Economic Brief

Residential Externalities

By Pierre-Daniel G. Sarte and Kevin Bryan

A Richmond, Va.,-based community development program provides a natural experiment for measuring how the choices of one property owner can increase or decrease the value of neighboring properties.

The historian Lewis Mumford famously described the original rationale for cities as "Sanctuary, Village, and Stronghold," with individuals settling densely in one place in order to facilitate religion, trade, and security.

Economists have also long been interested in why cities come into being, why they reach certain sizes and densities, and how the urban landscape is likely to change. Adam Smith noted that gains from specialization can only be achieved when a market is sufficiently large, meaning that cities often benefited from greater productivity. Spatial externalities, or the increase in productivity or welfare from being located near other people, are a driving force behind the existence and growth of cities.

An enormous amount of work has been done on production externalities. A group of factories may be built near one another because a common deepwater port is a more efficient shipment location than a series of smaller ports. Or, research laboratories may concentrate in one area — consider Silicon Valley — because new knowledge and technology spread more quickly when such labs are located near one another. Although the phone and the computer allow easy communication across distance, they don't provide opportunities for informal meetings of engineers with compatible business ideas in the way that an after-work happy hour might.

This *Economic Brief* discusses a second set of externalities, residential externalities, which we have studied recently at the Federal Reserve Bank of Richmond. A residential externality does not affect firms or productivity. Rather, it is the side effect of one homeowner's choices that increases or decreases his neighbor's welfare directly. For instance, when your neighbor repaints his house, the price of your house is likely to increase though you've done nothing on your own. Similarly when a smart child moves into a school district, the achievement of his fellow pupils is likely to increase. These residential externalities provide an incentive for individuals to locate near one another beyond the productivity increases that come from production externalities.

NEIGHBORHOOD REDEVELOPMENT

Consider two 2,500 square foot houses with three bedrooms, three baths, and identical appliances on a quarter-acre plot. The price of these two houses will be radically different if the first one is located in a crime-riddled neighborhood 25 miles from the nearest shopping

center and the second one is located in a tony neighborhood alongside a golf course.

Moreover, once a house is built, its value will continue to vary as neighborhood boutiques open and close, and as neighboring houses are renovated or fall into disarray. Measuring the effect of a new store or a renovated house on surrounding property is a difficult task, however. If your neighbor spends $50,000 on home renovations and the combined value of the houses in your community rises from $1 million to $1.1 million during the following year, it would be incorrect to credit all of that increase to externalities from the renovation.

First, there may be some secular increase in house prices across the region or nation. If prices are rising 10 percent everywhere, then the driving force behind the price increase is likely to be something other than externalities from the home renovation.

Second, and more importantly, your neighbor could have decided to renovate his house because he lived in a community with rising prices. In this case, it is not clear which way causality would run. Do rising prices in a neighborhood cause housing investments to be made, or do housing investments cause rising prices through externalities?

A NATURAL EXPERIMENT
Working with Esteban Rossi-Hansberg of Princeton University and Raymond Owens of the Federal Reserve Bank of Richmond, we studied a community development program in Richmond, Va., that provides a natural experiment which helps disentangle these effects.[1] Using primarily federal money, the city's "Neighborhoods in Bloom" program renovated hundreds of houses across four poor, urban neighborhoods between 1999 and 2004.

One unique aspect of our study is the presence of a nearby community that has similar demographic and housing stock characteristics as the neighborhoods selected for revitalization, but that did not ultimately receive funding. Using the non-revitalized neighborhood as a control, we compared the growth in home prices in the targeted neighborhoods with that of the control neighborhood during the same period. We used a statistical tool called semiparametric estimation, which allows land prices to be recovered from housing sales data with only minimal assumptions, to estimate house prices across each neighborhood both before and after the revitalization took place.

The results were striking. Average prices of houses that were not renovated in each of the targeted neighborhoods went up as much as 30 percent more than house prices in the control neighborhood over six years. Further, the effect was strongest near the exact site where houses

were renovated and declined with distance. Still, a minor price increase resulting from the renovation program was still evident a little more than half a mile from the site of the home renovations.

The total value of residential externalities in this case was large. The sum of price increases on non-renovated houses due to the Neighborhoods in Bloom program was two to five times the total cost of renovating the targeted houses. Earlier work by Amy Ellen Schwartz and her colleagues, using quite different methodology, found a similar effect in poor neighborhoods in New York City where run-down buildings were renovated.[2]

SOCIAL NETWORKS
Changes in housing values are not the only form of residential externalities. Economists and sociologists have applied the language and methodology of externalities to social interactions as well. Roland Bénabou, for example, proposed a model of educational interaction where students benefit if their fellow pupils are gifted.[3]

Testing such theories empirically is quite difficult due to selection bias. A rapid increase in a child's education level when he has good peers may reflect some other correlated unobservable fact, such as good teachers in the district that attract high quality students.

Weili Ding and Steven Lehrer attempted to circumvent this problem by obtaining a unique dataset on student achievement from China's Jiangsu province.[4] Teachers in Jiangsu are ranked every year by state inspectors, providing a proxy for teacher quality. Further, students in each county are assigned to high schools based on tests taken at the end of junior high. Top schools in a county attract students from all across China. Since the junior high tests are taken before any interaction with peers at the new high school, it is possible to measure increases in student achievement resulting solely from being placed with new higher or lower achieving peers. At the end of high school, a test which is nearly the sole determinant of college entry is given, meaning that student effort on this test is likely to be high.

In Ding and Lehrer's estimation, peer effects are large. A 1 percent increase in peer quality, as measured by junior high test scores, leads to a 0.08 percent to 0.15 percent increase in student achievement by the end of high school. Further, high variability of student quality in a single classroom lowers achievement for all students. Similar studies in the United States, using random dorm assignments in college[5] and random classroom assignments in a given school[6] also show convincing evidence of peer effects in educational quality.

CONCLUSION

Many people spend significant time choosing where to live, work, and raise a family. Neighbors, friends, coworkers, and strangers in close spatial proximity can have a substantial impact on career advancement, invention of new goods, the quality of a neighborhood, and student achievement, among many others. The desire of people to live in close proximity to others is arguably an inherent longing for most humans — one that also has profound economic consequences. ■

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ENDNOTES

[1] Rossi-Hansberg, Esteban, Pierre-Daniel G. Sarte, and Raymond E. Owens III. 2008. "Housing Externalities: Evidence from Spatially Concentrated Urban Revitalization Programs." Federal Reserve Bank of Richmond Working Paper 08-03.

[2] Schwartz, Amy Ellen, Ingrid Gould Ellen, Ioan Voicu, and Michale H. Schill. 2006. "The External Effects of Place-Based Subsidized Housing." *Regional Science and Urban Economics* 36: 679-707.

[3] Bénabou, Roland. 1996. "Heterogeneity, Stratification, and Growth: Macroeconomic Implications of Community Structure and School Finance." *American Economic Review* 86: 584-609.

[4] Ding, Weili, and Steven Lehrer. 2007. "Do Peers Affect Student Achievement in China's Secondary Schools?" *Review of Economics and Statistics* 89: 300-312.

[5] Sacerdote, Bruce. "Peer Effects with Random Assignment: Results for Dartmouth Roommates." 2001. *Quarterly Journal of Economics* 116: 681-704.

[6] Hoxby, Caroline. 2000. "Peer Effects in the Classroom: Learning from Gender and Race Variation." National Bureau of Economic Research Working Paper 7867.

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