The Dynamic Demand for Capital and Labor:
Evidence from Chinese Industrial Firms

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Motivation

- Joint dynamics of capital and labor vs. dynamics of capital or labor separately in existing studies
- Dramatic transformation in labor and capital market:
  - Labor market: household registration reform, iron-rice bowl in state firms, furlough around 2000, labor law reform, etc
  - Capital market: inflow of foreign direct investment, state firms reform, technology upgrade, investment tax, etc
- Firm's response $\Rightarrow$ dynamic demand for factor inputs

Preview

- Stylized facts on investment and employment growth rate, using firm-level data from 1998-2007
- Propose a dynamic problem re. optimal choices of capital and labor jointly
- Estimate structural parameters so the model is able to replicate the stylized facts
  - significant convex and fixed costs when adjusting K or L
  - joint convex and fixed costs are significant $\Rightarrow$ adjustments in K and L are inter-related
  - simultaneous adjustment is more costly than sequential adjustment
- Counterfactual: aggregate TFP $\uparrow$ by 1% and aggregate output $\uparrow$ by 7% if all adj costs are removed

Data

- Annual Surveys of Industrial Production 1998-2007: all state firms and non-state firms with revenue $>$ \$600,000
- Investment rate:

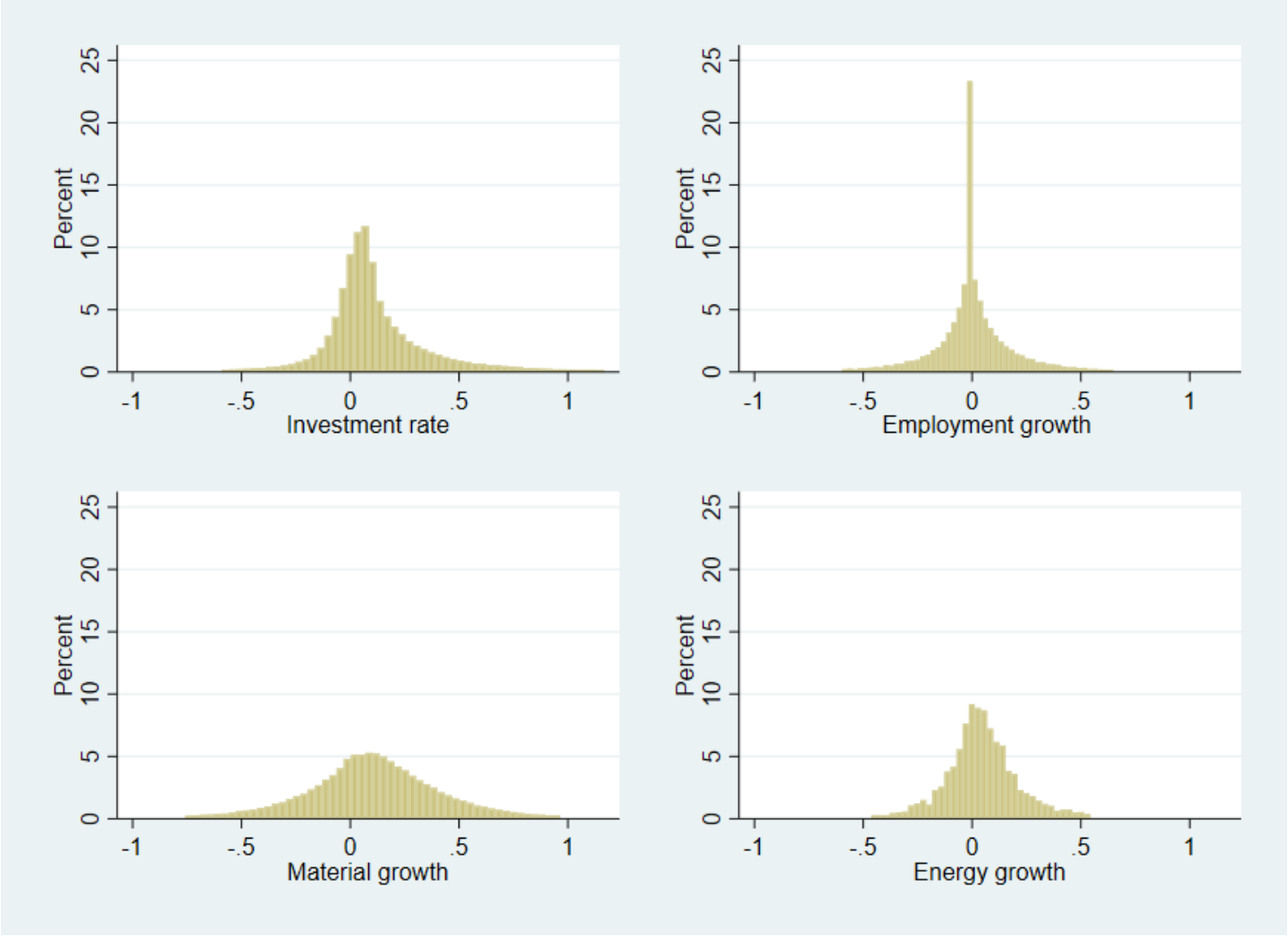
$$i_{it} = \frac{I_{it}}{K_{it}} = \frac{K_{it+1} - (1-\delta)K_{it}}{K_{it}} \approx \ln K_{it+1} - \ln K_{it} + \delta$$

- Employment growth rate:

$$l_{it} = \frac{L_{it+1} - L_{it}}{L_{it}} \approx \ln L_{it+1} - \ln L_{it}$$

Facts

Figure 1: Histograms of four factor adjustments



Facts

Table 1: Moments in investment rate and employment growth

Panel a: moments on investment rate i								
N20	N1020	N10	Inaction	P10	P1020	P20	*std*	$\lambda_{i_t,i_{t-1}}$
0.048	0.051	0.143	0.055	0.297	0.160	0.245	0.243	0.071
(0.0005)	(0.0005)	(0.0008)	(0.0005)	(0.0010)	(0.0008)	(0.0010)	(0.0006)	(0.0023)

Panel b: moments on employment growth l								
N20	N1020	N10	Inaction	P10	P1020	P20	*std*	$\lambda_{l_t,l_{t-1}}$
0.095	0.091	0.215	0.214	0.184	0.093	0.107	0.177	0.018
(0.0007)	(0.0007)	(0.0009)	(0.0009)	(0.0009)	(0.0007)	(0.0007)	(0.0004)	(0.0023)

Panel c: cross correlations between i and l		
λ_{i_t,l_t}	$\lambda_{i_t,l_{t-1}}$	$\lambda_{l_t,i_{t-1}}$
0.138	0.089	0.065
(0.0025)	(0.0027)	(0.0026)

Note: *std* = standard deviation; $\lambda_{i_t,i_{t-1}}/\lambda_{l_t,l_{t-1}}$ = serial correlation; P20 = investment rate (labor growth rate) in excess of 20%; P1020 = investment rate (labor growth rate) between 10% and 20%; P10 = investment rate (labor growth rate) less than 10% and greater than 1%, and Inaction is investment rate (labor growth rate) between -1% and 1%. The negative investment rate (N) moments are defined symmetrically. The entries are the fractions of observations with these investment rates (labor growth rate). λ_{i_t,l_t} is the correlation between i_t on l_t, and $\lambda_{i_t,l_{t-1}}(\lambda_{l_t,i_{t-1}})$ corresponds to the correlation between i_t (l_t) on $l_{t-1}(i_{t-1})$. Standard errors are in parentheses.

Table 2: Interrelations in capital and labor adjustments

	Model 1					
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	D{invest_neg}	D{invest_inaction}	D{invest_pos}	D{employ_neg}	D{employ_inaction}	D{employ_pos}
D{employ_neg}	0.310***	0.145***	-0.327***			
	(0.007)	(0.011)	(0.007)			
D{employ_inaction}	0.110***	0.061***	-0.118***			
	(0.009)	(0.013)	(0.008)			
D{invest_neg}				0.301***	-0.054***	-0.267***
				(0.007)	(0.008)	(0.007)
D{invest_inaction}				0.240***	-0.032**	-0.219***
				(0.013)	(0.014)	(0.013)
$\ln \text{Rev}_t$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln K_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln L_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
year	No	No	No	No	No	No
ownership	No	No	No	No	No	No
industry	No	No	No	No	No	No
province	No	No	No	No	No	No
pseudo R^2	0.013	0.007	0.013	0.029	0.010	0.018

	Model 2					
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	D{invest_neg}	D{invest_inaction}	D{invest_pos}	D{employ_neg}	D{employ_inaction}	D{employ_pos}
D{employ_neg}	0.300***	0.147***	-0.320***			
	(0.007)	(0.011)	(0.007)			
D{employ_inaction}	0.142***	0.087***	-0.156***			
	(0.009)	(0.013)	(0.009)			
D{invest_neg}				0.279***	-0.014*	-0.290***
				(0.007)	(0.008)	(0.007)
D{invest_inaction}				0.228***	0.010	-0.255***
				(0.013)	(0.015)	(0.013)
$\ln \text{Rev}_t$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln K_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln L_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes
ownership	Yes	Yes	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes	Yes	Yes
province	Yes	Yes	Yes	Yes	Yes	Yes
pseudo R^2	0.041	0.016	0.044	0.047	0.040	0.039

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

A dynamic model

- A continuum of firms of fixed measure one, indexed by i, produce intermediate goods using capital and labor according to:

$$Y_{it} = K_{it}^{\hat{\alpha}_1} \cdot (h_{it} L_{it})^{\hat{\alpha}_2}, \text{where } \hat{\alpha}_1 + \hat{\alpha}_2 \leq 1 \tag{1}$$

- These intermediate goods are bundled to produce the single final good using a standard constant elasticity of substitution (CES) aggregator:

$$Y_t = \left(\int \hat{A}_{it} Y_{it}^{\frac{\theta-1}{\theta}} di \right)^{\frac{\theta}{\theta-1}} \tag{2}$$

- Revenues (here, equal to value-added) for firm i at time t are:

$$R_{it} = P_{it} Y_{it} = Y_t^{\frac{1}{\theta}} \hat{A}_{it} K_{it}^{\alpha_1} \cdot (h_{it} L_{it})^{\alpha_2} \tag{3}$$

- Optimal choice of hours h is solved from:

$$\max_{h_{it}} \pi_{it} = R_{it} - (w_0 + w_1 h_{it}^{\zeta}) L_{it} \tag{4}$$

- The implied one-period profit π_{it} becomes:

$$\pi_{it} = G \cdot A_{it} \cdot K_{it}^{\alpha_K} \cdot L_{it}^{\alpha_L} - L_{it} w_0 \tag{5}$$

A dynamic model

- The Bellman equation is:

$$\begin{aligned} V(A_{it}, K_{it}, L_{it}) \quad = \max_{K_{it+1}, L_{it+1}} \quad & [G \cdot A_{it} \cdot K_{it}^{\alpha_K} \cdot L_{it}^{\alpha_L} - L_{it} w_0 - I_{it} \\ & - C(A_{it}, K_{it}, I_{it}, L_{it}, L_{it+1}) \\ & + \beta E_{it} V(A_{it+1}, K_{it+1}, L_{it+1})] \end{aligned} \tag{6}$$

subject to:

$$K_{it+1} = (1 - \delta) K_{it} + I_{it} \tag{7}$$

$$\ln A_{it+1} = u_i + \rho \cdot \ln A_{it} + \sigma \cdot \epsilon_{it+1}, \epsilon_{it+1} \sim N(0, 1) \tag{8}$$

A dynamic model

- The joint adjustment cost function is:

$$C(\cdot) = \begin{cases} C^K = \lambda^K \pi(A_{it}, K_{it}, L_{it}) + \frac{\gamma^K}{2}(\frac{I_{it}}{K_{it}})^2 K_{it} & \text{if } I_{it} \neq 0 \\ C^L = \lambda^L \pi(A_{it}, K_{it}, L_{it}) + \frac{\gamma^L}{2}(\frac{L_{it+1} - L_{it}}{L_{it}})^2 L_{it} & \text{if } L_{it+1} - L_{it} \neq 0 \\ C^{KL} = C^K + C^L + \lambda^{KL} \pi(A_{it}, K_{it}, L_{it}) + \frac{\gamma^{KL}}{2}(\frac{I_{it}}{K_{it}})(\frac{L_{it+1} - L_{it}}{L_{it}})\sqrt{K_{it} L_{it}} & \text{if } I_{it} \cdot (L_{it+1} - L_{it}) \neq 0 \end{cases}$$

- The firm's problem is:

$$\begin{aligned} V(A_{it}, K_{it}, L_{it}) \quad = \max \quad & \{V^{no}(A_{it}, K_{it}, L_{it}), \\ & V^K(A_{it}, K_{it}, L_{it}), \\ & V^L(A_{it}, K_{it}, L_{it}), \\ & V^{KL}(A_{it}, K_{it}, L_{it})\} \end{aligned}$$

Predefined parameters: calibration

Table 3: Predefined parameters in the model

Parameters	Description	Value
β	Discount rate	0.95
δ	Capital depreciation rate	0.10
θ	Elasticity of substitution	6
ζ	wage-hour elasticity	1.562
w_0	parameter in wage equation	0.129
$\hat{\alpha}_1$	Capital share in output	0.5
$\hat{\alpha}_2$	Labor share in output	0.5
G	Scaling parameter in Bellman equation	1
u_i	Time fixed-effect in $\ln A_{it}$	0

Structural parameters: SMM

- Structural parameters $\Theta = \{\gamma^K, \lambda^K, \gamma^L, \lambda^L, \gamma^{KL}, \lambda^{KL}, \rho, \sigma\}$

  $\Rightarrow$ Solve the dynamic model, and obtain decision rules

  $\Rightarrow$ Simulate the model, and generate a synthetic data set

  $\Rightarrow$ Calculate the 21 moments on the synthetic data set, and get $g_m(\Theta)$

  $\Rightarrow$ Compare model with data, $g_m(\Theta)$ vs g_d

- Parameters Θ are recovered as:

$$\begin{aligned} \mathrm{T}(\Theta) &= \min_{\psi} [g_m(\Theta) - g_d]^T \cdot W \cdot [g_m(\Theta) - g_d] \\ &\sim \chi^2(m-p) \end{aligned}$$

Structural estimation

Table 4: Estimation of structural parameters in the model

Definition of parameters	Parameters	Full (1)	No-joint (2)	Convex (3)	Fixed (4)	Capital (5)	Labor (6)	None (7)
Capital convex cost	γ^K	0.016	0.080	0.143		0.083		
		(1.566e − 06)	(3.468e − 04)	(2.960e − 03)		(6.636e − 04)		
Capital fixed cost	λ^K	0.001	0.047		0.070	0		
		(9.023e − 05)	(6.422e − 05)		(1.288e − 04)	(9.956e − 06)		
Labor convex cost	γ^L	0.006	0.100	0.087			0.083	
		(3.0171e − 04)	(1.031e − 03)	(9.811e − 04)			(6.664e − 04)	
Labor fixed cost	λ^L	0.0005	0.057		0.010		0	
		(4.124e − 05)	(3.969e − 04)		(1.969e − 04)		(1.594e − 05)	
Joint convex cost	γ^{KL}	−0.016		−0.110				
		(8.141e − 04)		(1.770e − 03)				
Joint fixed cost	λ^{KL}	0.080			0.070			
		(6.315e − 04)			(6.172e − 04)			
Serial correlation of shock	ρ	0.750	0.850	0.360	0.750	0.718	0.881	0.742
		(1.175e − 03)	(1.147e − 03)	(5.392e − 04)	(1.012e − 03)	(1.195e − 03)	(9.532e − 04)	(1.070e − 03)
SD of innovation to shock	σ	0.100	0.150	0.450	0.100	0.150	0.171	0.050
		(5.146e − 04)	(8.863e − 04)	(2.032e − 04)	(9.484e − 04)	(2.682e − 04)	(3.471e − 04)	(9.860e − 05)
Objective value in SMM	T(Θ)/100	1854	8291	6522	8522	2602	2417	3188

Note: standard errors are in parentheses.

Table 5: Simulated moments from models

Moments	Data	Full	No-joint	Convex	Fixed	Capital	Labor	None
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Moments on investment rate i								
N20	0.048	0.070	0.011	0.044	0	0.031	0.065	0.056
N1020	0.051	0.015	0.008	0.128	0	0.069	0.089	0.071
N10	0.143	0.017	0.026	0.124	0.001	0.130	0.117	0.125
Inaction	0.055	0.149	0.339	0	0.412	0.038	0.031	0.042
P10	0.297	0.309	0.263	0	0.205	0.217	0.185	0.072
P1020	0.160	0.298	0.212	0.386	0.288	0.248	0.222	0.383
P20	0.245	0.143	0.142	0.318	0.094	0.266	0.290	0.525
std	0.243	0.210	0.188	0.190	0.189	0.155	0.197	0.174
scorr	0.071	−0.066	0.073	−0.006	−0.071	0.282	0.297	−0.128
Moments on employment growth l								
N20	0.095	0.092	0.035	0.261	0.049	0.129	0.113	0.127
N1020	0.091	0.092	0.064	0.010	0.072	0.157	0.148	0.146
N10	0.215	0.126	0.076	0	0.089	0.193	0.200	0.092
Inaction	0.214	0.378	0.747	0.426	0.596	0.043	0.070	0.265
P10	0.184	0.129	0.024	0	0.120	0.183	0.197	0.094
P1020	0.093	0.099	0.008	0.035	0.039	0.166	0.166	0.150
P20	0.107	0.084	0.046	0.368	0.035	0.130	0.107	0.125
std	0.177	0.172	0.163	0.282	0.152	0.177	0.167	0.173
scorr	0.018	0.017	0.109	−0.079	0.102	0.393	0.332	−0.128
Cross correlations between i and l								
λ_{i_t,l_t}	0.138	0.228	0.781	0.945	0.720	0.416	0.304	0.999
$\lambda_{i_t,l_{t-1}}$	0.089	0.202	0.100	0.017	−0.002	0.986	0.047	−0.128
$\lambda_{l_t,i_{t-1}}$	0.065	0.510	0.161	−0.093	0.126	0.022	0.993	−0.128

Note: the row labeled with "Data" are moments from the firm-level data, the row labeled "(1)-(7)" are moments simulated based on the estimates in columns (1)-(7) of Table 4.

- The "Full" model is able to replicate most moments

Table 6: Interrelations in capital and labor adjustments on simulated data

Simulated Data						
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	D{invest_neg}	D{invest_inaction}	D{invest_pos}	D{employ_neg}	D{employ_inaction}	D{employ_pos}
D{employ_neg}	1.339***	1.198***	-1.290***			
	(0.063)	(0.032)	(0.027)			
D{employ_inaction}	1.046***	-0.435***	0.038			
	(0.066)	(0.031)	(0.024)			
D{invest_neg}				0.981***	-0.307***	-1.598***
				(0.039)	(0.031)	(0.069)
D{invest_inaction}				1.551***	-1.150***	-0.394***
				(0.028)	(0.030)	(0.024)

Actual Data						
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	D{invest_neg}	D{invest_inaction}	D{invest_pos}	D{employ_neg}	D{employ_inaction}	D{employ_pos}
D{employ_neg}	0.315***	0.159***	-0.337***			
	(0.007)	(0.011)	(0.007)			
D{employ_inaction}	0.147***	0.091***	-0.162***			
	(0.009)	(0.013)	(0.009)			
D{invest_neg}				0.295***	-0.016**	-0.290***
				(0.007)	(0.008)	(0.007)
D{invest_inaction}				0.246***	0.008	-0.255***
				(0.013)	(0.015)	(0.013)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

- The "Full" model reproduces correct signs in 9 out of 12 coefficients

Robustness: ownership types

Table 7: Structural estimations by ownership types

Definition of parameters	Parameters	State	Private
Capital convex cost	γ^K	0.016	0.020
		$(2.824e-06)$	$(9.932e-05)$
Capital fixed cost	λ^K	0.001	0.0025
		$(1.689e-04)$	$(1.632e-04)$
Labor convex cost	γ^L	0.006	0.010
		$(5.752e-04)$	$(1.108e-04)$
Labor fixed cost	λ^L	0.0005	0
		$(7.561e-05)$	$(4.784e-05)$
Joint convex cost	γ^{KL}	-0.016	-0.02
		$(1.476e-03)$	$(8.571e-05)$
Joint fixed cost	λ^{KL}	0.080	0.075
		$(1.182e-03)$	$(3.541e-04)$
Serial correlation of shock	ρ	0.750	0.800
		$(2.245e-03)$	$(6.642e-04)$
SD of innovation to shock	σ	0.100	0.100
		$(9.766e-04)$	$(5.183e-04)$
Objective value in SMM	$T(\Theta)/100$	599	1010

Note: standard errors are in parentheses.

Table 8: Simulated moments from two ownership models

	State		Private	
Moments	Data	Model	Data	Model
Moments on investment rate i				
N20	0.044	0.070	0.050	0.064
N1020	0.044	0.015	0.053	0.033
N10	0.129	0.017	0.149	0.020
Inaction	0.055	0.149	0.055	0.147
P10	0.345	0.309	0.279	0.314
P1020	0.171	0.298	0.155	0.255
P20	0.212	0.143	0.258	0.167
std	0.222	0.210	0.251	0.209
scorr	0.078	−0.066	0.068	−0.026
Moments on employment growth l				
N20	0.084	0.092	0.099	0.096
N1020	0.096	0.092	0.089	0.100
N10	0.304	0.126	0.181	0.166
Inaction	0.198	0.378	0.221	0.302
P10	0.193	0.129	0.181	0.146
P1020	0.065	0.099	0.104	0.100
P20	0.059	0.084	0.126	0.091
std	0.149	0.172	0.185	0.175
scorr	−0.015	0.017	0.020	0.042
Cross correlations between i and l				
λ_{i_t,l_t}	0.109	0.228	0.144	0.271
$\lambda_{i_t,l_{t-1}}$	0.059	0.202	0.095	0.262
$\lambda_{l_t,i_{t-1}}$	0.053	0.510	0.067	0.535

Note: the row labeled with "Data" are moments from the firm-level data, the row labeled "Model" are moments simulated based on the estimates in Table 7.

Robustness: sectoral analysis

Table 9: Structural estimations from two industrial sectors

Definition of parameters	Parameters	Machinery	Auto-parts
Capital convex cost	γ^K	0.016	0.015
		$(5.498e-06)$	$(8.678e-03)$
Capital fixed cost	λ^K	0.001	0
		$(3.221e-04)$	$(5.461e-04)$
Labor convex cost	γ^L	0.006	0.005
		$(1.149e-03)$	$(5.237e-04)$
Labor fixed cost	λ^L	0.0005	0
		$(1.477e-04)$	$(1.946e-04)$
Joint convex cost	γ^{KL}	-0.016	-0.015
		$(2.950e-03)$	$(7.274e-04)$
Joint fixed cost	λ^{KL}	0.08	0.055
		$(2.299e-03)$	$(5.913e-04)$
Serial correlation of shock	ρ	0.750	0.750
		$(4.283e-03)$	$(7.858e-03)$
SD of innovation to shock	σ	0.100	0.100
		$(1.868e-03)$	$(2.030e-03)$
Objective value in SMM	$T(\Theta)/100$	152	102

Note: standard errors are in parentheses.

Table 10: Simulated moments from two sectoral models

	Machinery		Auto-parts	
Moments	Data	Model	Data	Model
Moments on investment rate i				
N20	0.047	0.070	0.045	0.073
N1020	0.048	0.015	0.047	0.015
N10	0.136	0.017	0.126	0.016
Inaction	0.051	0.149	0.054	0.157
P10	0.294	0.309	0.296	0.273
P1020	0.166	0.298	0.181	0.315
P20	0.257	0.143	0.252	0.151
std	0.242	0.210	0.234	0.211
scorr	0.066	−0.066	0.061	−0.042
Moments on employment growth l				
N20	0.088	0.092	0.087	0.098
N1020	0.091	0.092	0.099	0.103
N10	0.237	0.126	0.259	0.121
Inaction	0.197	0.378	0.159	0.347
P10	0.188	0.129	0.187	0.134
P1020	0.095	0.099	0.101	0.115
P20	0.104	0.084	0.109	0.082
std	0.172	0.172	0.174	0.186
scorr	0.038	0.017	0.040	−0.012
Cross correlations between i and l				
λ_{i_t,l_t}	0.156	0.228	0.150	0.384
$\lambda_{i_t,l_{t-1}}$	0.081	0.202	0.121	0.185
$\lambda_{l_t,i_{t-1}}$	0.076	0.510	0.087	0.359

Note: the row labeled with "Data" are moments from the firm-level data, the row labeled "Model" are moments simulated based on the estimates in Table 9.

Robustness: regional analysis

Table 11: Structural estimations by coastal and interior regions

Definition of parameters	Parameters	Coastal	Interior
Capital convex cost	γ^K	0.013	0.016
		$(2.058e-04)$	$(2.586e-06)$
Capital fixed cost	λ^K	0	0.001
		$(9.456e-04)$	$(1.521e-04)$
Labor convex cost	γ^L	0.006	0.006
		$(9.080e-05)$	$(5.285e-04)$
Labor fixed cost	λ^L	0	0.0005
		$(2.090e-04)$	$(6.926e-05)$
Joint convex cost	γ^{KL}	-0.016	-0.016
		$(1.605e-04)$	$(1.356e-03)$
Joint fixed cost	λ^{KL}	0.080	0.080
		$(1.071e-03)$	$(1.069e-03$
Serial correlation of shock	ρ	0.750	0.750
		$(1.994e-03)$	$(1.992e-03)$
SD of innovation to shock	σ	0.100	0.100
		$(5.659e-03)$	$(8.727e-04)$
Objective value in SMM	$T(\Theta)/100$	1313	590

Note: standard errors are in parentheses.

Table 12: Simulated moments from two regional models

	Coastal		Interior	
Moments	Data	Model	Data	Model
Moments on investment rate i				
N20	0.049	0.073	0.047	0.070
N1020	0.054	0.014	0.045	0.015
N10	0.152	0.016	0.127	0.017
Inaction	0.056	0.157	0.053	0.149
P10	0.279	0.276	0.332	0.309
P1020	0.157	0.316	0.165	0.298
P20	0.253	0.149	0.231	0.143
std	0.246	0.212	0.238	0.210
scorr	0.083	−0.069	0.046	−0.066
Moments on employment growth l				
N20	0.095	0.096	0.093	0.092
N1020	0.093	0.100	0.087	0.092
N10	0.204	0.121	0.238	0.126
Inaction	0.196	0.354	0.250	0.378
P10	0.188	0.133	0.177	0.129
P1020	0.102	0.115	0.075	0.099
P20	0.121	0.083	0.081	0.084
std	0.182	0.179	0.165	0.172
scorr	0.031	0.006	−0.023	0.017
Cross correlations between i and l				
λ_{i_t,l_t}	0.148	0.240	0.117	0.228
$\lambda_{i_t,l_{t-1}}$	0.096	0.207	0.073	0.202
$\lambda_{l_t,i_{t-1}}$	0.073	0.484	0.051	0.510

Note: the row labeled with "Data" are moments from the firm-level data, the row labeled "Model" are moments simulated based on the estimates in Table 11.

Aggregate loss

Table 13: Impact on aggregate variables

Panel a: removing all costs							
	All	State	Private	Machinery	Auto-parts	Coastal	Interior
Δ% in aggregate TFP	1.134	1.134	1.461	1.134	1.070	1.121	1.134
Δ% in output Y	7.285	7.285	4.708	7.285	6.250	6.745	7.285
Δ% in capital K	8.034	8.034	4.136	8.034	7.052	7.472	8.034
Δ% in employment L	7.757	7.757	4.387	7.757	5.735	6.742	7.757

Panel b: reducing all costs by 50%							
	All	State	Private	Machinery	Auto-parts	Coastal	Interior
Δ% in aggregate TFP	0.116	0.116	0.149	0.116	0.109	0.103	0.116
Δ% in output Y	1.234	1.234	1.678	1.234	1.541	1.102	1.234
Δ% in capital K	1.299	1.299	1.691	1.299	2.193	1.085	1.299
Δ% in employment L	1.857	1.857	2.782	1.857	0.909	1.870	1.857

Note: the results in the column labeled with "Full" are based on the structural estimation in column "Full" of Table 4. The results in the column labeled with "State" and "Private" are based on the structural estimations in Table 7. The results in the column labeled with "Machinery" and "Auto-parts" are based on the structural estimations in Table 9. The results in the column labeled with "Coastal" and "Non-coastal" are based on the structural estimations in Table 11.

Conclusion

- Study the joint dynamic demand of capital and labor in Chinese industries
- Recover deep parameters in a dynamic model so the model is able to replicate the stylized facts
  - significant convex and fixed costs when adjusting K or L
  - joint convex and fixed costs are significant $\Rightarrow$ adjustments in K and L are inter-related
  - simultaneous adjustment is more costly than sequential adjustment
- Counterfactual: aggregate TFP $\uparrow$ by 1% and aggregate output $\uparrow$ by 7% if all adj costs are removed