

The Design of Public-Housing Policies

Neil Thakral*

May 2017

1. INTRODUCTION

Social programs are a central means for addressing inequality. The United States spends hundreds of billions of dollars every year on programs that provide assistance with basic goods and services such as food, housing, education, and health care. Funding for such programs remains a contentious issue in the public discourse, with proponents maintaining that welfare improves living standards and opponents advocating for spending cuts. This chapter proposes to view social programs through the lens of market design, focusing on the case of public-housing assistance.

One of the goals of this chapter is to deliver lessons for housing policy that can be gleaned from market design. After presenting relevant features of the market for affordable housing, we highlight various dimensions of inequality. We explore design considerations that pertain to inequality among those who do receive assistance as well as inequality in terms of which households receive housing assistance. We describe recent research that attempts to address these issues and suggest directions where further research can make progress. The chapter aims to show more broadly that the market for public housing also exemplifies general lessons for market design.

2. THE MARKET FOR AFFORDABLE HOUSING

Approximately 1.2 million households in the United States live in public housing units, administered by about 3,300 local Public Housing Authorities (PHAs). Of these

*Department of Economics, Harvard University, Littauer Center, 1805 Cambridge Street, Cambridge, MA 02138 (e-mail: nthakral@fas.harvard.edu). I am grateful to Scott Duke Kominers and Alexander Teytelboym for helpful comments and suggestions.

households, about one-third are headed by someone at least 62 years of age, and about one-third have at least one member with a disability, with about half belonging to at least one of these groups. The average annual income for households in public housing is about \$14,500, which is 90 percent of the federal poverty line for a household of two.

According to the United States Department of Housing and Urban Development (HUD), a household lives in *affordable housing* if rent payments do not exceed 30 percent of household income. Over 20 million US households spend more than 30 percent of their incomes on housing, with over half of them spending more than 50 percent [JCHS, 2016].

Yet only one in four households in the United States who are eligible for housing assistance receive any benefits at all. Federal housing assistance for low-income households comes in three main forms, reaching about 5 million households: Public Housing, Housing Choice Vouchers (HCV), Project-Based Rental Assistance (PBRA). Each of these programs provide households with in-kind transfers rather than cash transfers.¹ Public housing provides subsidized rent for publicly owned and operated units. Residents in public housing pay 30 percent of household income as rent each month. HCV and PBRA are both subsidized housing programs, with HCV providing portable vouchers that contribute towards rent payments on the private housing market and PBRA providing subsidized rent in designated buildings that are privately owned and operated. Each of these programs subsidizes the portion of rent that exceeds 30 percent of household income.²

Households face lengthy waiting times for housing assistance. Based on a recent survey conducted by the National Low Income Housing Coalition [NLIHC, 2016], 50 percent of all PHAs administering vouchers report expected waiting times that exceed 18 months, with half of them exceeding 36 months. PHAs report shorter waiting times for public housing waiting lists: 50 percent of waiting lists require a wait of at least 9 months, with half of them exceeding 18 months. Over 1.6 million households are on waiting lists for public housing throughout the United States with another 2.8 million households on HCV waiting lists. This understates the excess demand for housing assistance since only 85 percent of public housing waiting lists and 47 percent of HCV waiting lists are open to new applicants, and many of these

¹See Collinson et al. [2015] and Olsen and Zabel [2015] for a discussion of the justifications for in-kind transfers for housing assistance.

²Recent surveys by Collinson et al. [2015] and Olsen and Zabel [2015] provide an extensive review of low-income housing assistance in the United States.

waiting lists remain closed for a period of several years. The Public and Affordable Housing Research Corporation estimates that over 10 million households would be on these waiting lists in the absence of closures.

A household that lives in public housing may stay indefinitely, as long as it complies with the lease. Half of them remain in public housing for more than five years, and one in seven households live in public housing for over 20 years. Recipients of housing vouchers, on the other hand, lose eligibility for the HCV program when their income is sufficiently high that the voucher no longer covers any portion of the rent. 60 percent of these households remain in the program for more than five years, and one in three retain their voucher for over 10 years.

3. FORMS OF INEQUALITY

Beyond the fact that the direct beneficiaries of housing assistance consist of socioeconomically disadvantaged groups, various forms of inequality exist among those who are eligible for housing assistance as well as among those who receive housing assistance.

Housing assistance is not an entitlement in the United States. While other programs such as Medicaid and the Supplemental Nutrition Assistance Program are available to everyone who qualifies for assistance, housing benefits are rationed. PHAs typically prioritize applicants who are elderly, disabled, homeless, victims of natural disasters or domestic abuse, or veterans. However, after sorting by priorities, PHAs place households on waiting lists by random lottery. As discussed earlier, only about one in four eligible households in the United States receives housing assistance. The inequality induced by randomizing the availability of housing benefits extends to other economic outcomes, as a large body of research points towards spatial disparities in economic outcomes. Evidence from housing mobility programs that approximate random assignment of families to neighborhoods finds substantial impacts in education, employment, and health. The Gautreaux program, an early housing desegregation program in Chicago resulting from a Supreme Court consent decree, suggests that moving low-income inner-city families to less-segregated, wealthier, or suburban locations can lead to modest employment gains for adults and large increases in youth educational attainment and labor-market outcomes [Rosenbaum, 1995]. The Moving to Opportunity (MTO) demonstration by HUD reveals positive effects on physical and

mental health for adults, no effects on their earnings and employment, but substantial impacts for their children.³

Those who do receive assistance often express little choice in their place of residence. When a unit finally becomes available after a lengthy waiting period, PHAs make an offer of housing to the household at the top of the waiting list. Many PHAs in the US employ a take-it-or-leave-it assignment procedure, whereby a household cannot refuse an offer without being removed from or placed at the bottom of the waiting list. Allocation mechanisms of this form effectively randomize housing among those who are in need of assistance. [Lui and Suen \[2011\]](#) examine the market for public housing in Hong Kong, where about 30 percent of the population lives in government-owned housing, and provide evidence that public housing generates an inefficient matching between households and residential locations. They show that public-housing tenants are less likely than private-housing tenants to work near where they live. Moreover, while tenants of public housing are less likely to move than their counterparts living in private housing, they are more likely to move farther away from their original place of residence conditional on moving. This leads to inequality within public housing among those who receive assistance, as some households are randomized into particularly poor matches. Some PHAs allow households to refuse a limited number of offers, usually one or two, before removing them from or placing them at the bottom of the waiting list. This creates further disparities between households that can afford to wait for better offers and those with more immediate needs.

While rationing creates inequality among those who are eligible for housing assistance and the take-it-or-leave-it mechanism creates inequality among those who receive housing assistance, a potential justification for these policies might be that they act as screening devices. As [Nichols and Zeckhauser \[1982\]](#) argue, imposing restrictions or deadweight costs on beneficiaries of government transfer programs can enhance efficiency by targeting assistance towards those who value it most. Several facts about housing policy suggest that this channel does not explain the use of rationing or take-it-or-leave it allocation mechanisms. First, the application process itself functions as a screening device. Applications are costly to fill out, housing authorities verify the information reported on applications to determine priorities, and many housing authorities conduct in-person interviews of households that approach the top of the

³See [Gennetian et al. \[2012\]](#), [Ludwig et al. \[2012\]](#), [Ludwig et al. \[2013\]](#), and [Chetty et al. \[2016\]](#) for further detail.

waiting list. Second, some housing authorities use mechanisms that offer no additional screening benefit. Outside the US, housing authorities in Toronto, the Netherlands, Britain use first-come-first-served (FCFS) allocation mechanisms, in which applicants maintain their positions on the waiting list without any limitation on the number of units they may refuse. Third, housing authorities typically aim to minimize the length of time required to fill a vacant unit. This is perhaps the most likely justification for using procedures that restrict applicants' choices. Allowing applicants to refuse multiple offers creates delays in filling vacancies, which results in welfare losses and is often publicized in the media [Navarro, 2015].

4. PUBLIC-HOUSING ALLOCATION

A natural first step in applying ideas from market design to the allocation of public housing is to determine the objectives, both for households and for the social planner. Individuals in need of housing assistance may have heterogeneous preferences over residential locations. For example, workers may evaluate locations based on proximity to their place of employment, and the disabled or elderly may prefer locations that are more easily accessible, and families with children may prefer to live near better schools. The literature on spatial mismatch following Kain [1968] provides a useful benchmark that captures the motivation for much of the existing work in this area. The findings from Lui and Suen [2011] highlight the importance of location preferences and suggest that mechanisms which give applicants little choice in their place of residence induce inefficient allocations.⁴

Existing work on public-housing allocation takes heterogeneous household preferences as a primitive and considers two categories of objectives: utilitarian and axiomatic. In particular, the social planner might aim to maximize a utilitarian measure of social welfare, or to satisfy axioms based on notions of fairness, efficiency, and strategy-proofness. Recent work by Leshno [2015] and Thakral [2016] exemplifies these two approaches, which offer complementary perspectives on the design of public-housing policies. These studies, along with other recent work studying dynamic assignment mechanisms, develop models in which a social planner must assign objects that arrive over time to agents on a waiting list.⁵ An alternate approach due to

⁴Relatedly, Van Ommeren and Van der Vlist [2016] present empirical evidence on inefficiencies in the allocation of public housing under FCFS mechanisms.

⁵Other recent work in economics, particularly in the literature on dynamic assignment mechanisms,

Galiani et al. [2015] develops a model of neighborhood choice to empirically evaluate the design of location constraints for housing vouchers.

Leshno [2015] offers the following message for designing housing-allocation policies: contrary to the ubiquitous current practice of penalizing applicants who decline apartment units, the welfare-optimal assignment mechanism *incentivizes agents to decline* mismatched units. In the model, a unit of housing randomly drawn from one of two types becomes available each period and must be assigned to an applicant on a waiting list. Each household prefers one of the housing types, which the social planner does not observe, and households pay the same waiting cost each period they are unassigned. The social planner seeks to maximize the fraction of agents who are matched with their more preferred type of housing, irrespective of any particular applicant’s waiting time. Declining a housing unit generates a positive externality by reducing another applicant’s waiting time, but each applicant has a private incentive to reduce their own waiting costs, resulting in a tension between the socially optimal decision and the privately optimal decision which pushes towards inefficient allocations. The optimal allocation mechanism encourages the maximum number of households to wait for their more preferred type of housing by exploiting the fact that households are more willing to decline mismatched units when waiting times for their preferred type of housing are short. It does so through carefully chosen randomization schemes that balance expected waiting times across households that decline mismatched units by transferring higher waiting times from households that are already willing to wait for a better match to households that would otherwise be unwilling to wait.

Thakral [2016] expresses dynamic public-housing allocation as a general mechanism design problem and derives a new allocation mechanism, the Multiple-Waitlist Procedure (MWP), which allows applicants to sort into units which they value more, taking their respective waiting costs into account. Under MWP, all households begin on a centralized waiting list in order of priority, and associated with each building there is a separate First-In/First-Out (FIFO) queue. A unit that becomes available in a given building belongs to the household at the top of the queue for that building. If the queue is empty, then the unit is offered to the household with the highest priority on the centralized waiting list. The household can either accept the offer

also considers the problem of allocating public housing and analyzes first-come-first-served (FCFS) assignment mechanisms [Bloch and Cantala, 2017, Schummer, 2016]. Earlier papers in operations research also study assignment policies with applications to the allocation of public housing [Kaplan, 1986, 1987a,b].

or opt to join the FIFO queue for the next available unit in a different building of their choice. In contrast to FCFS, this allows applicants to trade off their preferences for different units and waiting times by choosing among a set of waiting lists, rather than only choosing to accept or reject units after they arrive. MWP satisfies notions of strategy-proofness, efficiency, and the elimination of justified envy, appropriately defined in an environment where a social planner assigns objects that arrive over time. Moreover, MWP results in substantial ex-post welfare gains. [Thakral \[2016\]](#) uses a structural model of household preferences for public housing based on [Geyer and Sieg \[2013\]](#) to compare welfare under various allocation mechanisms. In a sample of Pittsburgh households eligible for public housing, MWP improves welfare by over \$6,400 per applicant, or about 75 percent of the maximum possible welfare gain that a hypothetical social planner who knows the full realization of the arrival process in advance could achieve.

[Galiani et al. \[2015\]](#) evaluates the design of location constraints for housing vouchers using data from the MTO experiment. The MTO experiment randomly assigned families living in distressed public housing projects to one of three groups: a control group, a treatment group that received an ordinary housing voucher without location restrictions, and a treatment group that received mobility counseling as well as housing vouchers which could only be used in census tracts with 1990 poverty rates below 10 percent for the first year. [Galiani et al. \[2015\]](#) use experimentally-induced exogenous variation in rental prices based on voucher receipt in the MTO experiment to estimate a structural model of neighborhood choice. Counterfactual simulations indicate that mean exposure to poverty increases with the stringency of the location constraint (i.e., the maximum allowed poverty rate of the destination neighborhood) because take-up decreases. Furthermore, the model permits additional counterfactual policy experiments such as imposing race-based location constraints. The results highlight that subsidy take-up depends crucially on the design of the location constraint.

The abstract problem of matching households with apartments provides a basis for deriving implications about low-income housing policy. All three studies discussed above emphasize the role of preferences over different locations in shaping economic outcomes using different methodologies. [Leshno \[2015\]](#) and [Thakral \[2016\]](#) illustrate the use of theory to guide the development of new allocation mechanisms, and [Galiani et al. \[2015\]](#) demonstrate an approach to integrating applied microeconomic research with economic-design considerations for housing policy.

5. DISCUSSION AND FUTURE DIRECTIONS

We conclude by synthesizing some of the main themes of this chapter into lessons about housing policy and market design. By emphasizing the importance of empirical relationships, design objectives, and interactions among social programs more broadly, we highlight directions for future work on inequality-oriented economic design.

The design of housing-assistance programs involves many parameters, including eligibility restrictions and rent payments, which would benefit from further investigation. First, a better empirical understanding of the role of eligibility restrictions would help inform economic-design research related to low-income housing policy. The largest disparity in the market for affordable housing is between those who are eligible for housing assistance and those who actually receive it. HUD limits eligibility for HCV to households earning less than 50 percent of the median income for the county or metropolitan area in which the household chooses to live, and 75 percent of new housing voucher recipients must earn less than 30 percent of the Area Median Income (AMI). HUD imposes a more inclusive set of eligibility guidelines for public housing, allowing households earning up to 80 percent of AMI to apply. This may be due to the possibility of peer effects or spillovers from living near non-poor households [Collinson et al., 2015], which could also explain why households are permitted to remain in public housing even if their income rises above the eligibility threshold. While the downside risk of losing a housing voucher may deter households from exceeding the income threshold, the absence of such a threshold for public housing exacerbates the shortage of units for households in need of assistance. A useful direction for future research is to quantify these tradeoffs empirically. Second, the rent contract by which beneficiaries of low-income housing assistance pay 30 percent of household income as rent effectively imposes an additional 30 percent tax on earnings. A substantial body of work focuses on the labor-supply disincentives that such programs create. Jacob and Ludwig [2012] exploit random variation in voucher receipt from a lottery in Chicago to estimate that housing assistance reduces labor-force participation by 6 percent and labor earnings by 10 percent.⁶ As a recent attempt to understand how to improve the design of housing subsidies, the Rent Reform Demonstration (by HUD and research firm MDRC) uses random assignment to test new policies in five housing authorities. The experimental rent contracts involve several changes that

⁶Also see Mills et al. [2006] and Carlson et al. [2012].

aim to encourage work among voucher recipients: first, treated households pay only 28 percent of their income as rent, subject to a minimum rent ranging from \$75 to \$150 per month for households that do not receive a hardship exemption, to reduce implicit marginal tax rates; and second, rent recertification changes from every year to every three years to reduce the frequency with which income increases translate into rent increases. These experimental results along with the earlier empirical studies can inform future research in producing improved designs.

The problem of public-housing allocation demonstrates the necessity of developing models for addressing more complex inequality-oriented objectives. As discussed earlier, housing authorities throughout the world use mechanisms which result in suboptimal allocations. The allocation mechanism can induce inequality, even among those who receive housing assistance, by randomizing some households into poor matches from the perspective of household preferences. A crucial step for future research on public-housing policies is to consider additional design objectives. While existing applications of market design to housing policy focus on objectives based largely on household preferences, a household's preferences may misalign with society's preferences. This may occur, for example, if families place less weight on children's outcomes because of present bias or lack of information. Societal preferences, however, would account for such externalities, including spillovers from children's outcomes, peer effects on other low-income households, or other objectives such as deconcentrating poverty. Given a queueing model of public-housing waiting lists, [Kaplan \[1987a\]](#) evaluates priority assignment policies using measures such as assignment probabilities, expected waiting times, and racial integration. Incorporating other potential design considerations and externalities will be essential for making progress in providing practical solutions for low-income housing programs.

A broader topic for future work is to explore the interaction between public housing and other social programs. Another policy-relevant direction for future research would be to compare vouchers and public housing with direct cash assistance. Moreover, given that households have private information about their valuations for different social programs, a market-design approach may prove particularly useful for designing an efficient welfare system. This also applies to public-housing policies, where the federal government often administers multiple programs separately from each other. Based on the ideas in [Thakral \[2015\]](#), housing authorities that administer separate waiting lists for their public-housing and voucher programs could improve welfare by

allowing households to commit to the waiting list for the service for which they have a higher valuation given the expected waiting costs. More generally, jointly optimizing different forms of housing assistance and other social programs can potentially lead to welfare gains over treating them in isolation. An important direction for future work on inequality-oriented economic design is to develop frameworks that capture the broader tradeoffs faced by low-income households.

REFERENCES

- Francis Bloch and David Cantala. Dynamic assignment of objects to queuing agents. *American Economic Journal: Microeconomics*, 9(1):88–122, 2017.
- Deven Carlson, Robert Haveman, Tom Kaplan, and Barbara Wolfe. Long-term earnings and employment effects of housing voucher receipt. *Journal of Urban Economics*, 71(1):128–150, 2012.
- Raj Chetty, Nathaniel Hendren, and Lawrence F. Katz. The effects of exposure to better neighborhoods on children: New evidence from the Moving to Opportunity experiment. *The American Economic Review*, 106(4):855–902, 2016.
- Robert Collinson, Ingrid Gould Ellen, and Jens Ludwig. Low income housing policy. In *Economics of Means-Tested Transfer Programs in the United States, volume 2*. University of Chicago Press, 2015.
- Sebastian Galiani, Alvin Murphy, and Juan Pantano. Estimating neighborhood choice models: Lessons from a housing assistance experiment. *American Economic Review*, 105(11):3385–3415, 2015. doi: 10.1257/aer.20120737. URL <http://www.aeaweb.org/articles.php?doi=10.1257/aer.20120737>.
- Lisa A. Gennetian, Lisa Sanbonmatsu, Lawrence F. Katz, Jeffrey R. Kling, Matthew Sciandra, Jens Ludwig, Greg J. Duncan, and Ronald C. Kessler. The long-term effects of Moving to Opportunity on youth outcomes. *Cityscape*, pages 137–167, 2012.
- Judy Geyer and Holger Sieg. Estimating a model of excess demand for public housing. *Quantitative Economics*, 4(3):483–513, 2013. ISSN 1759-7331. doi: 10.3982/QE148. URL <http://onlinelibrary.wiley.com/doi/10.3982/QE148/abstract>.

- Brian A. Jacob and Jens Ludwig. The effects of housing assistance on labor supply: Evidence from a voucher lottery. *The American Economic Review*, 102(1):272–304, 2012.
- JCHS. The state of the nation’s housing 2016. Joint Center for Housing Studies, Harvard University, 2016. URL http://www.jchs.harvard.edu/research/state_nations_housing.
- John F. Kain. Housing segregation, Negro employment, and metropolitan decentralization. *The Quarterly Journal of Economics*, pages 175–197, 1968.
- Edward H. Kaplan. Tenant assignment models. *Operations Research*, 34(6):832–843, 1986.
- Edward H. Kaplan. Analyzing tenant assignment policies. *Management Science*, 33(3): 395–408, 1987a. ISSN 0025-1909. URL <http://www.jstor.org/stable/2631859>.
- Edward H. Kaplan. Tenant assignment policies with time-dependent priorities. *Socio-Economic Planning Sciences*, 21(5):305–310, 1987b.
- Jacob D. Leshno. Dynamic matching in overloaded waiting lists. *Mimeo*, 2015.
- Jens Ludwig, Greg J. Duncan, Lisa A. Gennetian, Lawrence F. Katz, Ronald C. Kessler, Jeffrey R. Kling, and Lisa Sanbonmatsu. Neighborhood effects on the long-term well-being of low-income adults. *Science*, 337(6101):1505–1510, 2012.
- Jens Ludwig, Greg J. Duncan, Lisa A. Gennetian, Lawrence F. Katz, Ronald C. Kessler, Jeffrey R. Kling, and Lisa Sanbonmatsu. Long-term neighborhood effects on low-income families: Evidence from Moving to Opportunity. *The American Economic Review*, 103(3):226–231, 2013.
- Hon-Kwong Lui and Wing Suen. The effects of public housing on internal mobility in Hong Kong. *Journal of Housing Economics*, 20(1):15–29, March 2011. ISSN 1051-1377. doi: 10.1016/j.jhe.2010.11.001. URL <http://www.sciencedirect.com/science/article/pii/S1051137710000471>.
- Gregory Mills, Daniel Gubits, Larry Orr, David Long, Judie Feins, Bulbul Kaul, Michelle Wood, and Amy Jones. Effects of housing vouchers on welfare families.

Washington, DC: US Department of Housing and Urban Development, Office of Policy Development and Research, 8:2010, 2006.

Mireya Navarro. New York City public housing units remain empty unnecessarily, audit finds. *The New York Times*, June 2015. ISSN 0362-4331. URL <http://www.nytimes.com/2015/06/25/nyregion/new-york-city-public-housing-units-remain-empty-unnecessarily-audit-finds.html>.

Albert L. Nichols and Richard J. Zeckhauser. Targeting transfers through restrictions on recipients. *The American Economic Review*, 72(2):372–377, 1982.

NLIHC. The long wait for a home. National Low Income Housing Coalition, Housing Spotlight Volume 6, Issue 1, 2016. URL <http://nlihc.org/article/housing-spotlight-volume-6-issue-1>.

Edgar O. Olsen and Jeffrey E. Zabel. United States housing policy. In J. Vernon Henderson and William C. Strange Gilles Duranton, editor, *Handbook of Regional and Urban Economics*, volume 5 of *Handbook of Regional and Urban Economics*, pages 887–986. Elsevier, 2015.

James E. Rosenbaum. Changing the geography of opportunity by expanding residential choice: Lessons from the Gautreaux program. *Housing Policy Debate*, 6(1):231–269, 1995.

James Schummer. Influencing waiting lists. *Mimeo*, 2016.

Neil Thakral. Matching with stochastic arrival. In *Proceedings of the Sixteenth ACM Conference on Economics and Computation*, EC '15, pages 343–343, New York, NY, USA, 2015. ACM. ISBN 978-1-4503-3410-5. doi: 10.1145/2764468.2764483. URL <http://doi.acm.org/10.1145/2764468.2764483>.

Neil Thakral. The public-housing allocation problem: Theory and evidence from Pittsburgh. *Mimeo*, 2016.

Jos N. Van Ommeren and Arno J. Van der Vlist. Households' willingness to pay for public housing. *Journal of Urban Economics*, 92:91–105, 2016.