Are shocks to human capital composition permanent? Evidence from the Mariel boatlift

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Abstract
We examine whether shocks to a city’s average level of human capital are associated with persistent or permanent changes in human capital. The Mariel boatlift of 1980 represents an exogenous negative shock to Miami’s average human capital because it attracted a particularly low-skilled mix of immigrants. To assess whether the boatlift affected Miami’s future human capital accumulation, we construct a synthetic control group to analyze the effect of this shock. The results suggest that the Miami metropolitan area experienced slower increases in average human capital than its synthetic control city after the boatlift. This result is robust to alternative estimation strategies, data sets, and alternative hypotheses. The result implies that a decreased level of average skills tends to subsequently attract unskilled skilled workers more strongly than skilled workers, at least in the context of immigration shocks. We discuss plausible mechanisms for this finding and place the findings into the context of the spatial equilibrium model.

JEL Classification J21 · R11 · R12

1 Introduction

Studies have long found that the average human capital level is one of the most important factors for city and regional growth (Bilbao-Osorio and Rodríguez-Pose 2004; Cheshire and Magrini 2000; Glaeser and Saiz 2003; Shapiro 2003; Simon and Nardinelli 2002). Cities with initially high human capital levels have grown substantially faster than others. Such cities also have experienced faster wage and rent growth. Thus, two important questions are: (1) whether cities with high average levels of human capital increase their human capital faster than cities with low average...
levels (and vice versa), and more directly related to our study, (2) can a city’s human capital intensity be permanently or at least persistently altered?

If increases in a city’s average human capital tend to accelerate its future growth of human capital, then growth differentials in population, wages, and rents between cities with high and low human capital levels will increase. The growth trajectories across cities and regions will diverge, which has important policy implications because without perfect mobility, people residing in human capital poor regions would suffer.

Despite the importance of the question, few studies have examined whether shocks to a city’s average human capital level can permanently change its level over time. Berry and Glaeser (2005) used a deep lag variable as an instrument and found that the average human capital level in cities has diverged. Lee (2016) finds similar results to Berry and Glaeser (2005) when using an education program as a natural experiment. However, using a similar method as Berry and Glaeser, but with more control variables, Betz et al. (2016) find that a city’s average level of human capital is not statistically associated with its future growth in human capital, but rather is positively linked to the size of the city. Other studies have examined the migration of skilled workers directly (Kerr et al. 2017; Faggian and McCann 2006; Venhorst 2013), but do not examine aggregate outcomes and feedback effects.

A related literature relates to equilibrium models in which the most prominent is the spatial equilibrium model (SEM) that generally predicts that after an exogenous shock to a region’s equilibrium, the region would eventually return to its equilibrium growth path. That is, while there is debate as to how fast the adjustment may take place, the notion is that aggregate outcomes such as total employment or population are not affected in the long run (Partridge et al. 2015). For example, Davis and Weinstein’s (2002) seminal paper finds that Japanese cities that were victims of massive Allied bombing during World War II had effectively returned to their long-run growth path within twelve years after the war. Brakman et al. (2004) found similar findings for Germany after the war. Such findings are prevalent in the literature for a host of other shocks such as military base closings (Partridge et al. 2015). However, the SEM has much less to say about whether other regional characteristics remain on the same equilibrium trajectory after an exogenous shock. For example, do demographic shocks such as the Mariel boatlift have permanent effects on a region’s skill composition that could have long-term implications for its economic welfare by affecting average wages?

In this paper, we analyze whether shocks to a city’s skill composition has permanent, or at least persistent effects to its future skill composition. The most important potential obstacle for such a study is endogeneity in that unobserved factors might influence both the present and future levels of human capital. For instance, long-term local government policy might influence trends in skill composition. To address this issue, we use the synthetic control method (SCM), which allows us to construct a “synthetic” control group for the treatment (Abadie et al. 2010), in conjunction with a natural experiment.

Our treatment group is the Miami metropolitan area, which received a disproportionate share of refugees from the 1980 Mariel boatlift. Most Cuban refugees from the Mariel episode were young and unskilled (Borjas 2015; Card 1990). It is widely
accepted that this event was exogenous and that these refugees migrated to Miami
due to proximity to Cuba. Another advantage of using the boatlift as a natural ex-
periment is that we can also use results from previous research to perform hypothes-
as to the mechanisms behind changes in Miami’s skill composition.

We find that the Miami metropolitan area experienced a much slower increase in
average human capital than the comparable synthetic control city after the Mariel
boatlift. The result implies an influx of unskilled people may lead to slower skill
aggregation. These results suggest that shocks to human capital can have perma-
nent effects on future levels of human capital, at least in the context of immigration
shocks. We use a variety of data and assumptions to show the robustness of this
result.

2 Conceptual framework

Our conceptual framework combines the spatial equilibrium model (SEM) (Roback
1982) with empirical findings from the prior Mariel boatlift literature. In the SEM,
two factors—local productivity and local household amenities—determine the
spatial distribution of economic activity. To address skill composition issues, we
employ Roback’s (1988) extension of the SEM to allow for heterogeneous labor by
dividing the workforce into skilled and unskilled labor, each having their own repre-
sentative utility functions.

Formally, the indirect utility function for worker type $j$ (skilled or unskilled) in
city $i$ for each period $t$ is $V_j\left(W_{ji}^t - C_{ji}^t, A_{ji}^t\right)$, in which $W_{ji}^t$, $A_{ji}^t$, and $C_{ji}^t$ are wage level,
(net) amenity level, and cost of living (monthly rent) for worker type $j$, in city $i$,
period $t$. Indirect utility is positively related to wages and amenities and negatively
related to rents. The SEM assumes that labor is perfectly mobile, and in equilibrium,
utility for both worker types in city $i$ will equal their respective national average util-
ity. The same applies for firms, in which profits are equalized nationally because
firms are also assumed to have perfect mobility.

More interesting to our discussion is that even though US household mobility
is relatively high, it is imperfect (Partridge et al. 2012, 2015). If there was perfect
mobility, we might expect that a given shock to be exactly offset by labor and capital
mobility, restoring initial conditions (e.g., skilled/unskilled labor ratio). However,
because labor mobility is imperfect, the interim change in conditions after a shock
could affect local amenities as governments and the private sector adjust to changes
from the shock. For example, a large relatively unskilled Cuban population shock
may increase public and private services that cater to their wishes, which could set
off further migration that reinforces this process. Such changes could lead to perma-
nent changes in the equilibrium that are not predicted by the standard SEM. Namely,
it could permanently alter the workforce skill composition and average productivity,
both of which affect average Miami’s wage.

There is an ongoing debate regarding how the Mariel boatlift affected Miami’s
labor market. For example, Card (1990) and Borjas (2015) find that Mariel boatlift
did not influence wages of Miami’s high-skilled workers relative to similar cities (Fig. 4 in Borjas 2015). Yet, its effect on unskilled worker wages is debated (Borjas 2015; Peri and Yasenov 2015), though there is no statistical evidence that their relative wages increased. Saiz (2003) finds that rents for low-quality housing in Miami substantially increased in the immediate aftermath of the boatlift, but not rents for high-income households. From these wage and rent findings, it appears that the real wages of low-skilled workers declined as a result of the boatlift, while the real wages of skilled workers were unchanged. For spatial equilibrium to be maintained in the long run (after households relocate to restore equilibrium), it must be that Miami’s amenities (quality of life) relatively improved for its low-skilled workers to offset the real income loss, though they would remain unchanged for its skilled workers.

The relative productivity of Miami’s skilled workers unlikely changed because their nominal wage did not change relative to similar cities (assuming nominal wages reflect productivity).1 Since Miami’s low-skilled nominal wages definitely did not relatively increase, we can rule out that their relative productivity increased.

Supporting the possibility that Miami’s low-skilled productivity declined, Lewis (2004) provides evidence that the Mariel boatlift delayed computer use in offices, which is a key source of skill-biased technological change. This pattern suggests that Miami firms substituted relatively low-wage less-skilled workers for a combination of high-skilled workers and computing technology. If real wages declined for Miami’s low-skilled workforce, then we expect that local consumer amenities for less-skilled workers to increase to maintain spatial equilibrium. To be sure, there can be sorting within skill groups. For example, on balance Hispanics may have been attracted to Miami, while some non-Hispanics may have moved elsewhere.

2.1 Discussion of mechanisms

The evolution of wage and rents after the Mariel boatlift helps isolate potential mechanisms for relative changes in Miami’s skill distribution as they help identify changes in productivity and amenities. This leads to the question, how could migration of (say) unskilled workers to Miami affect relative productivity and amenity levels, and in turn, wages and rents in equilibrium? First, a possible mechanism for productivity changes is that positive knowledge spillovers intensify as workers are employed in cities with increasing average levels of human capital (Glaeser and Gottlieb 2009; Glaeser and Saiz 2003; Winters 2013). Yet, above-average levels of human capital can unevenly increase productivity for skilled and unskilled labor. For example, Moretti (2004) argues that an increase in the share of college graduates increases the wages of unskilled workers more than skilled workers, implying that skilled labor and unskilled labor are complementary. In this case, a high average

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1 See Glaeser and Mare (2001) for a discussion of why workers consider real wages in maximizing utility while firms set nominal wages to value of marginal product (i.e., productivity) for profit maximization.
level of human capital may attract low-skilled workers, reducing the city’s average skill level.

Another mechanism for changing productivity is that a high (low) level of average human capital can induce skill-biased (unskilled-biased) technology adoption (Acemoglu 1998). Similarly, a high (low) level of human capital in cities can attract high-skilled (low-skilled) intensive industries, increasing the relative productivity of skilled labor compared to unskilled labor.

Turn now to how amenities can change after a population shock. For one, a positive high-skilled/high-income migration shock will attract more non-traded services that cater to their demands (and vice versa), such as high-quality private schooling. In turn, through economies of scale, such services can be less expensive in cities that have higher shares of high-skilled workers. Alternatively, we can consider the cultural difference between unskilled workers and skilled workers. If members of a cultural group tends to be particularly highly skilled (or unskilled) compared to those of other cultural groups on average, then sorting due to cultural differences can lead to long-term changes in a city’s skill composition. Such sorting would be reinforced if the sorting attracted non-traded firms that cater to their cultural preferences and income levels (e.g., types of grocery stores and entertainment) that in turn may attract additional similar migrants.

The Mariel boatlift’s inflow of the Cuban Hispanic population into Miami, therefore, may have subsequently increased inflows of those attracted to Cuban culture or the Spanish language. Further, by affecting the types of businesses and public services in Miami, this can affect amenity levels for Hispanics in general. The Hispanic population has below-average education levels, meaning that a positive shock of below-average educated Hispanics would attract businesses that tend to cater to lower income groups. (The boatlift population averaged less than a high school degree.) Schelling’s (1971) seminal paper describes how this mechanism can be self-sustaining and permanently alter the path of cities that face significant shocks—i.e., permanently (or at least persistently) increase Miami’s share of unskilled workers.2

3 Empirical strategy

To estimate the effect of a shock in skill composition on the future growth of human capital, we must address endogeneity issues such as unobservable and long-lasting factors that influenced the city’s skill level in the past and the future. To do that, we use the 1980 Mariel boatlift as an exogenous shock on Miami’s labor market (Bodvarsson, Van den Berg and Lewer 2008; Borjas 2015; Card 1990; Peri and Yasenov 2015).

2 Besides compositional effects, migration, and human capital externality spillovers, other potential causes for skill intensity to change are intergenerational transmission of low education among new residents, especially the children of Marielitos and Miami’s educational system being challenged to improve child outcomes, perhaps influenced by the Mariel inflow (e.g. low tax base).
On April 20, 1980, Fidel Castro, leader of Communist Cuba, announced that Cubans were free to leave the country. Even though the Carter administration worked to improve US–Cuban relations, this was an unexpected event for the Cubans and Miami residents (Card 1990). More than 125,000 Cubans migrated to the USA between April and October of 1980. Lacking basic necessities, most went to Miami, which was the closest to Cuba.

The majority (50–60 percent) of these people, called Marielitos, lived in Miami even in 1990 (Borjas 2015; Card 1990). They were unskilled, as 60 percent of Marielitos didn’t graduate high school and less than 10 percent were college graduates. This directly corresponded to a 1 percentage point decrease or 5 percent decline in the share of adult college graduates in Miami (Peri and Yasenov 2015). We use the event as a “negative” shock on Miami’s average skill level.

To analyze the effect of the boatlift, we need a suitable control group. To address this issue, we use the SCM, which allows us to construct a “synthetic” control group by taking a weighted combination of many “similar” cities. Abadie et al (2010) show that by constructing a synthetic control group whose pre-trends of dependent and control variables match well with the treatment group, we can estimate the treatment effect under quite general conditions. We also estimate a standard difference-in-differences method that confirms that the SCM results are robust.

4 Data

We collect information at the metropolitan statistical area (MSA) level from the U.S. Department of Housing and Urban Development (HUD) State of the Cities Data System. It provides aggregate city data from the 1970, 1980, 1990, and 2000 Censuses. The treatment group is the Miami metropolitan area as in Card (1990). From the 1990 Census onwards, this MSA was combined with the Fort Lauderdale metropolitan area to form a larger MSA. However, HUD provides consistent data for the Miami metropolitan area as defined by the 1980 MSA definitions.

For Miami and the possible donor cities, we calculate their college graduate share, which serves as the dependent variable for 1940 to 2000.3 We use the census data for 1940 to 1970 variables from IPUMS (Ruggles et al. 2015). This has drawbacks since we can only accurately measure a city’s college graduate share (and other skill composition measures) every 10 years in the census (for this period). However, a city’s demographic changes are usually gradual, so this should not cause serious distortion for the specification and extrapolation.4

To construct the synthetic control groups, we construct various predictor variables for each MSA from HUD in 1970 and 1980. We calculate four measures of skill intensity including adult population shares for those with some college or higher, high

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3 The 1940 Census was the first census that provided information on educational attainment.

4 We experimented with using CPS data to get more pre-treatment periods. However, there are issues with the selection of synthetic control cities as well as significant measurement error owing to the CPS’s small samples. Still, the SCM results from this exercise are broadly consistent with the base results. See Sect. 5.3.
Are shocks to human capital composition permanent? Evidence…

School graduates or higher, college graduates or higher, and those who did not complete high school. We use 1970 and 1980 population, as well as the respective Hispanic and African American population shares as control variables. The total employment share of industries that intensively hire skilled labor in 1970 and 1980 are added to reflect city industry structure. For both 1970 and 1980, the unemployment rate, median home value, and median family income are included to account for economic trends.

We then apply the SCM. The 1980 Census was conducted just before the Mariel boatlift. Thus, we use Census data up to and including 1980 in the construction of the synthetic control to minimize the mean-squared prediction error (MSPE). We exclude all Florida MSAs from being a part of the synthetic control due to the greater possibility of spillovers with Miami.

5 Empirical results

We first examine some descriptive evidence to assess how Miami may have been affected by Mariel boatlift. First, in results available from the author, we construct a SCM for comparing Miami’s population to its synthetic control city, finding that Miami’s population closely tracked the control unit’s over the 1940–2000 period. Because Miami’s population trajectory was unchanged after the boatlift, this is consistent with predictions from the SEM in that it quickly returned to its overall growth path. This result then implies that any gains among an educational category would need to be offset by corresponding changes in other educational categories.

Regarding Miami’s skill composition, the data indicate that growth in its college graduate share greatly slowed after 1980 (not shown). For example, out of the sample’s 121 MSAs, Miami’s college graduate share, respectively, ranked 55th, 47th, 46th, 70th, and 81st in 1960, 1970, 1980, 1990, and 2000, illustrating Miami’s post-1980 decline. Likewise, when comparing the change in growth rates between the 1970s and the 1980s, Miami’s declining growth of college graduates is the fourth largest among the 121 MSAs, only trailing Pueblo, CO, Jackson, MI, and Houston, TX. Aside from Houston, the other two cities are much smaller than Miami, with 1980 populations below 120,000 (Miami’s was 1.27 million).

A key reason for why Houston’s college graduate share grew even slower than Miami’s is that Houston was a primary resettlement site for South Vietnamese refugees in the 1980s as designated by the Indochinese Assistance and Refugee Assistance Act of 1975 (Chafetz and Ebaugh 2000). Thus, Houston also experienced a similar immigration shock as Miami and thus would not serve as a good control city candidate. Jackson and Pueblo are also poor candidates because small cities tend to

5 These include FIRE (Finance, Insurance, & Real Estate), Professional Services and Business and Repair Services. Workers in these industries are most likely to be college graduates. See “Appendix 4.”
6 Calculated as $Z=100 \times (B - A)/A$, where $A$ is the 1970 to 1980 change in the city’s share of immigrants and $B$ is the 1980 to 1990 change in the city’s share of immigrants (based on HUD census data). Thus, $Z$ is the percent change between the 1980s and 1970s in the growth of the city’s immigration share. Exact results are available upon request.
7 There are only 121 MSAs available for use from 1940, with only a small Sunbelt representation.
have slower growth in their college graduate shares (Berry and Glaeser 2005; Betz et al. 2016). Thus, they would lag Miami just on that basis.

Miami exhibits a similar trend for other educational categories when comparing the 1970s to the 1980s. For example, the magnitude of Miami’s decline in the share of adults over 25 years old with some college (but no Bachelors degree) is the third most among the 121 MSAs, its decline in its high school graduate share is the second largest, and its increase in the share of high school dropouts is the second largest. Overall, the descriptive evidence is consistent with the pattern that Miami’s human capital growth declined after 1980.

5.1 Main results

We now turn to the SCM results based on 1940 to 1980 data to identify the donor cities. Figure 1 compares the college graduate shares between the Miami MSA and its synthetic control unit over the 1940 to 2000 period (see Appendix Tables 4, 5 for details). The vertical axis represents the share of college graduates (age 25 or older). After tracking very closely between 1940 and 1980, Miami’s college graduate share grew more slowly than for its synthetic control unit in both the 1980s and 1990s. Table 1 provides the point estimates of the estimated difference between Miami and its synthetic control unit. The estimated difference in the college graduate share between Miami and the synthetic control unit is $-0.037$ in 1990 and $-0.063$ in 2000, illustrating at least a highly persistent departure if not a permanent departure from trend for Miami.

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8 See Appendix D.1 for comparison between Miami and the synthetic control city’s variables and weights used in constructing the donor cities.
One way to understand the size of this difference is to calculate the “direct effect” from Marielitos. The 1980 Census was conducted in early April, just before the boatlift. So we can calculate the direct effect of the mere presence of Marielitos on Miami’s 1990 proportion of college graduates. Miami’s college graduate share among those aged 25 or older in 1980 was 0.168. The number of Marielitos aged 16 to 65 who were still in Miami in 1990 was 54,196 (Peri and Yasenov 2015). The 1990 Census indicates that 1,281,295 people in Miami were 25 or older. Among them, 240,460 were college graduates. Even assuming that none of the Marielitos graduated from college and dropping them from the total count, the share of college graduates among the remaining people age 25 or older in 1990 would have been around 0.196, which is still much smaller than the 0.23 share for the synthetic control unit. Thus, the Mariel boatlift decreased the 1980–1990 change in the college graduate share by about 60% more than would be expected from mechanically adding Marielitos to the calculation, suggesting that there was additional sorting due to migration of low- and high-skilled workers.

We now assess the SCM results for the other broader measures of skill aggregation using other educational attainment measures other than four-year college graduation or above. Specifically, our two broader measures skill groups are: some college or higher and then high school graduate or higher. In Miami’s case, we use some college and above as well as high school and above as measures of “higher skills” because as we noted earlier, there was such a disproportionate share of low-skilled boatlift newcomers that did not have a high school degree. Similar measures are used as to proxy for regional human capital levels in previous studies (Coulombe and Tremblay 2001; Glaeser and Saiz 2003; Goetz and Rupasingha 2009).

Figures 2 and 3, respectively, show that Miami also experienced slower growth in the share who had some college or higher (see Appendix Tables 6, 7 for details),

| Table 1 | Point estimated differences between Miami and the synthetic control unit |
|---------|------------------------------------------------------------------------|
| Year    | Difference between Miami and control (control–Miami)                  |
|         | Year                      | Share of college graduates from 1940 Census | 1990 | −0.037 |
|         |                           |                                              | 2000 | −0.063 |
|         | Share of some college experience or higher from 1940 Census           | 1990 | −0.068 |
|         |                           |                                              | 2000 | −0.106 |
|         | Share of high school graduates or higher from 1940 Census             | 1990 | −0.102 |
|         |                           |                                              | 2000 | −0.126 |
|         | Share of high school dropouts from 1940 Census                        | 1990 | 0.102  |
|         |                           |                                              | 2000 | 0.126  |

9 We include Marielitos 16 to 24 in this estimate, which further works to raise the Miami’s college graduate share.

10 We also do the similar analysis for the other educational attainment measures. In the case of some college experience, the direct effect is 15 percent. In the case of high school graduates, the direct effect is only 10 percent.
as well as slower growth in the high school graduate or higher share (see Appendix Tables 8, 9 for details.). These results further support our findings that skill levels fell in Miami after the boatlift. Now turning to the lowest-skilled group, Fig. 4 shows that Miami made significant relative gains in high school dropouts (see Appendix Tables 10, 11 for details.). For these cases, Table 1 reports the estimated point difference between Miami and its synthetic control unit.
Inference and placebo tests

We now use a standard method to help infer classical statistical significance of the SCM treatment effect (Abadie et al. 2010; Cavallo et al. 2013). First, we construct a new synthetic control for each of the “donor” MSAs that are used to construct Miami’s synthetic control. Then we obtain a distribution of differences in the dependent variable between each donor and its synthetic control unit after “treatment”—i.e., “in-place placebo effects” (Abadie et al. 2010; Cavallo et al. 2013). Then we compare Miami’s estimated treatment effect to this distribution. From the distribution of donors, a pseudo-p-value is calculated for where Miami’s treatment effects sit in the distribution. If Miami’s treatment effect is in the tails of this distribution, it implies that Miami’s effect is more likely to arise from the boatlift, not by chance.

| Year         | P-value   |
|--------------|-----------|
| 1990         | 0.042     |
| 2000         | 0.008     |
| 1990         | <0.001    |
| 2000         | <0.001    |
| 1990         | <0.001    |
| 2000         | <0.001    |
| 1990         | <0.001    |
| 2000         | <0.001    |
The two-sided $p$-value representing the percentage of donors who experience a change in the college graduate share (from their synthetic control) that is at least as large as Miami’s is 4.2 percent in 1990 and 0.8 percent in 2000. Although this $p$-value may not have classical statistical significance, these values generally imply that Miami’s estimated treatment effect is larger than for other cities. With the same method, we also calculate the $p$-values for the alternative educational attainment measures. Table 2 summarizes the results, in which their estimated $p$-values are even smaller.

5.2 Robustness checks

5.2.1 In-time placebo test

For another robustness check, we perform the “in-time placebo test.” This test assesses the possibility that Miami’s slower increase in human capital might have actually began before 1980. By setting the treatment year before 1980 to construct the synthetic control, we appraise whether Miami’s human capital level diverged before 1980. For this, we use 1970 (10 years before the boatlift) as the imagined treatment time for this placebo test (we use the control variables up till 1970). The corresponding results for the college graduate share, the share with some college or higher, high school graduate or higher share, and high school dropout share are shown in Figs. 5, 6, 7 and 8 (for the comparison between Miami and the synthetic control unit and donor MSA weights, see Appendix Tables 12, 13, 14, 15, 16, 17, 18, 19). The results clearly show that the results are robust with human capital in Miami and its synthetic control beginning to diverge after 1980.

![Figure 5](image_url)  
**Fig. 5** In-time placebo test: college graduate share in Miami and the synthetic control after 1940
5.2.2 Matching on early pre-periods

Recently, Kaul et al. (2018) noted that controlling for all of the pre-treatment periods can lead to misleading results. Thus, following their suggestion, we drop 1980 as a pre-treatment period (recall 1980 census period is just before treatment). Figures 9, 10, 11 and 12 present the results (for comparisons between
Miami and the synthetic control and the MSA donor weights, see Appendix Tables 20, 21, 22, 23, 24, 25, 26, 27). Even further, by dropping 1970, we construct another synthetic control unit for each human capital measure by only using the pre-treatment outcomes for 1940, 1950, and 1960. Even though there is a full 20 year period between the latest pre-treatment period and the treatment year, the model is remarkably robust (see Appendix Figs. 19, 20, 21, 22. Tables for comparisons between Miami and the synthetic control and the MSA donor weights are available upon request).
5.2.3 Other robustness checks

Two concerns with using pre-treatment outcomes up to 40 years before the treatment (pre-dating World War II) are: (1) that is a long time to expect parallel pre-treatment trends and (2) the number of Sunbelt cities available in the data is considerably less for constructing the synthetic control. However, even when we use pre-treatment outcomes from 1970 to 1980 to allow for more Sunbelt cities and a
shorter pre-treatment trend, our conclusions remain unchanged (results available on request).

In constructing the synthetic control unit, including all MSAs as potential donors may be problematic because many MSAs are quite different from Miami (Abadie et al. 2010; Cavallo et al. 2013). Thus, as another robustness check, we restrict our potential donor pool to only MSAs in the south and southwestern USA with populations between 500,000 and 4 million between 1970 and 2000 (24 MSAs). The results, available from the authors, indicate that the results remain robust to using this regionally more consistent donor pool.

5.3 Using CPS data

When using the SCM, it is often desirable to have many pre-treatment periods. Thus, we experimented with using monthly Current Population Survey (CPS) data to allow for more pre-treatment periods, although small CPS sample sizes increase measurement errors. To minimize measurement error, we use the three-year average share of college graduates (though we caution that the sample sizes are still miniscule compared to the census). For example, the “1980 college graduate share” is the average share over 1978 to 1980. In results available from the authors, Miami had a lower college graduate than its synthetic control over the 1980 to 2000 period, which echoes

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*Fig. 12* Matching on early pre-periods: high school dropouts share in Miami and synthetic control unit after 1940

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11 These include: Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, Texas, California, New Mexico, and Arizona. All Florida MSAs are excluded from the donor pool to reduce spillover effects. The population of Miami (Dade County) was 1267,792 in 1970 and 2,253,362 in 2000. Thus, as a lower bound, we use 500,000 (one-half of Miami’s 1970 population) and 4,000,000 as the upper bound (double Miami’s 2000 population) for the potential donor cities for the synthetic control. In this case, we use pre-treatment outcomes from 1970 (322 US. MSAs are available) to include more potential donors in constructing the synthetic control unit.
the base findings. Miami also had much lower shares of adults with some college and high school graduates, which by default means greater shares of high school dropouts (see Appendix Figs. 23, 24, 25, 26 and Appendix Tables 28, 29, 30, 31, 32, 33, 34, 35 for comparisons between Miami and the synthetic control and MSA donor weights).

5.4 Alternative identification strategy

In this subsection, we use a linear difference-in-differences (DiD) as an alternative to the SCM. The resulting estimation equation is:

\[ D_{it} = \alpha + \beta_{1970} \times \text{treatment} + \sum_{t=1980,1990,2000} \beta_t \times \text{Year dummy}_t \times \text{treatment} + \sum_{t=1980,1990,2000} \text{Year Fixed effect}_t + \sum \text{MSA Fixed effect}_t + \epsilon_{it} \]

This is a response function form of the DiD approach. \( D_{it} \) is a measure of the skill level defined as either the share of college graduates, some college or higher, or high school graduates or higher, whereas treatment is Miami. Since the Mariel boatlift occurred just after the 1980 Census, the coefficients of interest are \( \beta_{1990} \) and \( \beta_{2000} \). For the control group, we pick MSAs that have a less than 0.01 percentage point difference in the growth of the college graduate share with Miami over the 1970 to 1980 period. Control groups were chosen analogously for high school graduates or higher and of some college or higher. Appendix Table 36 shows that the 1980 treatment effect is statistically insignificant, consistent with the parallel trends assumption. Further, there is a significantly negative influence of the Mariel boatlift on the shares of college graduates, some college and above, and high school graduates and above. The sizes of their effects are stable even after including MSA fixed effects and are comparable to the estimated impacts from the SCM, and all specifications show the effect grows over time.

6 Proposed mechanisms for the post-Mariel boatlift findings

In this section, we analyze some mechanisms for changes in relative productivity and amenities along with the SEM to help interpret our results. First, we assess relative changes in Miami’s wage and rents using the SCM.\(^{12}\) Figures 13, 14, 15, 16 and 17 show the comparison of overall average wages and average wages by education group (college graduates, some college, high school graduates,

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\(^{12}\) For wage and rent data, we use census data from IPUMS. However, rent data is only available from 1960.
and high school dropouts\textsuperscript{13} to Miami’s synthetic control unit (for comparisons between Miami and the synthetic control and the MSA donor weights, see Appendix Tables 37, 38, 39, 40, 41, 42, 43, 44, 45, 46). To be sure, unlike the prior case, these groups are only for the listed group (e.g., high school graduates) and not for additional categories with more education (e.g., not some college and college graduates in the case of high school graduates). Figure 18 reports the corresponding comparison for overall average rent levels (for comparisons between Miami and the synthetic control and the MSA donor weights, see Appendix Tables 47, 48). The results show that there is some evidence that Miami wages for high school dropouts and high school graduates is slightly below the synthetic control, but the evidence suggest little or no wage difference for those with some college, as well as college graduates. Likewise, Miami’s overall average (nominal) wage declined over the period, but any response could be mainly from a composition effect of having relatively more lower-paid less-skilled workers—i.e., indicating no clear productivity change among individuals in Miami’s workforce.

Figure 18 likewise shows no clear trend in relative rents, though Miami may have slightly lagged its synthetic control after 1990. Yet, because there are possible compositional effects entangled in overall rents, we do not make strong claims based on the SCM rent results. However, given that Saiz (2003) more carefully examined housing composition effects, finding evidence that Miami’s relative rents for low-income residents increased, we believe that it is likely that real wages of the less-skilled declined in Miami in the aftermath of the boatlift. Thus, under this assumption, the SEM model suggests that the amenities for Miami’s low-skilled workers increased, leading to in-migration of more low-skilled households and an ensuing decline in their real wage to reestablish spatial equilibrium.

To further assess whether there was a compositional shift, we appraise whether there was a change in Miami’s industry structure after the boatlift. As a first pass at

\textsuperscript{13} In this case, we use the non-overlapping education attainment group. In other words, each group doesn’t contain people with higher level of education.
this, we use the SCM to investigate this question for broadly defined industry divisions (see Appendix Tables 49, 50, 51, 52 for details). Appendix Fig. 28 shows that Miami’s share of low-skilled-intensive industries significantly increased relative to the synthetic control unit following the boatlift.\textsuperscript{14} Likewise, Appendix Fig. 27 shows that Miami experienced a slower growth of skilled-intensive industries compared to the synthetic control from 1980 to 1990, though overall the difference is not striking.

\textsuperscript{14} Agriculture, Mining and other extractive industries, Transportation, Communication, and Wholesale and Retail Trade. See Appendix Table 3.
compared to the change for low-skilled-intensive industries. Thus, the evidence suggests that Miami’s industry composition adjusted to the relative increase in supply of less-skilled workers.

According to the HUD census data, Miami also experienced a large increase in its Hispanic population share after 1980, moving from 35% in 1980 to 56% by 2000 (and 70% in 2010). Miami’s share of non-Hispanic whites declined from 46% in 1980 to 20% in 2000 (10% in 2010). So the Mariel boatlift appears to have been a “tipping point” in shifting Miami to a strong hub of Hispanic culture, which is consistent with the previous literature (Card et al. 2008; Schelling 1971). To more
formally test this proposition, we use the SCM to appraise how Miami’s Hispanic population share evolved (see Appendix Tables 53, 54 for details). The results indicate that Miami’s Hispanic share was 10 percentage points higher than its synthetic control in 1990, with the gap growing to 17 percentage points in 2000.

We can then perform the following back-of-the-envelope calculation. It is known from Census data that the percentage of Hispanics who have a bachelor’s degree is approximately 15 percentage points lower compared to non-Hispanic whites (Stella et al. 2012). Then the change in the Hispanic share after 1980 can explain approximately 40 percent of the difference between the share of college graduates in Miami and the synthetic control unit in 1990 and 2000. On the other hand, for 1990 and 2000, the change in the Hispanic share can explain approximately 30 percent of the difference between those with some college in Miami and its synthetic control unit, and 20 percent of the difference between the share of high school graduates in Miami and it synthetic control unit, respectively.

Miami role as a “gateway city” that takes in a large number of immigrants (generally lower-skilled compared to natives) also cannot explain the relative decline in Miami’s skill aggregation after 1980. That is, Miami’s relative immigration flows did not increase after 1980, owing to the fact that migration to Miami was already very high before 1980. Calculate $Z = 100 \times \frac{B-A}{A}$, where $A$ is the 1970 to 1980 change in the city’s share of immigrants and $B$ is the 1980 to 1990 change in the city’s share of immigrants (based on HUD census data). Thus, $Z$ is the percent change between the 1980s and 1970s in the growth of the city’s immigration share. The higher this value, the greater the growth in that city’s immigrant share after 1980. The value of $Z$ for Miami is negative ($-0.139$) and ranks 116th out of 323 MSAs. So, changes in Miami’s immigrant inflow after 1980 are unlikely to explain its relative skill-level decline.

There are 322 MSAs available from 1970.
Lastly, one might argue that rather than the effects of the boatlift, violent crime drove out the skilled population. Indeed, Miami was the inspiration of the 1980s popular television program *Miami Vice* that depicted it as the home of drug-running gangs. It is true that Miami’s crime rate has been historically high. However, Appendix Fig. 30 shows that the Miami’s homicide rate (whether measured for Dade County or just for the city of Miami) declined substantially in the 1980s and 1990s (with an especially sharp decline in the early 1980s).\footnote{The homicide rate is derived using National Archive of Criminal Justice Data (NACJD).} This pattern is in contrast to homicide rate trends in other major US cities, which experienced a sharp increase in homicide rate in the 1980s (Murder Rates in 50 American Cities 2017) before declining in the mid-1990s. Therefore, the changes in Miami’s relative skill composition cannot be attributed to violent crime.

7 Conclusion

We find that the Mariel boatlift considerably slowed Miami’s relative human capital growth rate, representing at least a highly persistent change if not a permanent one. We find our results are robust to using decennial census data or CPS data, the use of different pre-treatment periods, using different MSAs to form the control group, and to using the standard DiD approach. We find that Miami’s average rents did not diverge from its control group and there was some (weak) evidence that real wages for low-skilled workers declined, consistent with enhanced household amenities for low-income households to reestablish spatial equilibrium. Further, it seems that the results might be partially due to a type of cultural or racial sorting due to agglomeration of household amenities. Therefore, this result is likely to be generalizable to other cities as long as cultural characteristics are correlated with education and income levels.

For future study, it would be worthwhile to consider in other settings how shocks may have permanent effects. However, we suspect that given the strength of spatial equilibrium in the USA, it is generally not the case that localized shocks lead to a permanent shift in the aggregate growth of a region’s employment and population, though changes in demographic composition such as what we observed seems more likely. If so, it is worthwhile to understand the conditions that regions can (say) upskill to enhance future growth. In addition, future research should also conduct a
fuller analysis on how Miami’s industry composition changed following the boatlift to better understand how shifts in a region’s skill composition may affect industry structure.

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**Appendix 1**

The HUD system provides the number of employed workers in each industry category by city. However, it does not provide the share of skilled workers in each industry. Thus, we calculate the correlation between the share of college graduates in each city and the number of employed workers in each industry category.

This table indicates that three industries—Professional Services, Finance, Insurance, and Real Estate (FIRE), and Business and Repair Services—are distinctively positively correlated with the share of college graduates in cities. Thus, we use the share of these industries as the share of skill intensive industries in my main regression. On the other hand, Agriculture, Mining and other extractive industries, Transportation, Communication and Public Utilities and Wholesale and Retail Trade are very negatively correlated with the share of college graduates. Thus we use the share of these industries as the share of non-skill-intensive industries in Sect. 6 (Table 3).
We construct the synthetic control city by using 1940, 1950, 1960, 1970, and 1980 Census to estimate the treatment effect on the share of college graduates. Appendix Table 4 shows the comparison between Miami and the synthetic control city. Appendix Table 5 shows weights of each MSA contained in the synthetic control for Miami. Root-mean-squared prediction error (RMSPE) is 0.001009.

See Tables 4 and 5.

### Appendix 2

**Table 3** Correlation between share of college graduates in each city and number of employed workers in each industry category

| Variables                                      | (1)                          |
|------------------------------------------------|------------------------------|
| Agriculture, mining and other extractive industries | $-0.0345$ (0.0525)          |
| Construction                                    | $0.159^*$ (0.0926)           |
| Professional services                           | $0.863^{***}$ (0.0457)      |
| Manufacturing                                   | $0.0855^{**}$ (0.0383)       |
| Transportation, communication, and public utilities | $-0.304^{***}$ (0.0803)     |
| Wholesale and retail trade                      | $-0.236^{***}$ (0.0594)     |
| Finance, insurance, and real estate             | $1.068^{***}$ (0.0777)      |
| Business and repair services                    | $1.831^{***}$ (0.0784)      |
| Personal services                               | $0.208^{***}$ (0.0657)      |
| Constant                                        | $-0.118^{***}$ (0.0389)     |
| Observations                                    | 1292                         |
| $R^2$                                           | 0.759                        |
| $N$                                             | 1292                         |
| df_m                                           | 9                            |
| $F$                                             | 448.2                        |
| rss                                             | 1.807                        |
| ll                                              | 2412                         |

Standard errors in parentheses

$^{***}p<0.01$, $^{**}p<0.05$, $^*p<0.1$
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Appendix 3

We construct the synthetic control city by using 1940, 1950, 1960, 1970, and 1980 Census to estimate the treatment effect on the share of some college or higher. Appendix Table 6 shows the comparison between Miami and the synthetic control city. Appendix Table 7 shows weights of each MSA contained in the synthetic control for Miami. RMSPE is 0.0030255.

See Tables 6 and 7.
Appendix 4

We construct the synthetic control city by using 1940, 1950, 1960, 1970, and 1980 Census to estimate the treatment effect on the share of high school or higher. Appendix Table 8 shows the comparison between Miami and the synthetic control city. Appendix 9 shows weights of each MSA contained in the synthetic control for Miami. RMSPE is 0.0129239.

See Tables 8 and 9.
Table 8  Comparison between Miami and synthetic control city

|                                | Miami     | Synthetic |
|--------------------------------|-----------|-----------|
| Share of people with Bachelor’s degree or higher in the population aged 25 or older |           |           |
| 1940                           | 0.0703    | 0.0691    |
| 1950                           | 0.0303    | 0.0329    |
| 1960                           | 0.0826    | 0.0853    |
| 1970                           | 0.1079    | 0.1079    |
| 1980                           | 0.1677    | 0.1679    |
| Share of people graduated high school or higher in the population aged 25 or older |           |           |
| 1940                           | 0.3791    | 0.3580    |
| 1950                           | 0.1705    | 0.1592    |
| 1960                           | 0.4697    | 0.4762    |
| 1970                           | 0.5193    | 0.5165    |
| 1980                           | 0.6400    | 0.6532    |
| Employment shares of industries that hire skilled labor intensively |           |           |
| 1970                           | 0.2759    | 0.2444    |
| 1980                           | 0.3203    | 0.2946    |
| Median family income           |           |           |
| 1970                           | 9245      | 9486.198  |
| 1980                           | 18,642    | 19,429.96 |
| Median home value              |           |           |
| 1970                           | 19,088    | 16,803.16 |
| 1980                           | 57,235    | 53,262.05 |
| Unemployed rate                |           |           |
| 1970                           | 0.0368    | 0.0388    |
| 1980                           | 0.0491    | 0.0535    |
| Total population               |           |           |
| 1970                           | 1,267,792 | 1,379,909 |
| 1980                           | 1,625,781 | 1,529,948 |
| African American share (1980)  | 0.1659    | 0.1211    |
| Hispanic share (1980)          | 0.3574    | 0.0751    |

Table 9  MSA weights in synthetic control

| MSA                                 | Weight |
|-------------------------------------|--------|
| Bridgeport, CT                      | 0.002  |
| Charlotte/Gastonia/Rock Hill, NC/SC| 0.463  |
| Columbia, SC                        | 0.017  |
| Fresno, CA                          | 0.101  |
| Los Angeles/Long Beach, CA          | 0.113  |
| Portland, ME                        | 0.231  |
| San Diego, CA                       | 0.039  |
| San Francisco, CA                   | 0.034  |

Appendix 5

We construct the synthetic control city by using 1940, 1950, 1960, 1970, and 1980 Census to estimate the treatment effect on the share of high school dropouts. Appendix Table 10 shows the comparison between Miami and the synthetic control city. Appendix 11 shows weights of each MSA contained in the synthetic control for Miami. RMSPE is 0.0129239. See Tables 10 and 11.
### Table 10  Comparison between Miami and synthetic control city

|                         | Miami     | Synthetic |
|-------------------------|-----------|-----------|
| **Share of people with Bachelor’s degree or higher in the population aged 25 or older** |           |           |
| 1940                    | 0.0703    | 0.0691    |
| 1950                    | 0.0303    | 0.0329    |
| 1960                    | 0.0826    | 0.0853    |
| 1970                    | 0.1079    | 0.1079    |
| 1980                    | 0.1677    | 0.1679    |
| **Share people didn’t graduate high school in the population aged 25 or older** |           |           |
| 1940                    | 0.6209    | 0.642     |
| 1950                    | 0.8295    | 0.8408    |
| 1960                    | 0.5303    | 0.5238    |
| 1970                    | 0.4807    | 0.4835    |
| 1980                    | 0.36      | 0.3468    |
| **Employment shares of industries that hire skilled labor intensively** |           |           |
| 1970                    | 0.2759    | 0.2444    |
| 1980                    | 0.3203    | 0.2946    |
| **Median family income** |           |           |
| 1970                    | 9245      | 9486.198  |
| 1980                    | 19,088    | 19,429.96 |
| **Median home value**   |           |           |
| 1970                    | 57,235    | 53,262.05 |
| 1980                    | 19,088    | 19,429.96 |
| **Unemployed rate**     |           |           |
| 1970                    | 0.0368    | 0.0388    |
| 1980                    | 0.0491    | 0.0535    |
| **Total population**    |           |           |
| 1970                    | 1,267,792 | 1,379,909 |
| 1980                    | 1,625,781 | 1,529,948 |
| **African American share (1980)** | 0.1659    | 0.1211    |
| **Hispanic share (1980)** | 0.3574    | 0.0751    |

### Table 11  MSA weights in synthetic control

| MSA                        | Weight |
|----------------------------|--------|
| Bridgeport, CT             | 0.002  |
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.463 |
| Columbia, SC               | 0.017  |
| Fresno, CA                 | 0.101  |
| Los Angeles/Long Beach, CA | 0.113  |
| Portland, ME               | 0.231  |
| San Diego, CA              | 0.039  |
| San Francisco, CA          | 0.034  |
Appendix 6: In-time placebo test for college graduates

See Tables 12 and 13.

Table 12  Comparison between Miami and synthetic control city for Fig. 5 (In-time placebo test) (RMSPE: 0.0035276)

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1940 | 0.0703| 0.0692    |
| 1950 | 0.0303| 0.0327    |
| 1960 | 0.0826| 0.0858    |
| 1970 | 0.1079| 0.1130    |

Share of people with Bachelor’s degree or higher in the population aged 25 or older

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1940 | 0.6209| 0.6431    |
| 1950 | 0.8295| 0.8397    |
| 1960 | 0.5303| 0.5322    |
| 1970 | 0.4807| 0.4641    |

Share of people didn’t graduate high school in the population aged 25 or older

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1940 | 0.2759| 0.2665    |
| 1970 | 0.1499| 0.1315    |

Employment shares of industries that hire skilled labor intensively

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.0368| 0.0298    |

Median family income

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 9245  | 9479.8    |

Median home value

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 19,088| 16,372.24 |

Unemployed rate

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 1,267,792| 1,290,496 |

African American share (1970)

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.1499| 0.1315    |

Hispanic share (1970)

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.2258| 0.0140    |

Table 13  MSA weights in synthetic control for Fig. 5 (In-time placebo test)

| MSA                          | Weight |
|-------------------------------|--------|
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.21   |
| Des Moines, IA                | 0.018  |
| Los Angeles/Long Beach, CA    | 0.033  |
| New York, NY                  | 0.062  |
| Oklahoma City, OK             | 0.164  |
| Portland/Vancouver, OR/WA     | 0.275  |
| Richmond/Petersburg, VA       | 0.212  |
| Topeka, KS                    | 0.026  |
Appendix 7: In-time placebo test for some college experience or higher

See Tables 14 and 15.

Table 14 Comparison between Miami and synthetic control city for Fig. 6 (In-time placebo test) (RMSPE: 0.0057033)

|                                    | Miami     | Synthetic |
|------------------------------------|-----------|-----------|
| Share of people with some college experience or higher in the population aged 25 or older |           |           |
| 1940                               | 0.1370    | 0.1408    |
| 1950                               | 0.0647    | 0.0660    |
| 1960                               | 0.1911    | 0.1938    |
| 1970                               | 0.2245    | 0.2333    |
| Share of people didn’t graduate high school in the population aged 25 or older |           |           |
| 1940                               | 0.6209    | 0.6487    |
| 1950                               | 0.8295    | 0.8419    |
| 1960                               | 0.5303    | 0.5346    |
| 1970                               | 0.4807    | 0.4672    |
| Employment shares of industries that hire skilled labor intensively |           |           |
| 1970                               | 0.2759    | 0.2692    |
| Median family income               | 1970      | 9245      |
| Median home value                  | 1970      | 9711.413  |
| Median home value                  | 1970      | 19,088    |
| Unemployed rate                    | 1970      | 0.0368    |
| Total population                   | 1970      | 1,267,792 |
| African American share (1970)      |           | 0.1499    |
| Hispanic share (1970)              |           | 0.2258    |

Table 15 MSA weights in synthetic control for Fig. 6 (In-time placebo test)

|                                    | Weight |
|------------------------------------|--------|
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.187  |
| Dallas, TX                         | 0.136  |
| Des Moines, IA                     | 0.112  |
| New York, NY                       | 0.071  |
| Portland, ME                       | 0.251  |
| Richmond/Petersburg, VA            | 0.238  |
| Tulsa, OK                          | 0.006  |
Appendix 8: In-time placebo test for high school or higher

See Tables 16 and 17.

Table 16  Comparison between Miami and synthetic control city for Fig. 7 (In-time placebo test) (RMSPE: 0.0144967)

|                         | Miami    | Synthetic |
|-------------------------|----------|-----------|
| Share of people with Bachelor’s degree or higher in the population aged 25 or older | 1940 0.0703 | 0.0693 |
|                         | 1950 0.0303 | 0.0294 |
|                         | 1960 0.0826 | 0.0858 |
|                         | 1970 0.1079 | 0.1116 |
| Share of people graduated high school or higher in the population aged 25 or older | 1940 0.3791 | 0.3592 |
|                         | 1950 0.1705 | 0.1651 |
|                         | 1960 0.4697 | 0.4665 |
|                         | 1970 0.5193 | 0.5344 |
| Employment shares of industries that hire skilled labor intensively | 1970 0.2759 | 0.2672 |
| Median family income | 1970 9245 | 8967.043 |
| Median home value | 1970 19,088 | 14,463 |
| Unemployed rate | 1970 0.0368 | 0.0351 |
| Total population | 1970 1,267,792 | 1,271,626 |
| African American share (1970) | 0.1499 | 0.0816 |
| Hispanic share (1970) | 0.2258 | 0.1296 |

Table 17  MSA weights in synthetic control for Fig. 7 (In-time placebo test)

|               | Weight |
|---------------|--------|
| Amarillo, TX  | 0.108  |
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.157 |
| Los Angeles/Long Beach, CA | 0.102 |
| Oklahoma City, OK | 0.131 |
| Portland, ME  | 0.136  |
| San Antonio, TX | 0.311 |
| Topeka, KS    | 0.054  |
Appendix 9: In-time placebo test for high school dropouts

See Tables 18 and 19.

Table 18 Comparison between Miami and synthetic control city for Fig. 8 (In-time placebo test) (RMSPE: 0.0144967)

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1940 | 0.0703| 0.0693    |
| 1950 | 0.0303| 0.0294    |
| 1960 | 0.0826| 0.0858    |
| 1970 | 0.1079| 0.1116    |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1940 | 0.6209| 0.6408    |
| 1950 | 0.8295| 0.8349    |
| 1960 | 0.5303| 0.5335    |
| 1970 | 0.4807| 0.4656    |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.2759| 0.2672    |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 9245  | 8967      |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 19,088| 14,463    |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.0368| 0.0351    |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 1,267,792| 1,271,626|

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.1499| 0.0816    |

| Year | Miami | Synthetic |
|------|-------|-----------|
| 1970 | 0.2258| 0.1296    |

Table 19 MSA weights in synthetic control for Fig. 8 (In-time placebo test)

| MSA                          | Weight |
|-------------------------------|--------|
| Amarillo, TX                  | 0.108  |
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.157 |
| Los Angeles/Long Beach, CA    | 0.102  |
| Oklahoma City, OK             | 0.131  |
| Portland, ME                  | 0.136  |
| San Antonio, TX               | 0.311  |
| Topeka, KS                    | 0.054  |
Appendix 10: Matching on early pre-periods for college graduates

See Tables 20 and 21 and Figs. 19, 20, 21 and 22.

Table 20  Comparison between Miami and synthetic control city for Fig. 9 (matching on early pre-periods) (RMSPE: 0.0026085)

|                         | Miami       | Synthetic  |
|-------------------------|-------------|------------|
| Share of people with Bachelor’s degree or higher in the population aged 25 or older | 1940 0.0703 0.0698 |
|                         | 1950 0.0303 0.0328 |
|                         | 1960 0.0826 0.0833 |
|                         | 1970 0.1079 0.1098 |
| Share of people didn’t graduate high school in the population aged 25 or older | 1940 0.6209 0.6336 |
|                         | 1950 0.8295 0.8376 |
|                         | 1960 0.5303 0.5242 |
|                         | 1970 0.4807 0.4769 |
| Employment shares of industries that hire skilled labor intensively | 1970 0.2759 0.2438 |
|                         | 1980 0.3203 0.2963 |
| Median family income    | 1970 9245 9539 |
|                         | 1980 18,642 19,517 |
| Median home value       | 1970 19,088 16,348 |
|                         | 1980 57,235 47,666 |
| Unemployed rate         | 1970 0.0368 0.0324 |
|                         | 1980 0.0491 0.0476 |
| Total population        | 1970 1,267,792 1,366,777 |
|                         | 1980 1,625,781 1,526,679 |
| African American share (1980) | 0.1659 0.1270 |
| Hispanic share (1980)   | 0.3574 0.0451 |

Table 21  MSA weights in synthetic control for Fig. 9 (matching on early pre-periods)

| MSA                           | Weight |
|-------------------------------|--------|
| Bridgeport, CT                | 0.007  |
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.425  |
| Columbia, SC                  | 0.039  |
| Dallas, TX                    | 0.104  |
| Los Angeles/Long Beach, CA    | 0.109  |
| Portland, ME                  | 0.314  |
| San Diego, CA                 | 0.002  |
The share of college graduates

Fig. 19 College graduate share in Miami and the synthetic control unit after 1940

The share of some college experience or higher

Fig. 20 Some college experience or higher share in Miami and the synthetic control unit after 1940
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The share of high school graduates or higher

Fig. 21 High school graduate share or higher in Miami and the synthetic control unit after 1940

The share of high school dropouts

Fig. 22 High school dropout share in Miami and the synthetic control unit after 1940
Appendix 11: Matching on early pre-periods for some college or higher

See Tables 22 and 23.

Table 22  Comparison between Miami and synthetic control city for Fig. 10 (matching on early pre-periods) (RMSPE: 0.0036858)

|                          | Miami     | Synthetic |
|--------------------------|-----------|-----------|
| Share of people with some college experience or higher in the population aged 25 or older | 1940 0.1370 0.1402 | 1950 0.0647 0.0659 |
|                          | 1960 0.1911 0.1920 | 1970 0.2245 0.2292 |
| Share of people didn’t graduate high school in the population aged 25 or older | 1940 0.6209 0.6376 | 1950 0.8295 0.8387 |
|                          | 1960 0.5303 0.5272 | 1970 0.4807 0.4737 |
| Employment shares of industries that hire skilled labor intensively | 1970 0.2759 0.2395 | 1980 0.3203 0.2947 |
| Median family income     | 1970 19,088 16,253 | 1980 18,642 19,123 |
|                          | 1970 57,235 47,476 | 1980 19,088 16,253 |
| Unemployed rate          | 1970 0.0368 0.0333 | 1980 0.0491 0.0507 |
| Total population         | 1970 1,267,792 1,374,170 | 1980 1,625,781 1,501,432 |
| African American share (1980) | 0.1659 0.1123 | 0.3574 0.0411 |
| Hispanic share (1980)    |                                       |

Table 23  MSA weights in synthetic control for Fig. 10 (matching on early pre-periods)

| MSA weights in synthetic control for Fig. 10 (matching on early pre-periods) | Weight |
|-----------------------------------------------------------------------------|--------|
| Charlotte/Gastonia/Rock Hill, NC/SC                                        | 0.399  |
| Greensboro/Winston-Salem/High Point, NC                                     | 0.071  |
| Los Angeles/Long Beach, CA                                                  | 0.129  |
| Mobile, AL                                                                  | 0.009  |
| Portland, ME                                                                | 0.392  |
Appendix 12: Matching on early pre-periods for high school or higher

See Tables 24 and 25.

Table 24  Comparison between Miami and synthetic control city for Fig. 11 (matching on early pre-periods) (RMSPE: 0.0132511)

| | Miami | Synthetic |
|---|---|---|
| Share of people with Bachelor’s degree or higher in the population aged 25 or older | 1940 0.0703 0.0698 | 1950 0.0303 0.0328 | 1960 0.0826 0.0833 | 1970 0.1079 0.1098 |
| Share of people graduated high school or higher in the population aged 25 or older | 1940 0.3791 0.3664 | 1950 0.1705 0.1624 | 1960 0.4697 0.4758 | 1970 0.5193 0.5231 |
| Employment shares of industries that hire skilled labor intensively | 1970 0.2759 0.2438 | 1980 0.3203 0.2963 |
| Median family income | 1970 9245 9539 | 1980 18,642 19,517 |
| Median home value | 1970 19,088 16,348 | 1980 57,235 47,666 |
| Unemployed rate | 1970 0.0368 0.0324 | 1980 0.0491 0.0476 |
| Total population | 1970 1,267,792 1,366,777 | 1980 1,625,781 1,526,679 |
| African American share (1980) | 0.1659 0.1270 |
| Hispanic share (1980) | 0.3574 0.0451 |

Table 25  MSA weights in synthetic control for Fig. 11 (matching on early pre-periods)

| | Weight |
|---|---|
| Bridgeport, CT | 0.007 |
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.425 |
| Columbia, SC | 0.039 |
| Dallas, TX | 0.104 |
| Los Angeles/Long Beach, CA | 0.109 |
| Portland, ME | 0.314 |
| San Diego, CA | 0.002 |
Appendix 13: Matching on early pre-periods for high school dropouts

See Tables 26 and 27.

Table 26  Comparison between Miami and synthetic control city for Fig. 12 (matching on early pre-periods) (RMSPE: 0.0132511)

|                          | Miami  | Synthetic |
|--------------------------|--------|-----------|
| Share of people with Bachelor’s degree or higher in the population aged 25 or older | 1940 0.0703 | 0.0698 |
|                         | 1950 0.0303 | 0.0328 |
|                         | 1960 0.0826 | 0.0833 |
|                         | 1970 0.1079 | 0.1098 |
| Share of people didn’t graduate high school in the population aged 25 or older | 1940 0.6209 | 0.6336 |
|                         | 1950 0.8295 | 0.8376 |
|                         | 1960 0.5303 | 0.5242 |
|                         | 1970 0.4807 | 0.4769 |
| Employment shares of industries that hire skilled labor intensively | 1970 0.2759 | 0.2438 |
|                         | 1980 0.3203 | 0.2963 |
| Median family income | 1970 9245 | 9539 |
|                         | 1980 18,642 | 19,517 |
| Median home value | 1970 57,235 | 47,666 |
|                         | 1980 57,235 | 47,666 |
| Unemployed rate | 1970 0.0368 | 0.0324 |
|                         | 1980 0.0491 | 0.0476 |
| Total population | 1970 1,267,792 | 1,366,777 |
|                         | 1980 1,625,781 | 1,526,679 |
| African American share (1980) | 0.1659 | 0.1270 |
| Hispanic share (1980) | 0.3574 | 0.0451 |

Table 27  MSA weights in synthetic control for Fig. 12 (matching on early pre-periods)

| MSA                          | Weight |
|------------------------------|--------|
| Bridgeport, CT               | 0.007  |
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.425  |
| Columbia, SC                 | 0.039  |
| Dallas, TX                    | 0.104  |
| Los Angeles/Long Beach, CA   | 0.109  |
| Portland, ME                 | 0.314  |
| San Diego, CA                | 0.002  |
Appendix 14: Fig. 2

There are several issues with using the CPS. First, we can only identify 30 MSAs from the IPUMS distribution of the data, as we start from 1973 (the earliest year when Miami itself is identified). And it contains a large number of Midwestern MSAs but few in the South, which means that it is unlikely to contain good control candidates for the synthetic control of Miami.

Second, there are potentially very serious measurement errors compared to city aggregation information from HUD. For instance, according to the CPS data, the share of college graduates did not increase from 1973 to 1980 (in fact, it declined slightly, from 14.7 percent in 1973 to 13.5 percent in 1980). This result is starkly inconsistent

![Fig. 23](image1.png) College graduate share in Miami and synthetic control

![Fig. 24](image2.png) Some college or higher share in Miami and synthetic control
The share of high school graduates

Fig. 25 High school graduate or higher share in Miami and synthetic control

The share of high school dropouts

Fig. 26 High school dropouts share in Miami and synthetic control

Table 28 MSA weights in synthetic control (RMSPE: 0.012427)

| Weight | Weight |
|--------|--------|
| Buffalo–Niagara Falls, NY | 0.11 |
| Detroit, MI | 0.171 |
| Newark, NJ | 0.333 |
| Riverside/San Bernardino, CA | 0.387 |
**Table 29** Comparison between Miami and synthetic control city

| Average share of people with Bachelor’s degree or higher in the population aged 25 or older | Miami | Synthetic |
|---|---|---|
| 1973–1975 | 0.1463 | 0.1436 |
| 1974–1976 | 0.1459 | 0.1472 |
| 1975–1977 | 0.1432 | 0.1445 |
| 1976–1978 | 0.1452 | 0.1441 |
| 1977–1979 | 0.1455 | 0.1467 |
| 1978–1980 | 0.1517 | 0.1546 |

**Table 30** MSA weights in synthetic control: share of some college or higher (RMSPE: 0.0110246)

| Weight          |      |
|-----------------|------|
| Buffalo–Niagara Falls, NY | 0.032 |
| Houston, TX      | 0.359 |
| New Orleans, LA  | 0.006 |
| Newark, NJ       | 0.414 |
| Philadelphia, PA/NJ | 0.189 |

**Table 31** Comparison between Miami and synthetic control city: share of some college or higher

| Average share of people with some college experience or higher in the population aged 25 or older | Miami | Synthetic |
|---|---|---|
| 1973–1975 | 0.2840 | 0.2812 |
| 1974–1976 | 0.2912 | 0.2931 |
| 1975–1977 | 0.2913 | 0.2913 |
| 1976–1978 | 0.2983 | 0.2968 |
| 1977–1979 | 0.2979 | 0.3000 |
| 1978–1980 | 0.3124 | 0.3104 |

**Table 32** MSA weights in synthetic control: high school or higher (RMSPE: 0.0159895)

| Weight          |      |
|-----------------|------|
| Buffalo–Niagara Falls, NY | 0.157 |
| Cincinnati, OH/KY/IN | 0.139 |
| Philadelphia, PA/NJ | 0.686 |
| Riverside/San Bernardino, CA | 0.017 |
with the results from HUD (specifically, that the share of college graduates increased from 10 to 17 percent in Miami from 1970 to 1980).

See Figs. 23, 24, 25, 26 and Tables 28, 29, 30, 31, 32, 33, 34 and 35.
Appendix 15

See Table 36.

Table 36 Difference-in-differences outcome

| Variables                  | The share of college graduates | The share of some college experience | The share of high school graduates |
|----------------------------|-------------------------------|-------------------------------------|----------------------------------|
|                            | (1)                           | (2)                                 | (3)                             |
| Treatment                  | $-0.01^{***}$                 | 0.0004                              | $-0.0036$                       |
|                            | $(0.00302)$                   | $(0.00802)$                         | $(0.00559)$                     |
| 1980*Treatment             | 0.000378                      | 0.000378                            | 0.00107                         |
|                            | $(0.00445)$                   | $(0.00155)$                         | $(0.00795)$                     |
| 1990*Treatment             | $-0.0180^{***}$               | $-0.0180^{***}$                     | $-0.0550^{***}$                |
|                            | $(0.00468)$                   | $(0.00144)$                         | $(0.00792)$                     |
| 2000*Treatment             | $-0.0308^{***}$               | $-0.0308^{***}$                     | $-0.0853^{***}$                |
|                            | $(0.00498)$                   | $(0.00198)$                         | $(0.00774)$                     |
| Year Fixed                 | Yes                           | Yes                                 | Yes                             |
| MSA Fixed                  | No                            | Yes                                 | No                              |
| Observations               | 496                           | 496                                 | 368                             |
| $R^2$                      | 0.645                         | 0.970                               | 0.846                           |
| $F$                        | –                             | –                                   | –                               |
| rss                        | 0.719                         | 0.0612                              | 1.000                           |

Robust standard errors in parentheses

***p < 0.01, **p < 0.05, *p < 0.1
Appendix 16

See Tables 37, 38, 39, 40, 41, 42, 43, 44, 45 and 46.

**Table 37** Comparison between Miami and synthetic control city: average wage (RMSPE: 26.42229)

|                  | Miami     | Synthetic |
|------------------|-----------|-----------|
| Average wage     | 477.250   | 424.528   |
|                  | 903.135   | 890.984   |
|                  | 1607.235  | 1738.647  |
|                  | 2787.584  | 2875.104  |
|                  | 5862.711  | 6118.477  |
| Share of people with Bachelor’s degree or higher in the population aged 25 or older | 0.0703 | 0.0688 |
|                  | 0.0303    | 0.0363    |
|                  | 0.0826    | 0.0915    |
|                  | 0.1079    | 0.1145    |
|                  | 0.1677    | 0.1700    |
| Share of people didn’t graduate high school in the population aged 25 or older | 0.6209 | 0.6664 |
|                  | 0.8295    | 0.8547    |
|                  | 0.5303    | 0.5412    |
|                  | 0.4807    | 0.4860    |
|                  | 0.3600    | 0.3362    |
| Employment shares of industries that hire skilled labor intensively | 0.2759 | 0.2419 |
|                  | 0.3203    | 0.2886    |
| Median family income | 9245      | 9487.712  |
|                  | 18,642    | 19,645.65 |
| Median home value  | 19,088    | 17,066.14 |
|                  | 57235     | 51006.64  |
| Unemployed rate   | 0.0368    | 0.0407    |
|                  | 0.0491    | 0.0551    |
| Total population  | 1267792   | 1325494   |
|                  | 1625781   | 1463126   |
| African American share (1980) | 0.1659 | 0.1378 |
| Hispanic share (1980) | 0.3574 | 0.0505 |

**Table 38** MSA weights in synthetic control: average wage

| MSA                                | Weight |
|------------------------------------|--------|
| Columbia, SC                       | 0.111  |
| Greensboro/Winston-Salem/High Point, NC | 0.437  |
| Los Angeles/Long Beach, CA         | 0.078  |
| New York, NY                       | 0.019  |
| Salt Lake City/Ogden, UT           | 0.222  |
| Stockton/Lodi, CA                  | 0.041  |
| Tacoma, WA                         | 0.093  |
### Table 39
Comparison between Miami and synthetic control city: college graduates wage (RMSPE: 384.6324)

| Year | Miami          | Synthetic       |
|------|----------------|-----------------|
|      | Average wage of people with Bachelor’s degree or higher in the population aged 25 or older |      |
| 1940 | 1613.686       | 1540.519        |
| 1950 | 1680.126       | 2809.575        |
| 1960 | 4723.263       | 5307.415        |
| 1970 | 9246.232       | 9654.034        |
| 1980 | 17679.95       | 17400.63        |
|      | Share of people with Bachelor’s degree or higher in the population aged 25 or older |      |
| 1940 | 0.0703         | 0.0680          |
| 1950 | 0.0303         | 0.0280          |
| 1960 | 0.0826         | 0.0889          |
| 1970 | 0.1079         | 0.1109          |
| 1980 | 0.1677         | 0.1680          |
|      | Share of people didn’t graduate high school in the population aged 25 or older |      |
| 1940 | 0.6209         | 0.6708          |
| 1950 | 0.8295         | 0.8502          |
| 1960 | 0.5303         | 0.5469          |
| 1970 | 0.4807         | 0.4704          |
| 1980 | 0.3600         | 0.3320          |
|      | Employment shares of industries that hire skilled labor intensively |      |
| 1970 | 0.2759         | 0.2712          |
| 1980 | 0.3203         | 0.3156          |
|      | Median family income |      |
| 1970 | 9245           | 8732.482        |
| 1980 | 18,642         | 18,711.79       |
|      | Median home value |      |
| 1970 | 19,088         | 14,288.57       |
| 1980 | 57,235         | 44,345.28       |
|      | Unemployed rate |      |
| 1970 | 0.0368         | 0.0408          |
| 1980 | 0.0491         | 0.0531          |
|      | Total population |      |
| 1970 | 1,267,792      | 1,175,575       |
| 1980 | 1,625,781      | 1,329,512       |
|      | African American share (1980) |      |
|      | 0.1659         | 0.0968          |
|      | Hispanic share (1980) |      |
|      | 0.3574         | 0.1324          |

### Table 40
MSA weights in synthetic control: college graduates wage

| City                                      | Weight |
|-------------------------------------------|--------|
| Fresno, CA                                | 0.025  |
| Greensboro/Winston-Salem/High Point, NC   | 0.114  |
| Knoxville, TN                             | 0.147  |
| Little Rock/North Little Rock, AR         | 0.125  |
| Los Angeles/Long Beach, CA                | 0.084  |
| Oklahoma City, OK                         | 0.176  |
| Salt Lake City/Ogden, UT                  | 0.037  |
| San Antonio, TX                           | 0.206  |
| Spokane, WA                               | 0.086  |
Table 41 Comparison between Miami and synthetic control city: some college experience wage (RMSPE: 247.6642)

|                        | Miami         | Synthetic     |
|------------------------|---------------|---------------|
| **Average wage of people with some college experience in the population aged 25 or older** |               |               |
| 1940                   | 1371.432      | 1340.738      |
| 1950                   | 2463.017      | 2569.887      |
| 1960                   | 4082.555      | 4355.196      |
| 1970                   | 7477.838      | 7437.911      |
| 1980                   | 13310.18      | 12,899.43     |
| **Share of people with Bachelor’s degree or higher in the population aged 25 or older** |               |               |
| 1940                   | 0.0703        | 0.0692        |
| 1950                   | 0.0303        | 0.0304        |
| 1960                   | 0.0826        | 0.0903        |
| 1970                   | 0.1079        | 0.1089        |
| 1980                   | 0.1677        | 0.1619        |
| **Share of people didn’t graduate high school in the population aged 25 or older** |               |               |
| 1940                   | 0.6209        | 0.6523        |
| 1950                   | 0.8295        | 0.8438        |
| 1960                   | 0.5303        | 0.5364        |
| 1970                   | 0.4807        | 0.4725        |
| 1980                   | 0.3600        | 0.3386        |
| **Employment shares of industries that hire skilled labor intensively** |               |               |
| 1970                   | 0.2759        | 0.2595        |
| 1980                   | 0.3203        | 0.2992        |
| **Median family income** |               |               |
| 1970                   | 9245          | 9291.545      |
| 1980                   | 18,642        | 19,583.92     |
| **Median home value**  |               |               |
| 1970                   | 19,088        | 15,505.26     |
| 1980                   | 57,235        | 52,720.67     |
| **Unemployed rate**    |               |               |
| 1970                   | 0.0368        | 0.0514        |
| 1980                   | 0.0491        | 0.0597        |
| **Total population**   |               |               |
| 1970                   | 1,267,792     | 1,321,153     |
| 1980                   | 1,625,781     | 1,490,586     |
| **African American share (1980)** | 0.1659        | 0.1027        |
| **Hispanic share (1980)** | 0.3574        | 0.1296        |

Table 42 MSA weights in synthetic control: some college experience wage

|                          | Weight |
|--------------------------|--------|
| Charlotte/Gastonia/Rock Hill, NC/SC | 0.185  |
| Dallas, TX               | 0.052  |
| Fresno, CA              | 0.208  |
| Los Angeles/Long Beach, CA | 0.103  |
| Oklahoma City, OK        | 0.305  |
| Stockton/Lodi, CA        | 0.147  |
Table 43  Comparison between Miami and synthetic control city: high school graduates wage (RMSPE: 97.23357)

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1940   | 1203.04 | 1186.677  |
| 1950   | 2130.37 | 2402.813  |
| 1960   | 3605.83 | 3765.045  |
| 1970   | 6062.18 | 6010.164  |
| 1980   | 11,129.53 | 11,032.41 |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1940   | 0.0703  | 0.0696    |
| 1950   | 0.0303  | 0.0316    |
| 1960   | 0.0826  | 0.0923    |
| 1970   | 0.1079  | 0.1112    |
| 1980   | 0.1677  | 0.1687    |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1940   | 0.6209  | 0.6613    |
| 1950   | 0.8295  | 0.8558    |
| 1960   | 0.5303  | 0.5353    |
| 1970   | 0.4807  | 0.4874    |
| 1980   | 0.3600  | 0.3484    |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1970   | 0.2759  | 0.2625    |
| 1980   | 0.3203  | 0.3038    |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1970   | 9245    | 8993.84   |
| 1980   | 18,642  | 19,253.16 |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1970   | 19,088  | 16,127.18 |
| 1980   | 57,235  | 50,609.74 |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1970   | 0.0368  | 0.0421    |
| 1980   | 0.0491  | 0.0553    |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1970   | 1,267,792 | 1,349,471 |
| 1980   | 1,625,781 | 1,515,736 |

| Year   | Miami   | Synthetic |
|--------|---------|-----------|
| 1980   | 0.1659  | 0.1596    |
| 1980   | 0.3574  | 0.0932    |

Table 44  MSA weights in synthetic control: high school graduates wage

| MSA                                      | Weight |
|------------------------------------------|--------|
| Charlotte/Gastonia/Rock Hill, NC/SC      | 0.224  |
| Columbia, SC                             | 0.124  |
| Dallas, TX                               | 0.037  |
| Fresno, CA                               | 0.172  |
| Greensboro/Winston-Salem/High Point, NC  | 0.042  |
| Little Rock/North Little Rock, AR        | 0.214  |
| Los Angeles/Long Beach, CA               | 0.116  |
| Oklahoma City, OK                        | 0.033  |
| Salt Lake City/Ogden, UT                 | 0.038  |
Table 45  Comparison between Miami and synthetic control city: high school dropouts wage (RMSPE: 411.9051)

| Year | Miami         | Synthetic     |
|------|---------------|---------------|
|      | Average wage of people didn’t graduate high school in the population aged 25 or older |   |
| 1940 | 845.0716      | 715.9728      |
| 1950 | 1633.762      | 1808.16       |
| 1960 | 2696.866      | 2886.247      |
| 1970 | 4486.973      | 4847.565      |
| 1980 | 7944.184      | 8648.898      |
|      | Share of people with Bachelor’s degree or higher in the population aged 25 or older |   |
| 1940 | 0.0703        | 0.0694        |
| 1950 | 0.0303        | 0.0316        |
| 1960 | 0.0826        | 0.0892        |
| 1970 | 0.1079        | 0.1105        |
| 1980 | 0.1677        | 0.1673        |
|      | Share of people didn’t graduate high school in the population aged 25 or older |   |
| 1940 | 0.6209        | 0.6621        |
| 1950 | 0.8295        | 0.8428        |
| 1960 | 0.5303        | 0.5410        |
| 1970 | 0.4807        | 0.4906        |
| 1980 | 0.3600        | 0.3418        |
|      | Employment shares of industries that hire skilled labor intensively |   |
| 1970 | 0.2759        | 0.2616        |
| 1980 | 0.3203        | 0.3075        |
|      | Median family income |   |
| 1970 | 9245          | 8851.847      |
| 1980 | 18,642        | 18,810.01     |
|      | Median home value |   |
| 1970 | 19,088        | 15,040.8      |
| 1980 | 57,235        | 45,394.36     |
|      | Unemployed rate |   |
| 1970 | 0.0368        | 0.0377        |
| 1980 | 0.0491        | 0.0480        |
|      | Total population |   |
| 1970 | 1,267,792     | 1,374,346     |
| 1980 | 1,625,781     | 1,570,054     |
|      | African American share (1980) |   |
|      | 0.1659        | 0.1064        |
|      | Hispanic share (1980) |   |
|      | 0.3574        | 0.2224        |

Table 46  MSA weights in synthetic control: high school dropouts wage

| MSA                                      | Weight |
|------------------------------------------|--------|
| Charlotte/Gastonia/Rock Hill, NC/SC      | 0.21   |
| Columbia, SC                             | 0.035  |
| Little Rock/North Little Rock, AR        | 0.076  |
| Los Angeles/Long Beach, CA               | 0.095  |
| Salt Lake City/Ogden, UT                 | 0.171  |
| San Antonio, TX                          | 0.413  |
Appendix 17: Evolution of Rent in Miami

See Figs. 27, 28, 29 and Tables 47 and 48.

**Fig. 27** High-skilled-intensive industries employment share in Miami and synthetic control unit after 1940

**Fig. 28** Low-skilled-intensive industries employment share in Miami and the synthetic control unit after 1940
The share of Hispanic

![Graph showing the share of Hispanic in Miami and synthetic control unit over years 1970 to 2000.](image)

**Fig. 29** Hispanic share in Miami and synthetic control unit

|                         | Miami      | Synthetic |
|-------------------------|------------|-----------|
| Average rent            | 1960 93.720 | 90.959    |
|                         | 1970 148.333 | 140.499   |
|                         | 1980 298.895 | 299.913   |
| Share of people with Bachelor's degree or higher in the population aged 25 or older | 1960 0.0826 | 0.0845    |
|                         | 1970 0.1079 | 0.1087    |
|                         | 1980 0.1677 | 0.1578    |
| Share of people didn't graduate high school in the population aged 25 or older | 1960 0.5303 | 0.5425    |
|                         | 1970 0.4807 | 0.4632    |
|                         | 1980 0.3600 | 0.3284    |
| Employment shares of industries that hire skilled labor intensively | 1970 0.2759 | 0.2458    |
|                         | 1980 0.3203 | 0.2772    |
| Median family income    | 1970 9245  | 10,469.19 |
|                         | 1980 18,642 | 21,191.67 |
| Median home value       | 1970 19,088 | 19,483.69 |
|                         | 1980 57,235 | 61,095.23 |
| Unemployed rate         | 1970 0.0368 | 0.0408    |
|                         | 1980 0.0491 | 0.0586    |
| Total population        | 1970 1,267,792 | 1,403,835 |
|                         | 1980 1,625,781 | 1,534,420 |
| African American share (1980) | 0.1659 | 0.1598    |
| Hispanic share (1980)   | 0.3574 | 0.0552    |
Appendix 18: The synthetic control method for the share of employment in industries

Appendix Table 49 shows the synthetic control unit for the employment shares of industries that hire skilled labor intensively. The RMSPE is 0.0002051.

Appendix Table 50 shows weights of each MSA contained in the synthetic control for Miami.

Table 48  MSA weights in synthetic control: average rent

|                | Weight |
|----------------|--------|
| Baltimore, MD  | 0.325  |
| Charlotte/Gaston/Char Rock, NC/SC | 0.171  |
| Las Vegas, NV/AZ | 0.363  |
| New York, NY   | 0.04   |
| San Jose, CA   | 0.101  |

Table 49  Comparison between Miami (treated) and synthetic control

|                                      | Treated | Synthetic |
|--------------------------------------|---------|-----------|
| Employment shares of industries that hire skilled labor intensively |         |           |
| 1940                                 | 0.1460  | 0.1456    |
| 1950                                 | 0.1521  | 0.1637    |
| 1960                                 | 0.1987  | 0.1984    |
| 1970                                 | 0.2716  | 0.2711    |
| 1980                                 | 0.3203  | 0.3201    |
| Share of people with Bachelor’s degree or higher in the population aged 25 or older |         |           |
| 1970                                 | 0.1079  | 0.1157    |
| 1980                                 | 0.1677  | 0.1767    |
| Share of people didn’t graduate high school in the population aged 25 or older |         |           |
| 1970                                 | 0.4807  | 0.4835    |
| 1980                                 | 0.3600  | 0.3261    |
| Median family income                 |         |           |
| 1970                                 | 9245    | 9137.941  |
| 1980                                 | 18,642  | 19,682.45 |
| Median home value                    |         |           |
| 1970                                 | 19,088  | 18,462.42 |
| 1980                                 | 57,235  | 56,731.07 |
| Unemployed rate                      |         |           |
| 1970                                 | 0.0368  | 0.0444    |
| 1980                                 | 0.0491  | 0.0530    |
| Total population                     |         |           |
| 1970                                 | 1,267,792 | 1,311,724 |
| 1980                                 | 1,625,781 | 1,580,032 |
| African American share (1980)        |         |           |
| 0.1659                               | 0.1704  |
| Hispanic share (1980)                |         |           |
| 0.3574                               | 0.1461  |
Appendix Table 51 shows the synthetic control unit for the share of not-skilled-intensive industries. The RMSPE is 0.0129097. Table H.4 shows weights of cities in the synthetic control.

See Tables 49, 50, 51 and 52.

| Table 50 | Weights of each MSA in the synthetic control |
|----------|-----------------------------------------------|
| Weight   |
| Austin/San Marcos, TX 0.057                    |
| Hartford, CT 0.051                              |
| Lincoln, NE 0.007                                |
| Los Angeles/Long Beach, CA 0.046                 |
| New Orleans, LA 0.423                           |
| Phoenix/Mesa, AZ 0.184                          |
| Pueblo, CO 0.009                                 |
| San Antonio, TX 0.141                           |
| San Diego, CA 0.072                             |
| San Jose, CA 0.009                              |

| Table 51 | Comparison between Miami (treated) and synthetic control |
|----------|----------------------------------------------------------|
| Treated  | Synthetic                                                |
| 1940     | 0.3710 0.3944                                           |
| 1950     | 0.4555 0.4408                                           |
| 1960     | 0.3405 0.3486                                           |
| 1970     | 0.3608 0.3638                                           |
| 1980     | 0.3599 0.3605                                           |
| 1970     | 0.1079 0.1011                                           |
| 1980     | 0.1677 0.1550                                           |
| 1970     | 0.4807 0.4923                                           |
| 1980     | 0.3600 0.3359                                           |
| 1970     | 9245 9264.436                                           |
| 1980     | 18,642 20,253.74                                         |
| 1970     | 19,088 17,839.99                                         |
| 1980     | 57,235 51,512.24                                         |
| 1970     | 0.0368 0.0517                                            |
| 1980     | 0.0491 0.0684                                            |
| 1970     | 1,267,792 1,362,345                                       |
| 1980     | 1,625,781 1,490,644                                       |
| 1980     | 0.1659 0.2030                                            |
| 1980     | 0.3574 0.0500                                            |
Appendix 19: The synthetic control method for Hispanic share

HUD doesn’t provide data on Hispanic share before 1980. Therefore, we use Census data (from 1970 to 2000) from IPUMS. However, we can only identify 111 MSAs (including Miami) from IPUMS data. Therefore, the fit between Miami and the synthetic control unit is worse than the previous results when the share of college graduates was used. However, it still can provide some evidence that Miami experienced a huge increase in the share of college graduates compared to its synthetic control unit. (Pseudo-p-value from all donors is very small, less than 0.01 in both 1990 and 2000.) The RMSPE is 0.01107. Table H.1 shows the balance table between Miami and its synthetic control unit, and Table H.2 shows weights of cities in the synthetic control.

See Fig. 30 and Tables 53 and 54.

| Table 52 Weights of each MSA in the synthetic control | Weight |
|------------------------------------------------------|--------|
| Decatur, IL                                           | 0.199  |
| Duluth/Superior, MN/WI                                | 0.151  |
| Los Angeles/Long Beach, CA                           | 0.099  |
| New Orleans, LA                                       | 0.501  |
| Norfolk/Virginia Beach/Newport News, VA/NC           | 0.022  |
| Topeka, KS                                            | 0.028  |

Fig. 30  Homicide rate (Per 100,000) in Miami and Dade County
Table 53  Comparison between Miami (treated) and synthetic control

|                        | Treated | Synthetic |
|------------------------|---------|-----------|
| Hispanic share         |         |           |
| 1970                   | 0.2479  | 0.2544    |
| 1980                   | 0.3845  | 0.3703    |
| Share of people with Bachelor’s degree or higher in the population aged 25 or older | | |
| 1970                   | 0.1079  | 0.1066    |
| 1980                   | 0.1677  | 0.1541    |
| Share of people didn’t graduate high school in the population aged 25 or older | | |
| 1970                   | 0.4807  | 0.5041    |
| 1980                   | 0.3600  | 0.3936    |
| Employment shares of industries that hire skilled labor intensively | | |
| 1970                   | 0.2759  | 0.2572    |
| 1980                   | 0.3203  | 0.2983    |
| Median family income   |         |           |
| 1970                   | 9245    | 8608      |
| 1980                   | 18,642  | 19,807    |
| Median household owner’s value | | |
| 1970                   | 19,088  | 13,404    |
| 1980                   | 57,235  | 44,619    |
| Unemployed rate        |         |           |
| 1970                   | 0.0368  | 0.0423    |
| 1980                   | 0.0491  | 0.0475    |
| Total population       |         |           |
| 1970                   | 1,267,792 | 1,387,403 |
| 1980                   | 1,625,781 | 1,567,489 |
| The average Fahrenheit (Celsius) temperature in Jan | 67.9 (19.94) | 57.06 (13.92) |

Table 54  Weights of each MSA in the synthetic control

| MSA                      | Weight |
|--------------------------|--------|
| Corpus Christi, TX       | 0.749  |
| Houston, TX              | 0.101  |
| Los Angeles/Long Beach, CA | 0.138 |
| San Antonio, TX          | 0.012  |

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