Labor Adjustment Cost: Implications form Asset Prices

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Hours $+$ Employment $\sim$ Equity Return

Labor Adjustment Cost: Implications form Asset Prices

$$
\begin{array}{ccccc}
\text{Hours} & + & \text{Employment} & \sim & \text{Equity Return} \\
\uparrow & & \uparrow & & \uparrow \\
\text{Hours per Worker} & & \text{Number of Workers} & & \text{Stock Return}
\end{array}
$$

Labor Adjustment Cost: Implications form Asset Prices

$$\overbrace{\begin{array}{ccc}\text{Hours} & + & \text{Employment} \\ \uparrow & & \uparrow \\ \text{Hours per Worker} & & \text{Number of Workers}\end{array}}^{\substack{\text{Micro structure} \\ \text{regarding labor adjustment cost}}} \sim \overbrace{\begin{array}{c}\text{Equity Return} \\ \uparrow \\ \text{Stock Return}\end{array}}^{\substack{\text{Macro Shock} \\ \text{affecting labor adjustment cost}}}$$

This Paper

Present a new empirical fact utilizing a measure of hours

Current high hours growth is associated with low future equity return

A 1% increase in hours predicts a 0.6% drop in equity return annually

Build a production-based asset pricing model with labor adjustment cost

Firms make explicit labor input decisions of hours and employment

Match firm-level moments, pooled distributions, and equity return predictability of hours and employment growth

Discuss model implications for labor adjustment cost

Firms face labor adjustment cost mostly in form of disruption to production

The labor adjustment cost on hours is important for data-consistent moments of hours and employment growth

Discuss model implications for adjustment cost shock

A shock that reduces labor adjustment friction leads to high marginal utility states

Firms adjusting hours more respond more to adjustment cost shock and earn lower equity returns

Selected Strands of Literature

Dynamic factor demand with adjustment cost: ignore hours margin (Yashiv [2000], Hall [2004], Merz & Yashiv [2007]) frictionless hours margin (Bloom [2009], Cooper & Willis [2009], Cooper et al. [2015])

Hours margin responds to macro shock quite substantially.

Labor market frictions and the cross-section of equity returns: Eisfeldt & Papanikolaou [2013] (organization), Donangelo [2014] (mobility), Belo et al. [2014a] and Belo et al. [2017] (skill + hiring), Zhang [2019] (automation), Bretscher [2019] (offshore)

Friction along hours margin generates cross-sectional equity return spread higher than Fama-French factors.

Production-based asset pricing model: Cochrane [1991], Cochrane [1996], Jermann [1998], Belo [2010], Zhang [2005]; Greenwood et al. [1997, 2000], Papanikolaou [2011], Kogan & Papanikolaou [2013, 2014]

Empirical identification of a typically ignored production input for production-based asset pricing model.

International economics on hours and employment: Ohanian et al. [2008], Ohanian & Raffo [2012], Llosa et al. [2014]

A micro-level measure of hours rather than national average.

Outline

Measure of Hours

Predictability of Hours on Equity Return

A Production-Based Asset Pricing Model

Discuss Model Implication for Labor Adjustment Cost

Discuss Model Implication for Adjustment Cost Shock

Three Datasets

BLS/Occupational Employment Statistics (OES)

- coverage: 1.2 million establishments; 62% non-farm employment
- annual by-industry (3-digit SIC) occupational data: 1997-2017
  - all possible occupations in a industry
  - each occupation's employment counts
  - each occupation's per-hour wages

CRSP and Compustat Merged (CCM)

- annual firm-level equity return
- annual firm-level employment and capital

BLS/Current Population Survey (CPS)

- annual individual-level survey weight
- annual individual-level usual hours

CCM Employment and Capital Definition | CPS Weight and Hours Definition

Idea: Linking Firms to Persons

Notation:	j firm	t year	i industry	o occupation	p person
CCM:	Firm j	Year t	Industry i		
OES:		Year t	Industry i	Occupation 1	
		$\vdots$	$\vdots$	$\vdots$	
		Year t	Industry i	Occupation o	
		$\vdots$	$\vdots$	$\vdots$	
		Year t	Industry i	Occupation O	
CPS:		Year t	Industry i	Occupation o	Person 1
		$\vdots$	$\vdots$	$\vdots$	$\vdots$
		Year t	Industry i	Occupation o	Person p
		$\vdots$	$\vdots$	$\vdots$	$\vdots$
		Year t	Industry i	Occupation o	Person P

CPS Number of Persons in One (Ind,Occ)

Measure of Hours: Methodology

Notation: t year, i industry, o occupation, p person, and j firm

$$H_t^{(i,o)} = \sum_{p \in \mathsf{CPS}_t(i,o)} \Omega_t^{(i,o,p)} \times H_t^{(i,o,p)}$$

Left-hand side

$H_t^{(i,o)}$: industry-occupation-level hours

Right-hand side

$\mathsf{CPS}_t(i,o)$: set of persons from CPS

$\Omega_t^{(i,o,p)}$: CPS person survey weight

$H_t^{(i,o,p)}$: CPS person usual hours

Measure of Hours: Methodology

Notation: t year, i industry, o occupation, p person, and j firm

$$H_t^{(i,o)} = \sum_{p \in \mathsf{CPS}_t(i,o)} \Omega_t^{(i,o,p)} \times H_t^{(i,o,p)}$$

$$H_t^{(i)} = \sum_{o \in \mathsf{OES}_t(i)} \left(\frac{N_t^{(i,o)} \times W_t^{(i,o)}}{\sum_{o \in \mathsf{OES}_t(i)} N_t^{(i,o)} \times W_t^{(i,o)}} \times H_t^{(i,o)} \right)$$

Left-hand side

$H_t^{(i)}$: industry-level hours

Right-hand side

$\mathsf{OES}_t(i)$: set of occupations from OES

$N_t^{(i,o)}$: OES ind-occ employment counts

$W_t^{(i,o)}$: OES ind-occ per-hour wages

$H_t^{(i,o)}$: industry-occupation-level hours

Measure of Hours: Methodology

Notation: t year, i industry, o occupation, p person, and j firm

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$$H_{jt} = H_t^{(i)} \mid j \in i$$

Left-hand side

H_{jt}: firm-level hours

Right-hand side

$H_t^{(i)}$: industry-level hours

Measure of Hours: Validation Exercises

Notation: t year, i industry, o occupation, p person, and j firm

$$H_t^{(i,o)} = \sum_{p \in \mathsf{CPS}_t(i,o)} \Omega_t^{(i,o,p)} \times H_t^{(i,o,p)}$$

$$H_t^{(i)} = \sum_{o \in \mathsf{OES}_t(i)} \left(\frac{N_t^{(i,o)} \times W_t^{(i,o)}}{\sum_{o \in \mathsf{OES}_t(i)} N_t^{(i,o)} \times W_t^{(i,o)}} \times H_t^{(i,o)} \right)$$

$$H_{jt} = H_t^{(i)} |\ j \in i$$

Represent 71% firm-year obs.

Uniform across SIC3s and years

Similar to national average (BLS/CES)

Not driven by ind-occ weights

Not driven by ind-occ composition

Remain w/ industrial representative firms

Rrepresent 71% Firm-Year | Uniform across SIC3s and Years | Similar to National Average (BLS/CES)

Not Driven by Occupation Weights | Not Driven by Occupation Composition | Industrial Representative Firms

Outline

Firm-Level Equity Return Predictability Regressions

$$R_{j,t+1} = a_0 + a_j + a_{t+1} + b_H \times G^H_{jt} + b_N \times G^N_{jt} + b_K \times G^K_{jt} + \boldsymbol{bF}_{jt} + e_{j,t+1}$$

Left-hand side $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$

Right-hand side a_0 is a constant; a_j is firm fixed effect; a_{t+1} is year fixed effect

G^H_{jt} is firm j's hours growth from January to December of year t

G^N_{jt} is firm j's employment growth from January to December of year t

G^K_{jt} is firm j's investment ratio (investment-to-capital) from January to December of year t

F_{jt} is a vector of firm j's pricing factors measured at end of year t

Current High Hours Growth Predicts Low Future Equity Return

A 1% increase in hours is associated with a 60 bps (0.6%) drop in equity return annually.

$$R_{j,t+1} = a_0 + a_j + a_{t+1} + b_H \times G_{jt}^H + b_N \times G_{jt}^N + b_K \times G_{jt}^K + \boldsymbol{bF}_{jt} + e_{j,t+1}$$

		[1]	[2]	[3]	[4]	[5]	[6]
Hours Growth	b_H	-62.86^{***}		-61.11^{***}	-54.03^{***}	-60.23^{***}	-54.00^{***}
	(se)	(14.74)		(14.71)	(12.57)	(14.67)	(13.35)
Employment Growth	b_N		-13.93^{***}	-14.96^{***}	-10.28^{***}	-11.23^{***}	1.52
	(se)		(1.43)	(2.15)	(1.48)	(2.24)	(2.13)
Fixed Effects		Firm, Year	Firm, Year	Firm, Year	Year	Firm, Year	Firm, Year
Investment Ratio		No	No	No	No	Yes	No
Pricing Factors		No	No	No	No	No	Yes
Observations		$23,030$	$42,063$	$23,030$	$23,030$	$23,030$	$23,029$
Firms		$4,473$	$5,824$	$4,473$	$4,473$	$4,473$	$4,473$
Years		$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$

Firm-Level Equity Return Predictability Regressions Results. This table tabulates the baseline results of firm-level equity return predictability regressions in the form indicated by table head. On the left-hand side, $R_{j,t+1}$ is the firm j's future annual equity return. On the right-hand side, a_0, a_j, a_{t+1} are respectively the constant, the firm fixed effects, and the year fixed effects. The key variables on the right-hand side are the firm j's current annual growth rates $G_{jt}^{H,N,K}$, of three production input choices hours (H), employment (N), and capital (K), respectively. Additionally on the right-hand side, $\boldsymbol{F}_{jt}$ is a vector of five pricing factors, namely, the market capitalization (size) and book-to-market ratio, the investment-to-assets and return-on-equity, and the profitability. Each column runs one firm-level equity return predictability regression, with *, **, and *** denoting 10, 5, 1% significance levels, and standard errors in (se). I implement all regressions using panel OLS with firm standard error clusters; the sample spans from 1998 to 2017 annually.

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One Standard Deviation | Results w/ Investment Ratio | Results w/ Pricing Factors | Alternative Specifications | Fama-MacBeth Regressions

Portfolio-Level: Current High Hours Growth Predicts Low Future Equity Return

Use portfolio approach to reduce idiosyncrasy at the firm-level

Portfolios Sorted By Current Hours Growth G_{jt}^{H} Value-Weighted Sum of Future Equity Return $R_{j,t+1}$					L-Minus-H Return Difference
3 Portfolios					
[Low]		[2]		[High]	[L-H]
11.44		10.51		2.76	8.68
5 Portfolios					
[Low]	[2]	[3]	[4]	[High]	[L-H]
11.64	9.24	7.54	7.15	4.97	6.66

Portfolio-Level Results. This table tabulates the main results of the portfolio-level analyses using the univariate 3 or 5 portfolios sorted by the cross-sectional hours growths. At the end of year t, each firm's annual hours growth is measured from January of year t to December of year t; then the cross-section of firms are sorted into 3 or 5 portfolios; the portfolio future annual equity returns are defined as value-weighted sum of firms future equity return and measured from July of year $t+1$ to June of year $t+2$.

Portfolio-Level: Current High Hours Growth Predicts Low Future Equity Return

Use portfolio approach to reduce idiosyncrasy at the firm-level; **Monotonic decreasing** future equity returns of portfolios with **increasing** current hours growth

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3 Portfolios					
[Low]		[2]		[High]	[L-H]
11.44		10.51		2.76	8.68
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Portfolio-Level: Current High Hours Growth Predicts Low Future Equity Return

Use portfolio approach to reduce idiosyncrasy at the firm-level; Monotonic decreasing future equity returns of portfolios with increasing current hours growth; [L-H] has **comparable magnitude** to other portfolios.

Portfolios Sorted By Current Hours Growth G^H_{jt} Value-Weighted Sum of Future Equity Return $R_{j,t+1}$					L-Minus-H Return Difference
3 Portfolios					
[Low]		[2]		[High]	[L-H]
11.44		10.51		2.76	8.68
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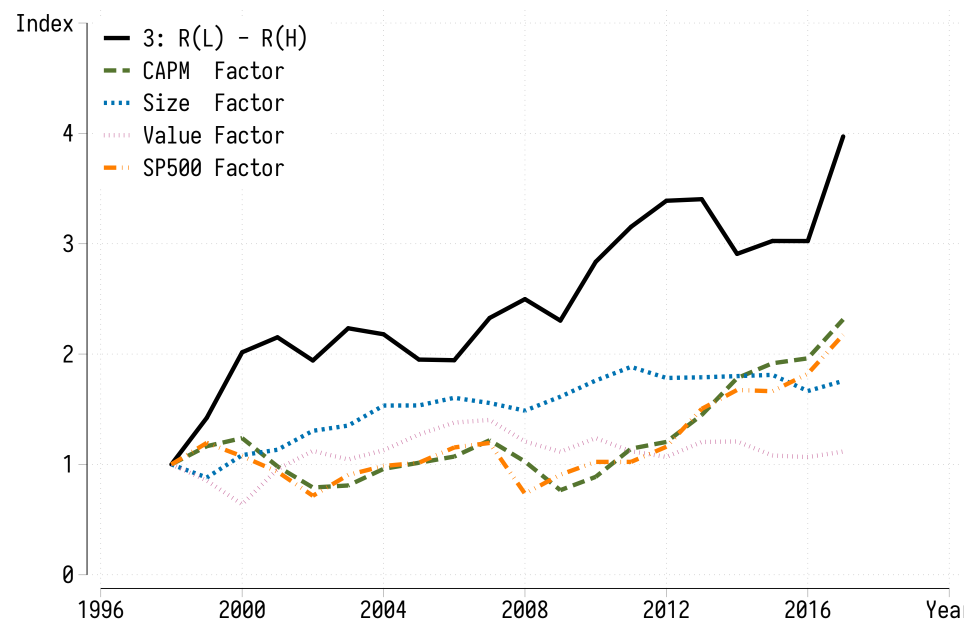

Compare Portfolio Cumulative Returns. The figure compares the cumulative returns of five portfolios: the low-minus-high 3 portfolios sorted by current hours growth, the CAPM factor, the Fama-French size factor, the Fama-French value factor, and the SP-500 index. All cumulative returns are normalized to 1 at the end of year 1998. The the sample spans from 1998 to 2017 annually.

Outline

Measure of Hours

Predictability of Hours Growth on Equity Return

A Production-Based Asset Pricing Model

Discuss Model Implication for Labor Adjustment Cost

Discuss Model Implication for Adjustment Cost Shock

Firms Make Explicit Labor Input Decisions of Hours and Employment

Production

$$Y_{jt} = A_t Z_{jt} (H_{jt} N_{jt})^{\alpha}$$

H_{jt} is hours; N_{jt} is employment; A_t is aggregate productivity; Z_{jt} is idiosyncratic productivity; α is labor share.

Compensation

$$W_{jt} = N_{jt}(\omega_0 + \omega \cdot H_{jt}^{\xi})$$

ξ controls the elasticity of compensation w.r.t. hours; ω_0 and ω represent the fixed and variant wage rates.

Adjustment Costs Occurs on Both Margins of Hours and Employment

		Disruption Cost		Irreversibility Cost		Quadratic Cost
Adjustment Cost on Hours:	$C_{jt}^{H} =$	$c_d^{H} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{H} \neq 0}$	$+$	$c_i^{H} \times W_{jt} \times \lvert G_{jt}^{H} \rvert$	$+$	$c_q^{H} \times H_{t-1} \times (G_{jt}^{H})^2$
Adjustment Cost on Employment:	$C_{jt}^{N} =$	$c_d^{N} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{N} \neq 0}$	$+$	$c_i^{N} \times W_{jt} \times \lvert G_{jt}^{N} \rvert$	$+$	$c_q^{N} \times N_{t-1} \times (G_{jt}^{N})^2$

Adjustment Costs Occurs on Both Margins of Hours and Employment

			Disruption Cost		Irreversibility Cost		Quadratic Cost
Adjustment Cost on Hours:	C^H_{jt}	$=$	$c^H_d \times Y_{jt} \times \mathbf{1}_{G^H_{jt} \neq 0}$	$+$	$c^H_i \times W_{jt} \times \lvert G^H_{jt} \rvert$	$+$	$c^H_q \times H_{t-1} \times (G^H_{jt})^2$
Adjustment Cost on Employment:	C^N_{jt}	$=$	$c^N_d \times Y_{jt} \times \mathbf{1}_{G^N_{jt} \neq 0}$	$+$	$c^N_i \times W_{jt} \times \lvert G^N_{jt} \rvert$	$+$	$c^N_q \times N_{t-1} \times (G^N_{jt})^2$

c_d **represents a fraction of production, depending non-convexily on growth.**

Adjustment Costs Occurs on Both Margins of Hours and Employment

		Disruption Cost	**Irreversibility Cost**	Quadratic Cost

Adjustment Cost on Hours: $C_{jt}^{H} = c_d^{H} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{H} \neq 0} + c_i^{H} \times W_{jt} \times |G_{jt}^{H}| + c_q^{H} \times H_{t-1} \times (G_{jt}^{H})^2$

Adjustment Cost on Employment: $C_{jt}^{N} = c_d^{N} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{N} \neq 0} + c_i^{N} \times W_{jt} \times |G_{jt}^{N}| + c_q^{N} \times N_{t-1} \times (G_{jt}^{N})^2$

c_d represents a fraction of production, depending non-convexily on growth.

c_i **represents a fraction of compensation, depending piecewise-linearly on growth.**

Adjustment Costs Occurs on Both Margins of Hours and Employment

	Disruption Cost	Irreversibility Cost	**Quadratic Cost**

Adjustment Cost on Hours: $C_{jt}^{H} = c_d^{H} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{H} \neq 0} + c_i^{H} \times W_{jt} \times |G_{jt}^{H}| + c_q^{H} \times H_{t-1} \times (G_{jt}^{H})^2$

Adjustment Cost on Employment: $C_{jt}^{N} = c_d^{N} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{N} \neq 0} + c_i^{N} \times W_{jt} \times |G_{jt}^{N}| + c_q^{N} \times N_{t-1} \times (G_{jt}^{N})^2$

c_d represents a fraction of production, depending non-convexily on growth.

c_i represents a fraction of compensation, depending piecewise-linearly on growth.

c_q **represents a fraction of inherited hours or employment, depending quadratically on growth.**

A Positive Adjustment Cost Shock Reduces Adjustment Costs for Adjusting Firms

Adjustment cost

$$C_{jt} = \frac{C_{jt}^{H} + C_{jt}^{N}}{X_t}$$

Adjustment cost wedge

$$\log(X_t) = \rho_X \log(X_{t-1}) + \sigma_X \epsilon_t^X$$

Adjustment cost shock

$$\epsilon_t^X \sim \mathcal{N}(0, 1)$$

An aggregate shock that improves the economic condition for adjustment and **benefits the adjusting firms**.

Maximization Problem

Bellman equation

$$V(A_t, X_t, Z_{jt}, H_{j,t-1}, N_{j,t-1}) = \max_{H_{jt}, N_{jt}} \{(Y_{jt} - W_{jt} - C_{jt}) + \mathbb{E}[M_{t+1} \cdot V_{j,t+1}]\}$$

Stochastic discount factor

$$M_{t+1} = (R^f_{t+1})^{-1} \frac{\exp\{\gamma_A \Delta \log(A_{t+1}) + \gamma_X \Delta \log(X_{t+1})\}}{\mathbb{E}[\exp\{\gamma_A \Delta \log(A_{t+1}) + \gamma_X \Delta \log(X_{t+1})\}]}$$

Loadings of Stochastic Discount Factor on Aggregate Shocks

Numerical Solution via Simulated Method of Moments

Moments not targeted to empirical fact: use predictability of hours growth on equity return as crosschecks

not sensitive to inclusion or exclusion of capital: target hours and employment moments

Parameters estimate adjustment cost: $(c_d^N, c_i^N, c_q^N, c_d^H, c_i^H, c_q^H)$

calibrate the rest: use common sources

State Space exogenous: Terry and Knotek II (2011)

endogeneous: grid search and cubic Hermite interpolation

Calibration

Definition	Symbol	Value	Source
Production function labor share	α	0.73	Cooper et al. (2015)
Compensation function hours curvature	ξ	1.013	Cooper et al. (2015)
Annual employment destruction rate	δ	0.12	Bloom (2009)
Persistence coefficient of aggregate productivity	ρ_A	0.859	Khan and Thomas (2008)
Conditional volatility of aggregate productivity	σ_A	0.014	Khan and Thomas (2008)
Persistence coefficient of adjustment cost wedge	ρ_X	0.859	Khan and Thomas (2008)
Conditional volatility of adjustment cost wedge	σ_X	0.014	Khan and Thomas (2008)
Persistence coefficient of idiosyncratic productivity	ρ_Z	0.859	Khan and Thomas (2008)
Conditional volatility of idiosyncratic productivity	σ_Z	0.022	Khan and Thomas (2008)
Risk-free rate	R^f	0.015	Belo et al. (2014)
Loading of SDF on aggregate productivity shock	γ_A	-6.75	Belo et al. (2014)
Loading of SDF on aggregate adjustment cost shock	γ_X	$+14.5$	Belo et al. (2014)

Calibration. This table reports the calibration of the baseline model operating at the frequency of one annum. I set the labor share with decreasing return of scale $\alpha = 0.73$. This value is implied by the labor share of $2/3$ from a constant return to scale production function, and an isoelastic demand curve with the price elasticity of demand of 5. The parameter ξ controls the curvature of compensation function with respect to the hours. A value of $\xi > 1$ ensures a positive elasticity of the marginal compensation function with respect to the hours; I let $\xi = 1.013$ from Cooper et al. (2015), which has the most relevant economic environment. In specifying the stochastic processes in model, I follow Khan and Thomas (2008) closely; I use the same persistent coefficient value for all the three stochastic processes $\rho_A = \rho_X = \rho_Z = 0.859$; I assign the conditional volatility value $\sigma_X = \sigma_A = 0.014$ for the aggregate processes and $\sigma_Z = 0.022$ for the idiosyncratic process. Two parameters in stochastic discount factor from are the loadings on the two aggregate shocks. From Belo et al. (2014), I let the loading on the aggregate productivity shock $\gamma_A = -6.75$ and that on the aggregate adjustment cost shock $\gamma_X = +14.5$.

Estimated Model and Data Firm-Level Moments

Description	Definition	Data	Model
Targeted			
Kurtosis of hours growth	$kurt(G^H)$	13.783	10.931
Kurtosis of employment growth	$kurt(G^N)$	7.750	4.995
Persistence of hours growth	$rho(G^H)$	-0.376	-0.227
Persistence of employment growth	$rho(G^N)$	-0.005	-0.110
Same-period correlation coefficient	$corr(G^H, G^N)$	0.029	0.000
Cross-period correlation coefficient	$corr(G^H, G^N_{-1})$	-0.024	-0.026
Non-Targeted			
Cross-period correlation coefficient	$corr(G^H_{-1}, G^N)$	0.012	0.032
Mean of hours growth	$mean(G^H)$	0.001	0.001
Mean of employment growth	$mean(G^N)$	0.051	0.003
Variance of hours growth	$var(G^H)$	0.001	0.001
Variance of employment growth	$var(G^N)$	0.044	0.009
Skewness of hours growth	$skew(G^H)$	0.156	0.172
Skewness of employment growth	$skew(G^N)$	0.371	0.346

Compare Data- and Model-Implied Moments of Firm-Level Hours and Employment. This table summarizes the moments matching between data and baseline model. In presenting the moments, the upper panel lists the six targeted and the lower panel lists the seven non-targeted. In choosing the vector of moments, I take two cautionary steps. First, given that the model is abstract away from the capital, I regulate the chosen moments to be insensitive to the inclusion or the exclusion of capital. Second, I do not explicitly target any asset pricing moments from empirical results; I use asset pricing moments to crosscheck the model fit. In calculating the data-implied moments, I use pooled (across all firms and years) data from 1997 to 2017 and compute values with bootstrapping after removing firm and year fixed effects. In calculating model-implied moments, I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions.

Economic Mechanism

Positive adjustment cost shocks **increase** stochastic discount factor.

Adjustment cost shock is positively loaded in stochastic discount factor.

(Equivalently) Adjustment cost shock has a negative risk price.

Firms **adjusting hours** take advantage of a **positive** adjustment cost shock.

(Because a positive adjustment cost shock lowers adjustment cost.)

Firms adjusting hours generate higher cash flows.

Firms adjusting hours earn lower equity returns.

Key economic mechanism is **adjustment cost** and **adjustment cost shock**.

Understand the micro structure: adjustment cost

Understand the macro shock: adjustment cost shock

Outline

Discuss Model Implication for Labor Adjustment Cost

Adjustment cost Match **equity return predictability** of hours and employment growth

Match **pooled distributions** of hours and employment growth

By matching Discuss implication for **labor adjustment cost** main component

labor adjustment cost mostly in form of disruption to production

Discuss implication for **labor adjustment cost** on hours

important for data-consistent moments of hours and employment growth

Firm-Level Equity Return Predictability Regressions

Current high hours growth predicts low future equity return.

$$R_{j,t+1} = a_0 + a_j + a_{t+1} + b_H \times G_{jt}^H + b_N \times G_{jt}^N + e_{j,t+1}$$

Left-hand side $R_{j,t+1}$ is firm j's equity return from t to $t+1$

Right-hand side a_0 is a constant; a_j is firm fixed effect; a_{t+1} is year fixed effect

G_{jt}^H is firm j's hours growth from $t-1$ to t

G_{jt}^N is firm j's employment growth from $t-1$ to t

Data and Model Predictability of Hours Growth on Equity Return

Current high hours growth predicts low future equity return.

$$R_{j,t+1} = a_0 + a_j + a_{t+1} + b_H \times G^H_{jt} + b_N \times G^N_{jt} + e_{j,t+1}$$

		[1]	[2]	[3]	[4]	[5]	[6]
		Data			Model		
Hours Growth	b_H	-62.86^{***}		-61.11^{***}	-47.45^{***}		-47.46^{***}
	(se)	(14.74)		(14.71)	(0.95)		(0.95)
Employment Growth	b_N		-13.93^{***}	-14.96^{***}		-14.82^{***}	-14.83^{***}
	(se)		(1.43)	(2.15)		(0.38)	(0.38)
Fixed Effects		Firm,Year	Firm,Year	Firm,Year	Firm,Year	Firm,Year	Firm,Year
Observations		$23,030$	$42,063$	$23,030$	371,825	371,825	371,825
Firms		$4,473$	$5,824$	$4,473$	2,675	2,675	2,675

Compare Data and Model Firm-Level Equity Return Predictability Regressions Results. This table compares the firm-level equity return predictability regressions in data and in model. On the left-hand side, $R_{j,t+1}$ is the firm j's future annual equity return. On the right-hand side, a_0, a_j, a_{t+1} are respectively the constant, the firm fixed effects, and the year fixed effects. On the right-hand side are the firm j's current annual growth rates $G^{H,N}_{jt}$ of labor input choices hours (H) and employment (N). Each column runs one firm-level equity return predictability regression, with *, **, and *** denoting 10, 5, 1% significance levels, and standard errors in (se). I implement all regressions using panel OLS with firm standard error clusters. In examining the equity return predictability of hours growth on equity return in the data, I use the sample from 1998 to 2017 annually. In calculating model-implied predictability, I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions.

Pooled Distributions of Hours and Employment Growth

Description	Definition	Data	Model
Hours Growths			
Negative spike rate (%)	$G^H \in (-\infty, -0.2]$	0.00	0.00
Negative maintenance rate (%)	$G^H \in (-0.2, -0.1]$	1.40	3.07
Inaction rate (%)	$G^H \in (-0.1, +0.1)$	96.81	93.61
Positive maintenance rate (%)	$G^H \in [+0.1, +0.2)$	1.79	3.32
Positive spike rate (%)	$G^H \in [+0.2, +\infty)$	0.00	0.00
Employment Growths			
Negative spike rate (%)	$G^N \in (-\infty, -0.2]$	9.04	2.03
Negative maintenance rate (%)	$G^N \in (-0.2, -0.1]$	12.09	13.52
Inaction rate (%)	$G^N \in (-0.1, +0.1)$	58.60	69.03
Positive maintenance rate (%)	$G^N \in [+0.1, +0.2)$	10.13	13.16
Positive spike rate (%)	$G^N \in [+0.2, +\infty)$	10.14	2.26

Compare Data and Model Pooled Distributions of Hours and Employment Growths. This table compares the pooled distributions of hours and employment growth in data and in model. The pooled distributions are characterized by five categories. Namely, the negative spike is defined as large negative growth exceeding -20%, the negative maintenance is defined as moderate negative growth between -20% and -10%, the inactivity is defined as small growth around zero between -10% and $+10\%$, the positive maintenance is defined as moderate positive growth between $+10\%$ and $+20\%$, and the positive spike is defined as large positive growth exceeding $+20\%$. Both in model and in data, the growth is calculated using DHS method following Davis et al. (1996). In computing data-implied pooled distributions, I use the sample from 1998 to 2017 annually; in computing model-implied pooled distributions, I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions.

Pooled Distributions of Hours and Employment Growth

Disruption cost is large on both.

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Pooled Distributions of Hours and Employment Growth

Disruption cost is large on both. **Quadratic** cost is larger on hours.

Description	Definition	Data	Model
Hours Growths			
Negative spike rate (%)	$G^H \in (-\infty, -0.2]$	0.00	0.00
Negative maintenance rate (%)	$G^H \in (-0.2, -0.1]$	1.40	3.07
Inaction rate (%)	$G^H \in (-0.1, +0.1)$	96.81	93.61
Positive maintenance rate (%)	$G^H \in [+0.1, +0.2)$	1.79	3.32
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Employment Growths			
Negative spike rate (%)	$G^N \in (-\infty, -0.2]$	9.04	2.03
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Pooled Distributions of Hours and Employment Growth

Disruption cost is large on both. Quadratic cost is larger on hours. **Irreversibility** cost is larger on employment.

Description	Definition	Data	Model
Hours Growths			
Negative spike rate (%)	$G^H \in (-\infty, -0.2]$	0.00	0.00
Negative maintenance rate (%)	$G^H \in (-0.2, -0.1]$	1.40	3.07
Inaction rate (%)	$G^H \in (-0.1, +0.1)$	96.81	93.61
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Pooled Distributions of Hours and Employment Growth

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The Driving Force of Labor Adjustment Cost is Disruption

Disruption cost is large on both. Quadratic cost is larger on hours. Irreversibility cost is larger on employment.

The Driving Force of Labor Adjustment Cost is Disruption

Disruption cost is large on both. Quadratic cost is larger on hours. Irreversibility cost is larger on employment.

Fraction (in Percentage) of Labor Adjustment Cost

	Employment	Hours	
Non-convex disruption cost	70.71	19.47	90.18
Linear irreversibility cost	7.42	1.61	9.03
Convex quadratic cost	0.29	0.50	0.79
	78.42	21.58	100.00

The Driving Force of Labor Adjustment Cost. This table tabulates the model-implied relative sizes of labor adjustment cost on two margins of hours and employment and across three components of disruption, irreversibility, and quadratic costs. In calculating the model-implied relative size of labor adjustment cost, I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions. Across columns, the last column computes the relative size of respective components summing over two margins; across rows, the last row computes the relative size of respective margins summing over three components.

The Driving Force of Labor Adjustment Cost is Disruption

Firms face **labor adjustment cost** mostly in the form of **disruption to production**.

Disruption cost is large on both. Quadratic cost is larger on hours. Irreversibility cost is larger on employment.

Fraction (in Percentage) of Labor Adjustment Cost

	Employment	Hours	
Non-convex disruption cost	70.71	19.47	90.18
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Role of Adjustment Cost on Hours

Outline

Measure of Hours

Predictability of Hours Growth on Equity Return

A Production-Based Asset Pricing Model

Discuss Model Implication for Labor Adjustment Cost

Discuss Model Implication for Adjustment Cost Shock

Discuss Model Implication for Adjustment Cost Shock

Positive adjustment cost shocks **increase** stochastic discount factor.

Adjustment cost shock is positively loaded in stochastic discount factor.

(Equivalently) Adjustment cost shock has a negative risk price.

Aggregate testable implication

Firms **adjusting hours** take advantage of a **positive** adjustment cost shock.

(Because a positive adjustment cost shock lowers adjustment cost.)

Firms adjusting hours generate higher cash flows.

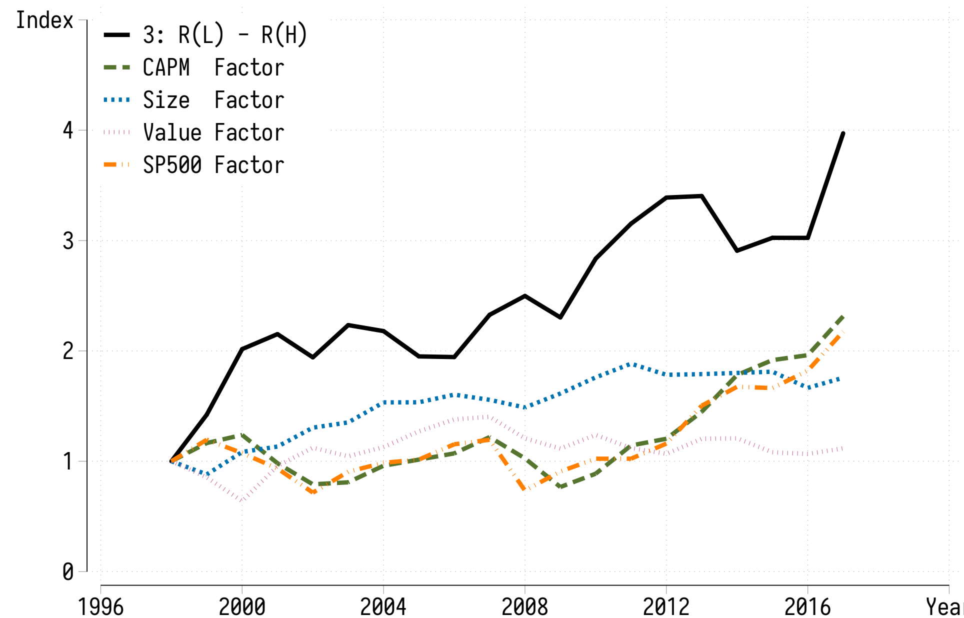
Firms adjusting hours earn lower equity returns.

Firm-level testable implication

An Adjustment Cost Shock Proxy: Intuition

Portfolios Sorted By Current Hours Growth G^H_{jt} Value-Weighted Annual Future Equity Return $R_{j,t+1}$					L-Minus-H Spread
3 Portfolio					
[Low]		[2]		[High]	[L-H]
11.44		10.51		2.76	8.68
5 Portfolio					
[Low]	[2]	[3]	[4]	[High]	[L-H]
11.64	9.24	7.54	7.15	4.97	6.66

Portfolio-Level Results. This table tabulates the main results of the portfolio-level analyses using the univariate 3 or 5 portfolios sorted by the cross-sectional hours growths. The portfolio future equity return are computed using value weights. At the end of year t, each firm's annual hours growth is measured from January of year t to December of year t; then the cross-section of firms are sorted into 3 or 5 portfolios; the portfolio future annual equity returns are defined and measured from July of year $t+1$ to June of year $t+2$.



Compare Portfolio Cumulative Returns. The figure compares the cumulative returns of five portfolios: the low-minus-high 3 portfolios sorted by current hours growth, the CAPM factor, the Fama-French size factor, the Fama-French value factor, and the SP-500 index. All cumulative returns are normalized to 1 at the end of year 1998. The the sample spans from 1998 to 2017 annually.

An Adjustment Cost Shock Proxy

An **factor-mimicking** portfolio procedure to construct a **return-based** proxy measure

$$F_t^{\mathsf{ACS}} = R_t^{\mathsf{Low}} - R_t^{\mathsf{High}}$$

Intuition: Comovement

Adjustment cost shock creates equity return difference between low- and high-hours growth portfolios

Larger adjustment cost shock enlarges such return difference

Model-implied correlation coefficient

$$\begin{aligned} \rho(F_t^{\mathsf{ACS}}, \Delta \log(X_t)) &= 53\% \\ \rho(F_t^{\mathsf{ACS}}, \Delta \log(A_t)) &= -2\% \end{aligned}$$

Positive Adjustment Cost Shocks Increase Stochastic Discount Factor

Equivalently

Adjustment cost shock is positively loaded in stochastic discount factor.

Adjustment cost shock leads to high marginal utility states.

Adjustment cost shock has a negative risk price.

Strategy

Loading of adjustment cost shock in stochastic discount factor is not directly testable.

But, risk price of adjustment cost shock is.

How?

Testing procedure: Fama-Macbeth regressions

Testing portfolios: 25 Fama-French portfolios and 17 Industry portfolios

Test Risk Price of Adjustment Cost Shock

Stochastic discount factor

$$M_t = a_M + \gamma^{\mathsf{MKT}} F_t^{\mathsf{MKT}} + \gamma^{\mathsf{ACS}} F_t^{\mathsf{ACS}}$$
$$\gamma^{\mathsf{ACS}} > 0$$

F_t^{MKT} is market (productivity) factor; F_t^{ACS} is adjustment cost shock factor.
γ^{MKT} is loading of market (productivity) factor; γ^{ACS} is loading of adjustment cost shock factor.

Beta pricing formula (an arbitrary testing portfolio ι excess return)

$$\mathbb{E}[R_{t+1}^{\iota} - R_{t+1}^{f}] = \lambda^{\mathsf{MKT}} \beta^{\mathsf{MKT}} + \lambda^{\mathsf{ACS}} \beta^{\mathsf{ACS}}$$
$$\lambda^{\mathsf{ACS}} = -\gamma^{\mathsf{ACS}} \mathbb{V}[F_t^{\mathsf{ACS}}] < 0$$

β^{MKT} is market (productivity) factor risk exposure; β^{ACS} is adjustment cost shock factor risk exposure.
λ^{MKT} is risk price of market (productivity) factor; λ^{ACS} is risk price of adjustment cost shock factor.

Derivation of Beta Pricing Formula | Estimation Procedure using Fama-Macbeth Method

Adjustment Cost Shocks Has A Negative Risk Price

$$M_t = a_M + \gamma^{\mathsf{MKT}} F_t^{\mathsf{MKT}} + \gamma^{\mathsf{ACS}} F_t^{\mathsf{ACS}} \qquad \gamma^{\mathsf{ACS}} > 0$$

$$\mathbb{E}[R_{t+1}^{\iota} - R_{t+1}^{f}] = \lambda^{\mathsf{MKT}} \beta^{\mathsf{MKT}} + \lambda^{\mathsf{ACS}} \beta^{\mathsf{ACS}} \qquad \lambda^{\mathsf{ACS}} = -\gamma^{\mathsf{ACS}} \mathbb{V}[F_t^{\mathsf{ACS}}] < 0$$

		[1]	[2]	[3]	[4]	[5]	[6]
Market (productivity) factor	λ^{MKT}	0.85^{***}	0.39^{**}	0.27^{**}	1.38^{**}	0.44^{***}	0.29^{***}
	(se)	(0.21)	(0.15)	(0.12)	(0.53)	(0.13)	(0.09)
Adjustment cost shock factor	λ^{ACS}		-0.31^{***}	-0.35^{***}		-0.28^{***}	-0.32^{***}
	(se)		(0.10)	(0.09)		(0.09)	(0.10)
Observations		500	500	500	340	340	340
Portfolios		25	25	25	17	17	17
Years		1999 – 2017	1999 – 2017	1999 – 2017	1999 – 2017	1999 – 2017	1999 – 2017
F_t^{ACS} Measurement		N.A.	3-Spread	5-Spread	N.A.	3-Spread	5-Spread
Testing Portfolios		ME-BM Sorted	ME-BM Sorted	ME-BM Sorted	Industry	Industry	Industry
Standard Errors		Newey-West	Newey-West	Newey-West	Newey-West	Newey-West	Newey-West

Asset Pricing Tests of Adjustment Cost Shock Risk Price. This table reports the asset pricing test results of adjustment cost shock risk price. The adjustment cost shock is measured as the portfolio return difference between low- and high-hours growth portfolios, where the portfolios are either three (30%-70%) or five (20%-40%-60%-80%) portfolios sorted by hours growth. I use two sets of testing portfolios, the Fama-French 25 portfolios size (ME) and book-to-market (BM) sorted and Fama-French 17 industry portfolios. I estimate the risk prices using Fama-Macbeth method with *, **, and *** denoting 10, 5, 1% significance levels, and with Newey-West optimal lag of two standard errors in (se). I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Adjustment Cost Shocks Has A Negative Risk Price

A shock that **reduces labor adjustment friction** leads to **high** marginal utility states.

		[1]	[2]	[3]	[4]	[5]	[6]
Market (productivity) factor	λ^{MKT}	0.85^{***}	0.39^{**}	0.27^{**}	1.38^{**}	0.44^{***}	0.29^{***}
	(se)	(0.21)	(0.15)	(0.12)	(0.53)	(0.13)	(0.09)
Adjustment cost shock factor	λ^{ACS}		-0.31^{***}	-0.35^{***}		-0.28^{***}	-0.32^{***}
	(se)		(0.10)	(0.09)		(0.09)	(0.10)
Observations		500	500	500	340	340	340
Portfolios		25	25	25	17	17	17
Years		$1999-2017$	$1999-2017$	$1999-2017$	$1999-2017$	$1999-2017$	$1999-2017$
F_t^{ACS} Measurement		N.A.	3-Spread	5-Spread	N.A.	3-Spread	5-Spread
Testing Portfolios		ME-BM Sorted	ME-BM Sorted	ME-BM Sorted	Industry	Industry	Industry
Standard Errors		Newey-West	Newey-West	Newey-West	Newey-West	Newey-West	Newey-West

Asset Pricing Tests of Adjustment Cost Shock Risk Price. This table reports the asset pricing test results of adjustment cost shock risk price. The adjustment cost shock is measured as the portfolio return difference between low- and high-hours growth portfolios, where the portfolios are either three (30%-70%) or five (20%-40%-60%-80%) portfolios sorted by hours growth. I use two sets of testing portfolios, the Fama-French 25 portfolios size (ME) and book-to-market (BM) sorted and Fama-French 17 industry portfolios. I estimate the risk prices using Fama-Macbeth method with *, **, and *** denoting 10, 5, 1% significance levels, and with Newey-West optimal lag of two standard errors in (se). I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Firm-Level Equity Return Predictability Regressions

$$R_{j,t+1} = b^{(1)} \times F_t^{\mathsf{ACS}} + \sum_{p=2}^{P} b^{(p)} \times F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in p} + c^{(1)} + \sum_{p=2}^{P} c^{(p)} \times \mathbf{1}_{G_{jt}^H \in p} + d \times \Gamma_{jt} + e_{j,t+1}$$

Left-hand side $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$

Right-hand side F_t^{ACS} is adjustment cost shock factor measured from July of year t to June of year $t+1$

$\mathbf{1}_{G_{jt}^H \in p}$ is 1 iff firm j's hours growth G_{jt} from Jan to Dec of year t is in the p-th portfolio, where the P-portfolios are sorted by hours growth in the cross-section

Γ_{jt} is a vector of firm j's control variables (e.g., cash flow, output) measured at end of year t

Firm-Level Equity Return Predictability Regressions

$$R_{j,t+1} = b^{(1)} \times F_t^{\mathsf{ACS}} + \sum_{p=2}^{P} b^{(p)} \times F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in p} + c^{(1)} + \sum_{p=2}^{P} c^{(p)} \times \mathbf{1}_{G_{jt}^H \in p} + d \times \Gamma_{jt} + e_{j,t+1}$$

F_t^{ACS} is adjustment cost shock factor measured from July of year t to June of year $t+1$;
$\mathbf{1}_{G_{jt}^H \in p}$ is 1 iff firm j's hours growth G_{jt} from Jan to Dec of year t is in the p-th portfolio.

Firms with **higher** hours growth respond **more** to adjustment cost shock.

More responsiveness to adjustment cost shock leads to **lower** equity return.

$$\begin{aligned} F_t^{\mathsf{ACS}} \uparrow \quad &\Rightarrow \quad |b^{(3)}| > |b^{(2)}| > |b^{(1)}| \\ \lambda^{\mathsf{ACS}} < 0 \quad &\Rightarrow \quad b^{(3)} < b^{(2)} < b^{(1)} \end{aligned}$$

Jointly (1) test model mechanism and (2) validate empirical proxy.

Response of Firm-Level Equity Return to Adjustment Cost Shock

$$R_{j,t+1} = b^{(1)} \times F_t^{\mathsf{ACS}} + \Sigma_{p=2}^{P} b^{(p)} \times F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in p} + c^{(1)} + \Sigma_{p=2}^{P} c^{(p)} \times \mathbf{1}_{G_{jt}^H \in p} + d \times \Gamma_{jt} + e_{j,t+1}$$

		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	0.01	-0.00	0.01	-0.05	-0.07	-0.06
	(se)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 2}$	$b^{(2)}$	-0.23^{***}	-0.23^{***}	-0.25^{***}	-0.03	-0.03	-0.04
	(se)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 3}$	$b^{(3)}$	-0.44^{***}	-0.42^{***}	-0.44^{***}	0.00	-0.00	-0.01
	(se)	(0.10)	(0.10)	(0.10)	(0.05)	(0.05)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 4}$	$b^{(4)}$				-0.20^{***}	-0.20^{***}	-0.21^{***}
	(se)				(0.06)	(0.06)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 5}$	$b^{(5)}$				-0.37^{***}	-0.35^{***}	-0.37^{***}
	(se)				(0.09)	(0.09)	(0.09)
Portfolios		$P = 3$	$P = 3$	$P = 3$	$P = 5$	$P = 5$	$P = 5$
Firm Controls		No	Equity Return	Cash Flow	No	Equity Return	Cash Flow
Observations		21369	21369	18936	21369	21369	18936
Firms		4428	4428	3635	4428	4428	3635

Response of Firm-Level Equity Return to Adjustment Cost Shock. This table reports response of firm-level equity return to adjustment cost shock, in the form of equity return predictability regression. On the left hand side, $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$. On the right hand side, F_t^{ACS} is adjustment cost factor measured from July of year t to June of year $t+1$, $\mathbf{1}(G_{jt}^H \in p)$ is dummy variable taking value of 1 if firm j's hours growth from January to December of year t is in the p-th portfolio, where the P-portfolios are sorted by hours growth in the cross-section, and Γ_{jt} is a vector of firm j's control variables (e.g., cash flow, output) measured at end of year t, or equity return measured from July of year t to June of year $t+1$. I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Response of Firm-Level Equity Return to Adjustment Cost Shock

$$R_{j,t+1} = b^{(1)} \times F_t^{\mathsf{ACS}} + \Sigma_{p=2}^{P} b^{(p)} \times F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in p} + c^{(1)} + \Sigma_{p=2}^{P} c^{(p)} \times \mathbf{1}_{G_{jt}^H \in p} + d \times \Gamma_{jt} + e_{j,t+1}$$

		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	0.01	-0.00	0.01	-0.05	-0.07	-0.06
	(se)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 2}$	$b^{(2)}$	-0.23^{***}	-0.23^{***}	-0.25^{***}	-0.03	-0.03	-0.04
	(se)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 3}$	$b^{(3)}$	-0.44^{***}	-0.42^{***}	-0.44^{***}	0.00	-0.00	-0.01
	(se)	(0.10)	(0.10)	(0.10)	(0.05)	(0.05)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 4}$	$b^{(4)}$				-0.20^{***}	-0.20^{***}	-0.21^{***}
	(se)				(0.06)	(0.06)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 5}$	$b^{(5)}$				-0.37^{***}	-0.35^{***}	-0.37^{***}
	(se)				(0.09)	(0.09)	(0.09)
Portfolios		$P = 3$	$P = 3$	$P = 3$	$P = 5$	$P = 5$	$P = 5$
Firm Controls		No	Equity Return	Cash Flow	No	Equity Return	Cash Flow
Observations		21369	21369	18936	21369	21369	18936
Firms		4428	4428	3635	4428	4428	3635

Response of Firm-Level Equity Return to Adjustment Cost Shock. This table reports response of firm-level equity return to adjustment cost shock, in the form of equity return predictability regression. On the left hand side, $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$. On the right hand side, F_t^{ACS} is adjustment cost factor measured from July of year t to June of year $t+1$, $\mathbf{1}(G_{jt}^H \in p)$ is dummy variable taking value of 1 if firm j's hours growth from January to December of year t is in the p-th portfolio, where the P-portfolios are sorted by hours growth in the cross-section, and Γ_{jt} is a vector of firm j's control variables (e.g., cash flow, output) measured at end of year t, or equity return measured from July of year t to June of year $t+1$. I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Response of Firm-Level Equity Return to Adjustment Cost Shock

$$R_{j,t+1} = b^{(1)} \times F_t^{\mathsf{ACS}} + \Sigma_{p=2}^{P} b^{(p)} \times F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in p} + c^{(1)} + \Sigma_{p=2}^{P} c^{(p)} \times \mathbf{1}_{G_{jt}^H \in p} + d \times \Gamma_{jt} + e_{j,t+1}$$

		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	0.01	-0.00	0.01	-0.05	-0.07	-0.06
	(se)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 2}$	$b^{(2)}$	-0.23^{***}	-0.23^{***}	-0.25^{***}	-0.03	-0.03	-0.04
	(se)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 3}$	$b^{(3)}$	-0.44^{***}	-0.42^{***}	-0.44^{***}	0.00	-0.00	-0.01
	(se)	(0.10)	(0.10)	(0.10)	(0.05)	(0.05)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 4}$	$b^{(4)}$				-0.20^{***}	-0.20^{***}	-0.21^{***}
	(se)				(0.06)	(0.06)	(0.06)
$F_t^{\mathsf{ACS}} \times \mathbf{1}_{G_{jt}^H \in 5}$	$b^{(5)}$				-0.37^{***}	-0.35^{***}	-0.37^{***}
	(se)				(0.09)	(0.09)	(0.09)
Portfolios		$P=3$	$P=3$	$P=3$	$P=5$	$P=5$	$P=5$
Firm Controls		No	Equity Return	Cash Flow	No	Equity Return	Cash Flow
Observations		21369	21369	18936	21369	21369	18936
Firms		4428	4428	3635	4428	4428	3635

Response of Firm-Level Equity Return to Adjustment Cost Shock. This table reports response of firm-level equity return to adjustment cost shock, in the form of equity return predictability regression. On the left hand side, $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$. On the right hand side, F_t^{ACS} is adjustment cost factor measured from July of year t to June of year $t+1$, $\mathbf{1}(G_{jt}^H \in p)$ is dummy variable taking value of 1 if firm j's hours growth from January to December of year t is in the p-th portfolio, where the P-portfolios are sorted by hours growth in the cross-section, and Γ_{jt} is a vector of firm j's control variables (e.g., cash flow, output) measured at end of year t, or equity return measured from July of year t to June of year $t+1$. I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Response of Firm-Level Equity Return to Adjustment Cost Shock

$$R_{j,t+1} = b^{(1)} \times F_t^{\text{ACS}} + \Sigma_{p=2}^{P} b^{(p)} \times F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in p} + c^{(1)} + \Sigma_{p=2}^{P} c^{(p)} \times \mathbf{1}_{G_{jt}^H \in p} + d \times \Gamma_{jt} + e_{j,t+1}$$

		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	0.01	-0.00	0.01	-0.05	-0.07	-0.06
	(se)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 2}$	$b^{(2)}$	-0.23^{***}	-0.23^{***}	-0.25^{***}	-0.03	-0.03	-0.04
	(se)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 3}$	$b^{(3)}$	-0.44^{***}	-0.42^{***}	-0.44^{***}	0.00	-0.00	-0.01
	(se)	(0.10)	(0.10)	(0.10)	(0.05)	(0.05)	(0.06)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 4}$	$b^{(4)}$				-0.20^{***}	-0.20^{***}	-0.21^{***}
	(se)				(0.06)	(0.06)	(0.06)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 5}$	$b^{(5)}$				-0.37^{***}	-0.35^{***}	-0.37^{***}
	(se)				(0.09)	(0.09)	(0.09)
Portfolios		$P = 3$	$P = 3$	$P = 3$	$P = 5$	$P = 5$	$P = 5$
Firm Controls		No	Equity Return	Cash Flow	No	Equity Return	Cash Flow
Observations		21369	21369	18936	21369	21369	18936
Firms		4428	4428	3635	4428	4428	3635

Response of Firm-Level Equity Return to Adjustment Cost Shock. This table reports response of firm-level equity return to adjustment cost shock, in the form of equity return predictability regression. On the left hand side, $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$. On the right hand side, F_t^{ACS} is adjustment cost factor measured from July of year t to June of year $t+1$, $\mathbf{1}(G_{jt}^H \in p)$ is dummy variable taking value of 1 if firm j's hours growth from January to December of year t is in the p-th portfolio, where the P-portfolios are sorted by hours growth in the cross-section, and Γ_{jt} is a vector of firm j's control variables (e.g., cash flow, output) measured at end of year t, or equity return measured from July of year t to June of year $t+1$. I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Response of Firm-Level Equity Return to Adjustment Cost Shock

Firms adjusting hours more respond more to **adjustment cost shock** and earn lower equity returns

		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	0.01	-0.00	0.01	-0.05	-0.07	-0.06
	(se)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 2}$	$b^{(2)}$	-0.23^{***}	-0.23^{***}	-0.25^{***}	-0.03	-0.03	-0.04
	(se)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 3}$	$b^{(3)}$	-0.44^{***}	-0.42^{***}	-0.44^{***}	0.00	-0.00	-0.01
	(se)	(0.10)	(0.10)	(0.10)	(0.05)	(0.05)	(0.06)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 4}$	$b^{(4)}$				-0.20^{***}	-0.20^{***}	-0.21^{***}
	(se)				(0.06)	(0.06)	(0.06)
$F_t^{\text{ACS}} \times \mathbf{1}_{G_{jt}^H \in 5}$	$b^{(5)}$				-0.37^{***}	-0.35^{***}	-0.37^{***}
	(se)				(0.09)	(0.09)	(0.09)
Portfolios		$P=3$	$P=3$	$P=3$	$P=5$	$P=5$	$P=5$
Firm Controls		No	Equity Return	Cash Flow	No	Equity Return	Cash Flow
Observations		21369	21369	18936	21369	21369	18936
Firms		4428	4428	3635	4428	4428	3635

Response of Firm-Level Equity Return to Adjustment Cost Shock. This table reports response of firm-level equity return to adjustment cost shock, in the form of equity return predictability regression. On the left hand side, $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$. On the right hand side, F_t^{ACS} is adjustment cost factor measured from July of year t to June of year $t+1$, $\mathbf{1}(G_{jt}^H \in p)$ is dummy variable taking value of 1 if firm j's hours growth from January to December of year t is in the p-th portfolio, where the P-portfolios are sorted by hours growth in the cross-section, and Γ_{jt} is a vector of firm j's control variables (e.g., cash flow, output) measured at end of year t, or equity return measured from July of year t to June of year $t+1$. I use the sample from 1998 to 2017 annually so the asset pricing tests use data from 1999 to 2017 annually.

Cash Flow Dynamics | Additional Firm Controls

Conclusion

Present a new empirical fact utilizing a measure of hours

Current high hours growth is associated with low future equity return

A 1% increase in hours predicts a 0.6% drop in equity return annually

Build a production-based asset pricing model with labor adjustment cost

Firms make explicit labor input decisions of hours and employment

Match firm-level moments, pooled distributions, and equity return predictability of hours and employment growth

Discuss model implications for labor adjustment cost

Firms face labor adjustment cost mostly in form of disruption to production

The labor adjustment cost on hours is important for data-consistent moments of hours and employment growth

Discuss model implications for adjustment cost shock

A shock that reduces labor adjustment friction leads to high marginal utility states

Firms adjusting hours more respond more to adjustment cost shock and earn lower equity returns

Thank You

CCM Employment and Capital Definition

Capital K_{jt} is lagged `PPENT` (total net property, plant and equipment); **Investment** I_{jt} is `CAPX` (capital expenditures) minus `SPPE` (sales of property, plant, and equipment), where missing values of `SPPE` are supplemented as zeros; **Employment** N_{jt} is `EMP` (employees).

Baseline Definition:

$$G_{jt}^{K} = \frac{I_{jt}}{0.5 \times (K_{j,t+1} + K_{jt})}; G_{jt}^{N} = \frac{N_{jt} - N_{j,t-1}}{0.5 \times (N_{jt} + N_{j,t-1})};$$

Alternative Definition:

$$G_{jt}^{K} = \frac{K_{j,t+1} - K_{jt}}{0.5 \times (K_{j,t+1} + K_{jt})}; G_{jt}^{K} = \frac{I_{jt}}{K_{jt}}; G_{jt}^{K} = \frac{K_{j,t+1} - K_{jt}}{K_{jt}}; G_{jt}^{N} = \frac{N_{jt} - N_{j,t-1}}{N_{j,t-1}};$$

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CPS Weight and Hours Definition

First Step is control for (1) labor force status (`labforce`), (2) employment status (`empstat`), (3) classes of works (`classwrk`), and (4) full- or part-time workers (`wkstat`).

Second Step is define (1) hours usually worked per week at all jobs (`uhrsworkt`), (2) hours usually worked per week at main job (`uhrswork1`), and (3) sample weight (`asecwt`).

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CPS Number of Persons in One (Ind,Occ) No Less Than 20

	Sample # Obs			%-iles of # Obs in One (Ind, Occ)				# Obs in One (Ind, Occ) No Less Than n		
	Original	Selected	Nomiss	p30	p35	p40	p45	n=10	n=20	n=30
Year	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
1997	131,854	52,905	47,873	9	13	17	23	29,427	24,689	21,793
1998	131,617	53,640	25,280	5	7	9	12	14,738	12,093	10,571
1999	132,324	54,124	49,090	10	13	18	24	30,922	25,550	22,694
2000	133,710	55,408	50,521	10	14	19	25	32,046	26,971	23,847
2001	218,269	88,476	80,817	16	22	31	40	56,054	48,806	44,243
2002	217,219	85,994	78,095	16	23	31	42	53,935	47,322	43,018
2003	216,424	84,756	76,515	13	18	23	32	51,280	44,059	39,138
2004	213,241	84,013	75,840	13	18	25	33	50,124	43,133	38,836
2005	210,648	83,101	74,694	12	17	25	34	49,205	42,250	38,137
2006	208,562	83,621	75,480	13	18	25	35	49,830	42,773	38,676
2007	206,639	83,273	76,091	13	19	27	36	50,305	43,697	39,636

	Sample # Obs			%-iles of # Obs in One (Ind, Occ)				# Obs in One (Ind, Occ) No Less Than n		
	Original	Selected	Nomiss	p30	p35	p40	p45	n=10	n=20	n=30
Year	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
2008	206,404	82,530	75,365	13	18	25	36	50,040	43,054	38,654
2009	207,921	79,359	72,299	13	18	26	34	48,015	41,271	37,444
2010	209,802	78,399	71,680	12	18	24	33	47,688	41,229	37,092
2011	204,983	76,991	70,524	12	17	23	33	46,744	39,930	36,340
2012	201,398	76,746	70,262	12	17	23	32	46,722	40,345	36,140
2013	202,634	77,334	71,043	12	17	24	34	46,980	40,736	36,494
2014	199,556	77,043	69,061	12	17	24	33	45,866	39,526	35,852
2015	199,024	77,116	71,212	13	18	26	36	47,606	41,130	37,244
2016	185,487	72,220	67,018	12	18	25	35	44,387	38,473	34,817
2017	185,914	73,235	68,171	13	18	25	35	45,358	39,254	35,401

Summary Statistics of Number of Persons in One (Ind,Occ) in BLS/Current Population Survey (CPS). This table tabulates the summary statistics of Number of Persons in One (Ind,Occ) in BLS/CPS - Annual Social and Economic (ASEC) supplement. In columns [1] to [3], the number of observations are listed, where the column [1] represents the original sample, the column [2] the sample after selection procedure, and the column [3] the sample with non-missing individual hours measures. In columns [4] to [7], the percentiles of number of observations in one industry-occupation pair are calculated. From these columns, it can be inferred that the control of 20 observations in one industry-occupation pair of each year corresponds to about 37% of observations. Finally, the columns [8] to [10] present the numbers of observations when controlling the requirement for number of observations within one industry-occupation pair of each year.

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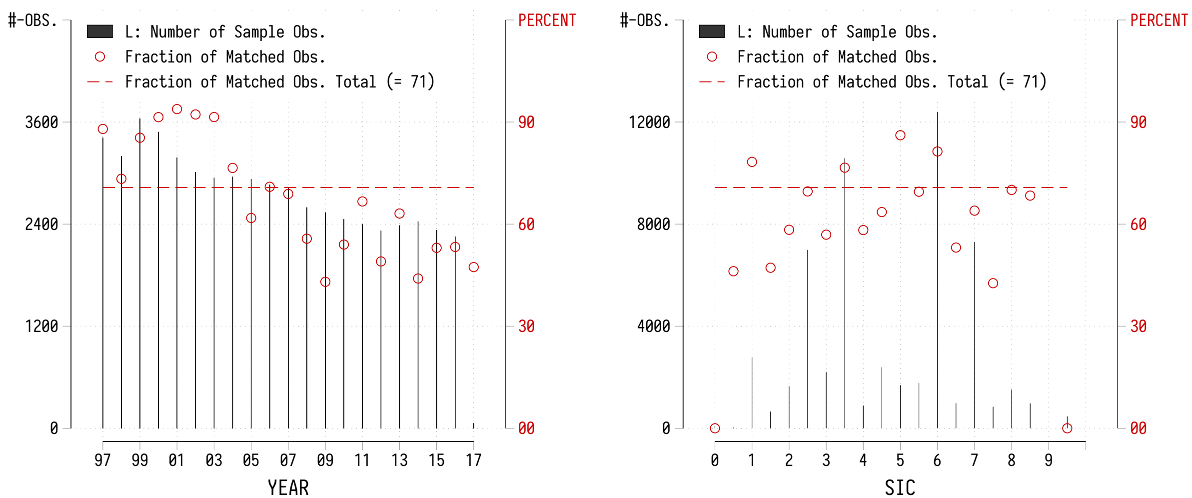
My Measure of Hours Identifies 71% of Observations in Three Major Exchanges



Identified Observations Across Year (1997-2017) and Across SIC3 (500-Bins). The left vertical axis scales the number of observations by year (left panel) or by SIC (right panel); the right vertical axis measures the fraction of matched observations in percentages. Overall, my measure of hours landed 71% of observations in the dataset of public firms from 1997 to 2017.

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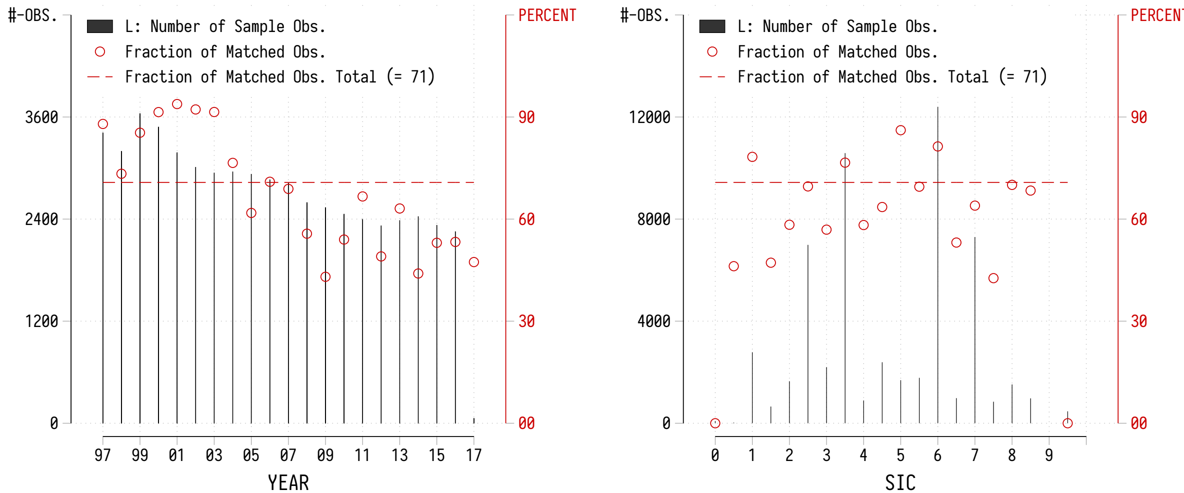
Identified Observations Distribute Uniformly across Year and SIC3



Identified Observations Across Year (1997-2017) and Across SIC3 (500-Bins). The left vertical axis scales the number of observations by year (left panel) or by SIC (right panel); the right vertical axis measures the fraction of matched observations in percentages. Overall, my measure of hours landed 71% of observations in the dataset of public firms from 1997 to 2017.

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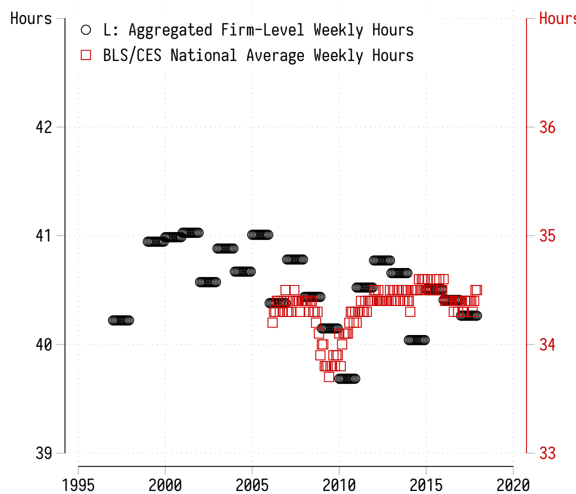
My Measure of Hours Implied Aggregate Hours Is Similar to National Average



Compare Aggregated Firm-Level Hours to National Average Hours. The figure compares the aggregated firm-level hours to national average hours from BLS/Current Employment Statistics (CES) program dataset. I plot the aggregated firm-level weekly hours on the left vertical axis, and the national average weekly hours from BLS/CES dataset on the right vertical axis. The firm-level measure of hours is annual. To facilitate a better comparison, I intensify the aggregated firm-level weekly hours to monthly by assigning the end-of-year annual value to all months within the year (backward-filling). This explains the horizontal bars in the aggregated firm-level weekly hours.

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Predictability is Not Driven by Industrial-Specific Occupation Weights

Alternative Occupation Weights

$$
\begin{aligned}
(1)\quad \mathsf{Hour}_t^{(i)} &= \sum_{o\in \mathsf{OES}_t(i)} \left(\frac{\mathsf{Empt}_t^{(i,o)} \times \mathsf{Wage}_t^{(i,o)}}{\sum_{o\in \mathsf{OES}_t(i)} \mathsf{Empt}_t^{(i,o)} \times \mathsf{Wage}_t^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right) \\
(2)\quad \mathsf{Hour}_t^{(i)} &= \sum_{o\in \mathsf{OES}_t(i)} \left(\frac{\mathsf{Empt}_t^{(i,o)}}{\sum_{o\in \mathsf{OES}_t(i)} \mathsf{Empt}_t^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right) \\
(3)\quad \mathsf{Hour}_t^{(i)} &= \sum_{o\in \mathsf{OES}_t(i)} \left(\frac{\mathsf{Wage}_t^{(i,o)}}{\sum_{o\in \mathsf{OES}_t(i)} \mathsf{Wage}_t^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right) \\
(4)\quad \mathsf{Hour}_t^{(i)} &= \sum_{o\in \mathsf{OES}_t(i)} \left(\frac{1}{||\mathsf{OES}(t, ind)||} \times \mathsf{Hour}_t^{(i,o)} \right)
\end{aligned}
$$

Predictability is Not Driven by Industrial-Specific Occupation Weights

	M.Cost		Wage		Emp't		Equal	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
β_H	-62.86	-60.23	-53.86	-50.47	-71.68	-68.27	-66.00	-62.13
[t]	-4.26	-4.10	-3.82	-3.59	-5.56	-5.31	-5.13	-4.84
β_N		-11.23		-11.20		-11.74		-11.73
[t]		-5.02		-5.00		-6.62		-6.60
β_K		-8.73		-8.75		-7.90		-7.93
[t]		-5.21		-5.22		-5.91		-5.92
# Obs.	23030	23030	23030	23030	34686	34686	34686	34686
# Firms	4473	4473	4473	4473	4978	4978	4978	4978

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Predictability is Not Driven by Industrial-Specific Occupation Composition

Alternative Occupation Composition

$$(1)\quad \mathsf{Hour}_t^{(i)} = \sum_{o\in \mathsf{OES}_t(i)} \left(\frac{\mathsf{Empt}_t^{(i,o)} \times \mathsf{Wage}_t^{(i,o)}}{\sum_{o\in \mathsf{OES}_t(i)} \mathsf{Empt}_t^{(i,o)} \times \mathsf{Wage}_t^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right)$$

$$(2)\quad \mathsf{Hour}_t^{(i)} = \sum_{o\in \mathsf{OES}_{t_0}(i)} \left(\frac{\mathsf{Empt}_{t_0}^{(i,o)} \times \mathsf{Wage}_{t_0}^{(i,o)}}{\sum_{o\in \mathsf{OES}_{t_0}(i)} \mathsf{Empt}_{t_0}^{(i,o)} \times \mathsf{Wage}_{t_0}^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right)$$

$$(3)\quad \mathsf{Hour}_t^{(i)} = \sum_{o\in \mathsf{OES}_T(i)} \left(\frac{\mathsf{Empt}_T^{(i,o)} \times \mathsf{Wage}_T^{(i,o)}}{\sum_{o\in \mathsf{OES}_T(i)} \mathsf{Empt}_T^{(i,o)} \times \mathsf{Wage}_T^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right)$$

$$(4)\quad \mathsf{Hour}_t^{(i)} = \begin{cases} \sum_{o\in \mathsf{OES}_{t-1}(i)} \left(\frac{\mathsf{Empt}_{t-1}^{(i,o)} \times \mathsf{Wage}_{t-1}^{(i,o)}}{\sum_{o\in \mathsf{OES}_{t-1}(i)} \mathsf{Empt}_{t-1}^{(i,o)} \times \mathsf{Wage}_{t-1}^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right) & t > t_0 \\ \sum_{o\in \mathsf{OES}_t(i)} \left(\frac{\mathsf{Empt}_t^{(i,o)} \times \mathsf{Wage}_t^{(i,o)}}{\sum_{o\in \mathsf{OES}_t(i)} \mathsf{Empt}_t^{(i,o)} \times \mathsf{Wage}_t^{(i,o)}} \times \mathsf{Hour}_t^{(i,o)} \right) & t = t_0 \end{cases}$$

Predictability is Not Driven by Industrial-Specific Occupation Composition

	Current		Staring		Ending		Previous	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
β_H	-62.86	-60.23	-62.18	-59.39	-67.85	-65.57	-64.87	-61.69
[t]	-4.26	-4.10	-4.54	-4.36	-4.69	-4.56	-4.49	-4.29
β_N		-11.23		-11.66		-12.00		-11.37
[t]		-5.02		-5.65		-5.19		-5.02
β_K		-8.73		-8.18		-8.88		-9.17
[t]		-5.21		-5.16		-5.14		-5.04
# Obs.	23030	23030	27275	27275	23296	23296	23934	23934
# Firms	4473	4473	4578	4578	4493	4493	4462	4462

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Predictability Remains With Industrial Representative Firms

	Firm-Level				Industry-Level			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
β_H	-62.86	-60.23	-61.11	-61.09	-35.92	-34.77	-35.71	-34.69
(se)	14.74	14.67	14.71	14.69	15.74	15.10	15.15	15.48
[t]	-4.26	-4.10	-4.15	-4.16	-2.28	-2.30	-2.36	-2.24
β_N		-11.23	-14.96			-9.13	-11.95	
(se)		2.24	2.15			4.87	5.28	
[t]		-5.02	-6.95			-1.88	-2.26	
β_K		-8.73		-11.68		-9.74		-12.19
(se)		1.67		1.59		6.30		6.48
[t]		-5.21		-7.35		-1.55		-1.88
# Obs.	23030	23030	23030	23030	2212	2212	2212	2212
# Firms	4473	4473	4473	4473	223	223	223	223

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One Standard Deviation Increase - One Percentage Point Increase

The firm-level equity return predictability regression of

$$R_{j,t+1} = \beta_H G^H_{j,t} + \beta_N G^N_{j,t} + \beta_K G^K_{j,t} + \text{constant+FEs+erros}$$

$$\begin{array}{llllll} \beta_H = & \text{-60.23-bps} & \sigma(G^H) = & .04 & \text{1SE} = & \text{2.40-pct} \\ \beta_N = & \text{-11.23-bps} & \sigma(G^N) = & .21 & \text{1SE} = & \text{2.36-pct} \\ \beta_K = & \text{-8.73-bps} & \sigma(G^K) = & .29 & \text{1SE} = & \text{2.53-pct} \end{array}$$

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Equity Return Predictability Regression Results w/ Investment Ratio

		$R_{j,t+1} = \beta_H G^H_{j,t} + \beta_N G^N_{j,t} + \beta_K G^K_{j,t} + \text{constant}$						
		[1]	[2]	[3]	[4]	[5]	[6]	[7]
1	β_H	-62.86	-60.23	-61.11	-61.09			
	(se)	14.74	14.67	14.71	14.69			
2	β_N		-11.23	-14.96		-11.06	-13.93	
	(se)		2.24	2.15		1.48	1.43	
3	β_K		-8.73		-11.68	-6.92		-9.62
	(se)		1.67		1.59	1.21		1.15
4	# Obs.	23030	23030	23030	23030	42063	42063	42063
	# Firms	4473	4473	4473	4473	5824	5824	5824

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Equity Return Predictability Regression Results w/ Pricing Factors

		$R_{j,t+1} = \beta_H G^H_{j,t} + \beta_N G^N_{j,t} + \beta_K G^K_{j,t} + \boldsymbol{\beta F} + \text{constant}$						
		[1]	[2]	[3]	[4]	[5]	[6]	[7]
1	β_H	-53.86	-53.83	-54.00	-53.65			
	(se)	13.35	13.36	13.35	13.36			
2	β_N		2.69	1.52		0.70	-0.34	
	(se)		2.19	2.13		1.47	1.43	
3	β_K		-3.06		-2.33	-2.81		-2.63
	(se)		1.76		1.74	1.30		1.27
4	# Obs.	23029	23029	23029	23029	42062	42062	42062
	# Firms	4473	4473	4473	4473	5824	5824	5824

$\boldsymbol{F}$ is a vector of five well-documented pricing factors, namely, the market capitalization (size) and book-to-market ratio (Fama and French [1992, 1993]), the investment-to-assets and return-on-equity (Hou, Xue and Zhang [2015]), and the profitability (Novy-Marx [2013])

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Equity Return Predictability Regression Alternative Specifications

$$R_{j,t+1} = \beta_H G^H_{j,t} + \beta_N G^N_{j,t} + \beta_K G^K_{j,t} + \boldsymbol{\beta F} + \text{constant}$$

		Main	Fixed Effects Variation			Cluster Variation		Outliers Variation		
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A		- Baseline Regression Without Pricing Factors Vector $\boldsymbol{F}$								
1	β_H	-60.23	-53.45	-24.73	-27.69	-60.23	-27.69	-60.16	-60.81	-61.42
	(se)	14.67	12.56	11.05	10.41	13.03	10.45	14.51	14.95	14.64
2	β_N	-11.23	-7.54	-11.82	-9.24	-11.23	-9.24	-6.72	-13.50	-0.68
	(se)	2.24	1.59	2.00	1.59	2.08	1.65	1.98	2.95	0.45
3	β_K	-8.73	-5.07	-10.05	-6.70	-8.73	-6.70	-6.72	-12.64	-10.82
	(se)	1.67	1.07	1.54	1.09	1.61	1.12	1.51	2.28	1.61
4	# Obs.	23030	23030	23030	23030	23030	23030	23464	22605	23241
	# Firms	4473	4473	4473	4473	4473	4473	4508	4436	4493

Column [1] original; column [2] without firm FE; column [3] without year FE; column [4] without FEs; column [5] without firm se clusters; column [6] without FEs nor clusters; column [7] with truncation of GN and GK 2-percent outliers; column [8] with winsorization of GN and GK 1-percent outliers; column [9] with truncation of GK 1-percent outliers.

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Equity Return Predictability Fama-MacBeth Regressions

		$R_{j,t+1} = \beta_H G^H_{j,t} + \beta_N G^N_{j,t} + \beta_K G^K_{j,t} + \boldsymbol{\beta F}$ + constant							
		W/O Factors				W/ Factors			
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
1	β_H	-58.18	-48.70	-49.18	-56.76	-87.55	-99.35	-94.28	-93.78
	(se)	38.61	40.17	40.22	38.65	37.49	42.80	41.16	39.69
2	β_N		-8.66	-10.53			3.28	1.96	
	(se)		4.66	4.80			6.05	6.39	
3	β_K		-4.17		-5.74		-2.30		-2.51
	(se)		1.70		1.88		1.93		2.31
4	# Obs.	23030	23030	23030	23030	23029	23029	23029	23029
	# Firms	4473	4473	4473	4473	4473	4473	4473	4473

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Economic Forces for Adjustment Cost Shock

- change of labor efficiency (Greenwood-Hercowitz-Krusell-AER1997-EER2000)
- change of labor input price (Papanikolaou-JPE2011; Kogan-Papanikolaou-RFS2013-JF2014)
- change of labor market condition (Belo-Li-Lin-Zhao-RFS2017; Kuehn-Simutin-Wang-JF2017)
- change of labor substitutes input (automation) (Zhang-JF2019; Acemoglu-Restrepo-JPE2020)

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Loadings of Stochastic Discount Factor on Aggregate Shocks

Stochastic discount factor a function of aggregate shocks

$$M_{+1} = (R^f_{+1})^{-1} \frac{\exp\{\gamma_A \Delta \log(A_{+1}) + \gamma_X \Delta \log(X_{+1})\}}{\mathbb{E}[\exp\{\gamma_A \Delta \log(A_{+1}) + \gamma_X \Delta \log(X_{+1})\}]}$$

where R^f_{+1} and $\mathbb{E}[\exp\{\gamma_A \Delta \log(A_{+1}) + \gamma_X \Delta \log(X_{+1})\}]$ terms are to deliver

$$1 = \mathbb{E}[M_{+1} R^f_{+1}]$$

- $\gamma_A < 0$ is loading of SDF on the aggregate productivity shock
  - low productivity, low output, low consumption, high marginal utility
  - simplified from household side
- $\gamma_X > 0$ is loading of SDF on the adjustment cost shock
  - big wedge, low adjustment cost, investment crowding out consumption
  - abstract away from capital

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Role of Adjustment Cost on Hours

Firm-Level Moments

Description	Definition	Data	Counterfactual
Targeted			
Kurtosis of hours growth	$kurt(G^H)$	13.783	4.009
Kurtosis of employment growth	$kurt(G^N)$	7.750	7.119
Persistence of hours growth	$rho(G^H)$	-0.376	-0.296
Persistence of employment growth	$rho(G^N)$	-0.005	-0.045
Same-period correlation coefficient	$corr(G^H, G^N)$	0.029	-0.066
Cross-period correlation coefficient	$corr(G^H, G^N_{-1})$	-0.024	-0.149
Non-Targeted			
Cross-period correlation coefficient	$corr(G^H_{-1}, G^N)$	0.012	0.183
Mean of hours growth	$mean(G^H)$	0.001	0.002
Mean of employment growth	$mean(G^N)$	0.051	0.002
Variance of hours growth	$var(G^H)$	0.001	0.005
Variance of employment growth	$var(G^N)$	0.044	0.007
Skewness of hours growth	$skew(G^H)$	0.156	0.299
Skewness of employment growth	$skew(G^N)$	0.371	0.616

Compare Data- and Model-Implied Moments of Firm-Level Hours and Employment. This table summarizes the moments matching between data and baseline model. In presenting the moments, the upper panel lists the six targeted and the lower panel lists the seven non-targeted. In choosing the vector of moments, I take two cautionary steps. First, given that the model is abstract away from the capital, I regulate the chosen moments to be insensitive to the inclusion or the exclusion of capital. Second, I do not explicitly target any asset pricing moments from empirical results; I use asset pricing moments to crosscheck the model fit. In calculating the data-implied moments, I use pooled (across all firms and years) data from 1997 to 2017 and compute values with bootstrapping after removing firm and year fixed effects. In calculating model-implied moments, I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions.

Role of Adjustment Cost on Hours

Pooled Distributions

Description	Definition	Data	Counterfactual
Hours Growths			
Negative spike rate (%)	$G^H \in (-\infty, -0.2]$	0.00	0.00
Negative maintenance rate (%)	$G^H \in (-0.2, -0.1]$	1.40	12.62
Inaction rate (%)	$G^H \in (-0.1, +0.1)$	96.81	74.93
Positive maintenance rate (%)	$G^H \in [+0.1, +0.2)$	1.79	12.45
Positive spike rate (%)	$G^H \in [+0.2, +\infty)$	0.00	0.00
Employment Growths			
Negative spike rate (%)	$G^N \in (-\infty, -0.2]$	9.04	0.89
Negative maintenance rate (%)	$G^N \in (-0.2, -0.1]$	12.09	9.81
Inaction rate (%)	$G^N \in (-0.1, +0.1)$	58.60	79.50
Positive maintenance rate (%)	$G^N \in [+0.1, +0.2)$	10.13	5.39
Positive spike rate (%)	$G^N \in [+0.2, +\infty)$	10.14	4.41

Compare Data and Model Pooled Distributions of Hours and Employment Growths. This table compares the pooled distributions of hours and employment growth in data and in model. The pooled distributions are characterized by five categories. Namely, the negative spike is defined as large negative growth exceeding -20%, the negative maintenance is defined as moderate negative growth between -20% and -10%, the inactivity is defined as small growth around zero between -10% and $+10\%$, the positive maintenance is defined as moderate positive growth between $+10\%$ and $+20\%$, and the positive spike is defined as large positive growth exceeding $+20\%$. Both in model and in data, the growth is calculated using DHS method following Davis et al. (1996). In computing data-implied pooled distributions, I use the sample from 1998 to 2017 annually; in computing model-implied pooled distributions, I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions.

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Derivation of Beta Pricing Formula from Stochastic Discount Factor

Euler pricing formula is $\mathbb{E}[M_{+1}(R_{+1} - R^f_{+1})] = 0$; therefore, beta pricing formula is

$$\mathbb{E}[R_{+1} - R^f_{+1}] = \beta^A \lambda_A + \beta^X \lambda_X$$

Prices of risk are

$$\lambda_A = -\gamma_A \cdot \mathsf{Var}[\Delta \log(A_{+1})]$$
$$\lambda_X = -\gamma_X \cdot \mathsf{Var}[\Delta \log(X_{+1})]$$

Quantities of risk are

$$\beta^A = \mathsf{Cov}[R_{+1} - R^f_{+1}, \Delta \log(A_{+1})]/\mathsf{Var}[\Delta \log(A_{+1})]$$
$$\beta^X = \mathsf{Cov}[R_{+1} - R^f_{+1}, \Delta \log(X_{+1})]/\mathsf{Var}[\Delta \log(X_{+1})]$$

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Estimation Procedure using Fama-Macbeth Method to Test Risk Price

The stochastic discount factor is

$$M_t = a_M + \gamma_{\mathsf{MKT}} F_t^{\mathsf{MKT}} + \gamma_{\mathsf{ACS}} F_t^{\mathsf{ACS}}$$

[1] F_t^{MKT}: productivity/CAPM market factor

[2] F_t^{ACS}: adjustment cost shock factor

$$\begin{aligned} \forall i : R_{i,t} = a_i + \quad \beta_i^{\mathsf{MKT}} F_t^{\mathsf{MKT}} \quad + \quad \beta_i^{\mathsf{ACS}} F_t^{\mathsf{ACS}} \quad + e_{it}^i, t = 1, \cdots, T \\ \forall t : R_{i,t} = a_t + \quad \lambda_t^{\mathsf{MKT}} \beta_i^{\mathsf{MKT}} \quad + \quad \lambda_t^{\mathsf{ACS}} \beta_i^{\mathsf{ACS}} \quad + e_{it}^t, i = 1, \cdots, N \end{aligned}$$

[1] $\mathbb{E}_T[\lambda_t^{\mathsf{MKT}}]$: known a positive risk price

[2] $\mathbb{E}_T[\lambda_t^{\mathsf{ACS}}]$: expect a negative risk price

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Response of Firm-Level Cash Flows to Adjustment Cost Shock

$$\Pi_{j,t+1} = b^{(1)} \times F_t^{\mathsf{ACS}} + \sum_{p=2}^{P=3} b^{(p)} \times D_{jt}^{(p)} \times F_t^{\mathsf{ACS}} + c^{(1)} + \sum_{p=2}^{P=3} c^{(p)} \times D_{jt}^{(p)} + d \times \Pi_{j,t} + e_{j,t+1}$$

		EBIT/AT		Log(EBIT)		EBIT Growth	
		W/o $\Pi_{j,t}$	With	W/o $\Pi_{j,t}$	With	W/o $\Pi_{j,t}$	With
		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	-0.10^{***}	-0.07^{***}	-0.23^{***}	-0.24^{***}	-0.54^{***}	-0.26^{***}
	(se)	(0.01)	(0.01)	(0.07)	(0.06)	(0.09)	(0.07)
$F_t^{\mathsf{ACS}} \times D_{jt}^{(2)}$	$b^{(2)}$	0.10^{***}	0.06^{***}	0.20^{**}	0.26^{***}	0.42^{***}	0.18^{**}
	(se)	(0.02)	(0.02)	(0.09)	(0.08)	(0.12)	(0.09)
$F_t^{\mathsf{ACS}} \times D_{jt}^{(3)}$	$b^{(3)}$	0.15^{***}	0.09^{***}	0.63^{***}	0.60^{***}	0.83^{***}	0.66^{***}
	(se)	(0.02)	(0.02)	(0.13)	(0.12)	(0.16)	(0.12)
# Obs.		24,640	24,592	18,601	17,293	17,293	15,198
# Firms		4,508	4,493	3,573	3,343	3,343	3,032

Notes: *, **, *** denote 10, 5, 1% significance; standard errors in ().

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Response of Firm-Level Equity Return to Adjustment Cost Shock

$$R_{j,t+1} = b^{(1)} \times F_t^{\text{ACS}} + \sum_{p=2}^{P=3} b^{(p)} \times D_{jt}^{(p)} \times F_t^{\text{ACS}} + c^{(1)} + \sum_{p=2}^{P=3} c^{(p)} \times D_{jt}^{(p)} + d \times y_{j,t} + e_{j,t+1}$$

		No $y_{j,t}$	$y_{j,t} =$ Equity Return	$y_{j,t} =$ EBIT/ Asset	$y_{j,t} =$ EBIT Growth	$y_{j,t} =$ Log EBIT	$y_{j,t} =$ Log SALE
		[1]	[2]	[3]	[4]	[5]	[6]
F_t^{ACS}	$b^{(1)}$	0.01	-0.00	0.01	-0.07	-0.02	0.00
	(se)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$F_t^{\text{ACS}} \times D_{jt}^{(2)}$	$b^{(2)}$	-0.25^{***}	-0.22^{***}	-0.26^{***}	-0.21^{***}	-0.25^{***}	-0.24^{***}
	(se)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$F_t^{\text{ACS}} \times D_{jt}^{(3)}$	$b^{(3)}$	-0.45^{***}	-0.42^{***}	-0.45^{***}	-0.34^{***}	-0.33^{***}	-0.46^{***}
	(se)	(0.11)	(0.11)	(0.11)	(0.09)	(0.09)	(0.11)
# Obs.		24,824	24,824	24,602	16,400	18,936	24,824
# Firms		4,567	4,567	4,496	3,255	3,635	4,567

Notes: *, **, *** denote 10, 5, 1% significance; standard errors in ().

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