How Market Structure Shapes Entrepreneurship and Inequality*

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Abstract

The US economy has experienced a secular increase in markups, declining entrepreneurship rates and increasing income inequality since the 1980s. To reconcile with these secular trends, I propose a theory of entrepreneurial choice with strategic competition among heterogeneous agents. Agents' decision to become either an entrepreneur or a worker is directly shaped by their competitors. I quantify the model for the period between 1988 and 2018 and find that technological change in the form of both higher fixed costs and more dispersed technologies, as well as a less competitive market structure can explain these trends. Viewed through the lens of the model, the primary factor underlying these secular changes is the increasing dominance of highly productive entrepreneurs who inhibit the entry of other productive agents, resulting in fewer entrepreneurs, higher markups and rising income inequality.

Keywords. Market Structure. Entrepreneurship. Inequality. Oligopoly. Markups.

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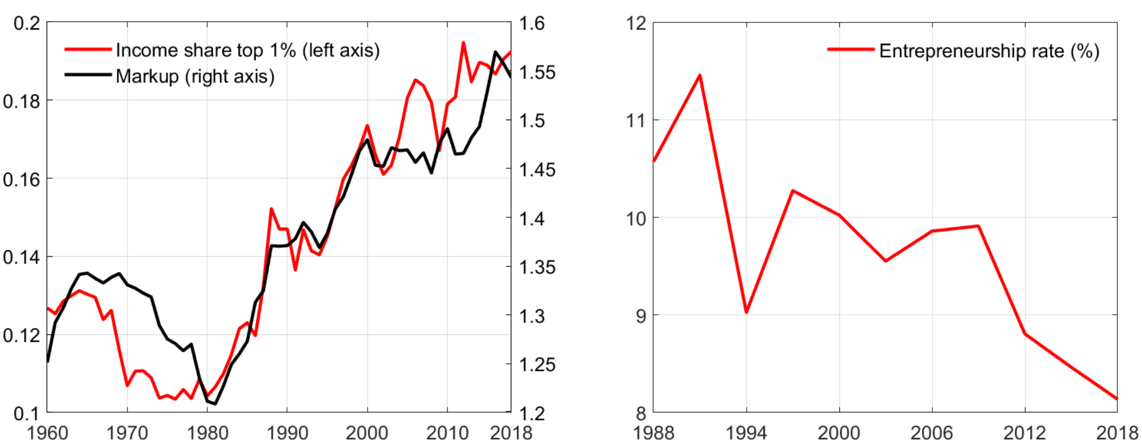
1 Introduction

The US economy has experienced significant long-term changes since the 1980s. There has been a sharp rise in top income inequality (Piketty and Saez (2003), Saez and Zucman (2020), Kuhn, Schularick, and Steins (2020), Kaymak, Leung, and Poschke (2020)). For instance, the share of income of the top 1% increased from 10.4% in 1980 to 19.25% in 2018.[1] While a majority of these top income earners are entrepreneurs or active owner-managers of private businesses, a significant part of the increase in top incomes come from the rise in their business incomes (Smith, Yagan, Zidar, and Zwick (2019), Zidar (2022)). However, rather surprisingly, as these entrepreneurs at the top of the distribution prosper, it coincides with an economy-wide decline in entrepreneurship rates (Kozeniauskas (2018), Salgado (2020), Jiang and Sohail (2023)). What is behind the rising income of top entrepreneurs, even as the overall entrepreneurship rate decreases? In this paper, I contend that the crucial factor to consider is the changing landscape of competition within the US economy.

Figure 1: Markups, Income Inequality and Entrepreneurship



(a) Income Share top 1% and Markups

(b) Entrepreneurship rate

Note : Panel (a) shows the evolution of top income inequality from WID (red), and the evolution of markups (black) from Compustat. Panel (b) shows the entrepreneurship rates in the US using the Survey of Consumer Finances (SCF).

Over the same period, the market structure of the US economy has been noticeably changing, showing signs of reduced competitiveness. Recent work by De Loecker, Eeckhout, and

[1]Source : World Inequality Database.

Unger (2020) indicate that firms have gained more pricing power, as evidenced by increasing markups.[2] At the same time, looking at the entire US economy and not just large publicly traded firms Autor, Patterson, and Van Reenen (2023) find an accompanying increase in product market concentration both for local and national product markets. Both these observations suggest a higher degree of product market power in the US economy. To see how these secular trends have evolved, Figure (1a) shows the evolution of top income inequality and markups. Both top income inequality and markups decline from the early 1960's until 1980, but have sharply increased since then, accompanied by a decline in entrepreneurship rate since the late 1980's as shown in Figure (1b).[3]

As a result this paper asks two key questions; first, how does the nature of competition in an economy shape entrepreneurial choice and what are its implications for inequality? In essence, does the nature of product market competition, whether competitive, monopolistic, or oligopolistic, have an impact on people's entrepreneurial choice? Second, study the evolution of the key structural forces and quantify what their relative contribution is in shaping (i) a less competitive economy with increasing markups, (ii) declining entrepreneurship rates, and (iii) higher levels of income inequality ?

To evaluate these questions, the paper develops a novel model of occupational choice where agents decide to become either an entrepreneur or a worker as in the models in Roy (1951), Lucas (1978) and Jovanovic (1982). I build on these canonical models and incorporate a key ingredient: market structure. The notion that the characteristics of the market shape entrepreneurial choice is also realistic. For instance, for the individual planning to open a restaurant, the primary focus is on the local competition within the culinary landscape of the neighborhood. In contrast, the individual starting a software company is more concerned with competitors within the software industry. This comparison emphasizes how the choice between becoming an entrepreneur in the restaurant industry versus the software industry is significantly influenced by the scope and scale of competition each prospective entrepreneur needs to consider.

Agents strategically compete in two stages, first in their occupational choice and thereafter

[2]They find an increase in the markups of both large publicly traded firms and manufacturing firms using Compustat and the Census of Manufacturing data, respectively.

[3]In Appendix (D.3) I show that the evolution of markups also coincides with the evolution of wealth inequality in the US.

the agents who choose to become entrepreneurs strategically compete in oligopolistic product markets. Such a framework allows us to study entrepreneurial choices with rich heterogeneity in markups, a crucial ingredient in explaining the rise of markups in the US economy.[4] Yet the equilibrium market structure is endogenous; all else equal an economy with many agents within a market choosing to become entrepreneurs will be more competitive than than one with only few a entrepreneurs.

The novel insight of the model is that an agent's occupational choice is directly shaped by the other competitors in their market. Both the number of agents in a market as well as their type distribution shapes entrepreneurial choice. For instance, an agent with a certain entrepreneurial productivity may not become an entrepreneur if their competitors are much more productive. On the other hand, this agent with the same productivity would choose to be an entrepreneur if their competitors are relatively less productive. To gain some perspective, think of a person endowed with a certain productivity who is paired with some highly productive agents in the e-commerce industry (say Jeff Bezos), in that case this person would choose to be a worker. However, if this person with the same productivity was in an industry where the other potential entrepreneurs were relatively less productive, they would instead choose to be an entrepreneur. As a result, a key feature of this framework is entry deterrence by highly productive agents. This leads to a lower entrepreneurship rate in their market accompanied with high levels of market power and concentration.

The model features a rich set of strategic interactions among heterogeneous agents, both in occupational choice and in the product market. It addition, it also encompasses all possible market structures (i) Monopoly (ii) Duopoly (iii) Oligopolistic competition (iv) Monopolistic competition and (v) Perfect competition. As a result the model of entrepreneurial choice presented in this paper also nests the canonical model of Lucas (1978) as a special limit case.

This novel model of entrepreneurial choice is the first key contribution of the paper, which serves as a unifying framework to study endogenous occupational choice, market power and inequality in the presence of strategic competition among heterogeneous agents. Studying the evolution of these three secular trends in a unifying framework also leads to new insights. This

[4] While there is sharp rise in markups since the 1980's, it is mainly driven by the right tail of the markup distribution (De Loecker et al. (2020)).

is important because it helps understand how the same structural force effects the three trends, their interrelations and highlights the key mechanisms. One such insight from the model estimation explains why a model with strategic competition in product markets can amplify inequality. For instance, increasing the dispersion of entrepreneurial productivity leads to fewer entrepreneurs as more productive entrepreneurs out-compete others, but it also worsens income inequality by increasing entrepreneurial incomes relative to workers by causing wages in the labor market to stagnate.

The second contribution of the paper is to quantify the effect of key structural forces that shape these secular trends while highlighting the main underlying mechanisms. In order to take the model to the data and quantify it, I use insights from De Loecker, Eeckhout, and Mongey (2022) and include two main sets of parameters that influence the overall competitiveness of the economy. The first comprises of the number of potential entrepreneurs in a specific product market while the second set comprises of parameters that shape technological change in the production process. This includes fixed costs of operating a firm, entrepreneurial and worker productivity distributions as well as the productivity distribution of large corporate firms. Once these structural forces are incorporated in the model, and estimated to match the data, I then decompose their relative contribution in the evolution of each of these secular trends.

The summary of the findings is as follows, first I find evidence of an increase in the dispersion of the latent entrepreneurial productivity distribution and an increase in the productivity premium of large corporate firms relative to entrepreneurs. Consistent with the superstar firm hypothesis in Autor, Dorn, Katz, Patterson, and Van Reenen (2020) this results in the rise of superstar entrepreneurs and firms over time, who deter entry into their product market, and leads to higher high markups and high entrepreneurial incomes. I also find that estimates of fixed costs that are increasing over time which is consistent with De Ridder (2019) and Kozeniauskas (2018). In addition, I find evidence of a decline in the number of agents in each product market leading to a larger number of markets in the economy, suggesting the creation of new product markets over time.[5]

These parameter estimates between 1988 and 2018 allow us to answer the key question that

[5]Even though it is an exogenous parameter estimated using the structure of the model, this finding can rationalize the incentives of entrepreneurs to continually carve out their own market (Navis and Glynn (2010), Dew, Read, Sarasvathy, and Wiltbank (2011)).

motivated this paper, that is, what is the relative contribution of each structural force in shaping these secular trends.[6] In terms of the decline in entrepreneurship rate, I find that increasing fixed costs and increasing dispersion of entrepreneurial productivity can account for 90% and 64% of the total decline respectively. On the other hand, a decline in the number of potential entrepreneurs per market leads to a counterfactual 47% increase in the entrepreneurship rate. For the increase in the markups of the large corporate firms, 49% of the increase can be accounted by an increase in their productivity premium, where this premium represents their relative productivity advantage over the entrepreneurial productivity distribution. At the same time, a decline in the number of potential entrepreneurs per market can account for 47% of the increase. In contrast, increase in the dispersion of entrepreneurial productivity leads to a 26% reduction in the markup of large corporate firms. Finally, increasing dispersion of worker and entrepreneurial productivity can account for 84% and 60% of the increase in the income share of the top 1%.

2 Related literature

This paper contributes to the extensive literature on the rise of market power, declining entrepreneurship rates and increasing income inequality in the US. From a theoretical perspective, this paper provides a unifying framework to study the aforementioned secular trends. As a result, to understand the mechanisms that link the evolution of product market power, entrepreneurship and inequality, I develop a novel model of occupational choice with strategic interaction among agents. The framework builds on the canonical models of occupational choice as in Roy (1951) and Lucas (1978) by incorporating oligopolistic competition in the product markets following the work of Atkeson and Burstein (2008) and De Loecker et al. (2022). This implies that an agent's choice between becoming an entrepreneur or a worker is shaped by the other agents in their market. The presence of strategic interactions in the product market leads to non-trivial entrepreneurship decisions which are solved using the entry game proposed by

[6] Note that given the general equilibrium setup, the sum of the counterfactual contributions from changing one parameter while holding others fixed will not sum up to the total change. Each moment in the model is influenced by several structural parameters with differences in the direction and strength of change along with interactions and feedback from other equilibrium variables.

Berry (1992). To the best of my knowledge, the model presented in this paper is the first where agents strategically compete in their occupational choice decision. In equilibrium the model generates a finite number of entrepreneurs in each market with heterogeneous markups and income that is unequally distributed among agents. As a result the model has implications for the evolution of market power, entrepreneurship and income inequality.

The recent work by De Loecker et al. (2020) has renewed interest in studying market power, leading to investigations into its sharp rise, macroeconomic implications, and the underlying structural changes in the US economy. This paper is therefore related to prior work, especially theoretical, that link the rise of markups and income inequality. Some prior work has already explored this through the lens of structural models that incorporate both markups and inequality. For instance, Cairo and Sim (2022) develop a two agent model with monopolistic competition and show that an increase in markups can explain rising inequality. Meanwhile, Colciago and Mechelli (2020) also study a heterogeneous agent model with investment choice, where firms have market power, therefore linking increasing market power to rising inequality.[7] In addition, Auray et al. (2022) build a heterogeneous agent model with an endogenous portfolio choice with wealth inequality dynamics, and find that increasing markups are the key determinant of rising income inequality in France. Furthermore, Boar and Midrigan (2022) derive optimal welfare improving product market interventions with heterogeneous markups modeled using the Kimball demand. My paper contributes to this literature by incorporating rich heterogeneity in markups, even within narrowly defined markets, while also allowing agents to make an endogenous entrepreneurial choice. Entrepreneurs owning firms in the model strategically compete with each other, a mechanism through which productive entrepreneurs inhibit entry and therefore, exacerbate inequality.[8]

The paper is also related to the recent literature on the decline in entrepreneurship rates in the US. Jiang and Sohail (2023), Kozeniauskas (2018) and Salgado (2020) focus on the skill-biased nature of entrepreneurial decline where high-skill entrepreneurship declines relatively

[7] Colciago and Mechelli (2020) model an economy with market specific markups. Since, they focus on symmetric equilibrium within each market, the markup of a firm is given by the number of homogeneous firms within the market.

[8] In other related work Deb et al. (2022b) study how market power in the product and labor market has led to increased wage inequality and skill premium between high and low skill workers between 1997 and 2016 in the US.

more than low-skill entrepreneurship.[9] Consistent with some of their findings, this paper reinforces the importance of both rising fixed costs and productivity difference among firms (technological change) in shaping the decline in entrepreneurship. While this paper does not specifically address the relative decline of entrepreneurship between college and non-college-educated individuals, it contributes to the literature on declining entrepreneurship by exploring how the structural forces that increase market power influences entrepreneurship. Consequently, the paper attempts to ascertain whether the diminishing competitiveness of the economy is linked to the decline in entrepreneurship rates and, if so, the mechanisms influencing their evolution.

Finally, this paper is also related to the literature that studies the underlying structural forces that shape the secular trends in markups and income inequality. Recent work has attributed the rise of markups in the US to increasing fixed costs (De Ridder (2019)), increasing fixed costs and productivity dispersion (De Loecker et al. (2022)) and innovation (Bao and Eeckhout (2023), Olmstead-Rumsey (2023)). At the same time the literature has also emphasized on several reasons for increasing top income inequality, especially Smith et al. (2019) argue that the increase in top entrepreneurial business income can be attributed to increased labor productivity, which is consistent with explanations based on the technological progress and/or higher markups.[10] As a result, a key contribution of this paper is to embed all these structural forces proposed by recent work on entrepreneurship, market power and income inequality in a single framework and to assess their relative contribution in shaping these secular trends.

Outline. The remainder of this article is organized as follows. Section 3 presents the theoretical framework. Section 4 presents the data and quantitative analysis framework including the identification arguments. Section 5 presents the estimation results and Section 6 performs the counterfactual experiments to quantify the contribution of the structural forces in explaining the secular trends in the US. Finally Section 7 concludes.

[9] In addition Krishnan and Wang (2019) and Morazzoni (2021) highlight the connection between increasing student debt and the decline in college-educated entrepreneurs.

[10] Furthermore, Dyrda and Pugsley (2022) show that tax reforms since 1980 and the resulting change in the composition of legal forms, has led to a rise of pass-through firms. This reorganization has induced a behavioral change of firms and their owners and can also explain the rise in the income share of the top 1 percent.

3 Model Setup

This section builds a general equilibrium model of entrepreneurship with strategic competition. Heterogeneous agents make an occupational choice, as they decide between becoming an entrepreneur or a worker. Agents who choose to become entrepreneurs have market power in the product markets. In the following section, I will set up the model's environment, highlight the key assumptions and show how agents make their occupational choices. I will demonstrate how this general model incorporates various market structures in equilibrium, and that it nests the canonical model of occupational choice, as in Lucas (1978), as a limit case. Furthermore, I will illustrate how an agent's competitors influence their entrepreneurial choices and how dominant entrepreneurs can inhibit entrepreneurship due to the presence of strategic competition. Finally, I will present some comparative statics analysis of the key structural parameters.

3.1 A model of entrepreneurship with strategic competition

Environment and Market Structure. The model is static. The product market is oligopolistically competitive and the labor market is perfectly competitive. There are a continuum of product markets indexed by $j \in [0, J]$. Each market has a finite number of agents or potential entrepreneurs given by M. Agents in market j can choose to be an entrepreneur *only* in product market j or choose to be a worker and supply labor in the common economy-wide competitive labor market.

Agents. Agents are indexed by i and are heterogeneous in two dimensions. They are heterogeneous in their entrepreneurial productivity a_i and their worker productivity z_i. Their entrepreneurial productivity is drawn from $log(a_i) \sim \mathcal{N}(-\sigma_a^2/2, \sigma_a^2)$ and their worker productivity is drawn from $log(z_i) \sim \mathcal{N}(-\sigma_z^2/2, \sigma_z^2)$.[11] Each product market j also has a large corporate firm with productivity a_{cj} where $log(a_{cj}) \sim \mathcal{N}(-\sigma_c^2/2 + \lambda, \sigma_c^2)$. Given these specifications, the large corporate firms have a productivity premium over the potential entrepreneurs given

[11] Note that the log distribution of each productivity has a specification for the mean which is adjusted by the standard deviation. This adjustment is made so that first, the mean of each of these distributions in levels is equal to 1 and second, given fixed total units of productivity in the economy only the assignment of these productivity units across agents shape equilibrium outcomes.

by λ, such that the ratio of the mean of their productivity distributions in levels is given by e^{λ}.[12]

Final Goods Producer. The final goods producer operates under a double nested CES structure as in Atkeson and Burstein (2008) and aggregates differentiated goods within and across markets. Goods within a market (Coca Cola vs Pepsi) have a higher degree of substitutability given by η than goods in different markets (Pepsi vs laundry detergent) denoted by θ. As a result these elasticities are ranked $\eta > \theta$.

$$Y = \left(J^{-1/\theta} \int_j y_j^{\frac{\theta-1}{\theta}} dj \right)^{\frac{\theta}{\theta-1}}, \quad y_j = \left((E_j + 1)^{-1/\eta} \left[\sum_{i \in \mathcal{I}_j} y_{ij}^{\frac{\eta-1}{\eta}} + (y_{cj})^{\frac{\eta-1}{\eta}} \right] \right)^{\frac{\eta}{\eta-1}} \tag{1}$$

where Y and y_j are the aggregate and market level CES indices of output while y_{ij} denotes the output of the entrepreneur and y_{cj} is the output of the large corporate firm. $E_j \leq M$ denotes the number of agents in equilibrium who choose to become entrepreneurs in market j and $\mathcal{I}_j$ denotes the set of all agents that choose to be entrepreneurs in market j. Furthermore, both the economy wide and market specific CES output levels are adjusted by the measure of markets and the number of active firms within a market respectively.[13]

Taking the price of the intermediate goods as given the final goods producer chooses optimally the quantity of each intermediate good to purchase in order to maximizes its profits,

$$PY - \int_j \left(p_{cj} y_{cj} + \sum_{i \in \mathcal{I}_j} p_{ij} y_{ij} \right) dj \tag{2}$$

subject to equation 1. Assuming that the final good Y is a numeraire, we can set the aggregate price index $P = 1$.

[12] This productivity premium is relative to the underlying entrepreneurial productivity distribution among all agents. In equilibrium only a subset of these agents choose to be entrepreneurs.

[13] These adjustments ensure that the measure of markets by itself does not have an effect on the equilibrium moments of interest, which are primarily shares and depend on the distributional properties of productivities. In Appendix (B.2) I show how this adjustment assists in isolating the mechanical effect emanating from changing the measure of markets while preserving the effect resulting from distributional changes.

Entrepreneurs and large corporate firms: Entrepreneurs and large corporate firms produce differentiated goods using labor as the only input. The production technology is given by;

$$y_{ij} = a_{ij} l_{ij}^{\nu} \quad , \quad y_{cj} = a_{cj} l_{cj}^{\nu} \tag{3}$$

where a_{ij} and a_{cj} are the entrepreneurial and large corporate firm productivity respectively while l_{ij} and l_{cj} are the labor input used. The parameter ν is the returns to scale or the span of control parameter as in Lucas (1978).

Let $\imath \in \{c, 1, 2 \ldots E_j\}$ be the index for all active firms in a market j. In equilibrium this would include all agents who choose to entrepreneurs and the large corporate firm in the market.

Firms choose labor $l_{\imath j}$ to maximize profits.

$$\pi_{\imath j} = \max_{l_{\imath j}} \left[\underbrace{p(y_{\imath j}, \mathbf{y}_{-\imath j}, Y, P) y_{ij}}_{\text{Sales}} - \underbrace{W l_{\imath j}}_{\text{Variable costs}} - \underbrace{\phi W}_{\text{Fixed costs}} \right] \tag{4}$$

where $p_{\imath j}$ and W are the price of the differentiated goods and the wage paid to labor respectively. I denote the index of firms in a market except firm $\imath$ as $-\imath$, as a result $\mathbf{y}_{-\imath j}$ denotes the vector of output choices of the firms in market j except firm $\imath$.[14] ϕW denotes the fixed costs of operation which are produced using ϕ units of labor.[15] Each firm is infinitesimal in comparison to the economy, as a result they take W as given. However, given there are finitely many agents M in each market, in equilibrium only $E_j \leq M$ agents choose to be entrepreneurs in market j. The remaining $M - E_j$ agents in each market choose to become workers. In equilibrium there are $E_j + 1$ firms within each market; that is E_j entrepreneurs and one large corporate firm.[16] These firms compete a la Cournot. There are two key takeaways from the profit maximization problem faced by firms. First, similar to models of monopolistic competition firms internalize

[14]For notational clarity, bold letters correspond to a vector of quantities or prices.

[15]The model can be further generalized to incorporate market specific fixed costs ϕ_j. The choice of an economy wide fixed cost has been made to not only simplify the exposition, but work by Decker et al. (2014) finds that the decline in entrepreneurship spans all sectors and regions and postulate that there must be common factors that are neither sector nor region specific that are driving the decline in entrepreneurship. Furthermore, De Ridder (2019) finds that fixed costs have increased across all broad sectors of product markets.

[16]The large corporate firm shares the same profit maximization problem as the potential entrepreneurs, the only difference being that the large corporate firms do not make an entry decision. These large corporate firms pay the fixed cost and maximize profits.

the affect of their quantity choice on the price of the output which is denoted by $p(y_{\imath j})$. However, at the same time these finitely many firms in market j also internalize that their price also depends on the quantity choice of the other firms in their market, which is denoted by $p(\mathbf{y}_{-\imath j})$. This is because each firm internalizes that they are a non-negligible share of the market. As a result the equilibrium quantities and prices for each firm are a function of the best response functions of all other firms in their market.

Assumptions. In this model heterogeneous agents make an entrepreneurial choice into oligopolistic product markets. This implies that they not only compete strategically in their occupational choice, but also conditional on choosing to become an entrepreneur, they also compete strategically in their oligopolistic product market. The model therefore requires finding a set of entrepreneurs in equilibrium such that, given the optimal occupational choice of agents, no agents have an incentive to deviate. In order to construct such an equilibrium that is tractable I make four assumptions. First, an agent's entrepreneurial productivity is uncorrelated to their worker productivity. This means that an agent can have a high entrepreneurial productivity but a low worker productivity and vice-versa. Second, agents do not have a market choice, they are randomly assigned to a market j.[17] This means that their post assignment entrepreneurial productivity can be expressed as a_{ij}. Third is a timing assumption. Agents first observe their entrepreneurial productivity a_{ij} choose their occupation (whether to become an entrepreneur or worker) and only thereafter observe their worker productivity z_i. Finally, the fourth assumption I make is that the ownership of the large corporate firms is perfectly diversified. While the first three assumptions are for tractability of the model the fourth assumption is made to close the model.[18]

[17] One can interpret this as agents drawing their markets from a uniform distribution such that $j(i) \sim \mathcal{U}_{\{0,J\}}$. Since the probability they draw market j is $1/J$, then in a large economy the expected number of agents in each market is given by I/J which is denoted as M; the number of agents in a market j. In order to abstract from realized differences in the number of agents per market, I assign exactly M agents per market given the measure of agents I and the measure of markets J.

[18] In the Model section below, I show why the first three assumptions are essential for the equilibrium to be well defined. Furthermore, while the fourth assumption is a strong assumption especially given its implications on income inequality, the notion of income inequality this paper considers is only labor earnings inequality. As a result within the model the only inequality in income I consider is inequality resulting from wage income for workers and profit income from running their firm as entrepreneurs, abstracting from the lump sum corporate profit transfers. At the same time, when mapping the model to the data, I only consider income from wages or salary and business incomes and therefore also abstract from dividend or stock income or transfers in the data.

3.2 Solution

Final goods producer. The Final goods producer chooses the quantity to purchase from each entrepreneur and corporate firm as a function of the prices in the economy. The solution to the final goods producer problem is given by;

$$y(p_{\imath j}, \mathbf{p}_{-\imath j}, P, Y) = J^{-1}\left(E_j + 1\right)^{-1}\left(\frac{p_{\imath j}}{p_j(p_{\imath j}, \mathbf{p}_{-\imath j})}\right)^{-\eta}\left(\frac{p_j(p_{\imath j}, \mathbf{p}_{-\imath j}))}{P}\right)^{-\theta} Y \tag{5}$$

The corresponding inverse demand function is given by;

$$p(y_{\imath j}, \mathbf{y}_{-\imath j}, P, Y) = J^{-1/\theta}(E_j + 1)^{-1/\eta} y_{\imath j}^{-1/\eta} y_j^{1/\eta - 1/\theta} Y^{1/\theta} P \tag{6}$$

This gives the inverse demand function for each intermediate goods producer.

The CES indices of prices are defined as[19]

$$P = \left(\int_j J^{-1} p_j^{1-\theta} dj\right)^{\frac{1}{1-\theta}} \quad , \quad p_j = \left(\left(E_j + 1\right)^{-1}\left[\sum_{i \in \mathcal{I}_j} p_{ij}^{1-\eta} + \left(p_{cj}\right)^{1-\eta}\right]\right)^{\frac{1}{1-\eta}} \tag{7}$$

Entrepreneur and large corporate firm optimization. Given the inverse demand function derived in equation (6) the entrepreneurs' and large corporate firms' first order condition for labor can be written as;

$$p_{\imath j}\left(1 + \frac{p'_{\imath j} y_{\imath j}}{p_{\imath j}}\right)\frac{\partial y_{\imath j}}{\partial l_{\imath j}} = W \tag{8}$$

In addition, in the following sections I show that this fully diversified corporate ownership does not distort an agent's occupational choice.

[19] Note that following the notational convention defined above with index $\imath$, the market price index could alternatively be expressed as $p_j = \left((E_j + 1)^{-1} \sum_\imath p_{\imath j}^{1-\eta}\right)^{\frac{1}{1-\eta}}$.

Using these first order conditions, we can define their markups. For instance, using the FOC for labor we can write;

$$p_{\imath j}\left(1-\frac{1}{\theta}s_{\imath j}-\frac{1}{\eta}(1-s_{\imath j})\right)\frac{\partial y_{\imath j}}{\partial l_{\imath j}}=W \tag{9}$$

where $s_{\imath j}$ is the sales share of firm $\imath$ in market j. Then we can define the markup for each firm as the ratio of the price over marginal cost.

$$\mu_{\imath j}=\frac{p_{\imath j}}{MC_{\imath j}}=\frac{1}{1+\varepsilon^{p}_{\imath j}}=\left(1-\frac{1}{\theta}s_{\imath j}-\frac{1}{\eta}(1-s_{\imath j})\right)^{-1}. \tag{10}$$

where $\varepsilon^{p}_{\imath j}$ is the elasticity of the inverse demand function. Unlike the model of monopolistic competition, markups are heterogeneous and specific to the firm. The key feature of these markups is that the dispersion in markups comes from the productivity differences among entrepreneurs and the large corporate firm in a specific market which leads to different sales shares. Entrepreneurs with high productivity relative to their competitors in their market have high sales shares and therefore high markups. Furthermore, high markups in this economy only require that entrepreneurs are large in their respective market, and they need not be large in comparison to the entire economy.[20]

As in Berger et al. (2022) and De Loecker et al. (2022) in each market j, the equilibrium sales shares for E_j entrepreneurs and the large corporate firm satisfy;

$$s_{\imath j}=\frac{\left(\mu_{\imath j}(s_{\imath j})a_{\imath j}^{-1/\nu}s_{\imath j}^{\frac{\eta-\theta}{1-\eta}\frac{1-\nu}{\nu}}\right)^{\frac{\nu}{\nu+\theta(1-\nu)}}}{\sum_{\imath}\left(\mu_{\imath j}(s_{\imath j})a_{\imath j}^{-1/\nu}s_{\imath j}^{\frac{\eta-\theta}{1-\eta}\frac{1-\nu}{\nu}}\right)^{\frac{\nu}{\nu+\theta(1-\nu)}}} \tag{11}$$

There are two notable features of Equation (11). First, in each market j we have a system E_j+1 equations and E_j+1 unknowns. As a result knowing the productivity of E_j entrepreneurs and

[20]Alternate models of heterogeneous markups have been studied using the Kimball (1995) demand system often using the functional form introduced by Klenow and Willis (2016). Boar and Midrigan (2022) use such a model of heterogeneous markups to study optimal product market market policy with a fixed mass of entrepreneurs and workers. In addition, Edmond et al. (2023) study a nested economy with finite number of firms in a market and incorporate strategic interaction among firms.

the large corporate firm in each market, we can solve for their respective sales shares. Second, the equilibrium of the model is block recursive such that these sales shares are independent of the economy wide aggregates output Y and wage W.[21]

Occupational Choice. An agent chooses to be an entrepreneur if the return from entrepreneurship is higher than the expected labor income $W\mathbb{E}(z_i)$ that they can earn as a worker in the labor market.[22] Therefore, given the productivity of all other agents in their market $\mathbf{a}_{-ij}$ along with the productivity of the large corporate firm a_{cj}, an agent with their entrepreneurial productivity a_{ij} decides to be an entrepreneur if $\pi(a_{ij}, \mathbf{a}_{-ij}, a_{cj}) \geq W\mathbb{E}(z_i)$. This is the standard condition for occupational choice as in Lucas (1978) where agents choose to entrepreneurs if their profit income from pursuing entrepreneurship is greater than their outside option as a worker. This can be expressed as;

$$p_{ij}a_{ij}l_{ij}^{\nu} - Wl_{ij} - \phi W \geq W\mathbb{E}(z_i) \tag{12}$$

Similar to the Lucas (1978), the parameter ν denotes the limited span of control of the entrepreneurs. This implies that the most productive entrepreneurs cannot control all resources, and that it is efficient for some resources to be managed by the next best entrepreneurs. In addition, to this standard result in the occupational/entrepreneurial choice models, the model presented in this paper has an additional dimension which shapes entrepreneurial decisions: *competition in the oligopolistic product market*.

This encapsulates two key features : first, the number of competitors in the market and second, the type distribution of these competitors. The distinction between the two is important, as two markets with the same number of potential entrepreneurs but with very different productivity distributions will constitute different levels of competition in equilibrium. As a result, in a model with oligopolistic competition, entrepreneurship decisions are shaped by market structure. The decision of an agent to become an entrepreneur or a worker depends on

[21]Interested readers are encouraged to read Berger et al. (2022) for insights into the block recursive and tractable features of such models with output demand and/or labor supply systems with a double-nested CES structure.

[22]Given the timing assumption of the model, the agents make their occupational choice after observing their entrepreneurial productivity and the productivity of their potential competitors, but prior to draw their worker productivity z_i.

the other agents in the market, it matters for an agent how many competitors they face and the agent's productivity relative to their competitors. To show this we can write the entrepreneurship condition for any agent i in market j as a function of three terms. The first term depends of the entrepreneurial productivity a_{ij} of the agent, whereas the second term depends on the productivity of the agent relative to their competitors. This can be seen as the second term is composed of an agents potential sales shares $s_{ij} = f(a_{ij}, \mathbf{a_{-ij}}, a_{cj})$ within a market. Conditional on them choosing to become an entrepreneur this depends on their productivity a_{ij} and the productivity of the other entrepreneurs $\mathbf{a_{-ij}}$ along with the productivity of the large corporate firm a_{cj}. Finally, third term is composed of the aggregate quantities, prices and scalars in the economy (Y, W, P, J) which are common for all agents in the economy. The condition for entrepreneurship can be written as,

$$\underbrace{\left(a_{ij}\right)^{\frac{\theta-1}{\nu+\theta(1-\nu)}}}_{\text{Productivity}} \underbrace{\left(\frac{\mu_{ij}(s_{ij})-\nu}{\nu}\right)\left(\frac{\mu_{ij}(s_{ij})}{\nu}\right)^{\frac{-\theta}{\nu+\theta(1-\nu)}}\left(\left(E_j+1\right)^{\frac{1-\theta}{\eta-1}} s_{ij}^{\frac{\eta-\theta}{\eta-1}}\right)^{\frac{1}{\nu+\theta(1-\nu)}}}_{\text{Strategic Competition}} \underbrace{\left[\frac{J^{\frac{-1}{\theta}} P Y^{\frac{1}{\theta}}}{W}\right]^{\frac{\theta}{\nu+\theta(1-\nu)}}}_{\text{Aggregate Scalar}} \geq \mathbb{E}(z_i)+\phi \tag{13}$$

Of these three terms, the first and the third are similar in spirit to the canonical models of occupational/entrepreneurial choice. The key contribution of this model to the literature is the second term, referred to as the *strategic competition* term. This term highlights the role played by market structure in shaping entrepreneurial choices. The key idea is that the entrepreneurship decision of agents also depends on their competitors in their market. For instance, a highly productive agent may not choose to be an entrepreneur if their competitors are much more productive than them. Meanwhile, an agent with the same entrepreneurial productivity may chose to be an entrepreneur if their competitors are much less productive.

This general model encapsulates a range of other market structures including constant markups as in monopolistic competition and no markups as in perfect competition. Consider a case with constant markups as in monopolistic competition where all goods are equally substitutable with one another and therefore, share the same elasticity of substitution. Therefore, we can set

$\eta = \theta$ and $M = 1$ we get to the corresponding entry condition with constant markups;

$$\underbrace{a_i^{\frac{\theta-1}{\nu+\theta(1-\nu)}}}_{\text{Productivity}} \underbrace{\left(\frac{\mu-\nu}{\nu}\right)\left(\frac{\mu}{\nu}\right)^{\frac{-\theta}{\nu+\theta(1-\nu)}} 2^{\frac{-1}{\nu+\theta(1-\nu)}} \left[\frac{J^{\frac{-1}{\theta}} PY^{\frac{1}{\theta}}}{W}\right]^{\frac{\theta}{\nu+\theta(1-\nu)}}}_{\text{Aggregate Scalar}} \geq \mathbb{E}(z_i) + \phi \tag{14}$$

In this case we can see that the entrepreneurship condition only depends on two terms 1. agents productivity and 2. the economy specific aggregate quantities, prices and constants.[23] We can see that there is a unique economy wide threshold on productivity a_i which would divide the entrepreneurial productivity distribution into a set of workers beneath the threshold and a set of entrepreneurs above the threshold.[24] This can be seen as the left hand side of the entrepreneurship condition in Equation (14) is an increasing function of a_i and the right hand side $\mathbb{E}(z_i) + \phi$ is a constant.[25] Agents with a higher productivity than the threshold choose to be entrepreneurs and the others choose to be workers.

However, in a model with strategic interaction the entrepreneurship condition would depend on the set of competitors faced by the agent. To see this consider the agent with the some productivity a_i who is assigned to market j in the model with strategic interaction. Consider two cases 1. Where the agent faces much more dominant competitors with much higher productivity. In this case the agent would be less likely to pursue entrepreneurship. This is because the high productivity of their competitors would drive the agent's sales share to 0 and therefore the agent's markups to the lower bound $\frac{\eta}{\eta-1}$. All else equal this would put a downward pressure on the agent's profitability, such that they would be more likely to choose to become a worker instead of an entrepreneur. Now consider the case 2. where the agent has an entrepreneurial productivity that is much higher than their competitors. In this case the agent is much more likely to pursue entrepreneurship. This is because the agent now competes with

[23] In a model without love for variety adjustments, the $M = 1$ restriction would not be necessary. In this model with love for variety scaling the equilibrium profits also depend on E_j which depends on M. Therefore, to replicate the common threshold property for entrepreneurship as in standard occupational choice models, setting $M = 1$ implies that all entrepreneurs in equilibrium will be in markets with 2 firms, with them operating a firm and the large corporate firm.

[24] Given that I set $M = 1$, here I also drop the subscript j from entrepreneurial productivity and express it only as a_i. This is without loss of generality as now the market assignment plays no role in determining an agent's profits due to the absence of strategic competition as $\eta = \theta$.

[25] The left hand side of the Equation (14) is increasing in a_i because the elasticity of substitution θ is greater than 1, as is common in models of constant markups with monopolistic competition.

other agents with much lower productivity, and as a result their sales shares would be close to 1 and their markups are close to the upper bound $\frac{\theta}{\theta-1}$. This puts an upward pressure on their profits such that they are more likely to become an entrepreneur instead of a worker.
This implies that in this model an agents entrepreneurial payoff and as a result their entrepreneurial choice now depends on the entrepreneurship decision of all other agents in their market.

Equilibrium selection for entrepreneurship. Following Berry (1992) the entry equilibrium can be defined in two steps. In the first step potential entrepreneurs decide to enter their respective markets and in the second stage the entering entrepreneurs compete a la Cournot which determines their operating profits. I solve for this using backward induction, where I solve for the second stage profits for the set of entrants. Given these payoffs and its comparison to the outside option of wage income, I iterate on this set of entrepreneurs until we converge to the fixed point of the entry game.

Formally, the strategy space of the first stage is given by (0,1) where 0 is to become a worker and 1 is to become an entrepreneur. Then $e^* \in \{0,1\}$ is Nash equilibrium strategy vector that satisfies

$$e^*_{ij}\pi_{ij}(e^*) \geq W\mathbb{E}(z_i) \quad \text{and} \quad (1-e^*_{ij})\pi_{ij}(e^{*+i}) \leq W\mathbb{E}(z_i) \quad \forall i,j \tag{15}$$

where e^{*+i} is equal to e^* except that the index $e^{*+i} = 1$. Together, these conditions specify a equilibrium strategy vector such that all entrepreneurs have no profitable deviation to become a worker and no worker would unilaterally and profitably deviate to becoming an entrepreneur. While Equation (15) is the standard definition of Nash Equilibrium, the equilibrium selection proposed by Berry (1992) is implemented as follows; (i) Start with a guess on the equilibrium set of entrepreneurs, specifically assume all potential entrepreneurs enter their markets. (ii) Compute each entrepreneurs incentive to enter by computing $\gamma_{ij} = \pi_{ij} - W\mathbb{E}(z_i)$. Given the guess some entrepreneurs will not satisfy Equation (15). (iii) Entrepreneurs with the most negative γ_{ij} exit first and then (iv) we can guess a new set of entrepreneurs. We can then iterate over the steps until Equation (15) is satisfied for all agents.[26]

[26] A similar entry algorithm is used in De Loecker et al. (2022) for a firm entry problem in oligopolistic markets.

Summary of model variables. Table 1 presents a summary of the model variables, organized into four categories. Category I includes the exogenous parameters, while categories II, III, and IV pertain to the endogenous agent specific, market-level, and economy-wide variables, respectively.

Table 1: Summary of model variables

I: Primitives			
J	Total number of markets	a_i	Entrepreneurial productivity of agent i
M	Total number of agents in each market	z_i	Worker productivity of agent i
θ	Output market: between-market substitutability	a_{cj}	Productivity of large corporate firm in market j
η	Output market: within-market substitutability	σ_a	standard deviation of $log(a_i)$
ϕ	Fixed cost parameter	σ_z	standard deviation of $log(z_i)$
ν	Lucas (1978) span of control parameter	σ_c	standard deviation of $log(a_{cj})$
λ	Productivity premium of large corporate firms		
II: Endogenous variables - Agent specific			
e_{ij}	Strategy vector of occupation choice	$l_{\imath j}$	Employment by entrepreneur $\imath$
$s_{\imath j}$	Sales share of firm $\imath$	$y_{\imath j}$	Output of good $\imath$
$\mu_{\imath j}$	Markup of firm $\imath$	$p_{\imath j}$	Output price in good $\imath$
III: Endogenous variables - Market			
y_j	CES output in market j	E_j	Number of entrepreneurs in market j
p_j	CES price in market j	N_j	Number of firms in market j where $N_j = E_j + 1$
IV: Endogenous variables - Aggregate			
L	Total employment	Y	CES output
W	Wage	P	CES price
μ	Aggregate markup	Π	Aggregate profits

Note : This table shows the set of exogenous parameters in section I and the endogenous parameters in sections II, III and IV.

General Equilibrium. In the decentralized general equilibrium economy, each heterogeneous agent maximizes utility by choosing consumption of the final good, the price of which is normalized to 1. They consume all their income and choose an occupation endogenously which maximizes their income. An agent chooses to be an entrepreneur if their profit income is higher than the wage. In equilibrium, the product market and the labor market clear. The formal definition of equilibrium is as follows:

Definition 1. *An equilibrium in this economy satisfies:*

1. *Given prices of differentiated goods, the quantities $\{y_{ij}\}$ maximizes the final good producer objective function given in equation (2);.*

2. *Agents choose their occupations optimally according to the Nash strategy vector defined in equation 15.*

3. *Given the inverse demand function from the final goods producer's optimization, the employment $\{l_{ij}\}$ maximize entrepreneurial and large corporate firm profits in equation (4).*

4. *The product market and the labor markets clear.*

3.3 Model Properties

In this section I highlight some of the key features of the model. First, I show the distribution of the equilibrium set of entrepreneurs in the model, contrast it with the canonical models of entrepreneurship in the literature. Second, I show the how the structure of the market shapes entrepreneurial choice of agents graphically. Finally, I show how strategic competition in the model by itself can lead to entrepreneurship deterrence, where dominant entrepreneurs deter entry both on the intensive and extensive margins.[27]

Market Structure and Entrepreneurship. Central to the model is the consideration that an agent's competitors play a crucial role in shaping their choice to become an entrepreneur. For instance, a highly productive agent when, in a market with other agents who are much more productive will decide to be a worker. However, at the same time an identical highly productive agent when in a different market with other agents who are less productive will instead decide to be an entrepreneur.

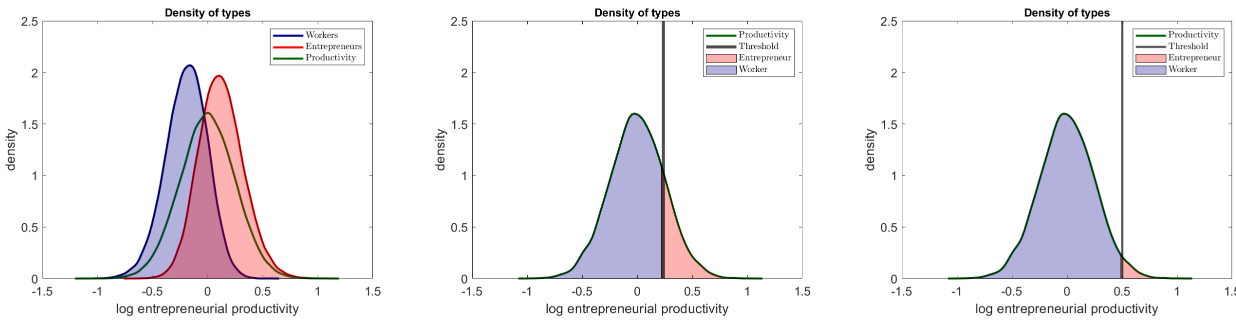
[27]Specifically, in this section I abstract from the presence of a large corporate firm within each sector and only show how competition among potential entrepreneurs by itself shapes entrepreneurial outcomes. Without loss of generalization, only in this section I set the mean of the log entrepreneurial productivity distribution to 0.

Figure 2: Limit cases

(a) Strategic Competition $\theta < \eta < \infty$

(b) Constant Markups $\theta = \eta < \infty, M = 1$

(c) Lucas (1978) $\theta = \eta \to \infty$



Note : Panel (a) shows the equilibrium set of entrepreneurs in the model. Panel (b) show the limit case with constant markups and Panel (c) shows the limit case with perfect competition as in Lucas (1978).

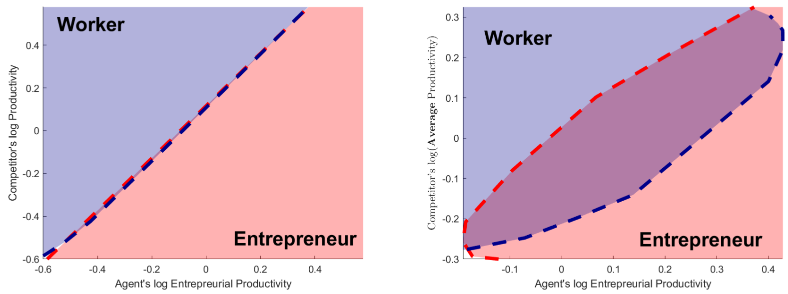
This can be seen in Figure (2) where the distribution of the latent entrepreneurial productivity $log(a_{ij})$ is shown in green in all three panels. The model endogenously splits this green distribution into two sets of agents, one comprising of agents that choose to be workers and the other that choose to be entrepreneurs. The distribution of workers and entrepreneurs are shown in blue and red respectively. The distribution for workers corresponds to their entrepreneurial productivity which remains unrealized as they choose to become workers.

Figure (2a), shows the equilibrium set of entrepreneurs with strategic competition. The overlapping region between the entrepreneurial productivity distribution of workers and entrepreneurs shows that there are agents in the model that have a high productivity but yet choose to become workers instead. Limit cases for constant markups and perfect competition as in Lucas (1978) are shown figure (2b) and figure (2c) respectively. In each of these limits, it is likely that they successively reduce the incentive of an agent to become an entrepreneur relative to being a worker. For instance, as the structure of the economy changes towards more competition the markups of the entrepreneurs decline. In monopolistic competition, markups are constant and equal to $\theta/(\theta-1) > 1$, while in models of perfect competition markups are equal to one. This reduction in markups puts a downward pressure on the profitability of an entrepreneur. Furthermore, all else being equal there is an increase in the demand for labor from each entrepreneur as markups decline.[28] This increase in labor demand puts an upward

[28]This can be seen from the first order condition of an entrepreneur as $l_{ij}^d = \left[(p_{ij}a_{ij}\nu)/(W\mu_{ij})\right]^{1/(1-\nu)}$.

Figure 3: Occupational choice and market structure.

(a) $M = 2$ (b) $M = 10$



Note : Panel (a) depicts the determinants of an agents occupational choice when there are two potential entrepreneurs per market, that is $M = 2$. Panel (b) does the same when $M = 10$.

pressure on the wage. Together these two mechanisms reduce an agents incentive to become an entrepreneur.

Occupational choice and market structure. Each product market j is composed of M agents who decide to become an entrepreneur and start a firm in market j or to become a worker and supply labor in a common economy wide labor market. Figure (3) highlights the role of an agents' competitors in shaping their entrepreneurship choice. The x-axis plots the agents' log entrepreneurial productivity while the y-axis plots the average entrepreneurial productivity of the $M - 1$ other agents in the market. The dashed blue and red lines show the frontier of the set of workers and entrepreneurs, respectively. I consider two cases here.

Case I: $M = 2$. Consider a case where there are only 2 potential entrepreneurs in the market. On the bottom right part of the Figure (3a), the agent has high entrepreneurial productivity while their competitor has low productivity. These agents in this region choose to be entrepreneurs. Contrary, to this on the top left part of the figure Figure (3a), the agent has low entrepreneurial productivity while their competitor has high productivity. These agents choose to be workers. However, along the diagonal where the frontiers coincide, an agent's entrepreneurial productivity increases at a certain proportion to the productivity of their competitors. This gives the indifference threshold for each agent's entrepreneurial choice as a function of their and the competitors entrepreneurial productivity.

Case II: $M = 10$. Consider a case where there are now 10 potential entrepreneurs in the market.

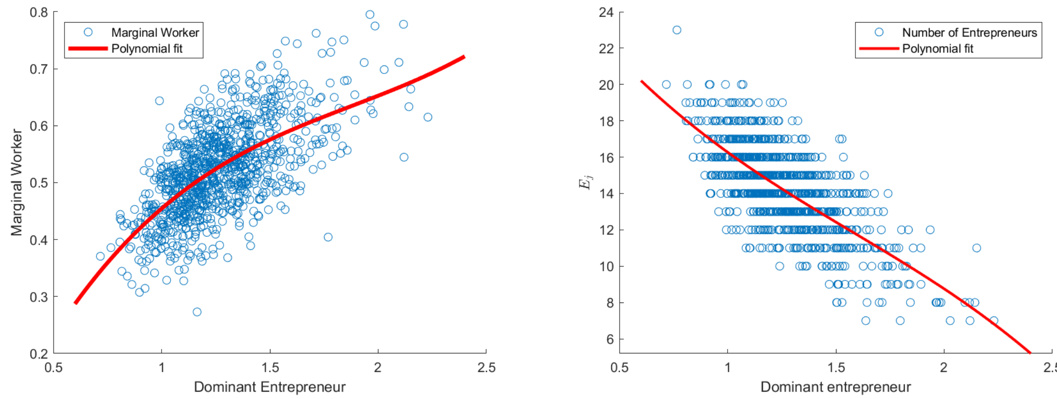
The key difference in Figure (3b) comes from the fact that the y-axis now shows the log of the average entrepreneurial productivity of the 9 other potential entrepreneurs in the market. This means while most of the intuition from *Case I* are valid, what this figure depicts is that the same average of the competitors could be a result of various distributional realization of their entrepreneurial productivity. This means that now along the lens in Figure (3b), the specific composition of an agent's competitors really matter and an agent can choose to either be an entrepreneur or worker depending on their productivity relative to the other $M-1$ agents in the market.

In contrast, in models of entrepreneurship with either monopolistic competition or perfect competition as in Lucas (1978) an agent's decision to become an entrepreneur is independent of the productivity of other potential entrepreneurs in the economy, except through the general equilibrium effect. This is because in both these cases, competition among entrepreneurs producing goods have the same elasticity of substitution (either finite or infinite) with respect to all other goods in the economy. Since, the margin of competition is economy-wide, the entrepreneurial choice in the canonical models is independent of the competitors productivity.

Dominant Entrepreneurs and Entry Deterrence. One of the key determinants of entrepreneurship in this model is an agents' productivity relative to other agents in their market. These relative productivities determine the potential market specific sales shares. Therefore this determines an agents' payoff from entrepreneurship, eventually shaping their entrepreneurial choice. Agents with low productivity in their market choose to be workers while those with high productivity choose to be entrepreneurs. For similar reasons, the presence of a dominant entrepreneur in the market can also serve as an entry deterrent for other agents. A dominant entrepreneur is defined as the most productive agent in the market who decides to be an entrepreneur. This can be seen in figure (4a) where the x-axis plots the productivity of the dominant entrepreneur in market j and the y-axis plots the entrepreneurial productivity of the most productive agent who chooses to be a worker. As seen in the higher the productivity of the dominant entrepreneur, the more productive is the marginal agent who drops out of entrepreneurship. Therefore, this upward sloping relationship highlights the extent to which dominant entrepreneurs deter entrepreneurship of other highly productive agents.

Figure 4: Entry deterrence by dominant entrepreneurs

(a) Marginal worker in the market (b) Number of Entrepreneurs in the market



Note : Each point in the figures corresponds to a market. Panel (a) plots the highest entrepreneurial productivity of an agent (y-axis) who decides to become a worker as a function of the most productive entrepreneur (x-axis). Panel (b) plots the equilibrium number of entrepreneurs in the market (y-axis) as a function of the most productive entrepreneur (x-axis). Both these figures are from a simpler version of the model which abstracts from the presence of large corporate firms.

Furthermore, unsurprisingly, on the extensive margin, these dominant entrepreneurs also lead to fewer entrepreneurs in the market. Their higher productivity relative to other agents leads to extremely low sales shares and markups for their competitors, forcing them out of entrepreneurship. This can be seen in figure (4b) where the y-axis now plots the number of entrepreneurs E_j in market j in equilibrium. Markets with a dominant entrepreneur with low productivity has high levels of entry into entrepreneurship, while markets where the dominant entrepreneur is highly productive have fewer entrepreneurs in the market, higher concentration and higher markups. This shows that the dispersion of the productivity distribution plays a crucial role in shaping the competitiveness of the market. *Dominant entrepreneurs not only inhibit entry of other highly productive agents, but they also let fewer entrepreneurs enter the market.*

3.4 Comparative Statics

This section shows the key comparative static results of the model in Figure (5). The endogenous variable of interest are the three secular trends on (i) entrepreneurship rate, (ii) the aggregate sales weighted markup of large corporate firms, (iii) income share of the top 1%. The comparative static results are shown for six exogenous parameters (i) the number of agents M per market, (ii) fixed cost parameter (iii) the standard deviation of entrepreneurial productivity σ_a, (iv) the standard deviation of worker productivity σ_z, (v) the standard deviation of large firm productivity σ_c and (vi) the productivity premium of large firms λ.

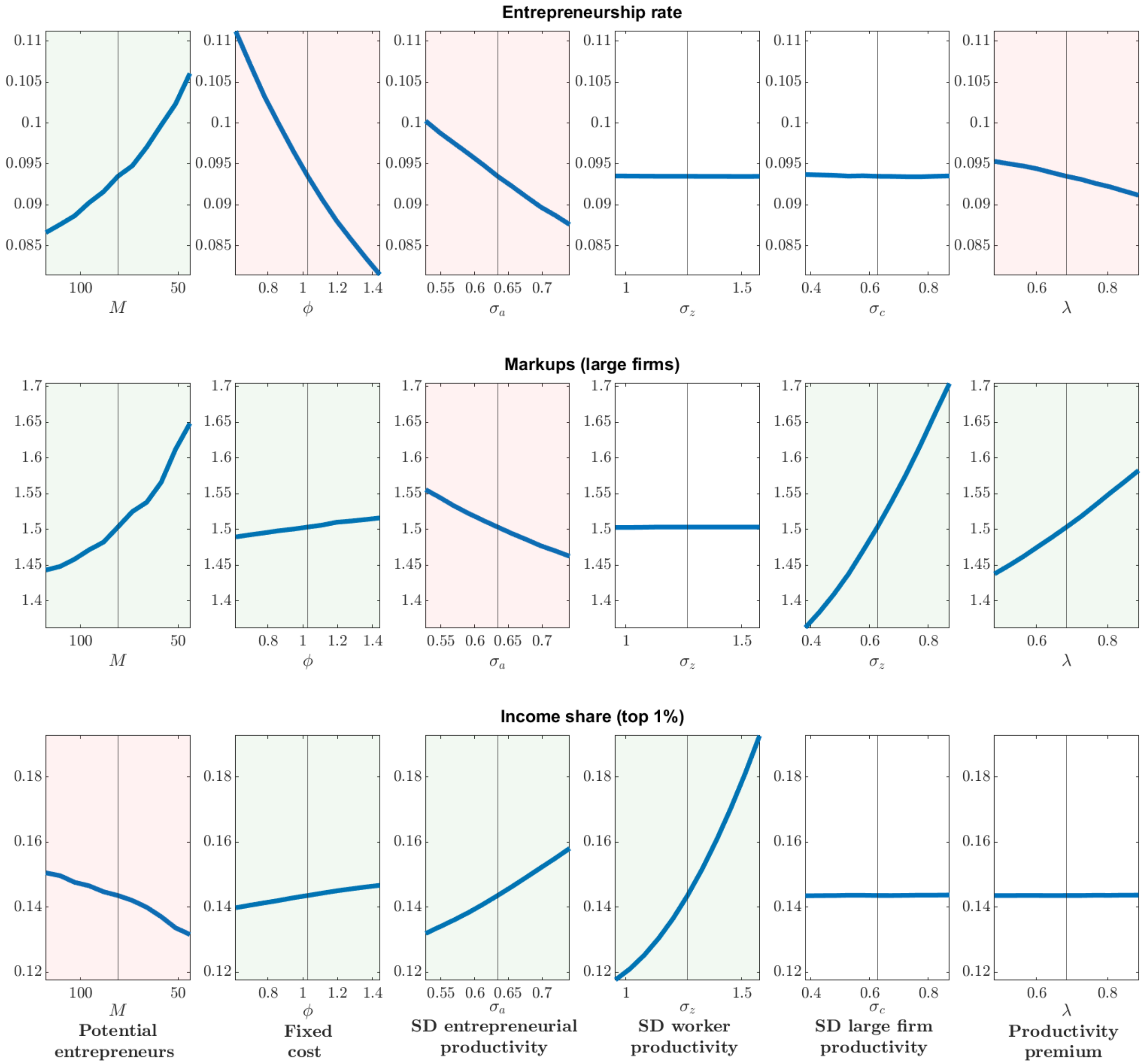
Potential Entrepreneurs : M. A decline in the number of agents in each market M, holding the number of agents constant in the economy constant and equal to $I = JxM$, implies an increase in the number of markets. With fewer agents in each market, fewer agents choose to be entrepreneurs in each market, leading to an increase in entrepreneurial markups. This increases the incentives to become an entrepreneur as result the entrepreneurship rate increases.[29] Since, there is less competition in each market the markups of the large firms increase as well. As M declines and entrepreneurship increases, the increased income from high markups accrue to entrepreneurs throughout the income distribution which results in a decline in the income share of the top 1%.

Fixed Costs: ϕ. Increasing fixed costs deters entry for the marginal entrepreneurs leading a decline in the number of entrepreneurs per market. This increases the sales share of the large firms leading to a rise in markups. Since, the increase in fixed costs mostly effects the marginal entrepreneurs, their drop in income from profits to wages is only marginal leading to an increase in the income share of the top 1%.

Standard deviation of entrepreneurial productivity : σ_a. An increase in the dispersion of entrepreneurial productivity deters entrepreneurship through two channels. The first is the direct channel where more dominant entrepreneurs on the right tail of the productivity distribution lead to fewer entrepreneurs per market. Second, through the general equilibrium effect where the increased dispersion shows up an an increase in the marginal product of labor, increasing wages and making entrepreneurship less attractive. This leads to fewer entrepreneurs in a market. This reduced competition from the entrepreneurs leads to an increase in the markups for large firms. For the entrepreneurs this increased dispersion not only increases their sales shares

[29] Consider a scenario where there are 20 agents in the economy in two markets. 5 choose to be entrepreneurs in each market yielding an entrepreneurship rate of 50%. Now consider a decline in M to 5 such that there are 4 markets now. If 3 in each market decide to enter, each market has fewer entrepreneurs, hence higher markups. However, the economy has 12 entrepreneurs now with a entrepreneurship rate of 60%.

Figure 5: Comparative Statics



Note : This figure plots the comparative statics for the three key secular trends in response to the six structural forces considered in the paper. The range of the parameters on the x-axis is the minimum and the maximum of their estimated values between 1988 and 2018. The vertical line for each parameters is the average of this range.

and hence markups, but also the scale of their operation leading to very large increases in their income share, leading to an increase in the income share of the top 1%.

Standard deviation of worker productivity : σ_z. An increase in σ_z has no effect on an agent's incentive to become an entrepreneur, which leads to no effect on the entrepreneurship rates. This is because of two reasons. First, the timing assumption means that agents make their entrepreneurial choice before observing their worker productivity. Second, increasing σ_z adjust the mean of the log distribution such that the mean of the level distribution is constant, therefore, there is no change in the aggregate labor supplied.[30] Since this does not change entrepreneurship rates the competition faced by the large corporate firms does not change either leaving their markups unchanged. Finally, this increase in dispersion of the worker productivity increases the labor earnings of workers in the top 1% of the income distribution thereby increasing top income inequality.

Standard deviation of large corporate firms : σ_c. Since an increase in σ_c keeps the mean of the level distribution unchanged, the corporate firms do not become more productive relative to the potential entrepreneurs therefore entrepreneurship rates remain unchanged. However, for the largest corporate firms this increases both their markups and sales, thereby leading to an increase in the sales weighted markups of the large corporate firms. Finally, this leaves top income inequality unchanged as this has negligible impact on either entrepreneurial incomes or labor income of workers.

Productivity premium of large corporate firms : λ. In contrast to σ_z, the increase in the productivity premium λ makes the large corporate firms more productive to the potential entrepreneurs. This leads to lower markups for the entrepreneurs as they face tougher competition reducing their incentives to become an entrepreneur. This leads to a decline in entrepreneurship rates. As fewer agents within each market choose to become entrepreneurs the sales share of the large corporate firm increases leading to an increase in their markups. Finally, this has negligible effect on the income share of the top 1%.

[30] In a model where the mean of the log distribution is not adjusted as a function of σ_z, an increase in σ_z would increase the mean of the z_i distribution leading to an increase in the supply of labor. This would put a downward pressure on equilibrium wage potentially making entrepreneurship more attractive relative to working, thereby increasing entrepreneurship rates.

4 Quantifying the model

In this section, I present the data sources used to construct moments and develop arguments for the identification of parameters used to match the moments. I fit the model on the data moments from 1988 until 2018. Thereafter, I show the fit of the model and the data for these moments and the underlying time series of estimated parameters.

4.1 Data and Definitions

The data sources and definitions are summarized in Table (2). The primary source of data I use for entrepreneurial outcomes and income inequality is the Survey of Consumer Finances (SCF), which is a household level survey conducted every three years between 1989 and 2019. Each survey has cross-sectional data regarding the income of U.S. households for the year before the survey, as well as detailed information on their characteristics, including demographic characteristics of families. The SCF is particularly valuable for studying inequality due to its sampling design as it samples appropriately from the wealthier households, who are also more likely to be entrepreneurs. I follow Salgado (2020) in defining entrepreneurs as individuals who are self employed (variable X4106) and have an active management role in a business (variable X3104). I use a definition of income which is closest to the model, where the income is defined as the sum of wage income and business income.[31] Similar, to Salgado (2020) and Kozeniauskas (2018) I find a decline in entrepreneurship accompanied by an increase in income inequality, including a rise in the income share of entrepreneurs relative to their share of population in the economy.

I use the Compustat as the data source to measure markups that correspond to the large corporate firms in the model. I follow De Loecker et al. (2020) in estimating these markups. I follow Davis and de Souza (2022) in computing profit margins in compustat. Finally, for data on fixed costs is also computed from Compustat following De Loecker et al. (2022). The increasing measures of fixed costs are consistent with findings in De Ridder (2019) who identifies fixed costs using information on firm level operating profits, revenue and estimates of markups. Consis-

[31] This exludes income from bonds, interest, dividends and mutual funds. It also excludes income from social security, pensions, transfers, government programs and other sources of income.

tent with the literature I find measures of increasing markups and increasing profit margins in the Compustat data. In Appendix D I describe in detail the sample selection and corresponding moments, including comparison with numbers from the literature.

Table 2: Data source and definitions

Moment	Source	Definitions
Entrepreneurship Rate	SCF	Self employed and active management
Markup (sales weighted)	Compustat	$\theta^{COGS}(Sales/COGS)$
Income Share (top 1 percent)	SCF	wages and business income
Average Fixed Cost Share	Compustat	SGA/Total cost
Share of entrepreneurs (top 1 percent)	SCF	-
Relative profit margin (sales weighted)	Compustat + SCF	Profit margin Compustat/Profit margin SCF

4.2 Parametrization and Approach

Externally chosen parameters. The externally set parameters are shown in Table (3). I set the values of the elasticities of substitution in the product market to those estimated in De Loecker et al. (2022), who quantity the affect of increasing market power on the declining dynamism in the US economy. Although these elasticities are vital for determining the markup distribution, I abstract from their estimation as one the key objectives of the paper is to understand the consequences of fundamental shifts in agent productivity distribution. Furthermore, I set the span of control or the returns to scale parameter following Boar and Midrigan (2022).[32]

Table 3: Externally set parameters

Parameter	Value	Description	Paper
θ	1.2	Between market elasticity	De Loecker, Eeckhout and Mongey (2022)
η	5.75	Within market elasticity	De Loecker, Eeckhout and Mongey (2022)
ν	0.85	Returns to scale	Boar and Midrigan (2022)

Estimated parameters. Given the parsimonious nature of the model, I estimate the 6 remaining exogenous variables: 1. the number of agents in a market M; 2. fixed cost parameter 3. the stan-

[32] One could potentially estimate the returns to scale parameter in the model, however the presence both entrepreneurial firms and large corporate firms would potentially require estimating two different returns to scale parameters due to the vast difference in the average firm size of an entrepreneur in SCF in comparison to that for large corporate firms in Compustat.

dard deviation of the entrepreneurial productivity distribution σ_a; 4. the standard deviation of the worker productivity distribution σ_z; 5. the standard deviation of the large corporate firm productivity distribution σ_c and 6. the productivity premium of the large corporate firms λ.[33] I estimate these parameters for each of the SCF sample years from 1989 to 2019 where the data on income corresponds to the previous year.[34] I match 6 moments on 1. entrepreneurship rate; 2. the aggregate sales weighted markup; 3. income share of the top 1%; 4. share of entrepeneurs in the top 1% 5. average fixed costs as a share of total costs and 6. the relative profit margins in Compustat relative to entrepreneurs in SCF.

Identification. Table (4) summarizes the comparative statics results for the six estimated parameters. For each of the parameters the range was chosen to be between the minimum and maximum estimated value between 1988 and 2018 from Figure (7). Arguments for identification are based on insights from De Loecker et al. (2022) such that each of the 6 parameters move the 6 moments in a unique way. Furthermore, some parameters move some moments with a much higher elasticity.[35] For instance, changes in the income share of the top 1% is most sensitive to changes in the standard deviation of the worker and entrepreneurial productivity distribution. This is intuitive, as all other parameters are common economy wide parameters while σ_a and σ_z affects the heterogeneity among the agents, especially at the right tail of the log normal distribution.[36]

To match the evolution of the data moments every 3 years between 1988 and 2018, parameters in table (4) are estimated using simulated methods of moments. This gives us a time series

[33]Given the mean adjustment of the productivity distribution, I do not estimate the mean of the log productivity distributions. The mean of the log productivity distribution of agents can be estimated to match levels in the economy, like wages, profits and output. For instance, Bao et al. (2022) estimate the mean of the market level log productivity distribution to match the evolution of workers' wage in a model that can rationalize the increase in CEO pay stemming from the rise of market power.

[34]The income variables in the SCF are for the previous calendar year while the job information is for the current year. As a result I assume that their work status was the same last year in order to study the link between income inequality and work status. This assumption also allows me to consider entrepreneurship rates and income inequality for a given year.

[35]The identification arguments presented here are local and around the range of the estimated values between 1988 and 2018, unlike global identification arguments proposed by Bilal and Rossi-Hansberg (2023).

[36]Note that, σ_c is also a source of heterogeneity in the economy. However given that I only consider inequality arising from wage income and entrepreneurial profit income in the model abstracting from the lump-sum profit transfer from the large corporate firms, σ_c has no effect on this measure of income inequality as seen in Table (4).

Table 4: Identification

Parameter	Moments					
	Entrepreneurship rate	Markup	Income share top 1%	Share entrepreneurs top 1%	$\frac{\text{Fixed Costs}}{\text{Total Costs}}$	Relative profit margin
$\searrow M$	+	+	−	−	+	−
$\nearrow \phi$	−	+	+	+	+	−
$\nearrow \sigma_a$	−	−	+	+	+	−
$\nearrow \sigma_z$	0	0	+	−	0	0
$\nearrow \sigma_c$	0	+	0	0	+	+
$\nearrow \lambda$	−	+	+	−	−	+
Data (1988-2018)	−	+	+	−	+	−

Note : The direction of arrows next to the structural parameters correspond to the direction of the estimated change in the parameter between 1988 and 2018. Signs + and − denote the increasing or decreasing direction of the comparative static of the moment in response to the parameter, respectively. A parameter that has no effect on the moment is denoted by 0 . The range of the parameters is chosen to be around the maximum and minimum of the parameters estimated between 1988 and 2018.

of these parameter, which are independent estimates across years given the model is static. The estimated parameters are given by minimization an objective function which computes percentage deviations of model moments from moments in the data, relative to average of the model and the data moment.[37]

$$\Omega^* = \min \sum_{k}^{6} \left[\frac{m_k^M(\Omega) - m_t^D}{\left(m_k^M(\Omega) + m_k^D\right) 0.5} \right]^2,$$

where Ω denotes the set of six parameters indexed by k described in Table (4) while $m^M(\Omega)$ and m^D denote the moments in the model and the data respectively.

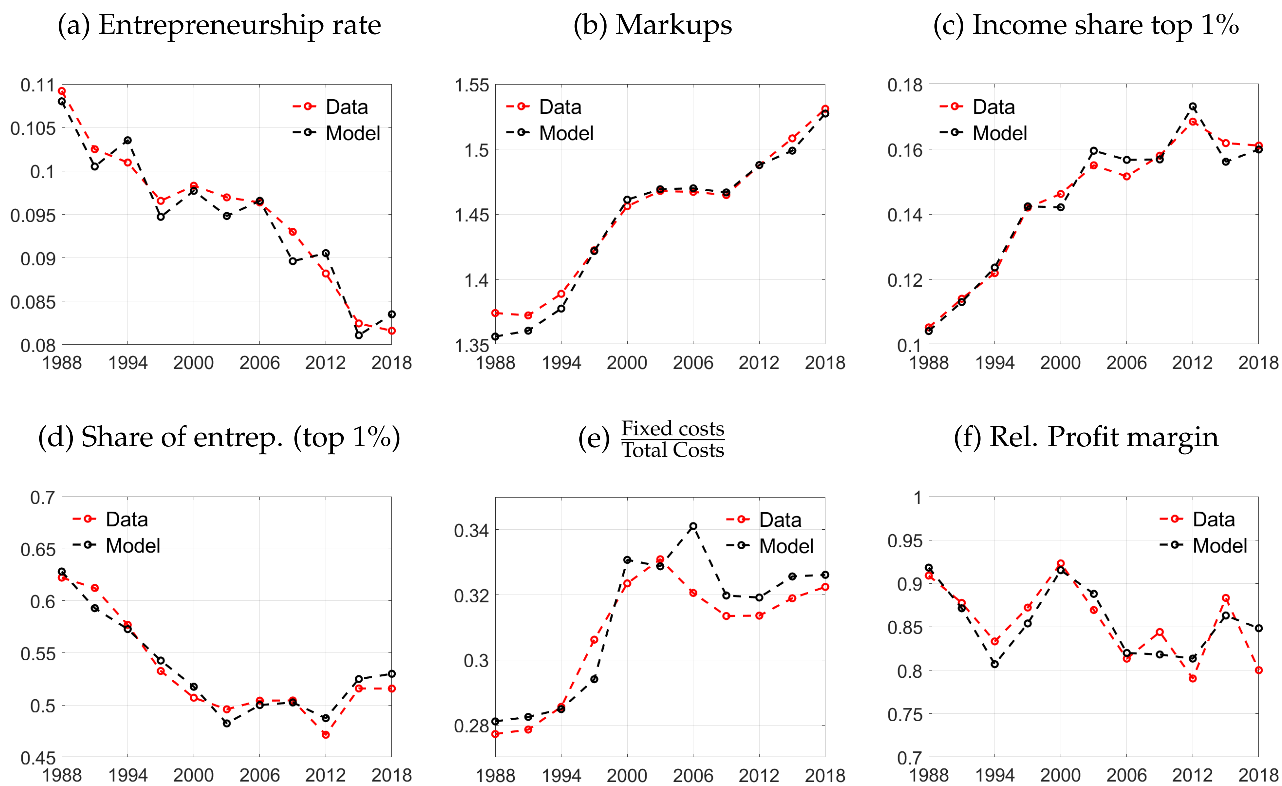
5 Estimation Results

Model Fit. Given the estimation targets 6 moments with 6 parameters, the model is exactly identified. To abstract from cyclical nature of these moments in the data in the baseline estimation I target two year centered moving averages of the yearly moments in the data. In Appendix (C.2) I show the model fit to the annual moments without smoothing. The model fit is presented in Figure (6), where the moments in the model are in black and the corresponding data moments are in red. The model can match the declining entrepreneurship rates which

[37]See De Ridder (2019) and Freund (2022) for similar objective functions which scale the objective function with the average of the moment in the data and model.

decline from almost 11% to 8%, the increase in markups from 1.37 to 1.53 and income share of the top 1% which increased from 11% to 16% between 1988 and 2018. Furthermore, the model can match the evolution of the three other moments on the share of entrepreneurs in the top 1% of the income distribution, the average fixed cost ration and the relative profit margins which are used to discipline the estimated parameters. Overall the model fits the trends in the data reasonably well.

Figure 6: Model Fit



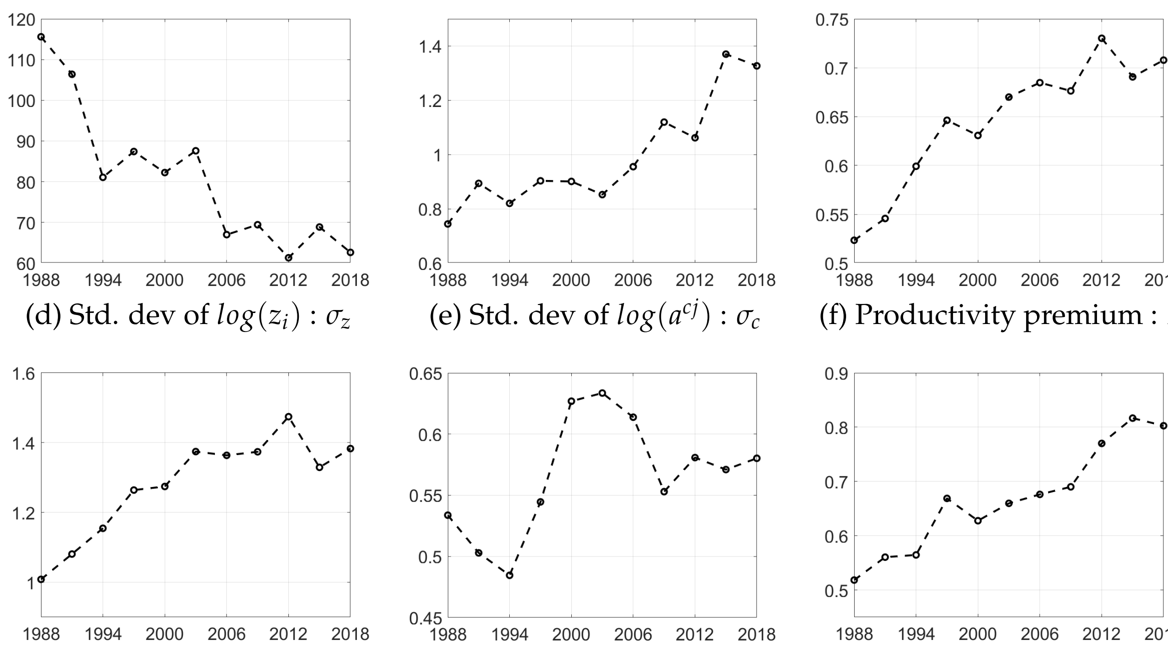
Note: The moments under consideration here refer to two-year centered moving averages of the actual annual moments within the dataset. The model's equivalent is the moment specific to each year, generated based on the estimated parameters corresponding to that year.

Structural parameter estimates and their validation with literature. I show the model estimates in Figure (7). The parameter $M = I/J$ indicates the number of potential entrepreneurs in each market. Holding population I constant a decline in M would suggest increase in the number of product market relative to population, such that there is an increase in product categories that are not close substitutes. This would suggest a changing market structure where competition shifts from within to across markets. The model estimates suggest a decline in M from 116 agents per market in 1988 to 63 in 2018, as shown in figure (7a). This steady decline in the agents per market, holding the number of agents constant leads to an increase in the measure of markets. Recall that a product market j is defined based on the similarity of products; two soft drinks are in the same market j with an elasticity of substitution η, while the soft drink and a neighborhood coffee store are in different markets competing with an elasticity of substitution θ.[38] Through the lens of the model this implies that as markets become more segmented over time there are fewer agents on average that consider entrepreneurship within each of these markets.

Figure 7: Estimated Parameters

(a) Agents per market : M (b) Fixed costs : ϕ (c) Std. dev of $log(a_{ij})$: σ_a

(d) Std. dev of $log(z_i)$: σ_z (e) Std. dev of $log(a^{cj})$: σ_c (f) Productivity premium : λ



Note: This figure presents the time series of the estimated parameters between 1988 and 2018. The matched moments are the two-year centered moving averages of the moments in the data.

As seen in figure (7b), the fixed costs parameter ϕ in the estimation increase from 0.74 in 1988

[38]While new market creation is not an endogenous outcome in the model, one can interpret an increase in the number of markets as increased market differentiation, that is product categories are becoming narrower over time. For instance, within soft drinks (NAICS code 312111) carbonated soft drinks could be considered to be one market in the 1980's but the emergence of energy drinks in the late 90's led to the emergence of a new market (Alsunni (2015)). At the same time, there has been creation of new product markets over time with the rise of new products like smartphones, internet services and online platforms and social media.

to 1.32 in 2018. While it is often hard to measure fixed costs in the data, these estimates are consistent with the findings of Kozeniauskas (2018) who interprets increasing use of information technology and increasing regulation over time as indicative of rising fixed costs.

Figures (7c) and (7d) suggests that the standard deviation of entrepreneurial productivity increased from 0.52 to 0.71 and the standard deviation of large corporate firms increased from 0.53 to 0.58. At the same time Figure (7f) suggests that the productivity premium of large corporate firms increased from 0.52 to 0.8. The magnitude of these dispersion along with the equilibrium distribution of firms in the model is consistent with Syverson (2004) who finds an interquartile range and P90 to P10 range of within market productivity equal to 0.45 and 0.99 from Census of Manufacturing in 1977, while the same numbers are 0.41 and 0.91 respectively, for the year 1988 in the model. Furthermore, the standard deviation of firms productivity increases from 0.42 to 0.54 during the same period. Consequently, the variation in employment and sales increases, leading to a rise in their concentration. This finding supports the idea that technology has contributed to the rise of superstar companies, as suggested by Autor et al. (2020) and this can rationalize a rise in markups and a decline in labor share.

Figure (7d) suggests that the standard deviation of worker productivity increased from 1 to 1.38. Such an increase is qualitatively consistent with the growing inequality in wage income among workers. Wages of the average worker have stagnated while managerial and CEO salaries have sharply increased over the last few decades. Together this increasing in the standard deviation of worker and entrepreneurial earnings is consistent with the findings of Song et al. (2018) and Bilbiie et al. (2023).

Model Validation. The evolution of non-targeted moments in shown Figure (8). In Figure (8a) I show the model can match the increase in the real wage growth in the data. While the model market clearing wage is the wage per efficiency unit or wage per worker productivity, I plot the wage per worker in the model to make it comparable to the average wage per worker in the data. The model predicts a 16% increase in the real wage, consistent with the real wage growth in the data. In Figure (8b) I show the increase in the average firm size in the data and the model, where the model predicts a 20% increase in the average firm size in comparison to a 18% increase in the data.

Furthermore, the model can also account for the increase in the income share of the top 1%. However, in contrast to the increase in roughly 20% in the data the model leads to more than 30% in the income share of the top 1%. While the model matched the average sales weighted markup in the data, the model with rich heterogeneity in the markup distribution can also account for the distributional changes in the evolution of markups. De Loecker et al. (2020) show that much of the increase in markups are driven by the right tail of the markup distribution while the median markups have been relatively stable since the 1980's. In Figure (8d) I show that the similarly to the data the model can account for the 25% rise in the 90th percentile of the sales weighted markup distribution, while the growth in the 10th percentile is relatively stable.

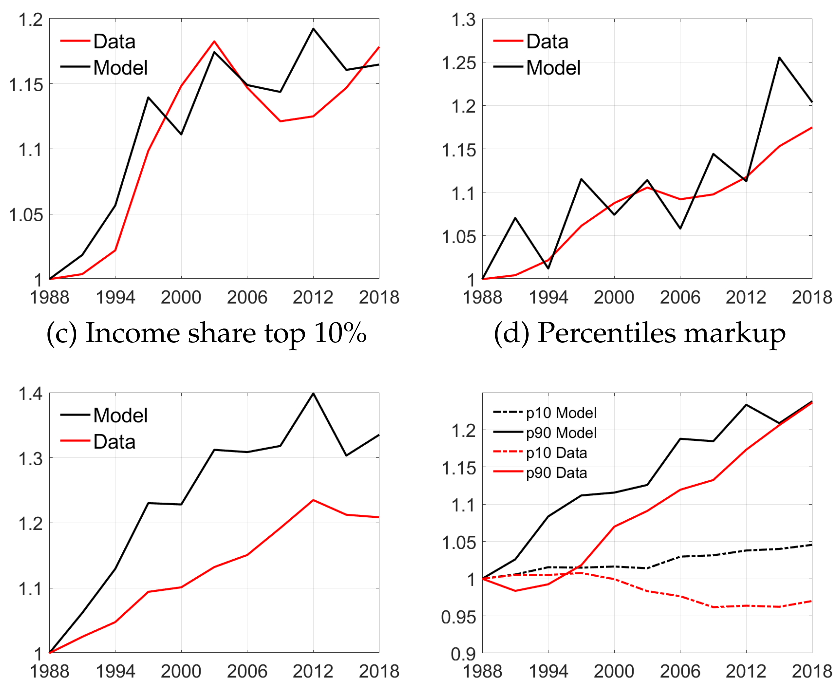
Figure 8: Non-targeted moments

(a) Wage income per worker

(b) Mean firm size

(c) Income share top 10%

(d) Percentiles markup

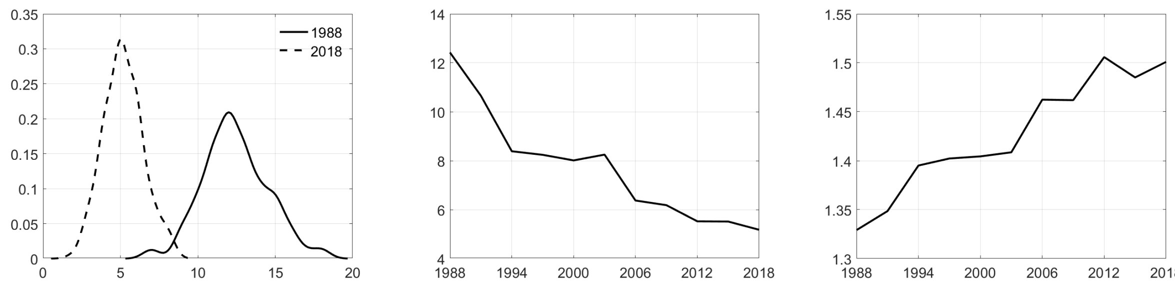


Note: The moments under consideration here refer to two-year centered moving averages of the actual annual moments within the data. The model's equivalent is the moment specific to each year, generated based on the estimated parameters corresponding to that year.

Market Structure and Entrepreneurial Markups. In Figure (9) I show the model predicted outcomes for the entrepreneurial sector. Figure (9a) shows that the distribution of entrepreneurs per market E_j has become more concentrated over time. The distribution of E_j indicates more competition in 1988 than in 2018 which translates into fewer entrepreneurs per market as shown in Figure (9b). This is consistent with recent evidence in Autor et al. (2023) who find an increase in concentration in both local and national product markets.

Figure 9: Entrepreneurial sector

(a) Distribution of E_j (b) Mean E_j (c) Entrepreneurial markups



Note: The model distributions and moments are generated based on the estimated parameters corresponding to that year using estimated parameters that match the smooth moments in the baseline estimation of the model.

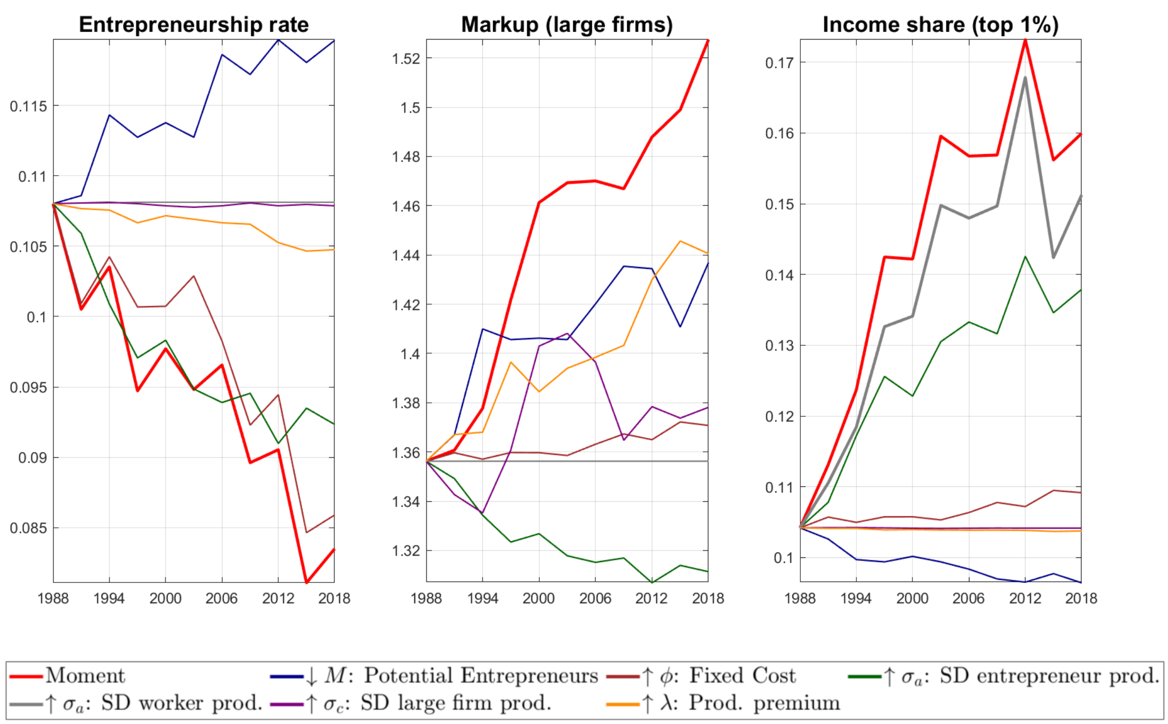
The markups observed in the data are for the large corporate firms in the Compustat. As a result the model on matches the markups of the large corporate firms within the model to it's data counterpart, while taking no prior stance on the evolution of entrepreneurial markups. However, consistent with the literature the model predicts that not only are large corporate firms see an increase in their markups, but perhaps it is an economy wide phenomenon. This is consistent with evidence on rising markups in the Census of Manufacturing (De Loecker et al. (2020), Edmond et al. (2023)), as well as rising retail markups Sangani (2023) and markups in LBD (Deb et al. (2022a), Deb et al. (2022b)). Overall, consistent with some of the recent findings in the literature, the model estimation implies a declining extent of competition in the economy with higher levels of concentration and higher markups.

6 Counterfactual Decompositions

After obtaining the model's estimated parameters, this section proceeds to perform a series of counterfactual experiments to assess how does the evolution of these structural estimates from 1988 to 2018 influence the economy. The findings presented in Figure (10) and Table (5) demonstrate the specific contributions of these factors to changes in the entrepreneurship rates, markup of large firms and income share of the top 1%.

To measure the impact of each parameter, I conduct the following experiment: I keep all other model parameters fixed at their estimated 1988 values and adjust only the parameter of interest to its estimated value in the following years. This approach enables us to examine how the three secular trends would have evolved under the scenario where only the particular parameter of interest changed, while keeping all other parameters constant at their estimated values from 1988.

Figure 10: Counterfactual Contributions

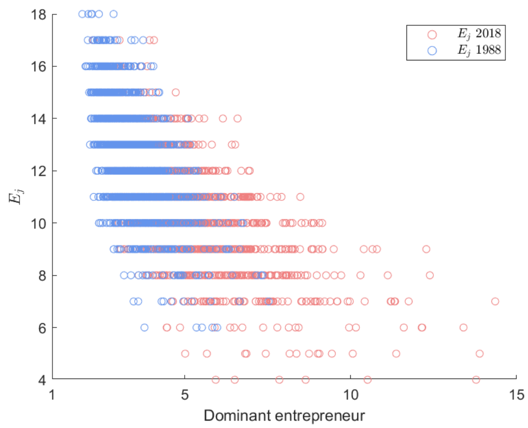


Note: The figure plots the counterfactual evolution of each moment when only one structural parameter is allowed to vary along its estimated path between 1988 and 2018. The actual moment is plotted in red and its counterfactual evolution is plotted in color, with each color specifically assigned to each structural parameter.

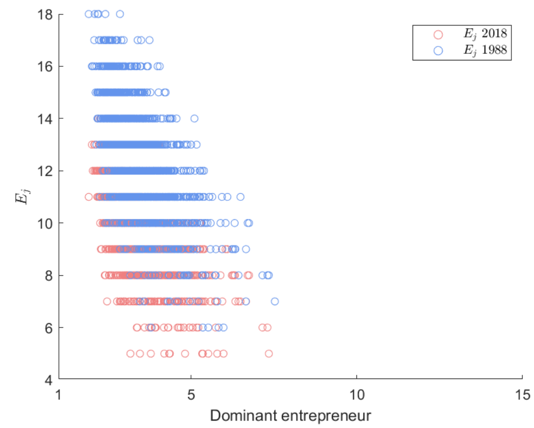
Decomposing the decline in entrepreneurship rates. Entrepreneurship rates in the US decline from 10.8% in to 8.35% between 1988 and 2018. Declining estimates of M lead to an increase in the entrepreneurship rate to 11.96%. A decline in M leads to a larger number of markets per capita in 2018 which leads to higher entrepreneurship rates even as entrepreneurial markups increase due a decline in M. Through the lens of the model, this suggests that ideas for newer product markets or categories have increased relative to the population, which implies more product market categories but fewer entrepreneurs with higher degree of market power in each market.

Figure 11: Entry deterrence in 1988 and 2018

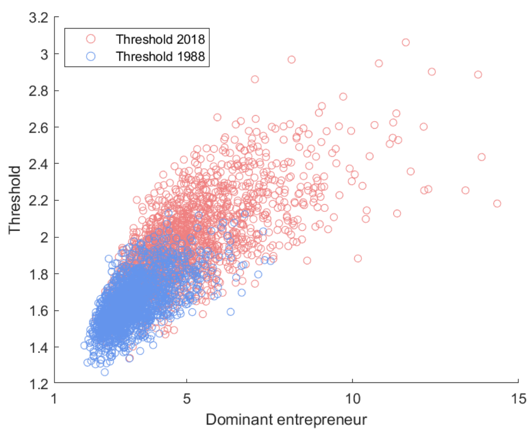
(a) E_j : σ_a counterfactual



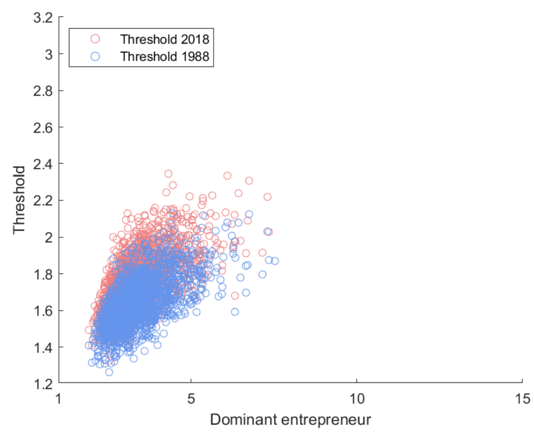
(b) E_j : ϕ counterfactual



(c) Infra-marginal entrepreneurs : σ_a counterfactual



(d) Infra-marginal entrepreneurs : ϕ counterfactual



Note: Each point in the figures correspond to a market. Panel (a) and Panel (b) plot the decline in the number of entrepreneurs per market due to the σ_a and ϕ counterfactual respectively. Panel (c) and Panel (d) plot the change in the threshold in each counterfactual, where the threshold is defined as the agent with the highest entrepreneurial productivity who drops out of entrepreneurship within a market.

However, the increase in both ϕ and σ_a have a substantial effect in reducing entrepreneurship. Increasing fixed costs leads to fewer entrepreneurs as it makes entrepreneurship infeasible for the marginal entrepreneurs reducing entrepreneurship from 10.80% to 8.59%, which accounts for 90% of the total decline. In addition to the general equilibrium effect on wage, the impact of increasing fixed costs on reducing entrepreneurship varies depending on the region in the productivity distribution where the marginal entrepreneurs are located. If the marginal entrepreneurs are close to the dense part of the productivity distribution a small change in fixed costs will lead to a high fraction of entrepreneurs choosing to be workers instead. The counterfactual of changing σ_a to its 2018 value reduces entrepreneurship rates from 10.80% to 9.23% explaining roughly 64% of the total decline. In addition to the general equilibrium effect of increasing the wage, σ_a also reduces entrepreneurship through strategic competition.

Both ϕ and σ_a have a significant effect on declining entrepreneurship as seen in Figure (11a) and Figure 11b). The figures plot the most productive entrepreneur in each market on the x-axis and the equilibrium number of entrepreneurs in that market. In both the counterfactuals we can see that there are fewer entrepreneurs in the markets leading to lower entrepreneurship rates.

While both σ_a and ϕ explain a majority of the decline in entrepreneurship rates, their mechanisms are different. As seen in Figure (11c) an increase in the dispersion of the entrepreneurial productivity distribution σ_a increases the threshold of the infra-marginal entrepreneur; the agent with the highest entrepreneurial productivity who chooses to be a worker. As a result, increasing σ_a leads to lower entrepreneurship through the strategic competition effect. In this case, the dominant entrepreneurs deter entrepreneurship of other agents by driving their markups to the lower bound, and therefore making entrepreneurship infeasible for them. In contrast, increasing ϕ primarily effects the marginal entrepreneurs without increasing the entrepreneurship threshold in each market, as seen in Figure (11d).

Decomposing the rise in large corporate firm markups. In 1988 the aggregate markup was 1.35 which increased to 1.53 in 2018. If only M declined to its estimated value from its value 116 in 1988 to its estimated value 63 in 2018 the markups would increase to 1.44, which is a percentage contribution of 47.8%. This is because as there are fewer agents and therefore, fewer entrepreneurs in equilibrium in each market, the large corporate firms face less competition. As a result the large corporate firms have a larger share of the market which eventually translates into increasing markups. Similarly, increase in the productivity premium of large corporate firms relative to entrepreneurs; λ has a similar affect on the increase in markups and increases markups by 49.24% to 1.44. This is because λ being a productivity shifter makes the large corporate firms more productive relative to entrepreneurs, leading to higher sales shares and

Table 5: Counterfactuals

Counterfactual	Markup (Large Corp. Firms)		Entrepreneurship Rate		Income share Top 1%	
	Level	% Change	% Level	% Change	Level	% Change
1988	1.35	0.00	10.80	0.00	10.42	0.00
M	1.44	47.88	11.96	47.30	9.64	-13.93
ϕ	1.37	8.48	8.59	-90.20	10.92	8.91
σ_a	1.31	-26.20	9.23	-63.96	13.79	60.46
σ_z	1.35	0.01	10.81	0.41	15.12	84.40
σ_c	1.37	12.78	10.79	-0.61	10.42	-0.06
λ	1.44	49.24	10.47	-13.32	10.37	-0.79
2018	1.53	100.00	8.35	-100.00	15.99	100.00

Notes: % refers to the percentage contribution which is defined as $\frac{m_{CF}-m_{1988}}{m_{2018}-m_{1988}}$. Here m refers to the model generated value of the endogenous variable of interest and it's subscript CF refers to the counterfactual parameter being changed to its 2018 value.

higher markups.

However, in contrast the increasing entrepreneurial productivity dispersion makes the entrepreneurs more productive relative to large corporate firms. As they the large corporate firms face higher competition from these more productive entrepreneurs this has an affect of reducing their markups by 26.2% to 1.31.

Decomposing the increase in the income share of the top 1%. The decline in the number of agents per market M reduces the income share of the top 1% by 13.93%, while the increase in fixed costs ϕ lead to a modest increase of 8.91%. The first key driver of income inequality at the top is the increase in the dispersion of the entrepreneurial and worker productivity distribution. This accounts for 60.46% of the total increase. Increasing σ_a has two effects on the income of the top entrepreneurs; 1. It increases their markups and, 2. it increases the scale of their firm therefore increasing their profits.[39] These estimates are qualitatively consistent with the observations of Smith et al. (2019) who suggest that increase in top entrepreneurial incomes closely track the evolution of labor productivity and highlight the role played by technological progress and higher markups.[40] An alternate way to interpret these estimates could be that

[39] An additional characteristic of increasing top income share is the choice of legal form (Smith et al. (2019)). While this model abstracts from an entrepreneurs choice of the legal form of organization, interested readers are pointed to work in Dyrda and Pugsley (2022) and Di Nola et al. (2023) who incorporate such a choice within their frameworks.

[40] Smith et al. (2019) mention that *"Labor productivity of top-owned firms has grown substantially.....This increase in value added per worker is consistent with explanations of top-pay growth that emphasize technological progress, demand-driven*

over time agents draw their innovation ideas or entrepreneurial productivity from a much more dispersed technology distribution, resulting in higher income inequality especially at the top of the income distribution. Such an interpretation is consistent with the findings of Aghion et al. (2019) that increasing innovations are highly correlate with top income shares, especially among entrepreneurs. At the same time, increases in the worker productivity dispersion leads to roughly 84.40% of the increase in the income share of the top 1%. This sharp increase in the estimates of σ_z helps match the composition of workers in the top 1% of the income distribution. The key intuition for this large increase comes from the fact that as wages stagnate for most workers in the model, the model still needs to rationalize the growth in the income of top workers like managers, engineers and CEO's.

Mechanism for rising inequality. To understand the key mechanism behind the rising inequality in the model, we can express the model equilibrium with aggregation equations.

$$\text{MPL} = \left(\int_j J^{-1} MPL_j^{\theta-1} dj \right)^{\frac{1}{\theta-1}}$$

$$\mu = \left(\int_j J^{-1} \left(\frac{MPL_j}{MPL} \right)^{\theta-1} \mu_j^{1-\theta} dj \right)^{\frac{1}{1-\theta}}$$

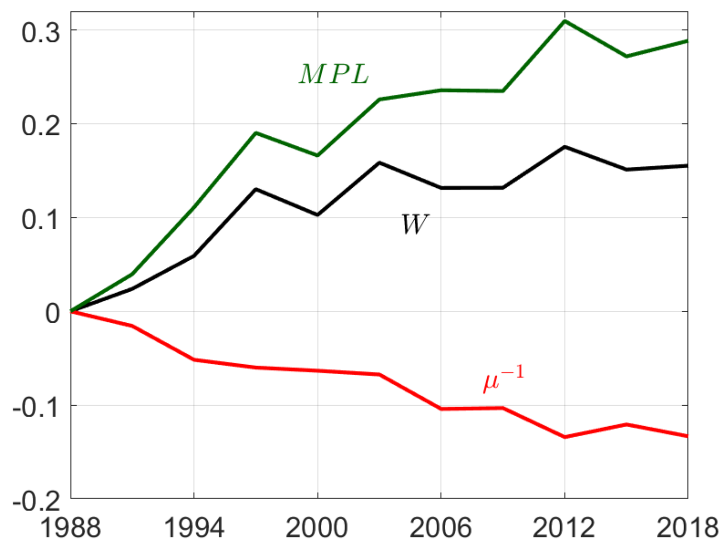
$$W = \frac{\text{MPL}}{\mu}$$

where MPL is the aggregate marginal product of labor, μ is the marginal product weighted aggregate markup and W is the equilibrium market clearing wage in the economy. I plot the evolution of different components of this equation in Figure (12) where the growth in wages can be decomposed into the growth in the marginal product of labor and downward pressure on wages from growth in markups.

In the absence of growth in markups, the benefits of reallocation of labor to more productive entrepreneurs would translate into wage growth of 28.85% but instead the wages in the model only increase by 15.52%. This indicates that when the economy experiences higher productiv-

growth in the service sector, or higher markups. Entrepreneurial income has tracked the evolution of labor productivity closely, suggesting that an important part of overall top entrepreneurial income growth is due to these drivers of value-added growth."

Figure 12: Inequality and Wage Stagnation



Note: This figure plots the evolution of wages, marginal product of labor and aggregated markup under the estimated parameters of the model.

ity growth, workers don't get the full advantage of it in the form of increased wages. Instead, entrepreneurs and large corporate firms make higher profits in the product market, which puts a downward pressure on the wages that workers receive. This can be seen as the difference between the growth of productivity and wages is exactly the growth in this aggregate measure of markup of 13.33%. These increasing rents to entrepreneurs and stagnating wages for majority of the workers is rationalized by a relatively higher increase in the dispersion of worker productivity σ_z to match the composition of workers (mainly managers, high skilled workers and CEO's) in the top 1%.

7 Conclusion

The United States' economy has witnessed various long-term trends starting in the 1980s. Notably, there has been a sharp rise in the income share of the top 1%. Moreover, successful business owners and entrepreneurs have experienced an increase in the business earnings, however at the same time this goes hand in hand with a secular decline in entrepreneurship rates. In this paper, I argue that a crucial element to take into account is the evolution of the nature of competition in the product markets within the US economy. In light of these secular trends, the objective of this paper is to provide a unifying framework to study 1. the rise of product market power 2. decline in entrepreneurship rates and, 3. rising income share of the top 1%.

As a result this paper develops a model of entrepreneurship with strategic competition among heterogeneous agents. The model features rich heterogeneity in markups and a notion of market structure. The model also features an endogenous occupation choice where agents choose to pursue either to be an entrepreneur and operate a firm or to become a worker and supply labor. The key innovation of the model is strategic competition among entrepreneurs. This implies that an agent's decision to become an entrepreneur also depends on the characteristics of other potential entrepreneurs in their market such that the equilibrium set of entrepreneurs is derived using a Nash equilibrium entry game into oligopolistic product markets. Such a model can reconcile, for instance why a highly productive person in the software industry competing with perhaps much more productive agents may choose to be a worker, while another person with the same productivity in a different industry where the competition is less intense, may opt for entrepreneurship instead. Furthermore, the model sheds light on new mechanisms as to how dominant entrepreneurs deter entry of other productive agents in their market and lead to an economy with fewer entrepreneurs, increased concentration and higher markups and increasing income inequality.

Quantitative analysis of the model for the US economy from 1988 to 2018 reveals that the decline in entrepreneurship rates can be attributed to two main factors: higher fixed costs and increased variability in entrepreneurial productivity. In contrast, the increasing markups of large corporate firms are associated with changes in market structure and productivity improvements among these firms. Furthermore, the primary driver of the growing income inequality at the top is the increased variability in productivity among workers and entrepreneurs. When viewed through the lens of the model, the key factor driving these long-term changes is the growing dominance of highly productive entrepreneurs. These dominant entrepreneurs actively discourage the entry of other productive agents, leading to a lower entrepreneurship rates, higher entrepreneurial markups and increased income inequality.

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Online Appendix

A Derivations

A.1 Final goods producer's optimization

The final good producer solves a static maximization problem. It's optimum choice of allocation of intermediate goods across markets can be written as the solution to a problem where it maximizes aggregate output while its expenditure from purchases of the market specific goods are less than a threshold Z. In the following sections let ι represent the index for all active firms with indices $\{c, 1, 2, \ldots, E_j\}$ in market j, including both entrepreneurs and the large corporate firm.

$$\max_{y_j} \left(\int_j \left(\frac{1}{J} \right)^{\frac{1}{\theta}} y_j^{\frac{\theta-1}{\theta}} dj \right)^{\frac{\theta}{\theta-1}} \text{ s.t} \int_j p_j y_j dj \leq Z \tag{A16}$$

The optimal allocation is given by:

$$\frac{\theta}{\theta-1} \left(\int_j \left(\frac{1}{J} \right)^{\frac{1}{\theta}} y_j^{\frac{\theta-1}{\theta}} dj \right)^{\frac{\theta}{\theta-1}-1} \left(\frac{1}{J} \right)^{\frac{1}{\theta}} \frac{\theta-1}{\theta} y_j^{\frac{\theta-1}{\theta}-1} = \lambda p_j$$

Which can be written as:

$$\left(\frac{1}{J} \right)^{\frac{1}{\theta}} Y^{\frac{1}{\theta}} y_j^{-\frac{1}{\theta}} = \lambda p_j$$

Then multiplying each side by y_j and integrating across J we get:

$$Y = \lambda \int_j p_j y_j dj$$

We define the aggregate price index P such that $PY = \int_j p_j y_j dj$ implying that $\lambda = P^{-1}$. Then plugging this into the first order condition gives us the demand function at the market level.

$$y_j = \left(\frac{1}{J}\right)\left(\frac{p_j}{P}\right)^{-\theta} Y$$

To derive the aggregate price index, we multiply both side by p_j and integrate across markets.

$$P = \left[\left(\frac{1}{J}\right)\int_J p_j^{1-\theta} dj\right]^{\frac{1}{1-\theta}}$$

Finally, using similar steps we can derive the entrepreneur level demand function as:

$$y_{\imath j} = \frac{1}{N_j}\left(\frac{p_{\imath j}}{p_j}\right)^{-\eta} y_j$$

and the market price index as:

$$p_j = \left(\frac{1}{N_j}\sum_{\imath} P_{\imath j}^{1-\eta}\right)^{\frac{1}{1-\eta}}$$

Plugging in the market demand function gives us the entrepreneur's demand function as:

$$Y_{\imath j} = \left(\frac{1}{J}\right)\left(\frac{1}{N_j}\right)\left(\frac{P_{\imath j}}{p_j}\right)^{-\eta}\left(\frac{p_j}{P}\right)^{-\theta} Y \tag{A17}$$

To derive the market inverse demand function we can write:

$$p_j = J^{-\frac{1}{\theta}}\left(\frac{y_j}{Y}\right)^{-\frac{1}{\theta}} P$$

and similarly we can write:

$$p_{\imath j} = N_j^{-\frac{1}{\eta}}\left(\frac{Y_{\imath j}}{y_j}\right)^{-\frac{1}{\eta}} p_j$$

Combining the above two equations gives us the entrepreneur level inverse demand function.

$$p_{\imath j} = \frac{1}{J}^{\frac{1}{\theta}} \frac{1}{N_j}^{\frac{1}{\eta}} Y_{\imath j}^{-\frac{1}{\eta}} y_j^{\frac{1}{\eta}-\frac{1}{\theta}} Y^{\frac{1}{\theta}} P \tag{A18}$$

A.2 Solution to the entrepreneur's production decision and market clearing equations in closed form

A.2.1 Using shares

The entrepreneurs chooses the number of workers to hire to maximize their profits.

$$\pi_{\imath j}\left(y_{\imath j}, \mathbf{y}_{-\imath j}, P, Y\right) = \max_{l_{\imath j}} p_{\imath j}\left(y_{\imath j}, \mathbf{y}_{-\imath j}, P, Y\right) y_{\imath j} - W l_{\imath j} - \phi W \tag{A19}$$

where $y_{\imath j} = a_{\imath j} l_{\imath j}^{\nu}$. The first order condition can be written as;

$$p_{\imath j} = \frac{W}{\nu} \mu_{\imath j} a_{\imath j}^{-1/\nu} l_{\imath j}^{1-\nu} \tag{A20}$$

Next we can substitute for $l_{\imath j}$ using the production function and use the demand function to write price of each firm as,

$$p_{\imath j} = \left(\frac{W}{\nu} \mu_{\imath j} a_{\imath j}^{\frac{-1}{\nu}} \left[\frac{1}{J} \frac{1}{N_j} \left(s_{\imath j} E_j\right)^{\frac{\eta-\theta}{\eta-1}} P^{\theta} Y \right]^{\frac{1-\nu}{\nu}} \right)^{\frac{\nu}{\nu+\theta(1-\nu)}} \tag{A21}$$

Thereafter using the optimization solutions of the final goods producer we can write the sales share of each firm in market j as

$$s_{\imath j} = \frac{p_{\imath j} y_{\imath j}}{\sum_{\imath} p_{\imath j} y_{\imath j}} = \frac{p_{\imath j}^{1-\eta}}{\sum_{\imath} p_{\imath j}^{1-\eta}} \tag{A22}$$

Plugging in the pricing equation we can derive a system of equations that give the sales share of each firm,

$$s_{\imath j} = \frac{\left(\mu_{\imath j} a_{\imath j}^{\frac{-1}{\nu}} s_{\imath j}^{\frac{\eta-\theta}{\eta-1}\frac{1-\nu}{\nu}}\right)^{\frac{\nu(1-\eta)}{\nu+\theta(1-\nu)}}}{\sum_\imath \left(\mu_{\imath j} a_{\imath j}^{\frac{-1}{\nu}} s_{\imath j}^{\frac{\eta-\theta}{\eta-1}\frac{1-\nu}{\nu}}\right)^{\frac{\nu(1-\eta)}{\nu+\theta(1-\nu)}}} \tag{A23}$$

Market Clearing Equations. Once the sales shares are solved in each market, for any given set of firms and workers we can use closed form aggregation equations to pin down the aggregate output and wage. To do so use the use the aggregation equation for P which gives us the goods market normalization equation

$$P = \underbrace{\left[\int_j \frac{1}{J}\left\{\sum_\imath \frac{1}{N_j}\left(\frac{\mu_{\imath j}}{\nu} a_{\imath j}^{\frac{-1}{\nu}}\left[\frac{1}{J}\frac{1}{N_j}\left(s_{\imath j}N_j\right)^{\frac{\eta-\theta}{\eta-1}}\right]^{\frac{1-\nu}{\nu}}\right)^{\frac{\nu}{\nu+\theta(1-\nu)}(1-\eta)}\right\}^{\frac{1-\theta}{1-\eta}} dj\right]^{\frac{1}{1-\theta}}}_{\widetilde{P}} W^{\frac{\nu}{\nu+\theta(1-\nu)}} Y^{\frac{1-\nu}{\nu+\theta(1-\nu)}} \tag{A24}$$

Where $\widetilde{P}$ is the part of aggregate price without the aggregate scalars Y, W. Simplify this to get an expression for Y, W.

$$\left(\frac{P}{\widetilde{P}}\right)^{\frac{\nu+\theta(1-\nu)}{\nu}} = WY^{\frac{1-\nu}{\nu}} \tag{A25}$$

Then the labor market clearing give us

$$\underbrace{\int_j \sum_{i \notin \mathcal{I}_j} z_i dj - \int_j \sum_\imath \phi dj}_{LS-L^{OL}_{demand}} = \tag{A26}$$

$$\underbrace{\int_j \sum_\imath a_{\imath j}^{\frac{-1}{\nu}}\left[\frac{1}{J}\frac{1}{N_j}\left(s_{\imath j}E_j\right)^{\frac{\eta-\theta}{\eta-1}}\right]^{\frac{1}{\nu}}\left(\frac{\mu_{\imath j}}{\nu} a_{\imath j}^{\frac{-1}{\nu}}\left[\frac{1}{J}\frac{1}{N_j}\left(s_{\imath j}N_j\right)^{\frac{\eta-\theta}{\eta-1}}\right]^{\frac{1-\nu}{\nu}}\right)^{\frac{-\theta}{\nu+\theta(1-\nu)}} dj}_{\widetilde{L}^{PL}_{demand}} \left[\frac{PY^{1/\theta}}{W}\right]^{\frac{\theta}{\nu+\theta(1-\nu)}}$$

Where $\widetilde{L}^{PL}_{demand}$ is the total demand for production labor without the aggregate scaling W, Y. Simply this equation to get W as a function of Y.

$$\left[\frac{LS - L^{OL}_{demand}}{\widetilde{L}^{PL}_{demand}}\right]^{\frac{\nu+\theta(1-\nu)}{\theta}} = Y^{1/\theta}W^{-1} \tag{A27}$$

Then

$$W = Y^{1/\theta}\left[\frac{\widetilde{L}^{PL}_{demand}}{LS - L^{OL}_{demand}}\right]^{\frac{\nu+\theta(1-\nu)}{\theta}} \tag{A28}$$

Finally we can solve for Y and W. To do so we can use this equation together with Equation A25, to get an expression for Y.

$$\left(\frac{P}{\widetilde{\widetilde{P}}}\right)^{\frac{\nu+\theta(1-\nu)}{\nu}} = Y^{1/\theta}\left[\frac{\widetilde{L}^{PL}_{demand}}{LS - L^{OL}_{demand}}\right]^{\frac{\nu+\theta(1-\nu)}{\theta}} Y^{\frac{1-\nu}{\nu}} \tag{A29}$$

$$Y^{\frac{1}{\theta}+\frac{1-\nu}{\nu}} = \left(\frac{P}{\widetilde{\widetilde{P}}}\right)^{\frac{\nu+\theta(1-\nu)}{\nu}}\left[\frac{LS - L^{OL}_{demand}}{\widetilde{L}^{PL}_{demand}}\right]^{\frac{\nu+\theta(1-\nu)}{\theta}} \tag{A30}$$

$$Y = \left[\left(\frac{P}{\widetilde{\widetilde{P}}}\right)^{\frac{\nu+\theta(1-\nu)}{\nu}}\left[\frac{LS - L^{OL}_{demand}}{\widetilde{L}^{PL}_{demand}}\right]^{\frac{\nu+\theta(1-\nu)}{\theta}}\right]^{\frac{\theta\nu}{\nu+\theta(1-\nu)}} \tag{A31}$$

$$Y = \left(\frac{P}{\widetilde{\widetilde{P}}}\right)^{\theta}\left(\frac{\widetilde{L}^{PL}_{demand}}{LS - L^{OL}_{demand}}\right)^{-\nu} \tag{A32}$$

Then W can be solved using Equation A28

$$W = \left[\left(\frac{P}{\widetilde{\widetilde{P}}}\right)^{\theta}\left(\frac{\widetilde{L}^{PL}_{demand}}{LS - L^{OL}_{demand}}\right)^{-\nu}\right]^{1/\theta}\left[\frac{\widetilde{L}^{PL}_{demand}}{LS - L^{OL}_{demand}}\right]^{\frac{\nu+\theta(1-\nu)}{\theta}} \tag{A33}$$

A.2.2 Solving the model levels.

This procedure of solving the model is useful under less restrictive assumptions on the production side and is fairly general. This is because with multiple inputs and different production functions one may not be able to derive a close form expression for sales shares independent of the aggregates. This sections shows an alternate way to numerically solve the model.
To do so write the FOC as before and replace all endogenous objects only as a function of labor.

$$\underbrace{p_{\imath j}(1+\epsilon^{p}_{\imath j})}_{\partial R_{\imath j}/\partial y_{\imath j}} \frac{\partial y_{\imath j}}{\partial l_{\imath j}} = W \tag{A34}$$

This can be done by using the following equations to express FOC in levels

$$p_{\imath j} = J^{-1/\theta} N_j^{-1/\eta} y_{\imath j}^{-1/\eta} y_j^{1/\eta - 1/\theta} Y^{1/\theta} P \tag{A35}$$

$$1+\epsilon^{p}_{\imath j} = 1 - \frac{1}{\theta}\frac{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}}{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\hat{\eta}}}} - \frac{1}{\eta}\left(1 - \frac{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}}{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}}\right) \tag{A36}$$

$$\underbrace{J^{\frac{-1}{\theta}} N_j^{\frac{-1}{\eta}} (y_{\imath j})^{-\frac{1}{\eta}} \left[\left(\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}\right)^{\frac{\eta}{\eta-1}\frac{(\theta-\eta)}{\eta\theta}}\right] P Y^{1/\theta}}_{p_{\imath j}} \underbrace{\left[1 - \frac{1}{\theta}\frac{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}}{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\hat{\eta}}}} - \frac{1}{\eta}\left(1 - \frac{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}}{\sum_\imath (y_{\imath j})^{\frac{\eta-1}{\eta}}}\right)\right]}_{1+\epsilon^{p}_{\imath j}} \underbrace{a_{\imath j} \nu l_{\imath j}^{\nu-1}}_{\partial y_{\imath j}/\partial l_{\imath j}} = W \tag{A37}$$

One can now directly normalize the aggregate price to 1.

$$J^{\frac{-1}{\theta}} N_j^{\frac{-1}{\eta}} (a_{\imath j} l_{\imath j}^{\nu})^{-\frac{1}{\eta}} \left[\left(\sum_\imath (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}\right)^{\frac{\eta}{\eta-1}\frac{(\theta-\eta)}{\eta\theta}}\right] Y^{1/\theta} \left[1 - \frac{1}{\theta}\frac{\sum_\imath (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}}{\sum_\imath (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\hat{\eta}}}} - \frac{1}{\eta}\left(1 - \frac{\sum_\imath (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}}{\sum_\imath (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}}\right)\right] a_{\imath j} \nu l_{\imath j}^{\nu-1} = W \tag{A38}$$

This gives us a system of N_j equations and N_j unknowns within each market. As a result if we know the vector of productivities $\mathbf{a}_{\imath j}$ we can solve for the vector of employment $\mathbf{l}_{\imath j}$ for any given guess of the scalar $\frac{Y^{1/\theta}}{W}$. Finally, one case can use the market clearing conditions to solve for the ratio $\frac{Y^{1/\theta}}{W}$

Algorithm to solve the model in levels directly In the absence of closed form solutions for sales shares and aggregation equations for Y and W, we can use the following way to solve the model.

- Step 1. Guess the scalar $\left(Y^{1/\theta}/W\right)^{guess}$
- Step 2. Now we can write Equation (A38) as a fixed point problem. Guess a vector of employment for each entrepreneur $l_{\imath j}$, compute the RHS of the following equation and update the vector on the LHS until convergence.
-

$$l_{\imath j}^{upd} = \left[\left\{ J^{\frac{-1}{\theta}} E_j^{\frac{-1}{\eta}} a_{\imath j} \nu l_{\imath j}^{\nu-1} \left[\left(\sum_{\imath} (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}\frac{(\theta-\eta)}{\eta\theta}} \right] \left[1 - \frac{1}{\theta} \frac{\sum_{\imath} (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}}{\sum_{\imath} (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\hat{\eta}}}} - \frac{1}{\eta} \left(1 - \frac{\sum_{\imath} (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}}{\sum_{\imath} (a_{\imath j} l_{\imath j}^{\nu})^{\frac{\eta-1}{\eta}}} \right) \right] \frac{Y^{1/\theta}}{W} \right\}^{-\eta} \frac{1}{a_{\imath j}} \right]^{\frac{1}{\nu}}$$

- Step 3. Compute the implied $\left(Y^{1/\theta}/W\right)$, and update it using the closed form market clearing conditions derived in Equation (A28) until convergence.

A.3 Deriving the closed form profit equations

This section derives the closed form profit equation, which can be expressed as a function of the entrepreneurial productivity distribution and aggregates. Since this equation holds for both the entrepreneurs and large corporate firm, I will use the index $\imath j$ to denote a firm $\imath$ in market j. To do so we can start from the firms first order condition.

$$p_{\imath j} \mu_{\imath j}^{-1} a_{\imath j} \nu l_{\imath j}^{\nu-1} = W$$

Then we can first construct the expression for variable profits given by $\widetilde{\pi_{\imath j}} = p_{\imath j} y_{\imath j} - W l_{\imath j}$. This can be expressed as a multiple of the wage bill,

$$\widetilde{\pi_{\imath j}} = W l_{\imath j} \left(\frac{\mu_{\imath j}}{\nu} - 1 \right)$$

This equation states that the variable profits of a firm are a multiple (greater than 1) over the wage bill, where this multiple is a function of the returns to scale $\nu \leq 1$ and $\mu_{\imath j} \geq 1$. The objective in the following steps is to replace $l_{\imath j}$ as a function of the productivity distribution in market j.

Use the production function and the demand function. Using the production function we can write,

$$\widetilde{\pi_{\imath j}} = W \left(\frac{\mu_{\imath j}}{\nu} - 1 \right) \left(\frac{y_{\imath j}}{a_{\imath j}} \right)^{1/\nu}$$

Plugging in the demand function $y(p_{\imath j}, \mathbf{p}_{-\imath j}, P, Y)$ this can be expressed as[41]

$$\widetilde{\pi_{\imath j}} = W \left(\frac{\mu_{\imath j}}{\nu} - 1 \right) a_{\imath j}^{-1/\nu} \left[J^{-1} N_j^{-1} \left(\frac{p_{\imath j}}{p_j} \right)^{-\eta} \left(\frac{p_j}{P} \right)^{-\theta} Y \right]^{\frac{1}{\nu}}$$

In the above expression the only two market specific endogenous variable are $p_{\imath j}$ and p_j. The next step is to express these as a function of the productivity distribution in the market. **Express p_j as a function of $p_{\imath j}$.** To do so we can use the Nash Equilibrium sales share equation,

$$\begin{aligned} s_{\imath j} &= \frac{p_{\imath j}^{1-\eta}}{p_j^{1-\eta}} \\ p_j &= p_{\imath j} \left(N_j s_{\imath j} \right)^{\frac{1}{\eta - 1}} \end{aligned}$$

[41] Here I replace $E_j + 1$ with N_j which is equilibrium set of firms in a market, comprising of E_j entrepreneurs and one large corporate firm.

where the last equation uses the definition of $p_j = \left(\frac{1}{N_j}\sum_\imath P_{\imath j}^{1-\eta}\right)^{\frac{1}{1-\eta}}$. Note that $s_{\imath j}(a_{\imath j}, \mathbf{a}_{-\imath j})$ is a function of the productivity distribution in market j. Plugging this into the variable profit equation we get,

$$\widetilde{\pi_{\imath j}} = W\left(\frac{\mu_{\imath j}}{\nu} - 1\right) a_{\imath j}^{-1/\nu}\left[J^{-1}N_j^{-1}\left(N_j s_{\imath j}\right)^{\frac{\eta-\theta}{\eta-1}} P^\theta Y\right]^{\frac{1}{\nu}} p_{\imath j}^{\frac{-\theta}{\nu}} \tag{A39}$$

Express $p_{\imath j}$ as a function of productivity distribution and aggregates. To do so we can use the first order condition, production function and demand function sequentially,

$$\begin{aligned} p_{\imath j} =& \frac{W\mu_{\imath j}}{\nu a_{\imath j}} l_{\imath j}^{1-\nu} \\ =& \frac{W\mu_{\imath j}}{\nu a_{\imath j}}\left(\frac{y_{\imath j}}{a_{\imath j}}\right)^{\frac{1-\nu}{\nu}} \end{aligned}$$

Next we can plug in the demand function to get,

$$p_{\imath j} = \frac{W\mu_{\imath j}}{\nu a_{\imath j}}(a_{\imath j})^{\frac{\nu-1}{\nu}}\left[J^{-1}N_j^{-1}\left(N_j s_{\imath j}\right)^{\frac{\eta-\theta}{\eta-1}} P^\theta Y\right]^{\frac{1-\nu}{\nu}} p_{\imath j}^{\frac{\theta(\nu-1)}{\nu}}$$

collecting the terms we can express the firm specific price as,

$$p_{\imath j} = \left[\frac{W\mu_{\imath j}}{\nu}(a_{\imath j})^{\frac{-1}{\nu}}\left[J^{-1}N_j^{-1}\left(N_j s_{\imath j}\right)^{\frac{\eta-\theta}{\eta-1}} P^\theta Y\right]^{\frac{1-\nu}{\nu}}\right]^{\frac{\nu}{\nu+\theta(1-\nu)}}$$

This gives us the price that is only a function of the productivity distribution and aggregates. Plugging the above equation into the Equation (A39) gives us,

$$\widetilde{\pi_{\imath j}} = W\left(\frac{\mu_{\imath j}}{\nu} - 1\right)\left(\frac{\mu_{\imath j}}{\nu}\right)^{\frac{-\theta}{\nu+\theta(1-\nu)}}(a_{\imath j})^{\frac{\theta-1}{\nu+\theta(1-\nu)}}\left[N_j^{\frac{1-\theta}{\eta-1}}\left(s_{\imath j}\right)^{\frac{\eta-\theta}{\eta-1}}\right]^{\frac{1}{\nu+\theta(1-\nu)}}\left(\frac{J^{\frac{-1}{\theta}} P^\theta Y}{W}\right)^{\frac{\theta}{\nu+\theta(1-\nu)}}$$

Then the entrepreneurship condition can be written as,

$$\underbrace{p_{ij}y_{ij} - Wl_{ij}}_{\widetilde{\pi}_{ij}} - W\phi \geq W\mathbb{E}(z_i)$$

which gives us the equation in the main text;

$$(a_{ij})^{\frac{\theta-1}{\nu+\theta(1-\nu)}} \left(\frac{\mu_{ij}}{\nu} - 1\right) \left(\frac{\mu_{ij}}{\nu}\right)^{\frac{-\theta}{\nu+\theta(1-\nu)}} \left[N_j^{\frac{1-\theta}{\eta-1}} (s_{ij})^{\frac{\eta-\theta}{\eta-1}}\right]^{\frac{1}{\nu+\theta(1-\nu)}} \left(\frac{J^{\frac{-1}{\theta}} P^{\theta} Y}{W}\right)^{\frac{\theta}{\nu+\theta(1-\nu)}} \geq \mathbb{E}(z_i) + \phi \tag{A40}$$

A.4 Aggregation equations

Start from the FOC

$$p_{ij} = \frac{W\mu_{ij}}{\partial y_{ij}/\partial l_{ij}}$$
$$p_{ij} = \frac{W\mu_{ij}}{\nu a_{ij} l_{ij}^{\nu-1}}$$

Now define the marginal product of labor $\nu a_{ij} l_{ij}^{\nu-1}$ as MPl_{ij} then;

$$p_{ij} = \frac{W\mu_{ij}}{MPl_{ij}}$$

Next define some aggregation aggregation equations for the Marginal Product at the market and economy level.

$$MPL_j = \left(\sum_{i} N_j^{-1} MPl_{ij}^{\eta-1}\right)^{\frac{1}{\eta-1}}$$
$$MPL = \left(\int_j J^{-1} MPL_j^{\theta-1} dj\right)^{\frac{1}{\theta-1}}$$

Now apply this definition to get the markup at the market and economy level. Use the market price index equation

$$p_j = \left(\sum_\imath N_j^{-1}\left(\frac{W\mu_{\imath j}}{MPl_{\imath j}}\right)^{1-\eta}\right)^{\frac{1}{1-\eta}}$$

$$p_j = \left(\sum_\imath N_j^{-1}\mu_{\imath j}^{1-\eta}MPl_{\imath j}^{\eta-1}\right)^{\frac{1}{1-\eta}}W$$

$$p_j = \left(\sum_\imath N_j^{-1}\mu_{\imath j}^{1-\eta}MPl_{\imath j}^{\eta-1}MPL_j^{\eta-1}MPL_j^{1-\eta}\right)^{\frac{1}{1-\eta}}W$$

$$p_j = \underbrace{\left(\sum_\imath N_j^{-1}\left(\frac{MPl_{\imath j}}{MPL_j}\right)^{\eta-1}\mu_{\imath j}^{1-\eta}\right)^{\frac{1}{1-\eta}}}_{\mu_j}\frac{W}{MPL_j}$$

$$p_j = \underbrace{\left(\sum_\imath \underbrace{\frac{MPl_{\imath j}^{\eta-1}}{\sum_\imath MPl_{\imath j}^{\eta-1}}}_{\text{weight}_i}\mu_{\imath j}^{1-\eta}\right)^{\frac{1}{1-\eta}}}_{\mu_j}\frac{W}{MPL_j}$$

Similarly we can define the aggregate markup using the $MPl_{\imath j}$ aggregation definition and the aggregate price index.

$$P = \underbrace{\left(\int_j J^{-1}\left(\frac{MPL_j}{MPL}\right)^{\theta-1}\mu_j^{1-\theta}dj\right)^{\frac{1}{1-\theta}}}_{\mu}\frac{W}{MPL}$$

$$P = \underbrace{\left(\int_j \underbrace{\frac{MPL_j^{\theta-1}}{\int_j MPL_j^{\theta-1}dj}}_{\text{weight}_j}\mu_j^{1-\theta}dj\right)^{\frac{1}{1-\theta}}}_{\mu}\frac{W}{MPL}$$

Use the labor market clearing equations to get

$$\underbrace{\int_j \sum_{i \notin \mathcal{I}_j} z_i dj - \int_j \sum_\imath \phi dj}_{LS - L^{Overhead}_{demand}} = \underbrace{\int_j \sum_\imath L^{prod}_{\imath j} dj}_{L^{Production}_{demand}}$$

$$\begin{aligned}
\int_j \sum_\imath L^{prod}_{\imath j} dj &= \int_j \sum_\imath \left(\frac{y_{\imath j}}{a_{\imath j}}\right)^{1/\nu} dj \\
&= \int_j \sum_\imath \left(\frac{a_{\imath j}}{MPl_{\imath j}}\right)^{-1/\nu} \left(\frac{y_{\imath j}}{MPl_{\imath j}}\right)^{1/\nu} dj \\
&= \int_j \sum_\imath \left(\frac{a_{\imath j}}{MPl_{\imath j}}\right)^{-1/\nu} \left[MPl_{\imath j}^{-\nu} J^{-1} E_j^{-1} p_{\imath j}^{-\eta} p_j^{\eta-\theta} P^\theta Y\right]^{1/\nu} dj
\end{aligned}$$

This gives an expression for the production labor $\int_j \sum_\imath L^{prod}_{\imath j} dj$ as

$$\int_j J^{-1/\nu} \underbrace{\sum_\imath \left(\frac{a_{\imath j}}{MPl_{\imath j}}\right)^{-1/\nu} E_j^{-1/\nu} \left(\frac{\mu_{\imath j}}{\mu_j}\right)^{-\eta/\nu} \left(\frac{MPl_{\imath j}}{MPL_j}\right)^{(\eta-1)/\nu}}_{\Omega_j} \left(\frac{\mu_j}{MPL_j}\right)^{-\theta/\nu} \left(\frac{W}{P}\right)^{-\theta/\nu} Y^{1/\nu} dj$$

$$\underbrace{\int_j J^{-1/\nu} \Omega_j \left(\frac{\mu_j}{\mu}\right)^{-\theta/\nu} \left(\frac{MPL_j}{MPL}\right)^{(\theta-1)/\nu} dj}_{\Omega} \left(\frac{Y}{MPL}\right)^{1/\nu}$$

Then the aggregate production function can be written as

$$\begin{aligned}
Y^{1/\nu} &= \frac{L}{\Omega\phi} MPL \\
Y &= \left(\frac{1}{\Omega\phi}\right)^{\nu} MPL \times L^\nu \\
\ln Y &= \nu \ln L + \ln MPL - \nu \ln \Omega - \nu \ln \phi \\
\ln Y &= \nu \ln \underbrace{(\underbrace{L}_{\text{Aggregate Input Resource}} - \underbrace{\int_j \sum_\imath \phi dj}_{\text{Labor in Fixed cost}})}_{\text{Production Labor}} + \ln \underbrace{MPL}_{\text{Selection into Entrep.}} - \nu \ln \Omega
\end{aligned}$$

where

$$
\begin{aligned}
\phi &= \frac{L}{L - \int_j \sum_\imath \phi dj} \\
\Omega &= \int_j J^{-1/\nu} \Omega_j \left(\frac{\mu_j}{\mu}\right)^{-\theta/\nu} \left(\frac{MPL_j}{MPL}\right)^{(\theta-1)/\nu} dj \\
\Omega_j &= \sum_\imath \left(\frac{a_{\imath j}}{MPl_{\imath j}}\right)^{-1/\nu} E_j^{-1/\nu} \left(\frac{\mu_{\imath j}}{\mu_j}\right)^{-\eta/\nu} \left(\frac{MPl_{\imath j}}{MPL_j}\right)^{(\eta-1)/\nu} \\
MPL &= \left(\int_j J^{-1} MPL_j^{\theta-1} dj\right)^{\frac{1}{\theta-1}} \\
MPL_j &= \left(\sum_\imath N_j^{-1} MPl_{\imath j}^{\eta-1}\right)^{\frac{1}{\eta-1}}
\end{aligned}
$$

B Other Model Properties

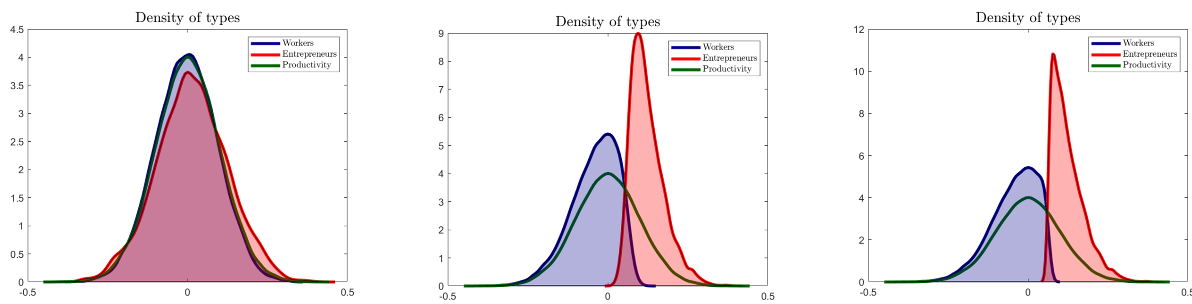
In this section, I show some additional model properties. First, I show alternate assignment rules other than random assignment. The objective is to show that the while market choice is endogenous in the real world, the assumption on random assignment delivers an intermediate outcome between positive assortative and negative assortative matching of agents to markets. Second I show the effects from the love for variety adjustment. The objective is to show that holding the measure of agents constant, changes in the measure of markets, given the assignment rule implies changes in M, however the effect only comes from distributional changes within a market and not across markets. In a sense, given these scaling, mechanical changes in the measure of markets leave all relative moments in the model unchanged.

B.1 Alternate Market Assignments

Each agent i in market j is endowed with a productivity a_{ij}. However, the assignment of agents to markets shapes the extent of overlap between the productivity distribution of entrepreneurs and the latent productivity distribution of workers. Consider an economy where the least productive M agents are assigned to market 1, the next M agents to market 2 and so forth until the final market has the most productive M agents. These markets would have low within market variance, σ^2_{within} as all M agents are very similar within each market j. Then as the most productive agents in each market become entrepreneurs, the extent of overlap between the productivity distribution of entrepreneurs and workers is large as seen in figure A1a. On the other hand if markets are constructed such that they have very high within market variance, the overlap between the two distribution is low as seen in figure (A1c).

Figure A1: **Assignment Rules**

(a) low σ^2_{Within} (b) RA : $\sigma^2_{Within} \sim \sigma^2_{log(a_{ij})}$ (c) high σ^2_{Within}



Finally, in case of random assignment where all markets are randomly drawn from the productivity distribution, the within market variance is roughly similar to the overall variance of the productivity distribution. The corresponding overlap between the two distributions can be seen in figure (A1b). As a result, throughout the main body of the paper, the benchmark economy features random assignment of agents to markets.

B.2 Adjustment for love for variety

In this section, I show that holding the distribution of productivities unchanged, the results are solely driven by changing M and not changing J. This is because of three main reasons. First, because J is an aggregate scalar common for all agents. Second, the final goods aggregator has love for variety adjustment that adjusts for the scale of the economy. And third, only changes in M drive the results as the only source of strategic competition is within and not across markets. The combination of these three features of the model mean that the measure of markets influence the results, only to the extent it has within market distributional changes. To see this consider two economies,

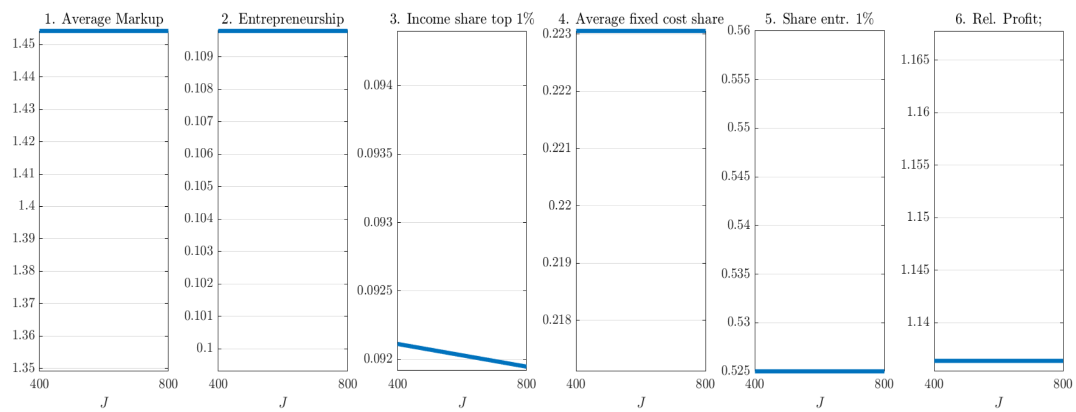
Baseline Economy. Consider an economy with I = 20,000 where the number of markets J = 400. Given the random assignment rule the expected number of potential entrepreneurs per market is M = 50.

The key exercise is to double the size of the economy, which is done by replicating the initial economy. The exact replication is important as the distribution of productivities is identical (there are no distributional changes), there are just twice as many of each agent in the new economy. The only difference remains if this replication is within or across markets.

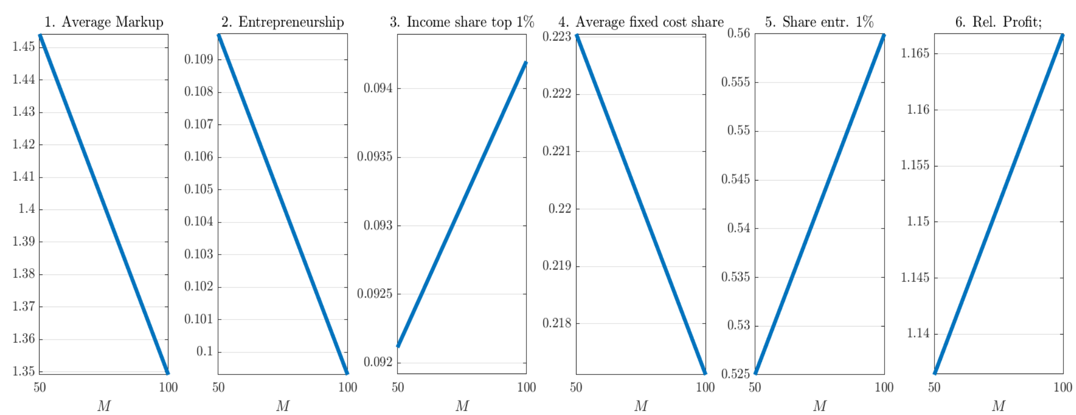
CASE 1 : Only the measure of markets increases. Counterfactual Economy with J =800, M=50.

Figure A2: Changing M vs J

(a) Changing J



(b) Changing M



In this case the replication is across markets, there are exactly 2 copies of each market now. Therefore J doubles.

CASE 2 : Only potential entrepreneurs in a market increases Counterfactual Economy with J =400, M=100. In this case the replication is within market, there are exactly 2 copies of each agent within a market. Therefore M doubles.

Why does J not effect the shares in the model. The important reason is that J is an aggregate scalar. First, given the love for variety scaling adjustment in the Final Goods Producer technology, scaling an identical economy leaves equilibrium prices like W unchanged. This is because leaving the incentives of the agents unchanged, this exactly double the labor demand and labor supply in the same proportion. Second, since it is an aggregate scalar it keeps the shares among agents unchanged. Then the natural question is, why does M have an effect ? This is primarily because of strategic competition. The strategic competition in this model is only within a market j as there are finitely many agents engaged in either Cournot or Bertrand competition in product markets. Furthermore, since there are a large number of markets there is no strategic competition across markets.

C Estimation

This section provides additional estimation results. First, I show the point identification of each of the 6 estimated structural parameters for the first and the last year of the sample. Second, I show the model fit and estimated parameter for the non-smoothed data.

C.1 Point Identification

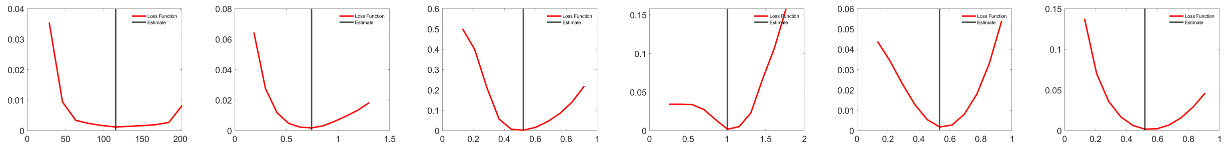
Each sub-figure in Figure (A4) shows the change in the objective function as the parameter is perturbed around the estimated value. The perturbation is such that the parameter space spans 25% of the estimated value and 175% of the estimated value. Each panel shows that the estimated value is indeed the value that minimizes the objective function which computes the deviation of the model and data moments.

C.2 Estimation of non-smooth moments

In this section I show the ability of the model to match the non-smoothed moments in the data and the corresponding estimated parameters. The primary reason of matching the two year moving average of moments in the main paper was to focus on the trend, while abstracting

Figure A3: 1988

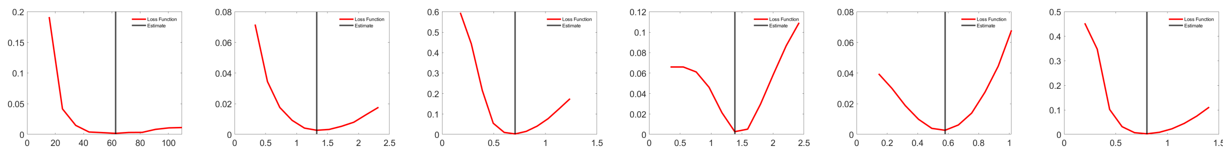
(a) M (b) ϕ (c) σ_a (d) σ_z (e) σ_c (f) λ



Note: Distance criterion in 1988 as parameters are perturbed around the estimated point.

Figure A4: 2018

(a) M (b) ϕ (c) σ_a (d) σ_z (e) σ_c (f) λ

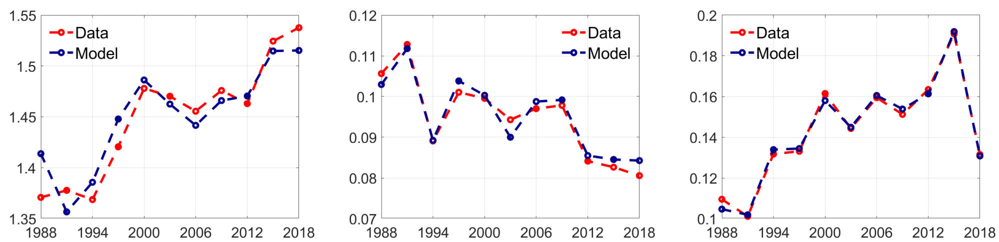


Note: Distance criterion in 2018 as parameters are perturbed around the estimated point.

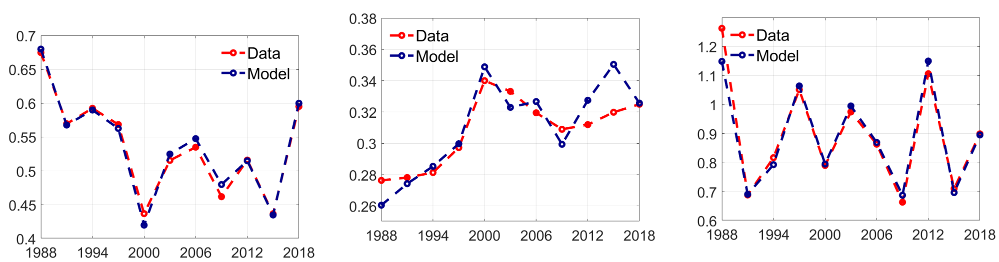
from fluctuations due aggregate to aggregate shocks.

Figure A5: Model Fit: non-smoothed moments

(a) Markups (b) Entrepreneurship rate (c) Income share top 1%



(d) Share of entrep. (top 1%) (e) $\frac{\text{Fixed costs}}{\text{Total Costs}}$ (f) Rel. Profit margin



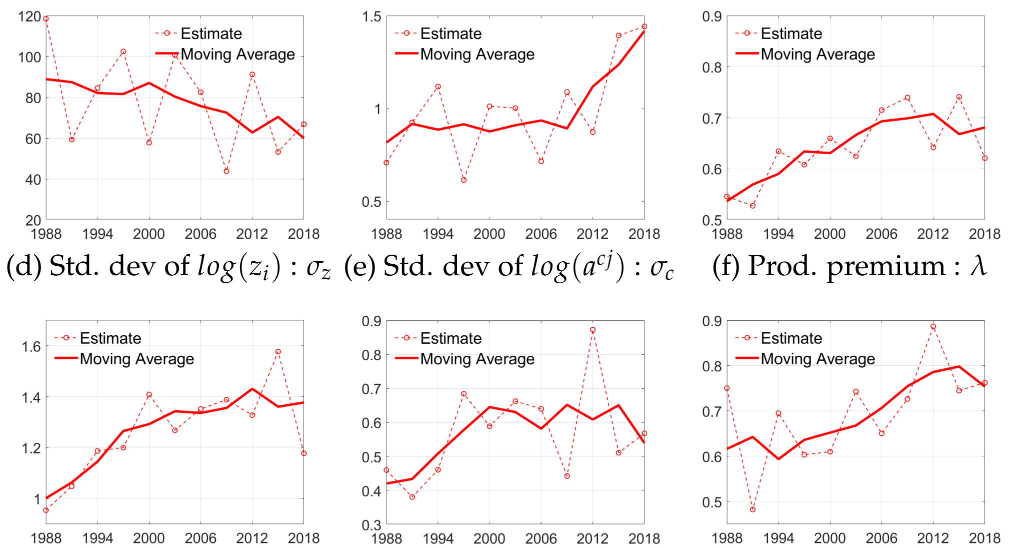
Note: The moments under consideration here refer to the actual annual moments within the data. The models equivalent is the moment specific to each year, generated based on the estimated parameters corresponding to that year.

Figure (A5) shows that the fit of the model to non-smoothed data. Similarly to the model fit in the main text, the model can match the series of the secular trends on markups, entrepreneurship rate and income share of the top 1% and the 3 accompanying moments used to discipline the 6 structural parameters of interest. Figure (A5). In Figure (A6) I show the corresponding estimates that generate the model fit.

Figure A6: Estimated parameters: non-smoothed moments

(a) Agents per market : M (b) Fixed costs : ϕ (c) Std. dev of $log(a_{ij})$: σ_a

(d) Std. dev of $log(z_i)$: σ_z (e) Std. dev of $log(a^{cj})$: σ_c (f) Prod. premium : λ



Note: Estimated parameters for the non-smoothed moments.

While the trend in these structural estimates is similar to those reported in the main text, these estimates have more fluctuations from one sample year to another. This is primarily due to these fluctuations in the moments in the data due to aggregate shocks and business cycle fluctuations. While such an evolution of these structural parameters may be informative of the underlying shocks in the economy, the objective of the paper is to understand the role of trends in such parameters. As a result the main body of the paper focuses on the trend estimates rather than the one with fluctuations from one sample year to another.

D Data

The data used in this paper comes from two sources. First, data on markups and fixed costs are computed from Compustat. Second, data for entrepreneurship and inequality is computed from the Survey of Consumer Finances (SCF). In the subsequent sections I provide details on the sample properties and the data cleaning steps involved for each data source.

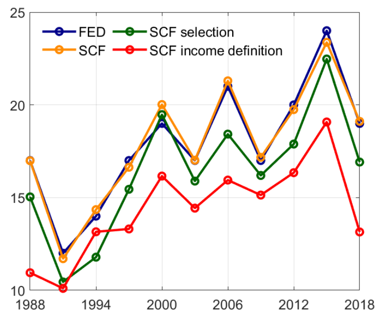
D.1 Survey of Consumer Finances (SCF)

The Survey of Consumer Finances is a household level survey which is conducted every three years since 1989. I use data from 1989 until 2019, which is the last survey before the Covid 19 pandemic. The survey provides cross-sectional data on U.S. households' gross income for the calendar year preceding each survey, detailed information on their income and its components. The SCF is widely used to study inequality due to its sampling design, which over-samples richer households, who are also more likely to be entrepreneurs to ensure a representative sample of the existing distribution of income.

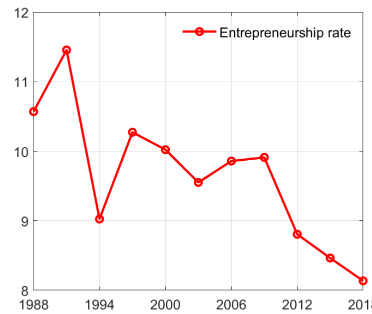
Sample Selection and definitions: Following Salgado (2020), I focus on heads of households between the ages of 22 and 60. In addition, I restrict the sample to contain only those who are employed. I do so because the model does not feature agent's decision between employment and unemployment or their decision to either stay within the labor force vs or opt out of labor force. All agents within the model are employed, they only need to decide whether they are employed as workers or as entrepreneurs. Finally, the notion of income I consider is only restricted to wage and business income. In Figure (A7a) I show how each of these selection affects the income share of the top 1%. Starting with the series in dashed-blue reproduces the FED's SCF bulletin numbers from Bricker et al. (2020). The dashed-orange series replicates their findings without any selection using the SCF micro data while the dashed-green line gives the income share of top 1% after the selection on age and employment status. Finally, the dashed-red line defines income as only the income coming from wages and business income in computing the share of income of the top 1%. Following Salgado (2020) an individual qualifies as an entrepreneur if they are self-employed in their main job (variable X4106 in the SCF) and actively manage at least one private business (variable X3104 in the SCF).[42]

Figure A7: SCF Data

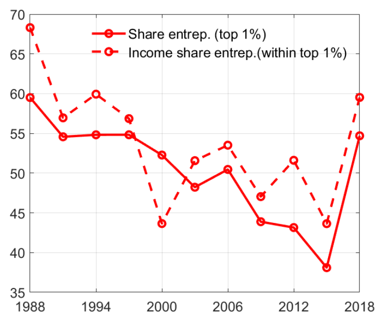
(a) Income share top 1%



(b) Entrepreneurship share



(c) Entrepreneurs in top 1%



(d) Profit Margin

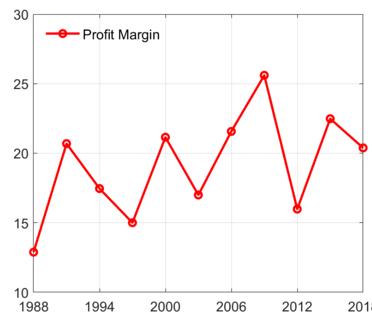


Figure (A7b) plots the entrepreneurship rate which declines from 10.5% to 8.14%, which is consistent with decline in the entrepreneurship rate documented in the literature. Figure (A7c) documents the composition of entrepreneurs in the top 1% of income and their income share within the top 1%. Finally Figure (A7d) plots the profit margins in the SCF data.[43]

D.2 Compustat

Compustat provides comprehensive financial information on publicly traded firms in the US. It provides the balance sheet and income statement for each firm including data on sales and various input expenses. I follow De Loecker et al. (2020) in estimating markups using the

[42] Michelacci and Schivardi (2020) add another condition for identifying entrepreneurs: individuals must have ownership in privately held businesses (variable X3103). However, this additional criterion does not change the underlying trends

[43] Following, Davis and de Souza (2022) I plot the sales weighted profit margins. In addition, to control for the outliers in the aggregation, I truncate the profit margin and the revenue at the 97th percentile.

production function approach, where I use cost of goods sold (COGS) as the variable input.[44] The markup for each firm is then given by;

$$\mu_{it} = \theta^{v}_{it} \frac{Sales_{it}}{COGS_{it}}$$

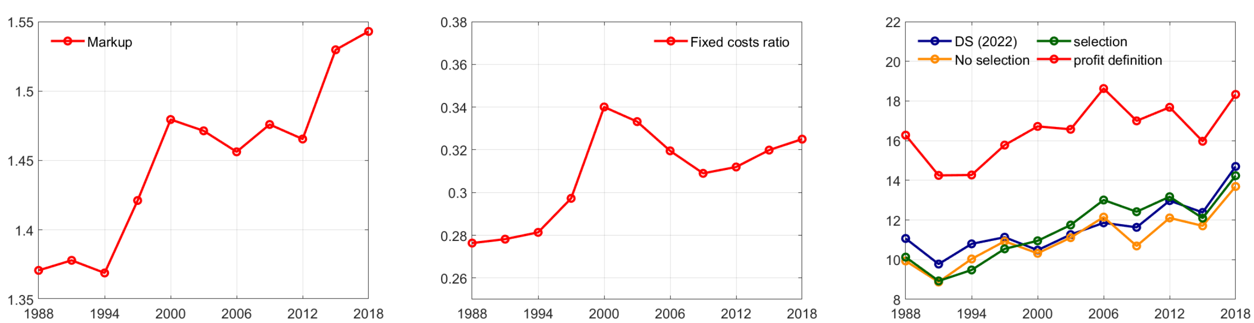
where I take estimates of θ^{v}_{it} from De Loecker et al. (2020), which are 2-digit NAICS-year specific output elasticities of variable input. The measure of fixed costs in the data I use are SGA costs, which are "Selling, General, and Administrative" expenses. Then the fixed cost ratio in total costs is given by;

$$\text{Fixed cost share}_{it} = \frac{SGA_{it}}{COGS_{it} + SGA_{it}} \tag{A41}$$

Finally, I follow Davis and de Souza (2022) in defining profit margins.[45] However, to make it comparable to the pre-tax income in SCF I define profits as the sum of operating income before depreciation and non-operating income ($oibdp + nopi$). Then profit margins are defined as the ratio of profits to sales at each firm. In Figure (A8) I show the evolution of the sales weighted markup, the average fixed cost share and the sales weighted profit margin. The estimated

Figure A8: Compustat Data

(a) Markup (b) Fixed cost ratio (c) Profit margin



markups shown in Figure (A8a) and are comparable to those reported in De Loecker et al. (2020). These markups are sales weighted and increase from 1.37 to 1.54 between 1988 and 2018. Meanwhile the average fixed cost share increase from 28% to 32% between the same

[44]In this section, I drop market specific subscript j and add subscript t which refers to the sample year.

[45]I would like to thank Leila Davis and Joao de Souza for providing the profit margin numbers from their work which are plotted in blue in Figure (A8c).

period as shown in Figure (A8b). While these are the average unweighted fixed shares the sales weighted fixed costs shares are similar to those estimated by De Ridder (2019). Finally, Figure (A8c) shows the evolution of the sales weighted profit margin in the data. The blue line shows the numbers from Davis and de Souza (2022) and the yellow line shows the numbers computed in this paper using their definition.[46] The green line shows the effect of sample selection used in the paper and the red line shows the profit margin for the profit definition including selection used in this paper. These measures of markups and fixed costs are consistent with recent work by De Loecker et al. (2020), De Loecker et al. (2022) and De Ridder (2019). Furthermore, the profit margin of firms in Compustat relative to entrepreneurs in SCF, has some noise, and is around 1, however it shows signs of a slight decreasing trend. While this finding is for relative profit margins, Davis, Sollaci, and Traina (2023) find similar trend in profit rates where public to private profit rate ratio has decreased over time.

D.3 Markups and other measures of inequality

In this section, I show the evolution of markups in the US economy has a trend since the 1960's, which is similar to several measures of inequality. I follow De Loecker et al. (2020) in computing markups for the publicly traded firms in the US using Compustat data. For data on inequality I use the World Income Database (WID) with measures of inequality from 1960 to 2018. [47]

As seen in Figure A9 both markups, wealth and income inequality decline from 1960 until 1980's, however, they sharply increase since then. Moreover, similar to the rise in income and wealth inequality which are primarily driven by the top of the distributions, the rise of markups is similarly attributed to increases resulting from the increase of the 90th and 99th percentile of the markup distribution.

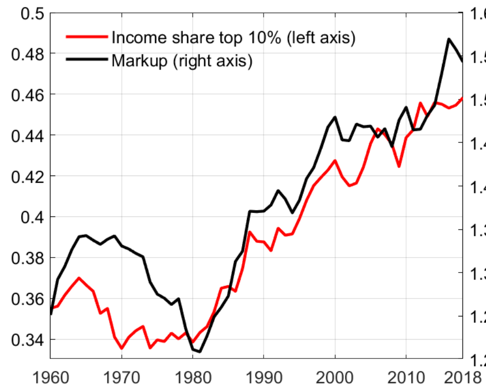
Specifically, markups after an initial decline between 1960 and 1980 increase from 1.21 in 1980 to 1.54 in 2018. As seen in Figure (A9a) and Figure (A9b) the evolution of income inequality also follows a very similar pattern declining from the 1960 until the 1980's and sharply increasing since then. Specifically, in the WID the income share of the top 10 percent between

[46] Differences in the sample selection could be the reason for the minor differences in the two series.

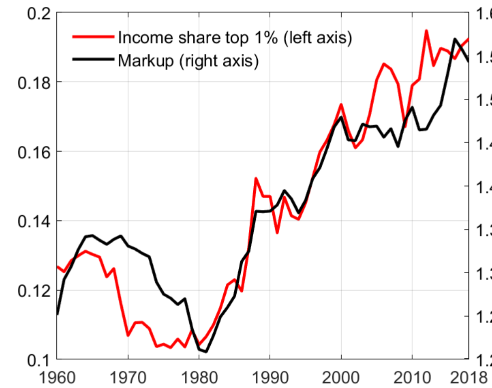
[47] In the main text, I use measures of inequality from the Survey of Consumer Finances, which is conducted every three years between 1989 and 2019. In this section, I use the WID which gives us longer time series for the evolution of different measures of inequality.

Figure A9: Markups and Inequality

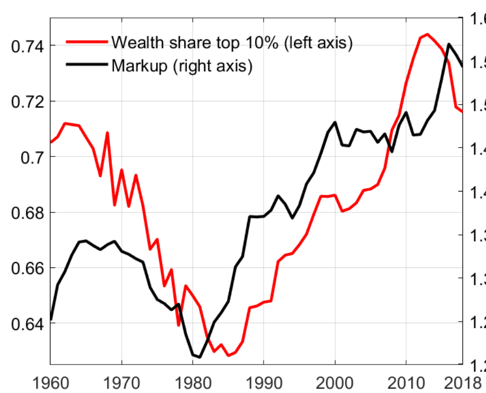
(a) Income share top 10%



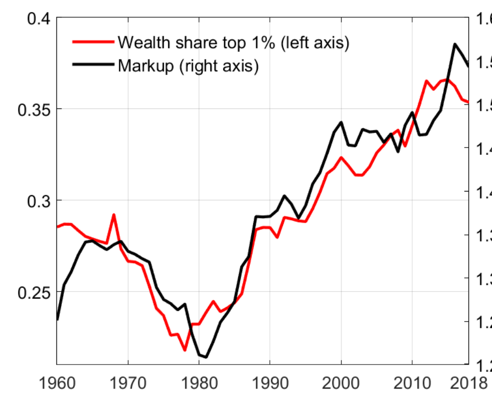
(b) Income share top 1%



(c) Wealth share top 10%



(d) Wealth share top 1%



1980 and 2016 increased from 34% to 46% and that of the top 1% increased from 10% to 19%.[48]

In addition, the US has also seen an increase in wealth inequality since the 1980's. As seen in Figure (A9c) and Figure (A9d) the wealth share of top 10 percent increased from 65% to 72% and that of the top 1% increased from 23% to 35%.[49]

Several papers have documented the sharp rise in income and wealth inequality in the US. This paper shows that these measures of top income and wealth inequality have strikingly similar pattern to the evolution of markups since the 1960's. Most notably, their simultaneous decline since the 1960 until the 1980, but a sharp increase in then. This paper has studies the

[48]Similar increases in income shares of the top 10% and top 1% are seen in SCF.

[49]While WID gives a longer time series for the evolution of wealth inequality, wealth shares from the SCF between 1989 and 2016 also show a similar increase in the wealth shares of the top 10 percent from 67% to 76% and that of top 1% from 30% to 37% as per the FED bulletin statistics.

structural forces that can jointly reconcile with increasing income inequality and markups. In other work, Cairo and Sim (2022) use a two agent framework with monopolistic competition and find that increasing markups can reconcile with increasing income and wealth inequality.[50] While it is beyond the scope of this paper, what remains to be understood is the long-run co-movement between market power and inequality since the 1960's. This is important because if there are common structural forces that shape these trends as highlighted by the key findings of this paper, and as I show in Figure (A9), *it remains to be understood the key source of this reversal in trends since the early 1980's.*

[50] In their setup the evolution of markups is only pinned down by the elasticity of substitution parameter, which is exogenous in the model. Instead, in this paper the markup is endogenous and heterogeneous and is shaped not only the elasticity of substitution parameters, and market structure but also by other technological forces like the productivity distribution among agents and fixed costs.