Entry Costs and Aggregate Dynamics

Germán Gutiérrez* Callum Jones† Thomas Philippon‡

Online Appendix

A Full Description of Model

Here, we provide an exposition of the elements of the model not described in the text.

A.1 Capital Producers

A capital-producing firm accumulates capital K_t to maximize its market value, taking as given the economy's (real) pricing kernel Λ_t. Management chooses employment and investment to maximize firm value. Let V_t^k denote the cum-dividend value (at the beginning of time t, before dividends are paid) of a capital-producing firm:

$$V_t^k = \mathbb{E}_t \sum_{i=0}^{\infty} \Lambda_{t+i} \mathrm{Div}_{t+i}^k, \tag{1}$$

where Div_t are the distributions to the firm's owners. Capital accumulates as

$$K_{t+1} = (1-\delta) K_t + I_t. \tag{2}$$

Let R_t^k be the real rental rate on capital and I_t gross investment. Investment is subject to convex adjustment costs à la Lucas and Prescott (1971) and we ignore taxes so that dividends are

$$\mathrm{Div}_t^k = R_t^k K_t - I_t - \frac{\phi_k}{2} K_t \left(\frac{I_t}{K_t} - \delta\right)^2. \tag{3}$$

*New York University, ggutierr@stern.nyu.edu
†Federal Reserve Board, callum.j.jones@frb.gov
‡New York University, CEPR and NBER, tphilipp@stern.nyu.edu

The firm's problem is to maximize (1) subject to (2) and (3). We can write the firm's objective as the dynamic programming problem

$$V_t^k\left(K_{j,t}\right) = \max_{I_t} \mathrm{Div}_t^k + \mathbb{E}_t\left[\Lambda_{t+1} V_{t+1}^k\left(K_{t+1}\right)\right]. \tag{4}$$

Given our capital adjustment cost assumptions, the value function is homogeneous in capital K_t. We can then define $\mathcal{V}_t^k \equiv \frac{V_t^k}{K_t}$ and net investment $x_t \equiv \frac{I_t}{K_t} - \delta = \frac{K_{t+1}-K_t}{K_t}$ and write the problem of the firm as

$$\mathcal{V}_t^k = \max_{x_t} \left[R_t^k - x_t - \delta - \frac{\varphi_k}{2} x_t^2 + \left(1 + x_t\right) \mathbb{E}_t\left[\Lambda_{t+1} \mathcal{V}_{t+1}^k\right]\right]. \tag{5}$$

The solution of this problem is the Q-investment equation,

$$x_t = \frac{1}{\phi_k}\left(Q_t^k - 1\right), \tag{6}$$

where Q_t^k is Tobin's Q, defined as

$$Q_t^k \equiv \mathbb{E}_t\left[\Lambda_{t+1} \mathcal{V}_{t+1}^k\right] = \mathbb{E}_t\left[\Lambda_{t+1} \frac{V_{t+1}^k}{K_{t+1}}\right], \tag{7}$$

which is the market value of the firm divided by the replacement cost of capital, all measured at the end of the period. We index it by k to distinguish it from the total industry-level Q which includes the rents of the final producers discussed below. Tobin's Q satisfies the recursive equation

$$Q_t^k = \mathbb{E}_t\left[\Lambda_{t+1}\left(R_{t+1}^k + \left(1 + x_{t+1}\right) Q_{t+1}^k - x_{t+1} - \delta - \frac{\phi_k}{2} x_{t+1}^2\right)\right], \tag{8}$$

which, given (6), can be written as

$$Q_t^k = \mathbb{E}_t\left[\Lambda_{t+1}\left(R_{t+1}^k + Q_{t+1}^k - \delta + \frac{1}{2\phi_k}\left(Q_{t+1}^k - 1\right)^2\right)\right]. \tag{9}$$

In the logic of the Q-theory of investment, Q_t^k is the discounted value of operating returns, R_{t+1}^k, plus future Q_t^k net of depreciation, plus the option value of investing more when Q_t^k is high, and less when Q_t^k is low.

A.2 Goods Producers

The goods-producing firms hire capital, labor, and an intermediate good for production and make pricing decisions. The number of firms in our economy is time-varying. Firms pay an entry cost to become active producers in the subsequent period, with the price of entry increasing in the number of entrants. We describe the entry decision of firms in the main text, and here discuss the price-setting problem they face.

The economy is populated by firms indexed by i who face pricing and production decisions. The firms' output is aggregated into an industry output

$$Y_t = \left(\int_0^{N_t} y_{i,t}^{\frac{\epsilon-1}{\epsilon}} \mathrm{d}i \right)^{\frac{\epsilon}{\epsilon-1}}. \tag{10}$$

where N_t is the number of firms active (producing) at time period t and ϵ is the elasticity of substitution across firms. The price index is an aggregate of firm level price choices:

$$P_t = \left(\int_0^{N_t} p_{i,t}^{1-\epsilon} \mathrm{d}i \right)^{\frac{1}{1-\epsilon}}. \tag{11}$$

Firm i has access to a Cobb-Douglas production function with stationary TFP shocks A_t, and takes economy-wide wages W_t and the real rental rate R_t^k as given when they maximize profits:

$$\mathrm{Div}_{i,t} = \max_{p_{i,t}, \ell_{i,t}, k_{i,t}, m_{i,t}} \frac{p_{i,t}}{P_t} y_{i,t} - \left(\frac{W_t}{P_t} \ell_{i,t} + m_{i,t} + R_t^k k_{i,t} + \phi \right), \tag{12}$$

subject to the production function

$$y_{i,t} = A_t k_{i,t}^{\alpha} h_{i,t}^{1-\alpha} \tag{13}$$

where $h_{i,t}$ is a CES aggregate of the intermediate input $m_{i,t}$, produced one-for-one from the final good, and labor $\ell_{i,t}$,

$$h_{i,,t} = \left[(1-\psi)^{\frac{1}{\rho}} m_{i,t}^{\frac{\rho-1}{\rho}} + \psi^{\frac{1}{\rho}} \ell_{i,t}^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}.$$

The CES structure for $h_{i,t}$ yields the price index for $h_{i,t}$ as

$$P_{h,t} = \left[(1-\psi) P_t^{1-\rho} + \psi W_t^{1-\rho} \right]^{\frac{1}{1-\rho}},$$

and for a given $h_{i,t}$, we can write the allocation of the intermediate good and labor as

$$m_{i,t} = (1-\psi) \left[\frac{P_t}{P_{h,t}} \right]^{-\rho} h_{i,t}$$

$$\ell_{i,t} = \psi \left[\frac{W_t}{P_{h,t}} \right]^{-\rho} h_{i,t}.$$

The marginal cost depends on the price of the composition good (including real wages–there are no frictions in the labor market– and the price of intermediate goods) and on the rental rate (capital is subject to adjustment costs). Firms face the same factor prices, and so have identical marginal costs, denoted by χ_t:

$$\chi_t = \frac{1}{A_t}\left(\frac{R_t^k}{\alpha}\right)^{\alpha}\left(\frac{P_{h,t}/P_t}{1-\alpha}\right)^{1-\alpha}. \tag{14}$$

Factor choices in the firm's problem imply the choice of capital and the composite good $h_{i,t}$ are simply $k_{i,t} = \alpha\frac{\chi_t}{R_t^k}y_{i,t}$ and $h_{i,t} = (1-\alpha)\frac{\chi_t}{P_{h,t}/P_t}y_{i,t}$. All goods-producing firms choose the same capital to composite goods ratio $\frac{k_{i,t}}{h_{i,t}} = \left(\frac{\alpha}{1-\alpha}\right)\frac{P_{h,t}/P_t}{R_t^k}$. Given they choose the same capital to intermediate goods ratio, all firms set the same price $p_{i,t} = P_t$ and choose the same level of output.

In the full model used for estimation we assume that firms face some nominal rigidities in order to obtain well-behaved industry Phillips curves.[1] Since these small rigidities have second order effects on values and productivities, we simplify the exposition by presenting the flexible price equations. With flexible prices, firms set a fixed markup over marginal cost $\frac{p_{i,t}}{P_t} = \mu\chi_t$, where $\mu = \frac{\epsilon}{\epsilon-1}$. Since all firms have the same output, we can write

$$Y_t = \left(\int_0^{N_t} y_{i,t}^{\frac{\epsilon-1}{\epsilon}}\,\mathrm{d}i\right)^{\frac{\epsilon}{\epsilon-1}} = y_t\left(N_t\right)^{\frac{\epsilon}{\epsilon-1}}. \tag{15}$$

where, with some abuse of notation, we denote by y_t the average firm output. We see here the impact of product variety on productivity.

Endogenous Markups. We consider a setup where the markup decreases with the number of firms. We model this time-varying markup μ_t as simply:

$$\log\mu_t = \log\frac{\epsilon}{\epsilon-1} - \phi_\mu \log N_t + \zeta_t^\mu.$$

We implement this time-varying markup as a function of the number of firms

A.3 Households

We introduce a standard household sector and wage setting mechanism. Households maximize lifetime utility

$$\mathbb{E}_0\left[\sum_{t=0}^{\infty}\beta^t\left(\frac{C_t^{1-\gamma}}{1-\gamma} - \frac{\ell_t^{1+\varphi}}{1+\varphi}\right)\right], \tag{16}$$

[1] Formally, we assume that firms set prices à la Calvo so that the reset price at time t, $p_{i,j,t}^*$, solves

$$\mathbb{E}_t\left[\sum_{k=0}^{\infty}\vartheta_p^k\Lambda_{t+k}y_{i,t+k}\left(1-\epsilon_j+\epsilon_j\frac{P_{t+k}}{p_{i,t}^*}\chi_{t+k}\right)\right] = 0.$$

Indexation keeps the dispersion of prices small. In addition, we estimate relatively small nominal rigidities, so the impact of these rigidities on productivity (output) and value (Tobin's Q) are negligible.

subject to the budget constraint

$$S_t + P_t C_t \leq \tilde{R}_t S_{t-1} + W_t \ell_t, \tag{17}$$

where W_t is the nominal wage and $\tilde{R}_t$ is the (random) nominal gross return on savings from time $t-1$ to time t. The household's real pricing kernel between periods t and $t+j$ is

$$\Lambda_{t+j} = \beta^j \left(\frac{C_t}{C_{t+j}} \right)^{\gamma}. \tag{18}$$

By definition of the pricing kernel, nominal asset returns must satisfy

$$\mathbb{E}_t \left[\Lambda_{t+1} \frac{P_t}{P_{t+1}} \tilde{R}_{t+1} \right] = 1. \tag{19}$$

Wage setting Wage setting takes place as in the standard New Keynesian model (see Gali, 2008). The wage reset at time t, W_t^*, solves

$$\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta \vartheta_w)^k \, \ell_{l,t+k} C_{t+k}^{-\gamma} \left(\frac{1-\epsilon_w}{P_{t+k}} + \epsilon_w \frac{\mathtt{MRS}_{t+k}}{W_t^*} \right) \right] = 0, \tag{20}$$

where ϵ_w is the elasticity of substitution between labor varieties and where we define the marginal rate of substitution as

$$\mathtt{MRS}_{l,t+k} \equiv \ell_{l,t+k}^{\varphi} C_{t+k}^{\gamma}. \tag{21}$$

A.4 Shocks

We model the following shocks (where lowercase letters denote variables in logs):

- A shock to the valuation of corporate assets for both capital-producing and goods-producing firms

$$q_t^k = \mathbb{E}_t \left[\lambda_{t+1} + \log \left(r_{t+1}^k + q_{t+1}^k + 1 - \delta + \frac{1}{2\phi_k} \left(q_{t+1}^k \right)^2 \right) \right] + \zeta_t^q \tag{22}$$

$$q_t^{\epsilon} = \mathbb{E}_t \left[\lambda_{t+1} + v_{t+1}^{\epsilon} - k_{t+1} \right] + \zeta_t^q, \tag{23}$$

where the shock ζ_t^q is given by

$$\zeta_t^q = \rho_q \zeta_{t-1}^q + \sigma_q \epsilon_t^q. \tag{24}$$

The valuation shock is a *risk premium* shock that applies to corporate (risky) assets, which will help us account for time varying-risk aversion and expected returns. In reduced-form, this shock has similar implications as the marginal efficiency of investment shocks studied by Justiniano et al. (2011).

- Aggregate shock to the entry cost

$$\kappa_t = \kappa + \zeta_t^\kappa, \tag{25}$$

where the industry and aggregate-level shocks are autoregressive processes

$$\zeta_t^\kappa = \rho_\kappa \zeta_{t-1}^\kappa + \sigma_\kappa \epsilon_t^\kappa. \tag{26}$$

- We also include shocks to the linearized inflation equation

$$\zeta_t^e = \rho_\kappa \zeta_{t-1}^e + \sigma_e \epsilon_t^e. \tag{27}$$

These shocks will help us account for the observed variation in inflation.

- A discount rate shock to the pricing kernel, which helps match the sharp drop in risk free rates during the Great Recession, as is standard in the New Keynesian literature

$$\lambda_{t+1} = \log\beta - \gamma\left(c_{t+1} - c_t\right) + \zeta_t^b \tag{28}$$

$$\zeta_t^b = \rho_b \zeta_{t-1}^b + \sigma_b \epsilon_t^b. \tag{29}$$

- A shock to the monetary policy rule

$$\tilde{r}_t^* = -\log(\beta) + \phi_i \tilde{r}_{t-1}^* + (1-\phi_i)\left(\phi_p \pi_t^p + \phi_y\left(\ln Y_t - \ln Y_t^F\right)\right) + \phi_g \ln\left(\frac{Y_t/Y_{t-1}}{Y_t^F/Y_{t-1}^F}\right) + \sigma_i \epsilon_t^i. \tag{30}$$

We compute the flexible price level of output Y_t^F from the equilibrium of the model, but with no pricing frictions.

B Data Sources and Definitions

We use a wide range of aggregate-, industry- and firm-level data, summarized in Table A.1 and described in the rest of this section.

B.1 Data Sources and Definitions

B.1.1 Aggregate Data

FRED. For use in the model, we gather the change in real consumption per capita, the net investment rate, inflation, and employment from FRED. We follow Smets and Wouters (2007) in

Table A.1: Summary of Key Data Sources

	Source	**Key Data fields**	**Granularity**
Aggregate	Federal Reserve Economic Database	$\bar{r}_t$, π_t^p, c_t, x_t, ℓ_t	Aggregate
	Financial Accounts of the United States	I, K, OS, and Q	Sector (NFCB, NFNCB)
Industry	BEA GDP by Industry	Output & prices	˜NAICS L3
	BEA Fixed Assets Tables	I, K	˜NAICS L3
	Economic Census	Concentration	NAICS L3-L6
	Peter Schott's website	Imports	NAICS L6
	Census OES	Employment by occupation	NAICS L3-L6
	RegData	Regulation Index	NAICS L3-L6
Firm	Compustat NA	Q, I, K and OS	Firm
	Peters & Taylor	Intangible K	Firm
	Thomson Reuters SDC	M&A deal value	Transaction

using the GDP deflator for inflation (FRED code GDPDEF), constructing real consumption per capita (FRED code PCEC divided by the GDPDEF, and the index of civilian non-institutional population CNP16OV),[2] and non-farm business hours (FRED code PRS85006023 times the civilian employment level CE16OV, divided by the index CNP16OV). Consumption and inflation are demeaned prior to estimation.

Financial Accounts of the U.S. For our motivating analyses, we gather quarterly data for the Non-Financial Corporate and Non-Financial Non-Corporate sectors of U.S. Data is sourced from the Financial Accounts of the United States via FRED. See Section B.2 below for details on the data series and definitions used for each Figure.

B.1.2 Industry-level data

Investment and Capital Stocks. Industry-level investment and capital stocks are gathered from Section 3 of the BEA Fixed Assets tables, available here. Data includes current-cost and chained values for the net stock of capital, depreciation and investment. Note that BEA I and K include some intangible assets (i.e., software, R&D, and some intellectual property), in addition to tangible capital.

The data includes 63 granular industry groupings. We group these industries into 47 categories to ensure all groupings have material investment; reasonable Compustat coverage; and yield stable investment and concentration time series. In particular, we group industries so that each group contains at least ∼10 firms, on average, and contributes a material share of output and investment. We exclude Financials and Real Estate; and also exclude Utilities given the

[2] We also smooth CNP16OV to account for jumps in the series.

influence of government actions in their investment. Last, we exclude 'Management of companies and enterprises' because there are no companies in Compustat that map to this category. This leaves 43 industry groupings, summarized in Table A.2. All other datasets are mapped into these 43 industry groupings.

Output and Prices. Nominal Gross Output and Prices are gathered from the BEA's GDP by Industry accounts (file GDPbyInd_GO_1947-2017). Industry segments closely follow those of the Fixed Assets tables.

Regulation Index. We gather industry-level regulation indices from RegData 3.1, available at link and introduced in Al-Ubaydli and McLaughlin (2015). RegData aims to measure regulatory stringency at the industry-level. It relies on machine learning and natural language processing techniques to count the number of restrictive words or phrases such as 'shall', 'must' and 'may not' in each section of the Code of Federal Regulations and assign them to industries. Note that most, but not all industries are covered by the index. We map the Regulation index to BEA segments by selecting the closest NAICS industry(s) to a given BEA segment.[3] Most industries map one-to-one. When this is not the case, we take the average number of restrictions across the given industries.

Regulatory Employment. We gather employment by occupation x NAICS x year from the BLS Occupational Employment Statistics, available here. We map NAICS codes to BEA segments through the same process as the Regulation Index. We measure regulatory-related employment in a given industry as the total number of employees with Legal or Compliance occupations (codes 23-0000 and 13-1040, respectively). For our regressions, we set regulatory employment to missing for the BEA Professional Services industry (which includes Legal Services).

B.1.3 Firm-level data.

Our firm-level data source is the CRSP-Compustat merged database, available through WRDS. We download tables Funda and Company from Compustat, and table msf from CRSP. We also download the CRSP-Compustat linking table (ccmxpf_linktable) to match the datasets. We merge the CRSP file and apply standard screens (consol = "C", indfmt = "INDL", datafmt = "STD", popsrc = "D" and curcd = "USD"). We keep firm-year observations incorporated in the USA (fic = "USA"), with non-missing year, gvkey, Q (as defined below). We require assets above \$1 million to mitigate the impact of outliers.

We use the industry codes in the Compustat Company table. NAICS codes are populated for all firms that existed after 1985, but are sometimes missing for firms that exited beforehand.

[3] We use the mapping in tab 'NAICS codes' of file `GDPbyInd_GO_1947-2017.xls`.

Table A.2: Mapping of BEA industries to segments

BEA code	Sector/Industry	Mapped segment
	Agriculture, forestry, fishing, and hunting	Omitted
1100	Farms	Agriculture
1130	Forestry, fishing, and related activities	Agriculture
	Mining	Omitted
2110	Oil and gas extraction	Min_oil_and_gas
2120	Mining, except oil and gas	Min_ex_oil
2130	Support activities for mining	Min_support
2200	**Utilities**	Omitted
2300	**Construction**	Construction
	Durable goods manufacturing	Omitted
3210	Wood products	Dur_wood
3270	Nonmetallic mineral products	Dur_nonmetal
3310	Primary metals	Dur_prim_metal
3320	Fabricated metal products	Dur_fab_metal
3330	Machinery	Dur_machinery
3340	Computer and electronic products	Dur_computer
3350	Electrical equipment, appliances, and components	Dur_electrical
3360	Motor vehicles, bodies and trailers, and parts	Dur_transp
3360	Other transportation equipment	Dur_transp
3370	Furniture and related products	Dur_furniture
3390	Miscellaneous manufacturing	Dur_misc
	Nondurable goods manufacturing	Omitted
3110	Food and beverage and tobacco products	Nondur_food
3130	Textile mills and textile product mills	Nondur_textile
3150	Apparel and leather and allied products	Nondur_apparel
3220	Paper products	Nondur_paper
3230	Printing and related support activities	Nondur_printing
3240	Petroleum and coal products	Nondur_petro
3250	Chemical products	Nondur_chemical
3260	Plastics and rubber products	Nondur_plastic
4200	**Wholesale trade**	Wholesale_trade
4400	**Retail trade**	Retail_trade
	Transportation and warehousing	Omitted
4810	Air transportation	Transp_air
4820	Railroad transportation	Transp_rail
4830	Water transportation	Transp_other
4840	Truck transportation	Transp_truck
4850	Transit and ground passenger transportation	Transp_other
4860	Pipeline transportation	Min_oil_and_gas
4870	Other transportation and support activities	Transp_other
4930	Warehousing and storage	Transp_other

Table A.2: Mapping of BEA industries to segments (cont'd)

BEA code	Sector/Industry	Mapped industry
	Information	Omitted
5110	Publishing industries (includes software)	Inf_publish
5120	Motion picture and sound recording industries	Inf_motion
5130	Broadcasting and telecommunications	Inf_telecom
5140	Information and data processing services	Inf_data
	Finance and insurance	Omitted
5210	Federal Reserve banks	Omitted
5210	Credit intermediation and related activities	Omitted
5230	Securities, commodity contracts, and investments	Omitted
5240	Insurance carriers and related activities	Omitted
5250	Funds, trusts, and other financial vehicles	Omitted
	Real estate and rental and leasing	Omitted
5310	Real estate	Omitted
5320	Rental and leasing services and lessors of intangible assets	Omitted
	Professional, scientific, and technical services	Omitted
5411	Legal services	Prof_serv
5415	Computer systems design and related services	Prof_serv
5412	Miscellaneous professional, scientific, and technical services	Prof_serv
5500	**Management of companies and enterprises**	Omitted
	Administrative and waste management services	Omitted
5610	Administrative and support services	Adm_support
5620	Waste management and remediation services	Waste_mgmt
6100	**Educational services**	Educational
	Health care and social assistance	Omitted
6210	Ambulatory health care services	Health_ambulatory
6220	Hosp and nursing	Health_hospitals
6220	Hospitals	Omitted
6220	Nursing and residential care facilities	Omitted
6240	Social assistance	Health_social
	Arts, entertainment, and recreation	Omitted
7110	Performing arts, spectator sports, museums, and related activities	Arts
7130	Amusements, gambling, and recreation industries	Arts
	Accommodation and food services	Omitted
7210	Accommodation	Acc_accomodation
7220	Food services and drinking places	Acc_food
8100	**Other services, except government**	Omitted

We map those firms to the most common NAICS-4 industry among those firms with the same SIC code and non-missing NAICS. We also map all retired/new NAICS codes from the 1997, 2002 and 2012 versions to NAICS 2007 using the concordances in link.

We map firms to BEA industry segments using the mapping in tab 'NAICS codes' of file GDPbyInd_GO_1947-2017.xls. Firms with NAICS codes 999 are dropped because they cannot be mapped to BEA industries.

Industry Q. We estimate firm-level Q as the ratio of market value to total assets (AT). We compute market value as the market value of equity plus total liabilities (LT) and preferred stock (PSTK), where the market value of equity is defined as the total number of common shares outstanding (item CSHO) times the closing stock price at the end of the fiscal year (item PRCC_F). When either CSHO or PRCC_F are missing in Compustat, we fill-in the value using CRSP. We cap Q at 10 and winsorize it at the 2% level, by year to mitigate the impact of outliers. Last, we aggregate firm-level Q to the industry level by taking the mean, median and asset-weighted average across all firms in a given industry-year.

Industry Concentration. We estimate import-adjusted concentration using sales from Compustat and imports from Peter Schott's website. Import data are available by HS-code x year from 1989 to 2017. HS codes are mapped to NAICS-6 industries using the concordance of Pierce and Schott (2012). We map NAICS codes to BEA segments as described above, and aggregate to the industry-level.

We then define the import-adjusted market share of a given Compustat firm i that belongs to BEA industry k, as the ratio of firm sales to nominal gross output plus imports:[4]

$$s_{it}^k = \frac{\text{sale}_{it}^k}{\text{gross output}_{kt} + \text{imports}_{kt}}$$

Concentration ratios sum market shares across the top firms, by sales, in a given industry.

We aggregate concentration ratios using a nominal gross-output weighted average of industry-level concentration. Weighting by nominal output is appropriate in light of the model, but introduces some noise: the concentration ratio rises quickly in the late 2000's and then falls (Figure A.3, left plot). This is because of large variation in the price of oil, and therefore the weight of the Nondurable Petroleum industry (right plot). Real output and the corresponding aggregate CR remain far more stable, which justifies holding the CR fixed after 2012 in our main counterfactual.

[4]Because Compustat sales include exports, total sales in a given industry can exceed gross output plus imports. In that case, we define firm-level market share as the ratio of firm-sales to total Compustat sales.

B.1.4 M&A Transaction-level Data

Last, we gather M&A transaction-level data from Thomson Reuters SDC. We include only completed transactions of US-domiciled targets. SDC provides SIC codes by target. We map these codes to NAICS using the SIC-NAICS concordance available here. We then map NAICS codes to BEA segments and aggregate by summing the transaction values.

B.2 Details on the Construction of Selected Figures

Figure 2. Net Investment, Profits and Q-Residuals Top chart plots the ratio of net investment and net buybacks to net operating surplus for the Non Financial Corporate sector. Net operating surplus is sourced directly from series NCBOSNQ027S. Net investment is defined as gross fixed capital formation minus consumption of fixed capital (series NCBGFCA027N minus NCBCFCA027N). Net repurchases equal the negative of the net incurrence of equity liabilities (series NCBCEBQ027S).

Bottom chart plots the per-period and cumulative residuals of a regression of the net investment rate for the NFB sector on Q for the NFC sector. We use the 1990 to 2001 period as a training sample and use the estimated coefficients to forecast out-of-sample after 2001. The net investment rate is defined as the ratio of Net investment (see above) to lagged capital stock. The capital stock is defined as the sum of equipment, intellectual property, residential and non-residential structures. For the NFC sector, these are series ESABSNNCB, NCBNIPPCCB, RCVSRNWMVBSNNCB and RCSNNWMVBSNNCB. For NFNC sector, ESABSNNB, NNBNIPPCCB, RCVSRNWBSNNB and RCVSNWBSNNB. Tobin's Q for the non-financial corporate sector is defined as

$$Q = \frac{V^e + (L - FA) - \text{Inventories}}{P_k K} \tag{31}$$

where V^e is the market value of equity (NCBCEL), L are the liabilities (TLBSNNCB); FA are financial assets (TFAABSNNCB); and $P_k K$ is the replacement cost of capital (sum of the four NFC capital series listed above). Inventories are based on series IABSNNCB.

Figure 3. Cumulative Capital Gap for Concentrating and Non-Concentrating Industries. We begin by identifying industries with the largest and smallest log-change in 8-firm import-adjusted concentration ratio (CR8). The top plot shows the gross output-weighted average CR8 across the corresponding industries. Bottom plot shows the weighted average cumulative capital gap for the corresponding industries.

We estimate the industry-level capital gap as follows. Define the net investment rate for industry k, $\frac{NI_{kt}}{K_{kt-1}}$, as Investment minus Depreciation over lagged Capital stock – all in 2009 dollars, as measured by the Chain-Type quantity indexes. Then, regress $\frac{NI_{kt}}{K_{kt-1}}$ on the 1-year lagged median industry Q (from Compustat) over the 1990 to 2001 period. Generate the residuals ε_{kt}, and compute the cumulative gap as

$$\text{Gap}_{kt} = \varepsilon_{kt} + \text{Gap}_{kt-1} \times \left(1 - \frac{\delta_{kt}}{K_{kt-1}}\right)$$

We aggregate across industries by taking the weighted average by capital.

Figure 13. Aggregate Entry Cost Shocks vs. Regulation and M&A For regulation, estimate 3-year log-change in industry-level regulation index and winsorize at 5% level. Aggregate by taking the simple average across all industries. For M&A, simply compute the ratio of total M&A transaction values to total Gross Output across BEA industries in our sample.

C Additional Results and Figures

In this section, we present additional figures.

C.1 Additional Figures

- Figure A.1 plots impulse response functions for five shocks in our aggregate model. The aggregate entry cost shock is key for describing the evolution of the number of firms at the aggregate level, and generates comovement in aggregate consumption, investment, and inflation.

- Figure A.2 plots our filtered aggregate entry cost shock series against aggregate measures of regulation and an aggregate measure of M&A activity. The correlation with the measure of regulation is .26 while the correlation for M&A/GO is .45.

- Figure A.3 shows that weighting by nominal output introduces noise in the evolution of aggregate concentration (left plot). This is because of large variation in the price of oil, and therefore the weight of the Nondurable Petroleum industry (right plot). Real output and the corresponding aggregate CR remain far more stable, which justifies holding the CR fixed after 2012 in our main counterfactual.

- Figure A.4 plots the Gelman-Rubin diagnostic for the convergence of the posterior distributions along the two chains in the baseline industry estimation. The diagnostic across parameters is below the 1.2 level commonly used to indicate convergence (see Brooks, S. and A. Gelman, (1998), 'Monitoring Convergence of Iterative Simulations', Journal of Computational and Graphical Statistics, Volume 7, Number 4, Pages 434–455).

C.1.1 Aggregate Data

Figure A.5 plots the aggregate data used in estimation of the aggregate model. We describe how these series are constructed above.

Figure A.1: Aggregate Impulse Response Functions

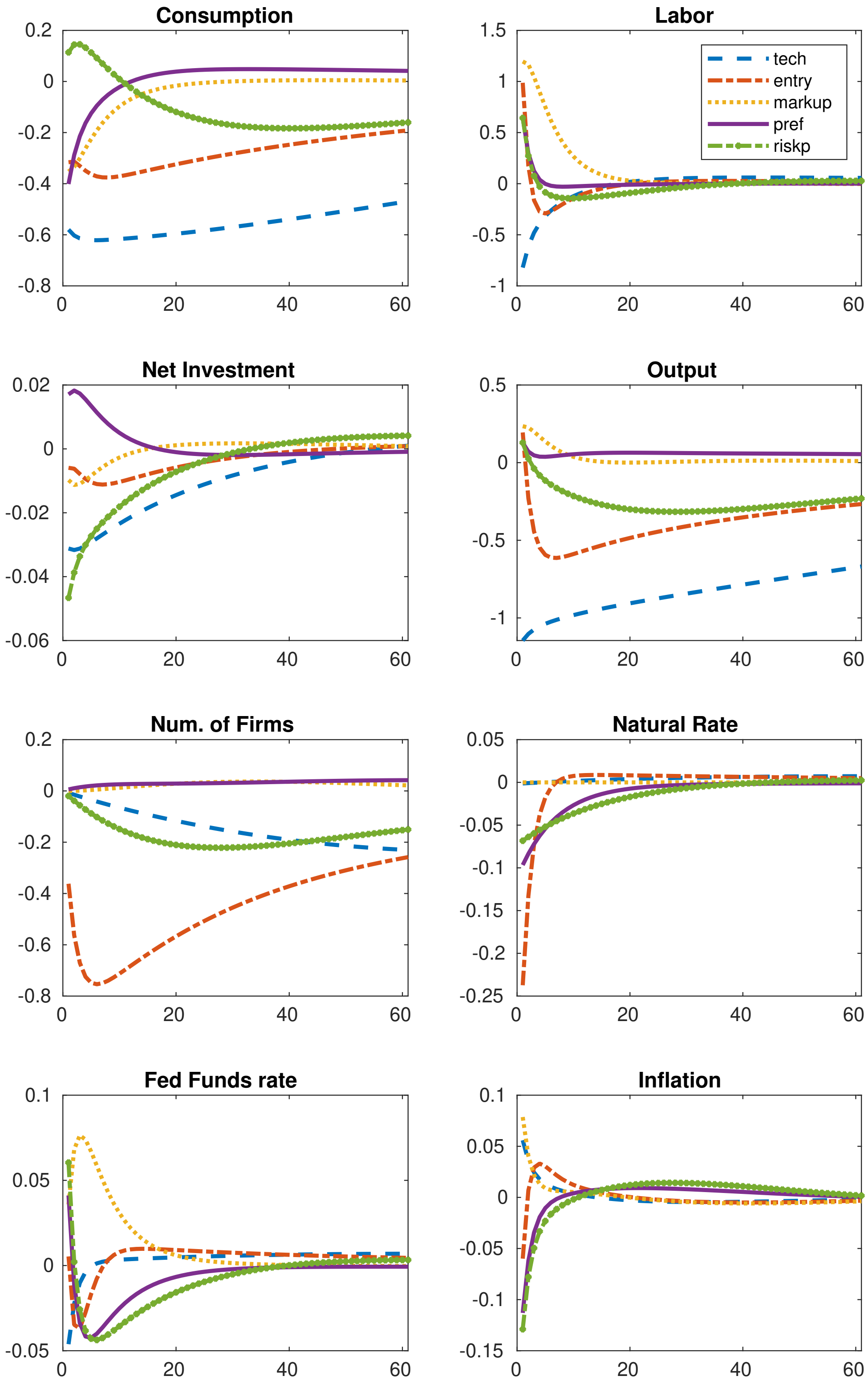
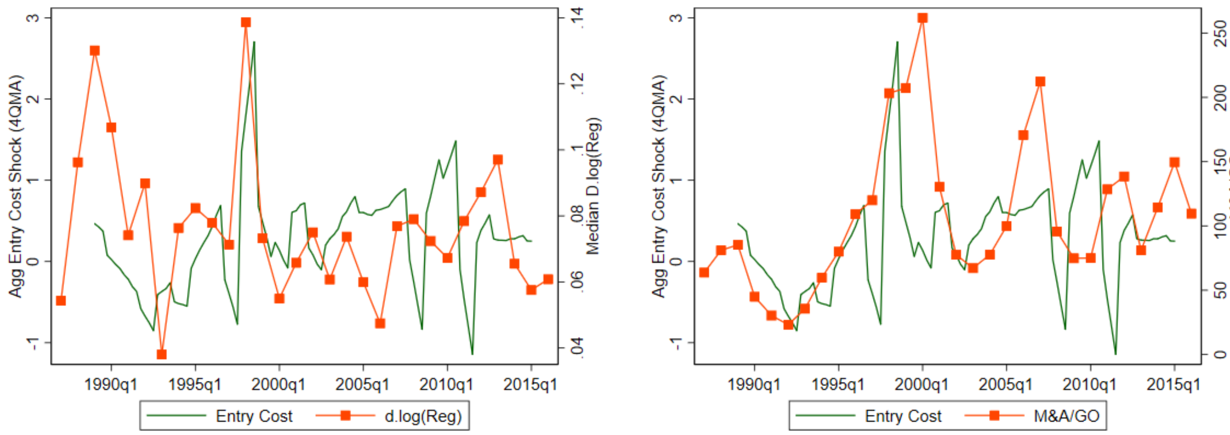


Figure A.2: Aggregate Entry Cost Shocks vs. Regulation and M&A



Notes: Annual data. Entry cost shocks estimated by the model. Regulation indices from RegData. M&A activity from Thomson Reuters SDC.

Figure A.3: Aggregated Concentration Series

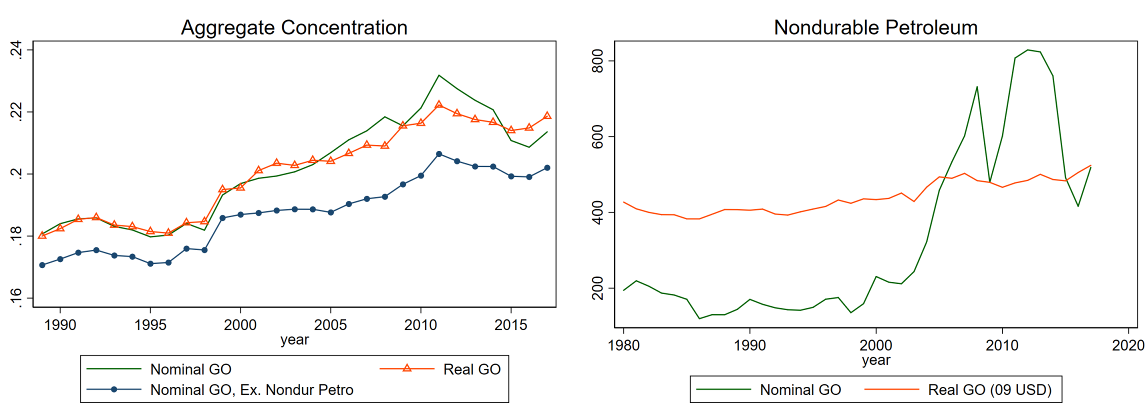


Figure A.4: Convergence of Posterior Distributions in Estimated Industry Model

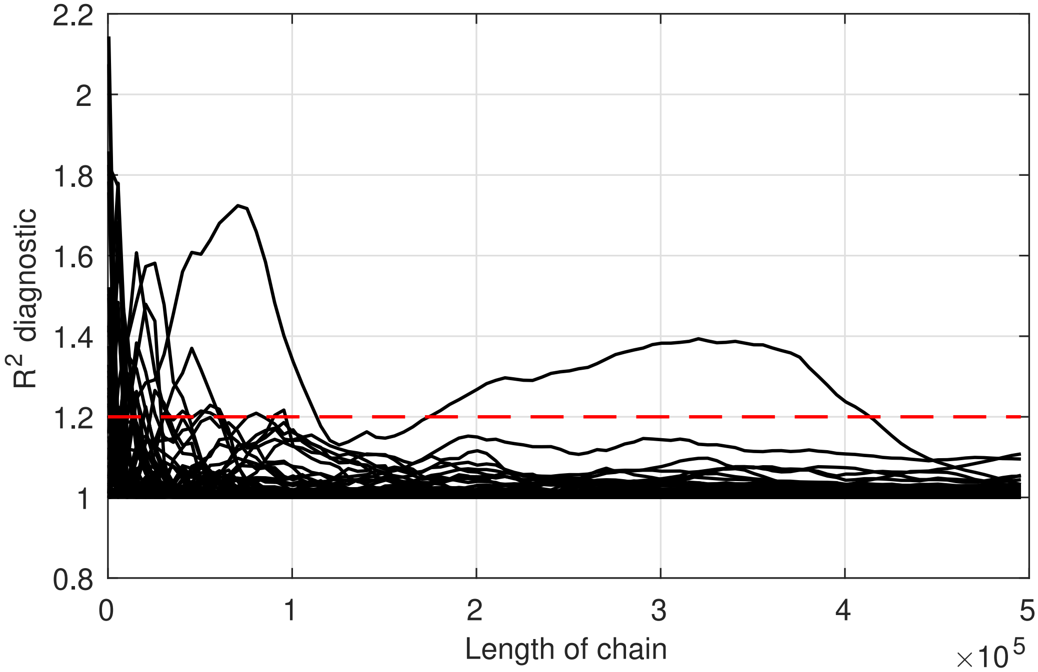
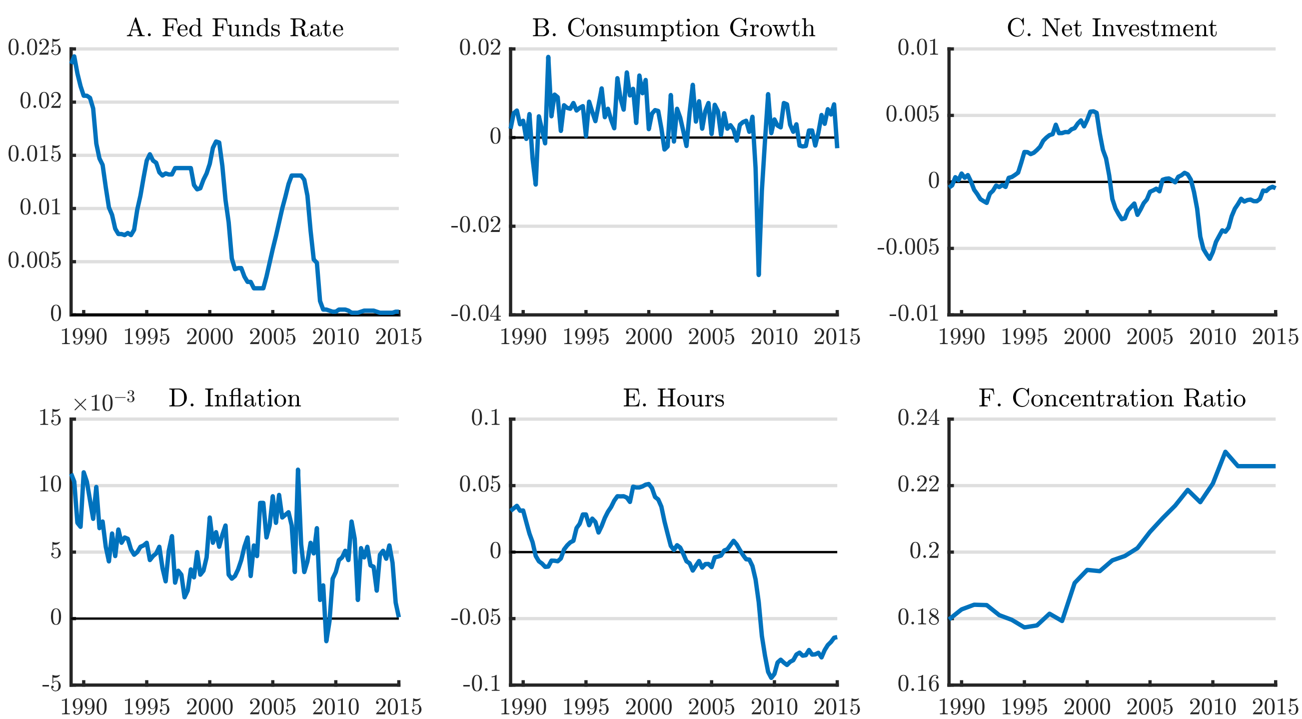


Figure A.5: Aggregate Data in Estimation



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