neighborhoods of the City of Houston and Harris County, Texas may go a long way to explain why patterns of immigration restriction and admission are so closely tied to changes in polarization in the House.

Figure 19: Mean DW1-NOMINATE: 40th to 112th Congress

Figure 19 presents a striking pattern of contracting and expanding levels of ideological polarization in Congress which correspond to major changes in immigration law. Shortly after the passage of the Immigration Act of 1924 which established strict immigration quotas, ideological polarization in Congress declined substantially from the period in which the immigration quotas were in place up to the point that they were removed by the Hart-Cellar Act in 1965.

Shortly after passage of Hart-Cellar, polarization began to increase and rapidly
accelerated after the passage of the Immigration Reform Act of 1986 which granted amnesty to illegal immigrants arriving in the United States prior to 1982. While polarization trends in Congress are unlikely to be entirely explained by geographic sorting and other demographic changes induced by migration and immigration, it is very likely that they are big part of the story. Future research will focus on exploring how patterns of immigration are linked to geographic polarization. The implications of the ideological Schelling model and the results of this study have broad implications for understanding trends in polarization not only in the United States but in other countries around the world that receive diverse groups of immigrants.
2 Not in My Backyard: Estimating the Impact of Immigrant Race and Proximity on Immigration Policy Opinion

2.1 Introduction

Despite the rhetoric coming from politicians and syndicated talk radio show hosts, public opinion polls suggest that Americans are sympathetic to the plight of illegal immigrants. In a May 2013 poll conducted by the Pew Research Center, 73% of Americans believed that immigrants entering the country illegally that met certain requirements “should have a way to stay legally” rather than face deportation.

Given the overwhelming support for amnesty, it is somewhat paradoxical that restrictive state and local immigration laws also receive majority support. In a July 2012 Quinnipiac poll, 61% of American voters supported the adoption of immigration legislation similar to Arizona’s controversial SB 1070 in their state. In a May 2011 Rasmussen poll, 59% of respondents favored cutting federal funding to “Sanctuary Cities” which support policies to protect illegal immigrants. In a June Gallup Poll during that same year, however, 64% of respondents indicated that undocumented immigrants should “remain in the U.S. and become a citizen.”

The divergence in public opinion on national, state and local level immigration policy dealing with illegal immigrants can be explained, in part, by NIMBYism. An acronym for “not in my backyard,” NIMBYism refers to the tendency of individuals to hold different opinions on issues which do not effect them directly. For example, while most homeowners might generally support the construction of affordable housing, far fewer would consent to the construction of affordable housing in or near their neighborhood.

In the immigration context, when respondents are presented with questions about national-level immigration policy, they may not consider that such policies will effect illegal immigration in their state, city or neighborhood. Consequently, they may answer these questions based upon what they feel is a socially acceptable response. Questions about state- and local-level immigration policy, on the other hand, primes respondents to consider the impact of immigration policy on the areas in which they live. This, in turn, may induce anxiety about the possibility of illegal immigrants.

\[\text{\footnotesize Among other measures designed to decrease the presence of illegal immigrants in Arizona, SB 1070 increased penalties for aliens not carrying identification at all times, required proof of immigration status during routine traffic stops when officers had “reasonable suspicion” that the person stopped is an illegal alien and barred state and local officials from preventing the enforcement of federal immigration laws, effectively banning Sanctuary City policies.}\]
But why should the possibility of illegal immigrants residing nearby induce anxiety among respondents? The answer to this question can be found in theories of racial and cultural threat. Racial threat theory, as developed by Blalock (1967), is based upon the idea that an increase in the perceived presence of minority out-group members triggers feelings of resentment and threat by members of the majority ingroup. This occurs as the result of perceived competition for jobs and public goods.

According to racial threat theory, as immigrant presence and salience increases, support for policies which seek to restrict immigration will also increase. Studies exploring the validity of this theory have mixed conclusions. While some find evidence of changes in voting behavior resulting from greater immigrant presence (Tolbert and Grummel, 2003), others find no evidence of threat (Cain, Citrin and Wong, 2000; Wong and Drake, 2006). Furthermore, some argue that threat is provoked only in certain contexts (Gay, 2006) while others find that residing near immigrants tends to reduce negative stereotyping (Pettigrew, 1998).

In an effort to explain inconsistencies in these findings, Hopkins (2010) proposes the “politicized places” hypothesis. According to this theory, interactions between national and local level conditions determine the extent to which immigrants are perceived as threatening. Using a variety of panel data sources, he finds that rapid increases in neighborhood concentration of immigrants when immigration is a nationally salient issue results in greater perceived immigrant threat.

In addition to threat induced by competition for jobs and public goods, immigrants are also thought to pose threats to national identity and culture. Such concerns, according to “cultural threat” theorists, lead natives to harbor negative views of immigrants whom they feel have cultural values at odds with their own.

But how do natives come to learn that immigrants have values antithetical to their own? Experimental research has found that immigrant country of origin, language and religious identity provide good signals to natives about the extent to which immigrants’ values differ from their own. In the Netherlands, for example, where many immigrants are Muslim, Sniderman, Sniderman, Haagendoorn, and Prior (2004) find that concerns about immigration are focused on issues of national identity. In the United States, Brader, Valentino and Suhay (2008) find that when a Hispanic, as opposed to a white, immigrant is shown, news about the costs of immigration boosts white opposition to immigration.

In a recent study, however, Hopkins (2013) finds little evidence to support cultural threat. Using a survey experiment, Hopkins (2013) manipulated the skin tone and English language ability of a hypothetical illegal Hispanic immigrant and found that, while skin tone did not have an effect on restrictionist attitudes, better perceived
English language ability tended to elicit more support for immigration restriction. Inconsistencies in the studies mentioned above leave open questions about the relative ability of racial and/or cultural threat to explain changing attitudes on immigration and immigration policy. In the racial threat literature, potentially biased treatment effects and inconsistent measures of immigrant salience make it difficult to assess the extent to which increases in immigrant salience affect attitudes on immigration. Indeed, other than through a clever regression discontinuity design or an instrumental variable, it is difficult to measure the causal effect of immigrant salience on attitudes toward immigration. This is because immigrant salience is generally measured within cross-sectional or panel data sets using Census demographics at coarse levels of geography. Furthermore, studies exploring the extent to which racial threat changes attitudes toward immigration must also contend with problems posed by workplace and neighborhood segregation (Hellerstein and Neumark, 2008; Massey, 1993) which make it unlikely that residents of counties or cities will perceive increases in immigrant salience even when immigration increases dramatically.

Studies exploring the relevance of cultural threat theory, however, have had a great deal of success in terms of estimating causal effects of immigrant characteristics on immigration policy and opinion. Other than Hopkins (2013), cultural threat research consistently finds that the greater the perceived cultural differences between immigrants and natives, the more natives tend to feel threatened by them. Similar to scholarship exploring racial threat, however, these studies are unable to manipulate perceived levels of immigrant salience.

Problems with the scholarship mentioned above leave two major questions about immigration unanswered. First, do attitudes on immigration policy change when immigrant salience increases and; second, are these attitudes related to the racial and/or cultural attributes of immigrant groups?

To answer these questions, I designed a survey experiment which utilizes Internet Protocol (IP) address reading technology allowing for manipulation of perceived

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The IP reading technology and survey experiment conducted in this paper was created using the Qualtrics Research Suite, Copyright © 2013 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. http://www.qualtrics.com
immigrant skin tone [light/dark] and proximity to the respondent [Low-Salience (No immigrant location information)/High-Salience (Immigrant resides in city and state of respondent) yielding a total of 4 treatments shown in Table 9.

I find that immigrant salience, by itself, effects attitudes on immigration policy as responses to questions about immigration become polarized when comparisons are made between the High- and Low-Salience Treatments (3 and 4 v. 1 and 2). I also find that the interaction between immigrant salience and race influences respondent attitudes on immigration policy. When respondents believe that the immigrant lives nearby, the darker immigrant elicits more anti-immigration responses. Conversely, when no immigrant location is provided, the darker immigrant elicits greater pro-immigration responses.

2.2 Methods


To the best of the author’s knowledge, however, no study has experimentally manipulated both perceived immigrant proximity and race. This is problematic because it leaves open questions about the relevance of racial threat theory and also how policy attitudes might change as immigrant presence becomes more visible. Answers to these questions may hold the key to understanding why there appears to be far less support for immigration restriction when immigration policies are framed as national versus state or local level policies.
Table 10: Respondent Demographics: Overall and By Treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>33.58</td>
<td>32.6</td>
<td>34.2</td>
<td>33.3</td>
<td>34.3</td>
</tr>
<tr>
<td>Male</td>
<td>62.85%</td>
<td>63%</td>
<td>59%</td>
<td>63%</td>
<td>66%</td>
</tr>
<tr>
<td>White</td>
<td>79.21%</td>
<td>77.3%</td>
<td>83.8%</td>
<td>75.8%</td>
<td>79.6%</td>
</tr>
<tr>
<td>College or Advanced Degree</td>
<td>48.60%</td>
<td>47.1%</td>
<td>48.6%</td>
<td>45.2%</td>
<td>53.4%</td>
</tr>
<tr>
<td>Ideology (1-7 Scale)</td>
<td>3.4</td>
<td>3.24</td>
<td>3.46</td>
<td>3.32</td>
<td>3.58</td>
</tr>
<tr>
<td>Democrat</td>
<td>42.76%</td>
<td>45.39%</td>
<td>36.03%</td>
<td>47.37%</td>
<td>42.72%</td>
</tr>
</tbody>
</table>

2.2.1 Survey Design

As mentioned above, the survey experiment was designed using the Qualtrics Research Suite. Between June 11, 2013 and July 12, 2013, a total of 485 subjects over 18 years of age and residing in the United States were recruited using Amazon Mechanical Turk. The survey was advertised as a brief, 3-5 minute poll of the respondent’s opinion on American immigration policy.

To ensure that the sample was comprised entirely of American citizens, respondents were asked if they were US citizens. Non-US citizens were subsequently excluded from the analysis. Since certain types of private IP addresses are unable to be read for location information, a question at the end of the survey confirming that respondents receiving the High-Salience treatment actually saw their city and state displayed was asked. Those respondents unable to view their location were removed from the analysis. Two validation questions asking about the name and country of origin of the immigrant mentioned in the stimulus were used to filter out respondents that did not read the stimulus. Finally, although respondents were told that they would not be compensated if they repeated the survey, the few that did were discovered using their Mechanical Turk Worker IDs and were removed. The final dataset yielded 428 individuals.

Respondents came from 46 states with the majority originating from California (52), Florida (32), New York (32), Texas (27), Illinois (20), Pennsylvania (19), Georgia (16), Michigan (16) and North Carolina (16).

Table 10 contains data on respondent demographics, political ideology and party identification overall and by treatment. Respondent ages range between 19 and 76 years of age with an average of 34. They are mostly white (79.21%), male (62.85%), college-educated (87.15%), ideologically liberal (55.14%) and identify as Democrats (42.76%) or Independents (33.88%). While the Mechanical Turk sample used in this analysis is by no means as representative as a cross-sectional survey such as the Amer-
Table 11: Kolmogorov-Smirnov Test P-Values for Every Treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>1/2</th>
<th>1/3</th>
<th>1/4</th>
<th>2/3</th>
<th>2/4</th>
<th>3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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<td>0.91</td>
<td>0.31</td>
<td>0.47</td>
<td>0.55</td>
<td>0.96</td>
</tr>
<tr>
<td>Male</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.98</td>
<td>1.00</td>
</tr>
<tr>
<td>White</td>
<td>0.97</td>
<td>1.00</td>
<td>1.00</td>
<td>0.9</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>College or Advanced Degree</td>
<td>1.00</td>
<td>1.00</td>
<td>0.98</td>
<td>1.00</td>
<td>1.00</td>
<td>0.89</td>
</tr>
<tr>
<td>Ideology (1-7 Scale)</td>
<td>0.62</td>
<td>0.92</td>
<td>0.71</td>
<td>1.00</td>
<td>1.00</td>
<td>0.67</td>
</tr>
<tr>
<td>Democrat</td>
<td>0.70</td>
<td>1.00</td>
<td>1.00</td>
<td>0.53</td>
<td>0.97</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 12: Race and Proximity Treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Light</th>
<th>Dark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Salience</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>High-Salience</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

The American National Election Study, it is far more geographically diverse and representative of the American population than the typical survey experiment conducted using college undergraduates and graduate students (Berinsky, Huber and Lenz 2011).

To ensure that no treatment randomization issues arose, I performed several non-parametric Kolmogorov-Smirnov (KS) tests of equality of probability distributions. The null hypothesis is equality of variable probability distributions.

Table 11 contains the p-values for multiple KS tests of equal probability distributions for every possible treatment comparison over 6 covariates. The results of these tests clearly suggest that there is no reason to believe that there were problems with treatment randomization.

Each survey respondent was presented with a stimulus containing a set of instructions and a short sample of a fictional newspaper article profiling an illegal Mexican immigrant named “Miguel”:

**Instructions:** Below is an excerpt from a newspaper article profiling immigrants [No text/living in City of Respondent, State of Respondent]. Please CAREFULLY READ THE TEXT BELOW and answer the following questions. You will be asked two short validation questions about the article which MUST BE ANSWERED CORRECTLY for you to be compensated. Image is concealed due to copyright restrictions.

As an illegal immigrant worker, Miguel’s journey to [the United States/City of Re-
spondent] was a difficult one. Like many illegal immigrants, he came to the US from Mexico using the services of a “coyote,” a specialist in human trafficking across the US-Mexican border. “Me and other members of my family were packed in the back of a small truck for days, sometimes without food or water,” he told me in his native Spanish. “When I finally arrived in the United States, I was so happy that I thought I could kiss the ground.” Now the problems that he faces are of a different kind. In his day to day life, he struggles to put food on the table for his family. “All my life, I always work hard, but there never seems to be enough money,” he tells me.

Contained within each stimulus are two pieces of information which serve as the proximity and race treatments shown in Table 12. Perceived proximity of the fictional immigrant to the survey respondent is experimentally manipulated using respondent Internet Protocol (IP) address software available as part of the Qualtrics Research Suite\textsuperscript{16}.

Figure 20 contains screen shots of two of the four treatments. As shown in Figure 20a, immigrant proximity to the respondent is manipulated by embedding the city and state of the respondent into three key locations within the stimulus. Because IP reading geo-location technology is sometimes inaccurate and certain types of IP addresses cannot be accurately linked to a city, to ensure that respondents in receiving the High-Salience treatment observed their city and state in the stimulus they were asked “Do you live in or near [Respondent City], [Respondent State]?” Those that responded “No” to this question were excluded from the analysis.

Immigrant race is suggested by either a dark or light colored skin tone as shown in Figure 21. When respondents click on the link containing the survey, images 21a or 21b are randomly presented within the stimulus. The blurry picture of the immigrant with the light skin tone clearly suggests that the immigrant is more Caucasian while the immigrant with the darker skin tone appears to be of a mixed racial background\textsuperscript{17}.

\textsuperscript{16}An Internet Protocol address is a set of numbers which uniquely identifies each computer tied into a network using the Internet Protocol for communication. Most public Internet Protocol addresses contain information which can be used to identify the city and state of an individual’s computer. Qualtrics survey technology reads the survey respondent’s IP address and uses a geo-location database to link that address to the respondent’s city and state which is subsequently displayed to the respondent within the stimulus. Per Institutional Review Board guidelines, the researcher never sees respondent Internet Protocol address or city of residence. State of residence is voluntarily provided by the respondent.

\textsuperscript{17}To avoid potential confounding effects introduced by different kinds of facial features possessed by individuals with darker and lighter complexions, the same face was used to create both race treatments. Skin tone was simply adjusted using brightness and contrast adjustments on facial and neck areas using Adobe Photoshop. For respondents familiar with Mexican ethnicities, the
darker immigrant would appear to them to be of Mestizo heritage (a mix of indigenous Mexican and white). Mestizos are the modal ethnic group in Mexico and comprise approximately 60% of that country’s population.

51
(a) Dark Skin Tone  (b) Light Skin Tone

Figure 21: Immigrant Skin Tones Presented
2.2.2 Survey Questions

I ask the same set of questions about immigration and immigration policy in each of the four treatments. The questions are grouped into three major categories: 1) personal assessments of the immigrant; 2) sharing in public goods and; 3) immigration policy and restriction. The full list of questions can be found in the Appendix below.

2.3 Results

I first assess the extent to which immigrant proximity/salience effects opinions on immigration. This is accomplished by comparing responses to questions in the Low- and High-Salience treatments (Treatments 1 and 2 vs. 3 and 4 from Table 12). These comparisons present two sets of in-group/out-group tensions: citizens (in-group) vs. immigrants (out-group) and city residents (in-group) vs. non-residents (out-group). While racial threat theory tells us that close immigrant proximity to respondents should trigger feelings of anxiety, the desire to express solidarity with a member of the same community as the respondent may attenuate this anxiety.

In either case, if immigrant salience effects opinions on immigration, responses to questions in the High-Salience treatments should elicit stronger feelings among respondents relative to the Low-Salience treatments, resulting in greater attitude polarization. To assess this claim, responses to each immigration question on a 1-7 Strongly Agree-Strongly Disagree or Strongly Approve-Strongly Disapprove scale were transformed into a polarization measure which indicated absolute deviation from respondent indifference:

\[
Polarization_q^i = |Response_q^i - 4| \quad (13)
\]

In these questions indifference is indicated by the “Neither Agree or Disagree” or “Neither Approve or Disapprove” response which are coded as 4 within the data. Thus, \(Polarization_q^i\) is a measure of the extent to which attitudes on each of these \(q = 1, ..., 10\) immigration questions deviates from indifference. A series of ten regressions were run on each of the \(Polarization_q^i\) dependent variables using a binary treatment indicator for the High- (equal to 1) vs. Low-Salience (equal to 0) treatment as the independent variable (\(Salience\)). Respondent demographics were included to increase the precision of the estimates (Rubin 1979; Bloom, Hayes and Black 2007; Zhang, Tsiadis and Davidian 2008):
<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Welfare</td>
<td>0.17*</td>
<td>0.22**</td>
<td>0.21**</td>
</tr>
<tr>
<td>Good Citizen</td>
<td>(0.10)</td>
<td>(0.09)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Stay Legal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USBorn</td>
<td>-0.04</td>
<td>0.10</td>
<td>-0.04</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.14</td>
<td>-0.20**</td>
<td>-0.14</td>
</tr>
<tr>
<td>White</td>
<td>0.08</td>
<td>-0.19*</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.11)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Educ</td>
<td>0.02</td>
<td>-0.09</td>
<td>-0.09</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>IdeologySelf</td>
<td>0.06*</td>
<td>-0.05</td>
<td>-0.08***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.54***</td>
<td>2.03***</td>
<td>2.48***</td>
</tr>
<tr>
<td></td>
<td>(0.33)</td>
<td>(0.31)</td>
<td>(0.29)</td>
</tr>
</tbody>
</table>

Observations  428  428  428
R-squared      0.03  0.05  0.05

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13: Regression of Polarization DVs on Salience Treatment

\[ Polarization^q = \alpha^q + \beta^q Salience + \Gamma^q X + \epsilon^q \] (14)
Figure 22 is a plot of the $\beta$’s with 95% confidence intervals. Attitude polarization on questions of whether illegal immigrants similar to the fictional immigrant described in the stimulus will be good citizens, should have a way to stay legally and should be eligible to receive state and local welfare benefits were higher when the immigrant was local. Table 13 presents detailed regression results for these three variables.
Regression results aside, a look at the distributions of responses in the Low- and High-Salience treatments for each of these three questions in Figures 23a, 23b and 23c clearly reveals greater indifference among respondents in the Low-Salience treatment.
The next question I sought to answer was whether anti-immigrant attitudes were induced when immigrant salience increased. Answers to these questions tells us about the relative importance of cultural threat in shaping attitudes toward immigrants. Since the immigrant in every group is an illegal Mexican immigrant, if feelings of cultural threat influence immigration policy attitudes, we would expect that non-Hispanic citizens would react to the immigrant residing nearby with more anti-immigrant attitudes.

To assess this claim, I ran a series of logistic regressions on a set of binary dependent variables in which favorable attitudes toward the immigrant for each (Approve/Agree/Favor) were coded as 1 for each question. The form of each of the regressions is identical to Equation 14 with only the dependent variable changed.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salience</td>
<td>0.38*</td>
<td>0.51**</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.21)</td>
</tr>
<tr>
<td>Observations</td>
<td>428</td>
<td>428</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.14</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14: Regression of Polarization DVs on Salience Treatment
Figure 24: Logistic Regression Coefficients with 95% Confidence Intervals: DV = Immigration Questions 1 = Agree, 0 = Otherwise

Figure 24 provides no evidence that cultural threat plays a role in determining immigration policy attitudes toward illegal Mexican immigrants. We not only do not observe more anti-immigrant sentiment when comparing responses to questions in the High- v. Low-Salience treatments, to the contrary, respondents provide more pro-immigrant responses in the High-Salience treatment. As Table 14 shows, on average, respondents are more likely to support “Sanctuary City” policies and believe that the immigrant would be a good neighbor in the High-Salience treatment.

The results above suggest that in-group solidarity between local residents may counteract potential feelings of anxiety created by close illegal immigrant proximity. Interestingly, however, pro-immigration responses in the High-Salience treatment are directed only toward the immigrant with the light complexion as the results from three logistic regressions in Table 15 and Figure 25 show.
Table 15: Logistic Regressions: Salience Treatment v. Three Dependent Variables by Immigrant Race

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Sanctuary</th>
<th>Good Neighbor</th>
<th>Legal Immigration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light-Complexion Immigrant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salience</td>
<td>0.81**</td>
<td>0.69**</td>
<td>0.58*</td>
</tr>
<tr>
<td></td>
<td>(0.33)</td>
<td>(0.30)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>Observations</td>
<td>214</td>
<td>214</td>
<td>200</td>
</tr>
<tr>
<td><strong>Dark-Complexion Immigrant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salience</td>
<td>-0.12</td>
<td>0.32</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.30)</td>
<td>(0.32)</td>
</tr>
<tr>
<td>Observations</td>
<td>214</td>
<td>214</td>
<td>195</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
In fact, no difference in responses to any question emerge when we compare the dark-complexion immigrants in the High- and Low-Salience treatments (2 vs. 4). When presented with the light-complexion immigrants in the High- and Low-Salience treatments (1 vs. 3), however, respondents take more pro-immigrant stances on three questions. They are more likely to agree that the local light-complexion immigrant will be a good neighbor, are more supportive of declaring their city a Sanctuary City and are more likely to favor increasing legal immigration.

Since each immigrant in each treatment is presumed to be an illegal Mexican immigrant with the same background story, these results suggest that the interaction between the immigrant’s race and proximity to the respondent plays a more important role in considerations of immigration policy than national origin, cultural background and salience alone. To further explore the relevance of immigrant race, I compared responses to questions by immigrant race within High- and Low-Salience treatments (Treatments 1 vs. 2 and 3 vs. 4).

If immigrant race influences immigration policy attitudes as the result of anxiety caused by racial threat, immigrant complexion should influence immigration policy attitudes among non-Hispanic and non-black respondents in the High-Salience
treatment. Because race-based anxiety would not be triggered among these citizens in the Low-Salience treatment, anti-immigrant or restrictionist attitudes among respondents presented with the dark-complexion immigrant should not emerge.

These claims are assessed by running two sets of logistic regressions within the High- and Low-Salience treatments:

\[
Question^S_q = \alpha + \beta\text{Race}^S + \Gamma^S X + \epsilon^S
\]

\[S = [\text{Low} - \text{Salience}, \text{High} - \text{Salience}]\]

\[q = 1, \ldots, 12\]

In the equation above, \(\text{Race}^S\) is coded 1 if the immigrant shown was dark and 0 if light. For the questions asked on a 1-7 scale \(Question^S_q\) is coded 1 if the respondent agreed with or approved of the statement posed, 0 otherwise. For the Legal Immigration question, \(Question^S_q\) is coded 1 if respondents thought that legal immigration should be increased, 0 otherwise. Finally, for the Arizona Law question, \(Question^S_q\) was coded 1 if respondents favored their state adopting a similar anti-immigration law to Arizona’s SB 1070, 0 otherwise.

The results in Figure 26 do not fit with any predictions made by either racial or cultural threat theories. In the Low-Salience treatment, non-Hispanic and non-black respondents exhibit more pro-immigrant sentiment when the darker immigrant is presented (Treatment 2). They are more supportive of providing immigrants access to federal, state and local welfare benefits and are more likely to favor increasing legal immigration. They are also more likely to agree that the immigrants similar to the darker immigrant are more trustworthy, would be good neighbors and good American citizens.

When we turn to between-race comparisons within the High-Salience treatments (Treatments 3 vs. 4), however, responses change dramatically as non-Hispanic and non-black respondents now indicate more anti-immigrant sentiment when exposed to the darker immigrant (Treatment 4). As the coefficients displayed in Figure 27 indicate, there are no differences, on average, between respondents exposed to the light v. dark complexion immigrant for all of the questions except one which is arguably the most important indicator of anti-immigrant sentiment: support for a respondent state adoption of an anti-immigration law similar to Arizona’s SB 1070.

In the High-Salience treatment, respondents were significantly more likely to favor a similar anti-immigration law in their home state when exposed to the immigrant with the darker complexion while in the Low-Salience treatment this difference is not present. A conclusion that can be drawn from this and the other findings discussed
above is that the interaction between immigrant race and salience play a crucial role in immigration policy opinion formation.
Figure 27: High-Salience Treatment: Logistic Regression Coefficients for the Race Variable with 95% Confidence Intervals
2.4 Discussion

This study’s findings have a number of implications for better understanding the current immigration debate in the United States at the national, state and local levels. First, they suggest that attitude polarization on questions about immigration tends to increase as immigrant proximity and salience increases. As a result, if immigration from Latin American nations continues to grow and immigrant presence becomes more visible in towns and cities across America, attitude polarization on immigration policy should continue to increase as well.

Second, since racial and cultural threat theories frame tensions arising from immigration as citizen (in-group) v. immigrant (out-group), they may have overlooked the importance of in-group solidarity that one may feel with members of their community. While some of the findings have demonstrated that solidarity with a fellow neighbor or resident can potentially counteract anxiety created by higher immigrant salience, the fact that residential in-group solidarity was triggered exclusively by the immigrant with the light complexion implies that racial and cultural divisions between immigrants and citizens will most likely continue to trump neighborly solidarity as long as immigrants, in terms of appearance, differ sufficiently from the average citizen.

Finally, between-race comparisons within High- and Low-Salience treatments demonstrate that immigrant race is one of the most important factors influencing attitudes on immigration when immigrants are perceived to be living in one’s backyard. In the Low-Salience treatment, white respondents were more supportive of the darker immigrant by almost every measure. Once they believed that the immigrant was residing nearby, however, this support reverses as respondents favored stricter state-level anti-immigration laws when the darker immigrant was shown.

Overall, the results of this study suggest that racial threat can better explain policy attitudes toward immigrants than cultural threat. Racial threat predicts that if immigrants are racially distinct from the dominant native group, as immigrant salience increases, the dominant group will be more likely to push back by enacting more restrictive immigration laws.

These findings also shed light on the paradoxical divide between broad support for permissive immigration legislation at the federal level and highly restrictive immigration legislation at the state level. As this study demonstrates, when immigration is framed as a national issue, non-Hispanic and non-black respondents tend to be more supportive of immigrants that are different from them. When immigrant salience is increased and immigrants are thought to be residing nearby, this finding is turned on its head.
3 Assessing the Gender Penalty: A Regression Discontinuity Approach (with Morris Levy)

3.1 Introduction

After a more than three-fold increase in the number of women in the U.S. House of Representatives since the 100th Congress (1987-89), women continue to account for under 20% of current (112th Congress) House members. Moreover, there are signs that the increases in the number of female representatives are slowing. As the number of women nominated by the major parties since the 1980’s surged (Dolan 2008), the number of females increased from 30 to 62 from the 102nd (1991-93) to the 107th House (2001-03). Yet the following ten year period saw an increase of only 14 females in the House. This paper brings a novel and direct design to bear on the question of whether net voter bias against female candidates for office can help explain the limited growth of female election to the House of Representatives. Specifically, a regression discontinuity design that uses primary vote share as the “forcing variable” permits us to estimate the causal effect of a major party nominee’s gender on that candidate’s vote share. Our period of study encompasses all Congressional elections from 1982, before which very few women were running for the House, to the present.

Observational studies have cast doubt on the role of gender bias in limiting the number of female representatives. Men tend to do as well as females once basic features of the candidate and the race are controlled (see, e.g., Darcy and Schramm 1977; Hedlund et. al. 1979; Burrell 1994; Darcy, Welch and Clark 1994; Seltzer, Newman, and Leighton 1997; Dolan 2004). As Sanbonmatsu (2003) describes, scholars have thus emphasized factors leading to candidate selection and nomination rather than voter dispositions toward female candidates. One limiting factor is the high male share of incumbents (Burrell 1994). Another is the relatively small number of women in professions that often serve as a springboard for running for local office (Thomas 1994), which can in turn lead to candidacy for higher offices. Sanbonmatsu (2003) suggests that party recruitment practices, and relevant beliefs party and interest group leaders have about women’s likelihood of electoral success, helps explain patterns of female participation in electoral politics.

Recent innovative research convincingly revives the debate over whether voters’ gender bias limits female office-holding (Fulton 2012). Theoretically, as Fulton points out, it is hard to square null findings from vote-share models with survey evidence that many voters hold uncongenial stereotypes about female candidates (Kahn 1996; Dolan and Sanbonmatsu 2009) that do appear to influence votes. Empirically, Fulton takes the critical step of introducing a measure of candidate quality into models of
vote share, thus addressing a potential source of omitted variables bias that emerges if the pool of female candidates is on average more electable (aside from any gender bias) than the pool of male candidates. Given that women may face a more trying route to the nomination (Lawless and Pearson 2008), it is sensible to expect such bias, and, indeed, Fulton shows that, once candidate quality is controlled using her new measure, a three percentage point gender penalty emerges. Without this control, no female disadvantage is statistically apparent.

This research clearly demonstrates the hazards omitted variable bias can pose in the estimation of candidate gender effects on electoral outcomes. The control for quality, which is based on informants’ ratings of 176 men and 24 women incumbents, is subject to potential biases of its own. This could emerge if the foundations of assessments of males and females differ. For example, if assessments of male and female quality are differentially responsive to informants’ perceptions of how potential voters or donors were responding to male and female candidates up till the time of the interview, including the control for quality could bias the estimated effect on gender in either direction. There is also no guarantee that other omitted variables are not introducing bias. Finally, case selection is rather idiosyncratically based on available informant interviews and does not cover open seats.

3.2 Regression Discontinuity Analysis of Gender on House Election Outcomes

As the result of the myriad demographic and political factors which contribute to the selection of a female House candidate on a district’s general election ballot, identifying the causal effect of candidate gender on House election outcomes may, at first, appear to be an impossible task. For example, a preliminary look at differences between Congressional districts in which female candidates, in either party, were present on the ballot, reveals that voters in these districts tended to be younger, more educated, wealthier and more liberal compared districts with no female candidates on the ballot. Of course, these factors are among some of the known differences between these districts. There undoubtedly exist far more measurable and unmeasurable factors differentiating districts with female candidates on the ballot and those with none, rendering identification of the causal impact of gender on election outcomes a daunting task. By using House primary vote share as a forcing variable in elections in which a male candidate competes against a female candidate, however, our regression discontinuity design (RDD) enables us to eliminate these confounding factors and estimate the causal effect of a female candidacy on party vote share.
3.2.1 Model and Setup

Within the primary system exists an inherent RDD with respect to whom gets on the ballot in a general election. If a candidate is challenged in a Democratic or Republican primary, whether that candidate runs in the general election is a deterministic function of their primary vote share. For 2-candidate partisan primaries, the focus of this study, a candidate will represent their party in the general election if they receive greater than 50% of the vote share.

\[
\Pi_{ipt}^f = \alpha v_{ipt} + c_j + c_j' + \delta_i + \epsilon_{ipt}
\]

\[B_{ipt}^f = 1 \left[ \Pi_{ipt}^f > \frac{1}{2} \right]
\]

In Equation 16 above, \(\Pi_{ipt}^f\) represents primary vote share for a female candidate in a 2-candidate male/female primaries in district \(i\) for party \(p = \{\text{Democratic}, \text{Republican}\}\) in year \(t\). In the model above, primary vote share for a female candidate is a function of voter characteristics in the district, \(v_{ipt}\), candidate characteristics \(c_j\), opponent characteristics, \(c_j'\), fixed district characteristics, \(\delta_i\) and other factors which comprise the error term \(\epsilon_{ipt}\). In 2-candidate male/female primaries, whether a female represents her party in her district in the general election in year \(t\), \(B_{ipt}^f\), is determined entirely by whether she achieves \(\Pi_{ipt}^f > 1/2\).

In the potential outcomes framework, the treatment of interest is \(B_{ipt}^f\) where \(B_{ipt}^f = 1\) indicates that a female candidate for party \(p\) is runs in the general election whereas \(B_{ipt}^f = 0\) indicates that a male candidate for party \(p\) runs in the general election. The outcomes of interest are general election party vote share for districts in which a female candidate beat a male candidate in their party’s House primary, \(V_{ipt}(1)\), and party vote share in districts where a male candidate beat a female candidate in their party’s House primary, \(V_{ipt}(0)\). According to the potential outcomes model, the average causal effect of candidate gender on party vote share for district-years in which a female candidate ran in the general election is:

\[
\tau_{ATT}^p = E[V_{ip} | B_{ip}^f = 1] - E[V_{ip} | B_{ip}^f = 0]
\]

In Equation 17 above \(E[V_{ip} | B_{ip}^f = 1]\) is the average party vote share in districts containing a female candidate and \(E[V_{ip} | B_{ip}^f = 0]\) is the average party vote share for those same districts, had a male candidate been on the ballot. In reality, of course, we cannot observe the counter-factual. Indeed, we can only estimate party vote share for districts in which female candidates were present on the general election ballot.
and party vote share for districts in which male candidates were on the general election ballot $E[V_{jp}|B_{jp}^f = 0]$. Obtaining these quantities enables us to estimate the average treatment effect of gender on party vote share:

$$\tau_{ATE}^p = E[V_{ip}|B_{ip}^f = 1] - E[V_{jp}|B_{jp}^f = 0] \quad (18)$$

As mentioned above, districts in which female Democratic or Republican candidates run for House seats are substantially different, on average, from districts in which male candidates run for House seats. Thus, the treatment effect $\tau_{ATE}^p$ will be biased in proportion to the average difference in party vote share between districts in which male candidates ran and the counterfactual districts in which female candidates ran had those districts had male candidates:

$$Bias = E[V_{jp}|B_{jp}^f = 0] - E[V_{ip}|B_{ip}^f = 0] \quad (19)$$

The direction and magnitude of this bias will depend primarily upon factors relating to differences within parties and between districts and candidates. For example, districts in which a male Democratic candidate ran in the general election may be more conservative, on average, than districts in which a female Democratic candidate ran. If this is true, average Democratic party vote share in $(E[V_{jDemocratic}|B_{jp}^f = 0])$ among districts where male candidates ran should be lower, all things equal, than average Democratic party vote share in the counterfactual districts $(E[V_{ip}|B_{ip}^f = 0])$. In this case, the bias would be negative, leading to treatment effect attenuation in Equation 1818.

It is clear from Equation 19 that an unbiased treatment effect requires that $E[V_{jp}|B_{jp}^f = 0] - E[V_{ip}|B_{ip}^f = 0] = 0$ or $E[V_{jp}|B_{jp}^f = 0] = E[V_{ip}|B_{ip}^f = 0]$. From the perspective of an ideal thought experiment, this can be accomplished if female candidates are randomly placed on the ballot to run in House general elections. Clearly in that case $\tau_{ATE}^p = \tau_{ATT}^p$ and $Bias = 0$. While random assignment of female candidates by a researcher is clearly impossible, our regression discontinuity-design takes advantage of existing random assignment of female candidates to the general election ballot inherent in the primary process.

Since House primary vote share determines whether a man or woman will run in the general elections, we can take advantage of the fact that, for congressional districts in which a woman barely won v. barely lost to a male candidate of their party, it is as if a Democratic or Republican female candidate was randomly assigned to the ballot in the general election. This is the result of the sharp discontinuity

---

18If $Bias = 0$ in Equation 19, Equation 18 would clearly represent the average causal treatment effect. If $Bias > 0$, this would result in treatment effect inflation.
created by the majority vote share requirement. Within a narrow window of the 50% vote-share cutoff, \(0.50 - \epsilon < 0.50 < 0.50 + \epsilon\) the ability of a female candidate to win her party’s primary, and hence run for office on election day, can plausibly be assumed to be determined by chance. If this assumption is correct, there should be no differences, on average, in terms of district characteristics and candidate quality between districts in which a female candidate barely won or barely lost to a male candidate.

Thus, to estimate the causal effect of candidate gender on general election party vote share, we estimate the mean general election party vote share difference between bare female winners and bare female losers of competitive primaries\(^{19}\). Formally, we estimate:

\[
\tau_{SRD} = \lim_{\Pi \downarrow 0.50} E[V(1)_{i} | \Pi_{i} = 0.50] - \lim_{\Pi \uparrow 0.50} E[V(0)_{i} | \Pi_{i} = 0.50]
\]

where \(\tau_{SRD}\) represents the local average treatment effect of candidate gender on party vote share for candidates in close 2-person primaries.

One of the most significant benefits of regression-discontinuity designs, which make them second only to randomized experiments, are the lack of assumptions required to obtain causal effects. Indeed, as long as assignment to treatment around the cutpoint is close to “as good as random,” \(\tau_{SRD}\) will be unbiased. Failures of this assumption occur, however, when individuals near the cutpoint are able to manipulate their selection into treatment. Caughey and Sekhon (2011) provide evidence of vote share manipulation by incumbents in U.S. House of Representatives elections, thus making use of party vote share in general elections a poor choice of running variable to study the effect of incumbency on vote share.

While this may be true for general elections, there is no reason, \textit{a priori}, to believe that House primaries and more specifically, House primaries in which female candidates compete against male candidates, share similar pathologies. First, incumbents are rarely challenged in House primaries and close House primaries are typically contests among politically inexperienced, open seat candidates (Ansolabehere et. al. 2006). Second, House primaries useful for RDDs are almost always between two candidates of the same party. Third, House primary rules and dates differ substantially from state to state. The remaining portions of the paper describe the data that we use, results of our analyses and robustness and validity checks to assess RDD violations of election results in close primaries with female candidates.

\(^{19}\)Since we restrict our analysis to only male v. female primary competitions, if a female candidate barely lost, this implies that a male candidate barely won and vice versa
3.3 Data

Data containing information about House primary elections between 1982 and 2010 were collected from two sources: (1) Congressional Quarterly Elections data between 1994 and 2010 and; (2) data provided by David Brady of Stanford University for primaries between 1982 and 1992. Both sets of data contain candidate name, state, district, primary year and primary vote share. For competitive 2-person elections, candidate gender was determined and verified independently by both authors using candidate name. For cases in which candidate gender was ambiguous, we conducted Google searches to learn further information about the candidate. If a search revealed no further relevant information, they were counted as missing and the primary was not included in the analysis.

Two-candidate primaries included in the analyses below are those in which only a female candidate ran against a male candidate. For Democratic primaries between 1982-2010, there were $N = 252$ such primaries and $N = 149$ Republican primaries over the same time period.

3.4 Results

In this study, we focus on the causal impact of candidate gender on general election party vote share. Thus, our dependent variable of interest is candidate vote share in the general election. To explore whether candidate gender affects party vote share differently in midterm and presidential year elections, we split our samples by primary year and re-ran the RDD. Due to irregularities that we discovered in male/female Democratic primaries prior to 1994 which suggest vote share manipulation by male candidates, we restrict our analysis of Democratic primaries to those which took place between 1994 and 2010. These irregularities, and their implications, are discussed in greater detail below.

Figure 28 plots 206 competitive Democratic primaries in which a woman barely won or lost to a male candidate between 1994-2010. In all elections, it clearly demonstrates that Democratic candidate gender does not appear to have an impact on party vote share. As robustness checks below will demonstrate, there is evidence that male Democratic primary candidates are able to manipulate their primary vote share in close elections when competing against female candidates in Democratic primaries prior to 1994.

Similar problems, discussed in further detail below, do not appear to be present in male/female Republican primaries where female presence on the ballot appears to have a causal effect on Republican vote share in midterm year, presidential year and combined House elections.
Democratic Vote Share v. Female Democratic Primary Margin with Local Polynomial Regression Fit using Optimal Bandwidth (Imbens and Kalyanaraman, 2009) N = 206

The sharp discontinuities above and below zero in Figures 32 and 33, clearly suggest that female Republican candidates received a substantial vote share boost. Wald local average treatment effect estimates from the local regressions plotted in Figure 31 above suggest that female Republican candidates received a 13% boost in vote share in combined presidential and midterm year elections, a 14% boost in presidential year elections and an 9% boost during midterm elections compared to
Figure 31: All Elections

Figure 32: Mid-term Elections

Figure 33: Presidential Year Elections

Republican Vote Share v. Female Republican Primary Margin with Local Polynomial Regression Fit using Optimal Bandwidth (Imbens and Kalyanaraman, 2009) N = 145

their male counterparts.

Table 16 contains LATE estimates of Republican candidate female gender on Republican party vote share. Estimates obtained using different bandwidths suggest that the size of the treatment effect is not particularly sensitive to bandwidth choice.
### 3.5 RDD Assumptions and Robustness Checks

Regression-discontinuity designs are generally considered the “gold-standard” among observational studies because they offer the ability to estimate causal treatment effects with a near absolute minimum of assumptions. Problems can arise, however, when individuals with forcing variable values around the cutpoint are able to manipulate selection into or out of treatment. In the context of U.S. House of Representative elections, Caughey and Sekhon (2011) have demonstrated that in close House elections, Democratic and Republican incumbents appear to be able to manipulate their vote share in order to increase their likelihood of re-election. As mentioned above, however, close House primaries are very different from close general elections in ways which make utilizing them in regression-discontinuity designs plausible.

Irregularities in close elections of this kind that could potentially bias the treatment effect would thus have to be gender specific or at least correlated with candidate gender. For example, if males competing against females in either party are able to manipulate their vote share in close House primaries, selection bias is introduced and the validity of the RDD comes into question. To test whether female assignment to the general election ballot in competitive House primaries is truly random in very close elections, we employ a density test developed by McCrary (2008) and examine balance on demographic and political district-level covariates within a 2.5% vote margin window for Democratic and Republican primaries.

Non-manipulation of the running variable, called the “smoothness assumption,” is indicated by the lack of a discontinuity in the distribution of candidates near the cutpoint of the running variable. Such discontinuity can be discovered by plotting histograms of the forcing variable at several binwidths. An uneven distribution of bare female winners around the cutpoint provides possible evidence of male or female vote share manipulation. Another, perhaps more informative way to discover evidence of forcing variable manipulation is by examining differences between candidate and district characteristics at values close to the forcing variable cutpoint. True random assignment of individuals to treatment around the cutpoint implies that, on average, there should be no differences (other than the treatment) between

<table>
<thead>
<tr>
<th>Bandwidth Category</th>
<th>Bandwidth</th>
<th>Wald LATE Estimate</th>
<th>SE</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IK Optimal</td>
<td>0.23</td>
<td>0.13</td>
<td>0.05</td>
<td>0.009</td>
</tr>
<tr>
<td>50% IK Optimal</td>
<td>0.12</td>
<td>0.13</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>200% IK Optimal</td>
<td>0.10</td>
<td>0.10</td>
<td>0.04</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 16: LATE Estimates for Combined Republican Primaries
individuals near the cutpoint. If differences are found, this not only provides further
evidence of manipulation around the cutpoint, but also points to possible causes of
the manipulation.

In close House primaries where male candidates ran against female candidates,
we find evidence of primary vote share manipulation among male Democrats into
treatment or female Democrats out of treatment in primaries before 1994. Similar
evidence of manipulation among Democrats after 1994 or Republicans between 1982-
2010 is found. We speculate about possible explanations for this phenomenon below.
3.5.1 Density Test

Figure 34: Republican Primary Vote Margin

Figure 35: Democratic Primary Vote Margin

Density Test (McCrary 2008) using Female Primary Vote Margins 1982-2010

The density test above clearly demonstrates that there is an uneven distribution of close male v. close female candidates in Democratic primaries but not Republican primaries between 1982 and 2010. A closer look at counts of Republican and Democratic female winners and losers around the 2.5% vote share margin makes this clear.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Republicans</th>
<th>Democrats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Winner</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Male Winner</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 17: Distribution of Male and Female Candidates, 2.5% Vote Margin, 1982-2010

Table 17 demonstrates that, in close Democratic primaries where a male candidate competed against a female candidate, the odds of a man winning were better than 3 to 1, whereas differences in the distributions of male and female candidates in close Republican primaries are almost identical. Fortunately, further examination of Democratic primary data suggested that this uneven distribution disappeared if elections before 1994 were excluded.

Male/female winners in Democratic primaries are broken down in Table 18 above. It is clear from this that the distributions of male and female winners in close pri-
<table>
<thead>
<tr>
<th>Gender</th>
<th>1982-2010</th>
<th>1988-2010</th>
<th>1994-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Winner</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Male Winner</td>
<td>16</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 18: Democratic Primaries: Distribution of Male and Female Candidates, 2.5% Vote Margin

Primaries becomes negligible after 1992. This appears to be due to the fact that there were no bare female winners of Democratic primaries prior to 1992, a very unusual result. That the difference in distributions between bare male and female winners is negligible is confirmed by a density test performed on Democratic primary female vote margins between 1994 and 2010 and balance on covariates in these elections shown below.

![Figure 36: Density Test using Democratic Primary Female Vote Margins, 1994-2010](image)

As can be seen above in Figure 36, there is no discontinuity in the distribution...
of Democratic primary female vote margins if the data is restricted to 1994 and onwards.

3.5.2 Covariate Balance

Using a rich set of district and candidate covariates, this section further explores RDD violations among earlier Democratic primaries documented above. Figures 37 and 38 are plots of t-test p-values of mean differences between districts with close female winners and losers in Democratic and Republican primaries. While there do not appear to be differences between district demographic and political covariates in close Republican primaries, within close Democratic primaries, districts in which female candidates barely won had higher average median incomes, lower % foreign residents and higher populations.

These differences can be seen in mean difference plots in Figure 39. Differences improve substantially, however, when we restrict the sample to elections between 1994 and 2010 as shown in Figure 40 and practically disappear in very close elections during this time period as seen in Figure 41.

Potential explanations for these results include vote share manipulation by Democratic female candidates out of treatment in close primary races or vote share manipulation by Democratic male candidates into treatment in close primary races. One potential explanation covering both scenarios is higher likelihood of female Democratic candidates dropping out of hotly contested primaries. For example, in close male/female Democratic primaries, female candidates may decide to drop out of the election if a runoff is triggered or may not be as likely as male candidates to contest close election results. Both events either individually or in combination, could result in the discontinuity shown in Figure 35 above.
Candidate and District Covariates at 2.5% Primary Vote Margin, T-Test P-Values, 1982-2010
Figure 39: Mean Difference Between Bare Female Winners and Losers (2.5% Margin), 1982-2010
Figure 40: Mean Difference Between Bare Female Winners and Losers (2.5% Margin), 1994-2010
Figure 41: Mean Difference Between Bare Female Winners and Losers (1% Margin), 1994-2010
4 Bibliography and References


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Bornman, Elirea, and Johan C. Mynhardt. 1991. ”Social identity and intergroup contact in South Africa with specific reference to the work situation.” Genetic, social, and general psychology monographs.


Carmines, Edward G. and James A. Stimson. 1989. Issue Evolution: Race and


# Appendix

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Question Text</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Welfare</td>
<td>Illegal immigrants like Miguel...should have access to healthcare and other social welfare benefits provided by the federal government.</td>
<td>Strongly Agree/Disagree</td>
</tr>
<tr>
<td>Good Neighbor</td>
<td>Illegal immigrants like Miguel...would be good to have as neighbors.</td>
<td>Strongly Agree/Disagree</td>
</tr>
<tr>
<td>Good Citizen</td>
<td>Illegal immigrants like Miguel...would be good American citizens.</td>
<td>Strongly Agree/Disagree</td>
</tr>
<tr>
<td>Trust</td>
<td>Illegal immigrants like Miguel...can generally be trusted.</td>
<td>Strongly Agree/Disagree</td>
</tr>
<tr>
<td>Stay Legal</td>
<td>Illegal immigrants like Miguel...should have a way to stay in the U.S. legally if they meet certain requirements.</td>
<td>Strongly Agree/Disagree</td>
</tr>
<tr>
<td>Question</td>
<td>Description</td>
<td>Strongly Agree/Disagree</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>State Welfare</td>
<td>Illegal immigrants like Miguel should have access to [Respondent State] state and locally provided social welfare benefits such as healthcare.</td>
<td></td>
</tr>
<tr>
<td>Amnesty</td>
<td>Amnesty instead of deportation for illegal immigrants like Miguel is the best policy.</td>
<td></td>
</tr>
<tr>
<td>State Taxes</td>
<td>I would support increasing [Respondent State] state taxes to help illegal immigrants like Miguel.</td>
<td></td>
</tr>
<tr>
<td>Local Taxes</td>
<td>I would support increasing city and local taxes to help illegal immigrants like Miguel.</td>
<td></td>
</tr>
<tr>
<td>Sanctuary</td>
<td>A “Sanctuary City” is a city which follows a set of policies designed to protect illegal immigrants like Miguel. If your city of residence was currently considering becoming a Sanctuary City, how would you feel about this?</td>
<td></td>
</tr>
<tr>
<td>Legal Immig.</td>
<td>Legal immigration to the U.S. should be...</td>
<td>Decreased/ Kept at Present Level/ Increased/ Don’t Know.</td>
</tr>
<tr>
<td>Arizona Law</td>
<td>In 2010, Arizona passed an immigration law that requires people to show documents proving their immigration status if government officials have reasonable cause to ask for them and allows police to detain anyone who cannot prove their immigration status. If [Respondent’s State] adopted a similar law would you favor or oppose this law?</td>
<td>Favor/Oppose/Don’t Know</td>
</tr>
</tbody>
</table>