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Dear SCE EDRP,

Attached please find my responses to your request for further information in response to my request #SCE161567287. Thank you kindly for your time and effort on this. If you need any further information, please do not hesitate to contact me.

Sincerely,
A. Justin Kirkpatrick

1. Research Question

The academic literature on energy insecurity[1] draws a clear link between energy insecurity and socio-economic status. Furthermore, recent literature has noted that, even conditional on income, highly segregated and minority-dominated areas tend to have greater incidence of energy insecurity (Bednar, Reames, & Keoleian, 2017), a phenomenon termed *energy inequality*. This paper examines the drivers of this phenomenon with particular attention to the role of historic housing discrimination, known as "redlining," in driving *energy inequality*.

This paper posits the hypothesis that current incidence of *energy inequality* can be explained, at least in part, by redlining and the subsequent unfolding of the housing market over the period 1930-1980. Three hypotheses are tested: first, that initial formalization, through Depression-era federal mortgage policy, separated otherwise equal housing stock into "minority" and "non-minority" areas[2]. Second, that the period of discrimination from 1930-1980 drove divergence in own-ownership rates and credit access which in turn, drove decreased home energy efficiency investment (e.g. improved window isolation, higher-efficiency appliances, etc.) in "redlined" areas. Third, that following the end of institutional mortgage discrimination, persistent effects of segregation remain. Specifically, that community and social networks vital to lower income residents located in areas of low housing energy efficiency impose costs for individuals in low-efficiency (formerly segregated) areas to move to other areas with higher-quality, efficient housing stock of similar cost.

2. How the proposed research will advance understanding of California energy use and conservation

This research examines fundamental drivers of energy inefficiency in California housing stock. Utilities have invested millions in energy efficiency improvement programs for demand-side management, but in many cases, very low-income communities have been among the least likely to partake in these programs, and are the most likely to have inefficient housing. This may be largely a result of the prevalence of the principal-agent problem (renters have little incentive to make capital improvement to rented housing) common in low-income areas. Generating information on the dynamics of the housing market in low-income areas advances important understanding of a segment of California energy use that has been largely inaccessible to many existing programs, particularly those focusing on appliance efficiency (Bird & Hernandez, 2012; Boomhower & Davis, 2014).

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[1] Defined as "the condition of expending >10% of income on household energy including gas and electric" (Bird & Hernandez, 2012; Hernández & Bird, 2010)

[2] The Federal Homeowners Loan Corporation (HOLC) generated maps of 179 cities which designated areas of "subversive minorities" and "red lined" these areas. It was federal policy up until the 1970's to only issue, underwrite, or back mortgages to minority applicants within these "red" areas, regardless of income or creditworthiness. The maps, as well as surveryor notes on each area, can be obtained through the University of Richmond at https://dsl.richmond.edu/panorama/redlining/

3. How the data will be used

Household energy efficiency is inextricably linked to household energy consumption. To observe household energy efficiency over time, one must observe household consumption over time. Consumption data alone does not necessarily reflect *efficiency* directly - an inefficient home with a frugal resident will have high consumption, as will an efficient home with a non-frugal resident – however, within a small geographic area (census block group or zip+4), the unobserved preferences for energy services (e.g. willingness to pay for a constant 72-degree home during summer) are similar, and can be controlled for econometrically. SCE data would be the basis for assessing energy efficiency in redlined and adjacent, non-redlined areas.

Specifically, SCE data on consumption over the requested period both within census block groups that were "redlined" and adjacent to them would provide *absolutely vital* information on the energy efficiency of the housing stock in the block group. Data on consumption would be aggregated to the census block-group level, and would be merged with publicly-available (and aggregated) census data[3] and "redlined" designation, also at the census block-group level. Confidentiality is ensured in the aggregation.

4. How will the results be used and shared

The primary vehicle for results will be publication in an academic journal article, and will be a primary component in my PhD dissertation. It is expected that the results will inform California policymakers as to the drivers of energy inefficiency, which will, in turn, provide better information on effective means of improving energy efficiency in low-income areas.

Furthermore, this research would be part of a larger body of work underway at the Federal Reserve Bank of Chicago that examines the persistent effects of housing discrimination in many other areas, including present-day home ownership rates, family wealth, and health outcomes.

5. Related research, citations, and references

As previously mentioned, this research touches on the literature on *energy insecurity* and it's incidence in minority communities (Bednar et al., 2017; Bird & Hernandez, 2012; Hernández, 2015; Hernández, Aratani, & Jiang, 2014; Hernández & Bird, 2010; Reames, 2016a, 2016b). Ongoing research at the Federal Reserve Bank of Chicago on persistent effects of historic "redlining" is being undertaken by

[3] All demographic information available is at the census block group or census tract. Identifying individual households would not be useful to this research in any way as individual demographics are not available.

Daniel Aaronson and Bashkar Mazumder. This effort has not yet published any work, but is described in a Federal Reserve transcript available at this address[4].

Citations

Bednar, D. J., Reames, T. G., & Keoleian, G. A. (2017). The intersection of energy and justice: Modeling the spatial, racial/ethnic and socioeconomic patterns of urban residential heating consumption and efficiency in Detroit, Michigan. *Energy and Buildings*, *143*, 25–34.

Bird, S., & Hernandez, D. (2012). Policy options for the split incentive: Increasing energy efficiency for low-income renters. *Energy Policy*, *48*, 506–514.

Boomhower, J., & Davis, L. W. (2014). A credible approach for measuring inframarginal participation in energy efficiency programs. *Journal of Public Economics*, *113*, 67–79. http://doi.org/http://dx.doi.org/10.1016/j.jpubeco.2014.03.009

Hernández, D. (2015). Sacrifice along the energy continuum: a call for energy justice. *Environmental Justice*, *8*(4), 151–156.

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Reames, T. G. (2016a). A community-based approach to low-income residential energy efficiency participation barriers. *Local Environment*, *21*(12), 1449–1466.

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[4] https://www.chicagofed.org/~/media/publications/speeches/2017/03-24-2017-strong-foundations-evans-opening-remarks-cdps-washington-dc-print-pdf.pdf?la=en