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Room in the Kitchen for the Melting Pot: Immigration and Rental Prices

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Abstract

This paper studies the response of the housing market to immigration shocks. I find a positive association between immigrant flows and changes in rents in the United States' Metropolitan Areas. Following Card's (1990) approach, I examine the changes in rental prices in Miami and three comparison groups of cities after the 1980 Mariel boatlift. This exogenous immigration shock added an extra 9% to the renter population in the Miami area in one year. I find that differential real rental prices increased from 8-11% between 1979 and 1981. By 1983 the rent hike differential was still 7%. Higher quality units were not affected by the immigration shock. Units in predominantly low-income Spanish-speaking areas experienced an extra 6% differential hike with respect to other low-income units in the Miami MSA. Relative housing prices moved in the opposite direction from rents in the short run.

Keywords: Immigration, housing.

JEL: J61, R23, R31,

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I. Introduction

The literature on the impact of immigration in economics has focused on its implications for the labor market. But much less is known about its effect on local prices. This paper considers the impact of immigration on housing markets: does it boost rents and reduce the standard of living of previous residents?

Immigration in the United States and other industrialized countries has directly and swiftly affected housing markets, especially for rental units. The number of new immigrant households moving into rental units was greater than the full increase in the number of rentals between 1996 and 1999. This implies that immigrant households accounted for all new demand in this period, and displaced some native household from the rentals market. In the Northeast and Western regions, the foreign-born made up twenty-eight percent of renter households in 1999, up from fifteen percent in 1980.[1]

This paper provides evidence of the short-run effect of immigration on rental markets. A positive correlation exists between immigration flows in United States' metropolitan areas and changes in rents for rental units of moderate quality. This result holds when one controls for changes in income, changes in population and a proxy of expectations of future growth. To address concerns over the endogeneity of immigration flows, and following the approach in Card (1990), I make use of the Mariel boatlift in the Miami Metropolitan Area. A documented sharp increase in local rental prices this immigration shock caused. The immigrants from Mariel increased the renter population of Miami by at least nine-percent in one year (1980). From 1979 to 1981 rents increased by eight to eleven percent more in the Miami area than in three groups of comparison MSAs. This difference fell somewhat by 1983, but was still about seven percent. The evidence will show that the immigration shock, consisting mainly of Cuban nationals, had an even greater impact in housing units occupied in 1979 by poor Hispanic residents.

The results are important for understanding the short and medium run local response of natives to substantial localized immigration. One of the main motivations of the literature on immigration and labor market outcomes is to examine the distributive

[1] These figures are from Joint Center for Housing Studies (2000).

impact of immigration. Most of the studies find that immigration of workers with a certain skill level has little or no effect on the absolute and relative wages of the local population with similar skill levels. Card (1990) used the Mariel boatlift as a quasi-experiment to identify the impact of immigrants on wages and did not find any effect, even in the short run. At the same time, native workers seem to avoid and migrate out from areas with high levels of immigration (Filer, 1992). This suggests that the mobility of natives counterbalances the theoretical short run effects of immigration on local wages[2]. The fact that immigration shocks are quickly arbitraged away is itself surprising. If wages do not adjust in the short run, what motivates native workers to avoid the areas where immigrants concentrate? Workers take longer to react to other shocks in local labor (Blanchard & Katz, 1992), and local wages seem to be responsive to labor market shocks in the short run (Topel, 1986). These observations prompt Borjas (1994) to argue that the main empirical puzzle arising from this literature is: "Why should it be that many other regional variations persist over time, but the impact of immigration on native workers is arbitraged away immediately?"

This problem suggests that we need to look at other markets and social interactions to understand the local impact and responses to immigration. Several studies document the existence of competition between low-income immigrants and previous low-income residents for a variety of goods that are fixed in the short run.[3] Housing is the most important such good. To explain changes in the welfare and moving decisions of native-born people both wages and rents have to be taken into account within an economic spatial equilibrium (Rosen, 1979 and Roback, 1992).

The effects of immigration on housing markets can actually be better identified than the effects on labor markets. After all, it is not clear what is the counter-factual of immigration in the national labor market: international trade flows and domestic production are very much endogenous to the level of immigrant labor. Physical presence is actually the indisputable characteristic of the immigrant labor input, and has direct

[2] Altonji and Card (1989), Card (1996) and Weiss (2000). Borjas, Freeman and Katz (1996) argue that the effects of immigration on local labor markets are spread out in the national labor market. These authors rely on a structural approach to find moderate effects of immigration on wages

[3] Borjas and Hilton (1996) and Hansen and Lofstrom (2000) examine the use of welfare benefits by immigrants in the US and Sweden. Simon(1999, chapter 9) discusses the impact on natural resources and the environment. Hoxby (1998) analyzes the impact on admissions to top colleges of native minorities.

effects on housing markets and the spatial organization of neighborhoods and social relations (Zax, 1998; Jones-Correa, 2000).

Consider the case of relatively unskilled immigrants. Existing literature (Borjas, 1994 and 2000; National Research Council, 1997) argues that the average educational attainment of recent immigrants is below the average native born educational level in the United States. Because of their relatively low earnings during their initial years in the host country, unskilled immigrants are disproportionately likely to demand lower cost – and hence lower quality - housing. The housing units demanded are usually rented apartments. The short-run supply of low-quality rentals is bound to be more inelastic than the overall housing supply. Thus, in a segmented housing market with different qualities (Sweeny, 1974; Braid, 1980; O'Flaherty, 1996), the effects of unskilled immigration in the short run are stronger for low-quality units.

The fact that different quality segments of the housing markets may be differently affected by immigration is important. In the very short run immigration shock is unlikely to change substantially the local demand for higher quality housing. Therefore, we cannot explain the change in the purchasing power of relatively unskilled previous residents simply through changes in the overall local price index or changes in *average* housing costs. If one is interested in the real consumption wage of lower skilled individuals, it is important to look at changes in the costs of dwellings of moderate quality (usually rental units).

The paper is organized as follows. Section one presents a simple model that applies the idea of spatial equilibrium to the impact on rents of immigration. Section two describes the data sets I use for the empirical analysis. In section three, some general evidence on the correlation of immigrant flows and rents of moderate quality housing in the United States and define my empirical strategy are presented. Section four describes the short-run changes in rental prices, the housing stock supply adjustment, and the residential density change during the years after the Mariel boatlift. The medium-run adjustments after the boatlift are also described. Section five describes how the Miami housing market adjusted in the long run. Section six concludes the paper and discusses avenues for further research on the many new questions posed by this study.

II. Section One - A Model

In this section, a simplified model is presented that helps to understand the effects on the housing market of an immigration shock consisting of relatively unskilled individuals. The model uses the fact that housing units have different quality levels (Sweeny, 1974). As in Braid (1981) I use a bid rent approach to examine the demand for quality by different income groups. I simplify Braid's (1981) approach by considering only two income groups and a by using a utility function separable in income and tastes for housing quality. My focus is on simple predictions of empirical content in a framework of segmented housing markets, different income groups and mobility. Rental prices capture the advantages of a specific location in a spatial equilibrium. The model assumes that there are two types of individuals: type *U* individuals, who have inferior labor market skills[4] and generally earn lower wages; and type *S* individuals who have superior skills. Individuals are identical within a type. Both types of individuals decide whether to locate in city *M* or elsewhere in the country. If unskilled individuals decide to move into *M*, they receive a wage W_M^U that is a function of the measure of unskilled individuals in the city (N_U) with $\frac{dW_M^U(N_U)}{dN_U} < 0$. Skilled individuals receive a fixed-wage W_M^S (including town-specific amenities) if they move into the city.[5]

Once they move into *M*, both unskilled and skilled individuals occupy a single type of dwelling. This implies that total population is equal to the housing supply. There is a continuum of dwelling quality (Q). There is a short run supply of housing units of each quality. The supply function is represented by *S(p(Q),Q)*, with support $[0, \overline{Q}]$. The willingness-to-pay for quality differs between skilled and unskilled individuals and can be expressed as an increasing and strictly concave function $V^n(Q)$, for $n = U, S$. I

[4] The skill assignment process is exogenous to this analysis. Productive skills are understood in a comprehensive sense, and include cognitive skills, education, training, experience, cultural knowledge, language, linguistic registers, social skills, social networks and any other form of specific and general human capital. Many recent immigrants will start in their new countries with relatively lower levels of such skills even if their formal academic qualifications are high. See Weiss (2000) for an account of the experiences of highly educated Russian immigrants in Israel.

[5] Topel (1986) finds that "consistent with the greater geographic mobility of more educated workers, their wages are less sensitive to both current and future changes in relative local employment."

normalize so that $V^n(0)=0$. I assume that $\frac{dV^S(Q)}{dQ} > \frac{dV^U(Q)}{dQ}, \forall Q$ so skilled individuals are always willing to pay more for a dwelling with the same quality. The utility function for both skilled and unskilled is quasi-linear and separable in dwelling quality and a *numeraire* good. Both types of individuals enjoy a general amenity premium of A_M for living in location M. Assuming that any prospective immigration shock is completely unexpected, the spatial equilibrium before the immigration shock for the unskilled individuals implies that:

$$V^U(Q) + A_M + W_M^U(N_P) - P(Q) = \overline{U_U} \quad (1)$$

For all Q (where $\overline{U_U}$ is equal to the utility level a unskilled worker can attain elsewhere in the country, and $P(Q)$ is the price paid for a dwelling of quality Q). Let N_U^* be the equilibrium number of unskilled individuals residing in M.

From (1) I obtain the quality bid rents (ψ^U) for unskilled individuals[6] and for skilled individuals (ψ^S):

$$\psi^U(Q) = V^U(Q) + A_M + W_M^U(N_P^*) - \overline{U_U} \quad (2)$$

$$\psi^S(Q) = V^S(Q) + A_M + W_M^S - \overline{U_S} \quad (3)$$

The cut-off quality level that separates the qualities occupied by unskilled and skilled is Q^*, which corresponds to the intersection of the 2 groups' bid rents, where:

$$V^S(Q^*) + A_M + W_M^S - \overline{U_S} = V^U(Q^*) + A_M + W_M^U(N_U^*) - \overline{U_U} \quad (4)$$

[6] Notice that the bid rents and the final equilibrium prices of the dwellings absorb the value of the local advantages in M. This is essential to the analysis.

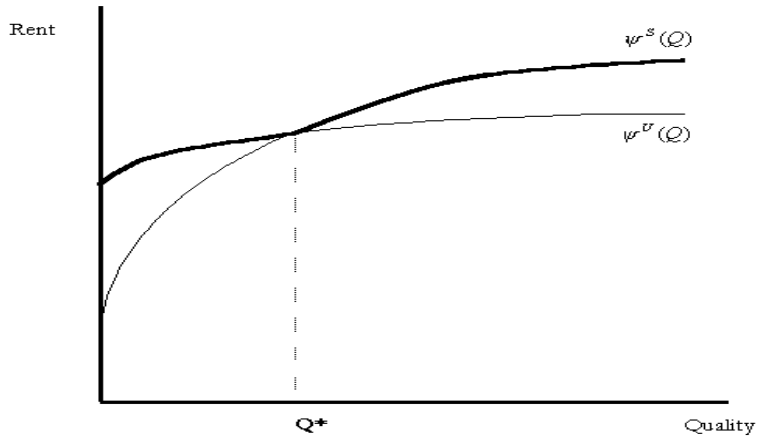
For qualities under Q* the market rent of the dwelling is determined by the unskilled bid rent curve. For qualities above Q* rents are determined by the skilled bid rent curve. Formally:

$$P(Q) = \begin{cases} \psi^U \quad if \quad Q \le Q^* \\ \\ \psi^S \quad if \quad Q > Q^* \end{cases}$$

Thus, rents reflect both the specific advantages of the city and the competition between and within the groups for better locations. The model produces a segmented housing market. Each skill level occupies a different portion of the quality continuum.

Equation (4) and the housing market clearing condition (5) determine the measure of unskilled[7] individuals living at M and the quality cut-off point.

$$(5) \qquad N_U^* = \int_0^{Q^*} S\left(\psi^U(Q), Q\right) \times dQ$$



The figure shows the bid rents for quality for the unskilled and the skilled group $\{\psi^U(Q)$ and $\psi^S(Q)$ respectively$\}$. The actual market rent corresponds to the highest bid rent at any given quality level: the envelope of the two bid rents (thicker line in the figure). Quality Q* separates the housing units occupied by the unskilled and skilled workers.

[7] The number of skilled individuals in equilibrium can be obtained from the housing supply for those qualities over Q*. Notice how the prices within this range are determined by the exogenous parameters.

This spatial equilibrium is portrayed in figure 1. The rent gradient corresponds to the highest bid rent at each quality. The nature of the equilibrium is determined by the advantage of the city for the skilled individuals[8].

Now, assume that an unpredicted immigration shock of immigrants with measure N_I arrives into M (with $N_I<N_U$). Assume that all of the immigrants are unskilled and have the same utility function that local unskilled individuals have, but with the addition of a premium specific to M, $A_{I,M}$[9]. The short run will be characterized by moving costs that are arbitrarily high for the previous native city dwellers (Borjas, 1998). Thus the total measure of unskilled individuals in the city will be $N_I + N_U^*$. The number of skilled individuals will not change. The slopes of the bid curves for both groups are determined by the preferences for quality and will not change because of the shock. Thus the new equilibrium bid rent curves can be characterized by adding a constant to the old bid rent curves (see Appendix 1). Let A and B be these constants for the low and skilled groups respectively. Let Q** be the new quality cut-off point that separates the skilled from the unskilled after the immigration shock.

Proposition 1: A >B> 0

In the short run, the increase in the rent paid by unskilled individuals is greater than the increase in the rent paid by skilled individuals.

Proposition 2: Q**>Q*

In the short run, the quality cut-off point increases as a result of the shock: individuals with low skills displace skilled individuals from "fringe" quality dwellings. The *proofs* are listed in appendix one.

Proposition 1 is the main result of the model. If the housing market is segmented, an unskilled immigration shock has a greater impact on the rents paid by unskilled individuals in the short run (and thus on the welfare of unskilled natives). This result holds even if the housing stock is formed by a continuum of qualities and individuals can move upscale to avoid crowding in the lower qualities. This result contrasts with the

[8] In **Appendix 1** I provide some comparative statics of the model. Concretely, an increase in W_M^S increases all housing rents and the supply of housing and population, while reducing the quality cut-off point.

[9] This premium arises because city M is used as a focal point to coordinate the location of immigrants: they can invest in specific ethnic local public goods and they value the proximity of individuals of the same

general effects of population growth on housing rents with a homogeneous population in urban economics models (Brueckner, 1988). Models in which marginal individuals are indifferent between the several housing qualities would also yield different conclusions. A corollary to proposition 1 is that an immigration flow that is small in comparison to the total population (i.e. the initial stock of housing) can have a substantial impact on the rents paid by unskilled individuals. This may be so if the unskilled group represents a small fraction of the total initial population. To see this, imagine that the skilled constitute most of the population. An unskilled immigration shock represents a major increase in the number of unskilled. Because the range of qualities occupied by the unskilled is small, it will take major price increases in these quality ranges to increase supply and displace some of the skilled from "frontier" qualities (around Q*). Conversely, because the skilled occupy a major portion of the quality scale, a small price increase in the higher quality range will accommodate all of the skilled individuals displaced by the unskilled in the limiting qualities (between Q* and Q**). Figure 2 and Appendix 1 are helpful for understanding these relationships.

In the long run, moving costs being negligible, the new equilibrium looks like the initial one as long as $N_I < N_U^*$. If the marginal unskilled individual is a native he should be indifferent between any two locations, as in the initial equilibrium. This long-run equilibrium is achieved through the out-migration of native unskilled individuals.

The results from previous empirical literature suggest that the sensitivity of the wages of the unskilled to incoming immigration (this is $W_M^U\left(N_U^*\right) - W_M^U\left(N_U^* + N_I\right)$ in the model) is very small. Thus, most of the short run impact of immigration into the welfare of other unskilled locals comes from changes in the prices of dwellings that immigrants tend to occupy. Moreover, if wages are sticky, the dynamics towards the long-run equilibrium can, in theory, be entirely explained by short-run changes in housing rents.

national group. The premium is necessary in the model if we assume that immigrants have a preference for the city and do not spread all over the rest of the urban system.

III. Section Two - Data

The main data source consists of 1974-1983 observations from rental units in the National and SMSA (Standard Metropolitan Statistical Area) Annual Housing Survey (AHS). The National Sample AHS surveyed some 60,000 housing units annually between October and December. Typically, 40% were rental units. Housing units were selected from the decennial Census of Population and Housing to represent the overall United States housing stock. The separate SMSA sample surveyed units in selected metropolitan areas annually, covering some 4,500 units in each SMSA until 1983 when sample size was reduced by 20%. The Metropolitan Areas were selected on a 4-year rotating basis. The Miami SMSA is included in the AHS Metropolitan Sample in 1979 and 1983, which provides a good portrait of the evolution of the Miami housing market before and after the boatlift[10]. For other years I used the smaller Miami sample from the National Sample. The comparison cities are from the National sample. The main comparison group is formed by the remaining Florida SMSAs included in the National AHS (encompassing Fort Lauderdale, West Palm Beach-Boca Raton, Tampa-Saint Petersburg, Orlando and Jacksonville). As the second comparison group, in order to pick up regional growth patterns, I used a group of cities in the American Sunbelt: Atlanta, New Orleans, Mobile, Albuquerque and Phoenix. The last comparison group is the rest of metropolitan United States.

The AHS followed the same units from 1974 to 1983, with additions of new housing and deletions because of demolition and a number of non-responses. Therefore this data set allows for a longitudinal treatment. The AHS was not carried out in 1982. After 1983 the National sample reduced its periodicity to two years, starting with the 1985 sample. The sample of units changed and it is not possible to match the 1979-1984 units.

[10] The SMSA sample for Miami provides observations for 4,000 units (about 1,600 rentals). The 79-83 panel does not contain suitable comparison cities. Notice that pooled comparison groups are necessary for the national AHS sample which typically includes 100-150 observations for each MSA, of which about 50% are rental units. **Table 1** offers summary statistics of the data.

Data on the characteristics of Miami and Florida residents are also extracted from the United States 1980 and 1990 Census Public Microdata Samples (IPUMS).

"Fair market rent" (FMR) data is from the United States Department of Housing and Urban Development (HUD). An individual's housing rent must be below the corresponding MSA's FMR in order to be eligible for housing subsidies in the United States. The FMR corresponds to the price of a vacant 2-bedroom rental unit at the 45^{th} percentile of the MSA's distribution. It is calculated annually by HUD using data from the AHS SMSA samples, when available, combined with random samples. The FMR can be interpreted as the price for a rental unit of moderate quality. Data on MSA income and county population growth are from the United States Bureau of Labor Statistics and the Census Bureau. Data on the postal code of immigrants' intended residence are from the "Immigrants Admitted to the United States, 1990" files, from the United States Immigration and Naturalization service. Postal codes are matched to 1990 Statistical Metropolitan Areas using the Census MABLE Geo-correlation engine. Data on the evolution of Gross Area Income at the MSA level is obtained from the Bureau of Economic Analysis.

Data on the Mariel boatlift population is obtained from a sample of 514 refugees (Mariel Cubans in Miami, 1983-1986) obtained by Alejandro Portes (John Hopkins University). Portes randomly sampled Census tracts with a high share of Cuban immigrants in 1980. The evolution of housing prices after 1982 is obtained from the Freddie Mac repeated sales index. This index uses the consecutive transaction prices of a longitudinal sample of housing units. Data on authorized housing starts at the Metropolitan Statistical Area level are from the Census Bureau C40 series "New Privately Owned Housing Units Authorized."

IV. Section Three - Background and Empirical Strategy

Recent immigrants to the United States and other countries tend to occupy rental units of relatively low quality[11]. Most immigrants arrive in their new country of residence without assets that can be used as collateral to buy a house. Some of them do not have credit records comparable to those in the United States. Many are uncertain as to the duration of their stay in the port city, and are not willing to undertake the home-ownership commitment. Furthermore, the supply of housing with the characteristics demanded by immigrants is not completely elastic in the short run.

To the best of my knowledge, only one previous study considered the impact of immigration on the evolution of rental prices. Muller and Espenshade (1985) compared the evolution of prices from 1967-1983 in Los Angeles, a port of entry for a high number of immigrants, to the changes in the rest of the United States. These authors find that "prices for medical care, rental housing, private transportation, and fuel rose faster than prices nationwide, and the price of rental housing was noticeably higher". These authors explain this pattern arguing, "because most immigrants live in rental units, the rental housing market would experience substantial pressure from the rising immigrant-induced demand". Although suggestive, these results cannot establish the causal effect of immigration on rents. Many other social changes were specific to the Los Angeles Metropolitan area in these years and could have accounted for the surge in rents.

The positive correlation between immigration and rental prices seems pervasive nevertheless. The first column in table 2 presents a reduced form regression of the log[12] of 1991 FMR for the U.S Metropolitan Statistical Areas (MSAs) on other variables. In column (1) the explanatory variables are the log of MSA population, the log of MSA per

[11] Joint Center for Housing Studies (2000). Callis (1997) uses the CPS to estimate that in 1996 the home-ownership rate for a non-citizen who entered the US in 1990 or later was only 14.7 percent. Friedman, Schill & Rosenbaum (1998) find that foreign-born households in NY City are more likely to live in crowded and dilapidated housing units. The fact that immigrants disproportionately consume rental units of lower quality is also true in the European context. Thave (1999) reports that 78.75% of immigrant households in France dwelt in rental units in 1984. The average area of an immigrant dwelling was 63 m^2, compared to 83 m^2 for French nationals.

[12] The regression in logs is more interesting that the regression in levels. The results of the regression in levels are especially sensitive to price changes in metropolitan areas with higher rents. The regression in logs can be interpreted as taking into account not absolute but percentage changes in rental prices.

capita income and the number of new immigrants per 100 population in 1990. State fixed effects are included to control for broad regional trends. Immigration appears strongly associated with higher prices for apartments of moderate quality. It can be argued, though, that immigration is endogenous to and capturing the effect of an omitted variable: expectations of future economic growth[13]. To control for this, column (2) introduces the rate of new housing permits per capita in 1989 as an explanatory variable. Expectations of future growth should translate into greater building activity. The results do not change. Yet, immigration flows might be correlated with unobservable MSA amenities that attract immigrants differentially and explain the higher rents. The concerns are addressed in columns (3) and (4) repeating the exercise but using the differences in rents, income and population between 1990 and 1992. The change of FMR rents between 1990 and 1992 seems strongly associated with the immigration flow in 1990. An immigration inflow that represents 1% of the MSA initial population is associated with a 3.5% increase in the FMR two years later. This effect is found despite the fact that I am controlling for income and *overall population growth*.

The results in table 2 clearly point at immigration as one explaining factor behind rent increases for lower quality housing. The results, though, might be biased. Immigration is endogenous to rental prices: at the margin, if rents become unusually high, some immigrants will decide to move into less expensive locations. In principle, this could bias the estimates downwards. At the same time omitted variables (such as positive productivity shocks that attract firms, immigrants and natives to some extent) could explain the changes in rental prices, and could be positively correlated with immigration flows. If the new housing starts variable did not capture this effect, this omitted variable problem would bias the estimates upwards.

To assess the robustness of these findings and tackle the possible identification problem I will make use of the exogenous immigration shock described by Card (1990). About 125,000 Cuban immigrants arrived in Southern Florida between May and September 1980. The inflow responded to an exogenous and unpredicted decision by the

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[13] The author does not concur in this criticism: expectations may change the asset price of housing units, but should not directly change spot market rents. If the population level is based on expectations this could explain increasing rents, but my regressions already control for this variable.

Cuban government to allow emigration from that country. Of these 125,000 immigrants, Card estimates that about 50% or some 62,500 decided to stay in the Miami Metropolitan Statistical Area. Portes and Stepick (1985) reckon that as of 1983 only "one third of the Mariel refugees were resettled and remain outside the Miami SMSA". Thus, as of 1983, the figure of Mariel immigrants in Miami had reached about 84,000 people. Mariel immigrants were relatively unskilled, both in terms of formal education and English fluency[14] (see Portes and Stepick, 1985). Table 3 supplies us with some data on the Miami rentals market in 1980. The Miami rentals market was clearly dominated by low-income tenants before the boatlift. 72% of rental unit tenants had household incomes below the Miami median. About 40% of the Miami population lived in rental units (646,627 persons from my tabulations of the 1980 Census). For immigrants living in the United States less than five years, the proportion of renters was a much higher 70%. Indeed, most of the new Mariel immigrants were participants in the rental market by 1983. My tabulations from the "Mariel Cubans in Miami" sample show that 92% of Mariel Cubans were in rental housing (compared to 52.42% for the population living in the census tracts sampled by this study, according to the 1980 Census). Using Card's (1990) conservative estimate, the number of new immigrants thus represented an exogenous increase[15] of about 9% in the previous rental population. If only 70% of the new immigrants participated in the rental market, the increase would still represent 7%.

To estimate the impact of such a shock on rental prices I compared the evolution of rents in Miami to that of rents in other cities before and after the shock. The identifying assumption is that nothing else specific to Miami accounts for any diverging trend in rental prices. The basic differences-in-differences equation estimated is:

$$R_{it} = \alpha_i + \beta \cdot D_{after} + \gamma \cdot D_{after} \cdot D_{Miami} + \varepsilon_i$$

[14] Portes and Stepick (1985) argue that only 24.8% of the Mariel entrants had a high school degree and only 10.6% of them reported speaking English well or very well.

[15] Some of the immigrants may have decided to go elsewhere because of the difficulty of finding affordable housing. Had they stayed in Miami prices would have increased even more. Thus the differences-in-differences estimate might be a lower bound for the actual impact of the Mariel boatlift on rental prices.

Where R_{it} is the rent for unit *i* at year *t*, α_i is a unit fixed effect, D_{after}, D_{Miami} are dummy variables that take value one if $t > 1980$ and the MSA is Miami, respectively, and ε_i is an error term.

It is not possible to find a perfect "twin" comparison city for Miami. Rent levels in Miami are bound to be different to those in other cities because of different amenities and labor markets. The evolution of rent differentials before the 1980 shock was, nevertheless, very stable. The cities that I choose make a good comparison group for this exercise. Figure 3 portrays the evolution of sample mean log rents in Miami versus that of the comparison cities from 1974 through 1983, using the National AHS sample. The picture tells a similar story for the three comparison groups. Rental prices in the rest of the comparison cities had been converging towards the Miami level from 1973 to 1980. For Florida, this convergence is bumpier, but it is hardly possible to discern any previous upward trend in the rental price differential. The clear convergence trend in rents between Miami and elsewhere before 1981 precludes the possibility that the estimates capture the effect of previous upward trends in the Miami rent differential, and introduces a somewhat conservative bias into the quantification of an increase due to the Mariel boatlift.

V. Section Four - Results and Discussion

The Price Response

Figure 3 suggests a sharp increase in the relative Miami rental prices differential in 1981, right after the boatlift, which persisted to a great extent in 1983. The pictures, of course, cannot be taken as a face value proof of the impact of the boatlift on rentals: the sample composition may vary somewhat between SMSAs and different qualities of the units could explain the price movements (due to composition effects).

To quantify the impact statistically, I resorted to a differences-in-differences regression. I matched the rental units that appear in the 1979 and 1983 samples. My differences-in-differences estimates will include a unit fixed effect. Which controlled to a

great extent for the unobserved quality (location and structure) of the dwelling in the sample. I consider rents for rental units that are not in Public Housing Projects.

Table 4 shows the results of this fixed-effects approach. I deflated rents in 1983 to their real value in 1979 dollars[16]. I used observations from the SMSA AHS sample for Miami and the National AHS sample for the comparison groups. The first column uses real rents as the dependent variable. The second column uses the logarithm of the real rents as the dependent variable. The quantitative conclusion is clear. There was a differential increase in rental prices in Miami from 1979 to 1983 with respect to the comparison group. Columns 3 to 6 show that the choice of the comparison group does not affect our conclusions. The higher rental price differential in Miami appears to be specific to that MSA. To interpret the results as differential percentage changes I used the logarithmic specification and the approximation to percentages supplied by Kennedy (1981). The estimated Miami differential represents a differential rent hike of 7.31%, 7.54% and 7.02% when the comparison groups are Florida, Sunbelt and the rest of metropolitan United States respectively.

Further evidence about the coincidence of the boatlift with the rent hike in Miami is supplied in table 4 (panel B). The table presents the fixed effects regressions for the AHS National sub-samples[17]. Here I examined the price differential between 1979 and 1981. Because the data are collected from October to December, the comparison gives us a good picture of rentals right before the boatlift while leaving some time for annual contracts to be re-negotiated afterwards. The results strongly point in the same direction:

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[16] The increase in the U.S urban CPI between December 1979 and December 1983 is used to deflate 1983 rents into 1979 dollars. Although the CPI takes into account changes in housing prices, the fact that we are dividing all of the 1983 observations by the same factor rules out any endogeneity bias. Moreover the evolution of the general urban CPI and the urban CPI net of shelter is identical in this period (the increase in the former representing a 98.14% of the increase in the latter). The Miami 1983 difference results in the log specification are unchanged by this transformation. The differences in differences results in levels are only divided by the inflation factor. The estimation in real terms is interesting, because it yields the change in the prices in terms of the opportunity cost of a 1979-dollar spent in an alternative bundle of goods, including housing, in a hypothetical US urban market. The cumulative urban CPI inflation rate between December 1979 and December 1983 was 32%.

[17] **Appendix 3.1** I address the comparability between the smaller national and the bigger SMSA samples of the AHS. Notice that I am confined to use data for the national sample for the comparison groups. Houston was also included in both the 79 and 83 SMSA samples. Although Houston does not make for a good comparison group for the Mariel quasi-experiment (a housing construction boom developing from 1979 to 1982), I can use Houston observations to check for the comparability of the two samples. **T**he coefficients in the fixed effects estimation are virtually identical. Despite the smaller size, *the National sub-samples do an excellent job in identifying the price change differentials.*

there was a major rent increase in the Miami MSA, whereas in the comparison groups there were no real changes. The regressions on the log of rents suggest a slightly larger short-run differential increase of 8.37%, 12.21% and 11.82% in the Miami rental prices with respect to the Miami, Sunbelt and United States comparison groups, respectively. Thus, as expected, the boatlift had a strong initial impact on rental prices that started to be arbitraged away by 1983[18].

The model introduced earlier also predicts that the price impact of an unskilled immigration shock should be higher for lower quality units. To assess the impact of the boatlift on the different value segments of the housing market I used the longitudinal nature of the 79-83 AHS samples. Table 5 studies the price change by rent quartile. By pooling the observations from the Miami SMSA and the National AHS samples. The comparison group is the United States I constructed sub-groups of observations including all housing units in the same MSA and with the same number of bedrooms. Within a group, I calculated the cut-off rent levels for each quartile in 1979. I then assigned each unit to a quartile according to these 1979 benchmarks. The regressions show the coefficient of the interaction of a 1983 dummy with a dummy for each quartile on real rents, and allow for a differential Miami effect. Units that were in the second and third quartiles in 1979 were singularly affected in Miami. Units in the first quartile experienced a somewhat lower differential hike. But this was not because rent increased less in Miami's bottom quartile than its middle quartiles. Rather, this "cheap rental" segment saw a spectacular generalized increase in rents of some 15% in real terms. As hypothesized, the Miami effect is not significant for the most expensive units. Rental units have, on average, lower quality than owner-occupied units. The findings are thus in line with the expectation that it is the inexpensive units, mostly rentals catering to below median income individuals, that were most affected by the boatlift.

Table 6 investigates whether the impact of the Mariel immigration shock had a concentrated impact in those areas of the city occupied by poor Spanish-speaking renters. One would expect the new Cuban immigrants to have settled mainly in areas that were affordable and predominantly Spanish speaking. Competition for ethnic specific

[18] All the qualitative results in this section are robust to possible outliers in the data: median regressions yield very similar results in all the cases.

amenities should have driven the price of rents in those areas up in the short run, until the marginal lower-income Spanish-speaking renter was indifferent between them and the rest of the city. This is an interesting exercise, because other hypothetical contemporaneous shocks in the Miami housing market that could explain my previous results do not have this implication. The AHS data do not provide any geographical information, besides central city location. Nevertheless we can again make use of the longitudinal nature of the sample to address this question. Let us start by considering only the rental units occupied in 1979 by renters with incomes below one half the median Miami income, where one would expect the immigration shock to have the strongest effect. Among these, I identify the ones occupied in 1979 by Spanish-speaking renters. Although some of these units may not be located in a predominantly Spanish-speaking area, the probability that they are is higher. Table 6 thus presents the differences-in-differences estimates of the change in prices in units occupied by poor Spanish-speaking renters in 1979, including housing unit fixed effects. The comparison group is units occupied in 1979 by non-Hispanic poor families. In the first column we can see that poor Hispanic rents rose twelve dollars more than poor non-Hispanics rents. This corresponds, as shown in column 2, to an extra 6% over the price paid by other poor renters. This is so even when the initial average price for those units was somewhat lower. The small size of the sub-samples and, more importantly, the fact that the Hispanic dummy is a very noisy proxy for Spanish-speaking area location produces rather high standard errors for these estimates. Despite this, I cannot reject at the 5% significance level the hypothesis that the rent hike for is higher poor Hispanics (the appropriate statistic being a one-tailed T-Student). All in all, the evidence supports the prior expectation that the impact of the boatlift was strongest in poor Spanish-speaking areas of the Miami MSA.

Sample Selection

The price estimates are from the matched units' sample with fixed effects, which track changes in rents for very same dwelling units. I can only offer results for those rental units that reported rents in both periods. I have to discard observations that do not appear in the 1983 Miami sample because of the AHS reduction. If the new sample continues to be representative these observations should not matter. Other observations are included in

the 1983 sample but I do not have rent data for them. This attrition can arise because of interview non-responses or because the units change to owner-occupied and do not report a rent. If the non-response or conversion is not random, the diffs-in-diffs estimates could be biased. Miami is a tourist area and converting apartments into second residence condos is a feasible option, whereas in the comparison group apartments are primarily put to a residential use. The regressions could be over-estimating the actual differential rent increase. Appendix 2 explains in more detail the nature of this potential bias. To address it I made use of the sample selection correction technique introduced by Heckman (1979)[19]. The procedure estimates by maximum likelihood the following system:

(1) $y = X\beta + \varepsilon$

(2) y observed if $Z\phi + \xi > 0$

(3) $\varepsilon \approx N(0,\sigma), \xi \approx N(0,1), corr(\varepsilon,\xi) = \rho$

(1) is the main equation of interest (where y is the dependent variable and X is a vector of explanatory variables) and (2) is the selection process (where Z represents the characteristics of the observations that are deemed important in explaining the pattern of selection). The results and specification of the selection correction procedure for the 1979-83 differences are supplied in table 7. In order to obtain enough heterogeneity in the characteristics of the control group I used the rental units in the metropolitan United States as a comparison group. All those observations that appear in both samples and that are specified as private rental units with positive rent in the 1979 sample are included (regardless of whether there is complete data in the second period). I took the first differences in the log of rents per unit and treat the observations without rent data in 1983 as missing. I allowed the probability of selection to differ in Miami, contingent on the

[19] Table 2 in Appendix 3 provides the results from an alternative approach: a diffs-in-diffs regression using the full samples. There I control for dwelling characteristics and cluster standard errors by unit. The controls include dummies for number of bedrooms, central city status and a dummy for buildings built before 1965. The qualitative results are similar. The quantitative results in levels are similar too, and slightly smaller in logarithms (an estimated impact of around 5.5%). The estimates are much more little precise: estimated standard errors of the parameters of interest are doubled.

initial rent[20]. The main results are nearly identical to those in table 4. I conclude that sample selection does not account for the results in table 4.

Further Results: Densities, supplies and turnover

In this section I try to explain how the market accommodated the unexpected increased demand for rental units in the short run. Much of the adjustment just after the boatlift occurred in terms of occupation densities. Figure 4 shows us the trends of density in rental units (measured in persons per bedroom in the market) in the AHS samples from 1974 to 1983. This measure of density takes into account both vacancy rates (which cannot be measured independently with accuracy in the national AHS samples) and density in occupied units. The pictures show steadily declining densities and a nearly constant differential between Miami and the rest of Florida until 1979. In 1980 and 1981 there is a sharp increase in persons per bedroom in the Miami sample[21].

Table 8 shows the results of a simple diffs-in-diffs regression analysis to approximate the change in densities in rental units in the Miami area between 1979 and 1981. The last row in of the table offers the point estimate of the differential percentage change in persons per room in Miami. Taking the rest of Florida as the relevant comparison group the estimated differential change in persons per available rental bedroom is about 12.7%. This magnitude is comparable with our estimates about the relative size of the immigration shock in the rentals market: a 7-9% increase. Indeed neither 7% nor 9% can be rejected at the 5% confidence level as the percentage change in persons per bedroom after the boatlift. Thus, the data would suggest that the new immigrants were absorbed in the short run entirely through higher occupation densities: lower vacancy rates and higher densities in the units occupied by newly arrived immigrants (which I cannot measure separately with accuracy). These results, again, point to the importance of the immigration shock in explaining the changes in rental prices found in the previous sections.

[20] Previous specifications with interactions of the Miami dummy and the rest of qualitative variables did not change the results: the interactions were insignificant in all cases.

[21] The very same exercise was conducted for densities of owner-occupied housing. There I find the steady decrease in densities before 1979 and no change whatsoever in 1980 and 1981: the density differentials remain stable.

Figure 5 illustrates the evolution of the supply of new housing in Miami and the comparison areas, using registered new housing start permits per capita. As can be seen there was no major supply response just after the boatlift. Just as in the comparison cities, there is a big dip in new housing start permits after 1980, which was attributable to the economic slowdown. In 1983, though, the new start permits in the comparison areas go back to their pre-1981 levels and actually surpass them. In Miami there was some reactivation in 1983, but new starts don't return to their 1979-80 levels.

As illustrated in figure 4 occupation densities revert rapidly after 1981 towards pre-1980 levels**.** In fact, as of the end of 1983 the rental units' vacancy rates measured by the AHS (9.7%) are substantially higher than the initial ones in 1979 (6.7%)[22]. Out-migration is necessarily the main mechanism explaining the partial convergence of rents from 1981 to 1983, given the scarce and slow adjustment in the housing supply in the immediate years after the boatlift[23].

Table 9 explores this population turnover. There was a remarkable population shift, especially in the rentals market. In particular there was an increase in the proportion of Hispanic renter occupying units and vacancies stemming from a displacement of white non-Hispanic renters. The number of rental units for which the household head was Hispanic increased by 6.2 percentage points between 1979 and 1983. The number of vacant units increased by three percentage points. The number of units with a white Anglo head of household decreased by a full 9.7 points in only these four years. Notice that this pattern is not a consequence of Hispanics moving into newly built units, but represents a real turnover. In columns I present the racial composition of head of household for apartments that were rented in 1979 and that appear again in the 1983 sample: the reader is looking at data for the very same dwellings.

The tabulations from the same data source suggest that the mean age in 1979 of the household heads who moved into a housing unit in Miami after 1979 (*newcomers*) was lower than the mean age of the previous dwellers (*leavers*) they replaced (37.2 vs. 45.3). The difference is statistically significant at the 5% confidence interval. The

[22] The AHS apartment vacancy rates for the metropolitan US (except Miami) were 5.98% in 1979 and 6.67% in 1983.

[23] Table 3 in Appendix 3 illustrates this. The Miami metropolitan area exhibits very low population growth rates just after the Mariel boatlift.

difference with the mean age of those who stayed in the same housing unit, *stayers*, (54.17) is significant for both: newcomers and leavers[24]. People who swap apartments within the Miami MSA represent a major proportion of turnover. This attenuates the actual difference between the age of those who left Miami for good and those who replaced them. Still, these findings clearly indicate that out-migrants were older than the immigrant group, but younger than the people who stayed in Miami.

Considering again those units that were sampled in the 1979 and 1983 waves, we can have a look at the income per capita of stayers, leavers and newcomers. Again, differences between leavers and newcomers are understated because many individuals just swap housing units within the Miami MSA. I used the increase in the US urban CPI from December 79 to December 83 to transform incomes in 1983 into real 1979 dollars. The average real income of stayers (individuals in the same housing unit) was 8,099 dollars in 1979 and 7,875 dollars in 1983, but this difference is not significant. The average income of newcomers (individuals moving into a new housing unit after 1979) was significantly different, 6,839 dollars. The income of those displaced by this group was $7160, but again the difference with the newcomers is not significant. The last group to consider is that of the individuals who left their housing units and whose homes remained vacant in 1983. Those individuals' average income in 1979 was $9,430. From this data we can draw two conclusions. As expected, immigrants replaced individuals with relatively low incomes (although the income of immigrants was still lower). At the same time, some high-income individuals decided to leave and were not replaced. This fact suggests that something other than housing market prices was important to explain the population turnover. Table 10 shows the shift in the demand for housing quality. I consider only rental units by quartile in the rent distribution. The first quartile corresponds to those apartments with lower rental prices. I compare vacancy rates in

[24] These tabulations are conducted as follows. I first eliminate the observations that do not appear again in both samples. I cannot obtain any information on the characteristics of leavers and stayers from these observations. Note the implicit assumption that the non-matched observations are missing at random. I then proceed to calculate the (weighted) mean of the household head's age in 1979 for those units not occupied by the same person in 1983 (leavers). I also calculate the mean age in 1983 of the household heads in the same units (newcomers). To compare these two magnitudes I subtract four years to obtain the age in 1979 of the new movers. I also calculate the mean age in 1979 of the household heads that did not change their residence (stayers). As a check, I repeat the same calculation for stayers in 1983 and subtract four years. The difference is a not significant 0.13 years, attributable to measurement error or to small differences in the timing of the sample.

Miami and the rest of Metropolitan US in 1979 and 1983. In Miami, vacancies in low-end units decreased dramatically, while vacancies rate in higher quality units increased. These changes contrast with relatively stable profiles in the rest of the US. The data clearly reflect the demand shift in the lower quality segment, as hypothesized, but also decreased demand for higher qualities. The demand for housing quality is a good proxy for permanent income. Also, the expected costs of moving for individuals living in rental units are smaller than for homeowners. The data thus suggest that wealthy individuals were only starting to move out of the Miami metropolitan area in 1983.

Out-migration, and not increased supply, explained the convergence of rents after the Mariel boatlift. The medium run native out-migrants tended to be non-Hispanic and white, older than the immigrant group, and of the similar (low) income to immigrants in the lower quality segment or of higher incomes in the higher quality segments.

Housing Prices and Rents: Solving an apparent paradox

While rents increased after the Mariel immigration shock, relative housing prices collapsed in Miami. The first column in table 10 (Panel A) illustrates this fact. The table shows the evolution of the Freddie Mac housing price index for Miami, the available comparison cities and the other MSAs in Florida included in the index. Miami has the lowest housing price appreciation between the third quarter of 1980 and the third quarter of 1983. Change in housing prices in Dade County was ten percentage points lower than the increase in the US urban CPI during the same period. A striking contrast is offered by the changes in prices in the Fort Lauderdale MSA, just 35 miles north of Miami, which mimic general price level increases.

How is it possible to reconcile the apparent paradox of rapid rent hikes and housing price devaluation? Housing prices capitalize the present value of future rents. Despite the short run pressures on the rental market participants in the housing market must have been predicting reduced future demand because of out-migration and reduced immigration among native-born people.

The impact of immigration on housing markets can be very different in the short and longer run. The longer run impact of immigration on housing markets is bound to depend on the amenity/disamenity value that the native born people assign to living in

proximity with the immigrant community. This amenity value might be different in different locations and contingent on the characteristics of the immigrant population.

The theoretical model introduced here predicts that the increase in rents caused by an immigration shock will eventually be offset by out-migration of natives. In the short run, welfare is reduced, but in the long run the welfare impact is negligible (the national long-run housing supply is assumed to be completely elastic). Thus, ceteris paribus, there is no reason to expect higher rents in the long run from an immigration shock as long as there are "marginal" mobile natives.

In the longer run, rents and housing prices decreased in Miami after 1983, relative to the comparison group cities. Table 11 also illustrates this trend in Miami's housing prices and rents during the late 80s. Compared to the rest of Florida and the comparison cities in the Sunbelt relative values and rents decreased in Miami. Unreported analysis of the 1986 AHS shows that by 1986 the entire extra Miami 1979-83 differential was completely depleted and there was actually a reverse differential in favor of the comparison groups.

Even if average relative prices decreased in the long run: did prices for low-end units or for units in higher demand by immigrants increase their prices differentially? The answer, again, is no. The following regression is for the Florida 1980 urban Census tracts:

$$log(rent90) = 0.891 \times log(rent80) + 0.053 \times log(rent80) \times Miami + 0.241 \times hisp - 0.265 \times hisp \times Miami$$

(0.011) (0.025) (0.066) (0.069)

N=1376, $\mathbf{R^2}$=0.8904

Log(rent80), log(rent90) stand for the logarithm of the mean 1980 or 1990 rent, *Miami* is a Miami dummy, and *hisp* is the increase in the number of Hispanic dwellers divided by the tract's 1980 population. I use *Hisp* as a proxy for the impact of immigration from Spanish Speaking countries (I do not have the number of foreign born in 1990 by 1980 census tract). The equation contains county fixed effects. The 1980 number of households in the tract weights observations. Estimated standard errors are in

parentheses below the parameter estimates. The elasticity of 1990 rent on 1980 rent is actually greater in Miami: Census tracts that were more expensive in Miami in 1980 have relative higher rent hikes. It would seem that high amenity areas become more attractive within the Miami MSA. Areas of growth of Hispanic population were associated with decreasing relative rents over the period of 1980-90 (contrary to what we found in the post-Mariel short run). This negative correlation suggests that the location of new Hispanic dwellers within the Miami MSA was endogenous to changes in rental prices. As relative (within city) prices go up in areas of strong Hispanic identity, many foreign born Hispanics came to prefer other locations within the city. In the long run, therefore, one should not expect an intra-city positive correlation between immigration and rent hikes. The maps are helpful understanding these intra-city long-run dynamics. Map 1 shows the share of foreign born in 1980 in Dade County. The basic geographic units are 1990 census tracts. The blank spaces are tracts for which data was not available. The map shows a clear concentration of the foreign-born population in 1980. Map 3 shows the growth in the number of Hispanic inhabitants as a percentage of the tract's 1980 population. The growth of Hispanic population tends to happen in those areas where the initial concentration of the foreign born was lower. Map 2 shows the percentage change of mean rents between 1980 and 1990. As can be seen, the areas with initially high concentration of foreign-born population tend to experience major rent increases (along with other areas). This suggests an increasing intra-city ethnic amenity premium for locations that were predominantly foreign born in 1980. This premium is perfectly compatible with a negative within-city correlation between immigration flows and rents in the long run.

Thus, in the case of Miami immigration increased rents in the short run. In the long run, rents in Miami were lower than in the comparison cities. In the short run rent hikes and immigration within neighborhoods in the Miami Metro area were positively correlated. In the longer run this correlation faded away, because immigrants moved to inexpensive locations after some time.

The long run impact can be explained by the broader impact of the immigration experience in Miami. Ethnographic studies on Miami (Portes and Stepick, 1993; Grenier and Stepick, 1992) point out the fact that the boatlift was instrumental in negatively

changing the perception of the city among English-speaking natives and in reducing tourism (due to crime scares). These studies suggest that the creation of an immigrant enclave in Miami might have been perceived as a negative amenity by many of the previous residents.

Filer (1992) reports, "White native workers are less likely than other ethnic groups to find the cities where the immigrants settle attractive". In the long run, then, immigration may interact with existing ethnic residential preferences (as documented by Cutler, Glaeser and Vigdor, 1998) or the loss of some coordination gains that arise from the local use of a single language[25]. We will explore the effects of such preferences on housing prices through the model presented in section 1. Because the high-skilled group is assumed to have substantially higher lifetime incomes their valuation of the perceived negative amenity that might be associated with an immigration shock is bound to be greater. Some high-skilled better-off individuals will demonstrate a high willingness to pay to avoid such perceived negative amenity. Figure 3 explores the possibility that such perceived negative amenity arising from preferences towards ethnic or linguistic homogeneity exists. Notice that *all rents decrease even when I assume that the amenity value for the less-skilled group does not change.* Because initial rents for lower quality housing are lower it is indeed a possibility that the proportional rent fall is higher for such units. Some less-skilled individuals, including immigrants, will occupy higher quality housing units. This process is analogous to the filtering of higher quality housing to the poor (O'Flaherty, 1993). If higher income residents perceive the immigration inflows as a negative amenity, the demand for higher quality units will decrease in the long run. The existence of vacant units of higher quality will put downward pressure on the prices of all housing units. The filtering down process will accelerate. Construction of new housing will decrease. At the same time, many immigrants will acquire skills and demand higher quality housing. Indeed, in table 12, we can see how, in the new long run equilibrium the foreign born represent an increasingly important part of the demand for higher quality housing, proportional to their overall growth. At the same time relative incomes and

[25] There are many studies and much anecdotal evidence to reinforce this claim. Concerning the Miami experience on which this paper's results are based, a good portrait of the ethnic tensions in Miami created by the big inflows of immigrant population can be found in Grenier and Stepick (1992) and Portes and Stepick (1993). *The Washington Post* (11/11/1998) and *US News* (4/29/96) provide anecdotal views on what they term the "white flight" from the Miami MSA.

education of high-end quality housing dwellers in Miami increase at a slower pace than in the rest of Florida.

The evidence is thus consistent with an out-migration among non-Hispanic white and relatively better off previous residents from Miami caused by a perceived negative amenity from the Mariel immigration shock. Rents increased considerably in Miami in the short run, but at the same time housing prices, population and incomes (see Table 3 in Appendix 3), and construction of new units fell just after the boatlift, compared to the comparison metro areas. Vacancy rates dropped for lower quality apartments in the medium run (79 to 83), but increased remarkably for more expensive units, while rental prices decreased. The proportions of white non-Hispanic households in the Miami area decreased by ten percentage points from 1979 to 1983. The initial rent hike differential was reversed by 1986 and turned to a negative differential. Using 1980 and 1990 Census data I also find that dwellers in higher quality units tended to become relatively poorer and less educated in Miami. This fact also suggests a sustained negative shift in the demand from better-off individuals (a higher Q* in the model). As stated earlier, if out-migration responded exclusively to competition in the less-skilled labor and moderate quality housing markets, then no differential changes in rents and housing prices would occur in the longer-run equilibrium.

While consistent with the negative amenity story, these results need to be taken with caution. Many other things were happening in the Miami Metropolitan area during the 80s. The results, nevertheless, are important to understand that the long run effects of immigration on housing markets may differ from the short run effects. Many variables, some of them correlated with immigration inflows, have bearing on long run population changes and housing supply.

VI. Conclusions

This paper identifies the short run impact of immigration on housing markets. Immigrants disproportionally demand lower-quality rental housing and are willing to bid

out natives for these kinds of dwellings in the “port of entry” metropolitan areas in the short run.

I find that the level immigration in 1990 was directly associated with increases in moderate quality dwelling rents between 1990 and 1992 for the United States Metropolitan Areas.

The Mariel boatlift immigration shock increased rental prices in the Miami are by 8 to 11% between 1979 and 1981. This differential increase was still 7% in 1983. Higher residential densities in rental dwellings mainly achieved the quantitative adjustment. Units that were occupied by poor Hispanic renters in 1979 experienced even higher rent hikes. The rent hikes did not affect units in the highest quartile in the 1979 Miami rent distribution.

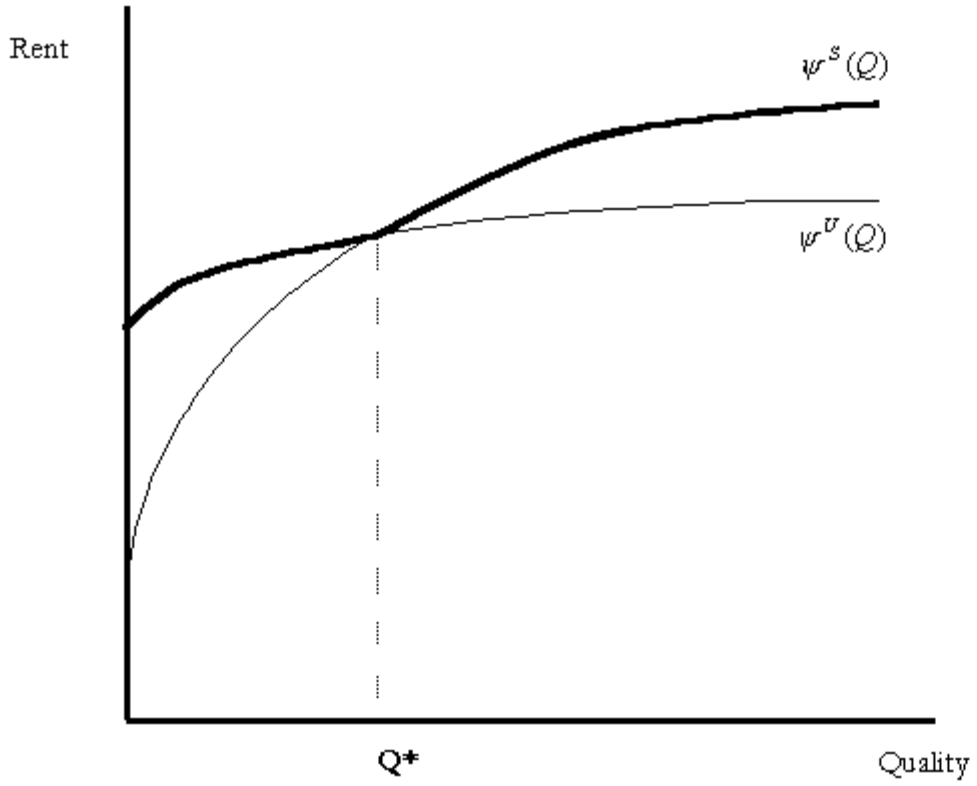
The results help to explain the moving decisions of native workers in the short to medium run. Even in the absence of reduction in nominal wages caused by immigration, the rent hikes decreased real consumption wages. These results qualify the findings of the labor economics literature on the local impact of immigration in the short run. Unskilled immigration does reduce the purchasing power of unskilled previous residents.

In the absence of further immigration, the long run evolution of rents and housing prices should not be affected, unless some previous residents perceive immigrants as a negative amenity. This was possibly the case in Miami after the Mariel boatlift. Relative housing prices, which capitalize future changes in rents, moved in opposite direction from rents even in the short run. There was a remarkable change in the ethnic composition of the city dwellers in only four years. The data supports the hypotheses that relatively better off white individuals migrated out of the Miami MSA. This might have boosted the long run supply of inexpensive units through an accelerated filtering process.

These results set a future research agenda on this topic. We have learned that unskilled immigration reduces real consumption wages for the unskilled in the short run through rent hikes. We need to understand better what the longer run impact of sustained immigration on housing markets is. Firstly, we need to understand what is the response of supply. It is particularly important to examine whether supply responds to sustained unskilled immigration inflows by, for instance, shifting construction towards multi-unit dwellings. Secondly, we need to understand what is the amenity value of immigration for

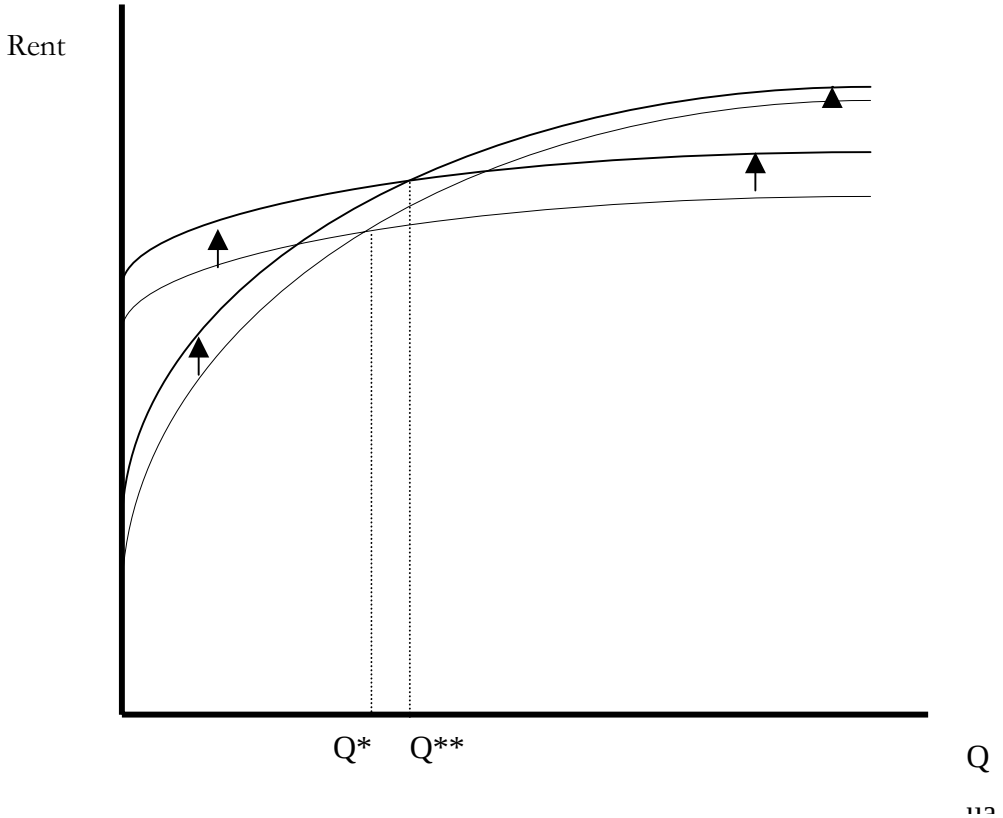
previous residents in general. The Miami case might be very specific and the methodology used in this paper constrains the validity of the results to the short run. Nevertheless, the results do suggest that labor and housing markets are not the only factor behind the moving decisions of natives in the long run. Social interactions are clearly important, and housing markets give us information on their value.

Figure 1: Equilibrium in the housing market



The figure shows the bid rents for quality for the unskilled and the skilled group $\{\psi^U(Q)$ and $\psi^S(Q)$ respectively$\}$. The actual market rent corresponds to the highest bid rent at any given quality level: the envelope of the two bid rents (thicker line in the figure). Quality Q* separates the housing units occupied by the unskilled and skilled workers.

Figure 2: Short run equilibrium in the housing market with immigration shock.



The figure shows how the bid rents for the two groups change in the short run given

The figure shows how the bid rents for the two groups change in the short run given during an immigration shock. The bid rents shift upwards. Q* is the initial quality that separated the unskilled and skilled before the shock. Q** is the new separating quality level.

Figure 3: Long-run equilibrium in the housing market with discriminating preferences by the high skilled.

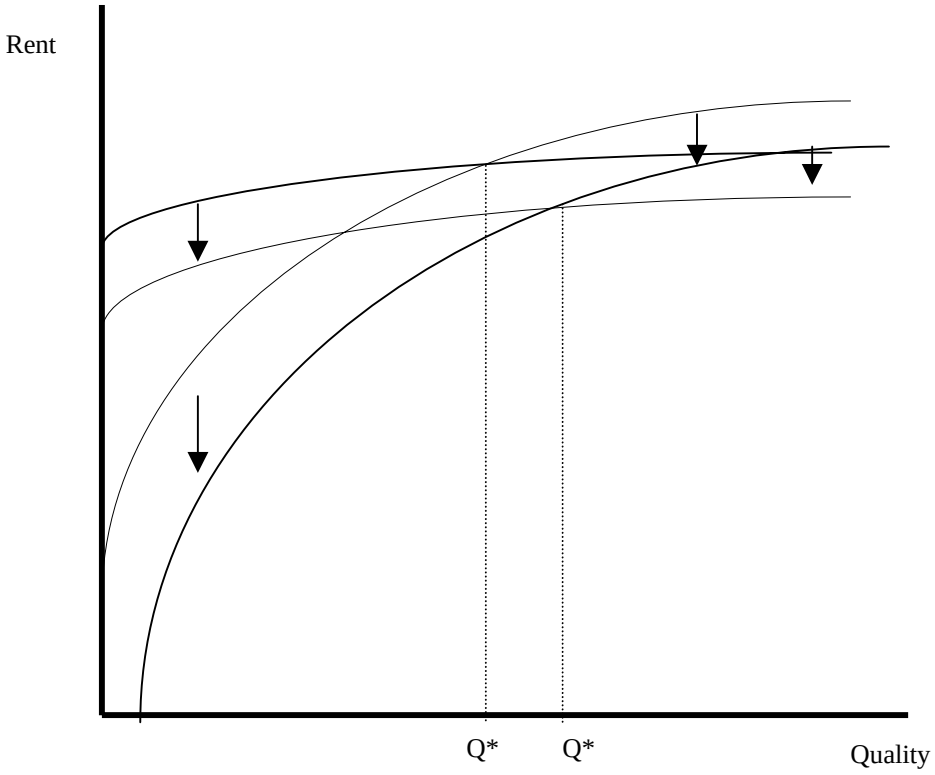
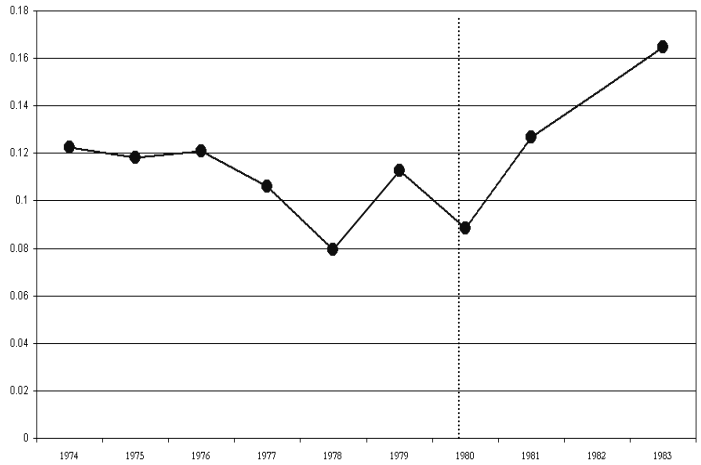


Figure 4: Rents in Miami and comparison cities (1974-1983)

MIAMI-FLORIDA



MIAMI-METRO US

MIAMI-SUNBELT

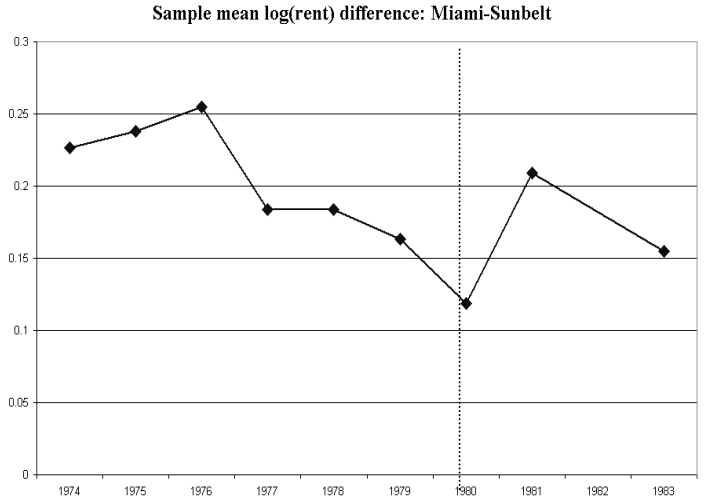
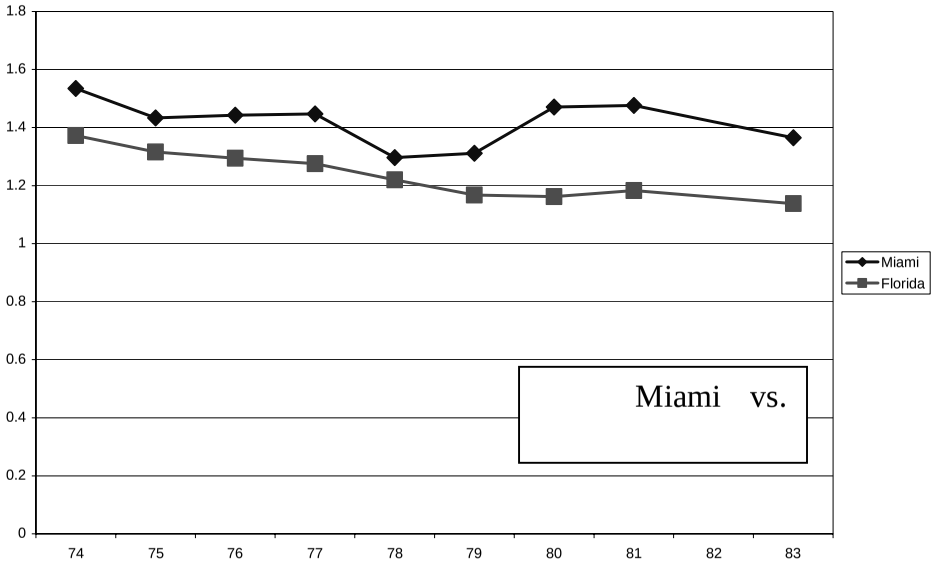
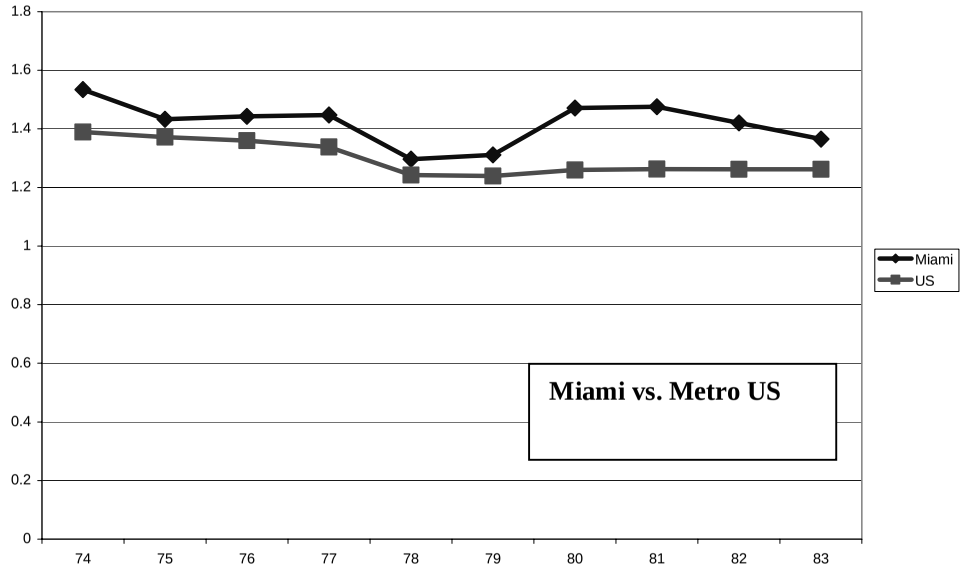


Figure 5: Persons per bedroom in rental units





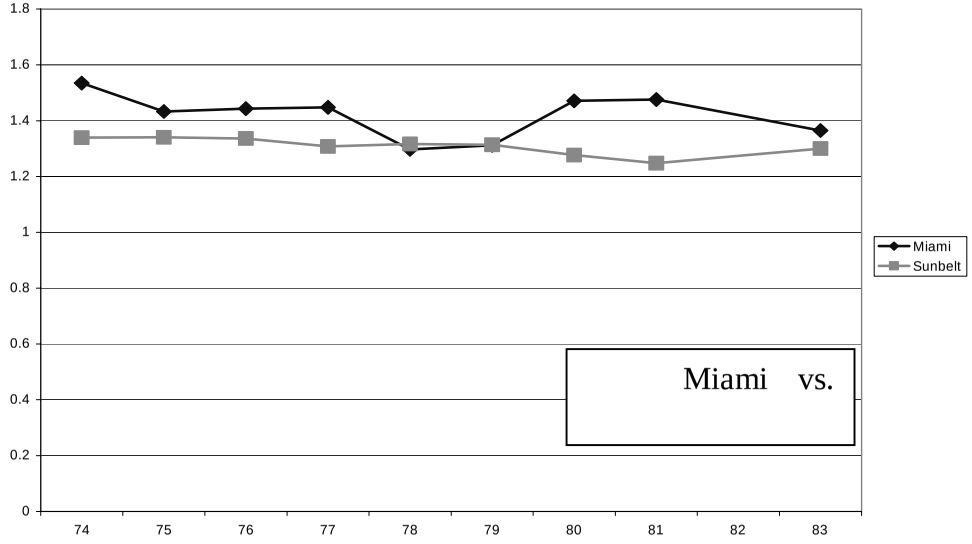


Figure 6: New housing permits (housing units/population)

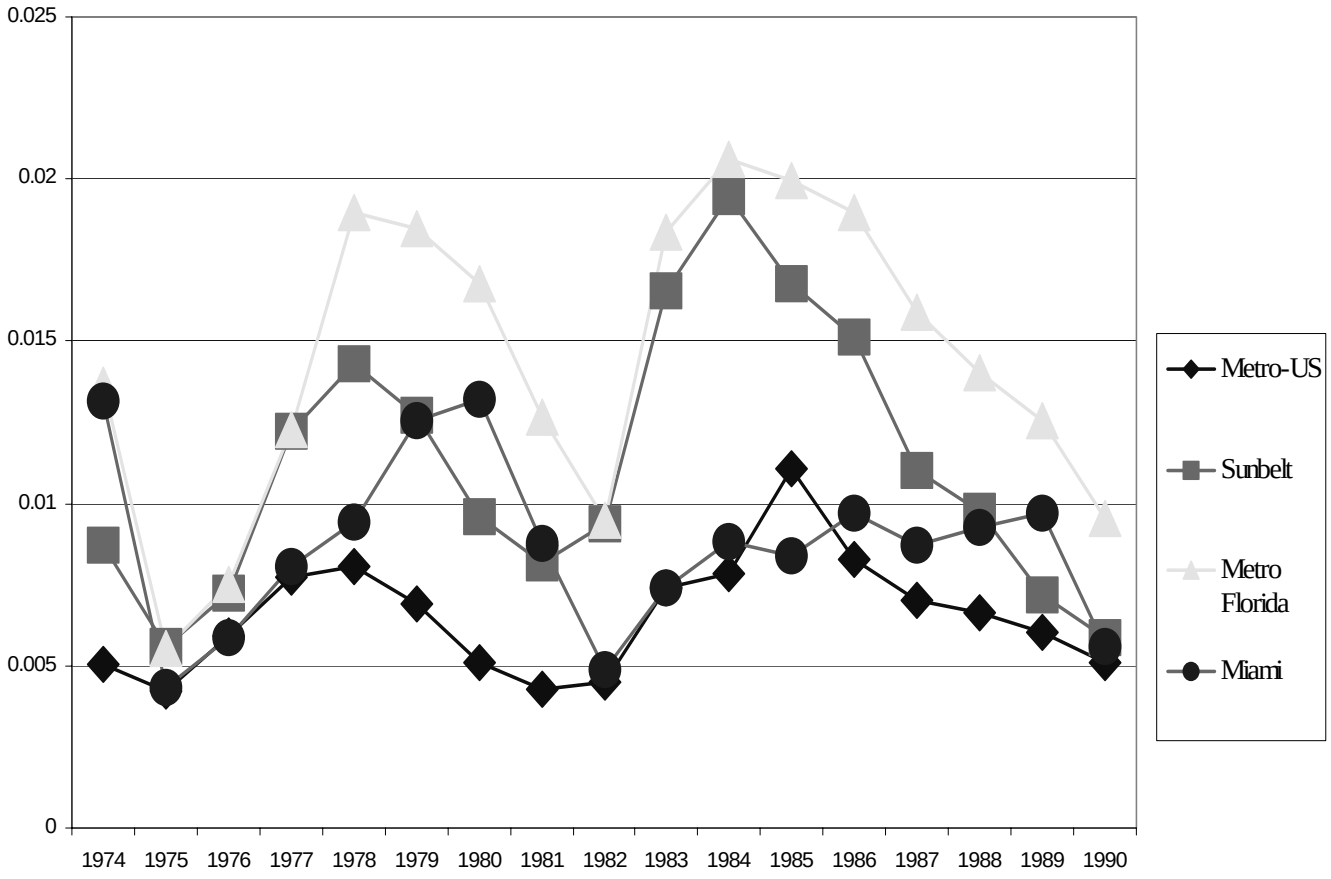


TABLE 1: *Weighted AHS rentals sample means*

	Miami		**Metro Florida**		**Sunbelt**		**Metro US**	
	1979	1983	1979	1983	1979	1983	1979	1983
Nominal rent	234.381	354.611	208.919	308.360	199.689	301.422	216.428	317.196
	(3.028)	(4.588)	(7.257)	(8.542)	(4.879)	(6.059)	(1.045)	(1.688)
Lives in central city	0.314	0.297	0.174	0.151	0.476	0.465	0.441	0.418
	(0.011)	(0.012)	(0.023)	(0.023)	(0.026)	(0.025)	(0.005)	(0.005)
Lives in suburbs	0.686	0.703	0.185	0.205	0.472	0.477	0.357	0.365
	(0.011)	(0.012)	(0.023)	(0.023)	(0.026)	(0.025)	(0.005)	(0.005)
C.C. status unknown	0.000	0.000	0.641	0.644	0.052	0.058	0.202	0.217
	0.000	(0.012)	(0.029)	(0.027)	(0.011)	(0.012)	(0.004)	(0.004)
1 bedroom	0.468	0.434	0.389	0.348	0.367	0.332	0.362	0.352
	(0.012)	(0.013)	(0.030)	(0.027)	(0.025)	(0.023)	(0.005)	(0.005)
2 bedrooms	0.331	0.346	0.368	0.421	0.405	0.424	0.406	0.405
	(0.011)	(0.012)	(0.029)	(0.028)	(0.026)	(0.025)	(0.005)	(0.005)
3 bedrooms	0.087	0.106	0.163	0.178	0.168	0.188	0.145	0.158
	(0.007)	(0.008)	(0.022)	(0.021)	(0.019)	(0.019)	(0.003)	(0.004)
4 bedrooms	0.012	0.013	0.013	0.015	0.021	0.023	0.024	0.025
	(0.002)	(0.003)	(0.006)	(0.007)	(0.008)	(0.007)	(0.001)	(0.001)
5 bedrooms	0.001	0.001	0.006	0.002	0.003	0.002	0.002	0.004
	(0.000)	(0.001)	(0.004)	(0.002)	(0.003)	(0.002)	(0.000)	(0.001)
6 or more bedrooms	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Built before 1965	0.445	0.417	0.360	0.313	0.423	0.338	0.594	0.562
	(0.012)	(0.013)	(0.030)	(0.027)	(0.026)	(0.024)	(0.005)	(0.005)
Unweighted observations	1915	1562	281	317	372	420	10863	11084

Notes: All means stand for weighted sample proportions, with the exception of for nominal rent. Data for Miami from AHS SMSA samples. Data for Florida and US from the AHS national sample. Other Florida includes observations from the following MSA's: Jacksonville, Orlando, Tampa-St.Petesburg, West Palm Beach-Boca Raton. Sunbelt includes: Albuquerque, Atlanta, Mobile, New Orleans and Phoenix-Mesa. Estimated standard errors *for the means* in parentheses. One bedrooms include efficiency dwellings.

TABLE 2: Immigrants and "Affordable" Fair Market Rents

	Log(rent91)		Log(rent92) - log(rent90)		Sample Means
	(1)	(2)	(3)	(4)	
Log(income per capita)	0.518 **	0.522 **	-	-	9.8238
	(0.048)	(0.048)	-	-	(0.1694)
Log(Population)	0.016 **	0.017 **	-	-	12.6845
	(0.007)	(0.007)	-	-	(1.0496)
New immigrants per 100 population (1990)	0.104 **	0.098 **	0.035 **	0.035 **	0.1502
	(0.038)	(0.039)	(0.011)	(0.011)	(0.1978)
Housing unit permits per capita (1989)	-	-0.802	-	-0.114	0.0054
	-	(1.649)	-	(0.499)	(0.0046)
Log(income92)-Log(income90)	-	-	-0.029	-0.028	0.0824
	-	-	(0.094)	(0.071)	(0.0286)
Log(population92)-Log(population90)	-	-	-0.024	-0.009	0.0251
	-	-	(0.094)	(0.109)	(0.0206)
State F.E	*yes*	*yes*	*no*	*no*	
R-squared	0.827	0.827	0.042	0.042	
N	296	294	296	294	296

Notes: Standard errors of regression parameters in parentheses. The sample means are unweighted between MSAs and are meant to provide a characterization of the sample observations. They should not be used to make inferences about the US population. Sample standard errors in parentheses.

TABLE 3: The rental market in Miami (1980)

Miami MSA: Ownership by Income Decile			Miami MSA: Distribution of the rental market by Income decile		
				Percent	**Cumulative**
Income Decile	**% renter**	**% owner**	1st	19.05	19.05
1st	73.19	26.81	2nd	15.68	34.73
2nd	62.48	37.52	3rd	14.26	48.99
3rd	50.39	49.61	4th	12.87	61.86
4th	56.13	43.87	5th	10.63	72.48
5th	41.69	58.31	6th	8.78	81.27
6th	34.41	65.59	7th	7.22	88.49
7th	28.31	71.69	8th	5.13	93.61
8th	20.12	79.88	9th	3.76	97.37
9th	14.74	85.26	10th	2.63	100
10th	10.3	89.7			

Miami MSA: renters vs. owners

%	All	Central City	Hispanic	Non-Hispanic	Recent immigrants	Recent Hispanic immigrants
Owner	60.22	39.4	53.72	64.01	35.37	30.98
Renter	39.78	60.6	46.28	35.99	64.63	69.02

Other Metro Florida

%	All	Central City	Hispanic	Non-Hispanic	Recent immigrants	Recent Hispanic immigrants
Owner	74.32	65.53	69.04	74.57	55.65	40.27
Renter	25.68	34.47	30.96	25.43	44.35	59.73

Notes: Data from Census Bureau 1980 5% Public Use Micro-Samples. Metro Florida stands for the following MSAs: Jacksonville, Orlando, Tampa, West Palm Beach and Fort Lauderdale.

TABLE 4 Diffs-in-diffs: Miami vs. comparison groups

Panel A: 1979-1983

	Metro Florida		Sunbelt		Metro US	
	(1)	(2)	(3)	(4)	(5)	(6)
	rent	**log(rent)**	**rent**	**Log(rent)**	**rent**	**log(rent)**
1983	5.786	0.035	2.897	0.033 **	10.869 **	0.038 **
	(5.988)	(0.027)	(2.650)	(0.018)	(0.767)	(0.004)
Miami*1983	20.677 **	0.071 **	23.565 **	0.073 **	15.593 **	0.068 **
	(6.382)	(0.029)	(3.449)	(0.021)	(2.336)	(0.011)
Constant	212.929 **	5.248 **	209.876 **	5.234 **	217.586 **	5.276 **
	(2.900)	(0.013)	(1.488)	(0.010)	(0.554)	(0.003)
Unit F.E	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **
R-squared	0.857	0.8597	0.917	0.904	0.9104	0.8744
N	2810	2810	2918	2918	18518	18518

Panel B: 1979-1981

	Metro Florida		Sunbelt		Metro US	
	(1)	(2)	(3)	(4)	(5)	(6)
	rent	**log(rent)**	**Rent**	**log(rent)**	**rent**	**log(rent)**
1981	-2.534	0.010	-4.421	-0.025	-3.588 **	-0.021 **
	(6.109)	(0.026)	(2.958)	(0.018)	(0.675)	(0.003)
Miami*1981	26.151 **	0.081 **	28.038 **	0.116 **	27.206 **	0.112 **
	(7.825)	(0.033)	(5.713)	(0.027)	(4.924)	(0.021)
Constant	212.894 **	5.262 **	211.398 **	5.242 **	216.898 **	5.270 **
	(2.973)	(0.012)	(1.887)	(0.010)	(0.481)	(0.002)
Unit F.E	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **
R-squared	0.8494	0.8711	0.9258	0.9221	0.9078	0.899
N	*752*	*752*	*884*	*884*	*17388*	*17388*

Notes: Standard errors in parentheses. Sample weights used in all regressions. In all tables, ** denotes a coefficient significant at the 5 percent level, * denotes a coefficient significant at the 10 percent level.

TABLE 5

Price changes by unit type 1979-83 (Miami vs. Metro US)

1983 interactions	Log(rent)	Rent
1st quartile	0.155 **	28.659 **
	(0.008)	(1.472)
2nd quartile	0.022 **	11.246 **
	(0.008)	(1.514)
3rd quartile	-0.009	6.507 **
	(0.008)	(1.498)
4th quartile	-0.049 **	-8.852 **
	(0.009)	(1.609)
1st quartile*Miami	0.052 **	13.343 *
	(0.022)	(4.083)
2nd quartile*Miami	0.096 **	22.132 **
	(0.023)	(4.310)
3rd quartile*Miami	0.084 **	18.764 **
	(0.022)	(4.159)
4th quartile*Miami	0.028	6.063
	(0.024)	(4.552)
R-squared	0.8691	0.8916
N	18972	18972

Notes: Data from National AHS (US) and pooled National SMSA AHS (Miami). Units are matched between samples. Includes unit fixed effects. Units are classified according to the rent quartile for the MSA and number of bedrooms group in 1979.

TABLE 6: Rental Units with renters below ½ Miami's median income per capita in 1979
Hispanic Occupied vs. Others

	(2) **Rent**	(1) **Log(rent)**
1983 dummy	18.749 **	0.079 **
	(4.889)	(0.029)
	999999	
1983*Hispanic	11.583 *	0.061
	(6.501)	(0.040)
Constant	194.286 **	5.175 **
	(2.548)	(0.016)
R-squared	0.882	0.835
N	788	788
1979 mean (Hispanic)	194.354	5.195
	(4.269)	(0.026)
1979 mean (non-Hispanic)	209.846	5.247
	(5.896)	(0.026)
Units	394	394
Hispanic occupied (79)	197	197

Notes: Data from Miami SMSA sample. 79-83 matched units sample. Regressions include unit fixed effects and are calculated using sample weights. I only consider units for which declared income per capita in 1979 was below Miami's median (in AHS). The Hispanic dummy controls for units that were occupied by Hispanic renters on 1979.

TABLE 7: Matched Sample Selection

	(1)	(2)
	log(rent83)-log(rent79)	**Included if >0**
Miami	0.065 **	1.686 **
	(0.011)	(0.587)
Constant	0.031 **	0.520 **
	(0.005)	(0.240)
Log(rent79)		0.125 **
		(0.043)
Log(rent79)*Miami		-0.359 **
		(0.109)
Built before 1965		-0.161 **
		(0.037)
Central city		0.032
		(0.032)
2 bedroom		-0.107 **
		(0.035)
3 bedroom		-0.446 **
		(0.044)
4 bedroom or more		-0.664 **
		(0.085)
Sigma		0.362 **
		(0.012)
Rho		0.077 **
		(0.035)
Chi-square		33.390
N		11233

Notes: Weighted with sample weights. Robust standard errors in parentheses.

TABLE 8: Differences in persons per room from AHS samples 1979-81

	Persons per bedroom		
	(1)	(2)	(3)
	Metro US	**Florida**	**Sunbelt**
Miami	0.076	0.135 *	0.100
	(0.058)	(0.071)	(0.068)
After	0.022 **	0.003	-0.067
	(0.009)	(0.049)	(0.043)
Miami*after	**0.149 ** **	**0.167 ** **	**0.237 ** **
	(0.068)	(0.083)	(0.080)
Constant	1.241 **	1.182 **	1.217 **
	(0.007)	(0.042)	(0.037)
R-squared	0.001	0.0238	0.024
N	*23359*	*986*	*1205*
(% Miami increase)	11.32%	12.70%	18.03%

Notes: Weighted least squares. AHS sample weights. Standard errors clustered by unit. Includes all rental units within the areas specified.

TABLE 9: Shifts in Ethnic Composition

	1979			183			1979	1983
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Household head group	**Owner-occupied**	**Rental units**	**All**	**Owner-occupied**	**Rental units**	**All**	**Matched rentals**	**Matched rentals**
Hispanic	0.216	0.327	0.264	0.252	0.389	0.311	0.324	0.359
	(0.008)	(0.011)	(0.007)	(0.010)	(0.012)	(0.008)	(0.012)	(0.013)
Black	0.093	0.174	0.128	0.105	0.179	0.137	0.183	0.199
(non-Hispanic)	(0.006)	(0.009)	(0.005)	(0.007)	(0.010)	(0.006)	(0.010)	(0.011)
White	0.544	0.425	0.493	0.462	0.328	0.405	0.416	0.314
(non-Hispanic)	(0.010)	(0.012)	(0.008)	(0.012)	(0.012)	(0.008)	(0.013)	(0.013)
Other	0.006	0.008	0.007	0.005	0.010	0.006	0.009	0.008
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.007)	(0.002)
Vacant/out of the market	0.142	0.067	0.110	0.176	0.097	0.142	0.068	0.121
	(0.007)	(0.006)	(0.005)	(0.009)	(0.008)	(0.006)	(0.012)	(0.009)
N	3523	2052	5575	2541	1717	4258	1592	1592

Notes: Estimates' standard errors in parentheses. Means and s.e. estimated using sample weights. Data from full SMSA Miami 1979 and 1983 AHS.

TABLE 10: Shifts in Demand for Quality

Rent quartile	Vacancy rate 1979		Vacancy rate 1983	
	Miami	**Metro US**	**Miami**	**Metro US**
1st quartile	0.111	0.051	0.054	0.047
	(0.014)	(0.004)	(0.010)	(0.003)
2nd quartile	0.054	0.047	0.089	0.060
	(0.010)	(0.003)	(0.015)	(0.004)
3rd quartile	0.040	0.060	0.108	0.066
	(0.008)	(0.004)	(0.017)	(0.004)
4th quartile	0.061	0.073	0.138	0.063
	(0.012)	(0.004)	(0.017)	(0.004)

***Notes*:** Data from Miami 1979 and 1983 SMSA AHS

TABLE 11

PANEL A: **Nominal house price appreciation**

	% Appreciation	
	1980-1983	**1980-1987**
Sarasota-Bradenton (FL)	27.97%	48.94%
Fort Myers-Cape Coral (FL)	21.28%	41.94%
Tampa-St. Petersburg (FL)	21.23%	44.85%
Albuquerque	21.00%	39.35%
Fort Lauderdale (FL)	*20.95%*	31.79%
Jacksonville (FL)	19.92%	40.81%
Orlando (FL)	19.39%	34.59%
Atlanta	18.42%	51.06%
New Orleans	16.09%	10.55%
West Palm Beach-Boca Raton (FL)	15.60%	27.12%
Melbourne-Titusville-Palm Bay (FL)	15.28%	25.63%
Daytona Beach (FL)	12.54%	22.96%
Phoenix-Mesa	12.26%	32.36%
Miami	*10.81%*	19.34%
US-Urban CPI	20.30%	37.33%

PANEL B: HUD Fair Market Rent evolution (1983-1990)

	Fair rent 83	**83**	**90**
Albuquerque	321	100	158.26
Atlanta	372	100	145.16
New Orleans	350	100	138.57
Tampa-St. Petersburg-Clearwater	368	100	133.15
Mobile	309	100	132.69
Phoenix-Mesa	422	100	131.99
Orlando	407	100	123.59
Jacksonville	374	100	121.93
Fort Lauderdale	491	100	120.77
Miami	*494*	*100*	*114.98*
West Palm Beach-Boca Raton	449	100	113.59
US-Urban CPI		100	129.10

Notes: Data from Freddie Mac and HUD. Housing price changes are from the 3rd quarter in 1980 to the 3rd quarter in 1983 and 1987.

TABLE 12: IPUMS tabulations of the High-end quality Dwellings in Florida and Miami

	% Foreign born	% Some college	% Hispanic	Income Florida poverty line=100
1980				
Florida				
Owner occupied: Value above median	5.88%	33.57%	2.80%	364.80
Renter occupied: rent above 66%	5.95%	31.43%	3.97%	254.97
All	6.25%	24.37%	3.48%	276.20
Miami				
Owner occupied: Value above median	29.98%	35.18%	32.17%	371.37
Renter occupied: rent above 66%	43.93%	28.88%	43.64%	252.59
All	36.23%	25.34%	36.50%	275.10
1990				
Florida				
Owner occupied: Value above median	8.94%	45.53%	4.35%	386.37
Renter occupied: rent above 66%	10.43%	42.40%	7.23%	288.47
All	9.59%	35.49%	5.67%	300.52
Miami				
Owner occupied: Value above median	43.60%	43.51%	47.50%	377.77
Renter occupied: rent above 66%	54.95%	36.26%	56.43%	257.05
All	49.08%	30.75%	50.05%	269.11
1990-1980				
Florida				
Owner occupied: Value above median	3.06%	11.96%	1.55%	21.57
Renter occupied: rent above 66%	4.48%	10.97%	3.26%	33.50
All	3.35%	11.12%	2.19%	24.32
Miami				
Owner occupied: Value above median	13.62%	8.33%	15.33%	6.40
Renter occupied: rent above 66%	11.02%	7.38%	12.79%	4.45
All	12.85%	5.40%	13.55%	-5.98

Notes: tabulations from 1980 and 1990 Census IPUMS. Florida includes all metropolitan areas in the State of Florida except Miami.

Appendix 1

Recall the equations defining the housing market equilibrium:

(4) $$V^S(Q^*) + A_M + W_M^S - \overline{U_S} = V^U(Q^*) + A_M + W_M^U(N_U^*) - \overline{U_U}$$

(5) $$N_U^* = \int_0^{Q^*} S\left(\psi^U(Q), Q\right) \cdot dQ$$

The parameter of interest is W_M^S. Introducing the price equation (the bid rent for the unskilled) in (5) we have:

(A.1) $$N_U^* = \int_0^{Q^*} S\left(V^U(Q) + A_M + W_M^U(N_P^*) - \overline{U_U}, Q\right) \cdot dQ$$

Similarly, we can obtain the number of skilled individuals in equilibrium:

(A.2) $$N_S^* = \int_{Q^*}^{\overline{Q}} S\left(V^S(Q) + A_M + W_M^S - \overline{U_S}, Q\right) \cdot dQ$$

In equilibrium we obtain N_P^* as a function of Q*. Differentiating (A.1) w.r.t. Q* yields:

(A.3) $$N_U^{*\prime}(Q^*) = S\left(\psi^U(Q^*), Q^*\right) + \int_0^{Q^*} S_1\left(\psi^U(Q), Q\right) \cdot W_M^{U\prime}(N_U^*) \times N_U^{*\prime}(Q^*) \cdot dQ$$

We can rearrange this to obtain:

(A.4) $$N_U^{*\prime}(Q^*) = \frac{S\left(\psi^U(Q^*), Q^*\right)}{1 - \left\{ W_M^{U\prime}(N_U^*) \times \int_0^{Q^*} S_1\left(\psi^U(Q), Q\right) \times dQ \right\}}$$

If there population does not affect wages, then when the equilibrium Q* increases, the increase of unskilled population is equal to the number of housing units of quality Q* in the old equilibrium. If there are wage effects (so that the bidding curve for the poor is differentially reduced), a reduction in the supply for all qualities up to Q* dampens the unskilled population increase.

Differentiating the equation (4), Q* being a function of W_M^S in equilibrium, yields:

(A.5) $$V^{S\prime}(Q^*) \times Q^{*\prime}(W_M^S) + 1 = V^{U\prime}(Q^*) \times Q^{*\prime}(W_M^U) + W_M^{U\prime}\left(N_U^*\right) \times N_U^{*\prime}(Q^*) \times Q^{*\prime}(W_M^U)$$

And rearranging:

(A.6) $$Q^{*\prime}(W_M^U) = \frac{1}{V^{U\prime}(Q^*) - V^{S\prime}(Q^*) + W_M^{U\prime}(N_P^*) \times N_U^{*\prime}(Q^*)} < 0$$

Thus, an increase in the skilled wage in location M reduces the quality cut-off level for which the skilled outbid the unskilled (gentrification). All the prices increase and the unskilled are not displaced one for-one, because a lower unskilled population increases wages, allowing this group to bid higher and to increase supply for the lowest qualities.

Now consider an immigration shock of N_I unskilled individuals. In the short run mobility costs are arbitrarily high. In the short-run equilibrium dwelling supply needs to adjust in order to house the native and the immigrant populations.

Lemma 1

The new bid curves will equal the old ones plus a constant.

Proof

The unskilled population competes for better qualities. In equilibrium all have to be indifferent between locations. The bid curve is determined by the native population (immigrants do not need to bid higher than natives). Call their utility level $\overline{\overline{U_U}}$. Let $\psi_2^i(Q)$ be the new rent bid for group i. We need to have:

(A.6) $$V^U(Q) + A_M + W_M^U(N_U^* + N_I) - \psi_2^U(Q) = \overline{\overline{U_U}}$$

and thus

(A.7) $$\psi_2^U(Q) = V^U(Q) + A_M + W_M^U(N_U^* + N_I) - \overline{\overline{U_U}}$$

(A.8)

$$\psi_2^U(Q) = V^U(Q) + A_M + W_M^U(N_U^*) - \overline{U_U} + \left\{W_M^U(N_U^* + N_I) - \overline{\overline{U_U}} - W_M^U(N_P^*) - \overline{U_U}\right\} \equiv \psi^U(Q) + A$$

And similarly we can obtain:

(A.9) $$\psi_2^S(Q) = \psi^S(Q) + B$$

Lemma 2

If B<0 then Q** < Q*

Proof

The number of skilled does not change in the short-run and we have:

(A.10) $$\int_{Q^{**}}^{\bar{Q}} S\left(\psi^S(Q)+B,Q\right)\times dQ = \int_{Q^{*}}^{\bar{Q}} S\left(\psi^S(Q),Q\right)\times dQ$$

Assume, towards a contradiction, that B<0 and Q**>Q*. From (A.10):

(A.11) $$\int_{Q^{**}}^{\bar{Q}}\left[S\left(\psi^S(Q)+B,Q\right)-S\left(\psi^S(Q),Q\right)\right]-\int_{Q^{*}}^{Q^{**}} S\left(\psi^S(Q),Q\right)\times dQ = 0$$

Because B<0, $\left[S\left(\psi^S(Q)+B,Q\right)-S\left(\psi^S(Q),Q\right)\right]<0,\forall Q$. Also $\int_{Q^{*}}^{Q^{**}} S\left(\psi^S(Q),Q\right)\times dQ > 0$

Then:

(A.11)' $$\int_{Q^{**}}^{\bar{Q}}\left[S\left(\psi^S(Q)+B,Q\right)-S\left(\psi^S(Q),Q\right)\right]-\int_{Q^{*}}^{Q^{**}} S\left(\psi^S(Q),Q\right)\times dQ < 0 \ , \Rightarrow\Leftarrow$$

Lemma 3

If B<0, then A>0

Proof

Assume B<0 and A<0. The unskilled population is equal to $N_I + N_U^*$ and we need:

(A.12) $$N_I + N_U^* = \int_{0}^{Q^{**}} S\left(\psi^U(Q)+A,Q\right)\times dQ$$

Using lemma 2 and equation (5) we obtain:

(A.13) $$N_I = \int_{0}^{Q^{**}}\left[S\left(\psi^U(Q)+A,Q\right)-S\left(\psi^U(Q),Q\right)\right]\times dQ - \int_{Q^{**}}^{Q^{*}} S\left(\psi^U(Q),Q\right)\times dQ$$

Because A<0 , $\left[S\left(\psi^U(Q)+A,Q\right)-S\left(\psi^U(Q),Q\right)\right]<0$ and $\int_{Q^{**}}^{Q^{*}} S\left(\psi^U(Q),Q\right)\times dQ > 0$,

implying that N_I<0, which contradicts our assumption of a positive immigration shock.

Lemma 4

B>0

Proof
Assume that B<0. By Lemma 2 Q**<Q*. By Lemma 3 A>0. The quality cut-off level that separates the unskilled from the skilled (Q**) is such that:

(A.14) $$\psi^S(Q^{**}) + B = \psi^U(Q^{**}) + A$$

Using equations (1) and (3) to substitute for the old price schedules at Q** , subtracting equation (4) and manipulating yields:

(A.16) $$\left[V^U(Q^*) - V^U(Q^{**})\right] - \left[V^S(Q^*) - V^S(Q^{**})\right] = A - B$$

It is clear that A-B>0 but as we assumed $\frac{dV^S(Q)}{dQ} > \frac{dV^U(Q)}{dQ}, \forall Q,$ we have

$$\left[V^U(Q^*) - V^U(Q^{**})\right] - \left[V^S(Q^*) - V^S(Q^{**})\right] < 0, \quad \Rightarrow\Leftarrow$$

Lemma 5

If B>0 then Q**>Q*

Proof

Similar to Lemma 2

Lemma 6

A>0

Proof

Assume A<0. By Lemma 4 B>0 and by Lemma 5 Q**>Q*. Notice that we'll have:

$$\left[V^U(Q^*) - V^U(Q^{**})\right] - \left[V^S(Q^*) - V^S(Q^{**})\right] > 0$$

But A-B<0 which contradicts equation (A.16).

Proposition

A >B (the price increase is higher for the unskilled individuals).

Proof

By previous lemmas A , B>0, and Q*<Q**, so:

$$A - B = \left[V^U(Q^*) - V^U(Q^{**})\right] - \left[V^S(Q^*) - V^S(Q^{**})\right] > 0$$

Appendix 2

Let us consider the following plausible case for which the regressions could be over-estimating the actual differential rent increase. Miami is a tourist area and converting apartments into second residence condos is a feasible option, whereas in the comparison group apartments can only be put to a residential use. There is an "actual" distribution of rents with expectation in Miami and the comparison cities equal, respectively, to $E(R_{M1})$ and $E(R_{C1})$ in the first period and to $E(R_{M2})$ and $E(R_{C2})$ in the second period. In the first period, we obtain two random samples with means $\overline{R_{M1}}$ and $\overline{R_{C1}}$. In the second period landlords in Miami can decide to put the apartment to an alternative use: sell it as a second residence condo and obtain rents equal to the price of the condo times the interest rate. This alternative rent, which I shall call RC, is assumed to be determined in the national (or international) market for second residence homes and not locally. The units in the second sample are randomly sampled in the comparison cities (with sample mean $\overline{R_{C2}}$). In Miami, though, those units with local market rents below RC are sold as condos and do not appear in our sample (which has an estimated mean equal to $\overline{R_{M2}}$). The actual difference in difference we want to obtain is:

$$DD = (E(R_{M2}) - E(R_{M1})) - (E(R_{C2}) - E(R_{C1}))$$

We actually estimate:

$$\overline{DD} = (\overline{R_{M2}} - \overline{R_{M1}}) - (\overline{R_{C2}} - \overline{R_{C1}})$$

The bias in our estimate would be equal to:

$$E(\overline{DD}) - DD = E(R_{M2} / R_{M2} > RC) - E(R_{M2}) > 0$$

Thus the fact that Miami is a tourist city makes condo conversion feasible, and could bias the estimates from the matched sample upwards.

Appendix 3

TABLE 1

Diffs-in-diffs: Miami vs. Houston (79-83)

	SMSA AHS samples		National AHS samples	
	(1)	(2)	(3)	(4)
	rent	**log(rent)**	**rent**	**log(rent)**
1983	0.059	0.006	-2.810	0.002
	(1.991)	(0.011)	(6.115)	(0.029)
Miami*1983	25.154 **	0.090 **	27.339 **	0.087 **
	(2.969)	(0.015)	(7.877)	(0.038)
Constant	232.226 **	5.359 **	242.314 **	5.389 **
	(1.125)	(0.007)	(2.964)	(0.014)
F.E	*yes* **	*yes* **	*yes* **	*yes* **
R-squared	0.883	0.8916	0.8873	0.8567
N	4772	4772	690	690

Notes: Standard errors in parentheses. Sample weights used in all regressions.

TABLE 2

Diffs-in-diffs: Miami vs. Comparison groups (79-83)

	Metro Florida		Sunbelt		Metro US	
	(1)	(2)	(3)	(4)	(5)	(6)
	rent	**log(rent)**	**rent**	**log(rent)**	**Rent**	**log(rent)**
Miami	36.918 **	0.198 **	46.333 **	0.241 **	14.969	0.069
	(12.701)	(0.040)	(4.819)	(0.027)	(2.908)	(0.011)
1983	2.132	-0.021	15.700 **	0.090 *	9.028	0.040
	(12.950)	(0.094)	(7.365)	(0.048)	(6.046)	(0.036)
Miami*1983	28.415 **	0.052	15.241 **	0.003	13.297 **	0.054 **
	(13.865)	(0.048)	(5.386)	(0.903)	(4.338)	(0.017)
Constant	172.975	5.038 **	186.324	5.092 **	223.748 **	5.284 **
	(16.839)	(0.103)	(9.256)	(0.079)	(3.988)	(0.023)
F.E	*no*	*no*	*no*	*no*	*no*	*no*
Quality dummies	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **
Quality*1983	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **	*yes* **
R-squared	0.2511	0.2834	0.325	0.343	0.1646	0.1838
N	4075	4075	4269	4269	25033	25033

Notes: Quality dummies include six dummies for number of bedrooms, a central city dummy and a dummy for dwellings built before 1960. Sample weights used in all regressions. Standard errors clustered by unit.

TABLE 3.a

Evolution of Real Income per capita growth rates in Miami and comparison cities

	1977	1978	1979	1980	1981	1982	1983	Annualized 77-83	1984	1985	1986	1987	Annualized 83-87
Mobile	1.63%	2.85%	-1.61%	-1.93%	0.66%	-3.12%	0.33%	*-0.19%*	3.25%	2.49%	2.22%	0.29%	*1.66%*
Miami	**1.59%**	**4.74%**	**-0.36%**	**-2.27%**	**-1.82%**	**-1.43%**	**2.42%**	*0.38%*	2.69%	1.69%	1.88%	2.74%	*1.86%*
United States	2.93%	3.87%	-0.09%	-2.77%	0.40%	-0.98%	2.19%	*0.77%*	5.29%	2.53%	2.92%	1.84%	*3.94%*
Jacksonville	1.70%	2.62%	-1.13%	-2.07%	1.46%	1.08%	3.53%	*1.01%*	5.05%	3.18%	3.07%	2.23%	*3.19%*
Albuquerque	2.41%	5.50%	0.02%	-3.98%	-0.35%	2.96%	3.03%	*1.33%*	4.44%	4.02%	1.79%	0.46%	*3.14%*
Atlanta	3.78%	4.00%	-0.98%	-1.86%	0.08%	-0.40%	5.04%	*1.35%*	7.68%	4.48%	4.27%	2.04%	*4.32%*
New Orleans	3.32%	4.61%	0.67%	-0.32%	3.03%	-0.95%	0.08%	*1.47%*	2.44%	0.25%	-0.82%	-1.05%	*0.94%*
Phoenix-Mesa	3.03%	6.58%	2.93%	-2.25%	0.37%	-3.70%	3.75%	*1.48%*	5.33%	3.18%	3.51%	0.80%	*3.33%*
Orlando	1.69%	5.64%	0.06%	0.80%	0.22%	0.80%	3.97%	*1.87%*	2.90%	3.20%	3.29%	1.41%	*2.91%*
Fort Lauderdale	4.83%	5.61%	1.30%	0.53%	1.65%	-3.01%	3.25%	*1.99%*	4.33%	2.03%	3.38%	2.21%	*3.09%*
Tampa-St. Petersburg	4.89%	4.79%	0.67%	0.41%	1.51%	-0.60%	3.86%	*2.20%*	3.89%	2.34%	3.11%	0.85%	*2.47%*
West Palm Beach-Boca Raton	4.28%	7.02%	2.24%	1.08%	4.05%	-1.88%	7.20%	*3.38%*	4.16%	4.92%	3.35%	4.19%	*3.31%*

Notes: Data in 1982-84 average dollars using the BLS urban CPI index. Nominal MSA Income per capita data from BEA.

TABLE 3.b

Evolution of population growth in Miami and comparison cities

	1977	1978	1979	1980	1981	1982	1983	average 79-83	1984	1985	1986	1987	annualized 83-87
United States	1.06%	1.11%	1.18%	0.99%	0.96%	0.92%	0.87%	*1.01%*	0.87%	0.89%	0.93%	0.90%	*1.38%*
New Orleans	1.19%	1.21%	1.77%	1.09%	1.38%	0.77%	-0.06%	*1.05%*	-0.06%	-0.04%	-0.19%	-1.48%	*0.51%*
Mobile	2.14%	0.85%	1.55%	1.25%	1.42%	0.81%	0.47%	*1.21%*	0.47%	1.14%	1.02%	0.82%	*0.84%*
Albuquerque	2.38%	3.13%	3.34%	1.69%	-4.47%	2.19%	2.13%	*1.45%*	2.13%	2.06%	2.57%	2.68%	*2.42%*
Jacksonville	1.50%	0.79%	2.73%	1.88%	1.73%	1.94%	2.71%	*1.89%*	2.71%	2.97%	3.09%	2.54%	*2.46%*
Miami	**0.73%**	**2.76%**	**2.58%**	**5.22%**	**0.98%**	**0.98%**	**0.66%**	***1.98%***	**0.66%**	**1.21%**	**1.38%**	**1.66%**	***1.15%***
Atlanta	1.89%	2.77%	2.51%	2.24%	2.12%	2.64%	3.13%	*2.47%*	3.13%	3.77%	3.64%	3.50%	*3.15%*
Fort Lauderdale	3.92%	4.65%	4.02%	2.85%	2.03%	1.70%	1.44%	*2.94%*	1.44%	1.99%	1.90%	2.29%	*1.91%*
Tampa-St. Petersburg-Clearwater	2.67%	3.66%	3.41%	3.10%	2.70%	3.00%	2.90%	*3.06%*	2.90%	2.81%	2.48%	2.27%	*2.27%*
Phoenix-Mesa	4.20%	4.73%	4.26%	2.90%	2.99%	3.11%	4.29%	*3.78%*	4.29%	5.14%	4.21%	4.43%	*4.21%*
Orlando	3.23%	4.25%	4.14%	3.97%	3.77%	4.43%	4.52%	*4.04%*	4.52%	4.04%	4.23%	4.21%	*4.02%*
West Palm Beach-Boca Raton	3.70%	6.28%	6.32%	5.95%	4.08%	3.34%	3.96%	*4.80%*	3.96%	4.20%	4.20%	4.18%	*3.29%*

Notes: Data from Census County Population estimates (Miami-Dade county) and BEA (rest of metropolitan areas).

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