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Tiebout Choice and the Voucher

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Abstract

This paper examines who is likely to gain and who is likely to lose under a universal voucher program. Following Epple and Romano (1998, 2003), and Nechyba (2000, 2003a), we focus on the idea that gains and losses under a universal voucher depend on two effects: changes in peer group composition and changes in housing values. We show that the direction and magnitude of each of these effects hinges critically on market structure, i.e., the amount of school choice that already exists in the public sector. In markets with little or no Tiebout choice, potential changes in peer group composition create an incentive for high-socioeconomic (SES) households to vote for the voucher and for low-SES households to vote against voucher. In contrast, in markets with significant Tiebout choice, potential changes in housing values create an incentive for high-SES households to vote against the voucher and for low-SES households to vote for the voucher. Using data on vote outcomes from California's 2000 voucher initiative, we find evidence consistent with those predictions.

Journal of Economic Literature Classification: H7, I2, L1

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I. Introduction

School vouchers are one of the most widely-discussed proposals to reform public education. Despite that fact, no state has yet adopted a comprehensive voucher program. Colorado, California, and Washington have all placed comprehensive voucher initiatives on their statewide ballots, but none of those initiatives received enough popular support to pass. Furthermore, while several cities and states are currently experimenting with limited voucher programs, all of those programs are small in scale and/or targeted to specific student populations, making it difficult to extrapolate their results to a comprehensive voucher program.[1] Such a policy would fundamentally change the institutional structure of school finance and could impact household decisions in ways that limited, targeted programs would not.

The fact that no state has yet approved a comprehensive voucher program leaves open many questions about what the actual effects of such a program might be. Some contend that vouchers will lead to higher-quality education for all students while others have focused on the distributional effects, pointing out that wide-scale voucher policies will have winners and losers. In particular, there is a growing theoretical literature that explores who is likely to gain and who is likely to lose with the introduction of a universal voucher (e.g., Nechyba, 2000, 2003a; Epple and Romano, 1998, 2003). By using general equilibrium models, these papers emphasize that the winners and losers under comprehensive vouchers will depend on how households sort themselves across schools and neighborhoods.

In this paper, we develop a conceptual framework that synthesizes the previous theoretical literature to highlight the gains and losses of introducing a universal voucher. We build primarily on the work of Epple and Romano, who focus on the 'cream-skimming' aspects of increased stratification by student characteristics, and on the work of Nechyba, who also draws attention to the complications that arise from the interaction of schooling and housing markets. Our framework thus focuses on the idea that gains and losses under a universal voucher depend on two effects: changes in peer group composition and changes in housing values. We show that the direction and magnitude of each of these effects hinges critically on market structure, i.e., the amount of school choice that already exists in the public sector. Specifically, in markets with little or no Tiebout choice, *potential changes in peer group composition* create an incentive for high-socioeconomic (SES) households to vote in favor of the voucher and for low-SES households to vote against the voucher. In contrast, in markets with significant Tiebout choice, *potential changes in housing values* create an incentive for high-SES households to vote against the voucher and for low-SES households to vote in favor of the voucher.

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[1] Milwaukee, Cleveland and the District of Columbia operate limited voucher programs while Florida and Colorado have enacted legislation that offers vouchers to students attending low-performing schools.

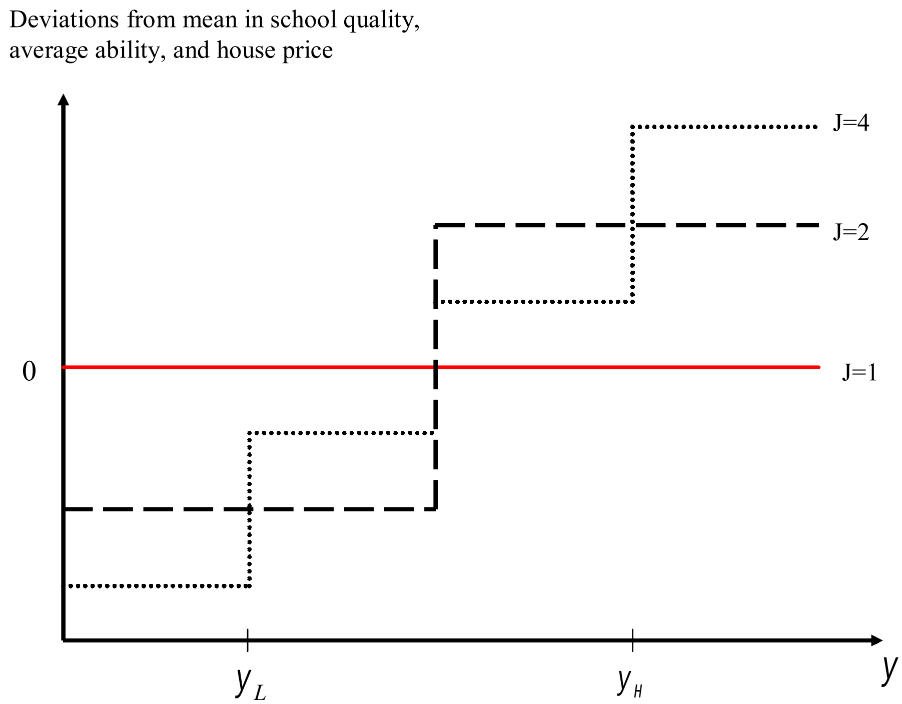
Using data on vote outcomes from California's 2000 voucher initiative, we find evidence that is consistent with those predictions. Specifically, our results indicate that in low-choice markets, high-SES households are significantly *more* likely to support the voucher initiative than low-SES households. In contrast, in high-choice markets, high-SES households are significantly *less* likely to support the voucher initiative than low-SES households. These results complement and tie together the findings of several recent studies that examine the impact of expanded school choice. For example, Figlio and Stone (2001) find that high-income, highly-educated and white households are significantly more likely to send their children to private school if they reside in a low-choice market. This is consistent with our finding that high-SES households are significantly more likely to support the voucher if they live in a low-choice market. Similarly, Brunner and Sonstelie (2003) and Brunner, Sonstelie and Thayer (2001), find that homeowners are significantly less likely to support school vouchers if they live in a good school district, a finding they attribute to a desire among homeowners to protect their property values. Our finding that in high-choice markets, high-SES households are significantly less likely to support school vouchers than low-SES households, leads us to a similar conclusion.

II. Conceptual Framework

In November 2000, Californians voted on Proposition 38, a statewide ballot initiative that would have provided families with a scholarship for every child enrolled in a private school. The scholarship would have been the greatest of three amounts: $4,000, half the national average of public school spending per pupil, or half California's public school spending per pupil. The initiative placed few conditions on scholarship-redeeming schools and prohibited the state from placing additional conditions on these schools in the future. Because the scholarship would have been made available to all students, including those already enrolled in private schools, Proposition 38 would have created the first universal voucher system in the United States.

In this section we synthesize the work of Epple and Romano (1998, 2003) and Nechyba (1997, 2000) to illustrate who was likely to gain and who was likely to lose if Proposition 38 passed. Consider an educational market with J equally-sized school districts and N households, with $N >> J$. Each household has one child that attends the local public schools and there is one school per district. Household $i's$ exogenous income is denoted y_i, and no two households have the same income. Housing

Figure 1: Allocations of Households Across School Districts by Household Income



within the educational market is assumed to be homogeneous and each household purchases a house in one of the J districts for a rental price of p_j.[2] Households derive utility from the perceived quality of the local public school their child attends and from a composite commodity. Perceived school quality, in turn, depends solely on the mean income of households within a district such that $q_j = \bar{y}_j$, where q_j is perceived school quality in district j and $\bar{y}_j$ is the average income of households in district j.[3]

Following Nechyba (1997, 2000) and Epple and Romano (2003), among others, households choose the school district that maximizes their utility, $U(y_{ij} - p_j, \bar{y}_j)$ treating the location decisions of other households as fixed. Market equilibrium is then defined as a set of housing prices and an allocation of households to school districts such that all housing markets clear. As demonstrated by Epple and Romano (2003), equilibrium is characterized by income, school quality and housing price stratification

[2] We assume all housing within a market is homogeneous purely for simplicity. Nechyba (2000) analyzes the more realistic case, in which the housing stock is heterogeneous, and reaches essentially the same conclusions that we do.
[3] Epple and Romano (2003) and Nechyba (2000, 2003a) assume that school quality depends on both the mean ability of a child's peer group (which is assumed to be an increasing function of parental income) and on per-pupil expenditures within a district. However, due to court-ordered reforms and Proposition 13, local school districts in California have almost no control over local spending levels and there is very little variation across districts in spending per pupil. As a result, we abstract from the role spending per pupil plays in determining local school quality.

with the highest-income families living in the district of highest quality (the district with the highest-quality peer group) and the highest housing prices, and the lowest-income families living in the district of lowest quality and the lowest housing prices. Thus, school districts are perfectly stratified in terms of school quality, housing prices and income.

Figure 1 illustrates equilibrium allocations for cases where the market consists of one, two, and four districts. The horizontal axis measures household income while the vertical axis shows deviations from market averages in school quality (peer quality) and housing prices. The solid horizontal line illustrates the case when one district comprises the entire market $(J = 1)$. In that case, all households necessarily attend the same school and hence there is no variation in school quality (peer quality) or housing prices in the market. As the number of districts increases, income stratification increases, as does the variation (spread) in school quality and housing prices.

The stratification pattern depicted in Figure 1 is supported by a number of recent studies. For example, Epple and Romano (2003) find that even in California, where spending per pupil has been essentially equalized, there is significant stratification by income across school districts. Urquiola (2005) reaches a similar conclusion. Based on a sample of 291 Metropolitan Statistical Areas, he finds that increases in the number of districts within an MSA leads to greater parental education and racial stratification. Furthermore, numerous studies have shown that school quality is capitalized into housing values, supporting the prediction that housing value differentials serve to support the observed income stratification patterns across schools and school districts.[4]

Introduction of Vouchers

Now consider the introduction of private school vouchers that give rise to private schools in an educational market. We assume the voucher induces mainly middle- and high-income households to opt out of the public school system. This assumption is supported by Lankford and Wykoff (2002) who use data from the National Educational Longitudinal Survey to estimate a model of public/private school choice and then simulate the effect of private school vouchers. Their simulations suggest that, relative to students that remain in the public sector, students that move to the private sector tend to come from families with substantially higher incomes and from families that are much more likely to be white and college-educated. Similarly, Hsieh and Urquiola (forthcoming) examine the impact of a nationwide private school voucher program introduced in Chile in 1981. Their results suggest that the main effect of

[4] Recent studies include Black (1999), Clapp, Nanda and Ross (2005), Downes and Zabel (2002), and Bogart and Cromwell (2000).

unrestricted school choice was a movement of students from high- and middle-income households to the private sector.[5]

As demonstrated by Nechyba (2000, 2003a), in a multi-district market, vouchers have two different effects on the welfare of households. First, most households will experience some change in school quality. In the absence of any productivity effects, these changes in school quality will arise from changes in the quality of the peer group to which each household's child is exposed. Second, vouchers create incentives for high-income households who take up the voucher to move to poorer districts to take advantage of lower housing prices. As a result, housing values in low-income districts will rise while housing values in high-income districts will fall. Thus, households will experience capital gains or losses depending on whether they initially reside in a high- or low-income school district.[6] For both these peer group and housing effects, the amount of Tiebout choice that *already* exists in the market will affect the magnitude of the changes when a voucher is adopted. In what follows we examine how these two separate effects of vouchers influence the welfare of high-income and low-income households conditional on whether they initially live in a low-choice or high-choice education market.

Consider first households in a low-choice market. Households with relatively high income clearly have more to gain from the introduction of a voucher than do households with relatively low income. To demonstrate that point, consider how the introduction of a voucher differentially affects the welfare of households with income of y_H or higher, and households with income of y_L or lower, when they live in a market with just one district. As Figure 1 illustrates, because high-income households in this market are initially restricted to a lower-quality peer group than they would face in other markets, they have much to gain in terms of peer quality (school quality) by opting out of the public school system. In contrast, low-income households in the market with one district have much to *lose* in terms of peer quality. These households are initially exposed to a higher-quality peer group but peer quality will fall as higher-income households use the voucher to move their children to the private sector. Furthermore, since there are no housing price differentials in the market with one district, neither high-income nor low-income households experience any change in housing values when the voucher is introduced.

Now consider how the introduction of a voucher differentially affects the welfare of these households when they live in the market with four districts (i.e. a high-choice market). High-income households in this market clearly have more to *lose* from the introduction of a voucher. To illustrate that

[5] Nechyba (2003a, 2003b, 2003c), who uses a computable general equilibrium model to examine the effects of introducing vouchers into a multidistrict public school system, reaches a similar conclusion. His simulations suggest that households that use vouchers are disproportionately drawn from the high end of the income distribution. Ferreyra (2003) reaches a similar conclusion using a CGE model similar to that of Nechyba.

[6] Reback (2005), who analyzes the effect of a statewide inter-district open enrollment program in Minnesota, finds evidence in favor of that hypothesis. Specifically, his results suggest that inter-district open enrollment led to a substantial decline in the housing price premium associated with living in a good school district.

point, note that in terms of peer quality, high-income households are unlikely to gain much by opting out of the public sector since that they have already sorted themselves into a relatively homogeneous school district. However, these same high-income households stand to incur significant capital *losses* if the voucher is implemented due to changes in housing values. In contrast, low-income households in the market with four jurisdictions stand to incur significant capital *gains* if the voucher is implemented and are unlikely to lose much in terms of peer quality since they are already exposed to a relatively low-quality peer group.

To summarize, in low-choice markets, changes in peer quality create an incentive for high-income households to vote *for* the voucher and for low-income households to vote *against* the voucher. In contrast, in high-choice markets, changes in housing values create an incentive for high-income households to vote *against* the voucher and for low-income households to vote *for* the voucher. Thus, in low-choice markets, support for the voucher should increase with household income, while in high-choice markets, support for the voucher should decrease with income.

In deriving the predictions discussed above we have made a number of simplifying assumptions, the most important of which is that households differ only along a single dimension, namely income. That assumption allowed us to clearly illustrate the stratification pattern that emerges as the number of school districts within an educational market increases. However, it also led us to restrict our attention to the case where willingness to pay for school quality depends solely on household income and where perceived school quality depends solely on the mean income of households within a district. Of course, willingness to pay and perceived school quality most likely depend on several factors other than income. For example, Bayer, Ferreira, and McMillan (2003) develop and estimate an equilibrium model of residential sorting in which households have preferences defined over school quality and the socio-demographic characteristics of their neighbors. Their results suggest that heterogeneous preferences for school quality and neighbors leads to substantial stratification along racial and socioeconomic lines, with white, highly-educated, and high-income households clustering in neighborhoods that contain the highest-quality schools. Similarly, Brasington and Haurin (2005) find that households appear to use easily observable characteristics, such as parental education and race, when comparing public school quality among school districts. Their results suggest that perceived school quality is higher in districts that contain more highly-educated households and lower in districts that contain higher concentrations of minority students.

Several recent studies have also developed residential sorting models where households differ along several dimensions, such as income and preferences (e.g. Epple and Platt, 1998; Epple and Sieg, 1999; Epple, Romer and Sieg, 2001; Bayer, Ferreira and McMillan, 2003, 2005). In contrast to the perfect income stratification result depicted in Figure 1, these models predict that in equilibrium, households will be stratified both in terms of income and other factors that determine willingness to pay for school quality. Since these models still predict that households will be stratified by income, they do not alter our predictions concerning the relationship between income and support for school vouchers in high- and low-choice markets. However, these models, combined with the empirical evidence on residential sorting discussed above, suggest that support for school vouchers in high- and low-choice markets may also vary systematically with educational attainment and race. In particular, if in addition to income, parental education and race are important determinants both of willingness to pay for school quality and of perceived school quality, the voting pattern of highly-educated and white households should be similar to that of high-income households. That is, our predictions regarding the relationship between income and support for vouchers in high- and low-choice markets should also hold for parental education and race. We examine that possibility in the empirical work that follows.

Our conceptual framework also assumes that each school district contains just one school. As a result, we have implicitly assumed that households exercise Tiebout choice solely by choosing among school districts in an educational market. However, as pointed out by Epple and Romano (2003), households may also exercise choice by choosing among neighborhood schools *within* districts. That is, the degree of choice within districts may be just as important as the degree of choice across districts. We examine that possibility in Section V. We have also assumed that prior to the introduction of school vouchers all school-age children attend public schools, an assumption that is clearly unrealistic. Nechyba (2003a, 2003c) analyzes the more realistic case, in which some households send their children to private schools prior to the introduction of school vouchers, but reaches essentially the same conclusions as we do about the impact of school vouchers on peer quality and housing values. Nevertheless, recall that California's 2000 voucher initiative would have made vouchers available to all families, including those with children currently enrolled in private school. Obviously, families with children currently enrolled in private school stood to benefit from the voucher. To account for that fact, we explicitly control for private school attendance in the empirical work that follows.

Our conceptual framework also ignores several additional issues that may have influenced voting behavior on Proposition 38. One such issue is the net fiscal impact of the voucher, a question that was likely on the minds of many taxpayers. Because Proposition 38 would have provided existing private school students with a scholarship, the state would absorb the direct expense of those scholarships. According to the Legislative Analyst's Office, the cost of providing existing private school students with scholarships would have been approximately $3.3 billion. On the other hand, the state would save money on each student transferring from public to private school, because the voucher was to be less than the average expenditure per pupil in public school. The net effect on the state budget would depend on the number of students who would transfer. According to the Legislative Analyst's Office, if only 5 percent of students were to transfer, the annual cost to the state would be approximately $2 billion. In contrast, if 15 percent of students were to transfer, the state would realize an annual savings of $700 million, and if 25 percent of students were to transfer, the state would realize an annual savings of $3.4 billion.

A related concern involves how the voucher might affect public school spending. On the one hand, because public school spending in California is essentially state-financed, it is unlikely that the voucher would lead to a dramatic change in the distribution of resources across districts. On the other hand, because the voucher would cause fewer families to enroll their children in public school, it could erode political support for school spending and thus cause a general decline in spending per pupil.[7] That fact may have influenced voter behavior. Note, however, that our concern is not with the overall level of support for Proposition 38, but rather with how support for the initiative varies with the degree of Tiebout choice within educational markets. As long as voter concern about the effect of vouchers on public school spending does not vary systematically across markets, that concern is unlikely to affect our results.

III. Data

Testing the predictions derived in the previous section requires data on vote outcomes for the voucher initiative, the characteristics of voters, and the degree of Tiebout choice within educational markets. While we do not have data on individual voting behavior, we do have block group-level data on the fraction of voters that supported the initiative and their characteristics. Block group-level data on vote outcomes for Proposition 38 were obtained from the Statewide Database, maintained by the Institute of Governmental Studies at the University of California, Berkeley. The database contains aggregate vote outcomes and voter registration information, for all statewide primary and general elections held in California since 1990.[8]

We use the December 2000 definitions of metropolitan and micropolitan statistical areas, developed by the Office of Management and Budget (OMB), to define educational markets. Metropolitan areas are defined as urbanized areas with a population of at least 50,000, while micropolitan areas are defined as urbanized areas with a population of at least 10,000 but less than 50,000. Both metropolitan and micropolitan areas are defined in terms of counties and include both the county containing the central core of the urbanized area and adjacent counties that have a high degree of economic integration as

[7] Note, however, that the voucher would also decrease the tax-price for public school spending faced by California taxpayers, since it would reduce the number of students in public school. Thus, whether the voucher would cause spending per pupil to rise or fall depends critically on which of these two effects dominates.

[8] The primary unit of analysis in the Statewide Database is the census block. However, the smallest Census-defined unit for which data on demographic characteristics are available is the block group. Consequently, we aggregated the vote outcome and voter registration data to the block group level to make it consistent with the demographic data used in our analysis. Detailed information on how the Statewide Database is constructed can be found at: http://swdb.berkeley.edu.

measured through commuting patterns. Of the 58 counties in California, 46 are located in one of the 37 metropolitan or micropolitan areas within the state.[9] We treat each of the 12 counties in California that are not part of a metropolitan or micropolitan area as separate educational markets.

Following Hoxby (2000) and others, we use a Herfindahl-style index, based on school district enrollment shares, to measure the degree of Tiebout choice within an educational market. Specifically, the choice index for market *k* is: $C_k = 1 - \sum_{j=1}^{J} e_{jk}^{\ 2}$, where e_{jk} is total K-8 enrollment in district j in metro area k as a share of total K-8 metropolitan enrollment. The choice index ranges in value from zero to one with a value of zero indicating that there is only one district in the metro area and a value of one indicating that there are many small districts within the metro area. Thus, larger values of C_k are associated with a greater degree of Tiebout choice. Among the 49 educational markets in our sample, the average value of the choice index is 0.69 with a standard deviation of 0.30. Six markets in our sample have a choice index equal to zero (i.e. contain just one district) and the inter-quartile range of the choice index is 0.56 to 0.88.

To ensure that our choice index is not picking up other market-specific factors that affect vote outcomes on the voucher initiative, we include six additional market-level variables in our analysis. Those variables are: the log of metro area population, the log of mean household income in the metro area, the fraction of white households, the fraction of the population age 25 or older with a college degree, an index of racial heterogeneity, and an index of educational heterogeneity. Following Urquiola (2005), the racial heterogeneity index we employ is: $H_k = 1 - \sum_{r=1}^{R} S_{rk}^{\ 2}$, where S_{rk} is racial group *r*'s share of the population in metro area *k*. Greater values of this index are associated with greater racial heterogeneity. We use a similar index to measure educational heterogeneity.[10] All six of these variables were constructed using county-level data from the 2000 Census aggregated to the metro area.

We use voter registration data from the Statewide Database and data from the 2000 Census to construct variables that describe the characteristics of voters within block groups. The first variable is the fraction of voters within a block group that are registered Republicans. We include this variable to

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[9] Two areas in California contain metropolitan subdivisions (MD's) that correspond to the old definition of Primary Metropolitan Statistical Areas (PMSA's). We define these metropolitan subdivisions as separate educational markets. Specifically, the Los Angeles-Long Beach-Santa Ana area is separated into the Los-Angeles-Long Beach-Glendale MD (Los Angeles County) and the Santa Ana-Anaheim-Irvine MD (Orange County). Similarly, the San Francisco-Oakland-Fremont area is separated into the San Francisco-San Mateo-Redwood City MD (Marin, San Francisco, and San Mateo Counties) and the Oakland-Fremont-Hayward MD (Alameda and Contra Costa Counties).
[10] Specifically, following Hoxby (2000), our index of educational heterogeneity is constructed upon shares of the population that belong to four educational attainment groups: less than high school, high-school graduate, some college, and four years of college or more.

control for the fact that school vouchers are a mainstay of conservative political ideology. The second variable is the fraction of K-12 students in a block group that are enrolled in private school. We include this variable to account for the fact that families with children in private school would have directly benefited from the voucher. The third variable is the fraction of employed persons sixteen years or older who work in educational services, which we take to be a proxy for the fraction of residents who are public school teachers. We include this variable because public school teachers and teacher unions are often vocal opponents of the voucher. The remaining variables are: mean household income, the fraction of the population age 25 or older with a college degree or higher, the fraction of households that are white, the fraction of households that are homeowners, and the fraction of households with school-age children.

We excluded a number of observations from our analysis. Specifically, in 2000, California had 22,133 block groups. We excluded 80 of those block groups due to missing data on vote outcomes for Proposition 38. We excluded an additional 111 block groups due to missing Census data on household income and educational attainment. As a result of those exclusions, our final data set contains 21,942 block groups.

Table 1 provides summary statistics at the metropolitan and block group levels. Columns 1 and 2 report the means and standard deviations of variables used in our analysis while column 3 reports the correlation between the choice index and all other variables. Note that for the block group characteristics, the correlations reported in column 3 represent the correlation between the choice index and the metropolitan averages of the block group-level variables. As column 3 reveals, high-choice markets tend to be larger, have lower percentages of white households, and have higher degrees of racial and educational heterogeneity.

Table 1
Summary Statistics

Variable	Mean	Standard Deviation	MSA-Level Correlation with Choice
	(1)	(2)	(3)
Metro Area Characteristics		*N = 49*	
Choice Index	0.69	0.30	1.00
Population (thousands)	691	1,528	0.26
Mean Household Income	54,256	13,480	0.23
Fraction of White Households	0.63	0.15	-0.42
Fraction College Educated	0.28	0.29	0.07
Index of Racial Heterogeneity	0.47	0.16	0.43
Index of Educational Heterogeneity	0.72	0.01	0.25
Block Group Characteristics		*N = 21,942*	
Fraction Voting Yes	0.29	0.07	-0.28
Fraction Registered Republicans	0.33	0.15	-0.20
Fraction Enrolled in Private School	0.12	0.15	0.12
Fraction Homeowners	0.59	0.27	-0.31
Fraction Employed in Education	0.09	0.06	-0.01
Fraction H.H's with School-Age Children	0.38	0.16	0.44
Fraction Households White	0.56	0.29	-0.41
Fraction College Educated	0.32	0.21	0.17
Mean Household Income	65,192	36,944	0.27

IV. Empirical Specification

Using the data described above, we specify the following equation for the fraction of yes votes in a block group:

$$yes_{lk} = \beta_1 A_{lk} + \beta_2 A_{lk} \cdot C_k + X_{lk}\gamma + Z_k\delta + \varepsilon_{lk} , \qquad (1)$$

where yes_{lk} is the logistic transformation of the fraction of yes votes on the voucher initiative for voters in block group l and metro area k, A_{lk} is either an individual block group attribute (the log of mean household income, fraction college, or fraction white) or a vector of attributes that determine how households sort themselves across districts, C_k is a Herfindahl index of school district choice in metro area *k,* X_{lk} is a set of control variables describing the characteristics of voters in block group l, Z_k is a set of metro area-specific variables, including C_k, and ε_{lk} is a random disturbance term.

The parameters of key interest are those on the sorting attributes, A_{lk}, and the interaction term, $A_{lk} \cdot C_k$. As noted above, we consider three block group variables that are likely to affect household sorting in an educational market, namely the log of mean household income, the fraction of residents with a college education and the fraction of households that are white. All three of these variables are defined relative to their metro area counterparts to account for the fact that Tiebout choice affects sorting patterns *within* metro areas. For example, we measure income as the log of mean household income in a block group over the mean household income in the metro area.

The predictions derived in the previous section suggest that as school district choice increases, support for the voucher should decrease among high-socioeconomic status (SES) households (high-income, highly-educated, and/or white households). In terms of our empirical model, that prediction implies that β_2, the coefficient on $A_{lk} \cdot C_k$, should be negative. Furthermore, our conceptual framework suggests that in low-choice markets, changes in peer quality create an incentive for high-SES households to vote in favor of the voucher and for low-SES households to vote against the voucher. In terms of our regression model, when choice is lowest, C_k is equal to zero and the interaction term drops out; thus, β_1, the coefficient on A_{lk} alone, reflects support among households in a low-choice market. Our predictions therefore imply that β_1 should be positive. Similarly, our predictions suggest that in high-choice markets, changes in housing values create an incentive for high-SES households to vote against the voucher and for low-SES households to vote for the voucher. In terms of our empirical model that prediction implies not only that β_2 should be negative but also that $\beta_1 + \beta_2 < 0$. That is, if capitalization effects matter, we should observe lower-than-average support among high-SES households in markets with *significant* Tiebout choice but higher-than-average support among low-SES households in those markets.[11]

[11] Note that the coefficient on the interaction term, β_2, may be determined by either changes in peer quality, or capitalization, or both. Specifically, in the absence of capitalization effects, β_2 should still be negative since changes in peer quality are smaller for high-SES households in markets with more choice. Thus, to identify the presence and relative importance of capitalization effects, we must look not only at the sign of the interaction term but the magnitude as well.

V. Results

Regression results are reported in Table 2. All the models we estimate are weighted by the total number of voters in each block group. In addition, all standard errors are clustered at the metro level to allow for within-metro area autocorrelation of the disturbance term, ε_{lk}. Columns 1 through 3 report results based on specifications where the district choice index is interacted with only one of the three sorting measures (income, education or race, respectively). Column 4 reports results based on a specification that includes interactions between the district choice index and all three sorting measures.

We first note that the coefficient estimates on our control variables are generally consistent with our expectations. For example, our results suggest that support for the voucher is higher among families with children enrolled in private school and among Republican households. Similarly, support for the voucher decreases with the fraction of people employed in educational services. That finding is consistent with the notion that public school teachers are more likely to oppose school vouchers.

Turning to the key parameters of interest, the results are qualitatively similar for all four specifications. For example, in column 1, the estimated coefficient on income alone is positive and statistically significant while the coefficient on the interaction term between the Herfindahl index and income is negative and significant. Thus, consistent with our earlier predictions, our results suggest that in markets with little or no Tiebout choice, high-income households are more supportive of the voucher than the average household but this support decreases as we move to markets with more choice. Furthermore, the magnitude of the coefficient on the interaction term is large enough that the sum of the two coefficients is negative.[12] This indicates that not only does support among high-income households decrease with choice, but in markets with significant Tiebout choice, high-income households are actually *less* supportive than the average household while low-income households are *more* supportive. As columns 2 and 3 reveal, this pattern holds for education and race as well.

As noted above, column 4 presents results based on a specification where the interaction terms between the district choice index and the three sorting measures are included simultaneously. In that specification, only the estimated coefficient on the interaction between the fraction of white households and district choice remains statistically significant. However, it is important to point out that these results are difficult to interpret since income, education, and race are highly correlated. Indeed, given the strong positive correlation among all three sorting measures, it is not too surprising that very few of the estimated coefficients of interest remain statistically significant.

In Table 3, we explore the robustness of our results to a number of specification choices. Although all the models in Table 2 include controls for metro-area variables, it is possible that the choice

[12] In all cases, a Wald test that the coefficients on the sorting variable and the interaction term sum to zero can be rejected at the five percent level.

Table 2
Coefficient Estimates
Dependent Variable: log[(fraction 'yes' on Prop. 38)/(1-fraction 'yes' on Prop. 38)]

	Income (1)	Education (2)	Race (3)	All Interactions (4)
Fraction Republican	2.135***	2.140***	2.186***	2.185***
	(0.091)	(0.090)	(0.093)	(0.092)
Fraction Private School	0.233***	0.235***	0.228***	0.229***
	(0.036)	(0.035)	(0.034)	(0.034)
Fraction Homeowners	-0.160***	-0.158***	-0.143***	-0.144***
	(0.039)	(0.038)	(0.036)	(0.035)
Fraction Emp. Education	-0.598***	-0.570***	-0.555***	-0.549***
	(0.068)	(0.065)	(0.069)	(0.067)
Fraction H.H's with Children	0.149***	0.143***	0.084**	0.088**
	(0.021)	(0.022)	(0.032)	(0.034)
Fraction White	-0.021	-0.028	1.158***	1.057***
	(0.060)	(0.059)	(0.318)	(0.346)
Fraction College	-0.120***	0.436**	-0.129***	0.053
	(0.017)	(0.172)	(0.018)	(0.158)
Income	0.596***	0.001	0.001	-0.097
	(0.153)	(0.024)	(0.023)	(0.241)
Income*Choice	-0.694***	…	…	0.115
	(0.167)	…	…	(0.289)
College*Choice	…	-0.648***	…	-0.212
	…	(0.217)	…	(0.199)
White*Choice	…	…	-1.420***	-1.302***
	…	…	(0.388)	(0.414)
Choice	-0.116	0.572**	1.344***	1.446**
	(0.109)	(0.226)	(0.413)	(0.557)
log MSA population	0.006	0.008	0.005	0.006
	(0.018)	(0.018)	(0.018)	(0.018)
MSA Race Index	0.158	0.178	0.179	0.182
	(0.344)	(0.344)	(0.340)	(0.340)
MSA Education Index	0.767	0.612	0.727	0.677
	(1.090)	(1.095)	(1.082)	(1.096)
log MSA Income	-0.104	-0.089	-0.097	-0.093
	(0.219)	(0.219)	(0.217)	(0.217)
MSA Fraction College	-0.033	-0.092	-0.036	-0.053
	(0.527)	(0.525)	(0.516)	(0.523)
MSA Fraction White	0.225	0.266	0.208	0.221
	(0.292)	(0.297)	(0.292)	(0.295)
Constant	-1.045	-1.736	-2.289	-2.105
	(1.953)	(1.982)	(1.973)	(2.023)
Observations	21942	21942	21942	21942
R-squared	0.69	0.69	0.70	0.70

Notes: (1) Robust, clustered standard errors in parentheses, (2) * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 3
Coefficient Estimates for Alternative Model Specifications
Dependent Variable: log[(fraction 'yes' on Prop. 38)/(1-fraction 'yes' on Prop. 38)]

	Baseline: Block Group and Market Controls (1)	Block Group Controls (2)	Market Fixed Effects (3)	Excluding 1-District Markets (4)	Excluding Non-MSA's (5)	2SLS (6)
Income	0.596***	0.619***	0.557***	0.671***	0.647***	0.679***
	(0.153)	(0.153)	(0.146)	(0.178)	(0.172)	(0.182)
Income*Choice	-0.694***	-0.728***	-0.662***	-0.781***	-0.752***	-0.791***
	(0.167)	(0.168)	(0.161)	(0.192)	(0.187)	(0.197)
R-squared	0.69	0.69	0.72	0.69	0.69	0.69
Fraction College	0.436**	0.449**	0.416**	0.491**	0.480**	0.501**
	(0.172)	(0.174)	(0.167)	(0.191)	(0.186)	(0.212)
College*Choice	-0.648***	-0.661***	-0.613***	-0.712***	-0.698***	-0.723**
	(0.217)	(0.218)	(0.211)	(0.239)	(0.234)	(0.268)
R-squared	0.69	0.69	0.72	0.70	0.70	0.70
Fraction White	1.158***	1.183***	1.129***	1.166***	1.164***	1.180***
	(0.318)	(0.319)	(0.320)	(0.321)	(0.321)	(0.352)
White*Choice	-1.420***	-1.462***	-1.369***	-1.430***	-1.427***	-1.447***
	(0.388)	(0.389)	(0.394)	(0.392)	(0.392)	(0.423)
R-squared	0.70	0.70	0.73	0.70	0.70	0.70

Notes: (1) Robust, clustered standard errors in parentheses, (2) * significant at 10%, ** significant at 5%, *** significant at 1%, (3) Models 1, 4, 5 and 6 include all block group and market-level control variables listed in Table 2.

index is still picking up some other market characteristics that could affect vote outcomes, or that our results are sensitive to which market variables we include. We address these concerns in two ways. First, we drop all market-level variables, leaving only block group characteristics, the choice variable and the interaction terms. These results are reported in column 2 of Table 3 (for comparison, the baseline results from Table 2 are repeated in column 1 of Table 3); in the interests of space, we report only the coefficients on the sorting variables and the interaction terms.[13] We also estimate an alternative specification that replaces the market-level control variables with a set of market fixed effects; those results are shown in column 4.[14] In either case, the results are quite similar to the previous estimates.

In columns 4 and 5, we verify that our results are robust to changes in the sample. Recall that there are six markets with only one school district (i.e., the choice index is equal to zero). To verify that our results are not driven by these outliers, we drop these markets from the sample and re-estimate our baseline model. We also estimate the model without the 12 counties that are outside metropolitan or micropolitan areas. Across all models, our results are consistent; in all cases, the estimated coefficients

[13] We also estimated specifications with subsets of the metro-area variables shown in Table 2. Our results do not appear sensitive to the choice of variables. Those estimates are available upon request from the authors.
[14] Note that because the fixed effects specification utilizes only within-market variation, the level effect of school choice is not directly estimable. However, the primary relationship of interest is the effect of choice conditional on sorting and that effect is still identified by the interaction terms between choice and the sorting variables.

support our predictions that among high-income, highly-educated and/or white households, support for the voucher decreases with the degree of Tiebout choice.

Finally, it is possible that our results could also be subject to bias from omitted variables if there is some unobserved variation in household sorting patterns that is correlated with market structure. It would then be inappropriate to interpret our results as the causal effects of sorting. For example, voters with a strong taste for choice in general may be more likely to support vouchers but may also have already chosen to live in areas with more school choice available. To reduce this bias, we estimate our models with instrumental variables.[15] Following Rothstein (forthcoming), we use two instruments based on historical patterns of district consolidation: the number of school districts in an MSA in 1945, and the Herfindahl index for enrollment in 1945. These historical measures should identify variation in the amount of current choice that is uncorrelated with any characteristics of the market today. The results of the 2SLS estimation are presented in column 6 of Table 3. In addition to the choice index itself, the interaction terms are also instrumented, using the interaction of the sorting variables and the instruments. Compared to the OLS results, there is very little change in the coefficients on any of the interaction terms. The fact that the estimated coefficients are fairly similar to all the other specifications gives us more confidence that they reflect the causal effects of sorting within and across markets with varying degrees of Tiebout choice.

Predicted Support

To see the effects of choice more clearly, Table 4 presents the predicted percentage of 'yes' votes on the voucher initiative, calculated using the coefficient estimates reported in Table 2. We show predicted support for the voucher for block groups with high, average and low values of each of our sorting variables, in a market with no Tiebout choice (Herfindahl index equal to zero) and in a market with significant Tiebout choice (Herfindahl index equal to one).[16] Recall that block group income, education and race are measured relative to the market. Thus, we define "high" values of the sorting variables as block groups at the 90th percentile of the distribution while "low" values represent block groups at the 10th percentile of the distribution.

These predicted values highlight some important patterns. In markets with no choice, block groups where households are high-income, highly-educated and/or white are much more supportive than the average but this support always decreases with the amount of choice. At the same time, block groups

[15] Hoxby (2000) and Rothstein (forthcoming) also discuss whether choice is endogenous in models where the dependent variable is a measure of school quality. It is less clear how choice is endogenous to voter support for vouchers; however, the instrumental variables approach would control for such endogeneity as well.
[16] All other block group and market characteristics are held constant at their sample averages.

Table 4
Predicted Percentage of 'Yes' Votes on Proposition 38

	Choice = 0	Choice = 1
High Income	39.2%	27.2%
Average Income	29.6	28.6
Low Income	22.1	30.0
High Fraction College	41.4%	24.3%
Average Fraction College	30.4	28.8
Low Fraction College	23.3	32.6
High Fraction White	53.1%	24.4%
Average Fraction White	30.2	28.6
Low Fraction White	12.6	33.9
High Income, College, White	51.1%	22.0%
Average Income, College, White	30.6	28.9
Low Income, College, White	14.2	36.6

where households are low-income, less-educated and/or non-white are much less supportive than the average and this support always increases with the amount of choice. In all cases, the effect of choice is large enough that households with higher-than-average support in the low-choice market flip to having lower-than-average support in the high-choice market, and vice versa.

It is notable that the differences in support *within* the low-choice market are quite large in all cases. High-income households are 17.1 percentage points more supportive of the voucher than low-income households; college-educated households are 18.1 percentage points more supportive than non-college-educated households; and white households are 40.5 percentage points more supportive than non-white households. This is strong evidence that in low-choice markets, concerns about peer quality have a large effect on voting behavior.

That we find particularly high support among high-income, highly-educated and white households in the low-choice market complements the results of Epple, Figlio and Romano (2004), as well as Figlio and Stone, who conclude that, "…high-income students, and those students with a high level of parental education, are more likely to enroll in the private sector as the public sector becomes more concentrated. Therefore, private school cream skimming may be exacerbated in places with fewer public sector options" (Figlio and Stone, 2001, p.255). Higher support for a universal voucher among high-SES households in more concentrated markets suggests that these households are more likely to use the voucher to opt out of the public school sector. Lower support for a universal voucher among low-SES households in more concentrated markets suggests that these households are aware of the potential for cream-skimming and are concerned about its consequences.

In markets with significant Tiebout choice, our results also support the hypothesis that *changes in housing values* lead high-SES households to be *less* supportive of the voucher than the average household but lead low-SES households to be *more* supportive, though the differences in support are somewhat smaller within the high-choice market. For example, the bottom panel of Table 4 shows that a block group where households are high-income, highly-educated and white is 14.6 percentage points less supportive than a block group where households are low-income, less-educated and non-white. These results complement the findings of Brunner, Sonstelie and Thayer (2001). Using precinct-level voting returns from California's 1993 voucher initiative, they found that homeowners located in school districts with high housing price premiums were significantly less likely to support the voucher than homeowners located in school districts with low housing price premiums. They conclude that the most plausible explanation for their results is that homeowners located in good school districts voted against the voucher to protect their housing values. Brunner and Sonstelie (2003) reach a similar conclusion based on their analysis of individual voting behavior on California's 2000 voucher initiative. Because these authors do not examine how support for school vouchers varies with the degree of Tiebout choice, their results are not directly comparable to ours. Nevertheless, their results are consistent with our finding that in high-choice markets, high-SES households are significantly less likely to support school vouchers than low-SES households.

It is also worthwhile to point out that the average level of support is marginally lower in high-choice markets. This is consistent with a number of studies (e.g., Rothstein, forthcoming; Urquiola, 2005; Hoxby, 2000) that suggest that increased Tiebout choice reduces demand for private schooling by allowing parents to more readily satisfy their preferences for schooling within the public sector. Hoxby (2000) also suggests that metropolitan areas with more Tiebout choice may have lower rates of private school enrollment because they have more productive public schools. That is, expanded school choice may lead public schools to become more efficient which, in turn, reduces the attractiveness of private school alternatives.[17] Thus, productivity effects could be an alternative explanation for our finding that support for vouchers decreases with choice at the average and among high-income households. However, because choice is a metro area measure, productivity effects cannot explain the differences between high- and low-income households within markets. Furthermore, we find that support for vouchers *increases* with choice among low-income households, the opposite of what we would expect if productivity concerns were driving our results.

[17] McMillan (2004) challenges the presumption that increased school choice will necessarily lead to more productive public schools. He demonstrates that in some circumstances, the introduction of universal vouchers may actually lead public schools to reduce productivity.

School-Level Sorting

Thus far, we have implicitly assumed that parents exercise Tiebout choice by choosing among districts in a metro area. However, as we noted in Section II, parents may also exercise choice by choosing among *schools* within *districts*. As a result, our measure of Tiebout choice, which is based on school district enrollment shares, may understate the degree of choice available to households residing in districts with multiple schools. To address that concern, we also estimate models in which we include a school-level choice index based on school enrollment shares within each district.[18] We interact the school index with each of our sorting variables and add these interaction terms, as well as the school choice index itself, to our model. The results are reported in column 2 of Table 5. For the sake of brevity, Table 5 reports only the coefficients on the sorting variables and the interaction terms for district and school choice; however, we note that our model also includes all the block group and MSA-level variables included in Table 2. In addition, we include the same controls at the district level as for the MSA (i.e., district enrollment, income, etc.).[19] The coefficients of primary interest are the interaction terms between the sorting variables and school choice. If households view within-district choice as a viable option, the conceptual framework outlined in section II would predict that the coefficients on the interaction terms for school choice should be negative. That is, the signs of those coefficients should be the same as the signs on the interaction terms between the sorting variables and our district choice index. However, we find that once we have controlled for district choice, school choice has no effect. The coefficients on the interaction terms between the school choice index and sorting variables, though negative for income and education, are never statistically significant.

The results reported in column 2 cast some doubt on whether households view within-district choice as a viable option. There are several plausible explanations for that result. First, as noted by Rothstein (forthcoming), within-district school attendance zones are subject to frequent revision, thus limiting the ability of households to exercise Tiebout choice at the school level.[20] In support of that argument, Rothstein (forthcoming) finds that district-level measures of school choice are consistently a

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[18] Using a district-specific choice index adds a minor complication to the analysis. Although the majority of block groups are located completely within the boundaries of a single school district, some block groups cross district boundaries. Since we now wish to match vote outcomes on the voucher initiative to specific school districts, these block groups obviously present a problem. Census blocks, however, are located completely within the boundaries of a single school district and although not all of our variables are reported at the block level, we do have vote outcomes on Proposition 38 and the fraction of voters that were registered Republicans at the block level. Consequently, in cases where a block group spanned more than one district, we measured vote outcomes on Proposition 38 and the fraction of voters that were registered Republicans at the block level and assigned block-group level values of the other variables.

[19] We also estimated all models with market fixed effects; those results are quite similar to the results reported in Table 5 and are available upon request.

[20] One common reason school districts often revise school attendance zones is to maintain appropriate racial and ethnic balances across schools within districts.

Table 5
School-Level Sorting
Logit Estimates

	District Choice (1)	District and School Choice (2)	District and School Choice Expanded (3)
Income	0.597***	0.541***	0.571***
	(0.154)	(0.139)	(0.133)
Income*District Choice	-0.694***	-0.533***	-0.454***
	(0.168)	(0.117)	(0.112)
Income*School Choice	…	-0.070	-0.200***
	…	(0.074)	(0.069)
Income*School Choice*Urban	…	…	0.062***
	…	…	(0.019)
College	0.438**	0.359***	0.399***
	(0.174)	(0.115)	(0.122)
College*District Choice	-0.652***	-0.471***	-0.445***
	(0.220)	(0.131)	(0.131)
College*School Choice	…	-0.047	-0.128**
	…	(0.061)	(0.063)
College*School Choice*Urban	…	…	0.049*
	…	…	(0.026)
White	1.162***	0.763***	0.851***
	(0.318)	(0.219)	(0.220)
White*District Choice	-1.422***	-1.116***	-1.010***
	(0.389)	(0.279)	(0.277)
White*School Choice	…	0.170	-0.108
	…	(0.125)	(0.105)
White*School Choice*Urban	…	…	0.141***
	…	…	(0.027)

Notes: (1) Robust, clustered standard errors in parentheses, (2) * significant at 10%, ** significant at 5%, *** significant at 1%, (3) all models include all block group and market-level control variables listed in Table 2; models 2 and 3 also include district-level control variables.

stronger predictor of MSA private school enrollment rates than school-level measures of school choice. Second, in 1993 the California State Legislature approved AB 1114, which established a mandatory program of intra-district school choice. Starting in the 1994-95 school year, parents could choose to send their child to any school within the boundaries of their designated school district. Thus, AB 1114 may have significantly weakened the link between residential location and within-district school assignments.

An alternative explanation is that a Herfindahl index of school enrollment shares is a somewhat imperfect measure of within-district choice. The school choice index is highly correlated with district enrollment, since the number of schools within districts tends to increase proportionally with district enrollment. However, the majority of California's largest districts are inner-city urban districts and the vast majority of schools within these districts serve minority and low-income students. For example, Fresno Unified, with an enrollment of over 79,000 students, contains 95 schools but 80% of the students that attend those schools are nonwhite and 73% of the students are low-income students that are eligible for free or reduced price lunch. Thus, although the school choice index takes on a high value, these schools may actually provide very little in the way of real choice. To allow for this possibility, we include an additional interaction term: the sorting variable-school choice index interaction is further interacted with a dummy variable that takes the value of unity for large inner-city urban districts.[21] As shown in column 3 of Table 5, the coefficient on this additional interaction term is consistently positive and statistically significant, indicating that high-income, highly-educated or white households in large inner-city urban districts are more supportive of vouchers than similar households in non-urban districts. That finding is consistent with the notion that our school-level choice index may be overstating the degree of choice in large inner-city urban districts. Furthermore, once we account for the separate effect of choice in large inner-city districts, the school-choice interactions have the expected negative signs and, with the exception of race, are statistically significant, suggesting that households *do* sort among schools within districts. This is consistent with the district-level results and our conceptual framework. However, we also note that this within-district sorting only slightly diminishes the effects of sorting across districts within metro areas. For ease of presentation, we will continue to focus on district choice for the remainder of the paper, keeping in mind that within-district school sorting is likely to reinforce these effects.

VI. Peer Quality and Capitalization

Our results suggest that in markets with relatively little Tiebout choice, high-income, highly-educated and white households are significantly more supportive of vouchers than low-income, less-educated and non-white households. We interpret this as evidence that households are motivated by the changes in peer quality that are likely to follow the implementation of a universal voucher. We also find that in markets with significant Tiebout choice, high-income, highly-educated and white households are *less* supportive than low-income, less-educated and non-white households. We interpret this as evidence that voters in high-choice markets are also motivated by the effect of vouchers on housing values.

However, there is an alternative explanation for our results in the high-choice market. We have been assuming that in markets with significant Tiebout choice, gains and losses due to peer quality are

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[21] We define large inner-city urban districts as districts with an enrollment of 25,000 students more and a student population that is at least 75% nonwhite. In 2000 there were 20 such districts in California, including California's largest school district, Los Angeles Unified.

minimal because households have already sorted into schools that match their preferences; thus, differences in support among high- and low-SES households in that market are motivated primarily by housing price effects. However, while high-SES households may be satisfied with their schools, it is quite likely that low-SES households are not. Since they are forced into schools with lower peer quality, low-SES households may be more supportive of vouchers, not because of capitalization, but because they would still like to leave the public sector in search of higher peer quality. If this is the case, peer effects alone could lead to the voting patterns we observe in both the low-choice and high-choice markets.

In order to identify the presence and relative importance of capitalization effects, we turn to the voting behavior of homeowners and renters. As discussed in Brunner and Sonstelie (2001, 2003) and Nechyba (2003a), if voters are aware of the potential impact of vouchers on housing values, renters and homeowners should view the benefits of a universal voucher quite differently. For example, consider how the introduction of school vouchers differentially affects high-SES homeowners and renters in a high-choice market. Because the voucher would reduce the housing price premium attached to living in a high-quality school district, high-SES homeowners stand to incur significant capital losses if the voucher is implemented. In contrast, high-SES renters incur no capital losses and may even benefit from lower rents. Thus, if the potential impact of vouchers on housing values influences voter behavior, the voting pattern of renters and homeowners in high-choice markets should look different. In particular, high-SES homeowners should be *less* supportive of school vouchers than high-SES renters in a high-choice market. Similarly, low-SES homeowners, who stand to incur significant capital gains if the voucher is implemented, should be *more* supportive of school vouchers than low-SES renters. We refer to these predictions as the capitalization hypothesis. On the other hand, if peer effects alone are driving the voting patterns we observe, the voting behavior of homeowners and renters should look quite similar. That is, there is no reason to believe that renters, of any socioeconomic status, are any more or less concerned about peer quality than homeowners. We refer to that prediction as the peer-quality hypothesis.

To examine which of the two hypotheses better explains the voting pattern we observe, we expanded our empirical model to include the characteristics of homeowners and renters separately. Specifically, our expanded specification takes the following form:

$$\begin{aligned} y_{lk} &= \beta_1^h w_{lk}^h A_{lk}^h + \beta_2^h w_{lk}^h A_{lk}^h \cdot C_k + w_{lk}^h X_{lk}^h \gamma^h + \beta_1^r w_{lk}^r A_{lk}^r + \beta_2^r w_{lk}^r A_{lk}^r \cdot C_k \\ &\quad + w_{lk}^r X_{lk}^r \gamma^r + Z_k \delta + \varepsilon_{lk} \end{aligned} . \tag{2}$$

In equation (2), the superscript h implies the coefficient or variable is for homeowners, while the superscript r implies the coefficient or variable is for renters. For example, A_{lk}^h is a vector of homeowner-specific sorting attributes (such as the average income of homeowners and the fraction of White homeowners) and X_{lk}^{h} is a set of control variables that describe other characteristics of homeowners within a block group. The variables with an r superscript are similarly defined except they now pertain to renters. Since the fraction of total votes cast by homeowners and renters must sum to one, all the homeowner variables in equation (2) are multiplied by the fraction of homeowners in a block group, w_{lk}^{h}, while all the renter variables are multiplied by the fraction of renters in a block group, w_{lk}^{r}.

Recall that in order to identify the presence and relative importance of capitalization effects one must compare the voting behavior of homeowners and renters in high-choice markets. Thus, in terms of our empirical model, one must compare the difference between $\beta_1^h + \beta_2^h$ and $\beta_1^r + \beta_2^r$. If capitalization effects influence voter behavior, the capitalization hypothesis predicts that high-SES homeowners should be *less* supportive of school vouchers than high-SES renters in a high-choice market. That prediction implies $\beta_1^h + \beta_2^h < \beta_1^r + \beta_2^r$. In contrast, the peer quality hypothesis predicts $\beta_1^h + \beta_2^h = \beta_1^r + \beta_2^r$. That is, homeowners and renters in the high-choice market look quite similar.

Results based on the estimation of equation (2) are reported in Table 6. The 2000 Census provides only a limited number of variables that can be broken down separately for homeowners and renters. Those variables are household income, the fraction of households with school-age children and the fraction of households that are white. For these three variables, separate parameter estimates are reported for homeowners and renters.[22] Column 1 reports results based on a specification where the district choice index is interacted with the log of mean homeowner income and the log of mean renter income. Similarly, column 2 reports results based on a specification where the district choice index is interacted with the fraction of white homeowners and the fraction of white renters.

In general, the results reported in Table 6 provide mixed evidence on whether voters in high-choice markets are responding primarily to peer effects or to capitalization effects. To illustrate that point, consider first the results reported in column 1. As noted earlier, if capitalization effects influence voting behavior, then $\beta_1^h + \beta_2^h < \beta_1^r + \beta_2^r$. The point estimates reported in column 1 reveal that this is the case for income: the sum of the homeowner coefficients on log income and the interaction of log income with choice ($\beta_1^h + \beta_2^h$) is -0.307 (0.697 + -1.004), while the sum of the renter coefficients on log

[22] At the block group level, the 2000 Census provides information on household income and race broken down separately for homeowners and renters. At the tract level, the 2000 Census provides information on households with school age children. Thus, we use tract level data to construct the fraction of homeowners and renters with school-age children. In addition, note that the 2000 Census does not provide information on educational attainment (one of our sorting variables), broken down separately for homeowners and renters.

Table 6
Homeowners versus Renters
Logit Estimates

	Income (1)	Race (2)
Variables Interacted with Fraction of Homeowners		
Constant	-0.813	-1.913
	(2.010)	(2.002)
Fraction of Homeowner Households with Children	0.273**	0.157*
	(0.108)	(0.079)
Fraction of Homeowners White	-0.109	1.026***
	(0.072)	(0.304)
Income	0.697**	-0.185***
	(0.264)	(0.034)
Income*Choice	-1.004***	…
	(0.320)	…
Fraction of Homeowners White*Choice	…	-1.351***
	…	(0.368)
Variables Interacted with Fraction of Renters		
Constant	-0.969	-2.086
	(2.005)	(1.992)
Fraction of Renter Households with Children	0.488***	0.445***
	(0.098)	(0.106)
Fraction of Renters White	0.063*	1.181***
	(0.033)	(0.373)
Income	0.506***	-0.084***
	(0.184)	(0.024)
Income*Choice	-0.683***	…
	(0.230)	…
Fraction of Renters White*Choice	…	-1.364***
	…	(0.467)
Other Control Variables		
Choice	-0.135	1.254***
	(0.101)	(0.410)
Fraction Republican	2.136***	2.184***
	(0.098)	(0.103)
Fraction Private School	0.220***	0.209***
	(0.042)	(0.040)
Fraction Emp. Education	-0.810***	-0.779***
	(0.097)	(0.096)

Notes: (1) Robust, clustered standard errors in parentheses, (2) ** significant at 5%, *** significant at 1%, (3) both models also include all the market-level control variables listed in Table 2.

income and the interaction of log income with choice ($\beta_1^r + \beta_2^r$) is only -0.177 (0.506 + -0.683). However, based on a Wald test, the null hypothesis that $\beta_1^h + \beta_2^h = \beta_1^r + \beta_2^r$ can only be rejected at the 15% level of significance. That is, the magnitude of difference between the homeowner and renter coefficients is not large enough to reject the hypothesis that the voting behavior of homeowners and renters is quite similar. That finding is generally consistent with the peer quality hypothesis. Now consider the results reported in column 2. In those results, the sum of the homeowner coefficients on fraction white and the interaction of fraction white with choice ($\beta_1^h + \beta_2^h$) is -0.325 (1.026 + -1.351) while the sum of the renter coefficients on fraction white and the interaction of fraction white with choice ($\beta_1^r + \beta_2^r$) is only -0.183 (1.181 + -1.364). Furthermore, based on a Wald test, one can now reject the null hypothesis that $\beta_1^h + \beta_2^h = \beta_1^r + \beta_2^r$ at the 3% level. Thus, the results reported in column 2 are generally consistent with the capitalization hypothesis.

Households with and without children

Table 6 provides some limited evidence that capitalization effects influence voting behavior. As an alternative method of identifying the presence of capitalization effects we turn to the voting behavior of households with and without school-age children. If capitalization effects influence voting behavior, one would expect the voting pattern of households with children in the high-choice market to look very much like the voting pattern of households without children, since capital gains and losses would affect both groups equally. On the other hand, if peer effects alone are driving voting behavior, one would expect the voting pattern of the two groups to look very different. In particular, since households without children have little reason to be concerned about the impact of vouchers on peer quality, there is no reason to believe support for the voucher among households without children should vary with whether they live in a low- or high-choice market. In contrast, support for the voucher among households with children should depend critically on whether those households live in a high- or low-choice market.[23]

To test those predictions, we used data on the fraction of households with school-age children in each block group to split our dataset into two similarly-sized samples. The first sample contains block groups in which the fraction of households with children is greater than 0.48, the 75th percentile of households with children in our sample. Similarly, the second sample contains the block groups in which the fraction of households with children is less than 0.273, the 25th percentile. Thus, the first sample corresponds to block groups with a high fraction of households with children, while the second sample corresponds to block groups with a low fraction of households with children. We then estimated separate regressions for each of the two samples.

[23] Households without children may still be concerned about peer quality; for example, if household members have grandchildren in public schools, are planning to have children, or are simply altruistic. However, it seems reasonable to assume that households with school-age children are *more* concerned about peer quality than households without children in school. This weaker assumption is all that is required for our identification strategy.

Table 7
Households with and without Children
Dependent Variable: log[(fraction 'yes' on Prop. 38)/(1-fraction 'yes' on Prop. 38)]

	% H.H's with Children Greater than 48%				% H.H's with Children Less than 27.3%			
	Income **(1)**	Education **(2)**	Race **(3)**	All Interactions **(4)**	Income **(5)**	Education **(6)**	Race **(7)**	All Interactions **(8)**
Fraction White	-0.048	-0.039	1.167***	0.891**	-0.011	-0.018	0.921***	0.908***
	(0.051)	(0.055)	(0.420)	(0.392)	(0.056)	(0.055)	(0.197)	(0.234)
Fraction College	-0.097***	0.571**	-0.106***	-0.345**	-0.128***	0.197*	-0.132***	0.178
	(0.024)	(0.267)	(0.028)	(0.157)	(0.023)	(0.113)	(0.021)	(0.190)
Income	1.251***	-0.013	-0.014	0.835***	0.041	0.017	0.017	-0.398
	(0.362)	(0.036)	(0.037)	(0.167)	(0.155)	(0.037)	(0.035)	(0.302)
Income*Choice	-1.462***	…	…	-0.982***	-0.031	…	…	0.486
	(0.427)	…	…	(0.196)	(0.168)	…	…	(0.352)
College*Choice	…	-0.770**	…	0.279	…	-0.381**	…	-0.363
	…	(0.344)	…	(0.179)	…	(0.149)	…	(0.236)
White*Choice	…	…	-1.414**	-1.101**	…	…	-1.133***	-1.118***
	…	…	(0.537)	(0.490)	…	…	(0.264)	(0.299)
Observations	5485	5485	5485	5485	5513	5513	5513	5513
R-Squared	0.66	0.66	0.66	0.67	0.75	0.75	0.76	0.76

Notes: (1) Robust, clustered standard errors in parentheses, (2) * significant at 10%, ** significant at 5%, *** significant at 1%, (3) all models include all block group and market-level control variables listed in Table 2.

Table 8
Predicted Percentage of 'Yes" Votes in Block Groups
with High/Low Fraction of School-Age Children

	% of Households with Children Greater than 48%		% of Households with Children Less than 27.3%	
	Choice = 0	Choice = 1	Choice = 0	Choice = 1
High Income	49.3%	26.1%	31.0%	26.3%
Average Income	28.3	29.1	30.4	26.2
Low Income	14.8	32.1	29.8	26.1
High Fraction College	45.2	24.1	35.3	23.4
Average Fraction College	30.6	28.4	30.5	27.2
Low Fraction College	21.5	31.8	27.2	30.4
High Fraction White	57.8	23.9	46.6	23.4
Average Fraction White	34.2	27.8	28.9	26.7
Low Fraction White	14.7	32.7	14.5	30.8
High Income, College, White	54.5	21.4	45.3	21.8
Average Income, College, White	31.4	27.9	29.9	27.6
Low Income, College, White	13.2	35.4	16.9	33.9

The results of that exercise are reported in Table 7.[24] Columns 1 through 4 report results for the sample that contains block groups with a high fraction of households with children, while columns 5 through 8 report results for the sample that contains block groups with a low fraction of households with children. These results provide further evidence in favor of the hypothesis that capitalization effects influence voting behavior. In particular, for the sample that contains block groups with a low fraction of households with children, the estimated coefficients on the interaction terms between the sorting variables and choice are negative and, for education and race, statistically significant. If there were no capitalization effects at all, we would expect those coefficients to be zero.

To see the effects of sorting and choice more clearly, we again calculate the predicted percentage of yes votes for block groups with high, average and low values of the sorting variables. These are reported in Table 8. As the table reveals, households in the high-choice market look quite similar, whether they have children or not, a result which is consistent with the hypothesis that households are concerned about the impact of school vouchers on housing values. We also note that in the low-choice market, where peer effects should dominate, high-SES households with children are much more supportive of the voucher than high-SES households without children. This is what one would expect since peer quality has a more direct impact on families with children.

VII. Conclusion

In this paper, we have provided evidence on the gains and losses associated with a universal school voucher. We find that in markets with relatively little Tiebout choice, high-income, highly-educated and white households are more supportive of vouchers than low-income, less-educated and non-white households. These differences can be quite large and are larger for households with school-age children. We interpret these differences as evidence that households are motivated by the changes in peer quality that are likely to follow the implementation of a universal voucher. Our results support the conclusions of Figlio and Stone (2001) that students from higher-income, more-educated and white households are more likely to move to the private sector as public sector choice declines. Thus, our results suggest that, in low choice markets, the introduction of universal vouchers may lead to more racially and economically segregated schools as a disproportionate number of high-income, highly-educated and white families opt out of the public sector.

We also find that in markets with a significant amount of choice, high-SES households are much *less* supportive of school vouchers than low-SES households, a result consistent with voter concern over the potential impact of vouchers on housing values. For high-SES households, the universal voucher

[24] In the interest of brevity, we have once again suppressed the estimated coefficients for the market-level control variables.

presents the potential for large losses from lower housing values and these losses may offset any gains from increased productivity or peer effects. While we find some evidence that these capitalization effects exist, we also note that differences between high- and low-SES households in high-choice markets are likely influenced by peer effects as well.

Regardless of the specific reasons for the differences in high-choice markets, our results provide strong evidence of the effect that existing levels of Tiebout choice can have on support for universal vouchers. In markets with little or no Tiebout choice, we predict 51.1 percent of high-SES households support school vouchers. In contrast, in markets with significant Tiebout choice, only 22 percent of high-SES households support school vouchers. It is particularly remarkable to see such low levels of support among high-SES households anywhere in California given the dramatic changes in California's system of public school finance that have occurred over the last three decades. Specifically, in response to court-ordered reforms and Proposition 13, California has transferred the responsibility for funding its schools from local school districts to the state and equalized spending per pupil across districts. As documented by Brunner and Sonstelie (2006), the transformation from local to state finance has led to a decline in spending per pupil relative to the rest of the nation: between 1970 and 2000 spending per pupil in California fell about 22 percent relative to spending per pupil in all other states. Student performance in California has also declined relative to other states. One therefore might expect voters in California to be relatively supportive of vouchers, particularly high-SES voters. In this context, the offsetting effect of increased Tiebout choice is especially striking.

On a final note, our results also have important implications for policymakers looking for broad-based popular support for vouchers. Recall that Proposition 38 was an initiative to adopt a *universal* voucher, available to all students. The gains and losses, and resulting voter support, could look quite different if the voucher were instead targeted to either low-performing or low-income students. Such a targeted voucher would clearly reduce the possibilities for cream-skimming, thereby reducing support among high-SES households in low-choice areas but increasing support among low-SES households. Thus, the specific design of a voucher proposal could have a significant impact on voter support.

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