1 Introduction

In the United States, parental input decisions differ between more- and less-educated parents. In particular, less-educated parents tend to allocate less time to parent-child activities and reside in lower-quality neighborhoods, two parental inputs that shape children's economic opportunities in adulthood.[1] As less-educated parents tend to work fewer hours than more-educated parents, the primary explanations for these differences are that they have tighter budget constraints, have higher attachments to low-quality neighborhoods, or are less effective at teaching their children.[2] Since Cunha et al. (2013), a growing strand of the empirical literature documents socioeconomic differences in beliefs about the relevance of parental inputs for later outcomes, offering an additional explanation for the socioeconomic gap in parental input decisions.

In this paper, I propose a novel learning mechanism that can lead to socioeconomic differences in parental beliefs. The key elements are young adults learning through the observations of older people *within* their neighborhood but being prone to erroneous inferences by imperfectly correcting for selection induced by residential segregation. Social learning—learning through interactions and observations of others—is a central learning channel, and selection neglect—the imperfect ability to correct for selection—an experimentally documented cognitive bias.[3]

I incorporate the learning mechanism in a quantitative spatial and overlapping generations model of human capital accumulation and parental decisions. The model features heterogeneous and altruistic parents who choose two parental inputs: the quality of their neighborhood and parental time. The technology of skill formation assumes children's fu-

[1] The literature shows parental time is a prime factor influencing child skill formation (Heckman and Mosso, 2014) and documents the difference in parental time between more- and less-educated parents in the United States and elsewhere (see Doepke et al. (2023) for a review). Chetty and Hendren (2018a) estimate neighborhoods' causal effect on children's development in the United States.

[2] See Guryan et al. (2008) for a discussion.

[3] Frick et al. (2022) theoretically show that selection neglect combined with strategic interactions can lead to stable equilibria with polarization, and Enke (2020) experimentally documents selection neglect bias. This cognitive bias is sometimes called "assortativity neglect."

ture human capital depends on parental inputs and human capital and, importantly, on an idiosyncratic and unobserved ability shock, which can be interpreted—to some extent—as luck. Motivated by Cunha et al. (2013)'s evidence, agents are unaware of the value of the elasticity parameter governing parental inputs' relevance for future human capital. They form beliefs about it through social learning before making parental decisions. Specifically, young agents infer the value of the elasticity parameter by observing current human capital and past parental inputs and human capital among adults in their neighborhoods. However, with a positive selection neglect parameter, young agents cannot fully comprehend selection on the unobserved ability shocks and, with selection on those unobservables, are prone to erroneous inferences. For example, suppose local ability shocks are higher than young agents perceive. In that case, young agents underestimate local shocks. They will wrongly attribute part of the local human capital due to local shocks to parental input decisions, overestimating the elasticity parameter value. Conversely, if local ability shocks are lower than young agents perceive, young agents will tend to underestimate the relevance of parental inputs. As a result, parents differ in their family history, their human capital, and education status—which influence their budget, labor supply, and time constraints—and potentially, their beliefs. Given the model structure, perfectly competitive land developers, and the social learning process, there are multiple critical equilibrium objects: the distribution of human capital and education, neighborhood choices and local rents, and parental beliefs, which are endogenously determined as fixed points.

The model is solved numerically and calibrated to match a set of critical moments from several United States representative datasets. It comprises ten quality-ranked neighborhoods and matches segregation and family earnings dispersion in the average commuting zone in the United States computed from the ACS 2000 and NHGIS 2000 datasets.[4] In addition, it targets causal estimates of neighborhood effects on children's future income and social

[4]Ruggles et al. (2023); Manson et al. (2022). I proxy neighborhood "quality" with neighborhoods' median household income that correlates with places' effects measured by Chetty and Hendren (2018b) but also with low poverty, crime, and high-performing schools.

mobility from the literature.[5] A key challenge is the lack of data on parental beliefs across neighborhoods, precluding their use as targeted moments. To overcome this difficulty and discipline the model's parental beliefs, I employ parental time and neighborhood quality choices across socioeconomic groups in the ATUS and Add Health data.[6]

The calibration results indicate a positive parameter for selection neglect bias, suggesting that residential segregation creates information friction that drives heterogeneous parental beliefs and distorted parental decisions. In equilibrium, these endogenous parental beliefs vary across socioeconomic groups and persist within families, leading to a self-fulfilling equilibrium with a stable distribution of beliefs. The underlying mechanism is as follows: equilibrium residential choices are partly influenced by unobserved ability shocks, which affect parents' human capital and, consequently, their budget constraints. This creates a positive correlation between these shocks and neighborhood quality, which young adults fail to fully perceive. Consequently, young adults tend to underestimate the relevance of parental input in low-quality neighborhoods and overestimate it in high-quality ones. In low-quality neighborhoods, young adults, therefore, receive low levels of parental input, dampening their future income, and low signals regarding the relevance of parental input, dampening their beliefs. As adults, they are likely to choose similarly low-quality neighborhoods, perpetuating this cycle for their children. The opposite occurs in high-quality neighborhoods. As a result, in equilibrium, low-income parents tend to under-invest in their children, while high-income parents tend to over-invest in them. Without assuming preference heterogeneity, the calibrated model explains why many parents who grew up in disadvantaged neighborhoods choose similar environments for their children and why college-educated parents, despite longer working hours, allocate more time to their children's education than non-college-educated parents.

First, I use the calibrated model to explore the channel of parental beliefs quantitatively. Results are two-fold: (i) heterogeneous parental beliefs have sizable effects on the economy

[5]Estimates are taken from estimated by Chetty and Hendren (2018b) and Chetty et al. (2014)
[6]Hofferth et al. (2020) and Harris et al. (2019).

and explain a large share of the socioeconomic gap in parental input choices, and (ii) a perfect information version of the model can only replicate the data by imposing sizable heterogeneous preferences across childhood neighborhoods and education status. To understand how heterogeneous parental beliefs affect the economy, I set the selection neglect parameter to zero, ensuring perfect information among parents, and solve for the new steady state. It improves low-income parents' input by 12.3% and decreases those of high-income parents by 1.4%.[7] The intergenerational rank-rank coefficient, a negative measure of social mobility, decreases by 15.4%, and the Gini index of income, a measure of inequality, by 3%, improving aggregate welfare by 4.9%.

Unsurprisingly, re-calibrating the model while setting the selection neglect parameter to zero results in a poor fit of all the now non-targeted parental behavior moments. To maintain the same set of targeted moments as in the baseline, I modify the model by replacing endogenous parental beliefs with preference heterogeneity, incorporating quadratic moving costs and education-specific parental time disutility parameters. Despite these adjustments, this alternative model still fails to capture untargeted intergenerational residential mobility moments. Only by introducing substantial heterogeneity in preferences for childhood neighborhood types does the alternative model with perfect information fit all moments. However, such large preference heterogeneity is difficult to empirically support. There is no empirical evidence of socioeconomic differences in parental time disutility parameters or for stronger preferences for deprived neighborhoods. On the contrary, when comparing low-income families randomly incentivized to move to higher-quality neighborhoods, the moving to opportunity literature tends to find higher satisfaction rates and willingness to stay among families living in higher-quality neighborhoods.[8]

Second, I use the calibrated model to study the effects of housing vouchers on the United

[7] These figures are consistent with the estimates from Cunha et al. (2013), who elicit the beliefs of disadvantaged African American mothers regarding the elasticity of child development with respect to parental investments. Their findings suggest that shifting median expectations to the lowest estimated elasticity would boost parental investments by 3.6% to 24.3%, with an average increase of 11.6%.

[8] See for instance Bergman et al. (2024).

States economy. Two key model frictions call for policy interventions: first, a friction common to overlapping generation models, parents cannot borrow against their children's future earnings, and second, model-specific frictions, information frictions arising from residential segregation. In the first step, I conduct three field experiments within the model and compare the partial equilibrium effects with empirical estimates from Jacob et al. (2015); Chetty et al. (2016); Bergman et al. (2024). The housing voucher in the model covers the difference between 16% of family income and 60% of median rents.[9] The first experiment targets young adults with income below the tenth percentile, the second adds information about neighborhood quality's impact on children's future human capital, and the third focuses on young adults with income below the third percentile. Although the model predicts higher mobility than observed in empirical studies, likely due to the younger age of the recipients, the partial equilibrium effects of correcting beliefs and improving neighborhood quality align with the empirical literature's estimates.

When scaling up the housing voucher policies to all families below the tenth percentile of the income distribution, general equilibrium effects depend on the policy's effectiveness in reducing residential segregation. I evaluate ten types of vouchers that cover the difference between a fraction Γ_y of income and a fraction Γ_r of the rent in each neighborhood.[10] The more effectively the policy reduces segregation, the greater the resulting improvements in welfare, income, and social mobility, although this would come with a longer transition to the new steady state. Conversely, a policy that only slightly reduces segregation could negatively impact both income and welfare—while potentially enhancing social mobility. Importantly, replacing endogenous parental beliefs with large preference heterogeneity would lead to the opposite conclusion.

[9] To align with historical data, I ensure that the model's housing voucher policy matches the total cost of the historical housing voucher program, achieving similar mobility rates for eligible households in partial equilibrium.

[10] To fix the policy features, specifically the fractions Γ_r and Γ_y, I impose two constraints: (i) the local rent limit must lie between 60% and 90% of the median rent, i.e., $\Gamma_r \in [0.6, 0.9]$, and (ii) in partial equilibrium, the rent in the lowest-quality neighborhood faced by an average eligible household should match the rent level under the historical housing voucher program.

This paper contributes to the macroeconomics literature that studies household heterogeneity and its consequences for aggregate outcomes.[11] It builds upon the literature pioneered by Aiyagari et al. (2002); Becker and Tomes (1986); Loury (1981) that models human capital accumulation and parental input decisions. Many subsequent analyses use this framework in quantitative models to study the consequences of parental input decisions for macroeconomic outcomes.[12] This paper not only analyzes the consequences of parental decisions for macroeconomic outcomes but also introduces the environment as a possible driver of parental decisions' heterogeneity. In that sense, it closely relates to Agostinelli et al. (2024), who study parental behavior responses to changes in peer quality in the United States, and to Kim et al. (2024), who rationalize very high education spending in South Korea through a status externality in which parents value their children's education relative to the education of other children. While the concern for status seems less relevant in the United States than in East Asia, the model includes direct peer quality effects and its key novel ingredient, social learning within neighborhoods.[13]

This paper connects residential segregation and social mobility by introducing social learning in a spatial model, contributing to the quantitative spatial economics literature.[14] Several recent quantitative studies underline the relationship between residential segregation and inequality through direct peer effects or local school funding (see, for instance, Chyn and Daruich (2022); Eckert et al. (2019); Fogli and Guerrieri (2019); Gregory et al. (2022)).[15]

[11] See Quadrini and Ríos-Rull (2015); Krusell and Smith (2006); Guvenen (2016); Heathcote et al. (2009) for surveys.

[12] See, for instance, Daruich (2018); Fuchs-Schündeln et al. (2022); Jang and Yum (2023); Kim et al. (2024); Lee and Seshadri (2019); Restuccia and Urrutia (2004); Yum (2023). The consequences of heterogeneity in parental time for social mobility have been studied by Yum (2023), who built a heterogeneous-agent overlapping-generations model calibrated to the United States.

[13] Quantitative macroeconomic papers that include parental beliefs in human capital accumulation models are rare. Two major exceptions are Fogli and Veldkamp (2011) and Fernández (2013), which rationalize the change in female labor supply over time through a convergence of beliefs toward the truth. In other sub-areas of macroeconomics, such as finance, individuals' beliefs are considered critical elements in explaining agents' investment behavior (see, for instance, Adam et al. (2017)).

[14] For a review, see Redding and Rossi-Hansberg (2017).

[15] For instance, after documenting a simultaneous increase in income inequality and residential segregation by income in the United States, Fogli and Guerrieri (2019) develop a quantitative model with peer effects and neighborhood choices, with which they find that following a skill premium shock in the 1980s, segregation contributes to 28% of the increase in inequality. Gregory et al. (2022) incorporate a homophily bias in a

Adding to this literature, this paper endogenizes residential sorting and social learning, resulting in heterogeneous valuations of neighborhood amenities—through parental beliefs—, contributing to the growing literature that considers endogenous neighborhood amenities.[16]

The notion that a neighborhood's demographic composition can influence educational outcomes through social learning has long been discussed (see, for instance, Durlauf (2011)). This paper's contribution lies in developing and calibrating a quantitative model of human capital accumulation that incorporates a social learning process, resulting in a self-fulfilling equilibrium with systematic bias in beliefs.[17] The social learning process primarily builds on Fogli and Veldkamp (2011), who explain geographical and historical variation in the increase of female labor supply by a change in local beliefs while abstracting. Nonetheless, the authors abstract from residential decisions and, hence, systematic and persistent bias in beliefs that this model generates. In a different context, abstracting from residential segregation, Piketty (1995) develops a self-fulfilling equilibrium of effort and social mobility. The author posits that individuals' past experiences shape their beliefs about the relevance of effort for upward mobility, which in turn affects their effort levels. Heterogeneous biased beliefs are stable if they lead individuals to exert effort levels that result in the believed probabilities of upward mobility. Similarly, my model generates a self-fulfilling equilibrium across generations, as parents' residential decisions, on average, provide confirming signals to their children.

Finally, since Cunha et al. (2013), a large empirical literature documents heterogeneous parental beliefs about the technology of skill formation. There is a relative consensus on the fact that beliefs influence parental decisions and differ by socioeconomic groups, while the technology of skill formation does not.[18] Social learning is a central channel through

neighborhood choice model with local school funding and can explain 80% of the Black-White college gap in the St. Louis metro area.

[16] See for instance Ahlfeldt et al. (2015); Bilal (2023); Diamond (2016).

[17] Roemer and Wets (1994) and Streufert (2000) are two studies that theoretically link beliefs and segregation, although in static settings. While Streufert (2000)'s model suggests the lack of high-income role models could depress schooling years in low-quality neighborhoods, Roemer and Wets (1994) assumes perfect segregation and generate biased beliefs assuming agents linearly extrapolate the actually convex relationship between schooling and the labor market outcomes.

[18] See for instance Attanasio and Kaufmann (2014); Attanasio et al. (2019b); Boneva and Rauh (2016, 2018); Belfield et al. (2019); Caucutt et al. (2017); Dizon-Ross (2019); Jensen (2010); Kaufmann (2014);

which people learn about technologies when outcomes are not immediately observable—by observing the history and outcomes among their older peers (Frick et al., 2022). The empirical literature provides examples of social learning in various contexts. It describes situations in which heterogeneous beliefs arise due to the variation of who is observed.[19] In particular, several papers argue that the lack of successful role models among low-income children's older peers partly explains low levels of motivation and effort.[20] The behavioral and psychological literature empirically documents this bias, called selection neglect (Enke, 2020): we are prone to erroneous inferences because we cannot always correct for selection on unobservables.

The remainder of the paper proceeds as follows. Section 2 presents the spatial overlapping generations model. Section 3 explains the model calibration and presents some quantitative results. Section 4 uses the model for policy analysis, and Section 5 concludes.

2 The Model

Consider one commuting zone with a finite number of heterogeneous neighborhood types. The economy is populated by a continuum of heterogeneous families composed of one parent and one child. Time is discrete, and each agent lives for two periods: childhood and parenthood. Parents choose two parental inputs that affect their child's adulthood human capital: in which type of neighborhoods to raise their child and how much time to spend on their child's education—parental time. One of the key and novel model mechanisms resides in parents' imperfect information about the technology of skill formation and the social learning process.

Wiswall and Zafar (2021)). One exception is Attanasio et al. (2019a) in the UK who does not find a socioeconomic gradient in beliefs.

[19] In rural Ghana for instance, Conley and Udry (2010) find that the use of fertilizer by small farmers is boosted by the observation of surprisingly successful peer farmers.

[20] See for instance Alan et al. (2019); Algan et al. (2020); Breda et al. (2023); Guyon and Huillery (2020); Nguyen (2008). Recently, Chetty et al. (2022) find that the share of high socioeconomic status friends in a ZIP code best predicts upward income mobility in the United States and propose social learning as one likely explanation.