Microfinance and Home Improvement: Using Retrospective Panel Data to Measure Program Effects on Fundamental Events

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Summary. — Rigorously estimating the effects of development programs is notoriously difficult. We present a methodology that borrows from "event studies" commonly used in the finance literature. In our RETRAFECT methodology, a retrospective panel dataset is created based on "fundamental" events in the history of surveyed households, events that are discrete, unforgettable, and important to welfare. We apply this methodology to examine home improvements among 1,672 households in Guatemala, India, and Ghana. Using village and country/year-level fixed effects, we find the probability of a major housing improvement increases from 0.038 to 0.070 in the years subsequent to a first microfinance loan.
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1. INTRODUCTION

There has been much written recently by development economists about the need for rigorous and systematic appraisal of the effectiveness of anti-poverty programs in developing countries (e.g., Armendáriz de Aghion & Morduch, 2005; Duflo & Kremer, 2003; Easterly, 2006; Savedoff, Levine, & Birdsall, 2006). Yet researchers and practitioners seeking to ascertain the true impact of development programs face a daunting task. Accurately appraising the effectiveness of development programs is both time-consuming and costly, especially for small institutions that seek accurate measures of their impact on clients. Moreover, many institutions would like to evaluate the effectiveness of their programs *ex post* to implementation, creating problems with the establishment of baseline surveys, control groups, and other means of identification. These obstacles have created a demand for new approaches to determining the effectiveness of many types of development programs, including microfinance.

In this paper we present a methodology for ascertaining welfare changes associated with development programs which can be employed *ex post* to program implementation, and may be applicable in a variety of contexts. Our methodology, a Retrospective Analysis of Fundamental Events Contiguous to Treatment (RETRAFECT), uses a single cross-sectional survey to create a retrospective panel dataset based on fundamental events in the history of households. We define fundamental events as those events in a household's history that are discrete, unforgettable, and important to household welfare. Analyzing the timing of these events within a window around the timing of treatment allows for statistical tests over the relationship between the treatment and changes in household welfare. This methodology borrows from "event studies"

undertaken in the finance literature, where the effect of events such as mergers and acquisitions are observed on stock prices. An excellent review of this use of event studies in finance is given in MacKinlay (1997). Here, however, instead of examining changes in equity prices within a time window surrounding a merger, we examine the *probability* of fundamental events within the time window surrounding a treatment.

In presenting the methodology, we stress the fact that identifying the relative timing of events is not equivalent to measuring causal program impacts. However, we suggest a number of diagnostics which allow researchers to test for whether the supply-side rollout of the program, as well as the demand-side uptake of the program, is exogenous to impact variables. To the degree that survey data pass these diagnostics, or in the case that corrections can be made for certain

types of endogeneity, it is possible to make a stronger case for causality. However, any time uptake of the treatment is driven by household choice (such as with microfinance) it is important to exercise caution in making causal inferences. In cases where uptake of the treatment affects an entire village population (such as a road or water system), the measured effects of the RETRAFECT methodology are similar to the standard *intention-to-treat effect*, or ITE and can often be interpreted as causal. Because households *choose* to take microfinance loans at any given time, in this context the question that our methodology is most clearly able to answer is "What happens when households take microfinance loans?" rather than "What is the impact of microfinance?."

We apply this methodology to studying the effects of microfinance among borrowers of microfinance institutions (MFIs) in three countries: Ghana, Guatemala, and India. We analyze changes in the probability of major dwelling improvements, such as upgrades of walls, roofs, floors, the installation of electricity and indoor toilets, as well as the purchase of major consumer durables, such as stoves, refrigerators, television, bicycles, and cell phones. Throughout our estimations we use a linear probability estimator on panel data that incorporates village and country-year fixed-effects as well as standard errors clustered at the village level.

We find using this methodology that microfinance borrowing precedes significant subsequent increases in the probability of major housing upgrades. The base probability of any housing upgrade across the three-country sample is 3.8% per year. After a household takes its first microfinance loan, this probability increases to 7.0% in countries where dwelling improvements are a strong indicator of improved household welfare. The effect is especially strong in the first two years subsequent to a household's first loan, where, the probability of a major housing improvement exactly doubles to an average of 7.6% per year. The relationship holds particularly strongly in Guatemala, where the replacement of adobe walls with concrete block walls and the replacement of dirt floors with concrete or tile floors are viewed as a significant upward step for a rural household. We also find some evidence that microfinance borrowing is positively associated with new purchases of televisions and refrigerators across all three countries, although the positive relationship with consumer durable purchases is less strong than with dwelling improvements. These results show that purchases *follow* loans, not that that they are *caused* by them. However, when we control to the fullest extent possible in our data for demand and supply side endogeneity and attrition bias, we continue to find evidence consistent with causal impacts, although they are restricted to improvements in housing.

The RETRAFECT methodology is quite general, and applicable to a wide variety of contexts. Indeed, we argue that this kind of methodology might be applied in a more straightforward way to studying the impact of treatments such as the introduction of fresh water systems, roads, vaccines, or other health interventions for which uptake is instantaneous and all-inclusive within a community. While it offers advantages relative to alternative approaches, however, researchers must exercise caution in implementation, in the use of statistical tests, and in interpretation of results under varying treatments and treatment conditions.

The next section provides a brief review of the impact study literature, and how different impact methodologies have been applied to an analysis of microfinance. Section 3 considers our field research context, methodology, and econometric model. Section 4 presents our results, and Section 5 concludes with suggestions and caveats about the appropriateness of our approach to other contexts.

2. IMPACT METHODOLOGIES AND MICROFINANCE

Historically, researchers have used a number of methodologies to ascertain the impact of microfinance. Each offers advantages and disadvantages in terms of cost, accessibility of data, and unbiasedness of impact estimates. One traditional methodology, for example, has been a before-and-after analysis of a treatment group relative to an ostensibly similar sample of individuals outside the treatment. An analysis of the "difference-in-differences" in this context is used to capture the difference in change among impact variables within the treatment group (see, e.g., van de Walle, 1999 or Banerjee & Duflo 2004 for an application to the relaxation of credit constraints in Indian firms). While such studies are relatively straightforward to carry out, they require pre-treatment data for both treated and untreated populations, and are thus often time consuming to practitioners.

Matching and propensity score methods attempt to create artificial controls in order to identify treatment effects. Gomez and Santor (2003), for example, use a statistical matching model to identify the effect of group lending relative to individual lending among 1,389 borrowers in a Canadian lending institution. However, analyses performed without a randomly chosen treatment and control groups can lead to impact bias from self-selection into the treatment based on unobservables, such as entrepreneurial drive or a predilection for self-improvement, or even raw IQ. Microfinance borrowers, in particular, are a self-selected group who are likely to possess characteristics that differ from the population norm. For example, entrepreneurial drive is likely to be much stronger among those seeking microfinance loans than a typical subject of a survey, and even a typical entrepreneur. As a result, problems with omitted variable bias are likely to cause an overestimation of treatment effects from microfinance.

Some have tried to skirt these problems by comparing old members of a treatment group with newer members, such as using newly enrolled or "pipeline" borrowers in a microfinance program as a control group for old borrowers (Coleman, 1999).[1] This had been the approach undertaken in some research on microfinance, including some of the early studies of the AIMS (USAID) research project, as well as Copestake, Bhalotra, and Johnson (2001). But as Karlan (2001) and Karlan and Alexander-Tedeschi (2009) point out, this kind of approach can suffer from "attrition bias" in which the performance of old borrowers may exceed those of new borrowers because of hidden qualities in old borrowers that have allowed them to remain in the program. Only a subset of new borrowers is likely to share these qualities, and hence the impacts observed by a researcher will be biased by this unobserved difference.

In other instances researchers have used instrumental variables to try to identify impacts. By using a third variable correlated with program access but with no direct effect on the impact variables of interest, the use of instrumental variables can overcome problems of endogeneity to allow for unbiased estimates. Work of this kind often uses the staggered implementation of programs or other participation rules which can be exploited by researchers to analyze program impact. Wydick (1999), for example, uses the staggered nature of the introduction of lending in different areas to help identify the degree of credit access granted to Guatemalan borrowers in estimating the effects of microfinance on child labor. In this approach credit effects on school enrollment are obtained using the staggered entry of a credit institution into different areas along with gross sales as instrumental variables for quantity of borrowing.