

# APARTMENTS OR MANSIONS

## THE EFFECT OF CONSTRAINTS ON HOUSING DISTRIBUTION

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### INTRODUCTION

Affordable housing is important for the development of a community, as without it, new residents are unlikely. In this project, I attempt to identify conditions under which affordable housing will be built by housing developers.

Consider yourself in the shoes of a housing developer. You can build many different types of homes, but each comes with its upsides and downsides. Some cost more to make, some take more land, and some just aren't going to sell. All these things must be taken under consideration as you try to maximize your profit.

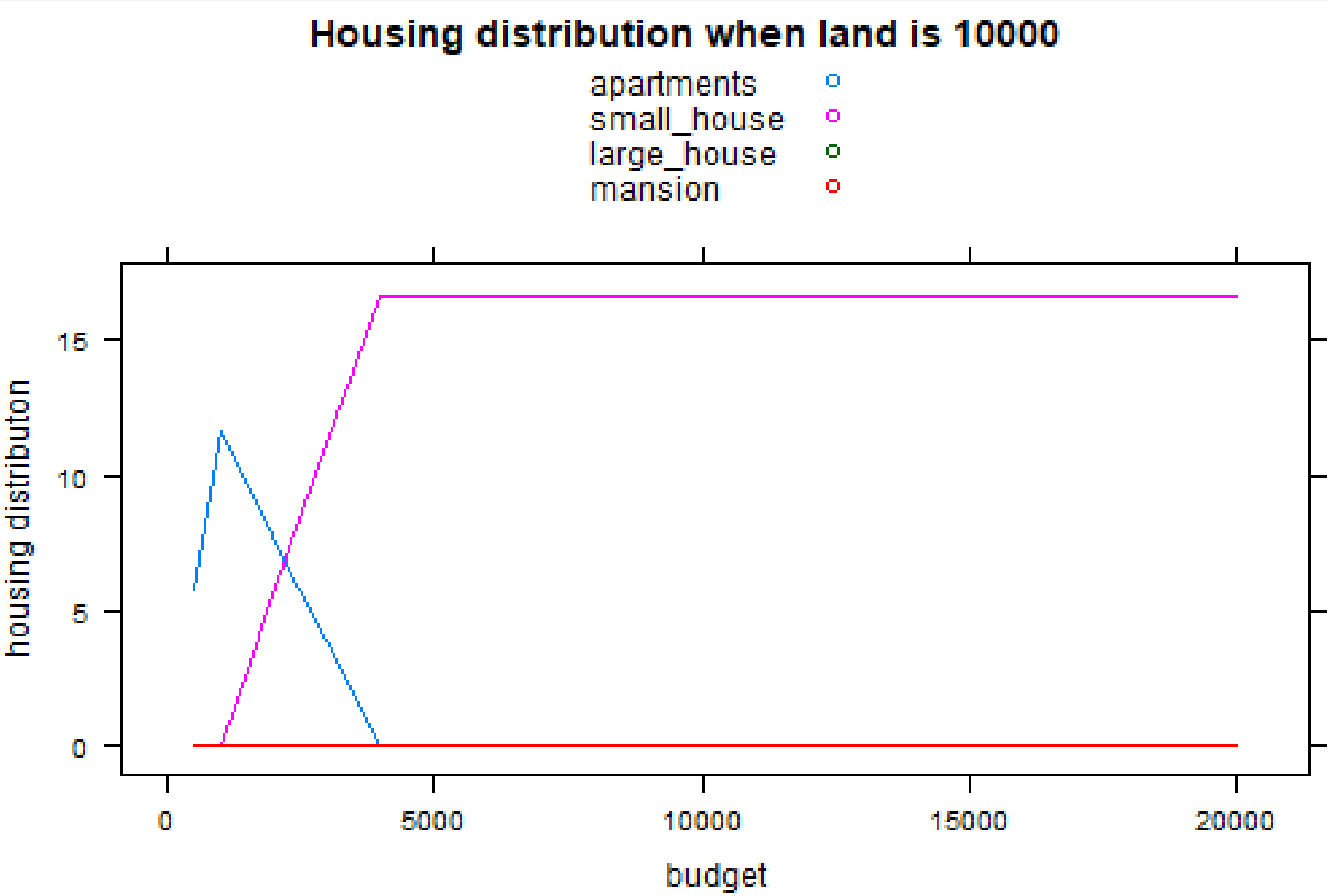
### PROBLEM

Under what budget and land constraints will a housing developer build the most affordable housing?



Small Houses in Denver

### RESULTS



### METHODS

The main problem the housing developer faces is what distribution of types of housing to build in order to maximize profit. Linear Programming is a mathematical modeling technique best suited for solving constrained optimization problems like this.

Using real-world data, I constructed a linear programming model for the problem facing the developer. I then adjusted the land and budget constraints to determine how this effects the optimal housing distribution. I noted that two different effects occurred based on the amount of land available, which I have charted and analyzed here.

### ANALYSIS

When faced with a small budget, and a small amount of land, a developer would build apartments because they have the smallest area. However, when the budget increases, a developer would profit more to build small houses, which cost a little more than apartments and are a little bigger, yet sell for more.

When a larger amount of land is available to the developer, the emphasis shifts. Now, apartments are still built when the budget is low, but we have enough room to continue building as many apartments as demand allows when the budget grows. Also, large houses are built, which are more profitable than small houses. They take up more land, however, which is why we did not build them when little land was available.

### POLICY PROPOSAL

Based on my findings, it seems the best way to ensure affordable housing (apartments and small houses) get built in Denver, is to encourage smaller developers to build in Denver. These smaller developers will be more restricted in their budget and available land, and so, by my research, will build apartments and small houses to maximize their profits.



Mansion in Denver

### BIBLIOGRAPHY

"Cost to Build." *Fixr*, 2018, [www.fixr.com/costs/](http://www.fixr.com/costs/). Data for costs and land sizes of different types of housing

"Redfin Data Center." *Redfin*, 2018, <https://www.redfin.com/blog/data-center>. Data for profit and demand of different types of housing

Schroeppel, Ken. "Denver's Single-Family Homes by Decade: 1880s." *DenverUrbanism Blog*, 13 Feb. 2012, [denverurbanism.com/2012/02/denvers-single-family-homes-by-decade-1880s.html](http://denverurbanism.com/2012/02/denvers-single-family-homes-by-decade-1880s.html). Picture

Shaw, Lisa. "What Does a Real Estate Agent DO For All That Money?" *Life in Denver*, 26 Sept. 2012, [lifewithlisashaw.blogspot.com/2012/09/what-does-real-estate-agent-do-for-all.html](http://lifewithlisashaw.blogspot.com/2012/09/what-does-real-estate-agent-do-for-all.html). Picture