Crime and Compensating Wage Differentials: Evidence from Miami in 1980

Claudia Smith Kelly
Grand Valley State University

In 1980 Miami's violent crime rate rose from 18.8 to 34.2 per 1000 individuals. Using samples from the Current Population Survey and exploiting this increase in the crime rate, I compare changes in the labor-market outcomes of Miami unskilled workers who faced a greater risk of suffering a fatal on-the-job injury to the corresponding changes in a group of comparison cities. The empirical analysis suggests that a rise in Miami's crime rate of 82 percent between 1979 and 1980 led to high-crime-risk workers in Miami earning a higher per hour relative wage than high-crime-risk workers in the comparison cities in 1980.

INTRODUCTION

Economic theory, since Adam Smith, suggests that individuals are induced to take high-risk jobs through a set of compensating differences in wage rates. There is a large literature on empirically testing the theory of compensating wage differentials, however, many of the studies produce wrong-signed or imprecise estimates.[1] Measurement error in measures of fatal injury risk and failure to observe workers' true labor-market productivity can bias estimates of compensating wage differentials derived from cross-sectional labor market data (Brown 1980; Duncan and Holmlund 1983; Garen 1988). Unobserved productivity heterogeneity alone can cause estimates to understate true compensating differentials by a factor of 50 percent or more, and even to result in wrong-signed coefficients (Hwang, Reed and Hubbard, 1992). In this paper, I employ a quasi-experimental framework to empirically test the theory of compensating wage differentials. The quasi-experimental framework allowed me to address the two primary problems of the literature simultaneously. The change in the working conditions for some workers in Miami in 1980 form one such quasi-experiment. The plausible exogenous variation in working conditions created by the increase in the crime rate is unrelated to workers' productivity, and hence circumvents the problem of unobserved heterogeneity. I mitigate the measurement error problem by using an injury-risk measure that is subject to less error. Data of the injury-risk measure, homicide on the job, is from the National Institute of Occupational Safety and Health.[2]

Miami's violent crime rate (murder, assault, robbery, and rape) peaked in 1980. Between 1979 and 1980, the violent crime rate increased by 82%, from 18.8 to 34.2 per 1000 individuals, the greatest increase in the crime rates between years from 1970 to 1992. In this paper, I argue that the drastic change in the crime rate altered the working conditions of high-crime-risk workers and lead to higher wage compensation. High-crime-risk workers are workers with occupations that have the highest homicide rate per occupation. In contrast, low-crime-risk workers are workers with occupations that have the lowest homicide rate per occupation.

While different work situations exhibit vastly different work-related probabilities of death and injury, the same is true for the same type of jobs in different times. Using the shock to Miami's crime rate as a plausibly exogenous variation in working conditions of high-crime-risk workers to empirically test the theory of compensating wage differentials, I compare the changes in wages of employees with high-crime-risk and low-crime-risk jobs within Miami and three comparable cities, Tampa-St. Petersburg, Houston and Los Angeles, between 1979 and 1983. The empirical analysis uses cross-sectional data from the 1979, 1980, 1981, 1982, and 1983 Outgoing Rotation Groups of the Current Population Surveys (ORG-CPS) and estimates that between 1979 and 1980 high-crime-risk workers in Miami earned between 43 cents and 88 cents per hour more relative to high-crime-risk workers in the comparison cities in 1980. From 1979 to 1983 high-crime-risk workers in Miami earned between 30 cents and 46 cents per hour more relative to high-crime-risk workers in the comparison cities in 1980.

The study is organized as follows. Section II provides a brief overview of Miami's crime rate. Section III describes the data and identification strategy. The estimation results are discussed in Section IV, followed by a brief conclusion.

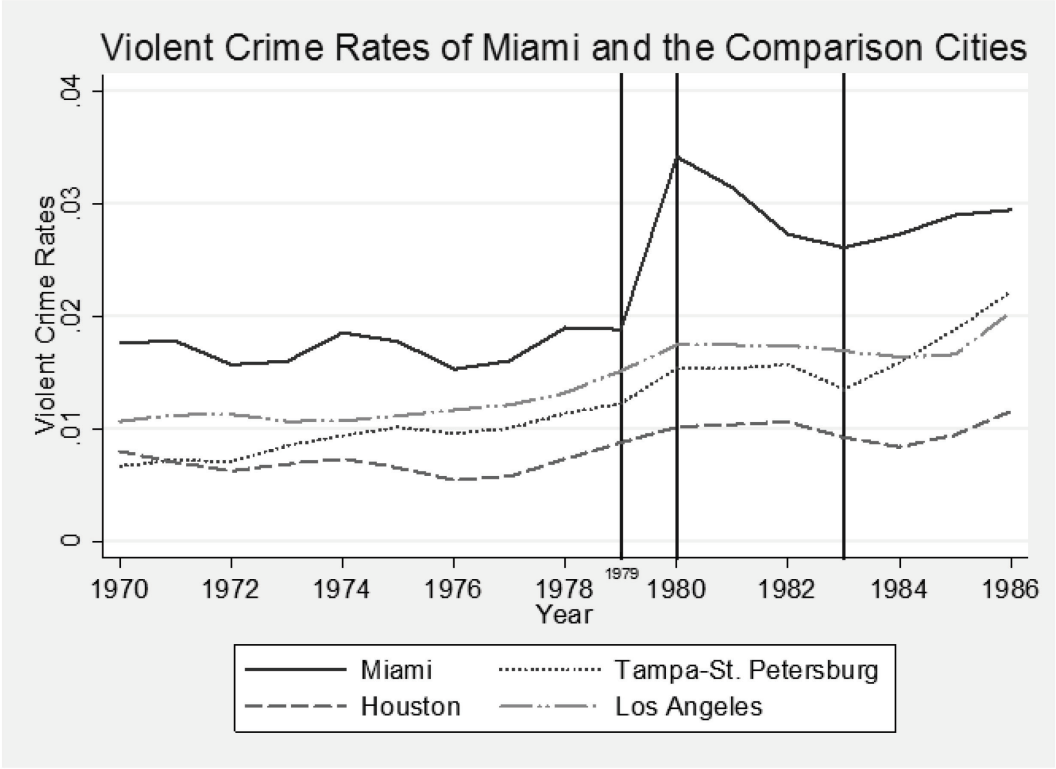
MIAMI'S CRIME RATE IN 1980

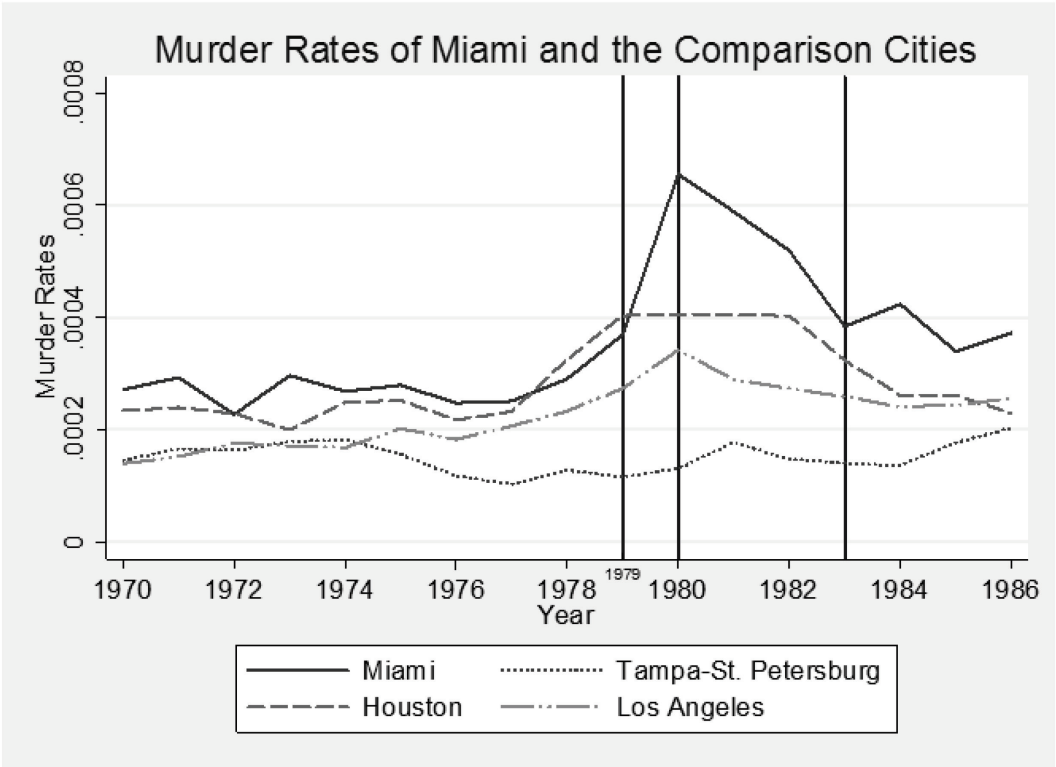
All of Miami's crime rates peaked in 1980. According to FBI statistics robbery, murder, aggravated assault and forcible rape increased by approximately 120, 78, 44, and, 35 percent. Property crimes, which include the offenses of burglary, larceny-theft, and motor vehicle theft, had similar patterns.[3] Miami's property crime rate increased by 46 percent and motor vehicle theft, larceny-theft, and burglary increased by approximately 75, 43, and 43 percent. Several reasons were cited for the crime epidemic in Miami. Among the reasons was poverty in Dade County. Kelly and Wallis (1980) states that 18 percent of the families living in Dade County, which includes Miami, Miami Beach and other communities, lived on annual incomes of less than $7500. Another reason cited for Miami's drastic change in the crime rate was racial tension stemming from the nonhomogeneous population in Dade County. Dade County population statistics reveal that in 1980, 45 percent of the population was White, 38 percent was Hispanic and 17 percent was Black. Many Southern Floridians, according to the media, blamed also the newly arrived Cuban refugees, the narcotic trade and the shortage of police in the rapidly-growing region for the crime epidemic. Some Americans feared the Cuban refugees and perceived them as a serious threat to society. This perception developed when it was known that several hundred inmates of mental hospitals and jails were allowed to leave Cuba on the flotilla of privately chartered boats to Port of Key West, Florida (Aguirre, Saenz and James, 1997) and that they were known for committing crimes of opportunity in Miami. In the early 1980s, Miami was the clearing point for smuggled drugs from Latin American countries, hence the effect of the narcotic trade on Miami's crime rate during that period. Also, in the early 1980s Miami grew rapidly, especially in 1980 when it was estimated by most sources that approximately 125, 000 Cuban refugees migrated to the U.S. and about one-half of these Cuban refugees settled permanently in Miami. The increase in population highlighted the shortage of police and their ineffectiveness to combat crime.

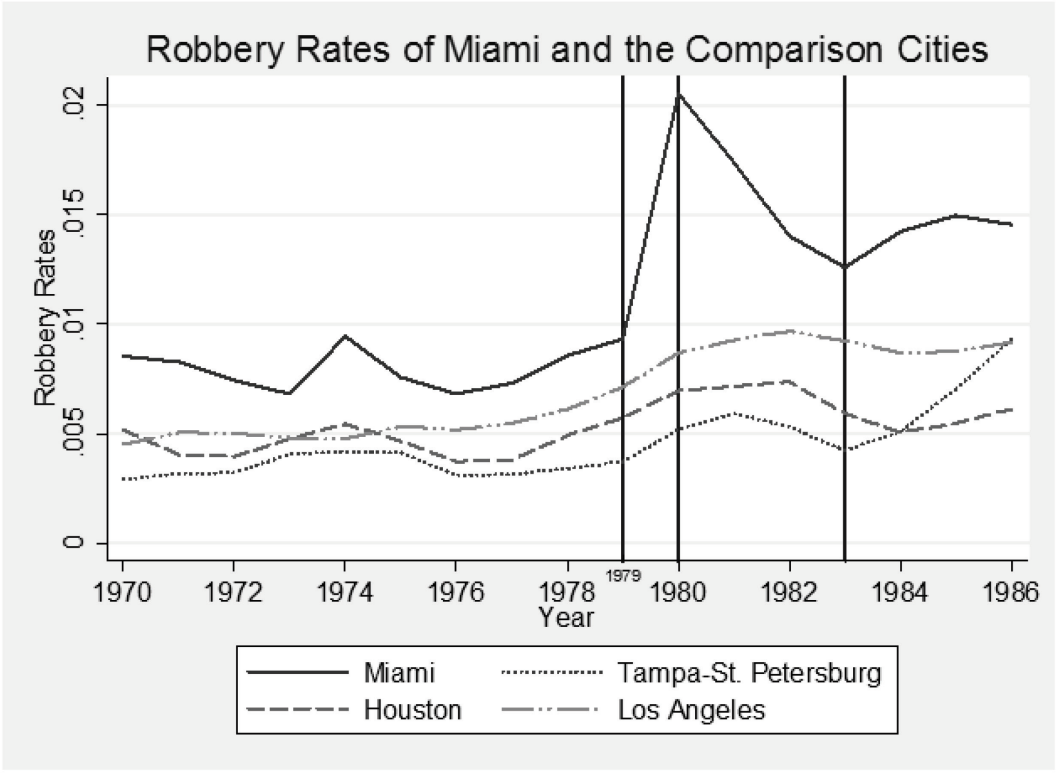
DATA AND IDENTIFICATION STRATEGY

In this paper I argue that the drastic change in Miami's violent crime rate altered the working conditions of workers with high-crime-risk jobs. The crime statistics is taken from the Uniform Crime Report. According to this report, violent crime is composed of four offenses: murder and non-negligent manslaughter, forcible rape, robbery and aggravated assault.

FIGURE 1
CRIME RATES OF MIAMI AND THE COMPARISON CITIES






Robbery Rates of Miami and the Comparison Cities
Robbery Rates
0
.005
.01
.015
.02
1970
1972
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1976
1978
1979
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1982
1984
1986
Year
Miami
Tampa-St. Petersburg
Houston
Los Angeles

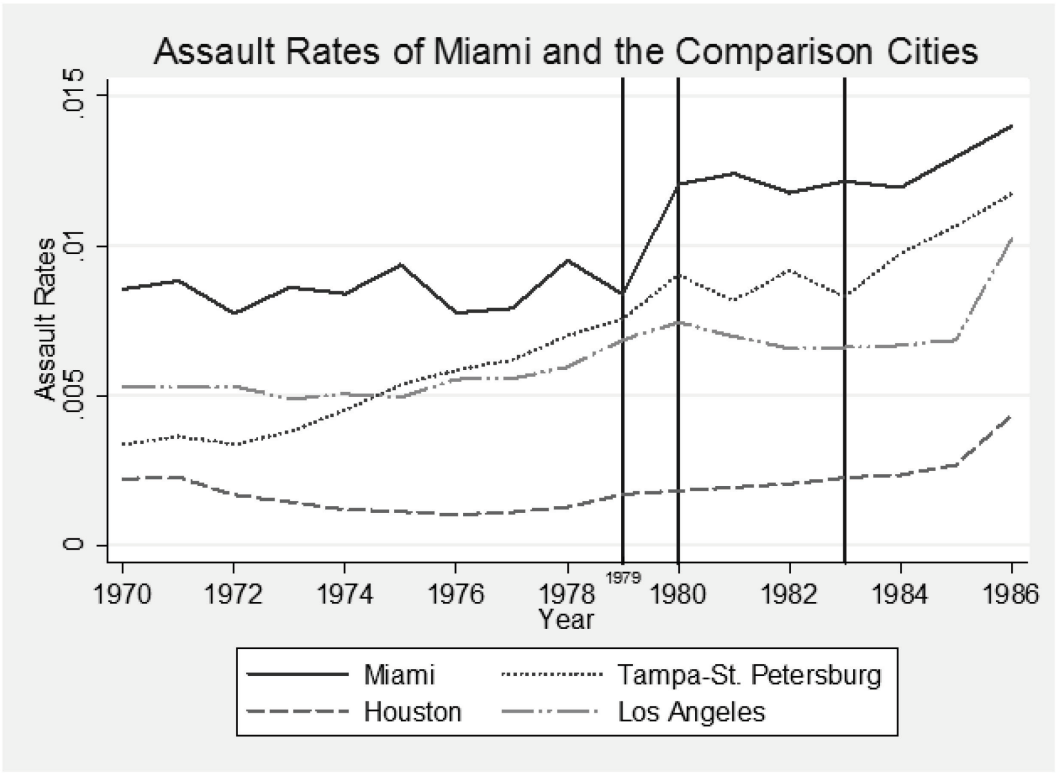
Assault Rates of Miami and the Comparison Cities
Assault Rates
0
.005
.01
.015
1970
1972
1974
1976
1978
1979
1980
1982
1984
1986
Year
Miami
Tampa-St. Petersburg
Houston
Los Angeles

Figure 1 depicts the violent crime rate of Miami and several comparable cities, namely, Tampa-St. Petersburg, Houston and Los Angeles from 1970 to 1986. These comparison cities were selected because they exhibited a pattern of economic growth similar to that in Miami over the late 1970s and early 1980s. The crime data in Figure 1 reveal that violent crime rate peaked in Miami in 1980 and then declined until 1983. Miami's violent crime rate increased by 82 percent between 1979 and 1980, and declined by 24 percent between 1980 and 1983. Figure 1 also depicts three components of violent crime separately from 1970 to 1986. Each type of crime rate in Miami peaked in 1980 and then declined shortly afterwards. For the comparison cities, between 1979 and 1980 Tampa-St. Petersburg, Los Angeles and Houston violent crime rate increased by approximately 26, 15, and 11 percent. Between 1980 and 1983 Tampa-St. Petersburg, Los Angeles and Houston violent crime rate decreased by 12, 3, and 10 percent.[4] The relatively sharp changes in Miami's violent crime rates between 1979 and 1980, and between 1980 and 1983 identify the source of variation in working conditions of workers with high-crime-risk jobs.

Firms may choose to respond or not to respond to the change in working conditions created by the increase in crimes. If firms respond to the change in working conditions of workers with high-crime-risk jobs and implement safety measures that are designed to reduce the level of risk these employees face while on the job, then wages in 1980 may fall or remain unchanged. Any form of safety measure implemented would have raised the relative cost of hiring these workers during this period of time. The increase in hiring cost would reduce the demand for labor. If workers value the safety measures implemented by their employers, then the supply of labor should have increased. If firms did not attempt to reduce the increased risk of suffering a fatal on-the-job injury, then some workers with high-crime-risk jobs should have been induced to migrate from these occupations to ones with less risk of injury (low-crime-risk jobs). Migration should continue until the wage difference between high-crime-risk and low-crime-risk jobs is large enough to induce workers to stay in their current occupations. Migration from high-crime-risk jobs to low-crime-risk jobs will reduce the labor supply for high-crime-risk jobs resulting in a wage increase. These arguments rely on the ability of wages to adjust freely to reflect employee valuation of workplace safety.

I use the ORG-CPS to assess the impact of the exogenous change in the crime rate on wages of high-crime-risk workers. CPS is a monthly survey of approximately 60,000 households, each of which is administered four monthly interviews, then ignored for eight months, then interviewed again for four more months. Weekly hours and earnings questions are asked only at households in their 4^{th} and 8^{th} interview and these households are called the outgoing rotation groups of the CPS. The individuals in the sample are paid employed workers, aged 16 and above with high school or less level of education, representing all kinds of economic activity. The sample was also restricted to those workers whose earnings were not imputed by the Census Bureau. To examine the impact of the exogenous change in working conditions on wages I use the entire sample from 1979 to 1983 and a sub-sample, namely 1979 and 1980. For each sample I run city, pair wise (Miami and a comparison city) regressions. Using the 1993 Census of Fatal Occupational Injuries (CFOI) data, which provide information on the number of homicides per occupation, and CPS data on employment per occupation I construct homicide rate per occupation per 100,000 individuals.[5] Homicide rate per occupation per 100,000 individuals ranged from 0 to 0.493. I sort occupations into high and low-crime-risk occupations base on the homicide rates. The upper one-third of the sample is workers with the highest homicide rate per occupation and is referred to as either the treatment group or workers with high-crime-risk jobs. The sample of workers with high-crime-risk jobs are taxicab drivers and chauffeurs; cashiers; counter clerks except food; delivery and route workers; salesmen, retail trade; garage workers and gas station attendants; and news vendors. The lower one-third of the sample consists of workers with the lowest homicide rate per occupation and they form the control group or are referred to as workers with low-crime-risk jobs. Selected means for the unskilled wage earners in Miami and the comparison cities are presented in Table 1. The differences between the treatment and control groups are few. The control groups for all the cities have higher wages, and are older than the treatment groups. In contrast, the treatment groups have more years of education completed than the comparison groups.

TABLE 1
SELECTED MEANS FOR UNSKILLED WAGE-EARNERS IN MIAMI AND THE COMPARISON CITIES, 1979-1983

Cities	Variable	Sample			
		1979 & 1980		1979 & 1983	
		Treatment Group	Control Group	Treatment Group	Control Group
Miami	Mean Years of Education	10.277 (0.238)	10.224 (0.076)	10.553 (0.153)	10.164 (0.050)
	Mean Log Hourly Wage	1.335 (0.033)	1.551 (0.013)	1.330 (0.026)	1.529 (0.008)
	Average Age	36.031 (1.848)	38.783 (0.433)	36.000 (1.239)	38.488 (0.274)
	N	65	1014	159	2493
Tampa – St. Petersburg	Mean Years of Education	11.217 (0.189)	10.917 (0.080)	11.311 (0.110)	11.060 (0.045)
	Mean Log Hourly Wage	1.407 (0.038)	1.537 (0.018)	1.350 (0.028)	1.519 (0.011)
	Average Age	32.587 (2.168)	37.579 (0.624)	32.858 (1.431)	37.101 (0.372)
	N	46	603	106	1569
Houston	Mean Years of Education	10.724 (0.158)	10.360 (0.061)	10.742 (0.106)	10.504 (0.037)
	Mean Log Hourly Wage	1.499 (0.040)	1.797 (0.012)	1.450 (0.030)	1.789 (0.008)
	Average Age	31.171 (1.564)	34.418 (0.336)	31.210 (0.933)	34.856 (0.207)
	N	105	1624	248	4100
Los Angeles	Mean Years of Education	10.885 (0.142)	10.088 (0.045)	10.841 (0.098)	10.154 (0.029)
	Mean Log Hourly Wage	1.592 (0.032)	1.724 (0.008)	1.548 (0.021)	1.702 (0.005)
	Average Age	30.781 (0.997)	36.132 (0.224)	32.231 (0.717)	36.535 (0.144)
	N	192	3778	433	9076

Source: Based on the samples of employed workers in the ORG-CPS in 1979-1983. Robust standard errors are in parentheses.

The goal of the empirical work, therefore, is to identify the effect of the drastic and sudden change in working conditions on wages of workers with high-crime-risk jobs within Miami. Identifying this effect requires controlling for any systematic shocks to the labor-market outcomes of the treatment group in Miami that are correlated with, but not due to the exogenous shock in working conditions. In the regression framework, I include city, month, and city-by-year effects. The city effects control for earnings differences in Miami, the city that had the exogenous change in working conditions, and those that did not, while the month effects capture any city trends in the earnings of the treatment group. The city-by-year effects control for city-specific shocks over this period which are correlated with the increase in the crime rate. Inclusion of these control variables allows me to compare the treatment and comparison workers in Miami, and measure the change in the treatment workers' wages, relative to the comparison cities. This relative comparison will produce the differences-in-differences-in-differences, DDD, estimator and requires that there be no contemporaneous shock that affects the relative outcomes of the treatment group in 1980.

REGRESSION FRAMEWORK AND ESTIMATION RESULTS

To obtain the difference-in-differences, DD, parameter estimates by cities within the regression framework, I estimate the equation:

$$\ln W_{it} = \alpha + \beta_1 X_{it} + \beta_2 Year80 + \beta_3 Occupation + \beta_4 (Year80 * High\_crime - riskjob) + \varepsilon_{it}. \qquad (1)$$

In equation (1), *i* indexes individuals, and *t* indexes years, for the 1979 and 1980, and the 1979 to 1983 samples (1 if 1980, 0 otherwise). *W* is the hourly wage, ***X*** is a vector of observable characteristics, *Year80* and *Occupation* are dummy variables representing a fixed year and occupation effect. *High-crime-risk job* is an indicator variable representing jobs that were associated with a relative increase in the probability of homicide at work resulting from an increase in the crime rate. The fixed effects control for the time-series changes in wages, β_2, and the job-type changes in wages, β_3. The second-level interactions control for changes over time in different types of jobs, β_4, and capture variation in wages specific to high-crime-risk jobs (relative to low-crime-risk jobs) in each city. This is the DD estimate of the compensating wage differential. The set of demographic covariates used includes education, potential experience, a dummy for nonwhite, a dummy variable for Hispanic, a dummy variable for marital status, and dummies for months. This regression analysis was conducted for the two samples. The estimation of regression equations in the difference-in-differences analyses is subject to possibly serial correlation problem. Serial correlation biases OLS estimates of standard errors, positive serial correlation in the error term will cause an under-statement of the standard errors while negative serial correlation will cause an over-statement. In my regression analyses I correct the standard errors for within-occupation correlation.[6]

TABLE 2
THE DD PARAMETER ESTIMATES, BY CITIES, ROBUST STANDARD ERRORS ARE IN PARENTHESES

Difference-in-Differences Parameter Estimates		
	Sample	
Cities	1979 & 1980	1979-1983
Miami	0.123*	0.087*
	(0.045)	(0.037)
N	1079	2652
Tampa-St. Petersburg	-0.079	-0.043
	(0.064)	(0.043)
N	649	1675
Houston	-0.135*	-0.021
	(0.050)	(0.037)
N	1729	4348
Los Angeles	0.001	0.032
	(0.053)	(0.039)
N	3970	9509

* Indicates statistical significance at the conventional 0.05 level (one-tail tests)

Table 2 presents the estimates of the second-level interaction from equation (1), β_4. For the 1979 and 1980 sample, high-crime-risk workers in Miami had a relative wage increase of 13.1 percent compare to low-crime-risk workers. In 1980 dollars the average hourly wage for high-crime-risk workers in Miami in 1979 was $3.62. Hence high-crime-risk workers in Miami earned 47 cents per hour more relative to low-crime-risk workers in Miami between 1979 and 1980. The relative wage change for high-crime-risk workers in Tampa-St. Petersburg and Los Angeles are statistically insignificant, indicating no significant relative change in wages for high-crime-risk workers. In Houston high-crime-risk workers had a 12.6 percent relative decline in wages. One possible reason for the relative wage decline in Houston was the beginning of the oil boom in the 1980s. With a larger sample, the 1979 to 1983 sample, Miami high-crime-risk workers had a smaller relative wage increase of 9.1 percent. In 1980 dollars the average hourly wage for high-crime-risk workers in Miami in 1979, 1981, 1982 and 1983 was $3.99. Therefore, a relative wage increase of 9.1 percent indicates that high-crime-risk workers in Miami earned 36 cents per hour more relative to low-crime-risk workers in Miami in 1980. High-crime-risk workers in Tampa-St. Petersburg, Houston and Los Angeles had no relative change in wages, the estimates are imprecisely estimated at the 5 percent level of significance.[7]

TABLE 3
THE DDD PARAMETER ESTIMATES, BY PAIRWISE CITIES, ROBUST STANDARD ERRORS ARE IN PARENTHESES

Difference-in-Differences-in-Differences Parameter Estimates		
	Sample	
Cities	1979 & 1980	1979-1983
Miami & Tampa-St. Petersburg	0.218* (0.086)	0.109* (0.045)
N	1728	4327
Miami & Houston	0.215* (0.077)	0.071* (0.028)
N	2808	7000
Miami & Los Angeles	0.113* (0.039)	0.048 (0.042)
N	5049	12161

* Indicates statistical significance at the conventional 0.05 level (one-tail tests)

Table 3 presents the DDD parameter estimates by pairwise cities. For the DDD regression framework, the regression equation has the following form:

$$\begin{aligned}\ln W_{it} &= \alpha + \beta_1 X_{ijt} + \beta_2 Year80 + \beta_3 Occupation + \beta_4 Miami \\ &+ \beta_5 (Year80 * High\_crime\_riskjob) + \beta_6 (Year80 * Miami) \\ &+ \beta_7 (High\_crime\_riskjob * Miami) \\ &+ \beta_8 (Year80 * High\_crime\_riskjob * Miami) + \varepsilon_{ijt}. \end{aligned} \quad (2)$$

In equation (2), j indexes cities (1 if Miami, 0 if comparison city) and Miami is a dummy for the treatment city (1 is treatment, 0 if comparison city). The second-level interactions control for changes over time in different types of jobs β_5, changes over time in Miami β_6 and time-invariant characteristics of high-crime-risk jobs in Miami β_7. The third-level interaction β_8 captures all variation in wages specific to high-crime-risk jobs (relative to low-crime-risk jobs) in Miami (relative to the comparison cities) in 1980 (relative to 1979 for the 1979 and 1980 sample, and 1979, 1981, 1982, and 1983 for the 1979 to 1983 sample). This is the DDD estimate of the compensating wage differential resulting from a change in working conditions of workers with high-crime-risk jobs in Miami.

The coefficient for Miami and Tampa-St. Petersburg indicates that relative wages increased by 24.4 and 11.5 percent for Miami workers with high-crime-risk jobs in 1980 using the 1979 and 1980, and 1979 to 1983 samples. The coefficient for Miami and Houston group shows that relative wages increased by 24.0 and 7.4 percent for Miami workers with high-crime-risk jobs in 1980 using the 1979 and 1980, and 1979 to 1983 samples. Comparing workers in Miami and Los Angeles, the coefficient estimate indicates

that relative wages of high-crime-risk workers in Miami increased by 12.0 percent between 1979 and 1980. All relative percent increase in wages in Table 3 are statistically significant at the 5 percent level except for the 1979 to 1983 sample comparing workers in Miami and Los Angeles. In sum, the empirical analysis suggests that between 1979 and 1980 high-crime-risk workers in Miami earned between 12.0 and 24.0 percent more relative to high-crime-risk workers in the comparison cities in 1980. Hence high-crime-risk workers in Miami earned between 43 cents and 87 cents per hour more relative to high-crime-risk workers in the comparison cities between 1979 and 1980. Using the larger sample, from 1979 to 1983, high-crime-risk workers in Miami earned between 7.4 and 12.0 percent more relative to high-crime-risk workers in the comparison cities in 1980, indicating that high-crime-risk workers in Miami earned between 30 cents and 48 cents per hour more relative to high-crime-risk workers in the comparison cities in 1980.

CONCLUSION

Miami's violent crime rate rose by 82 percent between 1979 and 1980, increasing the risk of an on-the-job injury for workers with high-crime-risk jobs. Using quasi-experiments I estimate compensating wage differentials from two samples of the ORG-CPS cross-sectional data. The evidence in this paper supports the predictions of compensating wage differentials theory. For the 1979 and 1980 sample, the DDD compensating wage differential estimate for Miami and each comparison city is consistently positive and statistically significant at the 5 percent level of significance. Similar results were obtained for the 1979 to 1983 sample except for the comparison between workers in Miami and Los Angeles. The empirical analysis suggests that between 1979 and 1980 high-crime-risk workers in Miami earned between 43 cents and 87 cents per hour more relative to high-crime-risk workers in the comparison cities in 1980. Using the larger sample, from 1979 to 1983, high-crime-risk workers in Miami earned between 30 cents and 46 cents per hour more relative to high-crime-risk workers in the comparison cities in 1980.

ENDNOTES

1. See for example Sherwin Rosen's chapter in the Handbook of Labor Economics (1986).
2. (Black and Kniesner 2003) found that injury-risk measures from the National Institute of Occupational Safety and Health have less measurement error than injury-risk measures from other sources.
3. Arson was excluded from the property crime rate because of many missing data points.
4. All crime rates in Houston for 1981 have missing data in the Uniform Crime Report.
5. The 1993 CFOI data on the number of homicides per occupation was the earliest such detailed information found. CPS data on employment per occupation from 1991 was used in the calculation of the homicide rate per occupation. This year was chosen because it was the closest year to 1993 before the BLS reclassified the occupational codes.
6. The standard errors are larger when clustered on occupations than without any correction.
7. All significance levels correspond to a one-tailed test.

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