Housing Affordability Intervention

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1 Introduction

We plan to start our analysis with a framework for analyzing public sector interventions aimed at improving housing supply and affordability. The framework will focus on measuring how each dollar spent on a public sector intervention affects the development of housing. We will use the framework to compare two alternative policies: direct project subsidies, and neighborhood enhancements such as investments in schooling or reductions in crime. Our hypothesis is that neighborhood enhancements are a more effective way to stimulate housing supply. Intuitively, neighborhood disamenities, such as violent crime, represent a housing supply restriction similar to physical and regulatory restrictions (Saiz (2010); Gyourko, Hartley, and Krimmel (2021)). While some location-specific characteristics or construction constraints are hard to change, crime can arguably be mitigated. Crime mitigation would have a particularly high value in neighborhoods that otherwise would have good amenities, such as proximity to the city centers.

The model delivers a key implication that we plan to test in the data: the NPV of a development project depends on neighborhood amenities, such as its crime rate. In our empirical work, we want to focus on how crime-reduction efforts can increase the likelihood of real estate development. In the model, three effects link crime to project NPV. First, NPV is affected by the rents homeowners are willing to pay, which are lower in areas with high crime. Second, the sale price of the developed property is also lower in such areas. Third, land prices—generally higher in neighborhoods with low crime—affect the overall NPV. This relation between crime and project NPV creates the possibility for public–private partnerships in which the public sector commits to improving safety in certain areas. While the model suggests a theoretical relationship between crime rates and the NPV of development

projects, it ultimately remains an empirical question whether development NPV is indeed a function of neighborhood quality.

We intend to use two natural experiments to investigate the connection between neighborhood crime rates and a developer's NPV. If the relationship implied by our model holds, we would expect project-based subsidies to have a more modest effect on sites in high-crime areas. To test this, we will examine how the impact of subsidies on development varies with preexisting crime.

One potential approach is based on LIHTC (Low Income Housing Tax Credit) generosity (Freedman and Owens (2011); Baum-Snow and Marion (2009); Soltas (2024)). The LIHTC program is more generous for projects located in Qualified Census Tracts (QCTs). A given location may lose or gain qualified status over time for various reasons. Status is based on the income of local households relative to Area Median Gross Income (AMGI), and can therefore vary over time based on changes in (measured) income of local households relative to the area median. Soltas (2024) argues that standard errors are sufficiently large that sampling error can explain a large share of census tract switching. Our intention is to use HUD's LIHTC database to estimate how the effect of LIHTC generosity on development depends on the level of local crime.

We will measure crime at the census tract level using data from city police departments. We have already assembled this dataset for Houston and intend to do this for other major cities. We will likely focus on variation in crime within cities given that crime levels may not be directly comparable across datasets. We can also use Uniform Crime Report data at the county level from ICPSR. These data may be more comparable across cities, but are much less granular.

We also plan to explore the effect of Opportunity Zone (OZ) designation on building permits. Established under the 2017 Tax Cuts and Jobs Act, the OZ program aims to spur "economic development" in "distressed communities" by providing federal tax incentives for equity investments in designated low-income census tracts. Using a difference-in-differences specification, Duarte, Umar, and Yimfor (2024) show that OZ designation leads to a significant increase in construction permits. Building on this, we estimate how the effects of OZ designation interact with local crime. Our model implies that OZ designation has a smaller effect in areas with high crime rates.

While our analysis is related to papers studying the effects of LIHTC de-

velopments on crime and other local outcomes (such as Freedman and Owens (2011); Baum-Snow and Marion (2009)), our question is distinct. Rather than looking at effects of development on site quality, we are interested in how pre-existing site quality affects developers' incentives. That is, is it more efficient for interventions to target site quality directly, rather than subsidize specific development projects.

Finally, we plan to use census tract supply elasticity measures from Baum-Snow and Han (2024) to examine the cross-sectional relationship between crime and housing supply elasticity within cities (conditional on other census tract characteristics, such as distance from the city center).

2 Model Outline

2.1 Developers

We consider the problem of developing a property with two characteristics, building quality (Q^b) and site quality (Q^s).

We start with the assumption that market rent given these characteristics ultimately reflects their utility value to households. Within the same market area, households are free to optimize across locations, and so differences in quality and amenities are factored into rents according to how much the marginal household values them (Fisher, Pollakowski, and Zabel, 2009). For property i in location j, the rent is given by:

$$\ln R_{i,j} = \beta_0 + \beta_1 \ln Q^b_{ij} + \beta_2 \ln Q^s_j \tag{1}$$

The coefficients β_0, β_1 and β_2, reflect the household's preferences for building and site quality (assuming Cobb-Douglas utility).

Developers build new housing only when the net present value (NPV) is greater or equal to zero. Developers care about the rent the finished property can generate. The developer can choose the building quality Q^b, and also the site location j. From Equation 1, the landlord receives lower rents for a property on a less desirable site, even though construction costs are the same (if not higher).

Specifically, the NPV of a development project i in location l is given by:

$$NPV(Q^b, R_{i,j}, Q^s_j) = \frac{V}{1+HR} - \text{Project Cost} - \text{Land Cost} \tag{2}$$

where V is the value of the completed and stabilized development, and HR is the hurdle rate required for project viability. The Project Cost includes all construction and related expenses, while Land Cost accounts for the cost of acquiring the development site.

The variables V, Project Cost, and Land Cost depend explicitly on the rent $R_{i,j}$ that households pay, as well as on the structural quality Q_i^b and site quality Q_j^s. Consequently, the Net Present Value (NPV) of a project depends directly on $R_{i,j}$, Q_i^b, and Q_j^s. We assume that developers take the market rents $R_{i,j}$, the hurdle rate (HR), land cost, and project cost as given. Developers can choose the quality of construction Q_i^b, but they treat the neighborhood's quality Q_j^s as fixed.

Given fixed costs of construction, it may makes sense for developers to develop higher-quality sites. In this paper, we will take crime as an example. Most households would require substantially discounted rent to live in a high crime location. However, it may not be any cheaper to construct housing in high crime locations (in fact project costs are arguably more expensive). These projects may therefore be simply unprofitable for developers. This is unfortunate, as high crime neighborhoods may not have intrinsically poor amenities. In fact, many are relatively close to city centers.

We also speculate that the presence of high crime areas in a city lowers that city's housing supply elasticity. While these locations already have housing, the housing stock is often aging and in need of redevelopment. Given the wedge that crime introduces between households' willingness to pay and the rents required to make development attractive, crime essentially reduces the supply of developable land, in a similar many to geographic and regulatory constraints.

2.2 Public Sector Intervention

The public sector may intervene to make development profitable, potentially increasing housing supply and improving affordability. There are different types of interventions and they have different effects. For simplicity, we omit the subscripts i and j in the following equations.

2.2.1 Subsidies

Subsidies can be used to set the developer's NPV to zero by covering the developer's NPV shortfall. Define subsidy spending as $T_{\text{Subsidies}}$. The NPV

of the project after accounting for subsidies is:

$$\text{Post Intervention NPV} = NPV(R, Q^b, Q^s) + T_{\text{Subsidies}} \tag{3}$$

The effectiveness of subsidies can be measured by its marginal impact on the project's Post Intervention NPV:

$$\frac{\partial \text{Post Intervention NPV}}{\partial T_{\text{Subsidies}}} = 1 \tag{4}$$

That is, every tax dollar spent on subsidies results in a dollar-for-dollar impact on the project's NPV.

2.2.2 Neighborhood Quality Interventions

Another intervention strategy such as improving location amenities Q^s may yield a larger impact on affordability. While developers have no control over neighborhood quality, the public sector can influence Q^s through interventions targeting crime or schooling in a given neighborhood. In general:

$$\frac{\partial \text{Post Intervation NPV}}{\partial T_{Q^s}} = \frac{\partial NPV}{\partial Q^s} \times \frac{\partial Q^s}{\partial T_{Q^s}} \tag{5}$$

Since the derivative above is potentially greater than one, public interventions aimed at enhancing locational amenities (such as schools and safety) may improve affordability more effectively than direct financial subsidies.

To exemplify how interventions on crime or schooling can actually help in housing affordability, let's define $NPV(R, Q^b, Q^s)$ in detail. To do so, define some key variables involved in real estate development evaluation:

- $L(Q^s)$: Land cost, dependent on site quality.
- $Area$: Area of the developed project
- VR: Vacancy rate.
- OER: Operational expense per unit of developed area.
- $Cap(Q^b, Q^s)$: Going-out cap rate, a function of building and site quality.

- $C(Q^b)$: Project cost per unit of developed area, dependent on building quality.

Using the definitions above, we have the net operating income (NOI) of the new and stabilized building at rent given at the maximum affordable rent.

$$NOI = R \times Area \times (1 - VR - OER) \tag{6}$$

The exit value of the project, based on the going-out cap rate, is:

$$V = \frac{NOI}{Cap(Q^b, Q^s)} \tag{7}$$

The project cost is:

$$\text{Project Cost} = C(Q^b) \times Area \tag{8}$$

Consider, for instance, Q_s as the crime rate in a given area. In this case, β_s is negative, as renters are willing to live in high-crime neighborhoods only with substantial discounts in rents. The public sector can intervene to improve safety, which may positively impact the NPV of housing development for a given group. To see this, substitute Equations 1, 6, 7, and 8 into Equation 2 and take the derivative of the NPV above with respect to Q^s:

$$\begin{aligned}\frac{\partial \text{NPV}}{\partial Q_s} = &\frac{\beta_s \times R \times Area \times (1 - VR - OER)}{Q_s(1 + HR) \times Cap(Q_s)} \\ &- \frac{R \times Area \times (1 - VR - OER)}{(1 + HR) \times Cap(Q_s)^2} \times \frac{\partial Cap}{\partial Q_s} \\ &- \frac{\partial L}{\partial Q_s}\end{aligned}$$

This derivative captures the impact of changes in the crime rate Q^s on the developer's net present value. The first term is negative because β_s is negative. Thus, a decrease in crime incentivizes development by allowing developers to charge higher rents. The second term is also negative under the assumption that cap rates are higher in high-crime areas; it captures how investors are willing to pay higher prices for buildings in safer neighborhoods. Finally, the third term is positive if land prices in high-crime areas are lower. This implies that reducing crime can drive up land costs, potentially discouraging development.

This framework provides a method for the public sector to analyze interventions that encourage housing development. Specifically, the marginal cost of one dollar in subsidies is one, while the marginal benefit to the developer's NPV is also one dollar. In contrast, a dollar spent on reducing crime may have a greater impact on the NPV of housing development.

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