

Do what the neighbours do

Reopening businesses after Hurricane Katrina

If you are trying to reopen a business after a disaster like Hurricane Katrina, how is your decision affected by whether or not your neighbours are reopening as well? **James LeSage, R. Kelley Pace, Richard Campanella, Nina Lam and Xingjian Liu** take cycle rides through a recovering New Orleans.

Disasters affect people, but affect businesses too. The aim after a disaster is for normal life to resume. That does not happen until people have returned to their homes – and until businesses have returned to their streets and are open and functioning as usual. To their employees these businesses provide jobs and incomes; to their customers they provide the necessities and the pleasures of everyday life. Their return signals recovery.

One step towards aiding recovery after a disaster is to find ways to encourage afflicted businesses to reopen as soon as is possible.

After Hurricane Katrina, how soon and in what sort of order did flooded-out shops, restaurants and businesses reopen? Was it large chain stores with their greater resources and headquarters far from the disaster zone that reopened first? Or small one-man or family-owned businesses, whose livelihoods and loyalties are local and whose incentive to reopen is correspondingly greater? Were reopenings spread randomly throughout the affected areas, or did they clump, or did they spread outward from the less affected areas to those more affected?

And, after future disasters, how could businesses best be encouraged to return? Should aid go uniformly to all affected businesses – which would mean, of necessity, that it would be in small amounts spread thin? Or should priority go to certain types of businesses, or to those in certain areas? Finding the answer to the first set of questions would help to answer the second.

In particular, we wanted to know this: if one business decides to reopen, does that affect and speed up the reopening decisions of its neighbours? If so, then “seeding” a few businesses with aid might result in many businesses in those streets rapidly reopening. If not, such concentrated aid would be inefficient as well as unfair.

So the questions that we set out to answer were as follows. In the areas stricken by Hurricane Katrina,



A house destroyed and lifted off its foundation by Hurricane Katrina, in Irish Bayou, New Orleans, LA. © iStockphoto.com/Chad Purser

which businesses reopened, in what order, and how soon? How did each reopening affect the decisions of its neighbours, and how important were such spillover effects? The hope was that what we would learn would facilitate decisions about alternative approaches to distributing disaster aid, and help to speed recovery in other cities after other disasters.

We had to collect our own data. By phone? By questionnaire? We did it by bicycle.

First, of course, we needed data. Not complex data on profit or loss – just whether premises were open for business or not. One might assume that such data would be easy to obtain. All we wanted to know was, after all, the dates at which the shops and offices reopened, and government agencies carry out regular surveys of business establishments.

But disasters that afflict cities also afflict surveys. Catastrophic events interfere with the regularly scheduled government surveys. This has been true for Hurricane Katrina and for the recent great earthquake in northeast Japan. Empirical observations on how businesses respond after a major catastrophe are rare, and information on economic recovery is hard to obtain.

What, then, of employment statistics? Surely they would help us? But employment information for smaller areas such as counties in the US comes from estimated labour market models and not directly from surveys. The models use information from a number of statistical programmes such as the Current Population Survey, Current Employment Statistics, and state unemployment insurance programmes. These sources have also been affected in various ways by Katrina¹.

A related drawback is that disaster effects tend to be localised: one street may be badly flooded; the next street might be a foot or two higher, just above the waters, and largely spared. Our analysis required information at fine scales – building by building, street by street – whereas labour market estimates for such small areas are frequently produced by statistically dividing up information from

larger areas, using state-level labour market models and the like. The result is that official labor statistics published by government agencies are not well suited to provide timely estimates of disaster impacts, nor are they useful for retrospective analysis of these events.

For example, Hurricane Ike struck Galveston county in September 2008. The official Quarterly Census of Employment and Wages (QCEW) reported that Galveston county showed a decrease of just 3 establishments in the third quarter of that year². Since Galveston Island was without power and water for several weeks following Hurricane Ike, this seems highly unlikely. In fairness, the QCEW focuses on the existence of establishments rather than on their operational status; which again makes this official data gathering programme ill-suited to the study of disasters.

It was evident that we would have to collect our own data. How to do so? By phone? By questionnaire? The method we chose was by bicycle. Starting on October 9th, 2005, six weeks after Hurricane Katrina and about two weeks after unflooded neighbourhoods began to repopulate, our team member Richard Campanella cycled, every week, 16 miles along the lengths of the three main business corridors of New Orleans, noting as he went the premises that were open for business and those that remained closed; and he kept up the weekly survey for a year.

Richard gathered data on 673 establishments along St. Claude Avenue, from Poland Avenue to Faubourg Tremé; the entire length of Magazine Street; and all of both South and North Carrollton avenues. These three corridors cover a wide range of social and economic conditions, from struggling working-class to middle- and upper-class neighbourhoods, and a range of flooding that varied from extreme to none at all.

Businesses of all types (retail, wholesale, services, etc.) that were visible from the street were recorded by address, name, description and category (food retail, restaurant, spa salon, florist, etc.), type of ownership (locally owned independent, regional chain, or national chain), general economic status (“functional”, “mid-range” or “high-end”), and by three divisions of size (“sole proprietorship with five or fewer employees”, “about 6–15 employees, such as a typical restaurant” and “scores of employees, such as a large grocery store”). Finally, and most importantly, the business’s status as “still

closed”, “open”, “partially open” (limited hours, by appointment only, etc.), “new” (a new post-Katrina business) or “moved” was recorded and re-recorded with each weekly visit. Follow-up phone calls or local inquiries were made when business status proved difficult to discern visually. Data from the Census Bureau, Federal Emergency Management Agency, State of Louisiana, and Army Corps of Engineers were then used to record the median household income of the surrounding neighbourhood, the area’s topographic elevation, and flood depths after Katrina. The weekly pace of surveys was reduced to biweekly in autumn 2006, because the number of reopenings or new businesses did not warrant a weekly revisit. By 2007–2008, conditions had stabilised to the point that only seasonal or annual visits were made.

We analysed the reopened status of all the 673 firms on those three major thoroughfares during the periods from 0 to 3 months, 0 to 6 months, and 0 to 12 months after Katrina.

The role of interdependent decisions – do you copy your neighbour?

In the aftermath of a disaster individual firms must make decisions about investing in the repairs that are necessary to restore business operations. The decision is likely to depend on what neighbouring firms decide. For retail firms, the number of customers they get may depend on the number of neighbouring establishments that are open: a business that depends on passing trade will need a busy street. But the busy street needs lots of open businesses in order to be busy. There is a vicious circle here, and the pioneering reopeners need courage to break it.

Even without disasters there is a tendency for businesses to prefer to be close to other businesses. It has even been given a name, the “law of retail gravitation”³, and there are sound economic reasons for it. Patrons of a restaurant may also patronise neighbouring entertainment venues, art galleries or retail shopping establishments, and vice versa. This “spatial spillover” business can arise from neighbouring establishments that offer competing or complementary products and services. For example, neighbouring restaurants (competing businesses) located on the same street may generate spatial spillover business for each other, since each one of them attracts diners to the area; and neighbouring

retail shops (complementary businesses) may also serve to attract potential spatial spillover patrons for restaurants.

For future disasters we needed a model, based on this disaster, that would give probabilities for firms of different types and differently affected reopening or to remaining closed. The usual statistical estimator model used by economists for the type of binary data that we had is the probit model. But the probit model assumes that the observations are statistically independent of each other – that the probability of shop A reopening does not depend on whether shop B has reopened or not. As we have seen, this assumption is not true in our situation: a shop’s decision to reopen or not does indeed depend on whether its neighbour has reopened – and the neighbour’s decision has depended in turn of that neighbour’s neighbour, and so on. We have a whole series of decisions that are far from independent. Everyone’s decision is affected by everyone else’s.

The conventional probit model attempts to explain which firms remain closed and which reopen in terms of variables (type of business, type of ownership, how deeply flooded, etc.) for each firm but ignores decisions made by neighbouring firms. This raises the question whether a single firm located on a street would decide to reopen knowing that all neighbouring firms on the street had decided not to reopen. Such an extreme case makes it clear that probit was not the right model for us.

We needed something that specifically related the probability of a business reopening to whether or not its neighbour had already reopened; and not only its neighbour but a whole succession of neighbouring firms. Economically, the decisions are governed by whether they can expect to make a profit; some part of that profit comes from “spillover” business generated by passing traffic that has been attracted to the street by neighbours.

Spatial autoregressive probit models

A number of approaches have been taken to model this sort of spatial dependence among observations. One approach takes the typical non-spatial probit model but augments it with disturbances from observations of nearby businesses^{4,5}. In other words, the main values are independent; only the disturbances to them are dependent on what neighbours do.

Table 1. Direct and spillover effects estimates for 0–3 month time horizon. Figures are changes in probabilities of reopening. A negative value indicates that, for example, increasing flood depth leads to decreasing probabilities.

Variables	Direct effects	Spillover effects
flood depth (in feet)	-0.0485*	-0.0296*
log(median income)	0.2116*	0.1284*
small size	-0.0802*	-0.0499*
large size	-0.0948	-0.0609
low-status customers	-0.0950*	-0.0583*
high-status customers	0.0247	0.0152
sole proprietorship	0.1596*	0.0994*
national chain	0.0199	0.0122

*Significant at the 95% level.

Our model takes a more direct approach. It includes spatial spillover from the start. It makes the decision of each establishment depend on, and impact on, the decisions of its neighbours. The neighbours’ decisions can also influence neighbours to the neighbours, and so on down the street. “Neighbouring establishments” were statistically determined to be the 11 nearest located adjacent and across the street from each establishment. Of course, spillover impacts are higher for the immediate neighbours than for the more distant of the 11.

Technical details of the analysis can be found elsewhere⁶. Our model gave probabilities of reopening for different businesses through two measures: a *summary statistic* measured the *direct* effect of factors such as higher levels of flooding and type of customer; and a *spillover statistic* measured the *spillover* impacts – that is, how those factors affect the neighbours.

Table 1 shows an example of the direct and spillover summary measures for the initial 0–3 month period after the hurricane. The variables used in the model are flood depth (in feet), the income of the neighbourhood, the size of the business, its clientele and its ownership. The direct and spillover effects of these are shown as changes in probabilities. In that first post-disaster phase, it shows, for flood depth, the result that one might expect: the deeper the flood, the less likely the business to reopen. We can give figures for it: every foot of flood depth gives a 4.8% decrease in direct probability of a business reopening; whereas the spillover impact is around 3%. The figures can be added; so if you had a foot of flooding

and none of your neighbours had reopened, the probability that you will decide to reopen decreases not by 4.8% but by 7.8%. This suggests an important role for interdependence in decisions between flooded establishments.

It should be noted that the impact on any *individual* neighbouring establishment is much smaller than 3%, since this represents the cumulative spillover impacts on neighbours, neighbours to neighbours, and so on. From a policy perspective, cumulating spatial spillover provides a measure of impact that reflects a viewpoint of *society at large*.

Similarly, the median income of the census block group in which the store was located raised the direct probability that a store would reopen by 2.11% for every 10% increase in income, with an extra indirect effect of 1.28%.

Conclusions

An important finding concerned the role played by the type of ownership of the businesses. As the table shows, sole proprietorship exhibited a positive direct effect, with a 16% higher probability of reopening in the 0–3 month time horizon, and a spatial spillover impact on decisions of neighbouring establishments that increased the probability of these reopening by 10%. This suggests that sole proprietorships exerted a positive total effect (direct plus spillover) of around 26% on the probability of reopening in the 0–3 month horizon compared to nationally owned chains. Sole proprietorships have several features which could account for their faster pace in reopening. First, they often employ multiple



A street scene in the heart of the French Quarter in New Orleans. © iStockphoto.com/Hillary Fox

members of the same family, which may confer a non-pecuniary benefit to reopening. Family pride may be involved, or pride in the local community and a desire to contribute to its swift recovery. Second, sole proprietorships may be the primary means of support for the owner and family members, who might have relatively poorer prospects on the open job market due to their firm-specific human capital. Third, sole proprietorships may be able to react faster when making such decisions than larger firms. With the passage of time to the 0–6 month horizon, the direct impact of sole proprietorships diminished, while the spatial spillover impacts on neighbouring firms grew, but both remained positive and significant.

As one might expect, very high levels of flooding at store locations tended to reduce the positive impacts associated with this type of ownership. Intuitively, repairs after deep flooding calls for more funds, which sole proprietors perhaps find hard to obtain.

In the longer term (0–12 months) as the economic climate climbed back towards pre-disaster conditions, factors that influenced the probability of reopening in the short term diminished, to the point of insignificance in many cases.

The overall picture, then, is that sole-proprietor businesses in less flooded areas are among the quickest to reopen, and that

their reopening does significantly encourage neighbours to reopen.

These significant spillover impacts have many implications. Around 75 per cent of the establishments eventually returned to business after Katrina – the figures after 12 months were 478 out of the 673 that were present pre-disaster – and as time passed, decisions to reopen became less dependent on the level of flooding they had had. That is, business responses became more constant, with regard to all characteristics, over locations that experienced high or low levels of flooding. This might provide a fruitful measure for assessing business recovery from flooding. Formal measures of variation in business response in locations with no flooding versus various levels of flooding could be developed in an effort to assess the time horizon when flood depths become unimportant.

Our results also helped answer our second set of questions. Cost–benefit analysis of disaster aid could be severely biased against benefits if spatial spillover benefits are not taken into account. One strategy for distributing aid would be to distribute funds equally to all establishments. The great effects of spillover make this a sub-optimal policy. Targeting aid to sole-proprietor businesses may be more efficient and more cost-effective. Helping them with the costs of repairs pays an extra dividend: their reopening cascades

down and persuades others to reopen. Their influence in the community can hasten the return to normality.

References

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