The Economic Impact of Hurricane Katrina on its Victims: Evidence from Individual Tax Returns

Even with excellent data, empirical challenges remain. Estimating the causal impact of Hurricane Katrina requires finding a credible comparison group to serve as a counterfactual for the experiences of New Orleans residents in the absence of the hurricane. However, f

A number of key results emerge. First, the hurricane had large and persistent impacts on where people live. Over one-fourth of New Orleans households

exogenous shock to migrate, people are able to choose from a wide range of possible locations to move to, and they seem to choose places that offer them better economic opportunities. Consistent with this hypothesis, Sacerdote (2012) reports that forced school changes because of Hurricane Katrina had an immediate negative impact on school outcomes for displaced children, followed by positive long-run effects on test scores. However, we find that the increase in wage earnings was concentrated among those who eventually returned to New Orleans. Moreover, we find that housing costs in New Orleans increased by roughly the same amount as wage incomes, relative to control cities. These two facts suggest that while the incomes and employment of Hurricane Katrina victims recovered quickly, the income growth we document reflects nominal, rather than real, increases. Importantly, our results do not imply that the utility of the storm victims improved. We cannot measure the non-pecuniary costs of the disruption created by Hurricane Katrina, but the fact that people tend to stay in a particular place when not hit by exogenous shocks suggests that these costs are high.

Our study sheds light on the appropriate levels of disaster aid and insurance. Diverse sources of aid were made available to Hurricane Katrina victims to ease the negative impacts of displacement and economic loss. Direct disaster relief amounted to slightly over $100 billion (Hoople 2013). Per capita unemployment insurance payments in New Orleans doubled from $63 per resident in 2004 to $126 per resident in 2005 and $167 per resident in 2006.[8] Some aid was also implemented through the federal tax system. The Work Opportunity Tax Credit, a program that offers tax incentives for firms to hire individuals from certain disadvantaged groups, was expanded to include individuals living in areas affected by Hurricane Katrina. Residents of New Orleans were allowed to make early withdrawals from their retirement accounts without paying

of the MTO indicate that there was little impact of moving on economic outcomes, although the program had some non-pecuniary benefits (Kling, Liebman, and Katz 2007).

[8] Authors' calculations using Regional Economic Information Systems data.

climate change is unlikely to be large, at least in developed countries.[10] In addition, the economic losses associated with forced dislocation from an unexpected event like Hurricane Katrina likely represent an upper bound on the costs associated with a dislocation that comes with decades of advance notice due, for instance, to rising ocean levels.[11]

The remainder of the paper is structured as follows. Section II provides additional background on Hurricane Katrina. Section III describes the data sources used in the analysis, with emphasis on the tax return data. Section IV presents the findings. Section V concludes.

Section II Background on Hurricane Katrina

Tropical Depression 12 developed on August 23, 2005.[12] It quickly grew in size and strength, and by the following day it was named Tropical Storm Katrina. Katrina developed into a Category 1 hurricane as it traveled northwest across the Bahamas. It first made landfall August 25 on the coast of Florida, causing only a handful of deaths. It then moved back across the Gulf of Mexico and at its peak strength was a Category 5 storm with wind speeds clocked at over 170 miles per hour. By the time Katrina reached the Louisiana coast on August 29, it had sustained winds that placed it as a strong Category 3 storm. In New Orleans, wind speeds were well over 100 miles per hour.[13]

[10] Our results are less informative regarding what long-run economic costs of natural disasters might be in developing economies. For instance, it is estimated that more than 26 million people living in low-lying areas of Bangladesh will be forced to relocate over the next half-century (Bierman and Boas 2010). Additionally, our results come with the caveat that what we observe is conditional on the government aid, insurance, and charitable activities

The government realized early on that Katrina had the potential to be the "perfect" storm causing massive wind damage and storm surges. New Orleanians had long known that a direct hit on New Orleans might have catastrophic results. The city is situated largely below sea level, protected from flooding by a system of canal

The worst flooding – more than nine feet of standing water occurred near Lake Pontchartrain and in the lower ninth ward, but serious flooding was seen throughout the city. A few areas of the city sustained minimal damage; these neighborhoods tended to be relatively affluent.

Nearly 60,000 members of the National Guard were sent to help with rescue and recovery, in an effort that one command sergeant referred to as "far more difficult that anything we faced in Iraq."[16] Soon thereafter, President Bush declared Katrina "one of the worst natural disasters in our nation's history" (Washington Post 2005). Statistics back up this statement. Not since the devastating Florida hurricane of 1928 had a natural disaster claimed as many American lives.[17] Katrina ranks as the most expensive storm, causing over $100 billion in damage, more than twice as much as the next storm, Hurricane Andrew (Blake, Landsea, & Gibney 2011). Nearly two years later, over 600,000 individuals had yet to return to their homes in the broader affected areas. Nearly nine years later, New Orleans's population recovered to only 75 percent of its pre-Katrina level.

Section III: Data and Identification

Our data are drawn from the universe of U.S. federal tax returns filed between 1999 and 2010.[18] To construct our sample, we begin by identifying all households whose tax returns were filed in New Orleans for the 2004 tax year (i.e., those that were due to be filed in April 2005) based on filing zip code.[19] We classify these households as victims of Hurricane Katrina, which hit New Orleans in August 2005. For each household, we collect data from tax records for the years 1999

[16] The PBS NewsHour, September 8, 2005.
[17] This figure doesn't take into account the many other Katrina-related fatalities, including an estimated 600,000 pet and animals that died or were left without shelter, and nearly the entire fish population of the world-renowned New Orleans Aquarium of the Americas (AP 2009; CNN 2005).
[18] These data are housed at the Internal Revenue Service's (IRS) Compliance Data Warehouse and contain transcribed data from all individual tax returns beginning in 1999.
[19] Throughout, we refer to tax filing units as "households".

through 2010.[20] Specifically, we obtain information on the household's income from wages and salaries, self-employment (Schedule C) income or losses, income from unemployment compensation, adjusted gross income, Social Security income, and gross retirement account distributions from IRS Form 1040. To reduce the influence of outliers, we winsorize adjusted gross income, wage income, and retirement account distributions by replacing the values above the 1st and 99th percentiles with the values at those percentiles. We additionally collect the demographic characteristics that can be obtained from tax records: filing status, number of child dependents, at home or away from home, age of the primary filer, and filing address. We drop tax filers who are reported to be under 16 or over 100 years old at any point during our sample. We use filing status to infer marital status. We define a movement from "married filing jointly" to single filer status as a divorce and the opposite movement between these filing statuses as a new marriage.[21]

Our panel of tax return data has several advantages over datasets that might be used to analyze the long-run economic impacts of Hurricane Katrina. First, we are able to track individual outcomes regardless of where victims eventually reside. The CPS only tracked evacuees, and location-specific datasets only track those who stay and those who move in. Thus, both aggregated city-level and evacuee-based analyses will miss a substantial portion of outcomes. Moreover, because there are likely to be differences between those who ultimately returned to New Orleans, those who permanently relocated, and those who never left, such e53

information on income amounts and sources. This allows us, for example

specific trends and we do not have a sample that is balanced along this dimension, our results may be biased. The ten cities from which we draw controls are: Baltimore, MD; Birmingham, AL; Detroit, MI; Gary, IN; Jackson, MI; Memphis, TN; Newark, NJ; Portsmouth, VA; Richmond, VA; and St. Louis, MO. Table 1 presents

36% own homes. They earned about $42,000 in adjusted gross income (AGI) each year, of which $30,000 was from wages, $1,600 was from retirement accounts, $1,000 was from self-employment, and $100 was from unemployment compensation. About 3.5% report some unemployment benefits

and

Section IV. Methodology and Results

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relative to that baseline year.

any wage income (panel (b)). The second is the receipt of unemployment insurance benefits, which have been taxable since 1987 (panel (c)). Both of these measures corroborate the evidence found in our wage measure: a short-run decline in labor market outcomes followed by a quick recovery. Specifically, there is no effect on non-employment in 2005, which is

about $75 in 2005, we find a significant $180 rise in self-employment income in 2006, which corresponds to almost 18% of the mean self-employment income in our sample. In 2010, self-employment income is about $200 higher than before the hurricane. However, given the low magnitude and low frequency of self-employment in our sample, this increase does not augment total income very much.[30]

Our data also allow us to (imperfectly) observe the extent to which Hurricane Katrina victims drew on their savings to weather the storm's impact. The savings measure we consider is gross distributions from retirement accounts, depicted in panel (e) of Figure 3. Typically, retirement savings accounts are given preferential tax treatment in order to incentivize saving for retirement and have penalties associated with tapping into these funds prior to a specific age. Between August 25th of 2005 and January 1st of 2007, however, Hurricane Katrina victims could withdraw up to $100,000 from their retirement accounts without incurring the early withdrawal penalty. They could also spread taxes on these withdrawals over a three-year period.[31] These policies were meant to provide easier access to retirement savings to suffer the shock of Hurricane Katrina when precautionary savings proved insufficient. It appears that people took advantage of this opportunity: retirement account withdrawals by Hurricane Katrina victims increase by about $150 in 2005 and about $940 in 2006, a large increase compared to the sample mean of $2,600.

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Orleans[36] We estimate the long-run impact on these three groups by allowing the effect of Katrina to vary by whether households reside (a) in a "look and leave" zip code ("LAL"), (b) a "look and stay"

In 2007, their wage incomes begin rising, ending up about $4,500 higher at the end of the sample period than before Hurricane Katrina. Those in the LAS areas experience modest wage income drops of about $1,300 in 2005 and $1,100 in 2006. At the end of the sample period, their wage incomes are almost $4,700 higher than before. The drop in wage income is concentrated among those who lived in areas with the 8o[(I)13(n t-7ba.(I)13a)13tIgema]TJ n t-7Ir wage

this effect could reflect the fact that withdrawals from retirement accounts became easier due to the early withdrawal penalty exemption. Finally, in panel (f) we see that the decrease in Social Security claims is concentrated among the LAL/LAS residents, while residents from other zip codes actually become more likely to claim Social Security.

Another determinant of how well people were able to cope with the storm may be their pre-Katrina wealth. Tax returns unfortunately do not measure a household's stock of wealth. To look at these differences, we divide the sample in half by whether the household's average 1999-2004 adjusted gross income (AGI) was above or below the median 1999-2004 New Orleans AGI, which is roughly $18,700. In our sample, AGI captures many income sources, such as wage earnings, business income, capital gains, and income from savings, so this income flow measure should be correlated with a measure of the stock of wealth.

The results for our measures of labor market outcomes are shown in Figure 6. The initial wage income declines look similar for both groups, implying that the relative fall is larger for those with lower earnings.[39] By the end of the sample, both groups are earning the control group, but the income gain of the above-median AGI group exceeds that of the below-median AGI group by over $2,000.

The fraction of people in each group reporting no wage income is nearly identical in 2006. However, in subsequent years, the above-median income group is much more likely to report no wage income than the below-median income group and the control group. By 2010, the below-median income group is more likely to have wage income than the controls, whereas the above-median income group is less likely to do so. Those with below median income are more likely to report unemployment income in 2005 and 2006, but the overall patterns of

[39] The mean 2004 wage income for those with below and above median AGI is $10,261 and $43,029, respectively.

although all three groups are significantly less likely to report receiving

file. Nevertheless, selective filing can bias our results, especially if Hurricane Katrina changed the probability of filing a tax return.

Figure 8 shows the effect of Katrina on non-filing behavior for the whole sample, and by LAL/LAS/other status. Following the hurricane, New Orleans residents are significantly less likely to file a tax return in each year prior to 2010.[41] Non-filing is particularly pronounced among those from "look and leave" or "look and stay" zip codes, people from these zip codes are 4-6 percentage points less likely to file in 2006, and 3-12 percentage points less likely to file in subsequent years. There is no effect on filing behavior in the rest of New Orleans. Because lower income individuals are generally less likely to file, we might be underestimating the negative effect of Hurricane Katrina on the overall population by using an unbalanced sample of taxpayers.

To verify that selective filing is not driving our results, we restrict the sample to individuals who file each year. The results for three outcomes, wage income, employment, and retirement account withdrawals, are shown in Figure 9. The top panel shows the estimates for the whole sample, while the bottom panel shows the differential effects by damages to one's neighborhood. Overall, selective filing does not appear to be driving our results. The point estimates and significance levels for all three outcomes as well as most other outcomes not shown in this figure are very similar to the unbalanced results.[42]

[41] To calculate the propensity score, we require tax filing units to be present in each year from 1999 to 2004, resulting in literally no pre-period differences between the control and treatment groups.
[42] In the balanced sample, we also estimate a slight but significant increase in divorces in 2006 and a persistent

Finally, Figure 10 shows the estimated effect of Hurricane Katrina if we make no adjustments to the control group, using the full random 10% sample from the ten cities listed in Table 1. Here, we do not require that the household filed taxes in each year between 1999 and 2004. We also do not employ propensity score weighting or restrict

fundamentally unanswerable, it is possible to see whether the industrial cities in our control group were disproportionately affected by the recession. We use Regional Economic Information System (REIS) data published by the Bureau of Economic Analysis to look at the relative impact of the recession on the counties in which our control cities are located.[44] Except for Portsmouth

seasonally-adjusted housing price indices for New Orleans and the control cities are shown in Figure 11. We normalize the June 30th, 2005 index values to 100

fixed costs of moving to be enormous: roughly $300,000 in their sample. This means that even with reasonable discount rates, a worker might forego $10,000 a year in income if it requires relocation. The magnitude of the wage increases we see empirically lies within that range.

One prediction of this model is that we should observe higher incomes for people who leave New Orleans, but not necessarily for those who stay. However, when we split the sample into who left the city in 2005 and those who did not, we find the opposite pattern: in 2007-2010, the incomes of "leavers" are significantly lower than the control group's while the incomes of "stayers" are significantly higher.[49] This is despite the fact that prior to Hurricane Katrina, the group that would leave New Orleans had significantly higher earnings than the control (although the leavers' wage incomes exhibit a downward trend as well). Of course, these results are relatively weak evidence against this hypothesis because we ultimately cannot isolate the exogenous component of the decision to leave New Orleans.

A third possibility is that the Katrina experience and its aftermath changed people in a fundamental way. For instance, exposure to tragedy might affect a person's values, identity, level of risk aversion, etc. These changes might be associated with a greater commitment to the labor market.[50] One manifestation of this phenomenon might be increased investment in education, which would also be consistent with a story in which the temporary lack of jobs makes the opportunity cost of obtaining education lower. Given the limits of our data, it is not obvious how to convincingly test this hypothesis.

A final explanation for the patterns observed – which again is not easy to test in our data – is that the storm destroyed assets which were not fully insured, which increased the marginal

[49] Results available upon request.
[50] Anecdotally, at least, it is said that those who grew up in the Great Depression had a lifelong commitment to frugality.

benefit of work. The fact that earnings in neighborhoods that were essentially unaffected by Katrina also outrace earnings in the control group (Figure 5) provides indirect evidence against this explanation.

Section V: Conclusion

Hurricane Katrina massively and unexpectedly disrupted the lives of New Orleans residents. The local economy essentially shut down, and hundreds of thousands of people were forced out of their homes. It is not surprising that the immediate economic experiences of the storm victims were negative. What is remarkable, however, is the rapidity with which their economic situation recovered. In our data, within just a handful of years, income of those affected by the storm actually surpasses those of a matched control group.

Our results have broader implications for several policy areas. With respect to federal disaster relief, a quick economic recovery by victims suggests that the federal and state relief programs that were initiated in response to Hurricane Katrina were adequate to avoid long-run economic losses. Alternatively, these results could suggest that less generous benefits are justified relative to a scenario in which earnings slowly (or never) recover from such a shock. If individuals are able to fully insure their assets at actuarially fair prices, and the integral of lifetime wages is unaffected by the disaster (or in the case we study, perhaps the disaster is associated with higher lifetime earnings), then it is unclear whether disaster relief is warranted at all.[51] If economic losses are short term, then easy access to loans, rather than cash transfers, could serve as an alternative form of disaster relief. With respect to the broader implications for climate change, our findings should be viewed with optimism. At least for the set of individuals

[51] The disaster is almost assuredly associated with a loss of utility, even if income is unaffected. This loss of utility might justify disaster relief.

affected by Katrina, the long-term economic impact was more favorable than would be expected. Undoubtedly, there were enormous pecuniary costs borne by the storm's victims; these also

Table 1. Summary statistics, New Orleans and control cities

	Total population	Median household income, 1999	Employment rate	Median age	% black	% hispanic	Total population	Median household income, 2005	Employment rate	Median age	% black	% hispanic
New Orleans, Louisiana	484,674	$ 31,808.91	57.80%	33.1	67.25%	3.06%	437,186	$ 30,711.00	55.30%	35.2	66.85%	3.13%
All control cities	370,244	$ 34,603.17	59.03%	32.96	64.79%	5.27%	343,381	$ 31,356.90	55.31%	33.7	65.32%	6.99%

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Table 2: PreKatrina summary statistics

	New Orleans	Control
Age	44.38	44.56
	(15.48)	(16.19)
Married	25.46*	29.53
	(43.56)	(45.62)
Number of kids	0.68	0.68
	(0.93)	

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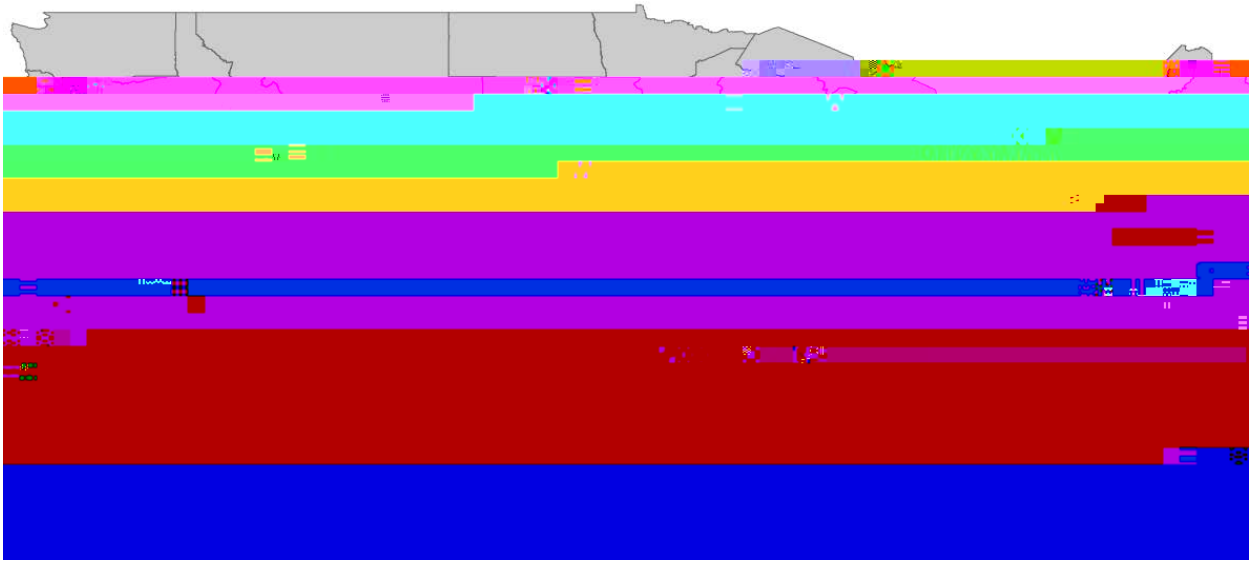
Figure 2. Control cities



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