USING MUNICIPAL RESIDENCY REQUIREMENTS TO DISGUISE PUBLIC POLICY

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Municipal residency requirements require city employees to live within the city limit. Many cities enacted residency requirements attempting to attract middle-class families into the city and to prevent them from leaving. The model developed in this article suggests that a residency requirement can increase a city's middle-class population but only if it is accompanied by a municipal wage premium. When effective, a residency requirement can also increase the likelihood that a municipal family will enroll its children in private school through a Tiebout sorting effect. Using U.S. census data, the author finds that comprehensive residency requirements are often but not always accompanied by a municipal wage premium. Furthermore, municipal families living in cities with both a residency requirement and a wage premium are significantly more likely to enroll their children in private school.

Keywords: *residency requirement; Tiebout hypothesis; school choice; urban land use; regional migration; urban flight*

Approximately 24 percent of U.S. cities have laws that require city employees to live within the city limit.[1] While many of these laws apply specifically to police officers and firefighters, several cities impose their residency requirement on all of their municipal employees. A residency law, by design, limits a family's choice in combining a job with a neighborhood. While most families can choose to live in any neighborhood they can afford, families covered by a residency requirement must live within the city limit or forfeit their city job. This article examines how these laws affect neighborhood choice by examining municipal wages and a family's decision to enroll its children in private schools.

Tiebout (1956) hypothesized that families with similar demand for publicly supplied goods will sort themselves into communities that

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supply the appropriate level of these goods. Public schools are an example. Families that demand high-quality education for their children will move to neighborhoods with reputable schools. Although the marginal cost of enrolling a child in public school is zero, families pay for reputable schools through higher local taxes and housing rent (see Black 1999; Oates 1969). A family picks its most desirable neighborhood by comparing the cost of living in each neighborhood with the quality and reputation of its schools. A residency requirement attempts to limit a family's ability to move to its most desired neighborhood. The model developed in this article suggests that a residency requirement can entice families to move into the city but only when it is accompanied by a municipal wage premium, subsidy, or some other nonpecuniary benefit. In fact, the municipal wage premium must be paid in addition to any citywide wage premium. Furthermore, while the model suggests that a residency requirement may not itself cause a municipal wage premium, city officials may create a new or use an existing wage premium as a disguised subsidy to attract families into the city. If effective, a residency requirement can disrupt the normal Tiebout sorting and thus increase the likelihood that a family will enroll its children in private school. If ineffective, a residency requirement will not affect a family's choice of neighborhood—municipal employees living in the city would have lived in the city anyway—and thus will not affect private school enrollment.

This article uses household data collected from the 1980 and 1990 censuses to estimate the impact that residency laws have on neighborhood choice by examining private school enrollment. The data include households from eighteen major cities, eight of which had a municipal residency requirement and ten of which did not. Through a series of double and triple difference-in-differences estimators, I find that many cities paid a municipal wage premium. Furthermore, in every city that combined a residency requirement with a municipal wage premium, municipal families were significantly more likely than nonmunicipal families to enroll their children in private school. Conversely, in every other city—those with a residency requirement but without a municipal wage premium, those with a municipal wage premium but without a residency requirement, and those without either—municipal families were no more likely than nonmunicipal

families to enroll their children in private school. Thus, combining a municipal residency requirement with a municipal wage premium was the only scenario that affected a family's decision to enroll its children in private school.

MUNICIPAL RESIDENCY LAWS

Municipalities establish residency requirements for two economic reasons: to increase the productivity of municipal workers and to influence migration into and out of the city.[2] Cities motivated to increase the productivity of its workforce generally target their residency requirements at specific occupations, most often at police officers and firefighters. Other cities have passed comprehensive residency requirements designed to influence who chooses to live in the city. Although targeted residency requirements might also affect migration, this article focuses specifically on comprehensive residency requirements. Specifically, do comprehensive residency requirements affect a family's neighborhood choice and, consequently, its decision to enroll its children in private schools?

Despite their popularity, there has been little economic research on the impact of residency requirements. Moreover, the research that exists focuses exclusively on requirements targeted at police officers and firefighters (see Getz 1979; Hirsch and Rufolo 1985; Mehay and Seiden 1986; Gonzalez, Mehay, and Duffy-Deno 1991; O'Brien 1997). Proponents of targeted residency laws argue that emergency personnel are more productive when they live in the city because they can respond more quickly to emergencies and because living in the community they serve increases an employee's knowledge and feeling of connection to that community.[3] Smith (1980) provides empirical evidence of a positive relationship between the efficiency of a police department and the percentage of officers living in the community they serve.[4] The productivity argument is not limited to police officers and firefighters. For example, some have argued that schoolteachers who live and teach within the same district are more productive.[5] However, unlike the previous research, this article focuses on comprehensive residency requirements. A comprehensive residency law re-

quires all municipal employees hired after the law is enacted to live in the city. Proponents of comprehensive residency requirements do not argue that the law will necessarily increase productivity—it is difficult to argue that accountants, groundskeepers, and zoo workers who live outside the city are somehow less efficient than those living within the city limit. Instead, proponents argue that a comprehensive residency law will attract middle-class families into the city and prevent them from leaving.

On its face, it would seem that a residency requirement would encourage migration into the city. Any individual who desires a municipal job must move into the city to get one. Municipal jobs generally pay middle-class wages, so it would seem that a residency requirement would increase the number of middle-class families living in the city. In fact, many cities cite this as the reason for their residency laws. For example, the city and county of Denver passed its residency law to combat urban flight. During the late 1970s, Denver lost more than 10% of its population, mostly from middle-class families moving to the suburbs. During the same time, Denver's public school enrollment was cut nearly in half.[6] In an attempt to reverse both trends, Denver amended its city charter to include a residency requirement that covered all city employees hired after 1979. According to the staff director for the city council for the city and county of Denver, "The people behind the charter amendment on residency felt that it was not right for people to have a good city job while at the same time they were contributing to the city's decline. The residency law was a way to keep 12,000 middle-class employees and their families (perhaps 40,000 to 50,000 people in all) in the city." The cities of Boston, Cleveland, and Memphis passed similar residency requirements around the same time.

ATTRACTING MIDDLE-CLASS FAMILIES TO THE CITY

Will a residency requirement, by itself, increase the number of middle-class families living in the city? Standard urban land-use theory predicts not. Instead, the model predicts that a residency requirement will only affect the composition of a city's residents if it is accompanied by a municipal wage premium or some other type of

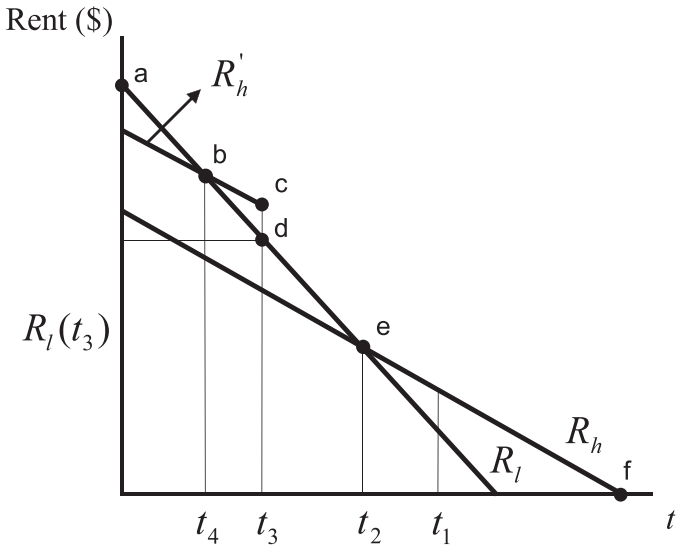

Figure 1: Bid Rent Functions for Workers with High (*h*) and Low (*l*) Levels of Education

subsidy. To understand why, consider a situation with two types of workers: those with a high level of education and those with a low level of education. For convenience, I will refer to those with a high level of education simply as "educated" and those with a low level of education as "uneducated." Educated workers earn middle-class wages, and it is these individuals that city officials are interested in attracting to the city. For simplicity, consider a city that only hires educated workers. Suppose, initially, that the city government does not offer a wage premium; that is, the city government and private city employers pay the same wage to educated workers. Figure 1 diagrams the Alonso (1964)–style bid rent functions for workers with high (h) and low (l) levels of education on an open monotonic urban space. The resulting rent gradient (segment *aef*) shows that uneducated workers will live nearest to the urban center (in the space $t < t_2$).[7] If the city boundary is at distance t_1 from the urban center, then the educated workers who lie in the interval (t_2, t_1) will live in the city.

Figure 1 is drawn such that most city residents are uneducated. Suppose that the city wants to attract more educated residents, and so it enacts a municipal residency requirement. If the interval (t_2, t_1) is large enough to house all of the municipal employees, then the residency requirement will fail to attract additional educated workers into the city. However, if (t_2, t_1) is insufficiently large to accommodate the municipal employees, or if the city boundary is at a distance to the left of t_2, then the residency requirement can attract educated workers into the city, but they will require a subsidy to raise their bid rents above that of the uneducated workers. For example, if the city boundary is at t_3, then the government employees would require a subsidy sufficient to raise their bid rent function above $R_l(t_3)$—say, to $R_h^{'}$. Now, the new rent gradient is segment *abcdef*, with the subsidized municipal employees residing in the interval (t_4, t_3). This result suggests that a residency requirement without an accompanying subsidy will not increase the size of the city's middle-class population, but a residency requirement combined with a subsidy can.

In Figure 1, the city boundary is an arbitrary point on a featureless urban space. Suppose, instead, that the city and suburb offer different public services. Specifically, assume that the public schools in the suburb are better than the public schools in the city. However, city residents may purchase private education equal in quality to that provided by the suburban schools at cost *T*. Figure 2 diagrams the bid rent functions for this case, with t_1 indicating the city boundary. Focusing only on the educated workers, R_h for $t > t_1$ represents the suburban bid rent function. If private education were free to educated workers, perhaps through a private school tuition voucher, then this bid rent function would include the segment *aa*. In this case, some educated workers would live in the city and send their children to private schools. This is the theoretical starting point—in reality, private schools are not free. As tuition increases, the dotted portion of the bid rent function shown in Figure 2 shifts down by *T* dollars, and educated workers will begin to move out of the city. If the cost of tuition is greater than $a - c$, then the bid rent function of the educated workers will fall below segment *cc*, and all educated workers will live in the suburb. However, the existence of public city schools puts a limit on how far down increasing *T* can shift the bid rent function. For example, let segment *dd* represent

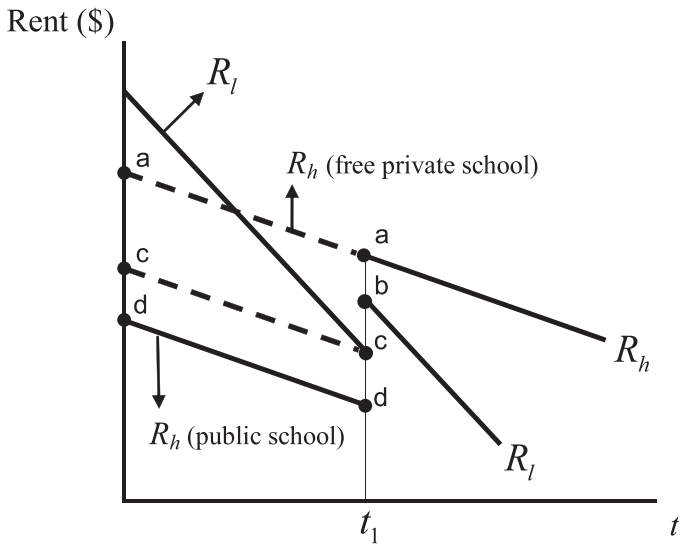

Figure 2: Bid Rent Functions with Higher Quality Suburban Schools

the bid rent function when there is no private school option. Increasing T beyond $a - d$ will not shift the bid rent function below segment dd because, at that tuition, educated workers living in the city would enroll their children in public schools.

Figure 2 is drawn such that, without the private school option, all educated workers would live outside city (i.e., $c > d$). It is certainly possible to draw a segment dd such that some educated workers will live in the city and send their children to public schools. Similarly, with the private school option, if $T < a - c$ and $T < a - d$, then some educated workers will live in the city and send their children to private schools. In both situations, a residency requirement would not require a subsidy, provided that the interval within the city occupied by educated workers is large enough to accommodate the city's municipal employees. If not, or if the bid rent functions are as they are shown in Figure 2, then the city employees covered by a residency requirement would require a subsidy to raise their bid rents above that of the unedu-

cated workers. This is essentially the same result as before—namely, that a residency requirement without an accompanying subsidy will not increase the size of the city's middle class. However, with a subsidy, a residency requirement can attract additional middle-class families into the city.

A subsidized residency requirement can also increase the city's municipal workers' private school enrollment rate. In Figure 2, the distance $a - d$ reveals the dollar value that educated workers place on the suburban schools over the city schools. Suppose that there are two types of educated workers: those who value the suburban schools and those who do not. Above, segment *aa* was described as an educated worker's theoretical bid rent function if private schools were free. It is also the bid rent function for an educated worker who views city and suburban schools as equivalent. If such educated workers exist, then, without a subsidized residency requirement, educated workers living in the city will enroll their children in public schools. With a subsidized residency requirement, municipal workers enticed into the city, for whom $T < a - d$, will enroll their children in private schools. Thus, a subsidized residency requirement can attract middle-class families into the city and also increase the municipal workers' private school enrollment rate.

The model described above simplifies many complex considerations about job and neighborhood choice, but it points out two important facts: first, a residency requirement will not necessarily create a municipal wage premium; second, an unsubsidized municipal residency requirement will not increase a city's middle-class population.[8] On the other hand, when accompanied by a subsidy, such as a municipal wage premium, a residency requirement can attract middle-class families into the city.[9] In fact, it is the subsidy that attracts families into the city, while the residency requirement ensures that only those living in the city receive the subsidy. A municipal wage premium may exist for many reasons, such as municipal labor unions (see Valletta 1993) or other city politics (see Gyourko and Tracy 1991).[10,11] Alternatively, if a municipal wage premium does not already exist, city officials may be willing to create one. For example, if the goal of city officials is to attract middle-class families into the city, then offering a wage premium, by itself, or enacting a residency requirement, by itself, may

not meet that goal. However, combining a residency requirement with a new or existing municipal wage premium can attract families into the city.

In fact, recent work by Alesina, Baqir, and Easterly (1998) suggests that some politicians do use public employment to disguise unpopular public policy. In their case, they find evidence that politicians use public employment to redistribute income to poorer areas. Similarly, while a city's constituents may not support a policy that directly pays families to move into the city, local authorities can achieve the same outcome by enacting a municipal residency requirement and accompanying it by an existing or newly created municipal wage premium.[12]

THE DATA

I analyze individual-level data from the 1980 and 1990 censuses of population and housing. The census data contain information on employment, income, and a variety of other demographic characteristics. In each census year, households were questioned about conditions in the previous year. Therefore, data from the 1980 census correspond to conditions in 1979, while data from the 1990 census correspond to 1989. The cities were selected based on the 1997 Personnel Practices Inventory, a survey of 428 jurisdictions conducted by the International Personnel Management Association. The first column of Table 1 lists the eight largest U.S. cities that enacted a comprehensive residency requirement prior to 1990. The table also lists when the law was passed and the time at which an employee must establish residency. The cities of Denver, Cleveland, and Memphis passed residency requirements between the two census years, and Boston passed one a few years earlier. Having data both before and after the residency law passed allows us to calculate the triple difference-in-differences estimator discussed below. In addition, the ten largest cities without any form of residency requirement prior to 1990 are listed in Table 2.

The first empirical step is to identify the group of municipal workers covered by a residency requirement. That task is complicated by two limitations of the census data. First, the census survey does not

(text continues on p. 97)

TABLE 1: 1979 and 1989 Mean Wages in Cities with a Residency Requirement

	1979					*1989*				
City/State	*Municipal Workers (1)*	*Other Workers (2)*	*Difference (3)*	*Double Difference (4)*	*Double Difference with Controls (5)*	*Municipal Workers (6)*	*Other Workers (7)*	*Difference (8)*	*Double Difference (9)*	*Double Difference with Controls (10)*
Boston (1976) (varies by	6.92	6.02	**0.90**			14.47	12.70	**1.77**		
position)	(0.14)	(0.04)	**(0.14)**	1.01***	**0.75*** **	(0.38)	(0.09)	**(0.39)**	2.14***	**1.98*** **
Rest of Massachusetts	6.71	6.82	–0.11	(0.18)	**(0.14)**	13.34	13.71	–0.37	(0.45)	**(0.38)**
	(0.06)	(0.01)	(0.07)			(0.15)	(0.03)	(0.15)		
Chicago (1919) (at time of	8.20	6.92	**1.28**			13.69	11.53	**2.16**		
appointment)	(0.07)	(0.02)	**(0.07)**	2.25***	**1.35*** **	(0.16)	(0.04)	**(0.17)**	3.49***	**2.32*** **
Rest of Illinois	6.66	7.63	–0.97	(0.10)	(0.08)	11.16	12.48	–1.33	(0.22)	**(0.19)**
	(0.07)	(0.01)	(0.07)			(0.12)	(0.02)	(0.13)		
Cleveland (1982) (six	6.13	6.38	**–0.25**			11.01	9.57	**1.44**		
months after appointment)	(0.14)	(0.04)	**(0.14)**	0.69***	**0.49*** **	(0.27)	(0.08)	**(0.28)**	2.28***	**1.69*** **
Rest of Ohio	6.10	7.04	–0.93	(0.17)	**(0.14)**	10.41	11.25	–0.83	(0.38)	**(0.32)**
	(0.05)	(0.01)	(0.05)			(0.09)	(0.02)	(0.10)		
Denver (1979) (six months	6.69	6.57	**0.13**			12.45	11.28	**1.17**		
after appointment)	(0.19)	(0.04)	**(0.20)**	0.83***	**0.74*** **	(0.41)	(0.10)	**(0.42)**	1.37**	**1.07** **
Rest of Colorado	6.19	6.89	–0.70	(0.24)	**(0.20)**	11.11	11.30	–0.20	(0.44)	**(0.38)**
	(0.10)	(0.02)	(0.10)			(0.16)	(0.04)	(0.16)		
Detroit (1913) (at time of	9.12	7.20	**1.92**			13.40	11.21	**2.19**		
appointment)	(0.10)	(0.03)	**(0.11)**	2.66***	**1.92*** **	(0.24)	(0.07)	**(0.25)**	2.72***	**1.65*** **
Rest of Michigan	7.02	7.76	–0.74	(0.13)	**(0.11)**	11.54	12.07	–0.53	(0.32)	**(0.27)**
	(0.06)	(0.01)	(0.06)			(0.12)	(0.02)	(0.12)		
Memphis (1980) (six	5.91	6.10	**–0.19**			9.82	10.22	**–0.41**		

(continued)

TABLE 1 (continued)

City/State	1979 Municipal Workers (1)	1979 Other Workers (2)	1979 Difference (3)	1979 Double Difference (4)	1979 Double Difference with Controls (5)	1989 Municipal Workers (6)	1989 Other Workers (7)	1989 Difference (8)	1989 Double Difference (9)	1989 Double Difference with Controls (10)
months after appointment)	(0.16)	(0.04)	**(0.16)**	0.56**	**0.45****	(0.35)	(0.09)	**(0.36)**	0.21	**0.49**
Rest of Tennessee	5.10	5.86	**–0.75**	(0.17)	**(0.14)**	9.27	9.89	**–0.62**	(0.36)	**(0.30)**
	(0.70)	(0.15)	**(0.72)**			(0.13)	(0.03)	**(0.13)**		
Milwaukee (1933) (at time	7.17	6.57	**0.60**			12.14	9.83	**2.31**		
of appointment)	(0.12)	(0.03)	**(0.12)**	1.29***	**0.58*****	(0.27)	(0.07)	**(0.28)**	2.63***	**1.73*****
Rest of Wisconsin	6.00	6.68	–0.68	(0.15)	**(0.13)**	10.22	10.55	–0.33	(0.36)	**(0.31)**
	(0.07)	(0.02)	(0.07)			(0.12)	(0.03)	(0.13)		
Philadelphia (1952) (one	7.57	6.46	**1.11**			13.37	11.33	**2.05**		
year prior to appointment)	(0.08)	(0.02)	**(0.09)**	2.34***	**1.51*****	(0.22)	(0.06)	**(0.23)**	3.32***	**2.07*****
Rest of Pennsylvania	5.69	6.92	–1.23	(0.11)	**(0.09)**	10.09	11.36	–1.27	(0.28)	**(0.24)**
	(0.05)	(0.01)	(0.06)			(0.12)	(0.02)	(0.12)		

NOTE: Standard errors in parentheses. The double-difference estimates with controls come from separate ordinary least squares (OLS) regressions by city. Controls include experience, experience squared, sex, marital status, English fluency, immigration status, five ethnic categories, five education categories, and six occupation categories.
**Statistically significant at the 95 percent confidence level. ***Statistically significant at the 99 percent confidence level.

TABLE 2: 1979 and 1989 Mean Wages in Cities without a Residency Requirement

	1979					*1989*				
City/State	*Municipal Workers (1)*	*Other Workers (2)*	*Difference (3)*	*Double Difference (4)*	*Double Difference with Controls (5)*	*Municipal Workers (6)*	*Other Workers (7)*	*Difference (8)*	*Double Difference (9)*	*Double Difference with Controls (10)*
Baltimore	5.73	6.11	**–0.38**			11.11	10.96	**0.15**		
	(0.12)	(0.03)	**(0.13)**	–0.08	**–0.30****	(0.30)	(0.08)	**(0.31)**	0.11	**–0.42**
Rest of Maryland	7.32	7.62	–0.30	(0.18)	**(0.14)**	13.69	13.65	0.04	(0.39)	**(0.32)**
	(0.09)	(0.02)	(0.09)			(0.15)	(0.03)	(0.16)		
Jacksonville	6.09	6.04	**0.05**			11.59	10.62	**0.98**		
	(0.17)	(0.04)	**(0.18)**	0.16	**0.24**	(0.35)	(0.07)	**(0.36)**	0.39	**0.52**
Rest of Florida	5.88	5.99	–0.11	(0.20)	**(0.17)**	11.27	10.67	0.59	(0.42)	**(0.36)**
	(0.05)	(0.01)	(0.05)			(0.09)	(0.02)	(0.10)		
Louisville	5.46	5.95	**–0.49**			9.95	9.62	**0.33**		
	(0.25)	(0.05)	**(0.26)**	0.49*	**0.11**	(0.50)	(0.10)	**(0.51)**	1.68**	**1.39****
Rest of Kentucky	5.21	6.19	–0.98	(0.29)	**(0.24)**	8.83	10.18	–1.35	(0.65)	**(0.55)**
	(0.09)	(0.02)	(0.10)			(0.19)	(0.03)	(0.20)		
Minneapolis	7.20	6.41	**0.78**			12.63	11.18	**1.45**		
	(0.18)	(0.05)	**(0.18)**	1.20***	**0.77*****	(0.49)	(0.12)	**(0.51)**	1.84**	**1.36****
Rest of Minnesota	6.57	6.98	–0.41	(0.22)	**(0.18)**	10.74	11.13	–0.39	(0.54)	**(0.46)**
	(0.08)	(0.02)	(0.08)			(0.13)	(0.03)	(0.14)		
Newark	6.01	5.69	**0.32**			11.72	10.61	**1.10**		
	(0.17)	(0.05)	**(0.17)**	1.03***	**0.32**	(0.44)	(0.10)	**(0.45)**	2.01**	**0.88**
Rest of New Jersey	6.96	7.68	–0.71	(0.27)	**(0.21)**	14.06	14.97	–0.91	(0.81)	**(0.68)**
	(0.06)	(0.01)	(0.06)			(0.13)	(0.03)	(0.14)		

(continued)

TABLE 2 (continued)

City/State	1979 Municipal Workers (1)	1979 Other Workers (2)	1979 Difference (3)	1979 Double Difference (4)	1979 Double Difference with Controls (5)	1989 Municipal Workers (6)	1989 Other Workers (7)	1989 Difference (8)	1989 Double Difference (9)	1989 Double Difference with Controls (10)
Norfolk	5.16	4.88	**0.28**			11.03	8.62	**2.41**		
	(0.24)	(0.05)	**(0.25)**	1.06**	**0.90****	(0.51)	(0.10)	**(0.52)**	3.05***	**1.74****
Rest of Virginia	5.91	6.69	–0.78	(0.32)	**(0.26)**	11.25	11.89	–0.64	(0.64)	**(0.53)**
	(0.07)	(0.01)	(0.08)			(0.13)	(0.03)	(0.13)		
Portland	7.07	6.65	**0.42**			13.11	10.96	**2.15**		
	(0.24)	(0.05)	**(0.24)**	0.55**	**0.46****	(0.51)	(0.09)	**(0.51)**	1.56**	**1.31****
Rest of Oregon	6.83	6.96	–0.13	(0.27)	**(0.23)**	11.35	10.76	0.59	(0.53)	**(0.46)**
	(0.10)	(0.02)	(0.10)			(0.18)	(0.04)	(0.18)		
Rochester	6.51	6.34	**0.17**			11.37	10.84	**0.53**		
	(0.21)	(0.05)	**(0.21)**	0.08	**–0.18**	(0.48)	(0.11)	**(0.50)**	–0.34	**–0.96**
Rest of New York	7.34	7.26	0.08	(0.29)	**(0.24)**	14.40	13.53	0.87	(0.72)	**(0.61)**
	(0.04)	(0.01)	(0.04)			(0.09)	(0.02)	(0.09)		
San Diego	6.96	6.35	**0.61**			13.25	11.99	**1.26**		
	(0.17)	(0.04)	**(0.18)**	0.22	**0.07**	(0.29)	(0.06)	**(0.29)**	–0.18	**–0.25**
Rest of California	7.69	7.30	0.39	(0.19)	**(0.16)**	14.69	13.25	1.44	(0.33)	**(0.28)**
	(0.05)	(0.01)	(0.05)			(0.11)	(0.02)	(0.11)		
Seattle	7.87	7.02	**0.85**			14.09	12.18	**1.91**		
	(0.19)	(0.04)	**(0.19)**	0.86***	**0.57****	(0.40)	(0.09)	**(0.41)**	0.90**	**0.59**
Rest of Washington	7.45	7.46	–0.01	(0.22)	**(0.19)**	12.85	11.84	1.01	(0.42)	**(0.36)**
	(0.09)	(0.02)	(0.09)			(0.14)	(0.03)	(0.14)		

NOTE: Standard errors in parentheses. The double-difference estimates with controls come from separate ordinary least squares (OLS) regressions by city. Controls include experience, experience squared, sex, marital status, English fluency, immigration status, five ethnic categories, five education categories, and six occupation categories.

directly ask an individual if he or she is covered by a residency requirement. Instead, I infer that a municipal employee is covered if he or she lives and works in a city with a residency requirement. However, each city exempted current employees when it passed its residency law. As a result, a municipal employee who chooses to live in a city that has recently passed a residency requirement will be mistakenly coded as covered by the requirement. Fortunately, that miscoding is only an issue for the cities of Boston, Cleveland, Denver, and Memphis, each of which is examined separately using triple difference-in-differences estimators.[13]

The second complication comes in identifying city employees. The census data define local government as a single "class" of employers, not separating out city workers from county workers. To mitigate that limitation, I have selected cities that reside in counties with similar residency laws. For example, all of the cities included in the sample that have no residency requirements reside in counties without residency requirements. Likewise, cities included in the sample that have a residency requirement reside in counties that have similar requirements. Specifically, Denver is a consolidated city and county; therefore, it provides the cleanest example. Wayne County (Detroit), Shelby County (Memphis), Norfolk County (Boston), and Philadelphia County have residency requirements similar to their city counterparts. Finally, Cook County (Chicago), Cuyahoga County (Cleveland), and Milwaukee County have residency requirements, but they do not cover all employees.

Given the limitations of the census data, I define the cohort covered by a residency requirement as all city and county workers who live and work in a city with a residency requirement. Based on census industry and occupation codes, I exclude schoolteachers and other groups of employees that are not covered by city residency requirements. Ultimately, that definition will incorrectly code some municipal employees as covered by a residency requirement when, in fact, they are not. Given the population of the cities in the sample, the percentage of municipal workers incorrectly coded is likely to be small. However, to the extent that coding errors exist, the double and triple difference-in-differences estimates reported below will underestimate the effect of a residency requirement.

ESTIMATION APPROACH

BASIC PATTERNS

The basic empirical approach of this article is to compare the wages and private school enrollment rate of cohorts of individuals and families covered by residency requirements with those not covered. The purpose of the wage comparisons is not to establish that residency requirements cause municipal wage premiums; in fact, economic theory developed above suggests that a residency requirement, by itself, may not cause a municipal wage premium. The purpose of the wage comparisons is merely to establish which cities offer a municipal wage premium. In fact, the evidence shows that many cities—both those with and without a residency requirement—offer a municipal wage premium. Once the wage premium is established, the purpose of the private school enrollment comparisons is to determine the conditions under which a residency requirement increase the private school enrollment rate of municipal workers.

Wage estimates are calculated from workers between the ages of eighteen and sixty-five in each of the eighteen cities. Columns (1) and (2) in Table 1 list the average 1979 wage of municipal and nonmunicipal workers in cities that had a residency requirement, along with the average wage of workers in the remainder of each state. Columns (6) and (7) in Table 1 list the same averages for 1989. Columns (3) and (8) in Table 1 list the difference between the average wage of municipal and nonmunicipal workers, by city. In every city that had a residency requirement, except Memphis in 1989, municipal workers earned more, on average, than nonmunicipal workers did. For example, in 1979, Boston's municipal workers earned, on average, 90 cents more per hour than nonmunicipal workers did. Cleveland is not an exception, even through its municipal wage difference was –.25 in 1979, because it had not enacted its residency requirements until 1982. For every other city, except for Memphis in both years and Denver in 1979, the municipal wage difference is statistically significant at the 95 percent confidence level. Table 2 lists the same statistics for cities that did not have a residency requirement. With Baltimore and Louisville as exceptions, municipal employees in cities without a residency requirement also earned more, on average, than nonmunicipal work-

TABLE 3: 1979 and 1989 Private School Enrollment Rate in Cities with a Residency Requirement

	1979					*1989*				
City/State	*Municipal Workers (1)*	*Other Workers (2)*	*Difference (3)*	*Double Difference (4)*	*Double Difference (Probit) (5)*	*Municipal Workers (6)*	*Other Workers (7)*	*Difference (8)*	*Double Difference (9)*	*Double Difference (Probit) (10)*
Boston (1976) (varies by	39.55	31.24	**8.32**			42.16	28.23	**13.92**		
position)	(4.02)	(1.14)	**(4.18)**	8.28**	**0.39**	(4.50)	(1.29)	**(4.68)**	13.42***	**7.80****
Rest of Massachusetts	10.90	10.86	0.04	(3.10)	**(2.60)**	12.55	12.05	0.50	(3.69)	**(4.10)**
	(0.94)	(0.22)	(0.97)			(1.23)	(0.24)	(1.25)		
Chicago (1919) (at time	43.85	26.00	**17.85**			48.85	25.68	**23.17**		
of appointment)	(1.48)	(0.43)	**(1.54)**	16.05***	**4.29****	(1.86)	(0.54)	**(1.93)**	22.84***	**10.33*****
Rest of Illinois	15.65	13.85	1.80	(1.73)	**(1.84)**	12.00	11.68	0.32	(1.82)	**(2.29)**
	(1.06)	(0.18)	(1.08)			(0.94)	(0.17)	(0.95)		
Cleveland (1982) (six	36.36	24.40	**11.97**			41.44	25.24	**16.20**		
months after appointment)	(3.62)	(0.95)	**(3.75)**	9.61**	**4.00**	(4.17)	(1.19)	**(4.34)**	14.50***	**3.47**
Rest of Ohio	15.39	13.03	2.36	(3.08)	**(3.00)**	12.97	11.27	1.70	(3.30)	**(3.04)**
	(0.83)	(0.16)	(0.84)			(0.84)	(0.16)	(0.85)		
Denver (1979) (six months	12.50	19.59	**–7.09**			21.11	16.93	**4.18**		
after appointment)	(4.02)	(1.03)	**(4.14)**	–6.99**	**–3.02***	(3.98)	(1.12)	**(4.14)**	6.00**	**4.44***
Rest of Colorado	5.18	5.28	–0.10	(2.92)	**(1.31)**	4.05	5.86	–1.82	(2.92)	**(3.28)**
	(1.06)	(0.22)	(1.08)			(0.94)	(0.21)	(0.96)		
Detroit (1913) (at time of	38.57	18.02	**20.55**			33.33	16.17	**17.16**		
appointment)	(1.92)	(0.57)	**(2.00)**	19.73***	**5.92*****	(2.55)	(0.76)	**(2.66)**	17.48***	**8.11*****
Rest of Michigan	11.63	10.82	0.81	(1.89)	**(2.10)**	9.86	10.18	–0.32	(2.37)	**(2.83)**
	(0.88)	(0.17)	(0.90)			(0.91)	(0.17)	(0.92)		

(continued)

TABLE 3 (continued)

City/State	1979 Municipal Workers (1)	1979 Other Workers (2)	1979 Difference (3)	1979 Double Difference (4)	1979 Double Difference (Probit) (5)	1989 Municipal Workers (6)	1989 Other Workers (7)	1989 Difference (8)	1989 Double Difference (9)	1989 Double Difference (Probit) (10)
Memphis (1980) (six months after appointment)	24.83	24.01	**0.77**			12.40	12.55	**–0.15**		
	(3.51)	(0.85)	**(3.61)**	2.80	**1.10**	(3.01)	(0.80)	**(3.12)**	1.04	**0.02**
Rest of Tennessee	4.73	6.75	**–2.02**	(2.59)	**(1.98)**	5.95	7.15	**–1.20**	(2.70)	**(1.94)**
	(0.93)	(0.19)	**(0.95)**			(0.99)	(0.20)	**(1.01)**		
Milwaukee (1933) (at time of appointment)	44.02	29.20	**14.82**			40.37	24.32	**16.05**		
	(3.17)	(0.97)	**(3.32)**	13.91***	**5.10**	(4.16)	(1.21)	**(4.33)**	17.30***	**10.48****
Rest of Wisconsin	19.23	18.32	0.91	(3.24)	**(3.42)**	12.98	14.23	–1.26	(3.82)	**(4.72)**
	(1.43)	(0.30)	(1.47)			(1.36)	(0.26)	(1.39)		
Philadelphia (1952) (one year prior to appointment)	53.41	38.06	**15.35**			55.94	35.81	**20.13**		
	(1.99)	(0.65)	**(2.09)**	12.92***	**1.70**	(2.98)	(0.92)	**(3.12)**	19.19***	**7.29*****
Rest of Pennsylvania	18.67	16.23	2.43	(2.03)	**(1.99)**	14.38	13.45	0.94	(2.59)	**(2.87)**
	(1.10)	(0.19)	(1.12)			(1.15)	(0.18)	(1.16)		

NOTE: Standard errors in parentheses. A municipal family is one in which the head of the household works for the city or county government. The double-difference estimates with controls come from separate probit regressions by city. Controls include family income, marital status, number of children, age, five ethnic categories, and five education categories for both the head of the household and his or her spouse. The cities of Boston, Chicago, Denver, and Memphis each enacted a residency requirement around 1979, making it possible to estimate the triple difference-in-differences estimates presented in Tables 6 through 9.

*Statistically significant at the 90 percent confidence level. **Statistically significant at the 95 percent confidence level. ***Statistically significant at the 99 percent confidence level.

ers did. However, the average municipal wage difference in cities without a residency requirement is statistically significant for only nine out of twenty city/years.

Private school enrollment rate estimates are calculated from families with at least one elementary school-age child. A municipal family is defined as one in which the head of the household is a municipal employee.[14] Columns (1) and (2) in Table 3 list the 1979 private school enrollment rates for municipal and nonmunicipal families in cities that had a residency requirement, along with the averages for families in the remainder of each state. Columns (6) and (7) list the same averages for 1989. Columns (3) and (8) list the difference between the private school enrollment rates of municipal and nonmunicipal families, by city. In every city that had a residency requirement, except Memphis, municipal families enrolled their children in private school at a higher rate than nonmunicipal families did. For example, in 1989, the private school enrollment rate for Boston's municipal families was 13.92 percentage points higher than it was for Boston's nonmunicipal families. Notice that Denver's municipal private school enrollment rate in 1979, when there was no residency requirement, was 7.09 percentage points lower than the nonmunicipal rate. In 1989—ten years after Denver passed its residency requirement—Denver's municipal private school enrollment rate was 4.18 percentage points higher than the nonmunicipal rate. A similar same trend occurred in Boston and Cleveland but not in Memphis, which passed its residency requirement in 1980. In fact, despite the 1980 passage of a residency law, Memphis's municipal families did not become more likely, relative to nonmunicipal families, to enroll their children in private school. However, as shown in summary statistics in Table 1, Memphis's residency requirement did not appear to be accompanied by a municipal wage premium. Therefore, the summary statistics are consistent with the economic theory developed above: that is, for a residency requirement to affect private school enrollment, it must be accompanied by a municipal wage premium.

Table 4 lists the same private school enrollment rate statistics for cities that did not have a residency requirement. Municipal families enrolled their children in private school at a higher rate than nonmunicipal families did in nine out of twenty city/years. However,

TABLE 4: 1979 and 1989 Private School Enrollment Rate in Cities without a Residency Requirement

	1979					*1989*				
City/State	*Municipal Workers (1)*	*Other Workers (2)*	*Difference (3)*	*Double Difference (4)*	*Double Difference (Probit) (5)*	*Municipal Workers (6)*	*Other Workers (7)*	*Difference (8)*	*Double Difference (9)*	*Double Difference (Probit) (10)*
Baltimore	24.38	18.83	**5.55**			21.43	19.56	**1.87**		
	(2.78)	(0.74)	**(2.87)**	7.10**	**3.25**	(3.54)	(0.89)	**(3.65)**	4.30	**1.57**
Rest of Maryland	12.79	14.34	–1.55	(2.94)	**(3.02)**	12.36	14.80	–2.44	(3.58)	**(3.42)**
	(1.30)	(0.29)	(1.33)			(1.33)	(0.29)	(1.36)		
Jacksonville	17.29	17.53	**–0.24**			19.10	15.62	**3.48**		
	(3.30)	(0.79)	**(3.39)**	1.68	**1.43**	(3.86)	(0.76)	**(3.94)**	4.20	**3.04**
Rest of Florida	12.47	14.39	–1.92	(3.25)	**(3.13)**	11.69	12.42	–0.72	(3.69)	**(3.63)**
	(0.82)	(0.19)	(0.84)			(0.83)	(0.19)	(0.85)		
Louisville	27.27	26.09	**1.19**			25.00	22.73	**2.27**		
	(7.65)	(1.38)	**(7.78)**	–1.92	**–2.52**	(7.94)	(1.57)	**(8.09)**	3.34	**3.59**
Rest of Kentucky	12.18	9.07	3.11	(5.53)	**(2.86)**	8.51	9.58	–1.08	(6.01)	**(5.62)**
	(1.47)	(0.24)	(1.49)			(1.49)	(0.25)	(1.51)		
Minneapolis	15.71	17.68	**–1.97**			19.44	21.39	**–1.95**		
	(4.55)	(1.22)	**(4.71)**	–4.08	**–3.55**	(6.83)	(1.73)	**(7.05)**	–0.12	**–0.82**
Rest of Minnesota	14.26	12.15	2.11	(4.31)	**(3.13)**	8.24	10.07	–1.83	(5.35)	**(4.26)**
	(1.30)	(0.26)	(1.33)			(1.12)	(0.23)	(1.14)		
Newark	21.30	15.96	**5.34**			21.62	18.43	**3.19**		
	(3.56)	(0.96)	**(3.68)**	3.84	**4.75**	(6.40)	(1.34)	**(6.54)**	1.88	**–0.76**
Rest of New Jersey	18.80	17.30	1.50	(3.91)	**(4.36)**	17.60	16.29	1.31	(6.32)	**(5.72)**
	(1.00)	(0.23)	(1.03)			(1.11)	(0.23)	(1.13)		
Norfolk	9.84	17.78	**–7.94**			10.71	11.59	**–0.88**		
	(4.84)	(1.29)	**(5.01)**	–6.65*	**–2.19**	(6.05)	(1.16)	**(6.16)**	–0.27	**0.60**
Rest of Virginia	6.56	7.86	–1.29	(3.76)	**(2.28)**	7.47	8.08	–0.61	(5.37)	**(4.71)**
	(0.97)	(0.18)	(0.99)			(0.98)	(0.19)	(1.00)		

Portland	15.22	16.25	**–1.04**			10.26	11.99	**–1.73**		
	(5.44)	(1.14)	**(5.56)**	0.07	**0.22**	(5.19)	(0.96)	**(5.28)**	1.14	**2.16**
Rest of Oregon	5.29	6.40	–1.11	(4.14)	**(3.37)**	4.40	7.28	–2.87	(4.53)	**(4.88)**
	(1.25)	(0.25)	(1.28)			(1.27)	(0.27)	(1.30)		
Rochester	27.45	23.39	**4.06**			17.95	21.75	**–3.80**		
	(5.95)	(1.44)	**(6.12)**	–1.02	**–2.95**	(6.59)	(1.55)	**(6.77)**	–6.53	**–5.59**
Rest of New York	23.51	18.43	5.08	(5.69)	**(4.64)**	17.11	14.38	2.73	(5.87)	**(3.59)**
	(0.69)	(0.20)	(0.72)			(0.72)	(0.19)	(0.75)		
San Diego	10.56	12.10	**–1.53**			10.14	9.79	**0.36**		
	(2.73)	(0.60)	**(2.79)**	–3.00	**–2.97**	(2.53)	(0.45)	**(2.57)**	–2.38	**–0.80**
Rest of California	14.68	13.21	1.46	(3.00)	**(2.53)**	14.72	11.99	2.74	(2.91)	**(2.63)**
	(0.72)	(0.18)	(0.74)			(0.79)	(0.17)	(0.80)		
Seattle	18.42	21.98	**–3.56**			18.75	25.39	**–6.64**		
	(4.74)	(1.19)	**(4.88)**	–5.51	**–3.04**	(6.26)	(1.44)	**(6.42)**	–5.96	**–1.18**
Rest of Washington	8.71	6.77	1.94	(3.35)	**(1.60)**	6.47	7.15	–0.68	(4.09)	**(2.57)**
	(1.00)	(0.21)	(1.02)			(0.90)	(0.20)	(0.92)		

NOTE: Standard errors in parentheses. A municipal family is one in which the head of the household works for the city or county government. The double-difference estimates with controls come from separate probit regressions by city. Controls include family income, marital status, number of children, age, five ethnic categories, and five education categories for both the head of the household and his or her spouse.
*Statistically significant at the 90 percent confidence level. **Statistically significant at the 95 percent confidence level.

in none of those cities was the higher rate statistically significant at the 95 percent confidence level. Even in cities that offered a municipal wage premium but had no residency requirement, municipal families did not enroll their children in private school at higher rates than nonmunicipal families did. Thus, the summary statistics in Table 3 are also consistent with economic theory: that is, a municipal wage premium, by itself, will not affect private school enrollment.

DIFFERENCE-IN-DIFFERENCES

The raw averages reported in columns (1) through (3) and (6) through (8) of Tables 1 through 4 do not control for differences in the characteristics of municipal and nonmunicipal workers and families. One approach to control for differences across cohorts is to estimate a regression including control variables. Another approach is the compare the wages and private school enrollment rates of municipal families and nonmunicipal families living in the city, using families living outside the city as a control group. That approach is called the difference-in-differences estimator (see Card and Sullivan 1988) and has the advantage of implicitly controlling for the unobserved characteristics of the city and its public schools since those characteristics are the same for both municipal and nonmunicipal families. This article uses a combination of both approaches. To that end, let m_i be a dummy variable equal to 1 if the individual is a municipal worker in the wage equation or if the head of the household is a municipal worker in the private school enrollment equation. Furthermore, let y_i represent the dependent variable, either the individual's wage or a dummy equal to 1 if the family enrolls an elementary school-age child in private school. The average difference in wages and private school enrollment between municipal and nonmunicipal workers or families in a given city and year is defined as

$$\delta = \bar{y}_{m=1} - \bar{y}_{m=0}. \tag{1}$$

The single difference (δ), reported in column (3) of Tables 1 through 4, was discussed in the basic patterns section above. To calculate the difference-in-differences estimator, let c_i be a dummy variable equal

to 1 for individuals or families living in the city. The difference-in-differences estimator is defined as

$$\delta^2 = (\bar{y}_{c=1,m=1} - \bar{y}_{c=1,m=0}) - (\bar{y}_{c=0,m=1} - \bar{y}_{c=0,m=0}). \quad (2)$$

The first term on the right-hand side of (2) represents the change in the treatment group. Specifically, it equals the difference in the dependent variable between municipal and nonmunicipal workers or families living in the city. The second term on the right-hand side of (2) represents the change in the control group. Specifically, it equals the difference in the dependent variable between municipal and nonmunicipal workers or families living outside the city. The double difference estimate is obtained from the following regression:

$$y_i = \beta_0 + \beta_1 c_i m_i + \beta_2 c_i + \beta_3 m_i + \varepsilon_i, \quad (3)$$

where $\hat{\beta}_1 = \delta^2$. The difference-in-differences estimator can also control for differences in observed characteristics by including control variables in (3). For example, let X_i represent a vector of control variables. Including the control variables, (3) becomes

$$y_i = \beta_0 + \beta_1 c_i m_i + \beta_2 c_i + \beta_3 m_i + \beta_4 X_i + \varepsilon_i. \quad (4)$$

In the wage equations, X_i includes potential labor market experience,[15] experience squared, gender, marital status, a dummy for speaks English "very good," a dummy for first-generation immigrants, five racial categories, five education categories, and six occupation categories. Although they are not reported here, the estimated coefficients on the control variables have the expected signs and are virtually always statistically significant.

Tables 1 and 2 report the difference-in-differences estimates in columns (4) and (9), along with the difference-in-differences with controls estimates in columns (5) and (10). Table 1 indicates that every city that has a residency requirement, except Memphis, also offers a municipal wage premium that is statistically significant at the 99% confidence level. Of course, economic theory does not preclude municipal wage premiums in cities without a municipal residency requirement. Table 2 indicates statistically significant municipal wage

premiums in cities without a residency requirement for eight out of twenty city/years.

In the private school equations, the vector of control variables X_i includes the household variables of family income, marital status, and number of children. It also includes characteristics of both the head of the household and his or her spouse, such as age, five racial categories, and five education categories. In addition, the dependent variable, y_i, is dichotomous, and so (4) is estimated as a probit model.[16] The estimates of (3) and (4) reported in Table 3 support the hypothesis that a residency requirement, combined with a municipal wage premium, will increase the private school enrollment rate of a city's municipal workers. For example, according to the probit estimates, in 1979, municipal families living in cities with both a residency requirement and a municipal wage premium enrolled at least one child in private school at a rate that was .39 to 5.92 percentage points higher than did nonmunicipal families. In 1989, that range was 3.47 to 10.48 percentage points. The year that Denver passed its residency law, municipal families were 3.02 percentage points less likely than nonmunicipal families to enroll their children in private school. Ten years after Denver passed its residency law, that trend reversed itself. A similar trend occurred in Cleveland and Boston but not in Memphis. However, Memphis did not accompany its residency law with a municipal wage premium, and so, true to theory, the law did not appear to affect the city's municipal families private school enrollment rate.

Finally, columns (5) and (10) in Table 4 indicate that the difference-in-differences estimator with control estimates in cities that do not have a residency law is often negative and never statistically significant. That is true even for cities that offer a municipal wage premium but do not have a residency requirement. Thus, consistent with theory, there is no evidence that offering a wage premium, by itself, will influence neighborhood choice.

CONSISTENCY OF THE DIFFERENCES ESTIMATOR

One of the requirements for the consistency of the difference-in-differences estimator is that selection into the treatment group be orthogonal to, in this case, the decision to enroll children in private

school. Cities that offer a municipal wage premium must ration municipal jobs by some mechanism other than price. Unfortunately, it is unclear what that rationing mechanism would be. While it seems unlikely that cities would intentionally offer municipal jobs to families that prefer private schools, the rationing mechanism could, nevertheless, be unintentionally correlated with that preference. If that is the case, then the difference-in-difference estimates will not be consistent. Thus, a critical assumption of the difference-in-difference estimator is that the rationing mechanism of municipal jobs is orthogonal to a family's decision to enroll its children in private school.

TRIPLE DIFFERENCE-IN-DIFFERENCES

The double-difference estimates reported in Tables 1 through 4 exploit differences inside and outside a city but not across time. A better approach is to track municipal workers living in a given city before and after it passed its residency law, using nonmunicipal workers as a control group. That approach is possible for the cities of Denver, Cleveland, Memphis, and, to a lesser extent, Boston, which passed their residency laws in 1979, 1982, 1980, and 1976, respectively. The city of Denver provides the best example for two reasons. First, Denver's residency law was enacted in 1979, which happens to correspond with the 1980 census. Second, Denver is a consolidated city and county, which minimizes the possibility of coding errors. Therefore, it is possible to track the changes in the private school enrollment rate for municipal and nonmunicipal families before and after the residency law went into effect. That approach leads to a difference-in-differences estimator. Furthermore, tracking the same changes using the rest of the state as a control group leads to a triple difference-in-differences estimator. The triple difference-in-differences estimator has the added advantage of implicitly controlling for school characteristics as well as anything else that remains constant between the control and treatment groups. For example, let c_i, m_i, and X_i be defined as above. Furthermore, let t_i be a dummy variable equal to 1 for the year 1989. The difference-in-differences estimator inside the city is defined as

$$\delta^2_{c=1} = (\bar{y}^{89}_{c=1,\,m=1} - \bar{y}^{79}_{c=1,\,m=1}) - (\bar{y}^{89}_{c=1,\,m=0} - \bar{y}^{79}_{c=1,\,m=0}). \tag{5}$$

The first term on the right-hand side of (5) represents the treatment group and is equal to the average change in the private school enrollment rate for city municipal employees between 1979 and 1989. The second term on the right-hand of (5) represents the control group and is equal to the average change in the private school enrollment rate for city nonmunicipal employees between 1979 and 1989. Similarly, the double-difference estimate for the remainder of the state is defined as

$$\delta^2_{c=0} = (\bar{y}^{89}_{c=0,\,m=1} - \bar{y}^{79}_{c=0,\,m=1}) - (\bar{y}^{89}_{c=0,\,m=0} - \bar{y}^{79}_{c=0,\,m=0}). \tag{6}$$

The double-difference estimates (5) and (6) are obtained from the following regression:

$$y_i = \beta_0 + \beta_1 t_i m_i + \beta_2 t_i + \beta_3 m_i + \varepsilon_i, \tag{7}$$

where (7) is estimated on observations inside the city and again on observations outside the city. The triple difference-in-differences estimate is defined as

$$\delta^3 = \delta^2_{c=1} - \delta^2_{c=0} \tag{8}$$

and is obtained from the following regression:

$$y_i = \beta_0 + \beta_1 t_i m_i c_i + \beta_2 t_i + \beta_3 m_i + \beta_4 c_i + \beta_5 t_i m_i + \beta_6 t_i c_i + \beta_7 m_i c_i + \varepsilon_i, \tag{9}$$

where $\hat{\beta}_1 = \delta^3$. Including controls, (9) becomes

$$\begin{aligned} y_i = {} & \beta_0 + \beta_1 t_i m_i c_i + \beta_2 t_i + \beta_3 m_i + \beta_4 c_i + \beta_5 t_i m_i \\ & + \beta_6 t_i c_i + \beta_7 m_i c_i + \beta_8 X_i + \varepsilon_i. \end{aligned} \tag{10}$$

Tables 5 through 8 list the double and triple difference-in-differences estimates of the impact of a residency requirement on private school enrollment rates in Denver, Boston, Cleveland, and Memphis.[17] Denver, Boston, and Cleveland each offered a municipal wage premium. Memphis did not. The double and triple difference-in-differences estimates support the hypothesis that a residency requirement, combined with a municipal wage premium, will increase the private school enrollment rate of municipal families. For example,

TABLE 5: Double- and Triple-Difference Estimates of the Impact of Residency Requirements on Private School Enrollment Rates in Denver, with and Without Controls

	Denver (1979)			*Rest of Colorado*		
	Municipal Workers	*All Other Workers*	*Difference*	*Municipal Workers*	*All Other Workers*	*Difference*
1979	12.5	19.6	–7.1*	5.2	5.3	–0.1
	(4.0)	(1.0)	(4.1)	(1.1)	(0.2)	(1.1)
	[96]	[1,470]		[444]	[10,285]	
1989	21.1	16.9	4.2	4.0	5.9	–1.8*
	(4.0)	(1.1)	(4.1)	(0.9)	(0.2)	(1.0)
	[90]	[1,140]		[618]	[11,938]	
Difference	**8.6**	–2.7*		–1.1	0.6*	
	(5.5)	(1.5)		(1.3)	(0.3)	
Double difference (δ^2)		**11.3***			–1.7	
		(5.9)			(1.5)	
Triple difference (δ^3)			**13.0*****			
			(4.1)			
With controls (OLS)			**12.9*****			
			(4.1)			
With controls (probit)			**11.9****			
			(7.1)			

NOTE: Standard errors in parentheses. Sample size in brackets. Controls include family income, marital status and number of children, age, five ethnic categories, and five education categories for both the head of the household and his or her spouse. OLS = ordinary least squares.
*Statistically significant at the 90 percent confidence level. **Statistically significant at the 95 percent confidence level. ***Statistically significant at the 99 percent confidence level.

during the 1980s, Denver's municipal families increased their private school enrollment rate by 8.6 percentage points (see Table 5). Over that same period, Denver's nonmunicipal families reduced their private school enrollment rate by 2.7 percentage points. Therefore, the double-difference estimate suggests that Denver's residency law increased the likelihood that a municipal family will enroll a child in private school by 11.0 percentage points. That increase is statistically significant at the 90 percent confidence level. Municipal and nonmunicipal families did not follow the same trend in the rest of Colorado. The double-difference estimate for the rest of Colorado is –1.7 and is not statistically significant. Thus, the triple-difference estimate suggests that Denver's municipal residency law and wage premium

TABLE 6: Double- and Triple-Difference Estimates of the Impact of Residency Requirements on Private School Enrollment Rates in Boston, with and Without Controls

	Boston (1976)			*Rest of Massachusetts*		
	Municipal Workers	*All Other Workers*	*Difference*	*Municipal Workers*	*All Other Workers*	*Difference*
1979	39.6	31.2	8.3**	10.9	10.9	0.0
	(4.0)	(1.1)	(4.2)	(0.9)	(0.2)	(1.0)
	[134]	[1,668]		[1,092]	[20,173]	
1989	42.2	28.2	13.9***	12.6	12.1	0.5
	(4.5)	(1.3)	(4.7)	(1.2)	(0.2)	(1.3)
	[102]	[1,229]		[701]	[18,962]	
Difference	**2.6**	–3.0*		1.7	1.2***	
	(6.5)	(1.7)		(1.5)	(0.3)	
Double difference (δ^2)		**5.6**			0.5	
		(6.3)			(1.6)	
Triple difference (δ^3)			**5.1**			
			(4.8)			
With controls (OLS)			**8.6***			
			(4.7)			
With controls (probit)			**7.3**			
			(5.4)			

NOTE: Standard errors in parentheses. Sample size in brackets. Controls include family income, marital status and number of children, age, five ethnic categories, and five education categories for both the head of the household and his or her spouse. OLS = ordinary least squares.
*Statistically significant at the 90 percent confidence level. **Statistically significant at the 95 percent confidence level. ***Statistically significant at the 99 percent confidence level.

increased the likelihood that a municipal family will enroll a child in private school by 13.0 percentage points, which is statistically significant at the 99 percent confidence level. When family income and other demographic controls are included, the triple-difference estimate becomes 11.9 and remains statistically significant at the 95 percent confidence level. Therefore, controlling for family income, the triple-difference estimate suggests that Denver's residency law and wage premium doubled the likelihood that a municipal family will enroll a child in private school.

With a double-difference estimate of 5.6, a triple-difference estimate of 5.1, and a triple difference with controls estimate of 7.3, Boston reports smaller estimates than Denver (see Table 6). Boston

TABLE 7: Double- and Triple-Difference Estimates of the Impact of Residency Requirements on Private School Enrollment Rates in Cleveland, with and Without Controls

	Cleveland (1982)			*Rest of Ohio*		
	Municipal Workers	*All Other Workers*	*Difference*	*Municipal Workers*	*All Other Workers*	*Difference*
1979	36.4	24.4	12.0***	15.4	13.0	2.3***
	(3.6)	(1.0)	(3.7)	(0.8)	(0.2)	(0.8)
	[143]	[2,078]		[1,673]	[42,066]	
1989	41.4	25.2	16.2***	13.0	11.3	1.7**
	(4.2)	(1.2)	(4.3)	(0.8)	(0.2)	(0.9)
	[111]	[1,363]		[1,434]	[37,582]	
Difference	**5.1**	0.8		–2.4*	–1.8***	
	(6.2)	(1.5)		(1.3)	(.2)	
Double difference (δ^2)		**4.2**			–0.6	
		(5.7)			(1.2)	
Triple difference (δ^3)			**4.9**			
			(4.5)			
With controls (OLS)			**2.8**			
			(4.4)			
With controls (probit)			**2.5**			
			(3.6)			

NOTE: Standard errors in parentheses. Sample size in brackets. Controls include family income, marital status and number of children, age, five ethnic categories, and five education categories for both the head of the household and his or her spouse. OLS = ordinary least squares.
*Statistically significant at the 90 percent confidence level. **Statistically significant at the 95 percent confidence level. ***Statistically significant at the 99 percent confidence level.

passed its residency law in 1976, four years prior to 1979, which may make it inappropriate to consider families in 1979 as a control group, not covered by the law. However, Boston's residency law exempted current employees; as a result, by 1979, the law only covered a small fraction of employees. Regardless, in 1979, Boston's municipal families were 8.3 percentage points more likely to enroll a child in private school than Boston's nonmunicipal families. In the following ten years—while the law covered more of Boston's municipal workers—municipal families became more likely to enroll their children in private school while nonmunicipal families became less likely. That trend was not seen in remainder of Massachusetts.

TABLE 8: Double- and Triple-Difference Estimates of the Impact of Residency Requirements on Private School Enrollment Rates in Memphis, with and Without Controls

	Memphis (1980)			*Rest of Tennessee*		
	Municipal Workers	*All Other Workers*	*Difference*	*Municipal Workers*	*All Other Workers*	*Difference*
1979	24.8	24.1	0.8	4.7	6.8	–2.0***
	(3.5)	(0.8)	(3.6)	(0.9)	(0.2)	(1.0)
	[149]	[2,548]		[719]	[16,940]	
1989	12.4	12.6	–0.2	6.0	7.2	–1.2
	(3.0)	(0.8)	(3.1)	(1.0)	(0.2)	(1.0)
	[121]	[1,705]		[672]	[16,778]	
Difference	**–12.4****	–11.5***		1.2	0.4	
	(4.8)	(1.2)		(1.2)	(0.3)	
Double difference (δ^2)		–0.9			0.8	
		(4.9)			(1.4)	
Triple difference (δ^3)			**–1.8**			
			(3.8)			
With controls (OLS)			**–2.5**			
			(3.6)			
With controls (probit)			**–0.7**			
			(2.3)			

NOTE: Standard errors in parentheses. Sample size in brackets. Controls include family income, marital status and number of children, age, five ethnic categories, and five education categories for both the head of the household and his or her spouse. OLS = ordinary least squares.
**Statistically significant at the 95 percent confidence level. ***Statistically significant at the 99 percent confidence level.

The city of Cleveland reports smaller estimates than Denver or Boston, with a double-difference estimate of 4.2, a triple-difference estimate of 4.9, and a triple difference with controls estimate of 2.5. Controlling for income, the triple-difference estimator suggests that Cleveland's residency law increased the likelihood that a municipal family will enroll a child in private school by 6.7 percent. The smaller effect in Cleveland, however, may be because the city did not enact its residency law until 1982, at which time it exempted current employees. As a result, by 1989, many of Cleveland's municipal workers were still not covered by the requirement.

Finally, Memphis enacted its residency law in 1980, at which point its municipal employees were earning less, on average, than its

nonmunicipal employees, although they were doing better than their municipal counterparts in the rest of Tennessee. During the 1980s, municipal wages in Memphis increased less than nonmunicipal wages did. Thus, Memphis did not accompany its municipal residency requirement with a municipal wage premium. As a result, the private school enrollment rates for Memphis's municipal families followed the same trend as it did for Memphis's nonmunicipal families. Both the double- and triple-difference estimates are negative and insignificant. True to theory, enacting a municipal residency law in a city that does not offer a municipal residency requirement does not affect private school enrollment rates.

CONCLUSION

Cities use comprehensive residency requirements to attract middle-class families into to city or to discourage urban flight. To achieve that goal, the model developed in this article suggests that a residency law must be accompanied by a municipal wage premium that is paid in addition to any citywide wage premium. While a residency requirement itself will not cause a municipal wage premium, city officials may be willing to pay premium wages as a disguised subsidy to families living in the city.

Using census data on families living in eighteen major cities, I find evidence that comprehensive residency requirements generally occur in cities that offer a municipal wage premium of nearly $1 per hour. In addition, controlling for income and other family characteristics, double and triple difference-in-differences estimates suggest that a residency requirement—when accompanied by a wage premium—will increase the likelihood that a municipal family will enroll a child in private school. The one city that did not accompany its residency law with a municipal wage premium, Memphis, was also the only city that had a residency requirement but saw no effect on the private school enrollment rate of its municipal families. Similarly, several cities that offered a municipal wage premium but did not enact a residency law also saw no effect on the private school enrollment rate of its municipal families. Thus, the empirical results suggest that offering a wage pre-

mium, by itself, or enacting a residency requirement, by itself, will not attract middle-class families into the city. However, by combining the two, city officials may be able to successfully use public employment to attract families into the city and prevent them from leaving.

NOTES

1. This estimate comes from the 1997 Personnel Practices Inventory, a survey of 428 jurisdictions conducted by the International Personnel Management Association.

2. There may be other political reasons, such as taxpayers who believe that a city should spend its tax revenue on residents, even if there is no financial impact in doing so.

3. Alternatively, some cities have imposed response time standards that allow city employees to live anywhere, provided that they can promptly respond to emergencies. For example, cities in California and Texas have adopted "reasonable distance" standards because state law forbids a residency requirement.

4. Even if true, it remains unclear why a municipality would not simply hire and promote more productive officers, rather than impose a strict residency requirement on itself. In general, restricting a city's choice set would not result in an increase in productive efficiency. However, legal and political realities might necessitate a strict law over a more flexible fiscal policy.

5. Schoolteachers are district employees and not generally covered by city or county residency requirements. However, some districts do impose separate district residency requirements on its teachers.

6. A federal court order that mandated school busing helped fuel the dramatic decrease in Denver's public school enrollment.

7. Of course, the bid rent functions could be drawn to show the opposite result, but in that case, the city probably would not be considering policies to attract middle-class families into the city.

8. That is an important distinction in the empirical section, which will not attempt to establish that residency requirements cause municipal wage premiums.

9. While this article looks for wage premiums, a city could also accompany a residency requirement with nonwage amenities, and so a residency law could attract families to the city without a wage premium. While some local amenities are under the control of city officials, others are not (see Gyourko and Tracy 1991). A residency requirement combined with an amenity will affect neighborhood choice only if the amenity is not also available to nonmunicipal workers living in the city.

10. Gonzalez, Mehay, and Duffy-Deno (1991) also discuss a model in which labor unions create an excess supply of municipal workers. Hirsch and Rufolo (1985) point out that a residency requirement can diminish a labor union's power if municipal workers are less likely to strike against their own communities.

11. Mehay and Seiden (1986) point out that a residency requirement can affect city expenditures by altering the preferences of the median voter. Even if the law fails to attract new families to the city, a private-sector employee's preference for public spending may change when he or she becomes a municipal worker.

12. Several cities have seen the popularity of their residency requirement wane once it became clear that rising housing costs would force them into directly subsidizing municipal workers. For example, in 1997, the city of Denver announced a housing subsidy program for low-income city workers. A year later, Denver voters repealed its residency law.

13. Actually, the miscoding is not a problem for the wage estimates if the residency requirement equally affects the wages of all municipal workers. However, miscoding can reduce the estimated affect of a residency requirement on private school enrollment.

14. The results do not change if a municipal family is defined as one in which the head of the household or his or her spouse is a municipal employee.

15. Potential labor market experience equals age minus years in school minus six.

16. A linear probability model produces estimates that are slightly larger and even more statistically significant.

17. Triple difference-in-differences estimates with controls were calculated for every city in the sample. The estimates were statistically insignificant for every city that did not have a residency requirement.

REFERENCES

Alesina, Alberto, Reza Baqir, and William Easterly. 1998. Redistributive public employment. Working Paper 6746, National Bureau of Economic Research, Cambridge, MA.

Alonso, William. 1964. *Location and land use: Toward a general theory of land rent*. Cambridge, MA: Harvard University Press.

Black, Sandra. 1999. Do better schools matter? Parental valuation of elementary education. *Quarterly Journal of Economics* 114:577-99.

Card, David, and Daniel Sullivan. 1988. Measuring the effects of subsidized training programs on movements in and out of employment. *Econometrica* 56:497-530.

Getz, M. 1979. *The economics of urban fire departments*. Baltimore: Johns Hopkins University Press.

Gonzalez, R. A., Steven L. Mehay, and Kevin Duffy-Deno. 1991. Municipal residency laws: Effects on police employment, compensation, and productivity. *Journal of Labor Research* 12:439-52.

Gyourko, Joseph, and Joseph Tracy. 1991. The structure of local public finance and the quality of life. *Journal of Political Economy* 99:774-806.

Hirsch, Werner Z., and Anthony M. Rufolo. 1985. Economic effects of residence laws on municipal police. *Journal of Urban Economics* 17:335-48.

Mehay, Stephen L., and Kenneth P. Seiden. 1986. Municipal residency laws and local public budgets. *Public Choice* 48:27-35.

Oates, Wallace E. 1969. The effects of property taxes and local public spending on property values: An empirical study of tax capitalization and the Tiebout hypothesis. *Journal of Political Economy* 77:957-71.

O'Brien, Kevin M. 1997. Do municipal residency laws affect labor market outcomes? *Urban Studies* 34:1759-69.

Smith, R. 1980. Police attitudes and performance: The impact of residency. *Urban Affairs Quarterly* 15:317-34.

Tiebout, Charles M. 1956. A theory of local expenditures. *Journal of Political Economy* 64:416-24.

Valletta, Robert G. 1993. Union effects on municipal employment and wages: A longitudinal approach. *Journal of Labor Economics* 12:545-74.

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