Demography and Population Loss from Central Cities, 1950-2000

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Abstract: The share of metropolitan residents living in central cities declined dramatically from 1950 to 2000. We show that, if not for a series of demographic factors – notably renewed immigration, delayed child bearing, and a decline in the share of households headed by veterans, who are eligible for military housing benefits – cities would have contracted even further over this period. We provide causal estimates of the relationship between the living in the central city and the presence of children in the household using the occurrence of twins as an exogenous event and of the relationship between the living in the central city and veteran status, relying on a discontinuity in the probability of military service during and after the mass mobilization for World War II. Demographic trends were only strong enough to stanch the flow of population from cities, not to generate an urban revival.

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I. Introduction

American households have been steadily leaving central cities over the past fifty years to settle in outlying suburbs. The share of metropolitan residents residing in the central city fell from 56 percent in 1950 to 32 percent in 2000. The growth of the suburbs intensified residential segregation by race and income (Fischer, et al., 2004). Because many public goods are locally financed, suburbanization also leads to disparities in access to locally-provided public services, notably education, and can impose a negative fiscal externality on remaining city residents as the urban tax base contracts (Baumol, 1967; Benabou, 1996).

Many economic, political and sociological trends have contributed to the decentralization of metropolitan population. These factors include the diffusion of the automobile and associated road building programs, which reduced the time cost of commuting to the central city (Baum-Snow, 2007); federal subsidies for the purchase of single-family homes through the underwriting of mortgages and the mortgage interest deduction (Jackson, 1985); the relocation of employment opportunities to the suburban ring (Boustan and Margo, 2010); and changes in the perceived benefits of urban residence due to racial diversity, income disparities between cities and suburbs, and heightened crime rates (Cullen and Levitt, 1998; Boustan, 2007, 2010).

Over the past decade, it has become conventional wisdom that, after fifty years of suburbanization, American households are beginning to return to central cities. This urban revival is often attributed to demographic forces, principally the delay of marriage and child rearing and the aging of the baby boom generation.[1] While we find no evidence of a recent urban

[1] A typical example of the journalistic emphasis on urban revival is Christopher Leinberger's (2008) statement in *The Atlantic Monthly*: "For 60 years, Americans have pushed steadily into the suburbs, transforming the landscape and (until recently) leaving cities behind. But today the pendulum is swinging back toward urban living." This return to the city is frequently ascribed to demography. Writing in *The New Republic*, Alan Ehrenhalt (2008) lists the "increased propensity to remain single, the rise of cohabitation, the much later age at first marriage for those who do marry, the smaller size of families for those who have children, and at the other end, the rapidly growing number of

revival in the Census data, our results confirm the intuition that demographic forces have sustained the population of central cities.

In this paper, we show that demography has been a partial counter-balance to the forces propelling households out of central cities. We identify four demographic shifts that have bolstered city population over the past fifty years: the growing share of the metropolitan population living in a household headed by an immigrant or an African-American; the declining share in a household headed by a veteran of the Armed Forces; and the declining share of households containing a child under the age of 18. If not for these demographic factors, the number of city residents would have declined 30 percent more than it did. Together, these forces were only strong enough to stanch the flow of population out of cities, not to reverse it.

We begin the paper with a parsimonious model of the demographic determinants of living in the central city, conditional on residing in a metropolitan area. We find that African-Americans and the foreign born are more likely to live in central cities, as are households without children. Veterans, on the other hand, are less likely to live in central cities, perhaps because of access to housing benefits that favor suburban homeownership. Interestingly, we find little evidence that life-cycle mobility of the large Baby Boom cohort from city to suburb (and back again) has had a quantitatively meaningful effect on residential patterns. This finding reinforces Nelson (1988) and Frey (1993)'s conclusion that hopes for "boomer-initiated 'gentrification'" are misplaced.

Unlike race and nativity, which are exogenous from the perspective of the individual household, optimal family size can be influenced by a household's selected residential location. Therefore, the relationship between the presence of children in a household and place of

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healthy and active adults in their sixties, seventies and eighties" as forces that pull the population toward "central cities over distant suburbs."

residence is potentially subject to reverse causality .For example, the family-friendly peer networks and infrastructure in the suburbs may encourage households to bear additional children. Furthermore, both child bearing and veteran status may be associated with unobserved household characteristics – such as wealth in the previous generation – that may otherwise be correlated with the probability of living in the suburbs. To address these concerns, we employ instrumental variables to estimate the causal effect of having an additional child or serving in the military on place of residence. In particular, we instrument for household size with the occurrence of twins on either the first or the second birth (Angrist and Evans, 1998). To identify the causal effect of military service, we compare birth cohorts who came of age during and just after the mass mobilization for World War II (Bound and Turner, 2002; Page, 2008; Fetter, 2010). For example, 83 percent of white, native-born men who were born in 1927 served in the US Armed Forces at some point, whereas men who were born just two years later in 1929 had only a 70 percent chance of being a veteran.

Our IV estimates suggest that the causal effects of military service and of having a second child are larger than OLS estimates would suggest. In other words, in comparing our OLS and IV estimates, it appears that both veterans and large families are selected on attributes, such as low socio-economic status, that are positively correlated with living in the central city. This pattern is consistent with the availability of draft deferments for the highly-skilled who were attending college or who were employed in an essential war industry. However, we note that the estimates from the IV specification are somewhat imprecise and, therefore, can just barely be statistically distinguished from their OLS counterparts.

The final section of the paper uses the estimated determinants of living in the central city to consider a series of demographic counterfactuals. Overall, we find that, absent these demographic forces, the share of the metropolitan population living in the central city would have declined by an additional 6 percentage points or by 30 percent. In order of quantitative importance, city population was bolstered most by a growth in the population of black and foreign-born residents, and then by the aging out of cohorts who served in World War II and an increase in childless households.

We emphasize that our counterfactual method will not account for the possibility that housing prices responded to the growth of city population. In particular, as demographic forces encouraged a greater number of households to settle in central cities, housing prices in the city may have risen relative to their suburban counterparts. As relative city prices increased, some households that would otherwise have selected to live in the city may have decided to live in the suburbs instead. Therefore, our counterfactuals will provide upper-bound estimates of the effect of demographic forces on city growth.

II. Residential mobility and the decline of central city population

A. Trends in city and suburban population, 1950-2000

Figure 1a documents trends in city and suburban growth from 1940 to 2000. Over the second half of the twentieth century, the share of metropolitan residents who lived in the central city fell from 56 percent to 32 percent. In the 1940s and 1950s, the relative decline in city population was driven by high rates of suburban growth. Although total city population grew a respectable eight to ten percent per decade in this period, the suburbs grew at the phenomenal rate of 35 to 50 percent. Since the 1960s, cities have continued to experience slow but steady population growth, with the exception of the decade of the 1970s, when city population declined by over 10 percent. However, throughout this period, the growth in city population was always slower than that in the surrounding suburbs.

Even in the 1990s, we see no evidence of urban revival, in the sense that cities were growing faster than their surrounding suburbs.[2] However, we note that many downtown areas, which historically have been industrial or commercial centers with little residential development, experienced rapid population growth in the 1990s. Birch (2005).reports that the average downtown grew by 13 percent in the 1990s – faster than the rest of the central city and the typical suburban area. However, by Birch's definition, the downtown core consists of a few Census tracts in each metropolitan area and, therefore, cannot be taken as a bellwether of general urban health.

The 93 metropolitan areas represented in Figure 1a are anchored by two very different types of cities: 55 cities experienced positive population growth from 1940 to 2000 while 38 declined in size over this period. Figures 1b and 1c display separate patterns of growth by city type. Despite differing *levels* of growth over this period, the *time pattern* of city and suburban growth is very similar across these two groups. The fastest rates of city growth were posted in the 1940s, when expanding cities grew by nearly 30 percent and declining cities experienced their last decade of positive growth. Yet, despite rapid urban growth in the 1940s, the suburban ring grew even faster in both cases, leading the share of the metropolitan population living in the central city to decline. The 1970s was the low-point of city growth for both city types, during which even the expanding cities lost population. In the 1980s and 1990s, expanding cities again experienced positive growth and the rate of population loss slowed in declining cities. Overall,

[2] We are not the first scholars to point out that there is little empirical basis for the notion of a recent urban revival. Rappaport (2003) documents that, with the exception of a few large, coastal cities such as New York, Boston and San Francisco, urban areas did not experience a reversal of fortunes in the past decade; rather, most cities either grew continuously or declined continuously since 1950.

the share of the metropolitan population living in the central city declined at a similar pace in both cities types, falling from around 60 percent in 1950 to around 35 percent in 2000.

B. Related literature

This paper contributes to two related literatures – one on the causes of urban decline and population decentralization and another on the determinants of residential mobility. Studies in both of these areas focus on the effects of race, nativity and household structure on residential location.

There is an extensive body of work documenting that African-Americans and the foreign-born are more likely than native-born, non-Hispanic whites to live in central cities (Massey and Denton, 1993; Portes and Rumbaut, 2001; Boustan, forthcoming). Blacks moved in large numbers from the rural South to metropolitan areas from 1940 to 1970 (Boustan, 2010). During this period, over 80 percent of black migrants settled in central cities. Although black suburbanization began in earnest in the 1970s, prompted by the growth of the black middle class and the passage of the federal Fair Housing Act in 1968, sizeable gaps in the residential locations of blacks and whites remain (Frey, 1985; Schneider and Phelan, 1993). In 2000, 61.6 percent of the black metropolitan population still lived in central cities, compared to 26.1 percent of whites.

Since the passage of the Immigration and Nationality Act of 1965, the large inflow of immigrants to central cities has partially compensated for some of the population loss due to the suburbanization of native-born whites (Martin and Midgley, 2003; Singer, 2004; Frey, 2005). Recent scholarship has emphasized that, unlike European immigrants of the early twentieth century, new immigrants groups are increasingly "bypassing central cities and settling directly in suburbs" (Alba and Logan, 1991, p. 432). Yet, it is still the case that immigrants from every sending country are much more likely than native-born whites to live in the central city; in 1990, only 33 percent of white metropolitan households lived in the city, compared to numbers ranging from 40.8 for Asian Indians to 82.9 percent for Dominicans (Alba, et al. 1999).

A portion of these residential differences can be explained by group disparities in socio-economic status. In general, poor households are more likely to live in cities (Glaeser, Kahn, and Rappaport, 2008). However, differences in residential location by race and nativity remain large even after controlling for income and education. This residual gap can be explained, in part, by the historical processes by which immigrant enclaves and majority black neighborhoods developed within central cities. To this day, some blacks and immigrants self-select into these areas to take advantage of familial or social networks or to enjoy community-specific amenities (Thernstrom and Thernstrom, 1997; Ihlanfeldt and Scafidi, 2002). In addition, African-Americans and the foreign-born continue to face barriers that preclude suburban residence, including limited access to mortgage finance (Munnell, et al., 1996; Berkovec, et al., 1996; Ondrich, Stricker and Yinger, 1999).

The literature is also clear that household structure is an important determinant of residential location. Married couples are more likely than other household types to live in the suburbs or to move to the suburbs in a given period conditional on living in a central city (Frey and Kobrin 1982; Alba and Logan, 1991; South and Crowder, 1997). The preference among married couples for suburban living is likely related to the association between marriage and child-bearing. A large majority of married couples either currently live with children, have lived with children in the past, or are planning for children in the future. Therefore, married couples may place a higher premium on the larger lot sizes and the bundle of public goods, including higher quality public schools, available in the suburbs. The presence of children in a household is itself positively related to *living in* the suburbs though, in some cases, it is negatively correlated with the likelihood of *moving to* the suburbs from elsewhere. A long literature, beginning with Rossi (1955), has shown that households with children are less likely to move overall and, conditional on moving, are more likely to move short distances (see also Long, 1972).

To the best of our knowledge, the effect of declining veteran share on residential locations has gone largely unnoticed by scholars and urban policy makers (Fetter, 2010 is one recent exception). The Servicemen's Readjustment Act of 1944, commonly known as the GI Bill, included a mortgage program that allowed veterans to purchase a home with little or no down payment. The Veterans' Administration assisted 2.1 million veterans in purchasing a home between 1946 and 1950 alone, the majority of which were located in suburban areas (Bennett, 1996, p. 24). The civilian market for credit also expanded during this period, driven by the creation of the Federal Housing Administration in the 1930s.[3] Despite the expansion of credit in the civilian market, Vigdor (2006) finds that eligible veterans were still seven percentage points more likely than non-veterans to own a home in 1970.

Journalists have speculated that the aging of the baby boom generation will lead retired couples to return to cities. Demographers, however, have been more skeptical. Frey (2007), for example, argues that seniors are more likely to "age in place." Mobility rates among the elderly are very low; less than five percent of Americans older than 65 move in a given year, compared to nearly 30 percent of those in their early twenties. As a result, there is little increase in the probability of living in the central city after either age 55 or age 65. A related literature points out that the elderly have high rates of home ownership; in 2003, 78 percent of Americans over

[3] The Federal Housing Administration (FHA) began insuring mortgages initiated by private lenders in the mid-1930s. As a result, mortgage rates fell from 6-8 percent in the 1920s to 2-3 percent in the 1940s and the average down payment declined from around half to around 10 percent of the value of the property (Jackson, 1985, p. 205).

the age of 75 owned their own home (Jones, 1997; Myers and Ryu, 2008; Painter and Lee, 2009). Contrary to the life-cycle savings model, there is no empirical evidence that seniors sell their home in order to dis-save as they enter old age. Rather, home sales among the elderly are prompted by life transitions, including the death of a spouse or a change in health status.

III. The demographic correlates of living in the central city

A. Estimating equation

The goal of this paper is to examine whether demographic trends are quantitatively large enough to have reversed the flow of population from central cities. This section begins by presenting the demographic correlates of living in the central city. The analysis is based on individual records from the 1960 to 1980 Censuses compiled by the Integrated Public Use Micro-data Series or IPUMS (Ruggles, et al., 2008). We selected these years because they are in the middle of the time period of interest, though we also present results from 1980 to 2000 for comparison below. Our sample includes all residents of metropolitan areas for whom place of residence (central city versus suburbs) is reported in the data.[4] We can identify place of residence for 76 percent of the metropolitan sample in 1960 and 83 percent of the sample in 1980.[5] This fraction increases over time both because cities get larger and because the Census privacy requirements were relaxed.

Our dependent variable is an indicator equal to one if the respondent lives in a central city. We pool individual records from 1960 to 1980 and estimate:

[4] IPUMS does not report central city status if so doing would allow users to identify geographic areas with fewer than 250,000 residents in 1960 and 1970 or 100,000 residents in 1980. In 1960, this restriction precludes the use of observations from 14 states with primarily rural populations (for example, North Dakota and Utah).

[5] Ideally, we would build a consistent sample of large metropolitan areas for which place of residence is reported in all years. However, in 1960, IPUMS does not report metropolitan area of residence and, in 1970, either metropolitan area of residence or place of residence (central city versus suburb) is known.

$$=1 \text{ if central city}_{iact} = \alpha + \Gamma'X_i + \nu_t + \mu_a + \theta_c + \varepsilon_{iact} \quad \textbf{(1)}$$

for individual *i* who is *a* years old in Census year *t* and belongs to birth cohort *c*. The regression includes fixed effects for Census years (ν_t), individual years of age (μ_a), and four coarse cohort groups, each representing twenty years of birth cohorts (θ_c).[6] X_i is a vector of characteristics for the household in which individual *i* resides.

In the baseline equation, X_i contains indicators for the race, nativity, and veteran status of the household head and a dummy variable for the presence of children in the household. We define a child as anyone who is 18 years of age or less regardless of his or her relationship to the household head. In alternative specifications, we allow residential location to vary with the number of children in the household and add indicators for being married or being an "empty nester." Households are considered to be "empty nesters" if one member reports having had children but there are no children currently present.[7]

Our paper is the first of which we are aware to estimate the age profile of city residence within birth cohorts over time. Vigdor (2006) and others report age profiles of city residence constructed from a single cross-section. These profiles likely overstate the probability that the elderly will "return" to the central city. Individuals who were 70 years old in 1970, for instance, were born in 1900 and came of age before the diffusion of the automobile and the large-scale suburban growth of the post World War II period. Therefore, the elderly in 1970 may have been

[6] The four cohort groups in the main specification are 1900-1920, 1920-1940 and 1940-1960, with the omitted category being those born before 1900. We are able to identify age, period, and cohort effects by constraining that cohort effect to be identical within these twenty year intervals. Results are robust to instead using finer cohort groups of either 13 or 16 years.

[7] We construct the "empty nest" indicator from the 1970 and 1980 Census questions about children ever born, which are asked of all women who are at least 15 years old.

more likely to live in central cities for both life-cycle and cohort-specific reasons.[8]

B. OLS results

Our estimating equation produces two main sets of results: the age profile of city residence over the life cycle and the relationship between the other demographic factors in the vector X and the probability of living in the central city. We report the age profile of city residence in Figure 2, which graphs the coefficients on single years of age from equation 1 (plus the constant). The probability that a metropolitan resident lives in the central city peaks between the ages of 21 and 25. Many individuals then leave the central city in their late twenties and thirties. Forty-two year olds exhibit the lowest probability of city residence, presumably an age at which households are most likely to have children and to be able to afford the larger homes available in the suburbs.[9] After that point, individuals slowly return to the city.

The rapid swings in the age profile of city residence account for the fact that we find little effect of the baby boom cohort on city growth. There has been no decade (yet) in which the baby boom generation has been clustered in either a peak or a valley of the city residence profile. In 1970, for example, many of the baby boomers were living in the central city in their early twenties. However, others in the cohort were still in their teenage years and therefore were more likely to be living in the suburbs. Similar patterns hold in 1980, 1990 and 2000. By 2010, the last of the baby boomers will have left their forties and the entire generation will have entered the "return to the city" phase of the age profile.

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[8] In our case, each age effect (μ_a) is identified by variation from within up to three birth cohorts. For example, the probability of living in the city at age 70 is identified from members of the oldest birth cohort (born before 1900) who were 70 years old in 1960, 80 years old in 1970, and 90 years old in 1980 and from two groups of the 1900-1920 birth cohort, those who were 70 years old in 1970 and those who were 70 years old in 1980.

[9] The probability of city residence is also locally minimized at age 10 when many children live in the suburbs with their parents.

Table 1 presents the results of regressions relating the other demographic characteristics to the probability of living in the central city.[10] Members of households whose head is foreign born are around 17 percentage points more likely to live in the central city. Having a black household head makes an individual even more likely to live in the central city (39 percentage points). Members of households whose head is a veteran of the US Armed Forces are 4.1 percentage points *less* likely to live in a central city.[11] Black veterans do take some advantage of the GI Bill to move to the suburbs but, perhaps because of other discriminatory aspects of the suburban housing market, the effect of veterans' benefits on the residential location of black household heads is not as strong as for their white counterparts, with black veterans only 1.6 percentage points less likely than other blacks to live in the city (results not shown).

In the first column, we estimate the effect of children on residential location with a single dummy variable for the presence of any child in the household. Households with at least one child are 8.1 percentage points less likely to live in the central city. The second column replaces the indicator variable with a linear measure of the number of children in the household. Each child appears to depress the likelihood of living in the central city by 1.4 percentage points. In other words, if the relationship between children and living in the suburbs were truly linear, a household would need to contain six children before it reached the 8.1 percentage point decline in city living associated with having at least one child, a number that seems implausibly large. Together, these estimates suggest that the relationship between the presence of children and residential location is non-linear and that, in particular, the first few children are most strongly associated with leaving the central city.

[10] Coefficients based on probit estimation rather than linear probability models are nearly identical to those presented in Table 1.

[11] A portion of the relationship between veteran status and residential location appears to be driven by an association between having served in the military and being married. Controlling for marital status in column 5 cuts the effect on veteran status in half, but the coefficient is still strongly statistically significant.

To further explore this non-linearity, the third column adds dummy variables for having exactly one child and for having two or more children in the household. Relative to households with no children, households with one child are 6.1 percentage points less likely to live in the central city and households with two or more children are 9.6 percentage points less likely to live in the central city. We experimented with adding a richer set of dummy variables and found no statistical difference between having two versus three children, three versus four children, etc.

Households may not instantaneously adjust their residential location decisions on the basis of current household composition. Rather, some households may move to the suburbs in anticipation of having children, while some households that once contained children may remain in the suburbs even after the children leave home. We provide evidence consistent with this life cycle perspective in columns 4 and 5. Column 4 uses two indicator variables to summarize household composition: one for the current presence of children and another for empty nesters who once had children living at home. The omitted category are individuals living in households that has never (to date) contained children. Compared to this omitted category, individuals living in households with children are 10.7 percentage points more likely to live in the suburbs, while empty nesters are 4.3 percentage points more likely to be suburban residents.

Thus far, our measures of child-bearing do not account for the fact that some households move to the suburbs in anticipation of having children. Column 5 proxies for the full life-cycle effect of having children with an indicator for being married, relative to either having never married or being divorced or widowed. Beyond the association between marriage and child-bearing, we can think of few reasons why marital status alone would affect residential location.[12]

[12] Married men have higher labor market earnings than their single counterparts, which may allow married couples to afford a suburban lifestyle (Korenman and Neumark, 1991; Ginther and Zavodny, 2001). When we control for household income, the effect on marital status declines by 20 percent (results not shown). We interpret the results in column 5 as the total effect of marriage on residential location, including a potential earnings channel.

Married individuals are 10.8 percentage points more likely than singles of the same age to live in the suburbs. Because marital status is highly correlated with the presence of children, the independent effects of both the current and prior presence of children in the household declines substantially. It appears that marital status is, to some degree, a better measure of the full life-cycle effect of children at all stages – anticipated, current and already departed – on household location decisions.

Our main specification focuses on the 1960 to 1980 period. However, there are reasons to believe that some of the demographic relationships of interest may have moderated over time. Scholars have shown that African-Americans and the foreign born gained increasing access to the suburbs after 1970, and, in many respects, the mortgage terms offered in the civilian market converged upon the standard package of veterans' benefits. The final column of Table 1 re-estimates our main specification (equation 1) with pooled data from the 1980 to 2000 Censuses. We find little change in any of the relationships between residential location and the various demographic factors over time.[13] Given the stability in these relationships over time, we feel more confident in using the coefficients generated from a single time period (in our case, 1960 to 1980) to conduct demographic counterfactuals for the entire second half of the twentieth century.

IV. Causal estimates: The effect of children and veteran status on city residence

Thus far, we have estimated the effects of four demographic characteristics – race, nativity, veteran status and the presence of children – on residential location. Ultimately, our

[13] The foreign born were slightly more likely to live in the central city between 1980 and 2000, perhaps because, after 1980, the foreign born were more likely to have recently arrived in the US. In 1960, the foreign born population still included a large number of European immigrants who had arrived in the US in the 1920s; however, by 1980, the typical immigrant was increasingly a recent arrival from either Asia or Latin America. Furthermore, if anything, the relationship between veteran status and residential location strengthens slightly after 1980, perhaps because of the high mortgage interest rates in the civilian market during that period.

goal is to use these estimates to infer the extent to which demographic trends have bolstered city population over the past half-century. However, before doing so, we must distinguish between exogenous characteristics such as race and nativity that are pre-determined at birth, and endogenous characteristics like veteran status and child bearing. Optimal family size, in particular, can be directly influenced by residential location; suburbanites may be encouraged by their friends and neighbors or by the child-friendly lifestyle to have an additional child. Furthermore, both child-bearing and veteran status may be correlated with other characteristics – most importantly, family income – that may otherwise be associated with living in the suburbs. As a result, we employ instrumental variables to estimate the causal effect of having an additional child or serving in the military on place of residence.

A. Veteran status

Our OLS estimates show that veterans are less likely than non-veterans to live in the central city. This relationship could be driven by the fact that veterans were offered generous housing benefits, providing the resources necessary to buy single-family housing in the suburbs. However, this relationship could also be generated by omitted variables that are correlated with veteran status. For instance, high-skilled men who were either attending college or who were employed in a war industry may have been exempted from service. In this case, our estimate could understate the relationship between veteran status and living in the suburbs.

We use variation induced by the military draft and the mass mobilization for World War II to create an instrument variable that is correlated with veteran status but is not otherwise associated with earnings or preferences for residential location.[14] The military draft was

[14] Bound and Turner (2002) and Page (2008) use a similar approach to study the effect of the GI Bill on educational attainment.

introduced by the 1940 Selective Service Act and the United States entered the war in earnest after Pearl Harbor (December 1941). This timing generates large differences in the probability of military service on the basis of quarter of birth. Figure 3 reports the share of white, native-born men who served in the Armed Forces by birth cohort. The probability of service increased from 50 percent for men born in 1915 to over 80 percent for men born between 1919 and 1927.

Men born after 1927 were less than 18 years old when the war ended in 1945. As a result, service in World War II falls off precipitously for men born after the third quarter of 1927. However, due to preparations for the Cold War and the Korean conflict, the probability of military service of any kind declines less dramatically (from 83 to 70 percentage points). While the advent of veterans' mortgage assistance was tied to the GI Bill, the benefits were extended to other cohorts of servicemen and women. Therefore, we rely on the decline in general veteran status, rather than in the sharper decline in service in World War II.

In our first stage equation, we compare the probability of veteran status for men who were born before and after 1927. We estimate:

$$=1 \text{ if veteran}_{it} = \alpha + \beta(=1 \text{ if born before } 1928)_{it} + \gamma(\text{quarter of birth})_{it} + \nu_t + \varepsilon_{it} \qquad \textbf{(2)}$$

The sample is restricted to white, male, native-born heads of household who were born before 1930. In our preferred specification, the indicator variable (pre-1928) is equal to one for men born between 1919 and 1927. For robustness, we consider different birth years as starting and ending points of the comparison window for robustness.[15] We include a linear trend in quarter of birth to account for other factors that may lead to rising homeownership over time (such as rising real incomes) in the second stage.

[15] For brevity, we report results in which the treated group consists of men born between 1919 and 1927 and the comparison group is either men born in 1928 and 1929 or between 1928 and 1932. Results are similar when we shorten the treatment window to 1921-1927 or 1923-1927 or lengthen the comparison window to 1935.

Table 2 presents the coefficients from our first and second stage equations. As is apparent from Figure 3, the first stage estimates suggest that men born before 1927 are 13 percentage points more likely to have served in the Armed Forces than are men born a few years after. In the full sample, we found that being a member of a household whose head served in the military reduces the probability of living in the central city by 4.1 percentage points (Table 1). Restricting our attention here to men in the relevant birth cohorts, we find a smaller OLS coefficient describing the relationship between veteran status and place of residence (2.9 percentage points). When we instrument for veteran status with an indicator for birth before 1927, the relationship between military service and place of residence doubles, with veterans being 6.7to 6.9 percentage points less likely to live in the central city. The fact that the IV estimates are larger than OLS suggests that, during the World War II era, veterans were selected on attributes that are positively correlated with living in the central city. This pattern is consistent with the availability of draft deferments for the highly-skilled who may have otherwise been less likely to live in the central city.

B. The presence of children

In our OLS estimation, we find that households with children are less likely to live in the central city. One explanation for this result is that having children increases the demand for certain aspects of suburban life, including the larger housing units, presence of open space and higher quality public schools. However, this finding could be contaminated by both omitted variables bias and reverse causality. During this period, rich households had fewer children and were more likely to live in the suburbs, which may lead the relationship between having children and living in the suburbs to be biased downward (in absolute value). On the other hand, residing in the suburbs could directly influence a household's preferences for optimal family size. The attitudes of friends and neighbors in the suburbs may encourage households to have an additional child. In this case, our estimate would overstate the effect of having children on moving to the suburbs.

We use the birth of twins as an instrument for the number of children in a household. Giving birth to twins is an unplanned event that increases the number of children in a household. Angrist and Evans (1998) argue that, conditional on the age and race of the mother, twinning is an exogenous event. Our data, which covers years between 1960 and 1980, pre-dates the advent of infertility treatments, which increase the probability of multiple births in the non-random sample of mothers that seek medical intervention. A large literature uses twinning to study the effect of family size on women's and children's outcomes (Bronars and Grogger, 1994; Rosenzweig and Wolpin, 1980a, 1980b; Angrist and Evans, 1998; Black, Devereaux and Salvanes, 2005).

One limitation of this approach in this context is that households must have at least one birth event in order to be at risk for having twins. While Table 1 suggests that the distinction between no children and one child is an important determinant of leaving the central city, twinning cannot be used as an instrument for the presence of the first child in a household. Instead, we use samples of households with at least one birth and consider the effect of having a twin on the first birth on the total number of children in the household (and likewise for the sample of households with at least two births). By restricting the sample to households with at least *X* number of birth events, we create comparison groups with similar preferences for family size.

We detect pairs of twins in the data by looking for two children in the same household with the same quarter and year of birth. 0.5 percent of households with at least one birth have twins on the first birth. Our first stage equations relate the presence of twins to either the total number of children in the household or to an indicator equal to one if the household has at least two (or at least three) children. For example, for household with at least one birth, we estimate:

$$\text{Number of children}_{it} = \alpha + \beta(=1 \text{ if twin on first birth})_{it} + \nu_t + \varepsilon_{it} \qquad \textbf{(3)}$$

Alongside the standard controls included in equation one, we also control for the race and age of the mother.

Table 3 presents the coefficients from our first and second stage equations. The raw data indicates that, among households with at least one birth, those with a singleton on the first birth have an average of 2.58 children, whereas those with a twin on the first birth have 3.34 children. Accordingly, we estimate that having a set of twins on the first birth event increases household size by 0.7 children. Much of the difference in completed family size arises from the (obvious) fact that all households with twins on the first birth have at least two children, while only 73.4 percent of households with a singleton first birth have an additional child. Consistent with this fact, we estimate that having twins increases the probability of having two children by 25.6 percentage points (73.4 + 25.6 $\approx$ 100). Similarly, we find that, among households with two or more births, having twins on the second birth increases total household size by 0.9 children and increases the likelihood of having at least three children by 41 percentage points.

In full sample, we found that each additional child in the household reduces the likelihood of living in central city by 1.4 percentage points. When we restrict our attention to households with at least one child, the OLS estimate suggests that each additional child reduces the likelihood of living in the central city by only 0.5 percentage points. For households with at least two children, there is no incremental effect of adding a third or higher order child.

When we instrument for the number of children in the household with the occurrence of twins on first birth, the effect of family size on residential location more than doubles in the sample of households with at least one birth. Each additional child reducing the probability of living in the central city by 1.9 percentage points. The same pattern holds if instead we include an indicator variable capturing the effect of moving from one child to two or more children. The larger IV estimates suggest that households with many children have unobserved characteristics that are otherwise positively associated with living in the central city (for example, these households may have a lower socio-economic status). As in the OLS specification, though, we continue to find that the effect of family size on residential location is not linear. Moving from one child to two children encourages households to move to the suburbs, while moving from two children to three or more has little effect on place of residence.

IV. A counterfactual exercise

In this section, we show that each demographic factor under consideration, including the share of foreign-born, African-American, and veteran household heads, as well as the presence of households with children, has changed dramatically from 1950 to 2000. We then assess the contribution of each component to the maintenance of city population over time.

Figure 4 depicts the share of the metropolitan population living in a household whose head was black, foreign-born or a veteran or that had at least one child present from 1950 to 2000. Because immigration to the United States was severely restricted in the mid-twentieth century, the share of the metropolitan population living with a foreign-born household head fell from nearly 30 percent in 1940 to a nadir of ten percent in 1970. With the abolition of immigration quotas in 1965, this share returned to nearly 30 percent by 2000. Given that the foreign born are more likely to live in central cities, this pattern served to moderate the flow of population out of cities from 1970 onward. The migration of blacks from the rural South to industrial cities also bolstered city population over this period. The share of the metropolitan population living with a black household head increased from eight percent in 1940 to 17 percent in 2000.

With the return of servicemen from World War II, the share of the metropolitan population living in a household headed by a veteran spiked from less than five percent in 1940 to nearly 50 percent in 1960 and 1970. Since 1970, the veteran share has declined to just over 10 percent in 2000. Because veterans are more likely to live in the suburbs, the reduction in the number of veterans in the population favors the city relative to the suburbs over this period. The share of households with a child present has also declined substantially since mid-century. While nearly 80 percent of households had at least one child in 1950, this share declined to 50 percent in 2000. Again, because households with children are more likely to live in the suburbs, the growth of childless households favors the city.

Table 4 uses the coefficient estimates relating these demographic trends to city residence to provide a counterfactual statement of how much further the share of metropolitan residents living in central cities *would have declined* between 1960 and 2000 if not for these demographic moderators. We select 1960 as our starting point because a number of our variables reached their minimum or maximum point in that year. We discuss the sensitivity of this result to varying starting points below.

In the first row of Table 4, we show the actual changes in the share of metropolitan residents living in central cities over this period. In 1960, 51.3 percent of metropolitan residents lived in the city. This figure declined to 33.5 percent by 2000, a drop of 17.8 percentage points. This decline in city residence was driven by many factors, including new highway construction and a shift in the location of employment opportunities. However, demographic trends acted as a partial counter-balance to the economic, political and sociological trends propelling population from the central city. To demonstrate this point, we consider the following counterfactual scenario: what if all other social forces had been held constant at 1960 levels and only the demographic factors under consideration here had been allowed to change between 1960 and 2000?

The second row demonstrates that, if demography had been the only relevant consideration, city population would have *increased* between 6.4 and 8.3 percentage points from 1960 to 2000. The low and high points of this range are based on using the OLS or IV coefficients, respectively, to measure the strength of the relationship between demography and residential location.[16] The IV estimates suggest a greater role for the decline in veteran status and in the share of households with children present. However, we caution that the IV estimates are less precisely estimated than their OLS counterparts and we can only barely reject that the OLS and IV estimates are the same.[17]

In the final rows of Table 4, we present the contribution of each demographic force to city population. In each case, we multiply the total change in the variable in question from 1960

[16] Because our IV regressions are estimated on selected samples, we use the ratio between the OLS and IV estimates in Tables 2 and 3 to scale the OLS coefficients estimated from the whole population. Specifically, we augment the veterans coefficient by 2.3 (= -0.067/-0.029 from Table 2, columns 1 and 2) and we augment the any child coefficient by 1.6 (= -0.052/-0.032 from Table 3, columns 3 and 4).

[17] The 95-percent confidence interval associated with the IV-based counterfactual ranges from 7.0 to 10.1 percentage points.

to 2000 by the estimated effect of that variable on the probability of living in the central city. For example, the share of households headed by an immigrant increased by 16.3 percentage points from 1960 to 2000 and, as a result, the share of metropolitan residents who lived in the central city rose by 2.8 points (= 16.3 0.167, coefficient estimate in Table 1). From this exercise, it is clear that the most important demographic trends in moderating the loss of city population are renewed immigration, followed by the increase in black population, the shrinking number of veterans and the declining share of households with children. If we, instead, selected 1940 or 1950 as a starting point for this exercise, the role of racial composition and the presence of children would have been respectively larger.

It is notable that the aging of the Baby Boom cohort plays no role in the counterfactual in moderating the loss of population from central cities. The explanation for this finding lies in part in the rapid swings in the age profile of city residence (Figure 2). Thus far, there have been no decade in which the baby boom generation has been clustered in either a peak or a valley of the city residence profile, though this pattern may change as boomers enter the (modest) “return to the city” portion of the age profile (after age 65).

V. Conclusion

The share of the American population that lives in central cities declined precipitously over the past fifty years. This paper shows that absent various demographic trends – including migration from abroad and from the rural South and declines in child-bearing and military service – the share of the metropolitan population residing in the central city would have fallen by an additional six to eight percentage points (or, by 30 percent). However, these demographic forces were only strong enough to attenuate, not to reverse, reductions in city population driven by other economic and social factors.

Despite this demographic ballast, population loss from central cities continued apace into the 1990s. However, we note that our national focus may miss localized instances of gentrification in certain neighborhoods or within particular cities (Vigdor, 2002). Furthermore, the interaction between demographic forces, particularly delayed child-bearing and longer life expectancies, and rising incomes in top income brackets may have contributed to the renaissance of "super star" cities like New York City and San Francisco (Gyourko, Mayer and Sinai, 2006). Understanding variation in the role of demography across different types of cities remains an important avenue for future research.

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Table 1: Demographic factors contributing to the probability of living in the central city

Dependent variable = 1 if live in central city

			1960-1980			1980-2000
RHS variable	(1)	(2)	(3)	(4)	(5)	(6)
Any children in HH	-0.081			-0.107	-0.059	-0.077
	(0.001)			(0.001)	(0.001)	(0.001)
Number children		-0.014				
		(0.000)				
One child			-0.061			
			(0.001)			
2+ children			-0.096			
			(0.001)			
Empty-nester				-0.043	-0.009	
				(0.001)	(0.001)	
Married					-0.108	
					(0.001)	
Head is foreign born	0.167	0.167	0.167	0.166	0.173	0.192
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Head is black	0.385	0.389	0.386	0.384	0.366	0.379
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Head is veteran	-0.042	-0.045	-0.041	-0.042	-0.017	-0.056
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.575	0.521	0.577	0.590	0.647	0.348
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.019)
N	3,631,502	3,631,502	3,631,502	3,631,502	3,631,502	3,112,127

Notes: Coefficients from estimation of equation 1 with standard errors in parentheses. Regressions also contains three birth cohort dummies, two census year dummies and dummies for ages between 1 and 90 or more. Sample contains all residents of metropolitan areas who report living either in the central city or the suburbs. Household members are assigned the characteristics of the household head.

Table 2: IV estimates of the effect of veteran status on place of residence

	Birth cohorts: 1919-1929		Birth cohorts: 1919-1932	
RHS variable	OLS	IV	OLS	IV
	A. First stage. Dependent variable = 1 if veteran			
=1 if born between 1919-1927		0.132		0.130
		(0.003)		(0.003)
	B. Second stage. Dependent variable = 1 if live in city			
=1 if veteran	-0.029	-0.067	-0.029	-0.069
	(0.003)	(0.029)	(0.002)	(0.028)
N	188,734	188,734	237,968	237,968

Notes: Regressions include a linear age trend in quarters, an indicator for children present in household, and dummies for 1970 and 1980 Census years. The sample is restricted to white, native-born male residents of metropolitan areas who report living either in the central city or the suburbs.

Table 3: IV estimates of the presence of children in the household on place of residence

	Households with at least one birth				Households with at least two births			
Dependent variables	OLS	IV	OLS	IV	OLS	IV	OLS	IV
A. First Stage								
=1 if twins on first (second) birth		0.705		0.256		0.924		0.408
		(0.012)		(0.004)		(0.010)		(0.004)
B. Second stage								
Number of children	-0.005	-0.019			0.000	0.004		
	(0.000)	(0.006)			0.000	(0.004)		
=1 if 2+ children			-0.032	-0.052				
			(0.001)	(0.015)				
=1 if 3+ children							-0.006	0.008
							(0.001)	(0.009)

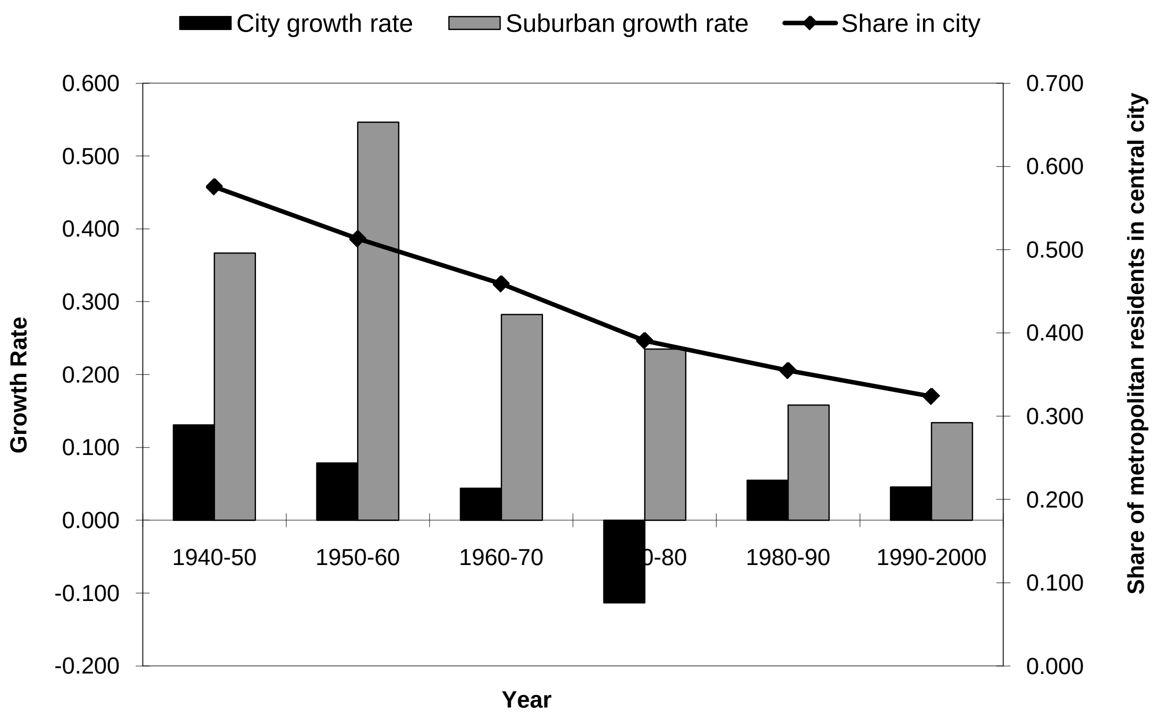
Notes: N = 2,372,595 for one birth and 1,746,963 for two births. Twins are defined as two children having the same year and quarter of birth in the household. The sample selection and other control variables are the same as in Figure 2.

Table 4. Demographic moderators of urban population loss: Counterfactual scenarios

	Share of metropolitan population living in central cities			
	Level in 1960	Level in 2000	Change (OLS)	Change (IV)
Actual share	51.3	33.5	-17.8	-17.8
Counterfactual share, 1960-2000	51.3	57.7	6.4	8.3 [7.0, 10.1]
1. Foreign born	*Increased 16.3 points; Increases probability living in city by 16.7 pp*		2.7	2.7
2. Black	*Increased 4.3 points; Increases probability living in city by 38.5 pp*		1.7	1.7
3. Veteran	*Declined by 25.8 points; Reduces probability of living in city by 4.2 pp*		1.1	2.5 [1.4, 3.6]
4. Children in HH	*Declined by 11.1 points; Reduces probability of living in city by 8.1 pp*		0.9	1.4 [1.2, 2.1]

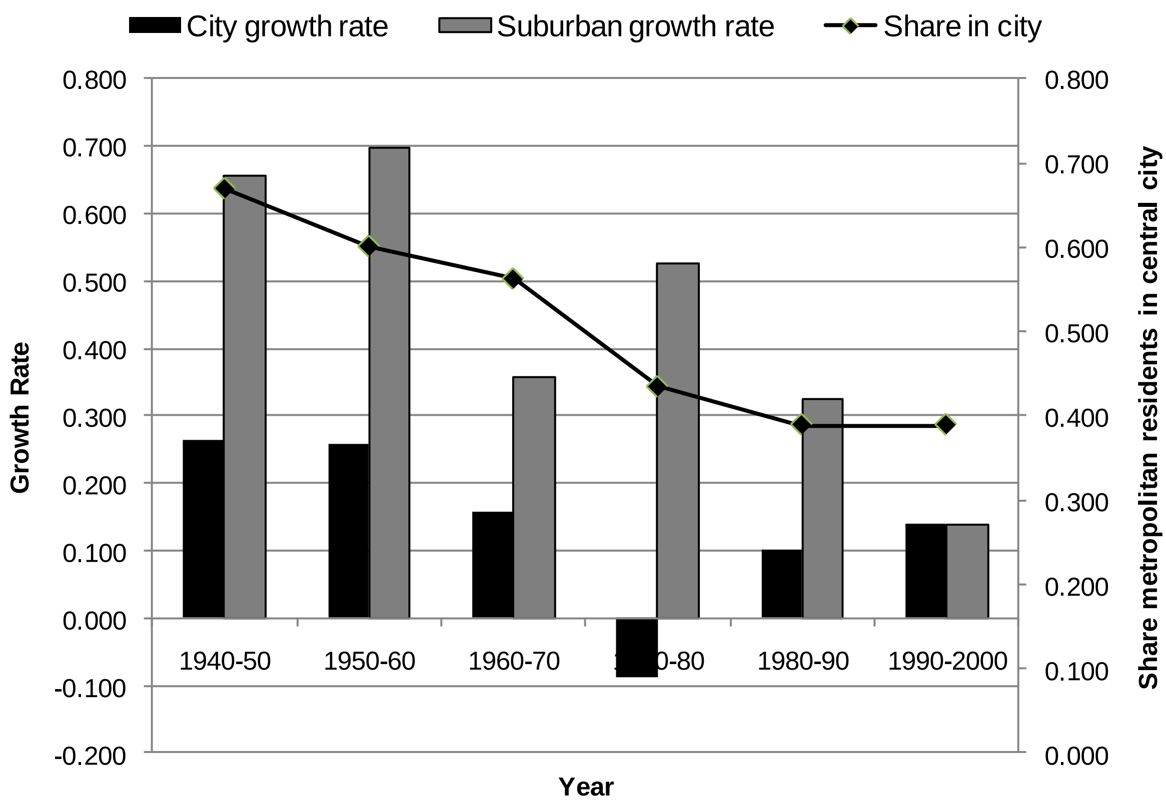
Notes: Row 1 reports the actual share of metropolitan area residents who report living the central city from IPUMS samples. Row 2 uses the coefficients from the OLS regression in Table 1 (column 3) or relationships based on the IV coefficients in Tables 2 and 3 (column 4) to calculate the counterfactual share of the metropolitan population living in central cities. The final rows considers each of the demographic factors in turn. We report the confidence interval associated with the counterfactuals based on the IV estimates in square brackets below the counterfactuals based on the mean.

Figure 1a. City and suburban population growth by decade, 1940-2000
93 metropolitan areas



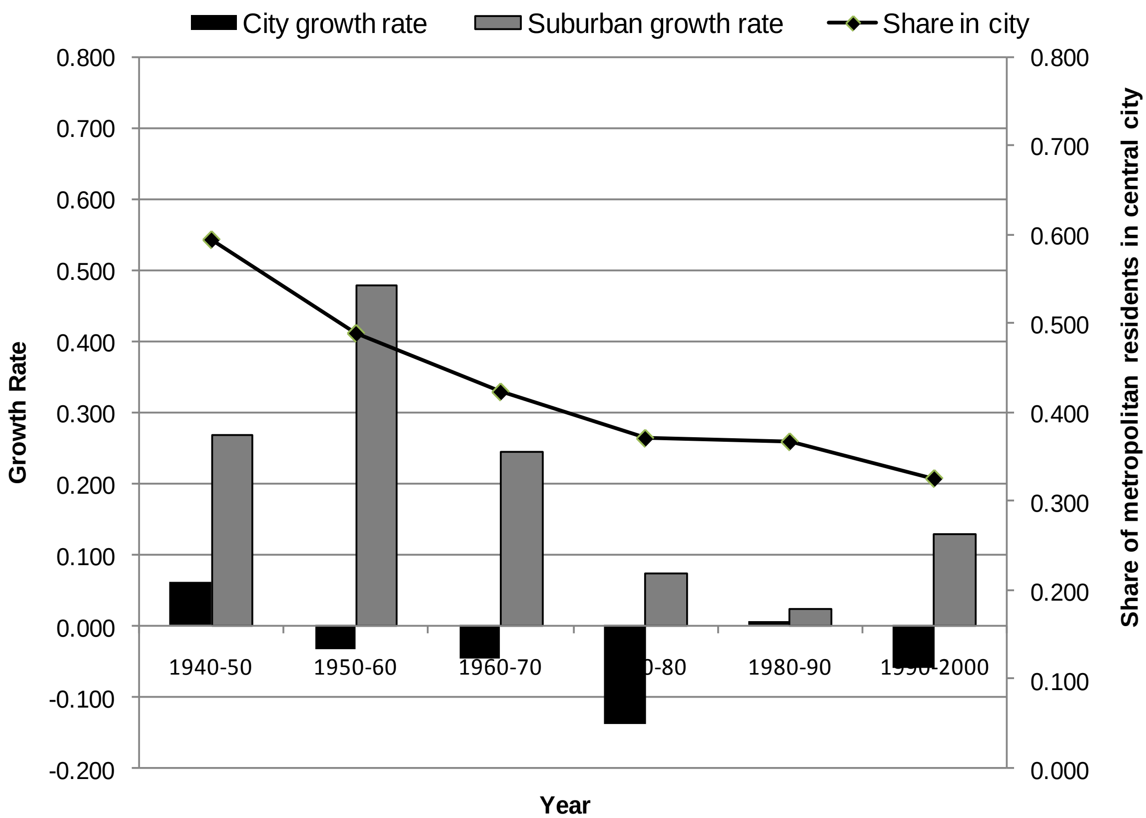
Notes: N=93 metropolitan areas. City and county population are taken from the City and County Data Books in the relevant years. We apply the 1970 county definitions of metropolitan areas in all years. Suburban population is computed as the total metropolitan area population minus the city population (using the 1940 borders for the central city). Central city shares refer to the end of the decade indicated on the *x*-axis.

Figure 1b. City and suburban population growth by decade:
55 metropolitan areas whose city gained population between 1940 and 2000



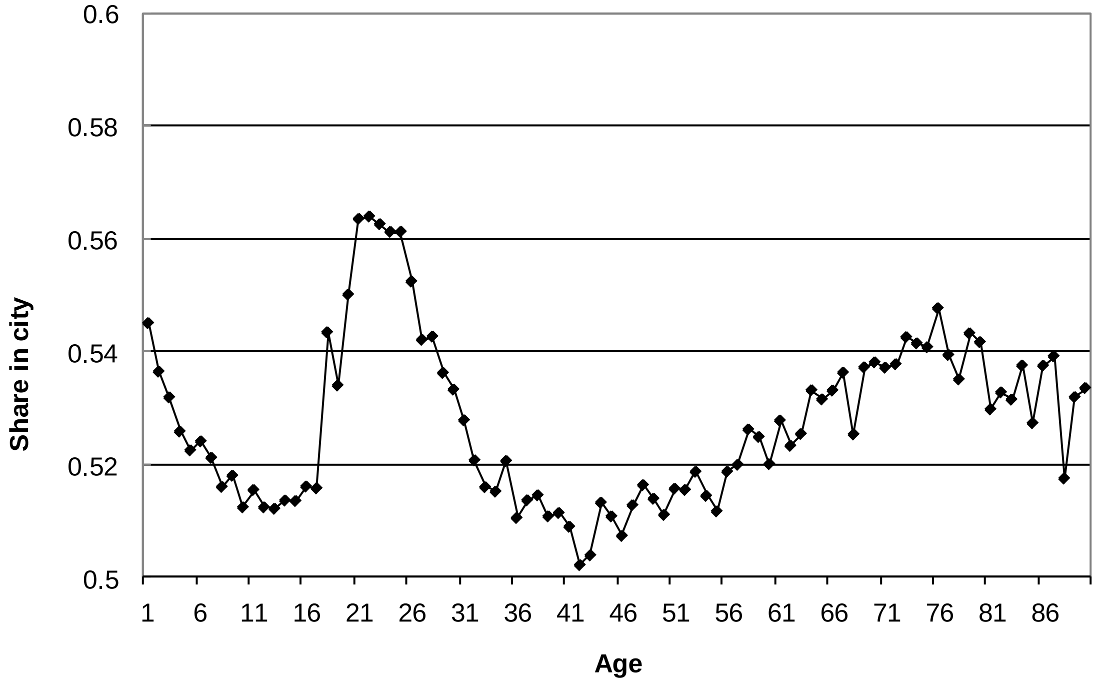
Notes: N = 55. See notes to Figure 1a.

Figure 1c. City and suburban population growth by decade
38 metropolitan areas whose city lost population between 1940 and 2000



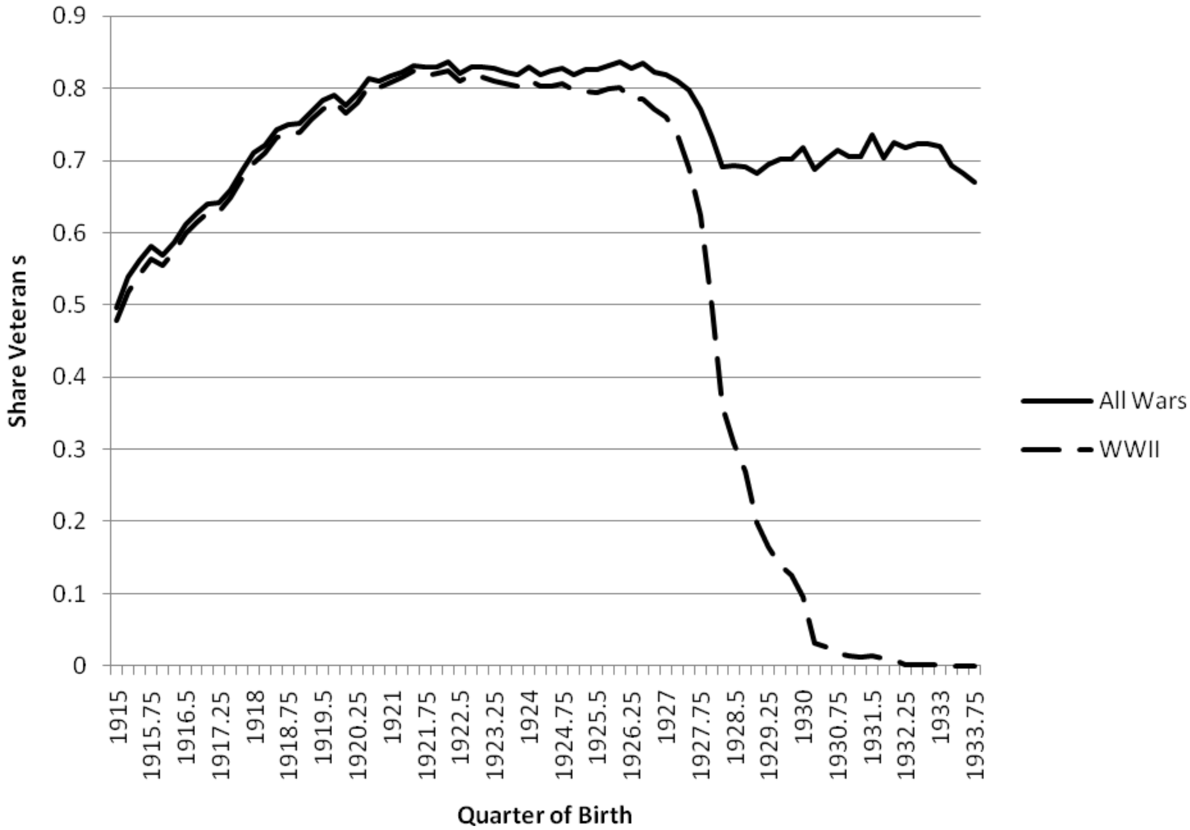
Notes: N = 38. See notes to Figure 1a.

Figure 2. Probability of living in city conditional on being in metropolitan area by age



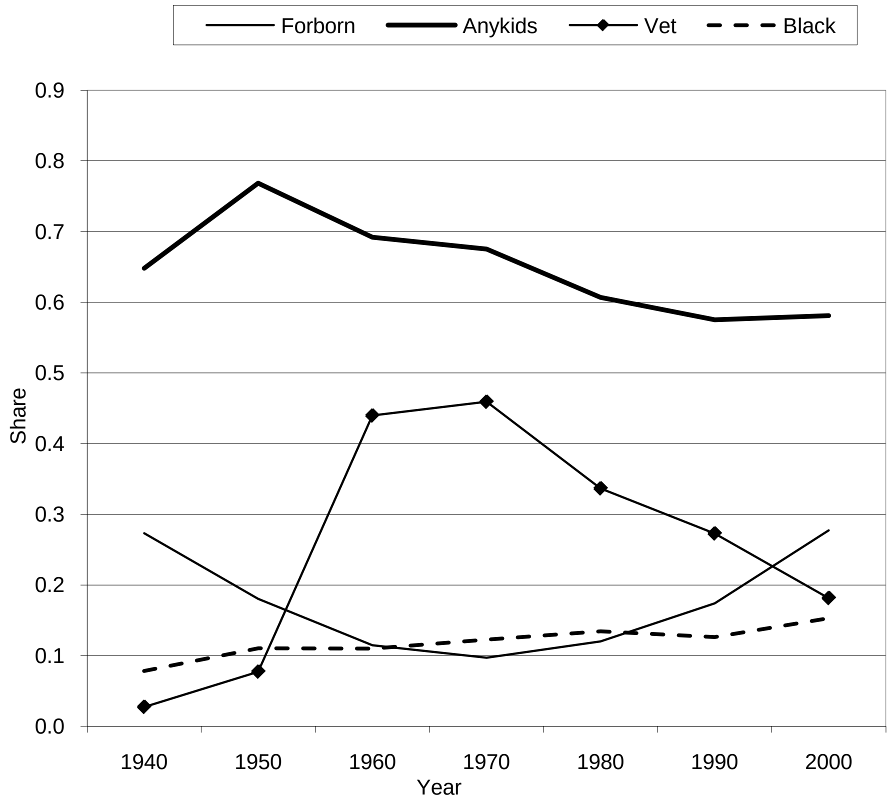
Source: IPUMS, 1960-80.
Notes: We plot the constant plus the coefficients on the single years of age indicators from equation 1, which estimates the determinants of living in the central city. The underlying regression equation also contains indicators for four birth cohorts, two census years, and controls for the presence of children in the household and the race, nativity and veteran status of the household head.

Figure 3. Share of white men serving in armed forces by year and quarter of birth



Notes: Sample includes all white, native-born men from the 1960-1980 1% IPUMS samples.

Figure 4. Characteristics of households and household heads, 1940-2000
Race, nativity, veteran status and presence of children



Notes: Sample contains all metropolitan area residents who report living either in the central city or the suburbs. Household members are assigned the characteristics of the household head.