Asset Pricing with Entry and Imperfect Competition[†]

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Abstract

I study the implications of fluctuations in new firm creation across industries for asset prices and macroeconomic quantities. I write a general equilibrium model with heterogeneous industries, allowing for firm entry and time variation in markups. Firms entering an industry increase competition and displace incumbents' monopoly rents. This mechanism is strongest in industries that exhibit both, a high elasticity of innovation to the cost of entry and a high elasticity of markups to new firm entry. I find the price of entry risk is negative. Therefore, industries with more exposure to the risk of entry earn higher returns. Using micro-level data on entry rates, I trace out the impact of firm creation on incumbent firms' stock returns. The effect is strongest for industries where both model elasticities are high. I confirm aggregate entry commands a large price of risk.

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1 Introduction

Innovation by new firms is an important driver of economic growth, an idea that goes back to Schumpeter (1942). However not all firms benefits from this type of innovation: new entrants generate an increased competitive pressure, leading to the displacement of monopolistic incumbents. Some industries are insulated from this displacement risk: barriers to entry can make it hard for new firms to disrupt an industry; moreover incumbents might protect their monopoly rents making it difficult for new entrants to significantly alter the competitive structure in the industry. I show how asset prices inform us about the qualitative and quantitative relevance of displacement risk across industries. Empirically, I find this risk is negative and quantitatively significant: investors command a large positive risk premium of 6% (in annualized returns) for holding an industry portfolio exposed to the risk of displacement over a portfolio insulated from it. To investigate the economic underpinnings of the result, I show it is necessary to introduce a margin of imperfect competition into asset pricing models. After exposing a novel framework for asset pricing, I derive sharp predictions on the link between an industry's organization and its asset prices. Finally, I confirm that two dimensions of industry dynamics, predicted by my theory, are crucial to understand the cross-section of industry returns.

There is a large systematic component in firm entry rates across industries. These aggregate fluctuations are akin to investment specific technological change, leading to variations in the rate of firm creation over time and across industries. Indeed different industries have different exposures to these aggregate movements thereby generating heterogeneity in their dynamics. The variations in entry rates across industries only captures a fraction of the heterogeneity in industry risk. How new entrants impact incumbent firms also plays a significant role. There I also find cross-sectional variation. While in some industries entry has a dramatic impact on competition and incumbents see their monopoly rents drop, other industries see little of this business-stealing effect.

From these two empirical observations, I design a dynamic asset pricing model to link the two industry characteristics to asset prices. Standard general equilibrium asset pricing models focus on the valuation of rents to capital that arise from adjustment costs (see for example Cochrane (1991)). These rents are ill-suited to explore the role of competition and firm entry on cash-flows and asset prices. Therefore I build on the international trade literature (see Melitz (2003)) to introduce a new asset pricing framework where firms earn rents from their monopolistic position. Firms' cash-flows and thereby their valuations are tied to their industry structure and dynamics. More precisely, upon the realization of an exogenous shock to the cost of firm creation, new firms enter and compete with incumbents across all industries. The response of firm creation to changes in aggregate conditions does vary across industries: some industries have a high sensitivity of entry to aggregate shocks while others are mostly immune to the same shocks. Then upon entry raise the competitive pressure in their industry, as they compete with incumbents and lead to a decline in monopoly rents. The impact of entrants on incumbents' rents varies across industries, due to differences in consumer demand elasticities. Hence firms' exposure to aggregate fluctuations hinges precisely on two elasticities: (a) the elasticity of new firms entry in an industry to aggregate shocks and (b) the elasticity of monopoly rents to these new entrants. Both elasticities are necessary to assess the risk of an industry: the large entry elasticity to aggregate shocks of an industry is risky only if this translates into an effect on rents through a rise in competition.

To tie these two characteristics to asset prices and derive the industry risk premium, I show the aggregate cost of entry is a systematic risk factor. Moreover the price of that risk is negative. After a shock that increases the productivity of the innovation sector, aggregate resources are shifted from consumption good production towards firm creation. This reallocation process lowers consumption contemporaneously, increasing the marginal utility of the representative investor. Hence firms in industries exposed to aggregate entry shocks, will see their cash-flow plunging after such shock due to both a large influx of new firms and a large decline in monopoly rents. Since in these states of the world consumption is dear to the representative investor, they command a risk compensation for holding these firms in their stock portfolio: firms in industries that are highly exposed to entry earn higher risk premia in equilibrium.

I calibrate the model to match moments of asset returns and real variables. I find firms in industries that are more exposed to risk of entry earn annual returns that are higher than firms in industries with low exposure to entry. This quantitative exercise leads me to exploring the link between entry shocks and risk premia in more details. Hence I set to trace out this shock in the data through its differential effect across industries.

First I measure the aggregate entry shock in the data. I use micro-level data on establishments at the four-digit industry code level (NAICS) from the Quarterly Census of Employment and Wages (QCEW) from the Bureau of Labor Statistics (BLS). I identify the shock through its two first principal components that account for 50% of the total variation in industry entry rates. Then I estimate the two elasticities derived from the model in the data: (a) with the aggregate entry process I measure the elasticity of industry entry rates to aggregate shocks; (b) with industry entry I recover industry cash-flow elasticities. Looking at stock returns I confirm my theoretical predictions, and I find firms in industries more exposed to entry risk have higher average annualized returns of 6%. Moreover I find both elasticities play a role in shaping industry expected returns. If industries have different exposure to aggregate risk, but both their cash-flow elasticity is small, then I find no significant differences in their expected returns. Similarly the highest premium stems from firms in industries where both the aggregate elasticity and the cash-flow elasticities are high. Finally to estimate formally the quantity of entry risk, I use a large cross-section of industry test assets. I find an additional unit of exposure to the aggregate entry shock commands an additional risk compensation of 0.5 to 1 percent annually. This confirms the price of entry risk is negative and large quantitatively.

In summary my results illustrate how the cross-section of industry returns can identify aggregate entry shocks through their differential effect on industries. I propose a novel mechanism for the volatility of cash-flows and stock returns across industries, leading to a risk-based explanation for the puzzling heterogeneity in the cost of capital across industries. This paper also shows the extensive margin of investment, firm entry, matters for industry level fluctuations. I show how the cross-section of industry returns identifies the industries, with high entry risk premia, for which that investment margin matters.

Related Literature — A vast literature in asset pricing investigates how firm characteristics and aggregate fluctuations explain the cross section of firms' risk premia theoretically and empirically (see Cochrane (2008) for a survey). I contribute to the empirical asset-pricing literature that links industries' economic characteristics to stock returns. Fama and French (1997) explain "uncertainty about true factor risk premiums" prevents a clear understanding of industries' cost of equity. More specifically, I complement the work of Hou and Robinson (2006) who show that concentrated industries earn on average lower expected returns than more competitive industries. I show concentrated industries are not *a priori* safer, because they have larger barriers to entry. Specifically, I show concentrated industries can be riskier, because their monopoly rents are good incentives for sectoral innovation.

I contribute to a literature that explores features of the macroeconomic real business cycle model (RBC) for asset prices. Jermann (1998), Tallarini (2000), and Boldrin, Christiano, and Fisher (2001) focus on the time-series properties of asset prices in macroeconomic models. My paper is closest to a branch of this literature investigating the effect of heterogenous firm characteristics for the cross section of risk premia (see, e.g., Berk, Green, and Naik (1999), Gomes, Kogan, and Zhang (2003)). Recently Corhay, Kung, and Schmid (2015) have shown that the competitive structure of the economy helps matching aggregate asset pricing moments and

Bustamante and Donangelo (2015) investigate how entry threat might explain why simply looking at more competitive industries does not account for the cross-section of industry returns.

Numerous studies (Kogan (2001), Gomes, Kogan, and Zhang (2003), Papanikolaou (2011), Gârleanu, Panageas, and Yu (2012), Gârleanu, Kogan, and Panageas (2012), Kogan, Papanikolaou, and Stoffman (2012)) analyze a general equilibrium production-based model to draw predictions about the time series and the cross section of returns. Their framework uses the intensive margin of innovation (firms' investment) to draw such predictions. My paper is closest to Papanikolaou (2011) and Kogan, Papanikolaou, and Stoffman (2012) who argue that firms' *assets in place* are subject to capital-embodied technical change, which makes them risky. I share a similar mechanism with this literature: in my model, the entry shock commands a negative price of risk in equilibrium and firms' differential exposures to this shock generate the cross section of risk premia.

I extend these previous works to study heterogeneous industries with multiple firms. My work focuses on the patterns of new firms' entry, and I bring empirical analysis from asset-pricing to shed light on the cross-section of industry entry.

Outline — The structure of the paper is as follows: in Section 2, I present the model and I derive its main implications for asset prices. In Section 3, I first present the data, summary statistics; then I test the model implications for expected excess returns. All proofs along with some ancillary results are in the appendix.

2 Model

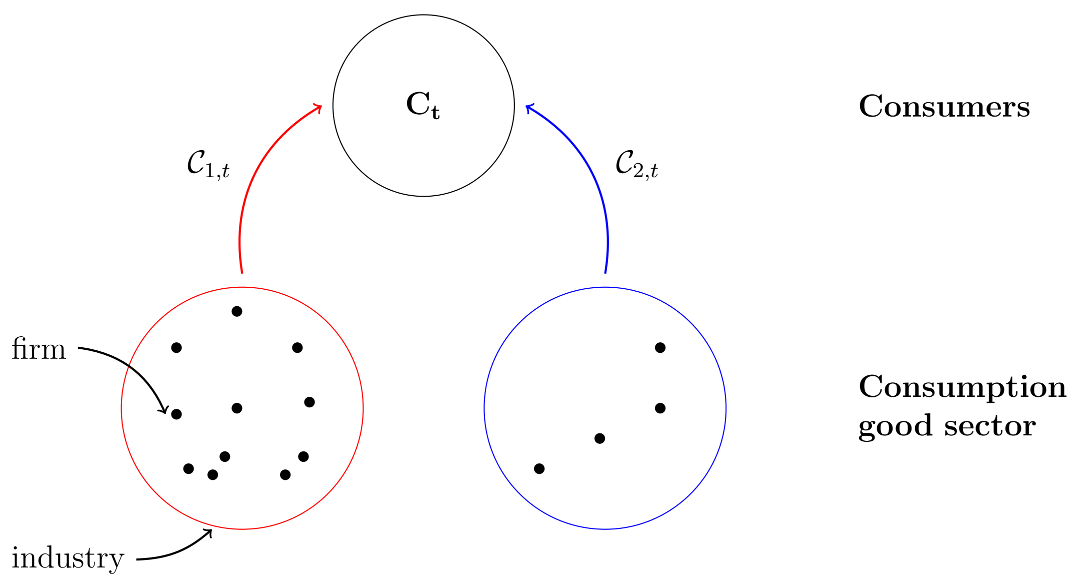
In this section I build a general equilibrium model to investigate the link between entry-specific shocks and asset prices. My framework builds on models featuring an explicit extensive margin of capital investment as in Bilbiie, Ghironi, and Melitz (2012) and Melitz (2003). The theory I introduce is novel to the asset pricing literature and crucial to our understanding of industry returns; classical models of asset pricing models tie valuations to capital adjustment costs rent, when my framework links monopoly rents and industries' organization to asset prices. The model has heterogeneous industries and leads to cross-sectional predictions I test and confirm in Section 3. I cast the model in discrete time and I solve it using perturbation methods.

2.1 Households

2.1.1 Intratemporal Consumption Choice

The consumption part of the economy is schematized on figure (1). The economy is divided into industries indexed by $h \in \{1, \ldots, H\}$. In each industry there is a continuum of firms, and each of these firms produces a differentiated good indexed by ω. There exists a continuum of identical households in the economy. They have nested preferences: first they maximize their utility at the industry level choosing their consumption over the set of available varieties within the industry. Then they choose their consumption at the aggregate level given an upper-tier preference over industry level consumption indexes. Finally the static utility from the upper-tier utility constitutes the final aggregate consumption index. Households consider this aggregate index for their inter-temporal decisions. I develop the dynamic consumer choice in Section 2.1.2.

Figure 1
Consumption-Goods Production in the Economy



Within industries — In each industry households maximize their utility $\mathcal{C}_h$ from consuming differentiated varieties ω from industry h given a level of expenditure E_h. They take as given their total level of industry expenditure E_h and the mass of available varieties $\Omega_h = [0, M_h]$:

$$
\begin{aligned}
\mathcal{C}_h = \max_{\{x(\omega)\}} & \int_0^{M_h} f_h(c_h(\omega), \mathbf{C}_h)\mathrm{d}\omega, \\
\text{such that} \quad & \int_0^{M_h} p_h(\omega)c_h(\omega)\mathrm{d}\omega \leq E_h,
\end{aligned}
$$

where M_h is the total number (or mass) of good producing firms in sector h, $c_h(\omega)$ is consumers' demand for variety ω, $p_h(\omega)$ its price and total consumption $\mathbf{C}_h = \int_0^{M_h} c_h(\omega)\mathrm{d}\omega$.[1] This type of preferences over a continuum of differentiated goods is a generalization of Dixit-Stiglitz preferences exposed in Zhelobodko et al. (2012). The generalization departs from the classical framework of Dixit-Stiglitz where markups are constant. I generalize these preferences such that (a) markups vary with the number of firms within an industry; (b) the elasticity of markups is industry specific. I show below how both dimensions are key in capturing the industry components essential to asset pricing.

I assume preferences over the differentiated varieties take the following form:

$$
f_h(x, \mathbf{X}) = \frac{x^{1-\eta_h}}{1-\eta_h} - a_h x \ \mathbf{X}^{-\eta_h},
$$

where η index the substitution patterns across different varieties ω and ultimately the elasticity of the demand curve. The parameter a shifts the demand curve out with total consumption $\mathbf{X}$.[2] This structure of aggregation improves on the Dixit-Stigliz aggregator and is – to the best of my knowledge – a novel contribution: it allows for a richer link between a firm's profit and the level of competition in a given industry. This added flexibility comes from a price elasticity of consumer demand that depends on η_h. The Dixit-Stiglitz benchmark is a subclass of my preferences for $a_h = 0$ or whenever the mass of firms in an industry becomes very large.[3]

To convey some intuition about the preferences I derive the price elasticity of consumer demand:

$$
-\frac{\partial \log c_h(\omega)}{\partial \log p_h(\omega)} = \frac{\partial_1 f_h(c_h(\omega), \mathbf{C}_h)}{c_h(\omega)\partial_{11} f(c_h(\omega), \mathbf{C}_h)} = \frac{1}{\eta_h} \cdot \left(1 - a_h M_h^{-\eta_h}\right). \tag{2.1}
$$

[1] I drop the time subscript for clarity in all optimization pertaining to intra-temporal choices.

[2] Total consumption is defined linearly as $\mathbf{X} = \int_\Omega x(\omega)d\omega$.

[3] The preferences I introduce while novel are close to the demand system introduced in Melitz and Ottaviano (2008) with the additional flexibility of an elasticity of the demand curve indexed by η_h,

Price elasticity of demand is governed by $1/\eta_h$. However the second term highlights the role played by the industry product market through M_h, on the elasticity. An increase in the mass of firms in the industry increases the elasticity, capturing the effect of an increasing substitutability whenever concentration decreases in the industry. I show later in the industry equilibrium section (2.3.1) how the concavity of preferences η_h plays a role in the firms' pricing decisions.

Finally I show my preferences generate an indirect utility function that has constant elasticity with respect to the industry expenditure level E_h. This property stands in contrast with other demand systems used in the international trade literature to model preferences over differentiated varieties. I am able to derive closed form aggregate consumption index from an upper-tier CES aggregator over industry level utilities. I define the upper-tier utility system below.

Across industries — Consumers maximize utility derived from the consumption of goods from H industries. Industries are made of a continuum of differentiated varieties. I model this upper-tier utility aggregator with a constant elasticity of substitution between all goods from the H industries:

$$C = \prod_{h=1}^{H} \left[(1-\eta_h)\mathcal{C}_h\right]^{\frac{\alpha_h}{1-\eta_h}}, \tag{2.2}$$

where $\sum_h \alpha_h = 1$.

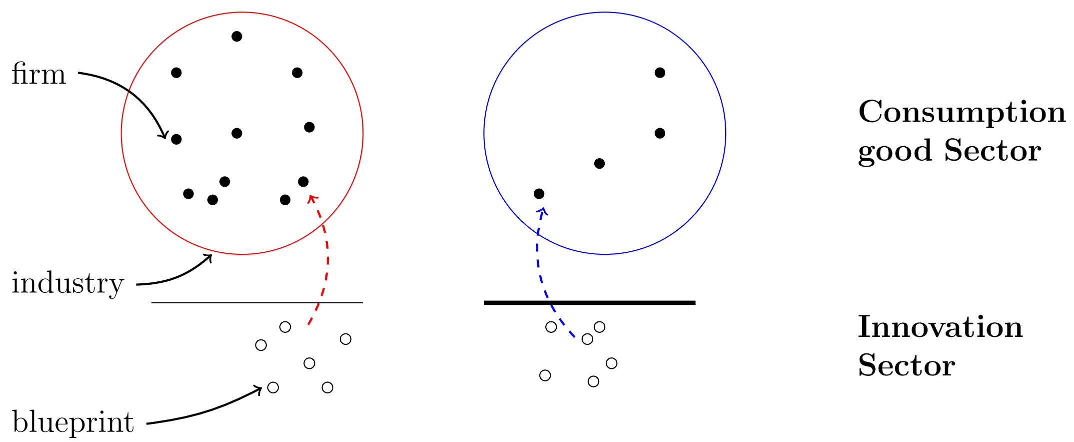
2.1.2 Intertemporal Consumption Choice

The representative household has recursive preferences of the Epstein and Zin (1989) type. He maximizes his continuation utility J_t over sequences of the consumption index C_t:

$$J_t = \left[(1-\beta)C_t^{1-\nu} + \beta\left(\mathsf{R}_t(J_{t+1})\right)^{1-\nu}\right]^{\frac{1}{1-\nu}},$$

where β is the time-preference parameter and ν is the inverse of the elasticity of inter-temporal substitution (EIS). $\mathsf{R}_t(J_{t+1}) = [\mathbf{E}_t\{J_{t+1}^{1-\gamma}\}]^{1/(1-\gamma)}$ is the risk-adjusted continuation utility, where γ is the coefficient of relative risk aversion. I use Epstein and Zin (1989) preferences to disentangle the risk characteristics of households across states, and across time. He supplies L units of labor inelastically each period in a competitive labor market, at wage w_t. Units of labor are freely allocated between the production in the consumption-good-sectors, (L_h^p), and the innovation sectors,

Figure 2
Consumption-Goods Production and Firm Creation in the Economy



(L^e_h), in each industry h:

$$\sum_h L^p_{h,t} + L^e_{h,t} = L.$$

2.2 Firms

In the economy production has two main purposes, the supply of consumption goods and the supply of new firms to industries, such that firm entry is endogenous. I represent both the consumption and the innovation sector in figure (2). I detail both supply-side structures.

2.2.1 Consumption Sector

The structure of industries' supply is identical. A firm in an industry is identified with the one variety ω it produces. Firms are infinitesimal within their industry and I assume they operate in a monopolistic competitive environment. They take consumers' demand curve (see equation 2.1) and input prices as given. Labor is the unique production input and there is no physical capital in the economy. I posit a linear production technology for consumption producing firms:

$$y_h(\omega) = A\ l_h(\omega),$$

where $y_h(\omega)$ is firm production of variety ω. Labor is subject to an exogenous productivity process and evolves according to an autoregressive process in logarithms:

$$\log A_{t+1} = \rho_A \log A_t + \sigma_A\, \varepsilon_{t+1}^A,$$

where $\sigma_A\, \varepsilon_t^A$ is an i.i.d. process with standard deviation σ_A, and $\rho_A < 1$, such that the process $\log A_t$ is stationary. Firms hire labor at market wage w and maximize their static profit, $\pi_h(\omega) = p_h(\omega) y_h(\omega) - w l_h(\omega)$. In a monopolistically competitive market structure, firms take consumers' demand curve $c_h(\omega)$ as given. They produce $y_h(\omega) = c_h(\omega)$ and set their price $p_h(\omega)$ at a markup $\mu_h(\omega)$ over marginal cost:

$$p_h(\omega) = \mu_h(\omega) \frac{w}{A}.$$

Markups are determined by consumers' demand curve, precisely their price elasticity of demand. In the case of a high price elasticity of demand, consumers are very price sensitive and it makes hard for firms to extract much surplus from their monopolistic positions, which translates into lower markups. To gather intuition about firms' pricing decisions, I anticipate on the static equilibrium. All firms are identical and set their prices identically, such that $p_h(\omega) = p_h$ and $y_h(\omega) = y_h$. This allows for a simple characterization of markups in equilibrium, since they only depend on consumers' demand curve.

$$\mu_h(\omega) = \mu_h = \frac{p_h - w/A}{p_h} = \frac{\eta_h}{1 - a_h M_h^{-\eta_h}}$$

I provide details of the derivation of the static industry equilibrium in appendix A.1. Note that here not only markups depend on the demand elasticity parameter η_h, but also on the level of competition through M_h. It is easy to gain intuition on the pricing decision through the elasticity of markups to a change in the mass of firms in the industry:

$$\frac{\partial \log \mu_h}{\partial \log M_h} = -\eta_h \cdot \frac{1}{M^{\eta_h}/a_h - 1}$$

First note that unlike most models of monopolistic competition, one preference parameter governs the elasticity of markups to entry at the industry level. For example in the limiting case of CES preferences, where a_h goes to 0, we have constant markups and an elasticity of zero. In the case of the translog demand system (see Feenstra (2003)), markups do depend on the mass of firms in the economy, as $\mu_h = 1/M_h$. However the elasticity of markups to the mass of firms is fixed at one. To capture the diversity of industries' dynamics of competition, it is important to allow not only markups to move over time but these movements to respond differently across industries. In particular, my purpose is to investigate how the dynamics of entry shapes firms' cash-flows across industries: hence both varying markups and different elasticity of markups are key to match the heterogeneity I observe in the data.

2.2.2 Innovation Sector

Entry — There are H different innovation sectors; each one is specialized to a single industry in the economy. In an innovation sector, there is a continuum of entrepreneurs endowed with a specialized technology. They transform blueprints into consumption firms in their industry of expertise. The cost of taking a mass M_h^e of blueprints and making them viable consumption firms in industry h are convex; I specify the labor requirement for introducing a given mass of blueprints, I discuss the implications of the functional form below:

$$L_{h,t}^e = \frac{1}{X_t}\Phi_h(M_{h,t}^e, M_{h,t}) = \frac{1}{X_t}\frac{f_{e,h}}{1+\zeta_h^{-1}}\left(\frac{M_{h,t}^e}{M_{h,t}}\right)^{1+\zeta_h^{-1}} M_{h,t}. \tag{2.3}$$

The process X_t is the aggregate productivity of the innovation sector. It is common to entrepreneurs across all industries and it follows an autoregressive process in logarithm:

$$\log X_{t+1} = \rho_X \log X_t + \sigma_X \varepsilon_{t+1}^X,$$

where $\sigma_X\,\varepsilon_t^X$ is an i.i.d. process with standard deviation σ_X, and $\rho_X < 1$, such that the process $\log X_t$ is stationary. A positive shock $\varepsilon_t^X > 0$ to X_t increases the productivity of new firm creation in the whole economy.[4]

The cost of entry equation is akin to the cost of capital adjustment encountered in the literature (see Jermann (1998). First there is an industry specific cost level $f_{e,h}$. Differences in $f_{e,h}$ correspond to changes in the absolute cost to enter the industry. In

[4]The functional form for the entry costs is smooth from the point of view of the representative entrepreneur. Although smoothness is attractive for analytical tractability, it is not a realistic feature for the extensive margin of investment. Some of the literature on the extensive margin of investment also argues that at a disaggregated level, most of the costs are fixed; see, for example, Khan and Thomas (2008) and Bloom (2009). However, smoothness of entry costs at the industry level does not preclude one from having a fixed cost at the disaggregated entrepreneur level. Following this interpretation, each of the infinitesimal entrepreneurs face fixed costs of firm creation that are distributed like the aggregate marginal cost curve.

equilibrium this coefficient directs the average mass of firms in the industry. Second the cost is convex in the entry rate M_h^e/M_h, and the convexity is governed by ζ_h^{-1}. The convexity parameter is key as it governs the elasticity of entry rates to changes in the marginal valuation of consumption firms in the industry.[5] It is also one of the two fundamental industry characteristics I measure empirically to assess the model's mechanism.

Entrepreneurs are in fixed supply, normalized to one. They earn rents to their concave "start-up" technology. The value of an entrepreneur $v_{h,t}^e$ represents a claim to the fixed supply of firm creation.[6] Their optimization program is simple as they maximize their value by choosing an entry rate and hire the required labor inputs. Within an industry entrepreneurs are competitive and they take wages, w_t, and the price of consumption firm, $v_{h,t}$ as given. They are infinitesimal, thus they do not internalize the effect of their decisions on the current or future value of consumption firms in the industry. It follows that they maximize their static profit each period:

$$\max_{M_{h,t}^e} \; v_{h,t} M_{h,t}^e - w_t L_{h,t}^e,$$

subject to the cost equation (2.3). The first order condition of the entrepreneurs reads:

$$v_{h,t} = \frac{w_t}{X_t} \partial_1 \Phi_h(M_{h,t}^e, M_{h,t}) = \frac{f_{e,h} w_t}{X_t} \left(\frac{M_{h,t}^e}{M_{h,t}} \right)^{\zeta_h^{-1}} . \tag{2.4}$$

By contrast with standard models of the extensive margin of innovation, in which the supply of entry is perfectly elastic, I introduce an inelastic supply curve.[7] Monopoly rents are shared between insiders—the incumbent firms— and the outsiders—the entrepreneurs. The sharing rule depends on the convexity of the cost of entrepreneurs, that is, the coefficient ζ_h.

[5]The diminishing returns to scale of entrepreneurs' efficiency with respect to the absolute level of entry can also be interpreted as Venture Capitalists (VCs) monitoring start-ups before selling them on capital markets. Sahlman (1990) and Lerner (1995) show most of VCs' activity is spent monitoring startup projects. In a world with a fixed supply of VCs' monitoring has to be shared between all the firm-creation projects in the industry.

[6]Alternatively, I could consider entrepreneurs need industry-specific land for firm creation. If this industry-specific land is in fixed supply, normalized to one, the value of entrepreneurs is a claim to the land used to create new firms.

[7]In classic models of firm entry dynamics (see, e.g., Hopenhayn (1992), Melitz (2003)) costs of entry are fixed and the supply is perfectly elastic whenever incumbents' value is above the fixed costs.

Exit and Timing — In each industry, consumption-goods firms are subject to an exogenous death shock at a rate δ. The shock hits firms at the end of the period. Firms do not face fixed costs to operate, and exit is entirely driven by this exogenous shock.

Entrants produced at time t face the same death shock as incumbents. Hence the dynamics for the mass of firms in industry h is given by the following accumulation equation:

$$M_{h,t+1} = (1-\delta)\left(M_{h,t} + M^e_{h,t}\right).$$

The dynamics for the mass of firms in an industry resembles that of capital in the neoclassical growth model.

2.3 Competitive Equilibrium

I solve for the competitive equilibrium of the economy.[8] First I solve for the static intra-temporal allocations given an aggregate consumption choice $\mathcal{C}_t$, and a product market structure $\{M_{h,t}\}$. Given the static allocations I derive the dynamic allocations of the extensive margin of investment through $\{M^e_{h,t}\}$ and aggregate consumption. The investment-consumption trade-off is driven by the monopolistic rents at the industry level.

2.3.1 Static Equilibrium

Industry Equilibrium — Within industry h, firms are identical and they have identical pricing decisions. In appendix A.1, I derive the symmetric equilibrium conditions for a given level of industry expenditure E_h and a given mass of firms M_h:

$$\begin{aligned}
c_h(\omega) = c_h &= \frac{E_h}{M_h} \cdot \frac{A}{w} \cdot \frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}}, \\
p_h(\omega) = p_h &= \frac{w}{A} \cdot \frac{1 - a_h M_h^{-\eta_h}}{(1-\eta_h) - a_h M_h^{-\eta_h}}, \\
\pi_h(\omega) = \pi_h &= \frac{E_h}{M_h} \cdot \frac{\eta_h}{1 - a_h M_h^{-\eta}}
\end{aligned} \tag{2.5}$$

[8]The planner allocation shows that there are distortions due to the dynamic and static inefficiencies of markups. I examine this issue in a companion note.

I show indirect utility follows:

$$\mathcal{C}_h = \left(\frac{A}{w}\right)^{1-\eta_h} [M_h^{\eta_h} - a_h(1-\eta_h)] \left(\frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}}\right)^{1-\eta_h} \frac{E_h^{1-\eta_h}}{1-\eta_h}.$$

The industry level indirect utility $\mathcal{C}_h$ has constant elasticity with respect to the level of expenditures. This property of the industry preferences allow for aggregation with multiple industries as I show hereafter.

Aggregate Equilibrium — I take the price of aggregate consumption C to be the numeraire each period, such that total expenditures are equal to the static utility derived from consumption $C = \sum_h E_h$. From the utility maximization at the aggregate level I find the first order condition:

$$\frac{\partial C}{\partial E_h} = \frac{\alpha_h}{1-\eta_h} \cdot \frac{C}{\mathcal{C}_h} \cdot \frac{\partial \mathcal{C}_h}{\partial E_h}$$

For a general industry preferences, the last term is not well defined as it depends on the expenditures and the mass of firms themselves. In my specification it is simply $(1-\eta_h)\mathcal{C}_h/E_h$. Hence industry expenditure are a constant fraction of total expenditures:

$$E_h = \alpha_h C$$

To conclude the static equilibrium derivation, I write the local demand in each industry given the market structure M_h and the aggregate consumption choice C:

$$c_h = \frac{A}{w}\left[\frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}}\right] \cdot \frac{\alpha_h}{M_h} \cdot C \tag{2.6}$$

2.3.2 Dynamic Equilibrium

Consumption Sector — There are H mutual funds specializing in the consumption-goods sector, and H mutual funds in the innovation sector. For each sector, a mutual fund owns all firms of an industry. Funds collect profits from firms—either entrepreneurs or consumption-goods producers depending on their specialization—and redistribute them to their shareholders. Households can invest in $x_{h,t}$ shares of a mutual fund specializing in industry h for a price $x_{h,t}(M_{h,t} + M_{h,t}^e)v_{h,t}$. Proceeds from the fund flow back to the shareholders and are equal to the profits made by all firms within an industry: $x_{h,t}M_{h,t}v_{h,t}$. Households also invest $x_{h,t}^e$ shares in mutual funds specializing in entrepreneurs of industry h. The price of $x^e_{h,t}$ shares is $x^e_{h,t}v^e_{h,t}$ (the supply of entrepreneurs is fixed at one). Proceeds from this investment are $x^e_{h,t}\pi^e_{h,t}$.

Hence the dynamic program the representative household faces, is the maximization of their continuation utility J_t subject to the following sequential budget constraint:

$$\sum_h \left[\int_0^{M_{h,t}} p_{h,t}(\omega)\ c_{h,t}(\omega)d\omega + x_{h,t+1}v_{h,t}\frac{M_{h,t+1}}{1-\delta} + x^e_{h,t+1}v^e_{h,t}\right]$$
$$\leq w_t L + \sum_h \left[x_{h,t}M_{h,t}(v_{h,t}+\pi_{h,t}) + x^e_{h,t}(v^e_{h,t}+\pi^e_{h,t})\right]. \tag{2.7}$$

I derive the one-period-ahead stochastic discount factor (SDF) from the household inter-temporal Euler equation:

$$\frac{S_{t+1}}{S_t} = \beta\left(\frac{C_{t+1}}{C_t}\right)^{-\nu}\left(\frac{J_{t+1}}{\mathsf{R}_t(J_{t+1})}\right)^{\nu-\gamma}. \tag{2.8}$$

I give details of the derivation of the household optimization condition in appendix A.1. The Bellman equation for pricing the consumption-goods firms in industry h is

$$v_{h,t} = (1-\delta)\mathbf{E}_t\left\{\frac{S_{t+1}}{S_t}\left(v_{h,t+1}+\pi_{h,t+1}\right)\right\}. \tag{2.9}$$

Innovation Sector — Entrepreneurs earn rent on their fixed supply specialized technology, that rent is rebated to the households. Households purchase stocks in new firms at market price with the rents, satisfying the budget constraint (2.7). Entrepreneurs equalize their marginal benefit of starting up a new firm in industry $v_{h,t}$, to their marginal cost of hiring labor to that process. The first order condition reads:

$$v_{h,t} = f_{e,h}\frac{w_t}{X_t}\left(\frac{M^e_{h,t}}{M_{h,t}}\right)^{\zeta_h^{-1}}. \tag{2.10}$$

The price of a firm in industry h does not only depend on the demand side from 2.9 but also from the supply and the incentives to enter into an industry. In this economy the incentives to innovate determine the stock price of firms in an industry. I analyze the link between incentives to innovate and industry asset prices in the next section.

2.3.3 Formal Competitive Equilibrium Definition

The competitive equilibrium is a sequence of prices, $(p_{h,t}, w_t, v_{h,t}, v^e_{h,t})$, and allocations, $(c_{h,t}, \mathcal{C}_{h,t}, C_t, L^e_{h,t}, L^p_{h,t}, M^e_{h,t}, M_{h,t}, x_{h,t}, x^e_{h,t})$; such that given the sequence of shocks $(\varepsilon^A_t, \varepsilon^X_t)$, (a) allocations maximize the households program (b) consumption-goods firms maximize profits (c) entrepreneurs maximize their value, (d) the labor, good, and asset markets clear, and (e) resources constraints are satisfied.

2.4 Asset Prices

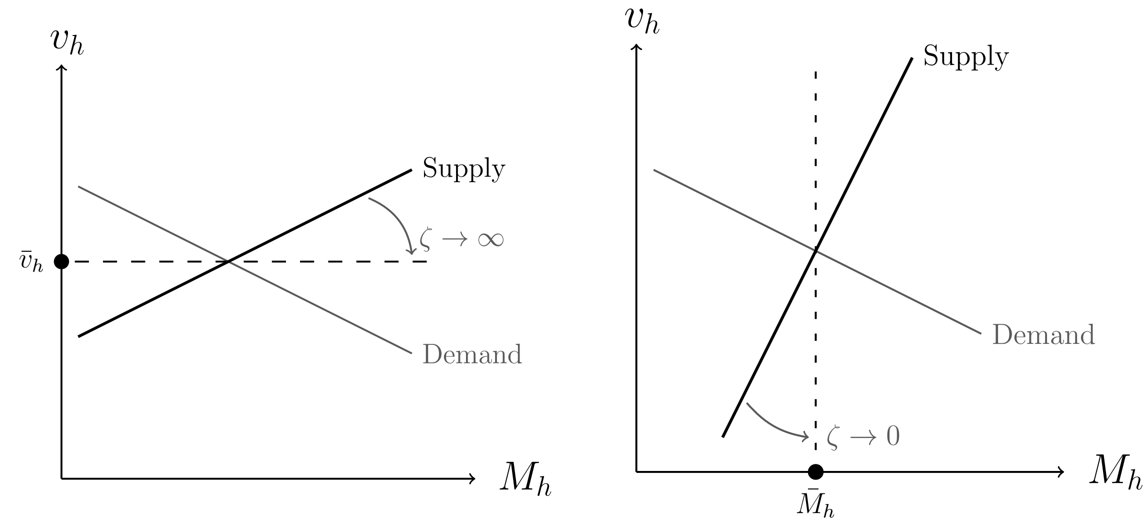
In this section I detail the mechanism at work in the model. I show how a shock ε^X that decrease the cost of entry in the aggregate, affect industries through its effect on the dynamics of firm entry. Then I also show how consumption responds to the entry shock leading to a risk premium due to entry risk.

The first order condition of entrepreneurs in each industry determines the supply curve of entry: hence it pins down how firms enter in and exit out of industries. The demand curve for new firms originate from consumer demand optimization, which evaluates the value of a firm inside an industry as a function of its future profits. I analyse the determinants of both supply and demand in the following sections, and their implications for firm dynamics.

2.4.1 Entry Dynamics

I derive the entrepreneurs first order condition in equation (2.10). The marginal value of an incumbent in an industry, $v_{h,t}$, must equate the marginal cost of entry of new firms. This condition sheds light on common assumption in the literature on firm dynamics: (a) As ζ becomes large the supply of new entrants flattens as small changes in the price triggers a large influx of new firms in the entrepreneurial sector (see figure (3a)); in the extreme case of $\zeta \to \infty$, entry is perfectly elastic and the price of a firm is fixed at the marginal cost of capital, here it is the entry cost $\bar{v}_{h,t} = f_{e,h} w_t / X_t$. (b) As ζ becomes small, the supply of new firms becomes inelastic and entry is fixed and it does not respond to variation in the value of a firm in the industry; see the extreme case of $\zeta = 0$ in (3b).

An imperfectly elastic supply curve allows for an intermediate case, introducing a varying wedge between the value of firm inside an industry, $v_{h,t}$ and its value outside (the marginal cost of starting up a firm for an entrepreneur). The extent of this



(a) Elastic Supply: $\zeta \to \infty$

(b) Inelastic Supply: $\zeta \to 0$

Figure 3
Elasticity of the Supply Curve of New Firms

wedge defines the elasticity of the supply of investment. This intuition is closely related to the literature on the q-theory of investment: there the wedge between the value of (intensive) capital inside and outside a firm depends on the level of adjustment costs.

Most importantly, the elasticity ζ does vary across industries such that different industries have different elasticities of firm entry. Empirically, in section 3, I estimate the entry elasticity for all industries, and I show how it captures an important component of the displacement risk of new entrants. Conversely, my framework generates a mapping between this industry statistics and firm exposures (and later risk premia). Measuring risk exposures across industries then inform us about the industry elasticity of innovation to changes in the aggregate cost of entry.

The novelty of my framework lies in the flexibility of the industry elasticity for the supply of "capital". Classic models of entry (see Melitz (2003)) assume a perfectly elastic supply of entrants. In such framework the sunk costs spent upon entry match exactly the value of a firm price in equilibrium, and the equilibrium product market through a target mass of firms. In that respect an inelastic supply allows to draw inference from prices on the incentives to innovate at the industry level.[9]

[9]Note that the fixed cost parameter, $f_{e,h}$ governs the level of the supply curve, not its shape. As discussed in the case of a perfectly elastic supply, it pins down the price but not its dynamics.

2.4.2 Profit Dynamics

After discussing how elasticities of the supply curve translate at the industry level translate into differential exposures to entry risk, I examine the role of consumers' demand for assets curve, from their Euler equation (2.9). Agents' asset demand links the value of a firm in the industry to its stream of future profits, that originate from operating in product market h: $\pi_{h,t}$. Given consumers' industry level demand curves, as the mass of firms rise future profits of incumbent firms decline due to an increase in competition (see equation (2.5)). The competitive effect depends on consumers' demand curve elasticity η. To understand how profits decline with the level of competition, I derive the elasticity of profits to the mass of firms in the industry:

$$\frac{\partial \log \pi_h}{\partial \log M_h} = -1 - \eta_h \cdot \frac{1}{M_h^{\eta_h}/a_h - 1} \tag{2.11}$$

The elasticity of profits with respect to competition declines for two reasons. First for a given level of expenditures in the industry, these are divided among more firms. That effect is present in all monopolistic competitive models and accounts for the negative one term. The second term is industry specific. The more elastic the demand curve (larger η) the more profits react to an increase in competition. This result is very intuitive as the elasticity of substitution between different varieties within an industry is given by $\sigma_h(M_h) = \frac{1}{\eta_h}(1 - a_h M_h^{-\eta_h})$. As M_h increases, σ_h increases, lowering incumbents' local monopoly power as consumers' demand curve becomes steeper. Thus firms' profits and markups also decrease with M_h.[10] The elasticity of profits to the mass of firms summarize this mechanism. It is clearly negative and more so for high elasticity (high η_h) industries. This is due to the elasticity of σ_h to a change in M, governed by η_h. Moreover the elasticity of profits to M_h is dampened in an already competitive environment, with a large M_h. This effect is also very intuitive and suggests decreasing returns to scale in competition: introducing new firms in a very concentrated industry will strongly decrease monopoly power; however in an already very competitive environment, the marginal effect of entry on competition is very low.

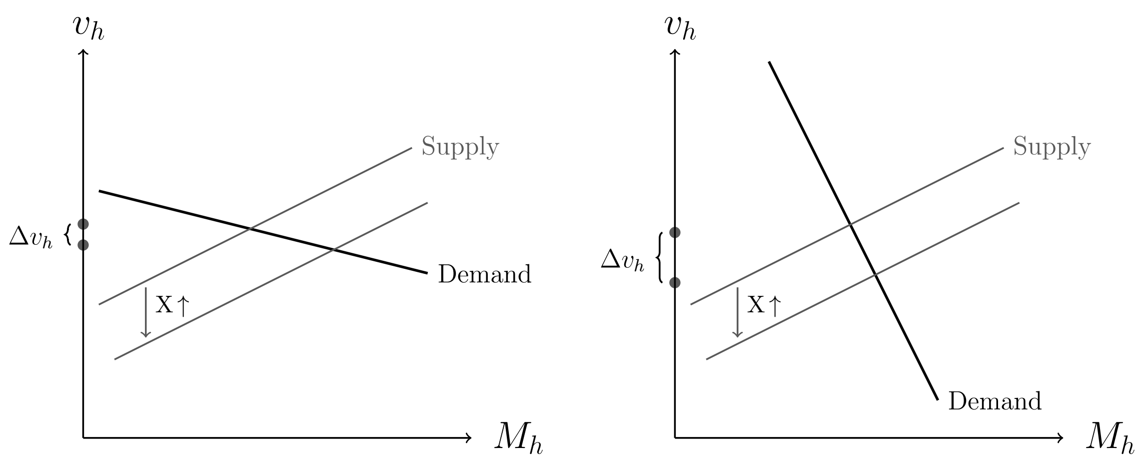
To visualize the role of the profit elasticity parameter η_h, I represent two industries with two different elasticities.

A shock to aggregate entry ε^X shifts the supply curve downwards. In the case of an inelastic (figure (4b)), an increase in entry translates into a large variation in the

I use the parameter to adjust the average markup level across industries.

[10]Note that as η_h increases the elasticity of substitution also increases, however this level effect does not translate into a higher elasticity of profits.

valuation of firms v_h. This is clearly not the case for a very elastic demand curve (where the elasticity of substitution is high) as seen on figure (4a). I stress the role of η_h as an industry statistic as it governs an industry's exposure to entry shocks along with the supply elasticity statistic ζ_h. Moreover I estimate the elasticity empirically, adding a measure of industry exposure to entry risk. Again I show in the calibration and empirical section it provides useful information to link industries' risk premia to their characteristics.



(a) Elastic Demand: low η **(b)** Inelastic Demand: high η

Figure 4
Elasticity of the Demand Curve of New Firms

To summarize, I showed two industry statistics control the effect of entry shocks on firms' prices at the industry level. η_h, the elasticity of the demand curve identifies how profits decline after new firms enter an industry and displace incumbents' monopolistic position. Second ζ_h is informative about the supply of new entrants into an industry after an entry shock, or an increase in the value of incumbents (inside firm value of the industry). Both statistics control the exposure of an industry to entry risk through supply and demand. After an entry shock, ζ_h answers the question: "how many firms enter the industry?" and η_h: "how much did incumbents lose in profit due to that entry?".

2.4.3 Aggregate Risk

I turn to the effect of entry shocks on aggregate risk. I have shown how industries are differentially exposed to the risk of entry. To understand their risk premia, I investigate how and how much do households care about that risk.

To show entry risk matters for households, it has to impact their marginal utility of wealth, or more specifically their stochastic discount factor (SDF). The SDF is the multiplier on the households' budget constraint: it is the state price of consumption weighted by the probability of that state. Assets with high payoffs in states in which the price of consumption is dear are attractive as they act as hedge in bad times. As a consequence they command a high price and have lower risk premia in equilibrium. To measure the extent to which households care about entry risk I introduce the price of risk for a given shock ε:

$$\mathrm{rp}_t^{\varepsilon} = \mathrm{cov}_t\left(\frac{S_{t+1}}{S_t}, \varepsilon_{t+1}\right)$$

Covariance of the SDF with the shock ε determines how much households care about these shocks and how much risk compensation they command for each additional unit exposure to ε. I focus on the price of entry risk $\mathrm{rp}_t^X = \mathrm{cov}_t\left(\frac{S_{t+1}}{S_t}, \varepsilon_{t+1}^X\right)$, which informs about the compensation earned by an investor for holding firms in industries with higher exposure to ε^X.

The sign of the price of entry risk rp^X, is equivocal. There are two concurring effects on the SDF: a shock to aggregate entry has no direct effect on contemporaneous consumption, as it acts as a shock that boosts investment and future output through entry of new firms. However a change in the production of the innovation sector, X_t, shifts the relative allocation of productive inputs from producing consumption goods to starting up new firms. The first effect lifts the household's continuation utility while the second decreases his contemporaneous utility.[11] From the expression for the SDF (Equation 2.8), I decompose the role of entry shocks on marginal utility into two elasticities:

$$\frac{\partial \log S_{t+1}}{\partial \varepsilon_{t+1}^X} = -\nu \cdot \frac{\partial \log C_{t+1}}{\partial \varepsilon_{t+1}^X} + (\nu - \gamma) \cdot \frac{\partial \log J_{t+1}}{\partial \varepsilon_{t+1}^X},$$

[11] This mechanism is akin to the response of the stochastic discount factor to capital-embodied shocks (investment-specific technological change) in general equilibrium with an intensive margin of adjustment for investment. Papanikolaou (2011) shows that under some preference assumption, the price of investment shocks is negative. This mechanism generates cross-sectional implications for firms, as it favors future "growth" opportunities and is detrimental to assets in place. See also Kogan, Papanikolaou, and Stoffman (2012) for an amplification of the mechanism.

where: (a) the contemporaneous consumption response is negative and contributes to an increase in marginal utility; (b) the continuation utility's response is positive and its role for marginal utility hinges on the sign of $\nu - \gamma$. Hence the role of the elasticity of continuation utility for the price of risk depends on the coefficient of relative risk aversion, γ, and the elasticity of inter-temporal substitution, ν^{-1}. A sufficient condition for the price of risk to be negative, that is an aggregate entry shock to increase marginal utility is: $\nu^{-1}\gamma < 1$.[12]

When consumers have preferences for late resolution of uncertainty ($\nu^{-1}\gamma < 1$), the effect on contemporaneous consumption and on continuation utility both contribute to a rise in marginal utility. Households do not diversify risk over time, and a positive shock to X_t increases the marginal utility of wealth: the price of risk is negative ($\mathrm{rp}^X < 0$). In the case of preferences for early resolution of uncertainty ($\nu^{-1}\gamma < 1$), households can diversify the risk over time and they have less precautionary savings. The risk incurred by shocks to the productivity of entrepreneurs is smoothed out over time and the effect on future aggregate consumption plays a larger role; hence the response of contemporaneous consumption and continuation utility play opposite roles on marginal utility. In that case the effect is ambiguous and depends on the relative size of $\nu - \gamma$ and ν and on both elasticities.

I find the price of entry risk is negative in the data (see Section 3.2.2). Hence, I anticipate on my empirical results and assume households have preferences for late resolution of uncertainty.[13]

2.4.4 The Cross Section of Industry Risk Premia

Next I characterize firms' risk premia across industries. My model features a rich equilibrium cross section of industries. Differences in firms' exposures to shocks to A_t or X_t arise endogenously as a consequence of differences in the entry technology of their innovation sector. Because the risk of both shocks is priced in equilibrium (i.e. rp^X and rp^A are different from zero), differences in exposures will generate heterogeneous risk premia across industries. There are no closed form solution for the exposure of firm valuations to the exogenous shocks in the model. However since most of the dynamics arise from variations in cash-flows through entry, I interpret

[12]Epstein and Zin (1989) show this condition is equivalent to late resolution of uncertainty for Kreps-Porteus utility functions.

[13]There is little consensus about *early* versus *late* resolution of uncertainty in non-time-separable utility functions. The long-run-risk literature shows early resolution of uncertainty helps solve some asset-pricing puzzles (see Bansal and Yaron (2004)). However others (see Papanikolaou (2011)) argue *late* resolution of uncertainty amplifies the price of investment specific shocks, leading to the value premium.

the valuation exposure through the lens of the cash-flow exposures from Section 2.4.2 (see Equation 2.11). I linearize the SDF around the non-stochastic steady state of the economy; then for firms in industry h, I decompose expected excess returns into two components:

$$\mathbf{E}_t\left\{R^e_{h,t}\right\} \simeq \mathrm{rp}^A_t \underbrace{\mathrm{Cov}_t\left(\frac{v_{h,t+1}+\pi_{h,t+1}}{v_{h,t}}, \varepsilon^A_{t+1}\right)}_{\text{Exposure to TFP shock}} + \mathrm{rp}^X_t \underbrace{\mathrm{Cov}_t\left(\frac{v_{h,t+1}+\pi_{h,t+1}}{v_{h,t}}, \varepsilon^X_{t+1}\right)}_{\text{Exposure to aggregate entry shock}}. \tag{2.12}$$

This approximate linear decomposition of expected returns decomposes expected returns as a two-factor model in the two exogenous state variable of the model.[14].The heterogeneity in risk premia across industries come from the latter term, of exposures to ε^X_t.

Shocks to the aggregate productivity of consumption play a small role in the cross-sectional dispersion of expected returns in the model. On impact, profits react identically for all industries because the elasticity of profits to A_t is common across industries. Differences in exposures to ε^A_t work through the mean reversion of profits to their steady-state value. In industries with high elasticity of the supply of entrants, after an increase in profits due to higher aggregate productivity, entry rates increase rapidly and drive down profits. Industries with high elasticity see a lower effect of aggregate productivity on their valuations as the innovation sector captures their profits. However, heterogeneity in the mean reversion of profit only generates a small dispersion in returns in the calibration.

In this paper, I focus on the effect of the second shock, ε^X_t, to the marginal productivity of innovators. Shocks to aggregate entry affect the level of profit through industry concentration. Heterogeneity of the response of profits (and firms' value) works through differences in the elasticity of the supply curve for entrants. Industries with high elasticity of entry (ζ_h) or high elasticity of profit margins (η_h) have low profits after the aggregate entry shock due to a strong increase in competition. In the data I find the price of risk of this shock is negative ($\mathrm{rp}^X < 0$), and a positive shock to X_t denotes a bad state of the world (high marginal utility of wealth). Hence firms in industries that have a high response to aggregate entry shock through both statistics (ζ_h, η_h) will have a low payoff in those bad states of the world. They earn higher expected returns in equilibrium.

[14] I derive the approximation in Appendix A.2

2.5 Calibration

In this section I calibrate the model to shed light on the link between industry characteristics and risk premia. I investigate the origin of the risk premia channel to generate heterogeneous returns across industries through the structure of both their innovation sectors and their product market. Specifically I look whether a neo-classical growth model with investment at the extensive margin, through entry, can match key real economic variables as well as asset returns. The exercise asserts the role of entry shocks as drivers of the dynamics of extensive investment and risk premia. To that goal I solve my model with four industries that differ along the two main dimensions of heterogeneity the model allows (ζ_h, η_h).

2.5.1 Parameter Choice

Table 1 summarizes the parameter choices used in my calibration. The key parameter that affects the role of the entry shock for aggregate dynamics is the volatility. I choose a high value of volatility for entry to match its volatility of entry across industries.

The rest of the parameters are standard from the literature. The main departure from the neo-classical growth model is the growth rate of the economy. As in Bilbiie, Ghironi, and Melitz (2012), I assume the a zero growth rate. In my model as in most of innovation based theory of growth, the growth rate of the economy is a function of the incentives of firms to innovate or of new firms to enter. These incentives are determined in my model by the elasticity of consumers' demand curve through the incumbents' markup. This elasticity is non-stationary as the economy expands the the mass of varieties in an industry expands. The non-stationarity of markup dynamics based on industry age is an interesting feature of the model in itself, however it falls outside of the scope of this paper.

Regarding the supply of capital, the innovation sector, I select an exogenous death rate of 12% to match the average entry rate in the economy. To determine the average level of entry cost in each industry, I choose a value of f_e that matches average markup levels of 10%.

To calibrate the heterogeneity in both the elasticity of the supply of entrants (ζ_h) and the elasticity of markups (η_h), I try to match industry moments. I take ζ_h to match the average volatility of entry rates and η_h to match the volatility of profits.

There is no debt in the model; this is in contrast with firm financing in practice. In the data firms are financed 40% by debt and 60% by equity. To ease comparison between the data and the model, I multiply stock returns by 5/3 as in Boldrin, Christiano, and Fisher (2001) to better approximate stocks as levered claims on capital.

Table 1
Calibrated parameters

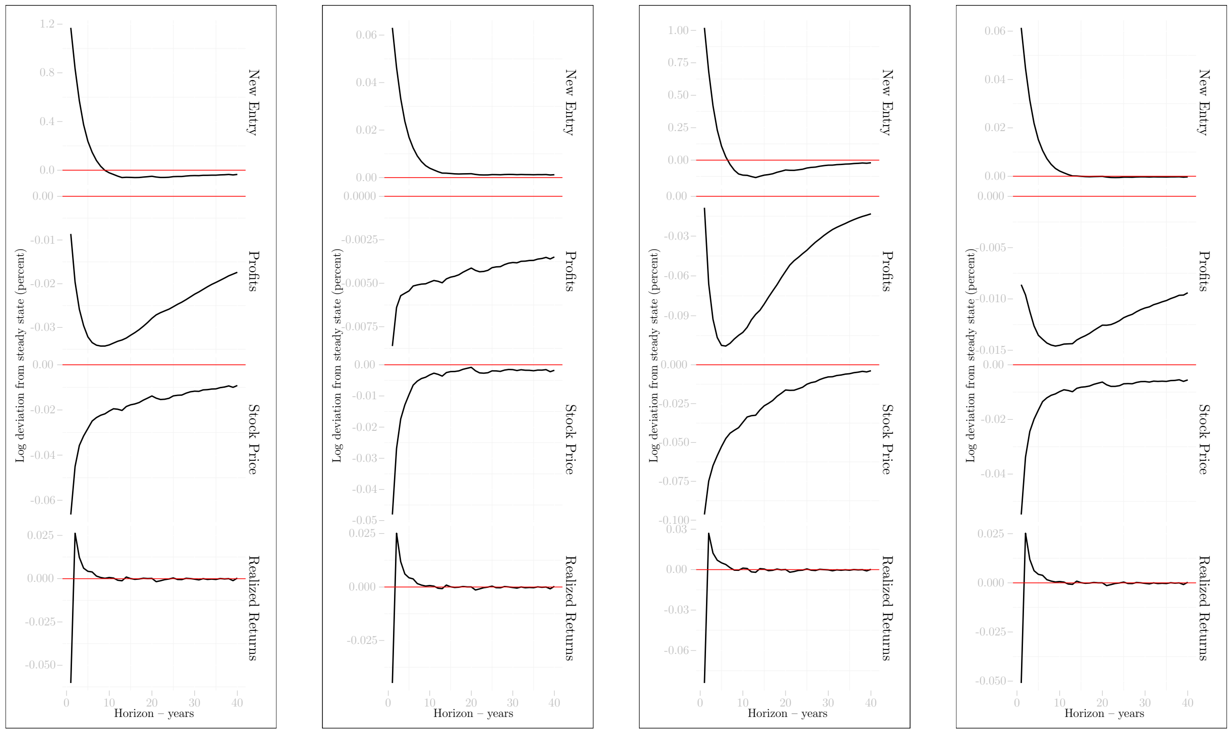
Parameter	Symbol	Value
Preferences (dynamic):		
Discount rate	β	0.971
Elasticity of intertemporal substitution	ν	0.25
Relative risk aversion	γ	1.1
Preferences (variety):		
Elasticity of consumer demand	η_h	0.8-6
Production Technology:		
Labor supply	L	0.5
Volatility of production in consumption good sector	σ_A	1%
Persistence of aggregate productivity	ρ_A	0.9
Innovation Technology:		
Supply elasticity of entrepreneurs	ζ_h	0.25 - 5
Exogenous death rate	δ	12%
Volatility of aggregate entry shock	σ_X	20%
Persistence of aggregate entry factor	ρ_X	0.7

2.5.2 Model Solution

I solve the model using perturbation methods along the steady state. To gain intuition in how the model works I show impulse response of quantity and price reactions to a shock ε^X in figure 5. After a shock to aggregate entry, new entry jumps from its steady state value, more so in industries with high entry elasticity (high ζ_h) as in panel (5a) and (5c). There lies the clear role of the first elasticity for exposure to entry risk. Then firms' cash-flows (profits) respond to an increase in competition by a clear drop. Exposure to this mechanism depends on the second industry statistics, η_h. Industries with high η_h see a higher drop for a given percent increase in entry, as in panel (5c) and (5d). The effect on firm value and realized returns is mechanic, and both drop subsequently with a magnitude that combines both elasticities, industry entry to aggregate fluctuations and profit margins to entry.

Finally the effect on aggregate quantities follows the theoretical predictions for my parameter values. After an entry shock consumption decreases contemporaneously before recovering and going above the steady state. The SDF initially increases sharply signaling a high marginal utility for the households, before quickly converging to steady state.

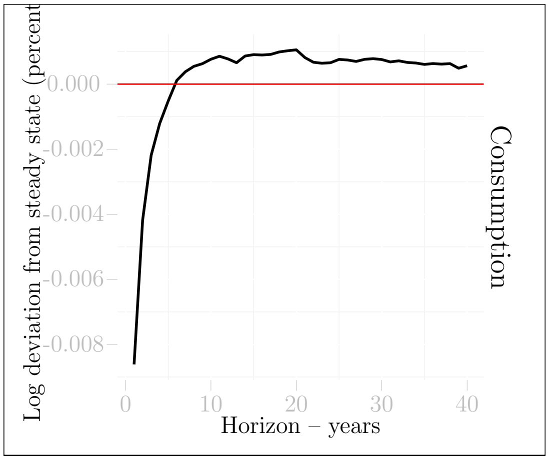
The conjunction of both an increase in marginal utility and a sharp decline in realized returns has implications for the pricing of entry risk: the risk has a negative price, times of high entry shocks are bad and households should command a higher risk premium for assets that do poorly in these states. I explore the pricing implications in the next section.



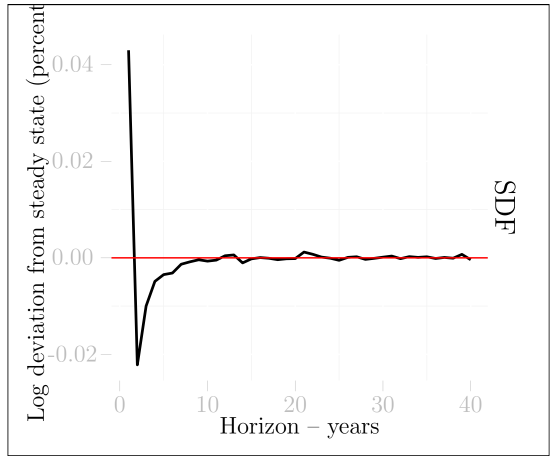
(a) High ζ, Low η **(b)** Low ζ, Low η **(c)** High ζ, High η **(d)** Low ζ, High η

Figure 5

Impulse Response of quantities and returns across industries



(a) Consumption Response



(b) Stochastic Discount Factor Response

Figure 6

Impulse Response of aggregate quantities

2.5.3 Model Implications

Aggregate Moments — I find I can replicate some of the target aggregate moments. As shown in table 2, I find consumption growth volatility is below target at 1.37% but within the same order of magnitude. I am able to match the risk-free rate level, but I find it is very volatile at 3.57%. This is partly due to the very low value of the EIS, that makes the risk-free rate very sensitive to changes in consumption growth. As a baseline I find the model generates the right magnitude of aggregate fluctuations.

Next I turn my attention to industry specific moments in table 2. In my calibration the average entry rate is within the empirical estimate at 1%. A constant in my industry level calibration is the volatility of real quantities being too small. This is due to my conservative calibration of the volatility of entry shock. The two moments I consider at the industry level are net markups and profits (per unit of capital). Net markups hit the target at 35% (for empirical estimate of 32%).[15] Profit levels also match the empirical estimates at 0.75 per unit of capital; however as for entry rates, I am not able to match the volatility of profits and my estimate fall an order of

[15] I take average estimate from Christopoulou and Vermeulen (2008) as my target for markup and I estimate profitability from compustat data for my profit empirical targets.

magnitude below. The difficulty to match profits with enough volatility stems from the trade-off between having a high entry elasticity and high cash-flow elasticity with a high enough level of profits in equilibrium.

Table 2
MODEL VERSUS DATA: AGGREGATE AND INDUSTRY QUANTITIES

Variable	Data		Model	
	Mean	Volatility	Mean	Volatility
Aggregate Moments				
Consumption	2.51	1.95	–	1.24
Risk-free rate	2.90	3.00	2.92	3.49
Industry Moments				
Entry Rate	1.23	3.62	1.66	1.27
Net Markups	32	–	38.20	1.25
Profits	0.44	1.40	0.99	0.043

Now I focus on the asset pricing moments generated by the model. I decompose the risk premia generated into the price of risk and the risk exposure at the firm level. I summarize asset pricing moments in table 3. Looking at the market portfolio, its volatility is 18% in the model exactly in line with the data. Moreover the model matches the market price of total risk in the economy as the Sharpe ratio is 31% (27% in the data).

The model undershoots the market price of risk for entry risk exposure. The Sharpe ratio of the long-short portfolio for entry elasticity (ζ) ranges from 10.7 to 11.4 percent, short of the empirical result I present in Section 3.2.1 as in the data. I undershoot the price of risk along the other dimension of industry heterogeneity, the cash-flow elasticity η: the Sharpe ratio only ranges from 13.3 to 14.2 percent while the empirical Sharpe ratio reaches 21 percent. The return spread in the long-short portfolio falls short of matching the data because the amount of risk of the portfolios is too low in the model.[16]

[16] All the empirical portfolios moments are anticipated from the empirical section; there I detail exactly their construction.

This evidence suggests a simple neoclassical growth model with imperfect competition can link asset prices with important industry characteristics such as innovation and product market structure. Not only my model replicates key industry price and quantity moments but it also sheds light on the mechanism at play for this margin of investment: the extensive margin. Prices are informative not only about industry risk, but also about the incentives to innovate across industries. To confirm theses theoretical findings, I conduct an empirical analysis of the link between these two key industry statistics (ζ and η) and asset prices.

Table 3
Model versus Data: Asset Pricing Moments

	Data	Model
Aggregate Moments		
Risk premium of the market portfolio	4.89	5.7
Volatility of the market portfolio	17.92	18.07
Sharpe ratio of the market portfolio	27	31
Average risk-free rate	2.90	2.93
Volatility of risk-free rate	3.00	3.50
Industry Moments		
Average return for the high-low ζ portfolio	3.74	[0.38 – 0.81]
Volatility of returns for the high-low ζ portfolio	8.53	[4.47 – 10.12]
Sharpe ratio (%) for the high-low ζ portfolio	44	[10.7 – 11.4]
Average return for the high-low η portfolio	2.3	[0.16 – 0.59]
Volatility of returns for the high-low η portfolio	11.3	[2.29 – 9.15]
Sharpe ratio for the high-low η portfolio	20.5	[13.3 – 14.2]

3 Empirical Evidence

3.1 Measurement

In this section I discuss the empirical counterparts of the model. I test the model's implications for asset prices in the data. I construct an empirical measure of entry shocks; I use this shock to capture the two dimensions of cross-sectional heterogeneity between industries in the model: ζ_h, the elasticities of industry entry to aggregate fluctuations in entry and η_h the elasticities of cash-flows to industry entry. Finally I confirm how these two elasticities are instrumental to capture heterogenity in risk premium across industries and ultimately to our understanding of the entry risk premium. The main tables are regrouped at the end of the paper.

Entry Data — To measure the empirical counterparts of our model, aggregate shock (X_t) and elasticities (ζ_h and η_h), I use micro-level data on establishments from the Quarterly Census of Employment and Wages (QCEW) from the Bureau of Labor Statistics. This dataset reports the number of establishments in each 4-digits NAICS code industry and their total wages at a quarterly frequency. The sample covers the period from 1992 to 2015 and includes 303 industries.

Firm or establishment entry is a conservative measure of the impact of new products on an industry market structure. Recent work with disaggregated data shows product creation is substantial within firms. Bernard, Redding, and Schott (2010) use plant-level data at a fine level of industry disaggregation (five-digit SIC code) to investigate the dynamics of product creation within firms. Their study shows 94% of new products are created within existing firms. At a finer level, Broda and Weinstein (2010) use barcode data and confirm the role of product creation for existing firms and find the market share of new products is four times that of newly created firms.

For robustness purposes I measure entry in two ways throughout this empirical section: weighted and non-weighted. My non-weighted measure captures establishment entry at the industry level by measuring the rate of new establishment creation. This is a net measure, it captures both the entry and exit of establishments within an industry. I also construct a weighted measure: I use the relative industry size to weight entry rates. A growth in establishment of 5% does not have the same meaning when the average establishment has a size of 10 or 100 employees. Hence I use lagged establishment average wage expenses to weight the entry rate across industries. This weighting only affects my aggregate entry measure as it distorts the relative size of entry rates across industries.

Aggregate Entry Process X_t — To construct an empirical counterpart to the measure of aggregate productivity of the entry technology, we remark the first two principal components of entry rates across our 4-digits industries account for 40% to 50% of the total variation in industry entry. I extract these first two components to find the empirical counterpart to the entry specific shock I introduced in the theoretical Section (X-shock). To separate the entry specific process from a neutral productivity shock (A in the model), I measure the empirical correlation between both principal components and aggregate quantities in Table 4. I find the first component is strongly positively correlated with aggregate profits indicating it captures variations from the A-shock.[17] On the other hand the second component is to some extent correlated with aggregate output, but not with profits, hence it is our best candidate to measure our entry specific shock.[18] Finally I represent the time series of the entry factor in Figure 7. In an appendix I report my results using the weighted version of this procedure using as a measure of relative size in entry rates, the average wages by establishments in an industry. All my results are robust to the use of this alternative measure and are regrouped in Appendix.

Table 4
Correlation Table of The Principal Components of Entry

	Consumption	Output	Corporate Profits
First Principal Component	0.0191	0.107	0.184
Second Principal Component	0.337	0.217	0.0449
Consumption		0.374	0.492
Output			0.118

The table reports the time series correlation between four time series: (i) the first and second principal component of entry across 4 digits NAICS industries from the QCEW; (ii) output (real GDP from NIPA); (iii) consumption (real personal consumption expenditures per capita from NIPA) ; (iv) corporate profits after tax (from NIPA).
The frequency is quarterly. Aggregate series are detrended.

[17] Even though there are no demand shocks in the model, this correlation could also be interpreted with demand driving the first principal component.

[18] Our theory predicts the correlation with aggregate profits should be negative; lagged values of the second principal component predict negative profits, unlike the first component, albeit not in a statistically significant way.

Entry and elasticities — The model's main predictions for asset prices are that two economic industry-level characteristics shape the cross-section of industry returns. The elasticity of industry entry to aggregate entry, ζ_h, and the elasticity of cash-flows to entry, η_h. So as to be able to test this first set of predictions, I estimate both elasticities at the industry level.

To measure the elasticity, ζ_h of industry entry to aggregate entry shocks, I use the loadings of each industry entry to the principal component measure of the shock. Intuitively ζ_h characterizes the dynamics of an industry, the investment opportunities (at the extensive margin) that get exercised whenever aggregate entry costs become low enough. A low loading on the factor signals a market with little opportunities for entrants at any level of entry costs: industries that are typically associated with large barriers to entry. A greater loading on the other hand translates into a larger reaction of industry entry rates to changes in the terms of aggregate entry.

To capture the second dimension of industry heterogeneity in the model, with the elasticity of firm level profits to industry entry (η_h), I directly estimate the impact of entry rates on firm cash-flows. I estimate firm-level regressions of future cash-flows on contemporaneous industry entry as follows:

$$\log(\pi_{h,t}) = \eta_h M^e_{h,t}/M_{h,t} + a_h + a_t + u_{h,t}. \tag{3.1}$$

Notations follow from the theory section: $M^e_{h,t}/M_{h,t}$ is the entry rate in industry h; $\pi_{h,t}$ is the cash-flow of firms in industry h in the following 2 years;[19] I also include time fixed effects to capture variations in aggregate conditions and industry fixed effects. The elasticity, η_h, accounts for the micro-level consequences of industry entry, specifically their effects on cash-flows. Firms in industries with low $|\eta_h|$ will hardly be affected by new entrants in their industry.[20] These industries have either an expanding demand or levels of competitions so high already that the effect of new entrants is only marginal. In Appendix Table (C.1), we list the top and bottom industries for each of the elasticity statistics. The table is a snapshot of which industries are most or least sensitive to entry risk.

Financial data and summary statistics — My sample of firms includes all firms with listed securities on the AMEX, NASDAQ, or NYSE that have both a match

[19] Cash-flow are measured using earnings before interests and depreciation minus inventories scaled by the total value of assets, see Rajan and Zingales (1998). I also reproduced all the results using the effect of entry on cash-flows for only one year in unreported robustness tests.

[20] Typically if demand shocks trigger entry in those industries, incumbents will be less affected than through a supply shocks. Though I try to capture mostly supply shocks through my aggregate entry measure, it is possible that some entry stems from demand shifts at the industry level.

in the CRSP monthly file and in the compustat annual file from 1985 to 2015. I exclude regulated industries and financials from the sample. To be included in my sample, firms must have a stock price, shares outstanding and a four-digit NAICS code. Moreover, firms in crsp/compustat must have their four-digit NAICS code in the entry dataset from the BLS (303 industries). We form equally weighted portfolios at the industry level based on real industry measure derived in the model and implemented as I detailed above.[21]

To understand if differences across industries elasticities is due to the firms that live inside of these industries more than the industrial organization, I estimate a summary of firm accounting variables in Table 5 across both quintiles of elasticity by ζ_h, and by η_h. The most significant difference across industry group is in size; however the dispersion in firm size is uncorrelated with the elasticity quintile. Book to market is decreasing with industry elasticity ζ_h, such that value firms are more present in less risky industries.

3.2 Asset Prices

In this Section, I explore the main predictions of the paper, namely how cross-sectional differences in industry entry elasticities are associated with differences in risk premia. First I test whether the elasticity of industry entry to aggregate entry does predict higher average excess returns. Then I investigate the role of cash-flow elasticities to industry entry. Finally we sort industries across both elasticities, ζ_h and η_h, to confirm the source of the entry risk premium.

3.2.1 Industry Portfolios

Aggregate Elasticity ζ_h — In Table 6, I present the average excess returns and risk characteristics for 5 industry portfolios, sorted on the elasticity ζ_h, of industry entry to aggregate entry shocks. The elasticity embeds information about how sensitive an industry is with respect to aggregate entry fluctuations: from the first column figuring the highest loading on aggregate entry, hence the more risky industry, to the smallest loading. In the last column I present statistics for a "long-short" portfolios consisting in going long high elasticity industries and short low elasticity industries.

First I find, in panel A, the industry portfolios show a rising pattern of average excess returns ranging from 8.8% to 12.6% with the industry elasticity quintiles.[22]

[21] Our results hold with value weighted portfolios.

[22] Returns are monthly, I multiply them by 1200 to have their magnitude comparable to annual returns.

This rise is such that the long-short portfolio has average excess returns of 3.74%. The risk-return trade-off of the portfolio is large and significant as the Sharpe ratio reaches 0.44 (in annualized terms). This is in line with estimates of the market Sharpe ratio of (0.5). I will in a later section develop the relative importance of the premium in returns for pricing (see Section 3.2.2). Second, industry portfolios do not exhibit a particular pattern in their exposure market portfolio, as illustrated in panel B. The difference in average returns is not explained by the CAPM; the CAPM alpha of the long-short portfolio is 4.5%, and statistically significant. The five industry portfolios also have monotonoously increasing alphas, from 0.2% to 4.7%. Moreover the dispersion in returns across ζ_h portfolios is distinct from the size and value effects. Computing alphas using the Fama and French (1993) empirical factor models leads to similar result as we see from panel C. The high-ζ_h minus low-ζ_h portfolio has an alpha of 6.2%, and the alphas across portfolios range from -2.5% to 3.7%.

In Table C.3, we reproduce the results for a different measure of the aggregate entry process, using wage weights, and therefore different industry elasticities. We find similarly, the long-short portfolio earns large average excess returns of 4.3% and abnormal returns ranging from 4.8% (CAPM) to 6.6% (three-factor model).

Industry elasticity η_h — In Table 7, I present the average excess returns and risk characteristics for 5 industry portfolios, now sorted on the elasticity η_h, of future cash-flows to industry entry – estimated from equation (3.1). The elasticity informs us on the sensitivity of firms cash-flows to entry. In other words how an increase in competition translates into a decrease in cash-flows. From the first column figuring the lowest elasticity, most negative and therefore most risky, to the last column where cash-flows do not respond or respond positively to competition.[23] In the last column I present statistics for a "long-short" portfolios consisting in going long high elasticity industries and short low elasticity industries.

First I find, in panel A, the portfolios show a declining pattern of average excess returns ranging from 11.4% to 9.3% with the elasticity quintiles. The long-short portfolio has average excess returns of -2.08%. The Sharpe ratio is 0.22 (in annualized terms). The numbers are smaller than for our previous Table 6, sorted on ζ_h. Indeed the model does predict that firms in industries with low negative η_h, have higher excess returns, but this is conditionnal on the industry being exposed to the aggregate entry factor. Firms exposed to cash-flow displacement but uncorrelated from aggregate factors do not command a higher risk premium in the model. The effects are not accounted for by the CAPM (panel B) or the three-factor model (panel

[23]Some of the elasticities are positive, likely because entry in these industries is mostly driven by neutral productivity shocks or demand shocks.

C), leading respectively to alphas of -2.42% and -4.2%. The three-factor alpha is statistically significant at the 10% level.

Portfolios along both elasticities: ζ_h and η_h — Both tables summarize how both industry characteristics matter for prices. It is important to understand that both elasticities work in conjunction: an industry with large loadings on aggregate risk but no cash-flow risk will not command higher risk premia. The same stands true of cash-flow risk that does not stem from systematic risk exposure. To emphasize this point I explore industry portfolios along both dimensions creating double-sorted portfolios. We investigate industries across terciles of loadings ζ_h, and within each tercile I form terciles of cash-flow exposures along η_h.

I present the results in Table 8, with 9 different industry portfolios sorted along both dimensions of heterogeneity predicted in my model. The first group of three portfolios (columns 1 to 3) correspond to higher industry entry elasticity (ζ_h), hence more risky portfolios. Within this group, industries are classified along their cash-flow elasticities to entry, from more risky to less risky. Similarly the third group of portfolios (columns 7 to 9) represent portfolios that are less risky along the ζ_h dimensions. Finally the last group (columns 10 to 12) figure three long-short portfolios between high values of ζ_h and small value of ζ_h within terciles of η_h. Hence column (10) represent the statistics of the long-short portfolio along ζ_h for the lowest tercile of cash-flow elasticity (riskiest).

First we confirm the previous findings, firms in industries with higher industry entry elasticity have higher average excess returns (panel A). Simply observing columns 10 to 13, we infer the premium for high ζ_h industries is positive, and more importantly it is highest in industries in the lowest tercile of cash-flow elasticity. Average excess returns of the riskiest long-short portfolio is 6% compared to 3% for the long-short portfolio in the highest η_h tercile. Sharpe ratios follow the same pattern: the riskiest portfolios has a large Sharpe ratio of 0.6 compared to the two other long-short with 0.14 and 0.21. Finally I verify the portfolios' heterogeneity in returns is not accounted for by the CAPM or three-factor model in panels A and B. In both panel we find similar differences in CAPM and three-factor alpha across terciles of elasticity: from 5.54% and 7.98% for the riskiest long-short portfolios to 4.11% and 4.6% for the least risky one.

We reproduce the results for our alternative measure of entry in Appendix Table C.4 to find similar results. Given the evidence exhibited gathered in Tables 6 7, 8, the main model's predictions are confirmed: (1) there is an entry risk premium, that is large and significant; (2) it affects firms in industries with high exposure to the systematic entry factor and with low (very negative) elasticities of cash-flow to industry entry. Now we turn to direct test of the role of the entry-risk factor for asset prices.

3.2.2 The Market Price of Entry Risk

Methodology — To the model's prediction about risk factors, I estimate a linear approximation of the SDF around its (stationary mean) as I derived in the model (see Equation 2.12):

$$S = b_0 - b_A \varepsilon^A - b_X \varepsilon^X, \tag{3.2}$$

where ε^A and ε^X are the aggregate productivity and entry shocks respectively. In this approximation, the price of risk for each factor is constant.[24] For aggregate productivity I use the return on the value-weighted market portfolio from CRSP. For the entry shock, I use two different measures: first the entry shock estimated in section (3.1), and for additional power I construct a factor mimicking portfolios guided by the model and the results of the previous section. The long-short portfolio from table (8), noted $(\Delta_\zeta R^e|\text{low-}\eta_h)$, that captures differential exposure to the entry shock through different elasticities of industry entry to aggregate entry. The factor mimicking portfolio is normalized to correlate positively with entry shocks.

I estimate the model parameters of the SDF using the generalized method of moments (GMM). I use the moment restrictions on the excess rate of return of any asset that is imposed by no arbitrage through the Euler equation:

$$\mathbf{E}\{SR_i^e\} = 0. \tag{3.3}$$

In my estimation, I use portfolios returns in excess of the risk-free rate, R_i^e, so the mean of the SDF is not identified from the moment restrictions. I choose the common normalization $\mathbf{E}\{S\} = 1$, the moment conditions now read:

$$\mathbf{E}\{R_i\} - r_f = -\operatorname{Cov}(S, R_i^e); \tag{3.4}$$

this is equivalent to equation (2.12), with the set of conditional moments replaced by unconditional ones. I evaluate the model's ability to price assets based on the residual of the moment conditions. I compute the J-test of over-identifying restrictions of the model, that all the pricing errors are zero. I adjust standard errors of the GMM estimator using Newey-West with a maximum lag of 2 years. It is always a challenge

[24] This is a reasonable approximation given that in the model the price of risk for each factor hardly varies

to estimate the SDF using the whole cross section of stock returns, because covariances are measured with errors and firm level stock returns are volatile. To reduce measurement errors, asset pricers resort to an aggregation of firm level returns into a smaller number of portfolios; these test assets are usually aggregation of stocks along meaningful economic characteristics. Indeed for an accurate estimation of b_A or b_X, an asset pricer needs significant dispersion in exposures to the risk factor. Since industry returns are already an aggregation of stocks, I use the 9 double sorted portfolios introduced in Table 8 and the Fama-French 49 industry portfolios (see Fama and French (1997)) as test assets.

Market Price of Real Entry Factor — I estimate the risk premium fo the entry shock to be negative, economically and statistically significant. In Tables 9 and 10 I present the results of estimating the SDF parameters via GMM with the two different sets of test assets. In panel A, I find the market price of risk as estimated from the 9 double-sorted industry portfolios is negative and significant in a one-factor model (column 1) and in a two-factor model (column 3). It ranges from -0.48 to -0.96. The factor loses significance when we try to estimate a four-factor model with entry added to the standard three-factor. This is probably due to overfitting given the small number of test assets. In panel B, the estimates for the price of entry risk using 49 industry portfolios are similar ranging from -0.26 to -0.9. They are all statistically significant. The lowest estimate is in column (3), for the two-factor model using the market portfolio and the entry risk factor.

This evidence suggests the real entry factor is priced in the cross-section of industry returns. It is helpful to visualize how the covariance of portfolios with the risk factor correlated with average excess returns. In Figure 8, we plot the covariance of industry portfolio returns agains their average excess returns: first in panel a., for 5 portfolios sorted on industry entry elasticity (see Table 6), and in panel b. for the 9 double-sorted portfolios. We find that portfolios with higher loadings are more negatively correlated with the entry factor, and they do also earn higher returns. This Figure shows that indeed the price of risk is negative (slope of the covariance and average returns relation), and the risk stems from a negative correlation of returns with the risk factor pointing to a displacement effect.

Market Price of Factor Mimicking Portfolio — Results are similar when using monthly returns and the factor mimicking portfolios $\Delta_\zeta\{R^e|\text{low-}\zeta_h\}$. We use as factor mimicking portfolio the long-short portfolio along the dimension of industry elasticity (ζ_h); particularly we choose the long-short portfolio within the smallest tercile of cash-flow elasticity (η_h). As emphasized in Table 8, column 10: this is where the risk premium is largest. Results of the estimation of the linear factor model is in Table 10. As in Table 9, I use two sets of test assets, 9 portfolios from Table 8 and the 49 industry portfolios from Fama and French (1997).

In panel A, I report the second-state estimate of my estimation using the 9 portfolios. I find the price of the factor mimicking portfolio to be negative and significant for all specification but the four-factor model (due to overfitting again). The estimates are range from -0.15 to -0.3, of the same order of magnitude of the market risk premium. In panel B, I use 49 industries and find similar negative estimates for the price of the entry return factor. The estimates range from -0.27 (column 3) to -0.9 (column 1) and are all statistically significant.

This evidence provides further evidence entry is priced risk factor in the cross-section of industry returns. We It is helpful to visualize how the covariance of portfolios with the risk factor correlated with average excess returns. In Figure 9, we plot the covariance of industry portfolio returns agains their average excess returns: first in panel a., for 5 portfolios sorted on industry entry elasticity (see Table 6), and in panel b. for the 9 double-sorted portfolios. We find that portfolios with higher loadings are more negatively correlated with the entry factor, and they do also earn higher returns as in the previous Figure. This confirms the price of risk is indeed negative and due to the displacement risk of cash-flows at the industry level.

4 Conclusion

In this paper, I introduced a general equilibrium model with heterogeneous industries, imperfect competition, and shocks to the aggregate cost of entry. Shocks to entry affect the monopolistic structure of industries differently depending on two elasticities: the elasticity of industry entry to aggregate fluctuation (ζ) and the elasticity of markups to industry entry (η). I identify the impact of shocks using asset prices. In industries with high elasticities (either ζ and η) changes in entry affect firm value significantly. I show this extensive margin of adjustment has a limited effect on industries with low elasticities.

Shocks to entry shift the allocation of production factors in the economy from consumption goods production to the creation of new firms. This reallocation process decreases contemporaneous consumption and, depending on households' preferences for smoothing consumption across states (risk aversion) and across time (inter-temporal substitution), shocks to entry will command a positive or a negative price of risk. I present evidence that the price of risk is negative, and after a shock to entry, the marginal utility of consumption increases. I find firms in industries with high entry elasticity and high cash-flow elasticities earn higher average returns, 4 to 6 percent, annually, higher than in industries with low elasticities.

My results shed light on the link between industry organization and aggregate fluctuations. Macroeconomics shocks impact heterogeneous industries in different ways. Understanding the cross section of industry returns contributes to our understanding of how aggregate shocks percolate the economy. To this task, the use of financial data is invaluable, because it captures some of the crucial heterogeneity in the real economy.

Table 5

Summary Statistics of Industries Across Elasticity Groups

	Summary Statistics across Elasticity Groups – ζ_h				
	High ζ_h – more risky	4	3	2	Low ζ_h – less risky
Size(bn)	2.19	1.61	2.4	1.2	1.81
Book to Market	0.829	0.879	1	1.04	1.07
Book Leverage	0.229	0.205	0.257	0.211	0.278
Cash-Flow	0.131	0.116	0.118	0.089	0.113
	Summary Statistics across Elasticity Groups – η_h				
	Low η_h – more risky	2	3	4	High η_h – less risky
Size(bn)	1.33	2.36	1.88	1.02	1.22
Book to Market	0.931	0.905	0.999	0.974	0.993
Book Leverage	0.931	0.905	0.999	0.974	0.993
Cash Flow	0.107	0.103	0.124	0.127	0.127

The table reports summary statistics for firms in different 4 digits industries. I sort industries based on my measure of industry entry elasticity to aggregate entry ζ_h and also the elasticity of cash-flows to industry entry η_h.

Size is market equity; Book to market is the ratio of book value to market value; Leverage is defined as the ratio of total debt to book value; cash-flow measures earnings before interests and depreciation minus inventories scaled by the total value of assets.

Table 6

Portfolios Sorted on the Elasticity of Industry Entry to Aggregate Entry (ζ_h)

Portfolio Quintiles - ζ_h	High ζ_h	4	3	2	Low ζ_h	Hi–Lo
Elasticity	8.35	4.2	0.796	-2.56	-7.61	-
	Panel A: Portfolio Moments					
Mean excess return	12.6	12.9	11	10.5	8.84	3.74^{**}
Volatility (%)	17.5	21.7	17.5	18.8	19.6	8.53
Sharpe Ratio (%)	71.9	59.5	62.7	56	45.2	43.8
	Panel B: CAPM					
α	4.69	3.05	2.92	2.24	0.202	4.49^{*}
	(2.68)	(2.55)	(2.25)	(2.76)	(2.86)	(2.11)
β^{MKT}	1.01	1.26	1.03	1.05	1.1	-0.0961
	Panel C: Fama-French Three-Factor Model					
α	3.71	2.43	1.62	-0.0976	-2.51	6.22^{***}
	(1.61)	(1.28)	(1.27)	(1.63)	(1.54)	(2.04)
β^{MKT}	0.929	1.13	0.975	1.03	1.1	-0.166
β^{HML}	0.227	0.132	0.307	0.558	0.649	-0.422
β^{SMB}	0.648	0.82	0.612	0.665	0.685	-0.037

The table reports summary statistics for simple monthly excess returns over the 30-day Treasury-bill rate for 12 portfolios of industries sorted on industry entry elasticity to aggregate entry shocks (ζ_h). I report mean excess returns over the risk-free rate and volatilities. I also report exposures of these portfolios to common risk factors (excess returns on the market, high-minus-low and small-minus- big portfolios) along with the intercept of the factor regressions (α).
I report standard-errors in parenthesis using Newey-West standard errors with 12 lags.
I only form test on the long-short portfolios: ***, **, and * indicate significance at the 0.1, 1, and 5% level, respectively.
Returns are multiplied by 1200 as to make the magnitude comparable to annualized percentage returns.

Table 7
PORTFOLIOS SORTED ON ELASTICITY η_h

Portfolio Quintiles - η_h	Low η_h	4	3	2	High η_h	Hi–Lo
Elasticity	-12.8	-0.263	2.73	6.97	18.1	-
	Panel A: Portfolio Moments					
Mean excess return	12.5	12.5	12.7	10.5	10.1	-2.31
Volatility (%)	18.4	16.6	18.6	19.7	21	11.3
Sharpe Ratio (%)	67.6	75.2	68	53.5	48.4	-20.5
	Panel B: CAPM					
α	4.37	5.09	4.24	1.98	1.95	-2.42
	(2.94)	(2.67)	(2.41)	(3.03)	(3.94)	(2.67)
β^{MKT}	1.04	0.95	1.08	1.1	1.05	0.014
	Panel C: Fama-French Three-Factor Model					
α	2.53	3.43	2.51	-0.864	-1.67	$-4.2^{\$}$
	(1.67)	(1.48)	(1.2)	(1.65)	(2.26)	(2.51)
β^{MKT}	0.973	0.894	1.02	1.08	1.06	0.091
β^{HML}	0.335	0.306	0.315	0.579	0.765	0.43
β^{SMB}	0.667	0.583	0.636	0.664	0.665	-0.002

The table reports summary statistics for simple monthly excess returns over the 30-day Treasury-bill rate for 12 portfolios of industries sorted on cash-flow elasticity to industry entry (η_h) using future cash-flows over a 2-year period. I report mean excess returns over the risk-free rate and volatilities. I also report exposures of these portfolios to common risk factors (excess returns on the market, high-minus-low and small-minus- big portfolios) along with the intercept of the factor regressions (α).
I report standard-errors in parenthesis using Newey-West standard errors with 12 lags.
I only form test on the long-short portfolios: ***, **, *, and $ indicate significance at the 0.1, 1, 5% and 10% level, respectively.
Returns are multiplied by 1200 as to make the magnitude comparable to annualized percentage returns.

Table 8

PORTFOLIOS BASED ON BOTH ζ_h ELASTICITY AND η_h ELASTICITY

Portfolio Terciles - ζ_h	High ζ_h			Mid ζ_h			Low ζ_h			Hi–Lo ζ_h		
Portfolio Terciles - η_h	Low (1)	Mid (2)	High (3)	Low (4)	Mid (5)	High (6)	Low (7)	Mid (8)	High (9)	Low (10)	Mid (11)	High (12)
Elasticity - ζ_h	6.3	6.78	7.09	1.13	1.45	1.57	-5.9	-4.91	-5.56		-	
Elasticity - η_h	-1.69	2.72	10.1	-2.64	2.5	11	-3.48	3.04	10.9		-	
	Panel A: Portfolio Moments											
Mean excess return	15.4	11.8	12.4	14.8	12.7	10.8	9.32	10.7	9.41	6.04^{***}	1.15	3.04
Volatility (%)	21.7	17.9	21.6	19.3	20.4	20.7	20.1	20.4	21.1	10.1	8.1	14.3
Sharpe Ratio (%)	70.8	65.9	57.6	76.5	62.4	52.3	46.4	52.2	44.5	60	14.2	21.2
	Panel B: CAPM											
α	6.07	3.95	4.64	6.38	3.59	2.06	0.534	2.3	0.529	5.54^{*}	1.65	4.11
	(2.79)	(2.85)	(4.38)	(3.16)	(2.36)	(3.06)	(2.92)	(3.17)	(3.25)	(2.3)	(1.68)	(3.62)
β^{MKT}	1.19	1.01	1	1.08	1.18	1.13	1.13	1.07	1.14	-0.0646	0.0649	0.138
	Panel C: Fama-French Three-Factor Model											
α	6.25	2.09	1.54	4.59	2.63	-0.83	-1.73	-0.898	-3.06	7.98^{***}	$2.99^{\$}$	4.6
	(1.67)	(1.62)	(3.18)	(1.91)	(1.19)	(1.81)	(1.83)	(1.84)	(1.97)	(1.82)	(1.6)	(3.69)
β^{MKT}	1.01	0.949	1.01	1.01	1.06	1.09	1.08	1.06	1.15	0.0674	0.113	0.135
β^{HML}	-0.171	0.347	0.655	0.322	0.116	0.578	0.438	0.662	0.756	0.609	0.315	0.1
β^{SMB}	0.797	0.64	0.576	0.687	0.714	0.74	0.675	0.685	0.69	-0.122	0.0446	0.113

The table reports summary statistics for simple monthly excess returns over the 30-day Treasury-bill rate for 12 portfolios of industries sorted on industry entry elasticity to aggregate entry shocks (ζ_h) and on on cash-flow elasticity to industry entry (η_h). I report mean excess returns over the risk-free rate and volatilities. I also report exposures of these portfolios to common risk factors (excess returns on the market, high-minus-low and small-minus- big portfolios) along with the intercept of the factor regressions (α).
We use an entry measure where industries are weighted by the total wage expenditures and cash-flow elasticity is measured two years out.
I report standard-errors in parenthesis using Newey-West standard errors with 12 lags.
I only form test on the long-short portfolios: ***, **, *, and $ indicate significance at the 0.1, 1, 5% and 10% level, respectively.
Returns are multiplied by 1200 as to make the magnitude comparable to annualized percentage returns.

Table 9
Pricing of Risk: Real Entry Factor

	(1)	(2)	(3)	(4)	(5)
	Panel A: 9 double sorted portfolios				
PC_X	-0.965		-0.484^{*}		-0.715
	(0.651)		(0.253)		(0.499)
R^{MKT}		0.335^{**}	0.287^{*}	$0.489^{\$}$	0.408
		(0.127)	(0.129)	(0.256)	(0.315)
R^{SMB}				-0.295	-0.583
				(0.5)	(0.682)
R^{HML}				-0.191	-0.439
				(0.272)	(0.439)
J-test	2.73	13.7	10.1	5.9	2.3
	Panel B: 49 industry portfolios				
PC_X	-0.903^{***}		-0.265^{*}		-0.317^{**}
	(0.154)		(0.123)		(0.108)
R^{MKT}		0.273^{**}	0.228^{*}	0.334^{***}	0.334^{***}
		(0.0937)	(0.0906)	(0.0938)	(0.0904)
R^{SMB}				-0.141	-0.285^{**}
				(0.0884)	(0.0973)
R^{HML}				0.0204	-0.0516
				(0.133)	(0.146)
J-test	34.4	32.7	38.4	31.9	37.4

The table shows results of estimating the stochastic discount factor of the model ($S = \exp(b_0 - \mathbf{b}'\mathbf{R} - b_X \varepsilon_X)$) via GMM. I report second-stage estimates of $\mathbf{b}$ and b_X using the spectral density matrix. I also report the J-test of over-identifying restrictions. Standard errors are in parenthesis.
In Panel A., I use 9 industry portfolios from (see Table 8) sorted both on the industry entry elasticity (ζ_h) and on the firm cash-flow elasticity (η_h) as test assets. In panel B, I use 49 industry portfolios from Ken French's data library (see Fama and French (1997)) as test assets.
I use the excess return on the market portfolio as a proxy for ε_A. In this table I use the principal component measure of entry for the entry shock ε_X: I use our measure on industry entry weighted by establishments.
***, **, * and \$ indicate significance at the 0.1, 1, 5% and 10% level, respectively.
The returns and factors are standardized as to make estimates comparables.

Table 10

Pricing of Risk: Factor Mimicking Portfolio

	(1)	(2)	(3)	(4)	(5)
	A. 9 double sorted portfolios				
$\mathbf{E}\{\Delta_\zeta R^e \vert \text{low-}\eta\}$	-0.298^{**}		-0.158^{*}		-0.17
	(0.0999)		(0.0633)		(0.136)
R^{MKT}		0.266^{***}	0.196^{*}	0.28^{*}	0.263^{*}
		(0.0768)	(0.0836)	(0.12)	(0.118)
R^{SMB}				-0.185	-0.168
				(0.187)	(0.186)
R^{HML}				-0.244^{*}	-0.0564
				(0.116)	(0.204)
J-test	8.46	9.71	6.04	5.96	5.18
	B. 49 industry portfolios				
$\mathbf{E}\{\Delta_\zeta R^e \vert \text{low-}\eta\}$	-0.404^{***}		-0.0571		-0.573^{***}
	(0.0619)		(0.0703)		(0.0975)
R^{MKT}		0.251^{***}	0.241^{***}	0.267^{***}	0.276^{***}
		(0.0554)	(0.0566)	(0.0601)	(0.0593)
R^{SMB}				-0.0947	-0.191^{*}
				(0.0827)	(0.0802)
R^{HML}				-0.0594	0.41^{***}
				(0.0878)	(0.103)
J-test	40.6	43	42.6	42	40.9

The table shows results of estimating the stochastic discount factor of the model ($S = \exp(b_0 - \mathbf{b}'\mathbf{R} - b_X \varepsilon_X)$) via GMM. I report second-stage estimates of $\mathbf{b}$ and b_X using the spectral density matrix. I also report the J-test of over-identifying restrictions. Standard errors are in parenthesis.
In Panel A., I use 9 industry portfolios from (see Table 8) sorted both on the industry entry elasticity (ζ_h) and on the firm cash-flow elasticity (η_h) as test assets. In Panel B., I use 49 industry portfolios from Ken French (see Fama and French (1997)) as test assets.
I use the excess return on the market portfolio as a proxy for ε_A. In this table I use a factor mimicking portfolio to measure the entry shock ε_X: I use the long-short portfolio of Table 8, high-ζ_h minus low-ζ_h, within small elasticities η_h; that is the portfolio where the premium is strongest.
***, **, * and \$ indicate significance at the 0.1, 1, 5% and 10% level, respectively.
The returns and factors are standardized as to make estimates comparables.

Figure 7
Principal Component of Entry Rates Across Industries

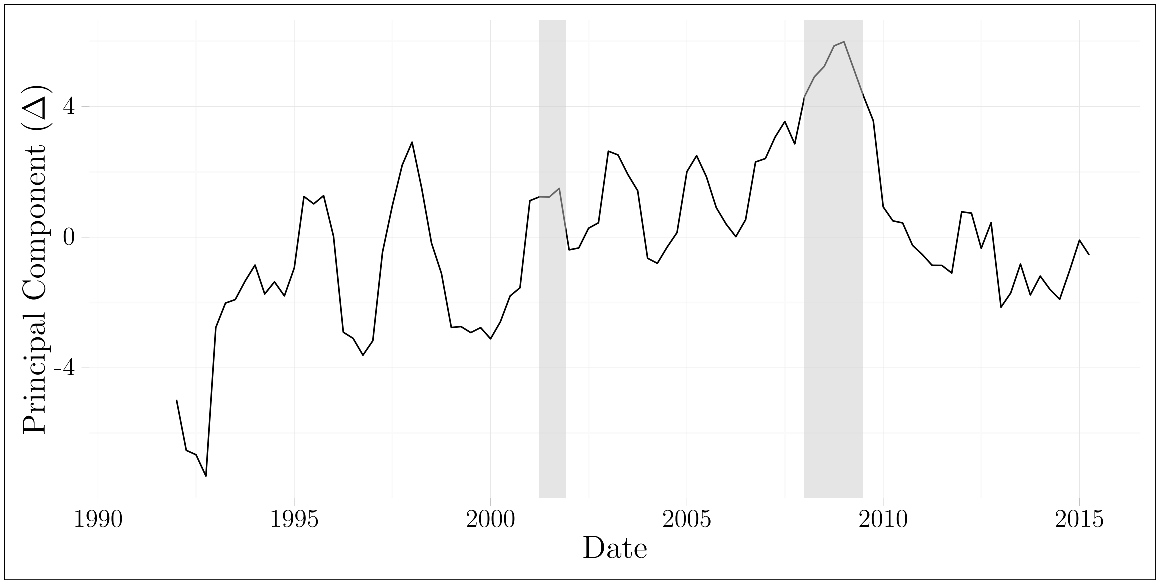
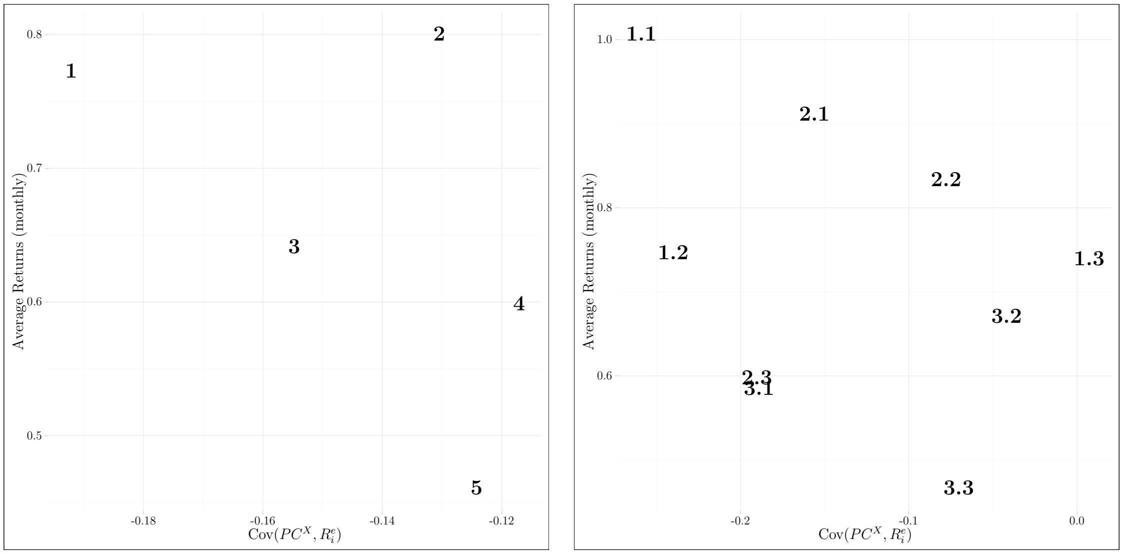


Figure 8

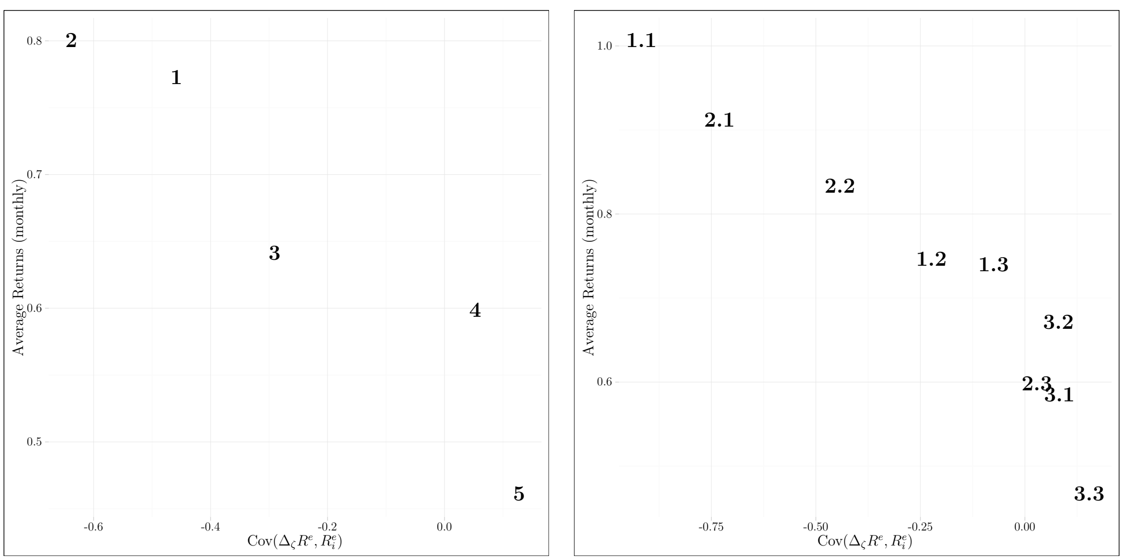
Average Returns and Covariance with the Real Entry Factor



(a) 5 portfolios **(b)** 9 double sorted portfolios

Figure 9

Average Returns and Covariance with the Factor Mimicking Portfolio



(a) 5 portfolios **(b)** 9 double sorted portfolios

We plot on the x-axis the covariance of industry returns with the real aggregate entry factor described above. On the y-axis we represent monthly excess returns of the same portfolios. On panel a. we use 5 industry portfolios constructed based on industry entry elasticity quintiles (ζ_h) as in Table 6. The portfolio numbered 5 has highest elasticity (riskiest) and the numbered 1 has the smallest loading on the aggregate factor. On panel b. we use the 9 industry portfolios based on both industry entry elasticity (ζ_h) and cash-flow elasticity (η_h) as in Table 8. Industry portfolios are numbered $x.y$, where x is the tercile of industry elasticity from 1 the lowest to 1 the highest and y is the tercile of cash-flow elasticity from 1 the lowest (also riskiest) to 3 the highest. Hence portfolio 1.1 is risky since it has high loadings on the aggregate entry factor (1) and a very negative cash-flow elasticity (1).

A Theory Appendix

A.1 Model Equilibrium derivation

In this section, I derive formally the competitive equilibrium of the model with two industries. First I solve the static allocation before setting up the aggregate optimization programs of the three parties of the economy (households, consumption good producers and entrepreneurs).

Static Allocations — I take as given the dynamic state variables of the economy $(A_t, X_t, \{M_{h,t}\})$. I solve for the static allocation at the industry level before aggregation. Recall that within industry h households have transversal preferences of the following form:

$$f_{\eta_h}(c_h) = \frac{c_h^{1-\eta_h}}{1-\eta_h} - a_h c_h \ \mathbf{C_h}^{-\eta_h}$$

Consumers' inverse demand function then is simply,

$$p(c_h) = \nu^{-1} c_h^{-\eta_h} \left[1 + a_h/(\eta_h - 1) M_h^{-\eta_h}\right],$$

with ν the Lagrangian multiplier on consumers' industry local budget constraint. The product market structure is monopolistic competition and firms' pricing decisions take consumers' demand curve as given. Hence firms maximize the following program:

$$\max_{c_h} \pi(c_h) = (p(c_h) - w/A)\, c_h$$

Using the budget constraint, total expenditure in the industry E_h equates total spending on goods $\int_0^{M_h} c_h(\omega) p_h(\omega) \mathrm{d}\omega$, we get the following symmetric industry equilibrium conditions:

$$\begin{aligned}
p_h &= \frac{w/A}{1 - r(M_h)} = \frac{1 - a_h M_h^{-\eta_h}}{(1-\eta_h) - a_h M_h^{-\eta_h}} \cdot \frac{w}{A} \\
c_h &= \frac{E_h}{M_h p_h} = \frac{E_h}{M_h} \cdot \frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}} \cdot \frac{A}{w} = \kappa_{c,h}(M_h) \frac{E_h}{M_h} \frac{A}{w} \\
\pi_h &= r_h(M_h) \frac{E_h}{M_h} = \frac{E_h}{M_h} \cdot \frac{\eta_h}{1 - a_h \ M_h^{-\eta_h}},
\end{aligned} \tag{A.1}$$

where r is the relative love for variety as defined in Zhelobodko et al. (2012) from the transversal utility $r(x) = -x\partial_{11} f_\eta(x, \mathbf{X})/\partial_1 f_\eta(x, \mathbf{X})$. r represents the net markup level. $\kappa_{c,h}(M_h)$ captures the demand effects coming from the mass of differentiated varieties:

$$\kappa_{c,h}(M_h) = \frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}}$$

Finally the local industry level consumption index is simply:

$$\mathcal{C}_h = \int_0^{M_h} f_{\eta_h}(c_h, \mathbf{C}_h)\mathrm{d}\omega = \left(\frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}}\right)^{1-\eta_h} (M^{\eta_h} - a_h(1-\eta_h)) \left(\frac{w}{A}\right)^{\eta_h - 1} \frac{E_h^{1-\eta_h}}{1-\eta_h}$$

From the local allocations we back up the aggregate allocations. The upper-tier program is:

$$\max \mathcal{C} = \prod_h \left[(1-\eta_h)\mathcal{C}_h\right]^{\frac{\alpha_h}{1-\eta_h}} \tag{A.2}$$

given the budget constraint $\sum_h E_h \leq E$, where E_h is the industry level expenditure and E the aggregate consumption expenditure level. The first order condition reads

$$\partial_{E_g}\mathcal{C} = \partial_{E_h}\mathcal{C} = \frac{\alpha_h}{1-\eta_h} \cdot \frac{\mathcal{C}}{\mathcal{C}_h} \cdot \frac{\partial \mathcal{C}_h}{\partial E_h} = (\alpha_h) \cdot \frac{\mathcal{C}}{E_h},$$

where the last equality is due to the fact that $\partial\mathcal{C}_h/\partial E_h = (1-\eta_h)\mathcal{C}_h/E_h$. Using the budget constraint we obtain that consumers have constant expenditure shares across all industries. This is due to the constant elasticity of industry level utility to the level of expenditure:

$$E_h = \alpha_h E.$$

I conclude by deriving the allocations as a function of aggregate state variables (endogenous or exogenous). From the fixed expenditure shares I obtain local consumption and the main object of interest, firm profit within an industry:

$$c_h = \frac{A}{w} \cdot \frac{(1-\eta_h) - a_h M_h^{-\eta_h}}{1 - a_h M_h^{-\eta_h}} \cdot \frac{\alpha_h}{M_h} \cdot \mathcal{C} = \frac{A}{w} \cdot \kappa_{c,h}(M_h) \cdot \frac{\alpha_h}{M_h} \cdot \mathcal{C}, \tag{A.3}$$

$$\pi_h = \frac{\eta_h}{1 - a_h\ M_h^{-\eta_h}} \cdot \frac{\alpha_h}{M_h} \cdot \mathcal{C} = r_h(M_h) \cdot \frac{\alpha_h}{M_h} \cdot \mathcal{C}, \tag{A.4}$$

were I used the normalization that aggregate consumption $\mathcal{C}$ is the numeraire.

Households Dynamic Problem — The representative household have recursive preferences of the Epstein-Zin type. He maximizes his continuation utility J_t over sequences of the consumption index C_t:

$$J_t = \left[(1-\beta)C_t^{1-\nu} + \beta\left(\mathsf{R}_t(J_{t+1})\right)^{1-\nu}\right]^{\frac{1}{1-\nu}},$$

where where β is the time preference parameter, ν is the inverse of the inter-temporal elasticity of substitution (IES) and γ is the coefficient of relative risk aversion (CRRA). $\mathsf{R}_t(J_{t+1}) = [\mathbf{E}_t\{J_{t+1}^{1-\gamma}\}]^{1/(1-\gamma)}$ is the risk adjusted continuation utility. In the core of the paper I assume preferences that are time separable constant relative risk aversion; it is a special case of this more general specification where the IES is the inverse of the CRRA. The representative household is subject to his sequential budget constraint:

$$\begin{aligned}\sum_h \Big[\mathcal{C}_t &+ x_{h,t+1}v_{h,t}\frac{M_{h,t+1}}{1-\delta} + x^e_{h,t+1}v^e_{h,t}\Big] \\ &\leq w_t L + \sum_h \left[x_{h,t}M_{h,t}(v_{h,t}+\pi_{h,t}) + x^e_{h,t}(v^e_{h,t}+\pi^e_{h,t})\right]. \end{aligned} \tag{A.5}$$

$x_{h,t}$ are the shares held by the representative household in a mutual fund specialized in consumption good producers of industry h; $x^e_{h,t}$ are shares held in a mutual fund that owns all the innovators in industry h. Households invest today by buying shares $x_{h,t+1}, x^e_{h,t+1}$ of the mutual funds at their respective market price: $v_{h,t}M_{h,t+1}/(1-\delta)$ and $v^e_{h,t}$. They receive proceeds from their shares in the funds as income, $M_{h,t}(v_{h,t}+\pi_{h,t})$ for consumption goods and $v^e_{h,t}+\pi^e_{h,t}$ from the innovation sector.

I call the respective Lagrange multipliers for equations A.5 κ_t. Optimization conditions on respectively $\mathcal{C}_{t+1}, \mathcal{C}_t, x_{h,t+1}$ and $x^e_{h,t+1}$ read:

$$\begin{aligned}&\kappa_{t+1} = \partial J_t/\partial C_{t+1},\\ &\kappa_t = \partial J_t/\partial C_t,\\ &\kappa_t v_{h,t} = (1-\delta)\mathbf{E}_t\left\{\kappa_{t+1}(v_{h,t+1}+\pi_{h,t+1})\right\},\\ &\kappa_t v^e_{h,t} = \mathbf{E}_t\left\{\kappa_{t+1}(v^e_{h,t+1}+\pi^e_{h,t+1})\right\}.\end{aligned} \tag{A.6}$$

In this environment it is possible to price any asset in zero net supply by adding them to the sequential budget constraint; their valuation would be given by the standard Euler equation as is the case for the innovators and the consumption good producers. Note that since households supply labor inelastically, the price of labor adjust such that the budget constraint holds exactly.

Entrepreneurs — Entrepreneurs operate a limited supply technology where they hire labor to create firms that will produce new varieties. They sell the new firms at their market value $v_{i,t}$, hence their profit function reads:

$$\max_{M^e_{h,t}} \pi^e_{h,t} = M^e_{h,t} v_{h,t} - w_t L^e_{h,t},$$

subject to their production frontier, that I specify using a convex cost function:

$$\Phi_h(M^e_{h,t}, M_{h,t}) = \frac{f_{e,h}}{1+\zeta_h^{-1}} \left(\frac{M^e_{h,t}}{M_{h,t}}\right)^{1+\zeta_h^{-1}} M_{h,t} \leq L^e_{h,t}.$$

Innovators are in perfect competition with each other. Hence there is no option value of firms entry, and maximizing innovators value is equivalent to maximizing their static profit. I call the Lagrange multiplier on the cost $q_{h,t}$, the optimization with respect to $M^e_{i,t}, L^e_{i,t}$ program reads:

$$v_{h,t} = q_{h,t} f_{e,h} (M^e_{h,t}/M_{h,t})^{\zeta_h^{-1}}, \tag{A.7}$$

$$q_{h,t} = w_t/X_t. \tag{A.8}$$

Dynamic Equilibrium — An equilibrium is a set of prices $(p_{h,t}, w_t, v_{h,t}, v^e_{h,t})$, a set of allocations $(c_{h,t}, \mathcal{C}_{h,t}, \mathcal{C}_t, L^e_{h,t}, L^p_{h,t}, M^e_{h,t}, M_{h,t}, x_{h,t}, x^e_{h,t})$ such that: (a) given prices, allocations maximize the households program; (b) given prices allocations maximize firms profits; (c) labor markets, good markets and asset markets clear.

To characterize the equilibrium, I derive the aggregate production function, firms' valuation and their dynamic through the Euler equation. But first I calculate the equilibrium profit of the differentiated varieties producers in each industry.

Within each industry the firm equilibrium is symmetric. Firms face the same optimization program, and the same consumer demand curve; hence they price is constant across varieties in one industry $p_{h,t}(\omega) = p_{h,t}$ and so is demand. The price of an individual variety in the industry is given by equation (A.1). Local demands and profits are given in equations (A.3) and (A.4) respectively.

Finding the wage requires some more work. First notice that:

$$\mathcal{C}_h = \frac{c_h^{1-\eta_h}}{1-\eta_h} M_h \left[1 - a_h(1-\eta_h) M_h^{-\eta_h}\right]$$

$$c_h = \frac{A}{w} \cdot \kappa_{c,h}(M_h) \cdot \frac{\alpha_h}{M_h} \cdot \mathcal{C}$$

Using the definition of $\mathcal{C}$ from (A.2), I find:

$$\begin{aligned} w_t &= A_t \prod_h \left[\kappa_{c,h}(M_{h,t}) \alpha_h M_{h,t}^{\frac{\eta_h}{1-\eta_h}} \left(1 - a_h(1-\eta_h) M_{h,t}^{-\eta_h}\right)^{\frac{1}{1-\eta_h}} \right]^{\alpha_h} \\ &= A_t \prod_h \left[W_h(M_{h,t})\right]^{\alpha_h} = A_t \mathbf{W}(\{M_{h,t}\}_h) \end{aligned} \tag{A.9}$$

Firm value is set by the marginal decision of the innovation sector (A.7, A.8), their optimization conditions give us:

$$v_{h,t} = \frac{w_t}{X_t} f_{e,h} \left(M^e_{h,t}/M_{h,t}\right)^{\zeta_h^{-1}}.$$

Finally the one period ahead stochastic discount factor $S_{t,t+1}$ is given in equilibrium by:

$$S_{t,t+1} = \frac{S_{t+1}}{S_t} = \beta \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} \left(\frac{J_{t+1}}{\mathsf{R}_t(J_{t+1})}\right)^{\nu-\gamma}$$

At last using (A.6), I derive the Euler equation for a firm in industry h:

$$v_{h,t} = (1-\delta)\mathbf{E}_t \frac{S_{t+1}}{S_t} \left\{ v_{h,t+1} + \alpha_h r_h(M_{h,t+1}) \frac{\mathcal{C}_{t+1}}{M_{h,t+1}} \right\} \tag{A.10}$$

I calculate the aggregate consumption index as a function of employment used for consumption production. Labor used in each industry for production is $L^p_{h,t} = \int \mathrm{d}\omega l_{h,t}(\omega)$. Using the property of the symmetric equilibrium I can rewrite this as $A_t L^p_{h,t} = M_h c_h / A$. Adding up the labor used in each industry such that $L^p_t = \sum_h L^p_{h,t}$, aggregate consumption reads:

$$\mathcal{C}_t = \frac{\prod_h \left[W_h(M_{h,t})\right]^{\alpha_h}}{\sum_h \alpha_h \kappa_{c,h}(M_{h,t})} \cdot A_t L^p_t \tag{A.11}$$

There is a distortion factor that depends on the product market structure in each industry. Production is below that of an economy with standard industry preferences with perfect competition.

Finally, in this paper I do not focus on the valuation of innovation specific firms, $v^e_{h,t}$.[25] However the optimization condition from the households yield an Euler equation specific

[25] See Papanikolaou (2011) for an analysis separating returns in the innovation (investment goods) sector and in the consumption good sector.

to the innovation sector:

$$v^e_{h,t} = \mathbf{E}_t \frac{S_{t+1}}{S_t} \left\{ v^e_{h,t} + \pi^e_{h,t} \right\} =$$
$$\mathbf{E}_t \frac{S_{t+1}}{S_t} \left\{ v^e_{h,t} + \frac{w_t}{X_t} \left[M^e_{h,t+1} \partial_1 \Phi_h(M^e_{h,t+1}, M_{h,t+1}) - \Phi_h(M^e_{h,t+1}, M_{h,t+1}) \right] \right\}$$

A.2 Other Results

Expected Returns — In the model asset pricing Section, I claim expected returns can be expressed as follow (see equation 2.12):

$$\mathbf{E}_t \left\{ R^e_{h,t} \right\} \simeq \mathrm{rp}^A_t \,\mathrm{Cov}_t \left(\frac{v_{h,t+1} + \pi_{h,t+1}}{v_{h,t}}, \varepsilon^A_{t+1} \right) + \mathrm{rp}^X_t \,\mathrm{Cov}_t \left(\frac{v_{h,t+1} + \pi_{h,t+1}}{v_{h,t}}, \varepsilon^X_{t+1} \right).$$

Starting with the pricing Euler equation, we have:

$$\mathbf{E}_t \left\{ R^e_{h,t} \right\} = -\frac{\mathrm{Cov}_t(R^e_{h,t}, S_{t+1})}{\mathbf{E}_t(S_{t+1})}$$

Our model is a two-factor model in its two exogenous state variables, hence we have:

$$R_{h,t+1} = \frac{v_{h,t+1} + \pi_{h,t+1}}{v_{h,t}} = f(\varepsilon^X_{t+1}, \varepsilon^A_{t+1}; (X_t, A_t))$$

Using a linear approximation of f we have $R_{h,t+1} = f_X \varepsilon^X_{t+1} + f_A \varepsilon^A_{t+1}$. Within the linear approximation the exposure to shocks of stock returns are given by $f_K = \mathrm{Cov}_t \left(R_{h,t+1}, \varepsilon^K_{t+1} \right)$. Given the definition of rp^A and rp^X, plugging back into the expression for expected returns concludes the derivation.

B Appendix —Measurement and Data Construction

B.1 Data construction

Industry Data on Entry Rates — I use the Quarterly Census of Employment and Wages (QCEW) to construct establishment level entry rates. I use the rate of entry in a 4-digit NAICS industry as the percent change of establishment from one quarter to the next. This means my entry rates are net entry rate of establishment entries minus exits. For robustness purposes I construct a weighted measure of entry based on total wages paid in an industry. This weighting scheme only plays a role while estimating the principal components, as the time series within industries is not modified.

Firms and industries' selection — I include all firms with listed securities on the AMEX, NASDAQ, or NYSE that have a match in the CRSP monthly file and in the COMPUSTAT annual file from 1980 to 2012. I exclude regulated industries and financials from the sample.[26] To be included in my sample, firms must have a stock price, shares outstanding and a three-digit NAICS codes. Moreover, firms in CRSP/COMPUSTAT must have their three-digit NAICS code in the entry dataset from the BLS (eighty-five). I define industries at three-digit level of the NAICS classification. Moreover, the data on entry rates is aggregated at the three-digit NAICS code level, which allows for a match at the industry level of the Bureau of Labor Statistics (BLS) data with the CRSP/COMPUSTAT sample.

Firm level quantities — I define cash-flows following Rajan and Zingales (1998): Cash-flows are earnings before interest, taxes, depreciation and amortization from COMPUSTAT (item `EBITDA`) plus decreases in inventories (item `invt`), decreases in receivables (item `rect`) and increases in payables (item `ap`), all scaled by assets (item `AT`). Description of stock market data is in the body of the paper.

[26] My results are robust to including regulated and financials. However, their price-setting decision might be regulated, and linking concentration to markups in such industries is difficult.

C Appendix —Supplementary Tables and Figures

Table C.1

Top and bottom 5 industries by Elasticity, ζ_h and η_h

Industry Description	NAICS **code**	**Elasticity**
Elasticity of industry entry to aggregate entry: ζ_h (in %)		
Other motor vehicle dealers	4412	−13
Iron and steel mills and ferroalloy mfg.	3311	−12.7
Activities related to credit intermediation	5223	−12.4
Wireless telecommunications carriers	5172	−12.2
Building foundation and exterior contractors	2381	−12.1
Ag., construction, and mining machinery mfg.	3331	10.9
Rooming and boarding houses	7213	11.5
Colleges and universities	6113	11.9
Outpatient care centers	6214	12.6
Oilseed and grain farming	1111	12.7
Elasticity of cash-flows to industry entry: η_h (in %)		
Direct selling establishments	4543	−109
Leather and hide tanning and finishing	3161	−32.3
Remediation and other waste services	5629	−29.8
General rental centers	5323	−27
Elementary and secondary schools	6111	−24.1
Other pipeline transportation	4869	27.8
Poultry and egg production	1123	28.5
Urban transit systems	4851	37.1
Alcoholic beverage merchant wholesalers	4248	93.7
Drinking places, alcoholic beverages	7224	129

C.1 Robustness Tables Using Total Wages as Weight

Table C.2

Summary Statistics of Industries Across Elasticity Groups – Weighted by Total Wages

	Summary Statistics across Elasticity Groups – ζ_h				
	High ζ_h – more risky	4	3	2	Low ζ_h – less risky
Size(bn)	2.42	1.61	1.92	1.32	1.58
Book to Market	0.782	0.966	0.957	0.943	1.09
Book Leverage	0.217	0.231	0.259	0.25	0.216
Cash-Flow	0.132	0.12	0.113	0.126	0.0841
	Summary Statistics across Elasticity Groups – η_h				
	Low η_h – more risky	2	3	4	High η_h – less risky
Size(bn)	1.53	1.9	2.1	1.81	1.49
Book to Market	0.986	0.935	0.924	1.03	0.952
Book Leverage	0.986	0.935	0.924	1.03	0.952
Cash Flow	0.103	0.0965	0.116	0.136	0.139

The table reports summary statistics for firms in different 4 digits industries. I sort industries based on my measure of industry entry elasticity to aggregate entry ζ_h and also the elasticity of cash-flows to industry entry η_h.

Size is market equity; Book to market is the ratio of book value to market value; Leverage is defined as the ratio of total debt to book value; cash-flow measures earnings before interests and depreciation minus inventories scaled by the total value of assets.

Table C.3

Portfolios Sorted on the Elasticity of Industry Entry to Aggregate Entry (ζ_h) – Wage Weights

Portfolio Quintiles - ζ_h	High ζ_h	4	3	2	Low ζ_h	Hi–Lo
Elasticity	9.55	5.2	1.44	-2.08	-5.63	-
	Portfolio Moments					
Mean excess return	13.3	11.1	12	11.1	8.97	4.29
Volatility (%)	18.3	19	19.7	18.4	19.6	9.2
Sharpe Ratio (%)	72.4	58.3	60.9	60.1	45.7	46.7
	CAPM					
α	5.01	2.42	2.95	2.95	0.258	4.76
	(2.72)	(2.41)	(2.36)	(2.7)	(2.78)	(2.21)
β^{MKT}	1.05	1.1	1.15	1.03	1.11	-0.0592
	Fama-French 3 Factor Model					
α	4.26	1.28	1.87	0.587	-2.33	6.6
	(1.64)	(1.42)	(1.06)	(1.56)	(1.59)	(2.09)
β^{MKT}	0.957	1.02	1.07	1.02	1.11	-0.151
β^{HML}	0.169	0.264	0.25	0.566	0.621	-0.452
β^{SMB}	0.69	0.689	0.737	0.652	0.637	0.0537

The table reports summary statistics for simple monthly excess returns over the 30-day Treasury-bill rate for 12 portfolios of industries sorted on industry entry elasticity to aggregate entry shocks (ζ_h). I report mean excess returns over the risk-free rate and volatilities. I also report exposures of these portfolios to common risk factors (excess returns on the market, high-minus-low and small-minus- big portfolios) along with the intercept of the factor regressions (α).
I report standard-errors in parenthesis using Newey-West standard errors. Returns are multiplied by 1200 as to make the magnitude comparable to annualized percentage returns.

Table C.4

PORTFOLIOS BASED ON BOTH ζ_h ELASTICITY AND η_h ELASTICITY

Portfolio Terciles - ζ_h	High ζ_h			Mid ζ_h			Low ζ_h			Hi–Lo ζ_h		
Portfolio Terciles - η_h	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
Elasticity - ζ_h	8.12	7.97	8.4	1.26	1.69	1.22	-4.44	-3.27	-4.93		-	
Elasticity - η_h	-0.538	0.688	3	-0.702	0.646	2.84	-0.988	0.914	3.2		-	
						Portfolio Moments						
Mean excess return	14.7	11.9	11.4	12.4	12.9	10.7	10.2	11	9.48	4.5	0.926	1.92
Volatility (%)	20.5	17.5	21.1	21.1	20.7	20.6	19.1	20.3	20	8.69	7.38	13
Sharpe Ratio (%)	71.9	67.9	54	58.8	62.5	51.8	53.4	54.2	47.4	51.8	12.6	14.8
						CAPM						
α	5.88	4.24	3.38	3.36	3.7	2.09	2.06	2.57	0.935	3.82	1.67	2.45
	(2.75)	(2.65)	(4.32)	(2.98)	(2.37)	(3.72)	(3.05)	(2.9)	(3.08)	(1.72)	(1.71)	(3.3)
β^{MKT}	1.13	0.986	1.03	1.17	1.19	1.11	1.05	1.08	1.1	-0.0867	0.0962	0.0673
						Fama-French 3 Factor Model						
α	5.62	2.17	0.192	1.24	2.84	-1.44	-0.167	-0.46	-2.42	5.79	2.63	2.61
	(1.67)	(1.59)	(2.81)	(1.53)	(1.16)	(2.24)	(1.88)	(1.73)	(1.78)	(1.31)	(1.72)	(3.24)
β^{MKT}	0.971	0.952	1.03	1.08	1.07	1.11	0.998	1.06	1.12	0.0275	0.111	0.0837
β^{HML}	-0.0662	0.409	0.669	0.382	0.0896	0.739	0.431	0.621	0.715	0.497	0.212	0.0456
β^{SMB}	0.798	0.562	0.624	0.804	0.73	0.697	0.665	0.682	0.58	-0.133	0.12	-0.0436

The table reports summary statistics for simple monthly excess returns over the 30-day Treasury-bill rate for 12 portfolios of industries sorted on industry entry elasticity to aggregate entry shocks (ζ_h) and on on cash-flow elasticity to industry entry (η_h). I report mean excess returns over the risk-free rate and volatilities. I also report exposures of these portfolios to common risk factors (excess returns on the market, high-minus-low and small-minus- big portfolios) along with the intercept of the factor regressions (α).

We use an entry measure where industries are weighted by the total wage expenditures and cash-flow elasticity is measured one year out.

I report standard-errors in parenthesis using Newey-West standard errors. Returns are multiplied by 1200 as to make the magnitude comparable to annualized percentage returns.

Table C.5

Pricing of Risk: Real Entry Factor using Earnings Entry Weights

	(1)	(2)	(3)	(4)	(5)
	A. 9 double sorted portfolios				
PC_X	−0.754		−0.189		−0.406
	(0.316)		(0.217)		(0.301)
R^{MKT}		0.335	0.313	0.489	0.453
		(0.127)	(0.135)	(0.256)	(0.257)
R^{SMB}				−0.295	−0.394
				(0.5)	(0.504)
R^{HML}				−0.191	−0.308
				(0.272)	(0.285)
J-test	4.64	13.7	10.6	5.9	4.1
	B. 49 industry portfolios				
PC_X	−1.13		−0.559		−0.529
	(0.148)		(0.13)		(0.122)
R^{MKT}		0.273	0.198	0.334	0.304
		(0.0937)	(0.0882)	(0.0938)	(0.0823)
R^{SMB}				−0.141	−0.284
				(0.0884)	(0.0875)
R^{HML}				0.0204	−0.0607
				(0.133)	(0.142)
J-test	31.2	32.7	32.1	31.9	30.6

The table shows results of estimating the stochastic discount factor of the model ($S = \exp(b_0 - \mathbf{b}'\mathbf{R} - b_X\varepsilon_X)$) via GMM. I report second-stage estimates of $\mathbf{b}$ and b_X using the spectral density matrix. I also report the J-test of over-identifying restrictions. Standard errors are in parenthesis.
In Panel A., I use 9 industry portfolios from (see Table **??**) sorted both on the industry entry elasticity (ζ_h) and on the firm cash-flow elasticity (η_h) as test assets. In Panel B., I use 49 industry portfolios from Ken French (see Fama and French (1997)) as test assets.
I use the excess return on the market portfolio as a proxy for ε_A. In this table I use the principal component measure of entry for the entry shock ε_X: I use our measure on industry entry weighted by total wages across establishments.
The returns and factors are standardized as to make estimates comparables.

Table C.6

Pricing of Risk: Factor Mimicking Portfolio using Earnings Entry Weights

	(1)	(2)	(3)	(4)	(5)
	A. 9 double sorted portfolios				
$\mathbf{E}\{\Delta_\zeta R^e \mid \text{low-}\eta\}$	−0.168		−0.142		−0.117
	(0.0837)		(0.0539)		(0.092)
R^{MKT}		0.223	0.167	0.0976	0.129
		(0.0839)	(0.0873)	(0.12)	(0.129)
R^{SMB}				0.105	0.0588
				(0.179)	(0.192)
R^{HML}				−0.124	−0.00725
				(0.126)	(0.155)
J-test	10.1	11.8	6.61	7.94	6.39
	B. 49 industry portfolios				
$\mathbf{E}\{\Delta_\zeta R^e \mid \text{low-}\eta\}$	−0.301		−0.0548		−0.545
	(0.057)		(0.066)		(0.12)
R^{MKT}		0.251	0.241	0.267	0.294
		(0.0554)	(0.0567)	(0.0601)	(0.061)
R^{SMB}				−0.0947	−0.114
				(0.0827)	(0.0798)
R^{HML}				−0.0594	0.461
				(0.0878)	(0.131)
J-test	44.9	43	42.5	42	42.5

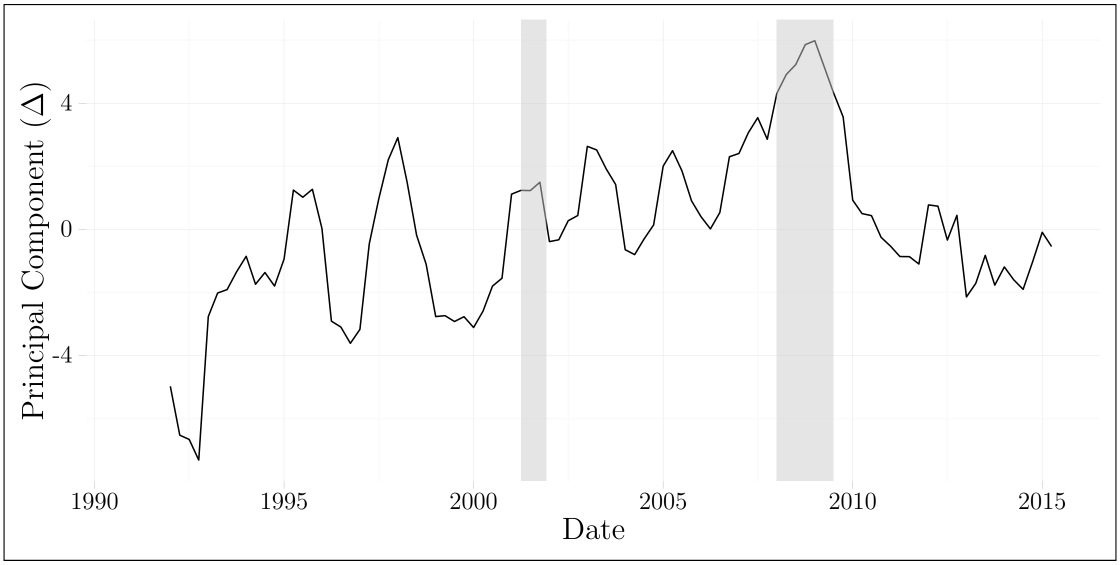
The table shows results of estimating the stochastic discount factor of the model ($S = \exp(b_0 - \mathbf{b}'\mathbf{R} - b_X \varepsilon_X)$) via GMM. I report second-stage estimates of $\mathbf{b}$ and b_X using the spectral density matrix. I also report the J-test of over-identifying restrictions. Standard errors are in parenthesis.

In Panel A., I use 9 industry portfolios from (see Table C.4) sorted both on the industry entry elasticity (ζ_h) and on the firm cash-flow elasticity (η_h) as test assets. In Panel B., I use 49 industry portfolios from Ken French (see Fama and French (1997)) as test assets.

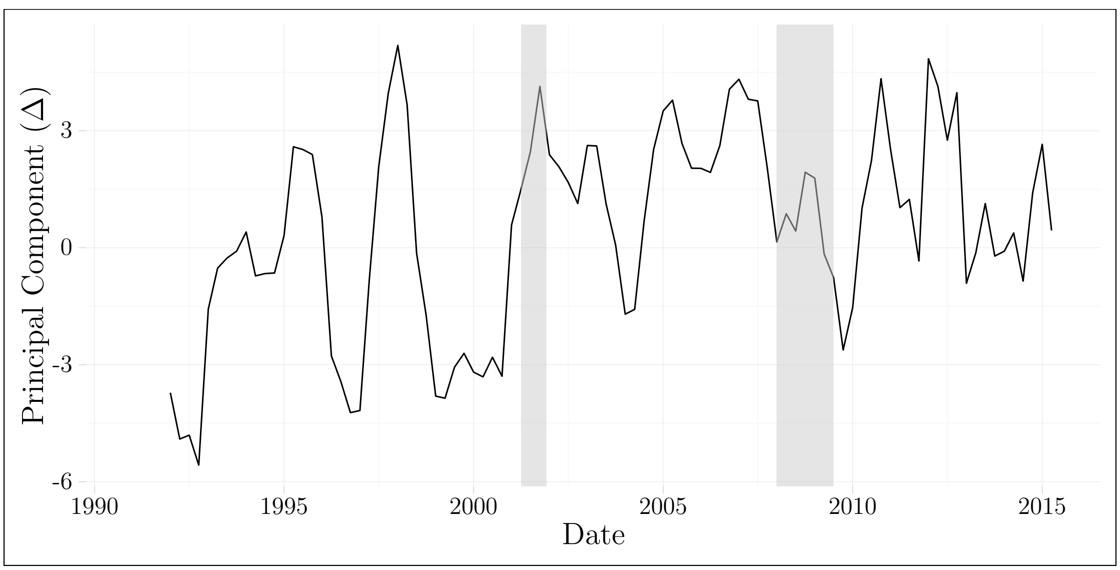
I use the excess return on the market portfolio as a proxy for ε_A. In this table I use a factor mimicking portfolio to measure the entry shock ε_X: I use the long-short portfolio of Table C.4, high-ζ_h minus low-ζ_h, within small elasticities η_h; that is the portfolio where the premium is strongest.

The returns and factors are standardized as to make estimates comparables.

C.2 Additional Figures

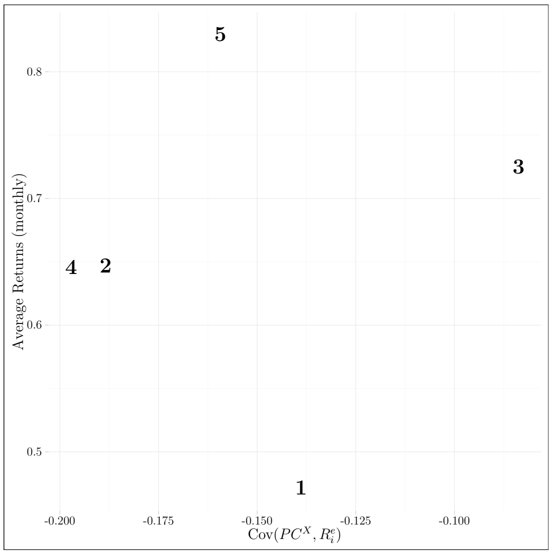


(a) Principal Component of Entry Rates Across Industries

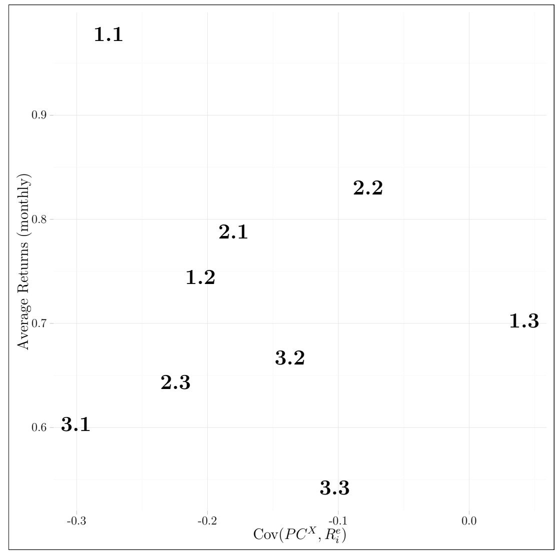


(b) Principal Component of Entry Rates Across Industries (Weighted by Wages)

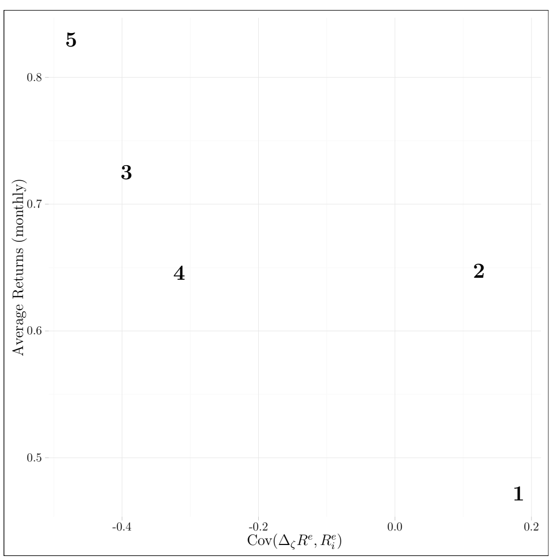
Figure 11
AVERAGE RETURNS AND COVARIANCE WITH THE ENTRY FACTOR – ENTRY WEIGHTED BY TOTAL WAGE



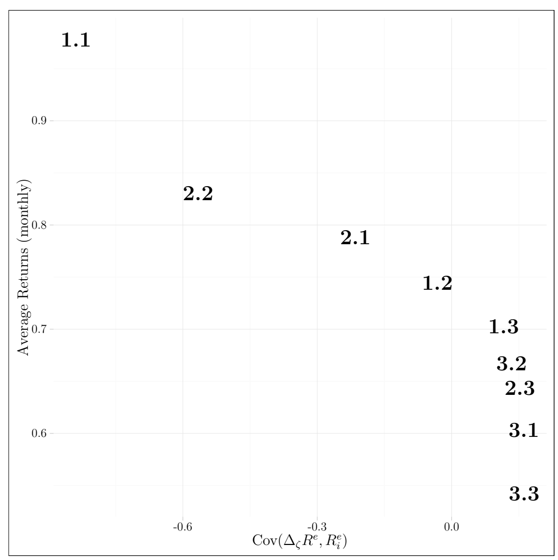
(a) 5 PORTFOLIOS WITH REAL ENTRY FACTOR



(b) 9 DOUBLE SORTED PORTFOLIOS WITH REAL ENTRY FACTOR



(c) 5 PORTFOLIOS WITH THE FACTOR MIMICKING PORTFOLIO



(d) 9 DOUBLE SORTED PORTFOLIOS WITH THE FACTOR MIMICKING PORTFOLIO

We plot on the x-axis the covariance of industry returns with the real aggregate entry factor described above. On the y-axis we represent monthly excess returns of the same portfolios. On panel a. we use 5 industry portfolios constructed based on industry entry elasticity quintiles (ζ_h) as in Table 6. The portfolio numbered 5 has highest elasticity (riskiest) and the numbered 1 has the smallest loading on the aggregate factor. On panel b. we use the 9 industry portfolios based on both industry entry elasticity (ζ_h) and cash-flow elasticity (η_h) as in Table 8. Industry portfolios are numbered $x.y$, where x is the tercile of industry elasticity from 1 the lowest to 1 the highest and y is the tercile of cash-flow elasticity from 1 the lowest (also riskiest) to 3 the highest. Hence portfolio 1.1 is risky since it has high loadings on the aggregate entry factor (1) and a very negative cash-flow elasticity (1).

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