Measuring the Impact of CDBG Spending on Urban Neighborhoods

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March, 2004

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This research was supported by a grant from the U.S. Department of Housing and Urban Development to the Urban Institute. The views expressed in this paper are the authors' and do not necessarily reflect those of HUD or the Boards of Trustees from the organizations represented by the authors.

The authors wish to thank Peter Eisinger and Hal Wolman for their comments on an earlier draft.

ABSTRACT

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We empirically investigate Community Development Block Grant (CDBG) Program spending in census tracts in 17 large cities. Regression analysis reveals several strong statistical associations between CDBG spending during 1994-96 and changes between 1993-94 and 1998-99 in three indicators that capture a wide range of neighborhood conditions, though their magnitudes are heavily contingent. First, there is no consistent association between CDBG spending levels and indicators of subsequent neighborhood change unless CDBG expenditures: (1) are sufficiently spatially targeted that they exceed a threshold of the sample mean expenditure level, and (2) are standardized for the number of poor residents in the neighborhood. Second, associations vary according to neighborhood trajectories prior to investment and contemporaneous changes in the local economy. Nevertheless, even in the least-hospitable contexts—highly concentrated neighborhood poverty, pre-existing declines in neighborhood home values, weak city job growth—our estimates are consistent with the hypothesis that CDBG spending at above-threshold amounts produces significant neighborhood improvements according to multiple measures. We discuss implications for spatially targeting CDBG monies and connections of our work with emerging literature on the dynamics of poor neighborhoods.

Keywords: Community development, block grants, thresholds, program targeting, neighborhood revitalization

Measuring the Impact of CDBG Spending on Urban Neighborhoods

Introduction

The Community Development Block Grant (CDBG) Program has remained for thirty years the primary vehicle through which the federal government funds improvements to America's low-income neighborhoods. Currently, cities, urban counties, and states are allocated over $5 billion annually on the basis of a national CDBG formula that takes into account population, poverty rates, age of housing stock, and other needs (HUD, 2003).

The Community Development Act of 1974, which created the CDBG Program, found that cities faced critical social, economic, and environmental problems due to population growth, increasing concentration of low-income persons, and inadequate public and private investment and reinvestment in housing and other physical facilities.[1] It was the program's intent to create "viable urban communities as social, economic, and political entities" by systematic and sustained action by federal, state, and local governments to eliminate blight, conserve and renew older urban areas, "to provide decent housing and a suitable living environment, principally for persons of low- and moderate-income."[2]

With the federal support authorized under the Act, local governments were expected to accomplish these overall goals by arresting deterioration of property and neighborhood and community facilities, removing conditions detrimental to health and safety, conserving the housing stock, improving community services, promoting income integration and neighborhood diversity through spatial de-concentration of assisted

[1] Housing and Community Development Act of 1974, Section 101(a)(1)-(2)
[2] Housing and Community Development Act of 1974, Section 101(b)(1) and Section 101(c).

housing and revitalization of deteriorating neighborhoods, and stimulating private investment in areas with population out-migration and stagnating tax bases. The Act did not require localities to adopt a specific mix of these activities, but to pick and choose those that, in their view, best met the program's intent.

Clearly, the overall thrust of the program as reflected in the authorizing legislation was to improve economic and social conditions of neighborhoods, as distinct from helping specific low-income individuals (although communities are free to emphasize this as they choose). Indeed, the CDBG Program is "an emphatically neighborhood-centered initiative" (Walker and Boxall, 1996: 25). Therefore, it is of considerable public policy interest whether CDBG jurisdictions have managed to improve the quality of their urban neighborhoods through use of the resources the Act provides. Put differently, to what degree have local governments successfully carried out their federal mandate under the CDBG Program?

Considerable scholarly research has focused on where and on what activities CDBG funds have been spent, which groups have been the prime beneficiaries, the efficiency of plans and their implementation, and the political forces behind these allocations (e.g., Nathan et al., 1977; MKGK Inc., 1980; Wong and Peterson, 1986; Rich, 1993; Urban Institute, 1994). By contrast, whether and under what circumstances these investments have produced any measurable changes in the affected neighborhoods' trajectories have been the subject of only two inquiries, neither devoted primarily to measurement of the program's impacts.

Bleakly et al. (1983) examined 30 Neighborhood Strategy Areas in 20 cities during the period 1979 to 1981. The NSA demonstration arose from a set of 1977 amendments to the CDBG Program encouraging a coordinated strategy through the spatial targeting of CDBG funds in conjunction with the Section 8 Substantial Rehabilitation Program and other investments. They examined an index of

neighborhood conditions based on the average of four components: percentage of structures in very good condition and percentages of blocks in area with: well-maintained streets, little litter, and landscaping in very good condition. Though no details of the analysis or statistical tests are presented, Bleakly et al. report that "improvement in neighborhood conditions [1979-1981] appears related to…a higher-than-average concentration of CDBG expenditures per block (p. 3)."

As one part of a comprehensive national assessment of the program, a team from the Urban Institute (1994) analyzed statistics from a random sample of 223 census tracts drawn from a nationally representative sample of 60 cities. They cross-tabulated CDBG expenditures per capita and changes in poverty rates from 1980 to 1990 in these census tracts. They found that tracts with declining poverty rates averaged $1,247 per capita whereas those with stable and rising poverty rates evinced lower spending levels of $844 and $737 per capita, respectively, though no tests of statistical significance are reported. The Urban Institute study also solicited 16 qualitative analyses by local experts of purposively selected neighborhood case studies where CDBG funds were targeted. On the basis of this and other evidence they concluded that the CDBG Program "has made an important contribution to city community development, including demonstrated successes in achieving local neighborhood stabilization and revitalization objectives (p. i)."

The Bleakly et al. (1983) and Urban Institute (1994) studies did not aim to produce statistically conclusive answers regarding the neighborhood impacts of CDBG spending, and indeed, they did not do so. But, increasingly, policymakers are demanding better evidence that public monies have produced their intended results. The Government Performance and Results Act (GPRA), passed by Congress in 1992, aims to increase the effectiveness and accountability government-wide by requiring agencies to measure the results of their program expenditures. CDBG was no

exception, and HUD's Annual Performance Plan specifies that "neighborhoods with substantial levels of CDBG investment will show improvements in such dimensions as household income, employment, business activity, homeownership and housing investment."

Therefore, for reasons of scholarship as well as sound policy, the effects of community development spending on urban neighborhoods are worth examining rigorously. In this research, we address two key questions. Has CDBG spending made a measurable difference in low-income neighborhood trajectories—the pace and direction of economic and social change—as measured by three robust indicators? Is the answer contingent upon neighborhood context and the spatial concentration of CDBG spending? We attempt to provide convincing answers to these questions by: (1) analyzing a large sample of census tracts in 17 cities; (2) conducting multivariate statistical tests of relationships using a variety of outcome indicators; (3) disaggregating CDBG expenditures by type; (4) searching for minimum thresholds of CDBG expenditures; and (5) testing sensitivity of relationships in different neighborhood and city economic contexts.

Our paper is organized as follows. We begin with a presentation of our conceptual and statistical model relating CDBG spending to changes in neighborhood conditions. We then describe our sample of 17 cities and the procedures we undertook to acquire usable CDBG information and robust neighborhood indicators for the neighborhoods in these cities. We report regression results for the entire sample and disaggregated by type of CDBG spending, then show how relationships vary by neighborhood and city context. We discuss results as they relate to the policy debate over spatially targeting investments. We close with caveats in interpretation, suggestions for further research, and connections of our work with emerging literature on the dynamics of poor neighborhoods.

Exploring the Relationship Between CDBG Spending and Neighborhood Change: Conceptual and Statistical Frameworks

Conceptual Model

In principle, CDBG investments could produce neighborhood improvements directly and indirectly. CDBG investments could improve neighborhoods *directly* by, for instance, renovating the housing stock, creating or upgrading community facilities and public infrastructure, and other activities that immediately create added value in neighborhoods. CDBG spending could improve neighborhoods *indirectly* by investing in one or a series of projects that encourage private investors to view CDBG-funded neighborhoods as places where favorable economic returns can be generated.

Many community development practitioners and scholars argue, however, that a "critical mass" of improvements is needed to trigger changes in the perception of investment prospects in a distressed neighborhood, but that once critical mass is achieved, the pace of neighborhood improvement accelerates (Taub, Taylor and Dunham, 1984; Quercia and Galster, 1997; Pollock and Rutkowski, 1998; Quercia and Galster, 2000; Galster, Quercia, and Cortes, 2000; Thompson, 2003). This critical mass of investment represents a threshold point, after which relationships between CDBG investment and neighborhood improvement alters dramatically for the better.

We expect, however, that the "productivity" of CDBG investments in creating neighborhood impacts (whether above- or below-threshold) is contingent upon two sets of factors: overall conditions in the city and pre-existing conditions and trajectories of change in the neighborhoods targeted for CDBG investments. Depending on their initial inventory of assets and liabilities and their recent trends, neighborhoods may respond quite differently to the same intensity of CDBG investments. Analogously, the same

amount of CDBG investment is less likely to produce improvements in neighborhoods located in cities where the larger economic, demographic and social stimuli are weaker, e.g., where unemployment, out-migration, and crime are increasing city-wide. Our key point here is that these factors are not "predictors" in the sense of control variables, rather that they provide a context that likely shapes the observed relationships among CDBG-funded investments, other private and public investments, and changes in neighborhood quality. This contextualization may take the form of altering the CDBG investment threshold point, or merely changing the relationship of such investment with neighborhood outcomes, either leading up to and/or exceeding the threshold.

Figure 1 summarizes the relationships described above. Of prime interest here, changes in neighborhood conditions (box 4) are directly influenced by CDBG-funded investments (box 1) and their indirect effect through other public and private investments that they may leverage in conjunction with the initial CDBG-funded projects (box 2). Neighborhood conditions also may be influenced by other investments from public and private sources that may initially have no connection to CDBG (box 3). In the best case when thresholds have been exceeded, CDBG investment-produced neighborhood improvements may trigger a "virtuous cycle" in which other public and private sources are subsequently induced to invest (the dotted feedback arrow in Figure 1) and improve neighborhood conditions thereby, which induces further public and private investment, and so on. The two key sets of encompassing contextual factors are shown at the bottom of Figure 1.

[Figure 1 about here]

Statistical Model

Our statistical modeling builds upon Figure 1 as follows. We directly measure for a sample of neighborhoods (census tracts) across 17 cities the annual average dollars of

CDBG investments over the 1994-1996 period and corresponding changes in values of several neighborhood indicators from 1994 to 1999. We regress the latter on the former to discern the basic relationship of interest. We implicitly assume a lag structure because not all impacts of CDBG spending should register immediately or completely during the year in which they occurred.

Unfortunately, there are no known cross-city data sources that would allow us to measure for neighborhoods on an annual basis the private investment or public investment from non-Federal sources (e.g., local spending on water and sewer infrastructure, streets, public safety, parks and open space, or other municipal services). We do not believe, however, that failure to control for these non-CDBG investments will be problematic for answering the research question at hand. First, if CDBG and other sorts of investments are not correlated, the exclusion of the latter sort will not produce bias in the estimate of CDBG monies' relationship with neighborhood changes. Second, insofar as non-CDBG investments are correlated with *and induced by* CDBG spending, the observed relationship between CDBG spending and neighborhood changes will constitute a "reduced form" estimate of both direct and indirect effects of CDBG. The estimated relationship between CDBG spending and neighborhood changes will prove biased only to the extent that CDBG spending is *caused by* prior, non-CDBG investments. We proceeded under the assumption that these investments did not affect observed patterns of CDBG spending, which is consistent with prior research on the determinants of CDBG allocations (Wong and Peterson, 1986; Rich, 1993).

We explore the empirical importance of the theorized contextual factors by conducting sensitivity tests over various strata of city types and neighborhood types. Finally, we investigate the existence of a threshold level of CDBG expenditures by experimenting both with cubic regression and by estimating regressions over samples of neighborhoods stratified by the intensity of CDBG spending. Cubic regressions permit

the estimation of a wide range of nonlinear relationships, some of which may be suggestive of thresholds.

In sum, our statistical model may be summarized symbolically as:

$$(1) \quad Y99_i = a + b_1(CDBG_i) + b_2(CDBG_i^{\,2}) + b_3(CDBG_i^{\,3}) + b_4(Y94_i) + \varepsilon$$

Where: a = intercept

b = coefficient

Y99 = 1999 value for outcome indicator Y in neighborhood i (our choices for indicator Y explained below)

Y94 = 1994 value for outcome indicator Y in neighborhood i

CDBG = annual average dollars of CDBG expenditures 1994–96, divided by number of residents below poverty line, 1990 (both measured in neighborhood i)

ε = random error term with the usual assumed statistical properties

Sample of Cities Analyzed

We conducted our analysis on cities we purposively selected to cover all U.S. regions, ensure differences in metropolitan area job growth (a proxy for overall economic health), and provide wide variation in CDBG investments across census tracts within cities. We were tightly constrained in our selections by the adequacy of HUD's CDBG data in the locale and the availability of other databases providing annual observations of multi-faceted local administrative data for census tracts, which served as foundations for our neighborhood indicators. Resource constraints in the face of costly cleaning of HUD's CDBG records (explained below) limited our final sample to 17 cities.

Five cities were chosen with certainty because they possessed unusually robust datasets with annually observed neighborhood indicators (more details below): Providence, Indianapolis, Boston, Cleveland and Oakland. Four additional cities were chosen because they were test sites for the American Community Survey and thus also offered unusually rich neighborhood data possibilities: Fort Lauderdale, Columbus, Houston and Portland.[3] The remaining eight cities were selected to fill in gaps in the sampling frame, with preference given for cities with higher CDBG allocations and HUD CDBG database with the least missing information: Denver, Milwaukee, Washington, Los Angeles, Birmingham, Long Beach, Tulsa and Charlotte. The final sample, stratified by region and metro growth profile, is shown in Table 1; respective CDBG allocations for 2000 are shown parenthetically.

[Table 1 about here]

Sources of Data on CDBG Spending and Neighborhood Change

Data on CDBG Expenditures

The success of any analysis of CDBG program impacts at the neighborhood level rests on accurate depiction of the amounts and location of CDBG spending. Unfortunately, such accuracy is extremely difficult to achieve, given the quality of the CDBG data available from HUD's record systems at the time of this study. Indeed, we believe that the sizable investment of resources required to clean data has been a major barrier to the systematic study of CDBG's neighborhood impacts heretofore. Despite our best efforts, the CDBG data used in this analysis likely contain measurement errors that

[3] When we originally drew the sample our intention was to utilize the early rounds of census tract-level information obtained from the ACS during the late 1990s, but delays in the ACS later rendered this infeasible.

weaken the precision of our statistical results, though we have no reason to believe that these errors create biases. There follows a brief description of the measures of CDBG activity developed for this research, and a description of the approach used to construct as complete and accurate a database as possible; details are presented in Appendix 1.

We used HUD's Integrated Disbursement and Information System (IDIS), other (older) administrative data maintained by HUD and, as necessary, direct contact with CDBG grantees, to construct a comprehensive database of CDBG neighborhood expenditures. Four main steps were involved:

(1) Compiling Data from Different Administrative Data Sources: Due to the timing of IDIS' phase-in we were forced to combine disparate CDBG records for the 1994-96 period from both IDIS and older, administrative databases unique to each city. In several cities there were gaps in the older data record, and others created gaps as they switched systems, thus forcing us to interpolate data for some periods.

(2) Geo-coding CDBG-funded Activities' Locations: The administrative records differed widely in the specificity and accuracy of the geographic information about where site-specific CDBG-funded activities were located. The median percentage of cases across our sample where we were able to assign site-specific expenditures to a particular census tract was 70 percent; the range was from 27 to 93 percent.

(3) Attributing Certain Expenditure Types to Particular Neighborhoods: For CDBG expenditures that were not site-specific we adopted an allocation algorithm. Expenditures indicated for "area benefit" and "direct" benefit activities that occurred in more than one designated census tract were pro-rated equally among tracts. We assigned "city-wide" expenditures that grantees targeted to eligible persons in their jurisdiction among census tracts in proportion to the share of the jurisdiction's 1990 poverty population.

(4) Distinguishing Type of Expenditure: Using codes provided in the databases, we grouped CDBG expenditures into four categories—housing, economic development, public facilities and social services, and property acquisition and disposition.

Data on Neighborhood Indicators

Local policymakers and community development practitioners have pursued a wide range of activities intended to improve neighborhoods, as measured by a comprehensive array of demographic, economic, and social indicators (Sawicki and Flynn, 1996). Given the potential for an unwieldy set of indicators to analyze as dependent variables in our research, we sought a parsimonious set that nevertheless would reflect a breadth of neighborhood outcomes most likely of interest to scholars and local policymakers alike.

Our method for selecting this parsimonious set of indicators proceeded in four steps as follows. We first identified five cities for which unusually rich, annually updated neighborhood (census tract) data could be assembled from local administrative records: Boston, Cleveland, Indianapolis, Oakland, and Providence. To these administrative data we appended 1990 Census tract demographic, socio-economic, and housing stock characteristics plus data from nationally available sources (Home Mortgage Disclosure Act, Dunn and Bradstreet, vendors of home sales records) for 1993/94 and 1998/99. Once completed, these datasets described for neighborhoods in these five cities during 1990s: mortgage market activity, home sales prices, jobs and firms, crime, public assistance and vital population statistics.

Second, we developed three to four dozen (depending on the site) neighborhood outcome indicators using the above data sources. These included a wide range of indicators that closely correspond to neighborhood socio-economic and housing

conditions that the CDBG program was designed to address, such as poverty, crime, and inadequate housing conditions.

Third, we conducted factor analyses on the full range of indicators in each of the five cities to ascertain whether a smaller number of distinct dimensions of neighborhood conditions could be identified consistently. There was remarkable cross-sectional and inter-temporal comparability in results, especially considering the wide range of city location, age, demographic composition, and economic base. In each of our five cities, five or six common clusters of indicators emerged that we believe correspond to intuitively plausible dimensions of neighborhood condition.[4] The most heavily weighted indicators in each factor provide a heuristic suggestion of label signifying a dimension: *Social Disadvantage, Housing Type and Tenure, Prestige, Business and Employment, Crime,* and *Housing Vacancy*. The legislative history presented in the Introduction makes it clear that these common dimensions of neighborhood closely correspond to the factors that CDBG investments should reasonably be expected to influence were they efficacious.

Fourth, we ascertained through regression and correlation analyses the degree to which a more limited set of indicators available and annually updated in *all* cities (not just those with special administrative databases) might capture significant variation in most of these key dimensions of neighborhood. We found that Home Mortgage Disclosure Act (HMDA)-generated data on mortgage approval rates and loan amounts, and Dunn and Bradstreet data on businesses did so and thus were selected as the parsimonious set for our analysis here. For more details, see Appendix 2 and Galster, Hayes and Johnson (forthcoming).

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[4] These factors had Eigen values greater than unity and explained three percent or more of the variance in the dataset. Cumulatively, these six factors explained approximately two-thirds of the total variance, differing modestly by up to five percentage points depending on city and date. Details for each of our five cities are available from the first author.

To summarize, our research suggested that three indicators based on widely available data sources offer robust proxies for several broader dimensions of neighborhood in which the Community Development Act was interested, and therefore offer reasonable (if not exhaustive) indicators for measuring the impacts of CDBG expenditures on neighborhoods. Changes in these indicators serve as alternative dependent variables in our statistical model summarized in equation (1) above: home purchase mortgage approval rate, median amount of home purchase loans originated, and number of businesses.

Results

Thresholds of CDBG Spending

Our principal measure of neighborhood CDBG spending was the annual average program expenditure from 1994 through 1996, by census tract.[5] We specified a three-year lag between the CDBG investment and measurement of our neighborhood outcome indicators' cumulative changes (1994 through1999), given assumed lags between recorded expenditures, completion of funded projects, and recognition of same by market forces in the neighborhood. CDBG expenditures were averaged over three years to help ensure longer-term investment patterns were captured, instead of possibly atypical transitory measures. The measure was developed for all census tracts in each of the 17 sampled cities and included expenditures on activities that directly benefited low- and moderate-income families such as housing rehabilitation, service provision, or economic development, as well as neighborhood-wide activities such as infrastructure

[5] The period was defined by program year, which sometimes starts midway through the calendar year, depending on the grantee.

and public facilities improvements.[6] Our measure excluded CDBG general program administration and planning expenditures, since this type of spending could not be associated with particular neighborhoods.

We experimented with a variety of operationalizations of the independent variable – annual average CDBG spending in the census tract over the 1994-1996 period – alternating among absolute dollar amounts and standardizations by total tract population and total tract population living below the poverty line. CDBG expenditures per poor resident in the census tract consistently produced the strongest results across our various neighborhood outcome measures, and will be reported here. This finding suggests that CDBG impacts are most appropriately measured in relation to the scale of local needs. Put differently, the ability of a marginal increase in CDBG spending in a tract to change neighborhood indicators appears to be inversely related to the concentration of poverty in that neighborhood.

Even using CDBG spending per poor resident, however, was typically insufficient to yield a statistically significant, positive relationship between it and changes in our neighborhood indicators when analyzing either the full sample of census tracts or only those with non-zero values of CDBG spending. Results dramatically changed, however, when we confined our analysis to only those tracts evincing above-sample-average CDBG spending, i.e., $86,737 or more annual average during 1994-1996.[7] Descriptive statistics for key variables for this set of tracts are presented in Table 2, by city.

[Table 2 about here]

For this stratum of neighborhoods we observed statistically significant, positive relationships between CDBG spending per poor resident and subsequent changes in all

[6] While expenditure categories were tracked in HUD databases, direct benefit vs. area-benefit expenditures were not explicitly separated.

[7] This is the mean produced after a few extreme outliers were excluded from the sample.

three neighborhood indicators that suggested improved conditions overall. See Table 3. Each additional $100 dollars of CDBG spending per poor resident annually during 1994-1996 was associated with cumulative increases over five years of: $2,358 in median amount of mortgage loan originated (4 percent of the 1993-94 sample mean), 0.44 percentage points (less than 1 percent of the 1993-94 sample mean) in mortgage application approval rates, and 1.77 businesses (1 percent of the 1993-94 sample mean) in the neighborhood (GCG fn here $212/poor mean. Though for some indicators the squared and cubed CDBG variables also proved statistically significant, they were always trivial substantively in shaping what essentially proved a linear relationship (above the mean).

[Table 3 about here]

As we will amplify below, these findings suggest a threshold effect regarding a critical mass of CDBG expenditures that must be attained before noticeable impacts ensue. Unfortunately, our database proved insufficiently robust to permit a precise identification of this threshold, despite our attempts to do so. Thus, we are more confident in claiming that below roughly $87 thousand in annual average expenditure one is unlikely to observe significant neighborhood payoffs from CDBG, than in claiming precisely at what level above this amount sizable impacts begin to ensue.

Results for Different Types of CDBG Spending

We replicated the analysis above, except that we employed independent variables measuring four different types of CDBG spending by categories delineated in the HUD databases—property acquisition and clearance, housing, economic development, and public facilities and services. Results (estimated for tracts evincing above-mean CDBG spending for that category) were intuitively plausible; see Table 4.

Table 4 summarizes only the statistically significant coefficients of the CDBG spending per poor resident variable.

[Table 4 about here]

CDBG spending on economic development activities was significantly correlated with all three indicators, but was the only type that was significantly correlated with neighborhood employment (not shown) and business formation. Housing-related and public facility and service expenditures were positively correlated with changes in median mortgage loan amount and loan approval rates. Spending on acquisition and clearance was not associated with any indicator in a statistically significant way, though relatively few tracts had such a type of expenditure in our sample (see Table 4).

Results for Different Neighborhood Contexts

As previously noted and illustrated in Figure 1, we expected neighborhood and city conditions to influence the productivity of CDBG investments in generating impacts. To test this we re-estimated the basic regression specification for different categories of neighborhoods and cities. We stratified all census tracts into terciles according to their 1990-1994 trends in single-family home median sales prices, our sense of the best overall measure to indicate the neighborhood's trajectory prior to the period under investigation. Tracts in which the median sales price declined by 21 percent or more constituted the "large price decline" category, tracts for which the change was 8.8 percent or greater constituted the "large price increase" category, and all those between were considered "relatively stable."

Results (again, estimated for above-mean CDBG spending tracts) are summarized in Table 5. An F-test confirmed that the stratification by neighborhood home price trajectory was justified statistically. Although there is a good deal of imprecision introduced into our stratified results due to the reduction in sample sizes,

patterns of results emerge that are consistent with our expectations. For all three outcome indicators, CDBG investments yielded the highest per dollar payoffs (as evinced by the size of the coefficients) in neighborhoods already experiencing a strong upward trajectory of housing prices. Having noted this, however, Table 5 also indicates that CDBG nevertheless had positive payoffs (at least above its threshold) in neighborhoods experiencing severe declines in home prices, which were robust across all three of our neighborhood outcome indicators.

[Table 5 about here]

Results for Different Types of City Economic Contexts

To investigate the sensitivity of results to contemporaneous city economic performance, we stratified regression runs according to the amount of job growth in the city between 1994 and 1997, using the same three breakdowns as presented in Table 1.[8] Results (again, estimated for above-mean CDBG spending tracts) are summarized in Table 6. An F-test confirmed that the stratification by city job change was justified statistically. As expected, we found that the per dollar payoffs from CDBG spending in terms of neighborhood business development proved least in cities experiencing contemporaneous job loss or stagnation, though the coefficients still were significantly positive even in these contexts. See the last column of Table 6.

[Table 6 about here]

[8] We would have preferred to use the 1994-1999 period but 1999 job data were not available at the time of our study.

Discussion

Spatial Targeting of CDBG Spending

History suggests that both federal policies and local actions have been inconsistent over time regarding the degree to which CDBG spending should be or actually is targeted in a spatially concentrated fashion. Research on spending patterns during the early years of the CDBG Program indicated a widely dispersed spatial allocation (Dommel et al., 1980; Dommel and Rich, 1987; Rich, 1993). The 1977 amendments to the CDBG Program, however, encouraged communities "to define areas for strategic investment…where concentration of public resources would produce a demonstrable difference over a 'reasonable' period of time" (Urban Institute, 1994: 4-23). The Neighborhood Strategy Areas Program was designed to operationalize this targeting principle, but most cities designating NSAs made them too large to be effective (Thomson, 2003). In the early 1980s all federal guidance about targeting was removed, falling victim to "local pressures to widely distribute investments across urban neighborhoods" (Walker and Boxall, 1996: 25). Even so, in the early 1990s "neighborhood-oriented" (as opposed to "community-wide") CDBG spending strategies were employed by a majority of cities, and over 90 percent concentrated at least some of their CDBG spending in particular areas (Urban Institute, 1994).

Our research strongly supports the proposition that spatial targeting influences the efficacy of CDBG spending in effectuating changes in a battery of indicators correlated with a wide range of neighborhood conditions. Put differently, we found that CDBG spending had *no* demonstrable relationship with these neighborhood indicators (changing from 1993/94 to 1998/99 averages) if it failed to reach roughly $87 thousand annual average expenditure in a neighborhood over the period 1994-1996. Although

because of data limitations our study was unable to identify this threshold more precisely, we urge this as a focus of future work.

Nevertheless, this ambiguity should not obscure the quantitative significance of our estimates of relationships above the threshold. For illustration, consider a stylized census tract with three alternative levels of 1994-1996 annual average CDBG investment: the threshold amount ($86,737), the mean amount for all tracts above threshold ($244,340), and the highest mean amount for all tracts above threshold in any sampled city: Charlotte ($471,667). Using the parameters reported in Table 2, we calculated for each of our indicators how much higher they would be in the latter two scenarios (above – threshold mean and maximum) compared to the first (threshold). These differences are presented in the last two columns of Table 7. We repeat this exercise for three archetypical concentrations of poverty in the stylized neighborhood of average population: 20, 30, and 40 percent poverty rates. These variations lead to differences in the measured CDBG spending per poor resident, and are portrayed in the three horizontal segments of Table 7.

[Table 7 about here]

The first thing to observe in Table 7 is that, above the threshold, CDBG spending has a strong association with our battery of neighborhood indicators. Compared to CDBG spending at the threshold level, spending at roughly five times that level (over three years) in a neighborhood with 20 percent poor residents is estimated to yield cumulative *increases* (over the same three years and then the subsequent two years) of:

- $12 thousand (19 percent from the mean)[9] in the median dollar amount of mortgages originated;
- two and a quarter percentage points (four percent from the mean) in the mean rate at which mortgage applications are approved; and

- nine (four percent from the mean) more businesses located in the neighborhood

The first indicator is particularly dramatic and deserving of further discussion. Not only did our aforementioned work (Appendix 2; Galster, Hayes and Johnson, forthcoming) reveal that median dollars of mortgage originations correlates well with a wide variety of neighborhood economic, social, and demographic indicators, but it is almost perfectly correlated (.95) with median price of homes sold.[10] So, assuming with confidence that changes in our indicator accurately track changes in residential property values, we can model a representative neighborhood where CDBG is invested that contains 1,500 residential properties and 30 percent poverty, and calculate what our parameter estimates imply. An additional $1,155,000 (i.e., $385 thousand per year—the difference between minimum and maximum CDBG levels shown in Table 7) invested in such a neighborhood over 1994-1996 is associated with an increase in aggregate residential property values from 1993/94 to 1998/99 of $12,112,500. Obviously, this is no trivial relationship.[11]

The second point to extract from Table 7 is that the relationship between levels of CDBG spending and changes in our indicators is contingent upon the concentration of poverty in the neighborhood. Because the most robust econometric specification by far involved standardizing CDBG spending by the number of poor residents, the implication is that the same amount of spending will produce smaller changes in neighborhood outcomes (by the factor $1/\delta$) the greater the neighborhood poverty rate (by the factor δ). Taking any outcome of interest and comparing the 20 and 40 percent poverty segments

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[9] Calculated based on the mean of the indicator at the beginning of the period; cf. Table 2.
[10] See Galster, Hayes, and Johnson (forthcoming) for more details.
[11] Interestingly, this 11:1 ratio of property value to community development subsidy approximates a typical capitalization rate, at which future rental income from property can be used to compute a

of Table 7, we see that the increase in any neighborhood outcome indicator predicted by raising CDBG spending from its threshold falls by half if the neighborhood in question has twice the poverty rate.

Caveats and Directions for Future Research

Even though our research makes what we believe is a quantum leap in terms of scope and statistical sophistication of analysis of CDBG impacts, we are cognizant that it nevertheless requires some qualifying commentary and leaves significant areas for improvement. First, our research investigated only an incomplete sphere of potential neighborhood impacts from CDBG. Not all CDBG expenditures, even above "threshold" amounts, were invested in ways intended to produce a visible neighborhood improvement effect. For example, investments to the underground infrastructure (water and sewer lines, for example) may be critically important to sustaining urban services to a poor neighborhood, but may be unobservable to private investors. We have no way of distinguishing between these investments and others (say, in urban parks, affordable housing, and commercial strip facades) that might have an obvious and positive effect on investor perceptions. Moreover, our three indicators do not constitute exhaustive measures of every conceivable aspect of neighborhood that might be visibly changed by CDBG spending.[12] Clearly, replication of our analysis using a more comprehensive battery of neighborhood indicators should prove instructive.

Second, the quality of CDBG data available for this analysis is not perfect. As noted in Appendix 1, information on CDBG spending for some years for nearly all cities is incomplete or missing entirely, and our procedures for allocating some CDBG

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current capital valuation. Galster, Tatian and Wilson (1999) find that cap rates for multifamily properties nationally average 9 percent.

expenditures across neighborhoods, however reasonable, is only approximate. The limited time span for which HMDA were available meant that we could not experiment with alternative structures of lags between CDBG spending and neighborhood changes. We hope that future research will be able to replicate our analysis when additional years of fine-tuning HUD's IDIS CDBG data collection system has yielded a more complete and accurate database.

Third, information that ideally would help us apply more control variables in our analysis did not exist in usable form. We had no measures of other public or private investment that contemporaneously could potentially complement CDBG spending in some neighborhoods. Similarly, we lacked pre-1994 measures of CDBG spending and thus could not tell the degree to which investments had been sustained over the long run.[13] Finally, measures of supportive or inhibiting neighborhood-, city-, or metropolitan-wide social, economic, and demographic influences on neighborhood conditions have only been partially controlled in this analysis by our use of pre-existing neighborhood home price trends and contemporaneous city job trends. Additional efforts to develop more control variables and operationalize the various contexts in which the payoffs from CDBG spending might vary are warranted.

Fourth, one of the most provocative findings from our work relates to threshold levels of CDBG spending. Due to the limitations of our CDBG data we were able to identify in only the most course terms where this threshold occurred—the sample mean level of annual average CDBG spending. Given the crucial policy significance of this parameter, we urge future researchers to both validate this notion of a threshold and, if possible,

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[12] Our factor analysis identified six dimensions of neighborhood quality that "explained" 65 percent of the variance among our collection of neighborhood indicators. These factors were, in turn, measured by indicators that explained only a portion of their variance.

[13] This omission is not damaging so long as these previous expenditures were on roughly the same scale as the ones we did measure, in which case the relative annual average across neighborhoods is an adequate proxy for earlier years' spending.

more precisely identify its value and the degree to which this value depends upon neighborhood and city context. To do so will require a larger sample of cities and more geographically precise CDBG data than are currently available.

Conclusion

Our empirical investigation of CDBG spending in 17 large cities during the 1990s has revealed several strong statistical associations with a battery of indicators that capture a wide range of neighborhood conditions. The evidence offers support for the claim that CDBG spending has made a considerable difference in the conditions of lower-income neighborhoods, though the magnitude of this implied impact is heavily contingent. First, it appears that there is no consistent association between CDBG spending levels and indicators of subsequent neighborhood change unless expenditures: (1) are sufficiently spatially targeted that they exceed the threshold (estimated here as the CDBG mean expenditure level per census tract), and (2) are standardized for the number of poor residents in the neighborhood. Second, implied impacts vary according to neighborhood trajectories prior to investment and contemporaneous changes in the local economy. Nevertheless, even in the least-hospitable contexts—highly concentrated neighborhood poverty, pre-existing declines in home values, weak city job growth—our estimates suggest that CDBG spending at above-threshold amounts produces significant improvements (both statistically and in practical terms) in multiple measures of neighborhood conditions.

In a broader sense, our research offers new perspectives on fundamental questions related to the prospects of low-income neighborhoods, especially given new research indicating that it is typically not their destiny to remain poor in perpetuity

(Galster et al., 2003; Jargowsky, 2003). What are reasonable expectations for improvements in poverty-stricken neighborhoods, and in what dimensions? How much investment from CDBG and other sources is required to produce these improvements, and under what circumstances? And where have neighborhoods and cities performed better than expected and what can we learn about the strategies and supporting factors that produced this result? This research only begins to answer these questions, but we hope that it is a promising beginning.

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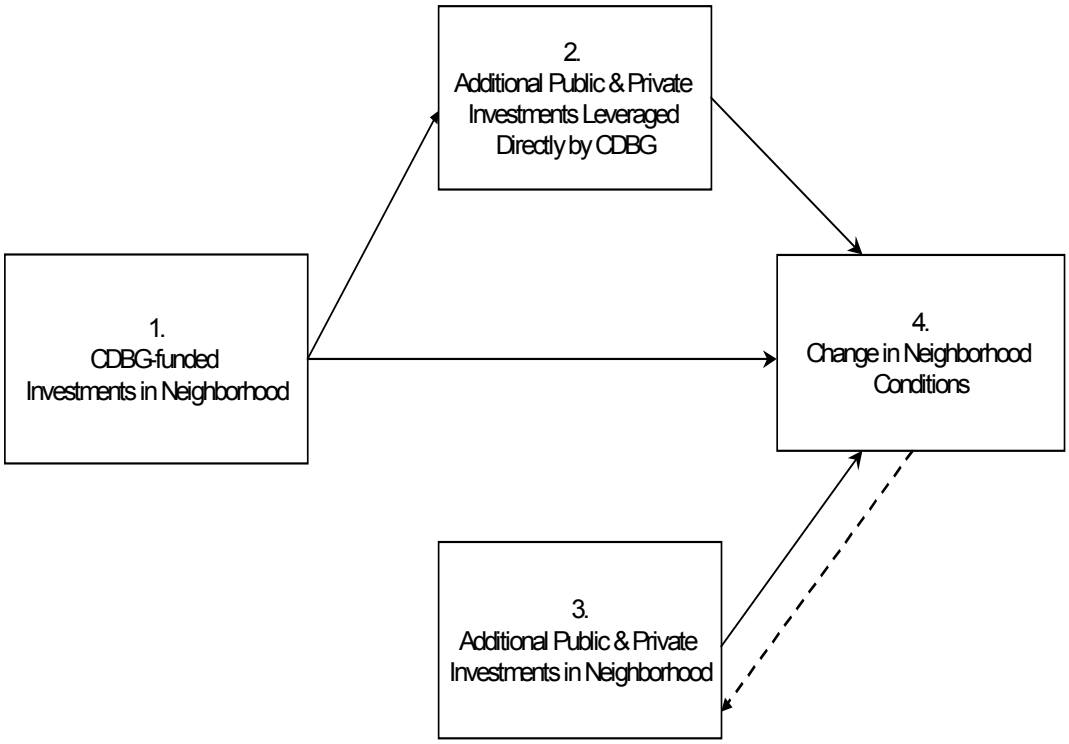
Figure 1
A Model of CDBG and Other Influences on Neighborhood Conditions



Contextual Factors Affecting Above Relationships:

Overall Conditions in City's Economy, Housing Market, Social Problems

Initial Inventory of Neighborhood Assets & Liabilities (Both Stocks and Trajectories)

Table 1

Cities Sampled, by Region and 1994-1997 City Job Growth Category

(CDBG allocations for 2000, in millions of dollars, shown parenthetically)

% Change in City's Jobs	Northeast	Midwest	South	West
No Growth: -11.8 – 1.5%	Providence (7.3)	Milwaukee (22.2)	Washington (23.5) Ft. Lauderdale (2.7)	Los Angeles (89.8)
Low Growth: 1.6-6.0%	Boston (24.8)	Cleveland (30.1)	Birmingham (8.3)	Denver (11.6) Long Beach (9.3)
High Growth: 6.1-48.8%	N/A	Columbus (8.5) Indianapolis (11.8)	Charlotte (4.7) Houston (35.0) Tulsa (4.8)	Oakland (10.3) Portland (11.8)

Sources: job change: HUD *State of the Cities 2000*; CDBG: HUD CDBG Data Tracking System

Table 2

Descriptive Statistics for Key Variables for Census Tracts Above Threshold*, by City

					Neighborhood Outcome Indicators					
City	Mean Tract Pop. 1990 (#)	Mean Tract Poverty Rate 1990 (%)	Mean Change Home Prices 1990-1994 (%)	Mean Annual CDBG $ / Tract 1994-1996 ($)	Median Loan Amt. 1993/94 (1,000 $)	Median Loan Amt. 1998/99 (1,000 $)	Mean Loan Approval % 1993/94 (%)	Mean Loan Approval % 1998/99 (%)	Mean Businesses 1995 (#)	Mean Businesses 1999 (#)
Oakland	2,866	24.2	87.8	205,005	96.15	103.50	51.9	49.2	311	263
Portland	3,549	21.0	41.8	221,681	70.75	110.08	73.5	68.1	244	254
Providence	5,478	29.2	33.5	169,814	67.92	76.42	64.8	53.9	317	280
Fort Lauderdale	4,425	45.4	-23.3	285,666	50.50	60.75	66.6	50.7	368	332
Boston	3,491	23.1	-6.7	265,962	73.30	114.30	64.5	61.3	89	85
Denver	3,228	27.5	71.8	305,061	65.93	103.58	71.4	67.5	367	341
Cleveland	2,439	37.9	27.8	173,307	25.84	48.88	57.2	50.8	90	82
Long Beach	7,419	25.4	-30.2	156,985	115.48	108.24	58.6	59.2	227	200
Los Angeles	5,519	28.4	-24.9	294,311	130.08	131.98	57.6	56.6	197	176
Columbus	3,695	32.4	9.5	182,356	50.43	68.68	61.5	57.5	218	219
Birmingham	4,581	35.3	81.8	250,290	32.65	41.15	59.6	46.3	302	265
Milwaukee	2,831	36.8	3.3	180,148	21.56	37.37	61.2	48.6	72	55
Indianapolis	2,796	35.2	21.3	199,117	25.89	47.33	59.9	48.2	83	72
Charlotte	2,582	34.2	-4.0	471,667	43.83	63.00	62.0	50.7	196	221
Tulsa	2,196	30.3	4.6	283,258	47.19	37.50	67.1	50.3	99	80
Houston	3,918	29.9	0.2	230,123	40.85	57.93	60.9	54.2	230	217
Washington	3,267	19.9	-27.1	279,033	99.35	110.16	67.1	63.6	129	117
Mean (unweighted)	3,781	30.4	15.7	244,340	62.22	77.70	62.7	55.1	208	192

* Threshold defined as 1994-96 average CDBG $ per tract > $86,737; outliers excluded

Table 3

Regression Estimates for Relationship Between CDBD Expenditures/Poor and Neighborhood Indicators
[for sample of all census tracts with 1994-96 average CDBG expenditures > mean]
[standard errors shown parenthetically]

	Neighborhood Indicator		
	Median Loan Amount	Loan Approval Rate	Number of Businesses
Independent Variables			
Neighborhood Indicator at Start of Period (1993-94)	0.807 [0.021]**	0.574 [0.037]**	0.958 [0.53E-2]**
CDBG $ / poor in tract (average/yr. 1994-1996)	0.024 [0.0057]**	0.438E-2 [0.211E-2]**	0.018 [0.56E-2]**
[CDBG $ / poor in tract]**2 (average/yr. 1994-1996)	-0.835E-5 [0.222E-5]††	-0.726E-6 [0.82E-6]	-0.636E-5 [0.218E-5]††
[CDBG $ / poor in tract]**3 (average/yr. 1994-1996)	0.517E-9 [0.1452E-9]††	0.364E-10 [0.537E-10]	0.404E-9 [.143E-9]††
Constant	24.24 [2.30]††	19.81 [2.23]††	-11.43 [1.89]††
Adjusted R-squared	0.75	0.37	0.99
Sample N	512	509	502
Dependent Variable Mean	94.11	56.17	163.21

Note: standard errors shown parenthetically

* = p < .05; ** = p < .01; one-tailed test
† = p < .05; †† = p < .01; two-tailed tests

Table 4

Summary of Regression Results of CDBG Impacts, by Type of Spending

(in census tracts with above-mean amounts of CDBG $ in given type)

Category of:		Change in Neighborhood as Indicated by:		
CDBG Expenditure Ave./year 1994-96	N	Median Loan $	Loan Approval %	# Businesses
Acquisition & Clearance	55	NS	NS	NS
Economic Development	175	.04	.02	.05
Housing	229	.05	.02	NS
Public Facilities & Services	246	.11	.04	NS

Note: Only coefficients of CDBG $ / poor residents shown if statistically significant (p<.05)

Table 5

Summary of Regression Results of CDBG Impacts, by Neighborhood Type

(in census tracts with above-mean amounts of CDBG $)

Neighborhoods Categorized by:		Change in Neighborhood as Indicated by:		
Home Price Change 1990-94*	N	Median Loan $	Loan Approval %	# Businesses
Large Decline	210	.04	.01	.02
Relatively stable	166	NS	.01	NS
Large Increase	99	.09	.03	.12

Note: Only coefficients of CDBG $ / poor residents shown if statistically significant (p<.05)

* See text for details

Table 6

Summary of Regression Results of CDBG Impacts, by City Economic Context

(in census tracts with above-mean amounts of CDBG $)

Neighborhoods Categorized by:		Change in Neighborhood as Indicated by:		
City's Job Change, 1994-97*	N	Median Loan $	Loan Approval %	# Businesses
Decline or no growth	238	.01	.01	.02
Low growth	138	.11	.03	.03
High growth	99	NS	NS	.04

Note: Only coefficients of CDBG $ / poor residents shown if statistically significant ($p<.05$)

* See text for details

Table 7
Estimated Marginal Impacts of CDBG Spending Above Threshold
(by degree of poverty concentration in simulated neighborhood)

	Min. CDBG* $ 86,737.00	Mean CDBG** $ 244,340.00	Max. CDBG*** $ 471,667.00
# Poor in Tract: 750 (approx. 20%)			
CDBG $ / Poor Person	$115.65	$325.79	$628.89
		Difference from Min. CDBG	Difference from Min. CDBG
Median $ Mortgage		4959.30	12112.46
Mortgage Approval %		0.92	2.26
# of Businesses		3.72	9.08
# Poor in Tract: 1125 (approx. 30%)			
CDBG $ / Poor Person	$77.10	$217.19	$419.26
		Difference from Min. CDBG	Difference from Min. CDBG
Median $ Mortgage		3306.12	8074.98
Mortgage Approval %		0.62	1.51
# of Businesses		2.48	6.06
# Poor in Tract: 1500 (approx. 40%)			
CDBG $ / Poor Person	$57.82	$162.89	$314.44
		Difference from Min. CDBG	Difference from Min. CDBG
Median $ Mortgage		2479.65	6056.23
Mortgage Approval %		0.46	1.13
# of Businesses		1.86	4.54

* At threshold (mean CDBG $ for all tracts)
** Unweighted average (above mean CDBG $ tracts only) across 17 sample cities
*** Highest per tract average annual CDBG spending: Charlotte, NC
[CDBG $ expressed as three-year annual ave.]

Appendix 1
Details of Methods for Generating CDBG Database

Compiling program data.

One of the major challenges with any analysis of the CDBG program for the years covered by the study is the problem of missing data. No single data system has comprehensive information on CDBG expenditures for 1994 through 2000, due to phase-in of IDIS starting in 1996. Most CDBG grantees went on-line with IDIS in the 1997 program year, and some communities not until 1998. Gaps in data coverage sometimes appeared with the system's phase in, compounding problems of missing data that hampered IDIS' predecessor information system. (Indeed, seven of the 17 cities in the analysis did not have complete data for the 1994 – 1996 period.) Despite supplemental coding of program documents, where available, a number of gaps remained in the final study database. All but two of the sampled grantees (Fort Lauderdale and Tulsa) lacked some CDBG program data for the period immediately preceding their transition onto IDIS, with the gap ranging from 3 to 18 months.

Geo-locating CDBG activities.

IDIS and HUD's earlier information system provide a range of geographic data at the activity level, but not always in a form that is easily geo-coded to census tract locations. We extracted all geographic information with a view to determining the census tract location of *all* of a grantee's expenditures. Our ability to do so varied, however, from a high of 93 percent tract geo-coded in Cleveland to a low of just 27 percent in Charlotte; the median was 70 percent.[14]

[14] In some instances, most notably Portland, geographically targeted expenditures were put in the "residual" category because there was insufficient information in IDIS or the GPR to determine the census tracts encompassed by the named target area(s).

Attributing expenditures to particular tracts.

While some CDBG-funded activities occur in a single census tract and therefore can be unambiguously assigned to a specific neighborhood location, other activities are more difficult to attribute to a particular neighborhood because they span census tract boundaries. For example, a commercial establishment aided with CDBG funds might have had a service area that encompasses more than one neighborhood, or a housing rehabilitation program might involve property improvements in more than one tract. We therefore used the following procedures for assigning expenditures to particular census tracts.

- Expenditures coded as "area" and "direct benefit" activities that occurred inside a single census tract were assigned entirely to that tract, even if the activities' direct beneficiaries did not necessarily reside in the same tract.
- Expenditures for area benefit and direct benefit activities that occurred in more than one census tract were pro-rated equally among tracts. Pro-rated expenditures accounted for between four (4) and 44 percent of the grantees' total geo-coded spending (that is, spending for which a tract location was available).
- We assigned "city-wide" expenditures that grantees targeted to eligible persons across their jurisdiction in proportion to the level of "demand" in each tract, as indicated by a tract's share of the jurisdiction's 1990 poverty population.
- Finally, "residual" expenditures, from activities that lacked sufficient information to determine a census tract location, were not assigned to particular census tracts. Effectively, therefore, these expenditures were excluded from the analysis of the CDBG program's neighborhood impact.

Defining Type of Expenditure.

One of the defining characteristics of CDBG is the discretion local grantees have in deciding what projects to pursue from a range of *eligible activities*. Because we anticipated that the characteristics of funded activities might have an important bearing on the nature of the program's impact, we grouped CDBG expenditures into four categories of eligible activities—housing, economic development, public facilities and social services, and property acquisition and disposition. These categories were flagged on the IDIS system.

Appendix 2

Details of Methods for Developing Neighborhood Outcome Indicators

Our method of selecting a parsimonious set of indicators to use as dependent variables in this study proceeded in the following steps:

Step 1: Assembling Comprehensive Data on Annual Changes in Neighborhoods

We first utilized unique local data sets assembled by the Urban Institute, as a part of the National Neighborhood Indicators Partnership (NNIP) program.[15] The five partners with the most complete information were selected: Providence, Indianapolis, Boston, Cleveland and Oakland. These cities' databases contain annual information for census tracts during the mid-1990s that allowed us to create indicators for such things as: violent and property crime, births to teens, low-weight births, welfare and food stamp usage, and land use.

Next, we assembled annually updated, census tract data from three sources that are available for most cities: business directories, property deed and tax offices, and federal financial institution regulators. Each in described below.

[15] The National Neighborhood Indicators Partnership (NNIP) is a collaborative effort by the Urban Institute and local partners to further the development and use of neighborhood-level geographic information systems in local policymaking and community building.

Business Directories. Dunn and Bradstreet Company produces a database containing information on 10 million business establishments nationwide, and can be used to group businesses at the zip code level. We drew three indicators from 1995 and 1999 Dunn and Bradstreet data at the zip code level: number of jobs, number of firms, and total dollar volume of sales annually. We converted the data to census tract values by approximating from zip code geography, using the MABLE/Geocorr Geographic Correspondence Engine available from the University of Missouri.

Home Price Data. Information regarding parcels of property in a community is maintained by local property tax assessors and auditors for the purpose of levying taxes on owners. At a national level, there are several commercial sources that gather and sell this information; we purchased such from DataQuick. Because we encountered census tracts for which no sales were reported in 1994 or 1999, median sales price of homes sold was calculated from 1993 and 1994 data combined, and 1998 and 1999 data combined.

Home Mortgage Disclosure Act Data. In 1975, Congress enacted the Home Mortgage Disclosure Act (HMDA), which requires that depository institutions (banks, savings and loans, thrifts, credit unions and others) and for-profit, non-depository institutions (for example, mortgage companies) report information on all mortgage applications and originations. Information that lenders must submit includes the type, purpose, and amount of loan, location of the property, occupancy, action taken, type of purchaser, reason for denial (optional), and the race, sex, and income of the applicant. Although some sorts of institutions are exempt from reporting, HMDA data provide the best portrait of mortgage market activity available at the census tract level on an annual basis.

Our analysis database contained a tract level summary of the 1993 and 1994 HMDA reports, and a similar summary for 1998 and 1999. We averaged tract level data

for 1993 and 1994 together, and 1998 and 1999 data together to reduce problems associated with few or no observations in one year. We calculated over both two-year time periods: the number of loan applications, percentage of applications that resulted in originations, the percentages of all mortgage applications intended for home purchase and for home improvements, and the median loan amount originated.

Finally, to supplement the above information we developed 26 indicators from 1990 census tract data, STF-4. They include such things as: female household headship and marriage rates, racial, immigration, and demographic characteristics, incomes and unemployment, education and occupational status, and housing stock ages, vacancy rates, values, and structure types. Even though annual updates of such indicators were not available during the 1990s, we nevertheless thought it important to see how these indicators correlated with those from the other data sources.

Step 2: Ascertaining Dimensions of Neighborhood Conditions

We analyzed the aforementioned set of indicators for each of our five cities with a principal components analysis using varimax rotation, a longstanding procedure in the field of social indicators (e.g., Ross, Bluestone and Hines, 1979; Wong, 2002). For each site we replicated the analysis for 1994 and 1999 indicators developed from NNIP, Dunn and Bradstreet, DataQuick and HMDA databases; indicators based on 1990 census data were employed in both cases.

There was remarkable cross-sectional and inter-temporal comparability in results, especially considering the wide range of city location, age, demographic composition, and economic base. In each of our five cities, six common clusters of indicators emerged that we believe correspond to intuitively plausible dimensions of

neighborhood condition.[16] The most heavily weighted indicators in each factor provide a heuristic suggestion of label signifying a dimension: *Social Disadvantage, Housing Type and Tenure, Prestige, Business and Employment, Crime,* and *Housing Vacancy*.

The first factor, *Social Disadvantage*, heavily weights indicators like female headship rates, teen birthrates, welfare usage, and percentages of black and (negatively) white populations. The second factor, *Housing Type and Tenure*, consists predominantly of the percentages of structures that are single-family homes and that are owner-occupied. The third factor, *Prestige*, loads heavily on percentages with college degrees and those in managerial, professional, or technical occupations, and median home values. The fourth factor, *Business and Employment*, is heavily comprised of the number of businesses and number of jobs, and less so on the volume of sales. The fifth factor, *Crime*, involves typically both property and violent crime rates. The last factor, *Housing Vacancy*, loads heavily on residential vacancy rates in all cities, though in several it also involves the percentage of units lacking some minimal plumbing. For each city, there is remarkable stability in the indicators' factor loadings between the two years.

Step 3: Ascertaining the Parsimonious Set of Indicators

Having identified six common dimensions of neighborhood condition, our next task was to ascertain the degree to which any individual indicators based on data sources available for *all* cities could serve as strong proxies for these dimensions. For this part of our investigation we regressed each factor produced for a particular city and period on each of the aforementioned indicators based on Dunn and Bradstreet,

[16] These factors had Eigen values greater than unity and explained three percent or more of the variance in the dataset. Cumulatively, these six factors explained approximately two-thirds of the total variance, differing modestly by up to five percentage points depending on city and date. Details for each of our five cities are available from the first author.

DataQuick and HMDA information. The resultant R-squared values provide an easily interpretable measure of how well each indicator explains the variation in the six factors.

We found, first, that several HMDA-based indicators proved to be especially strong, consistent predictors of the *Social Disadvantage* and *Prestige* factors; and to a lesser degree the *Housing Type and Tenure* factor and the *Crime* factor. In particular, the mortgage approval rate seemed most robust, being predictive of the *Social Disadvantage* and *Prestige* factors at R-squared values of .38 and .45, respectively, on average across the sites. The mortgage approval rate was reasonably predictive of the *Crime* factor as well (average R-squared of .22). The median dollar amount of mortgages issued proved to be a strong predictor of the *Prestige* factor (average R-squared of .74) and *Social Disadvantage* factor (average R-square of .28).[17] Second, the Dunn and Bradstreet-based indicators of business or jobs were extremely predictive of the *Business and Jobs* factor, with R-squares typically exceeding .95. Finally, the DataQuick-based indicator of mean sales price of single-family homes proved to be a good predictor of the *Social Disadvantage* and *Prestige* factors, with average R-squares of .25 and .72, respectively.

Next we identified which indicators above provided redundant information by correlating them with all others, using all census tracts with available information from our entire sample of five cities. Two pairs were clearly redundant: median loan amount – median home sales price, and number of businesses – number of jobs. Both indicators in each pair were highly correlated in identical fashion in both years, .95 for the former and .86 for the latter. However, because median home sales prices and number of jobs

[17] The number of home purchase loan application records (LARs) is the only generic-based indicator that is even modestly predictive of *Housing Type and Tenure* (average R-squared of .27). The share of mortgages intended for home purchase or the share for home improvements are modestly predictive of the *Social Disadvantage* and *Prestige* factors (average R-squared

provided slightly less explanatory power for neighborhood dimensions than their correlated counterpart, they were not maintained in the parsimonious indicator set. By contrast, the (HMDA-based) mortgage approval rate and median loan amount originated, and the (Dunn and Bradstreet-based) number of businesses, did not prove to be sufficiently inter-correlated to render any one redundant.

To summarize, our experiments suggested that three indicators based on widely available data sources offer robust proxies for several broader dimensions of neighborhood, and therefore offer reasonable (if not exhaustive) indicators for measuring the impacts of CDBG expenditures on neighborhoods. Changes in these indicators serve as alternative dependent variables in our statistical model summarized in equation (1) above: home purchase mortgage approval rate, median amount of home purchase loans originated, and number of businesses.

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values of .22 and .28, respectively), but in both cases the explanatory power is less than that provided by the mortgage approval rate indicator.