# Business Dynamism in Japan: Some Expositions

一橋大学
HITOTSUBASHI UNIVERSITY

Dec. 18th, 2021
ESRI, Cabinet Office

Daisuke Miyakawa†
w/ Kaoru Hosono‡ Koki Oikawa††
Miho Takizawa‡ Kozo Ueda††

†Hitotsubashi ‡Gakushuin ††Waseda

*This presentation is based on the academic researches conducted under the joint research agreement between Hitotsubashi University and TOKYO SHOKO RESEARCH, LTD. (TSR). Usual disclaimer is applied.

# Motivation

A) Stagnation in many advanced economies

- Business dynamism / Firm dynamics
  - Multi-dimensional description
    - Philippon '19; Akcigit & Ates '21 and so many
    - Evil GAFA-type theoretical explanation
- Japan? ⇔ Project-1: Hosono, Miyakawa, Takizawa

B) Any theoretical exposition for Japan?

- Endogenous growth model w/ long shadow of death

⇔ Project-2: Miyakawa, Oikawa, Ueda

# A. Facts: Data

- TSR firm-level panel data (⇔ D&B in the US)
  - Coverage: Macro (SME white paper) vs. TSR data

| | | | | |
|---|---|---|---|---|
| i. | #Firms: | 3.5M | vs. | 1M |
| ii. | Sales (JPY): | 1,428tn | vs. | 1,000tn |
| iii. | #Empl: | 47mn | vs. | 32mn |

  - Periods: 2008-2018
  - Concerns:
    - Tilted toward large firms & specific industries
    - Entry might be measured with some lag

# A. Facts: Business Dynamism

- Japan vs. U.S.
  - Disagree on "6" & "9"

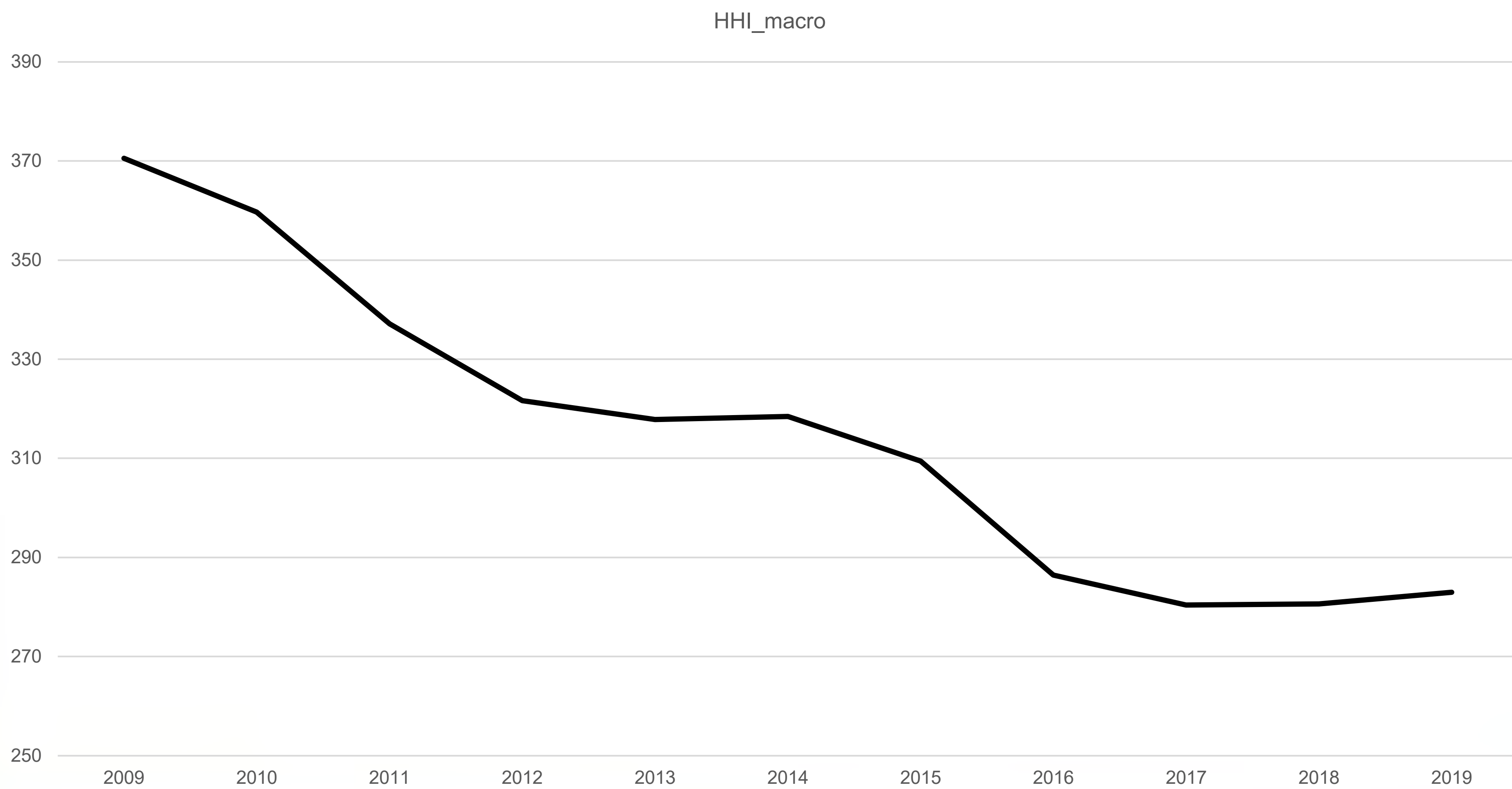
    ⇒ GAFA-story (e.g., Akcigit & Ates '21) is not applicable

    ⇒ Need another exposition

| Facts | Japanese Data | US Data | Lower knowledge diffusion (e.g., Akcigit & Ates '21) |
|---|---|---|---|
| 1. Entry | ↓ | ↓ | ↓ |
| 2. Young firms' empl. share | ↓ | ↓ | ↓ |
| 3. Dispersion of firm growth | ↓ | ↓ | ↓ |
| 4. Job creation | ↓ | ↓ | ↓ |
| 5. Frontier vs. laggard gap | ↑ | ↑ | ↑ |
| 6. Markups | ⇔ | ↑ | ↑ |
| 7. Profit | ↑ | ↑ | ↑ |
| 8. Labor share | ↓ | ↓ | ↓ |
| 9. Concentration | ↓ | ↑ | ↑ |

# A. Facts: Business Dynamism

- HHI of sales: All firms in all industries × Year



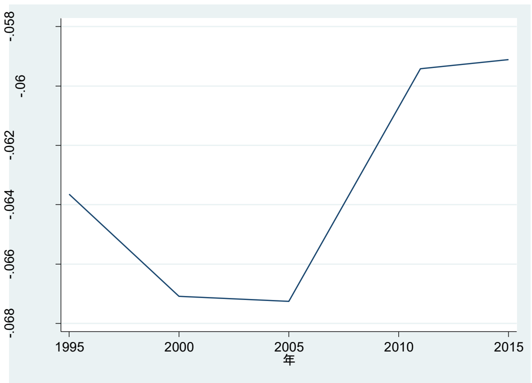
# B. Theory: Motivating Issues

- Low metabolism
  - Low exit & entry rates (e.g., SME whitepaper)
  - Productivity dynamics
    - Series of studies by Kyoji Fukao & his co-authors
- SMEs protection
  - Targeting policy
    - E.g., Beason & Weinstein. '96

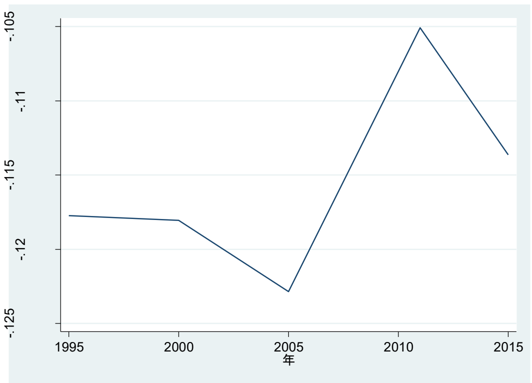
# B. Theory: Motivating Issues

## Net subsidy / Y over 1995 to 2015

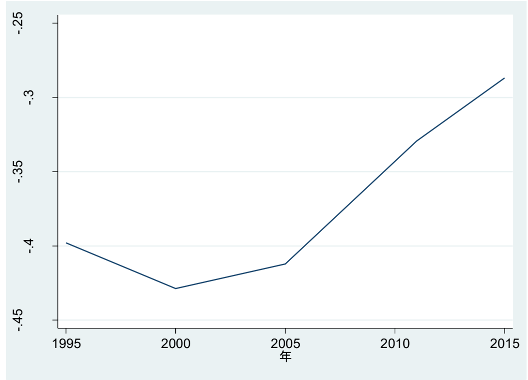
Y: Value-added



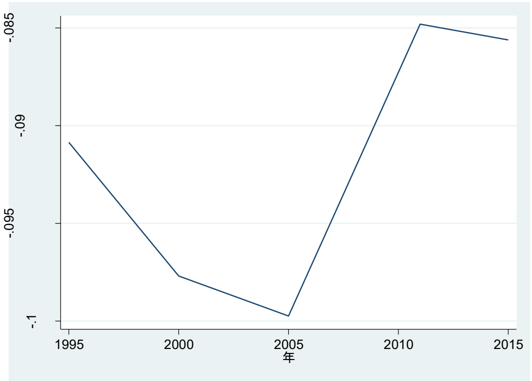

Y: Wage




Y: Depreciation




Y: Wage + Depreciation



# B. Theory: Model

(see Appendix-X2 for more detail)

- Endogenous innovation in GE-framework
  - Hopenhayn & Rogerson '93

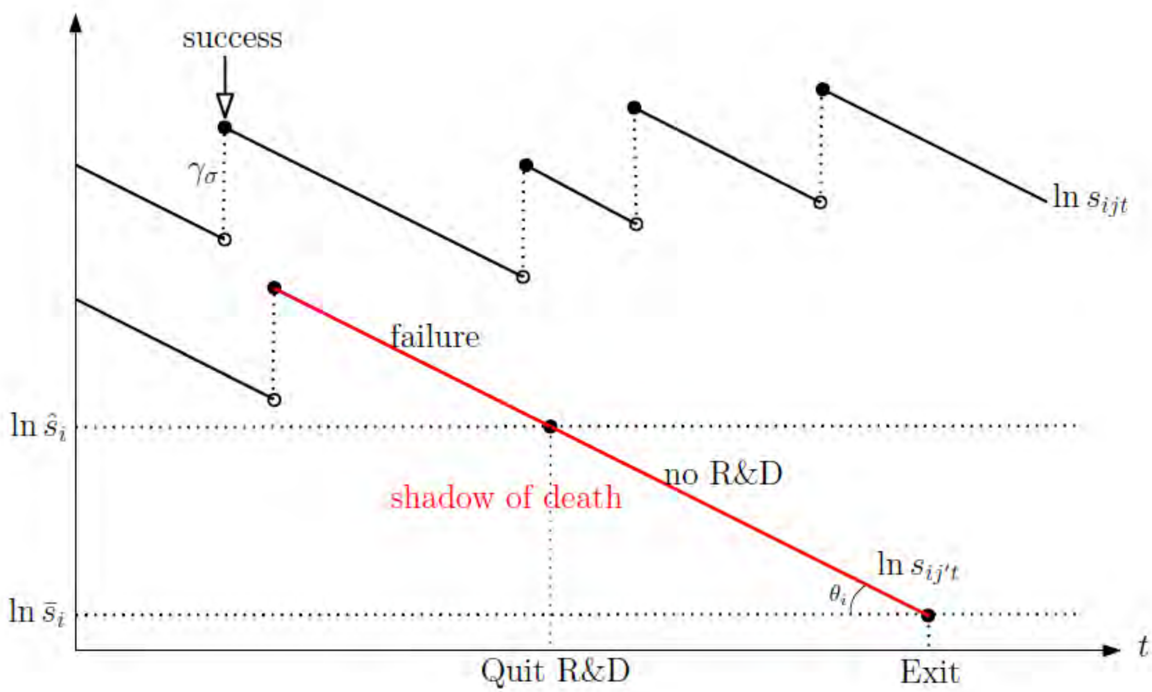
- Setup-1: Intermediate goods firms
  - Producing (final-goods specific) intermediate goods in industry $i \in [0,1]$ at time $t$
  - Monopolistic competition
  - Entry/exit
  - Intermediate goods firms can improve productivity through R&D

# B. Theory: Model

- Setup-2: Final goods firms
  - Continuum of industry $i \in [0,1]$
  - Perfect competition
  - Intermediate goods as input
- Setup-3: Households
  - Consuming final goods
  - Inelastic labor supply

# B. Theory: Illustration

- Dynamics of relative productivity
  - Stationary equilibrium
  - Two thresholds: Terminate R&D ($\hat{s}_i$) & Exit ($\bar{s}_i$)

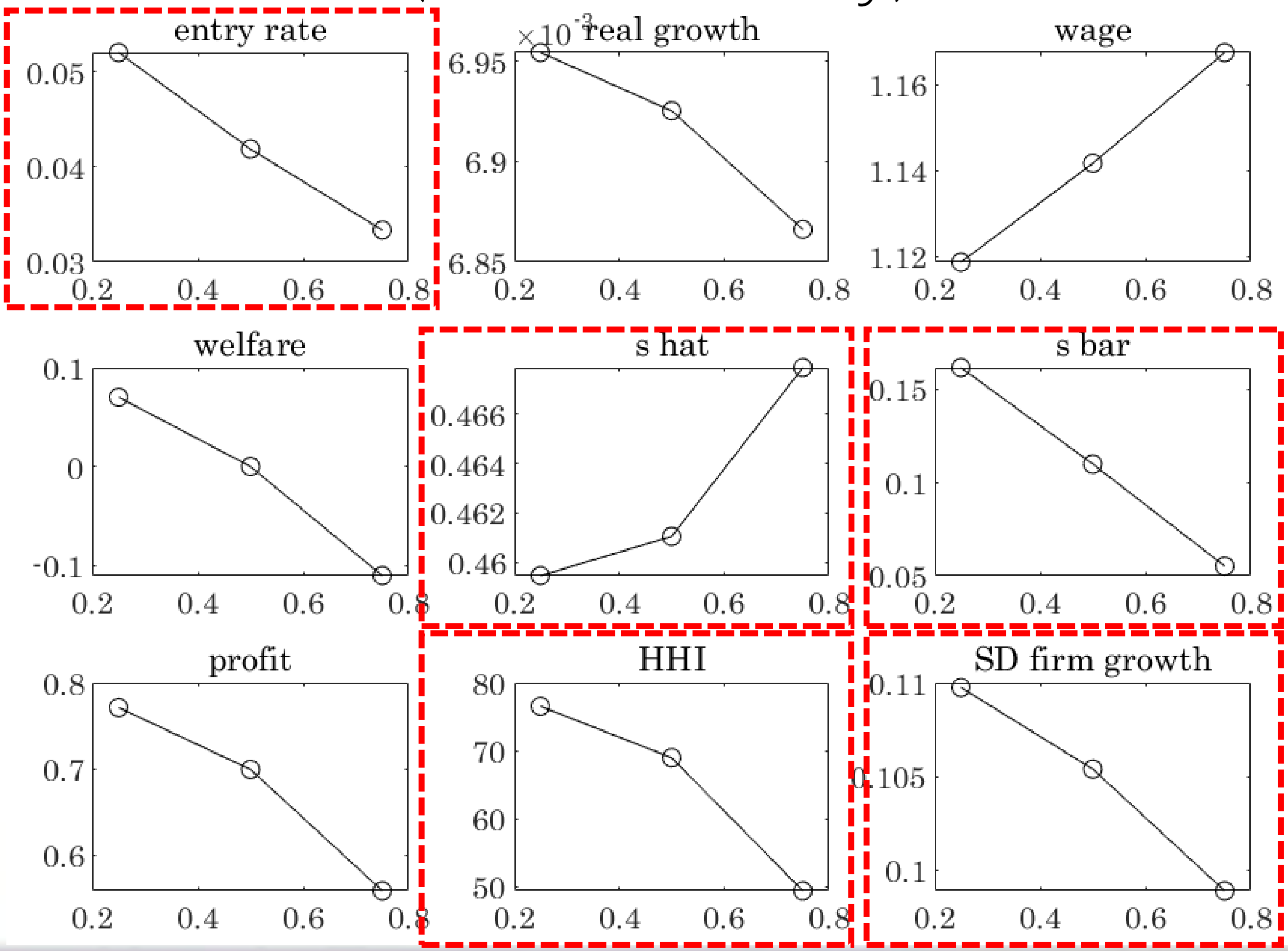


# B. Theory: Distortion

- Impact of distortion
  - E.g., SME subsidy ↑
    - Surviving longer on subsidies, $\bar{s}_i$ ↓
    - Smaller incentive to avoid sales decline, $\hat{s}_i$ ↑
  - Consistency w/ facts?

# B. Theory: Calibrated Model

- As distortion (SME subsidy) ↑



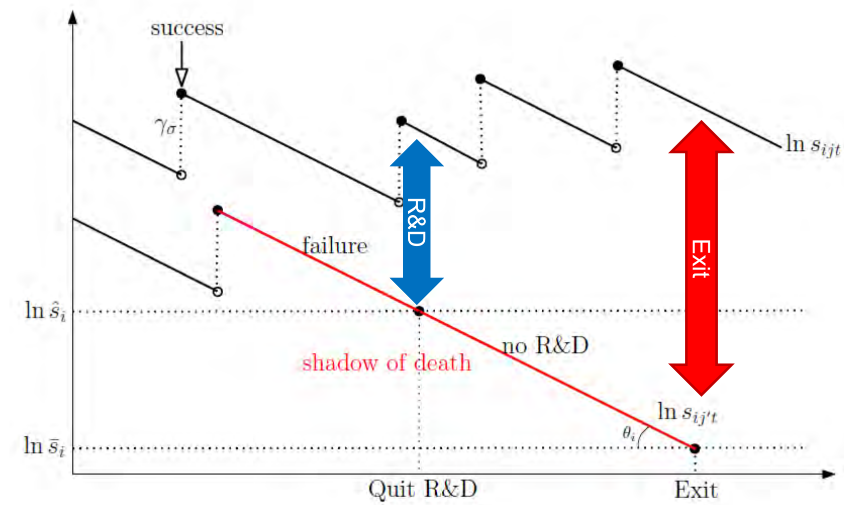
# B. Theory: Implication

- Most of the facts can be explained

| Facts | Japan Data | Higher distortion (Miyakawa, Oikawa, Ueda) |
|---|---|---|
| 1. Entry | ↓ | ↓ |
| 2. Young firms' empl. share | ↓ | ↓ |
| 3. Dispersion of firm growth | ↓ | ↓ |
| 4. Job creation | ↓ | ↓ |
| 5. Frontier vs. laggard gap | ↑ | ↑ |
| 6. Markups | ⇔ | ⇔ |
| 7. Profit | ↑ | ↓ |
| 8. Labor share | ↓ | ⇔ |
| 9. Concentration | ↓ | ↓ |

# B. Theory: Empirical Validity

- Supported by data?
  - TSR data (1998-2020)
    - Firm-level panel
    - Sales, R&D, exit
    - Panel estimation




  - Industry × Time measures for distortion
    a. Net subsidy for an industry (e.g., Beason Weinstein '96)
    b. Sunkiness (e.g., Balasubramanian & Sivadasan '09)

  - Distortion ↑
    ⇒ Longer shadow of death (i.e., shorter 

 & longer 

)

# B. Theory: Unexplained facts?

## Labor MKT & Plant Location might matter

| Facts | Japan Data | Higher distortion (Miyakawa, Oikawa, Ueda) | Weaker worker power (e.g., non-regular employees) | Plant relocation to foreign countries | Ideas getting harder | Higher financial friction for intangible investment (esp., young startups) |
|---|---|---|---|---|---|---|
| 1. Entry | ↓ | ↓ | ↑ | ↓ | ↓ | ↓ |
| 2. Young firms' empl. share | ↓ | ↓ | ⇔ | ⇔ | ↓ | ↓ |
| 3. Dispersion of firm growth | ↓ | ↓ | ↓ | ↑ | ↑ | ↑ |
| 4. Job creation | ↓ | ↓ | ↑ | ⇔ | ↓ | ↓ |
| 5. Frontier vs. laggard gap | ↑ | ↑ | ↑ | ↑ | ⇔ | ↑ |
| 6. Markups | ⇔ | ⇔ | ↑ | ↑ | ↓ | ↑ |
| 7. Profit | ↑ | ↓ | ↑ | ↑ | ↓ | ⇔ |
| 8. Labor share | ↓ | ⇔ | ↓ | ↓ | ↑ | ↑ |
| 9. Concentration | ↓ | ↓ | ⇔ | ⇔ | ↓ | ↑ |

# Summary

- Business dynamism in Japan
  - A slight diff requires new expositions (≠GAFA)
  - Distortion on firm exit (+ R&D) could be a key
    - Desirable policy for growth?
- Need to consider some other theories…
  - Labor market, location choice, and any other?

# Reference


- Akcigit, U. and S. Ates. 2021 Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory. American Economic Journal-Macroeconomics 13(1): 257–298.
- Balasubramanian, N. and J. Sivadasan. 2009. Capital Resalability, Productivity Dispersion, and Market Structure. Review of Economics and Statistics 91(3): 547-557
- Beason, R. and D. E. Weinstein. 1996. Growth, Economies of Scale, and Targeting in Japan (1955-1990). Review of Economics and Statistics 78(2): 286-295.
- Fukao, K. and K. Ito, H. U. Kwon, and M. Takizawa. 2008. Cross-Border Acquisitions and Target Firms' Performance: Evidence from Japanese Firm-Level Data. International Financial Issues in the Pacific Rim, Ito, T. and A. K. Rose, NBER-East Asia Seminar on Economics 17: 347-385.
- Fukao, K. and H. U. Kwon. 2006. Why did Japan's TFP Growth Slow Down in the Lost Decade? An Empirical Analysis Based on Firm-Level Data of Manufacturing Firms. Japanese Economic Review 57(2): 195-228.
- Fukao, K., Y. Kim, H. Kwon, and K. Ikeuchi. 2021. Abenomikusu Ka no Bijinesu Dainamizumu to Seisansei Joushou: 'Keizai Sensasu Katsudou Chousa' Chousa Hyou Jouhou ni yoru Bunseki (Business Dynamism and Productivity Improvement under Abenomics). RIETI Discussion Paper Series, #21-J-015. In Japanese.
- Ikeuchi, K., Y, Kim, H. Kwon, and K. Fukao. 2018. Chuushou Kigyou ni okeru Seisansei Dougaku: Chuushou Kigyou Sin'you Risuku Jouhou Deeta Beesu ni yoru Jisshou Bunseki (Productivity Dynamics of SMEs). Keizai Kenkyuu 69(2), pp.363-377. In Japanese.
- Inui, T., Kim, H. Kwon, and K. Fukao. 2011. Seisansei Dougaku to Nihon no Keizai Seichou: 'Houjin Kigyou Toukei Chousa' Kohyou Deeta ni yoru Jisshou Bunseki (Productivity Dynamics and Japan's Growth). RIETI Discussion Paper Series #11-J-042. In Japanese.
- Kim, Y., H. Kwon, and K. Fukao. 2007. Kigyou Jigyousho no Sannyuu Taishutsu to Sangyou Reberu no Seisansei (Productivity and Entry and Exit of Firm and Establishment). RIETI Discussion Paper Series #07-J-022. In Japanese.
- Kwon, H., Y. Kim, and K. Fukao. 2008. Nihon no TFP Joushou Ritsu ha Naze Kaifuku Shita no ka: 'Kigyou Katsudou Kihon Chousa' ni Motozuku Jisshou Bunseki (Why Does Japan's TFP Improve?). RIETI Discussion Paper Series #08-J-050. In Japanese.
- Hopenhayn, H. and R. Rogerson. 1993. Job Turnover and Policy Evaluation: A General Equilibrium Analysis. Journal of Political Economy 101(5): 915-938.
- Philippon, T. 2019. The Great Reversal: How America Gave Up on Free Markets. Harvard University Press.

# Appendix

# X1. Business Dynamism

- HHI of sales: Decile × Year

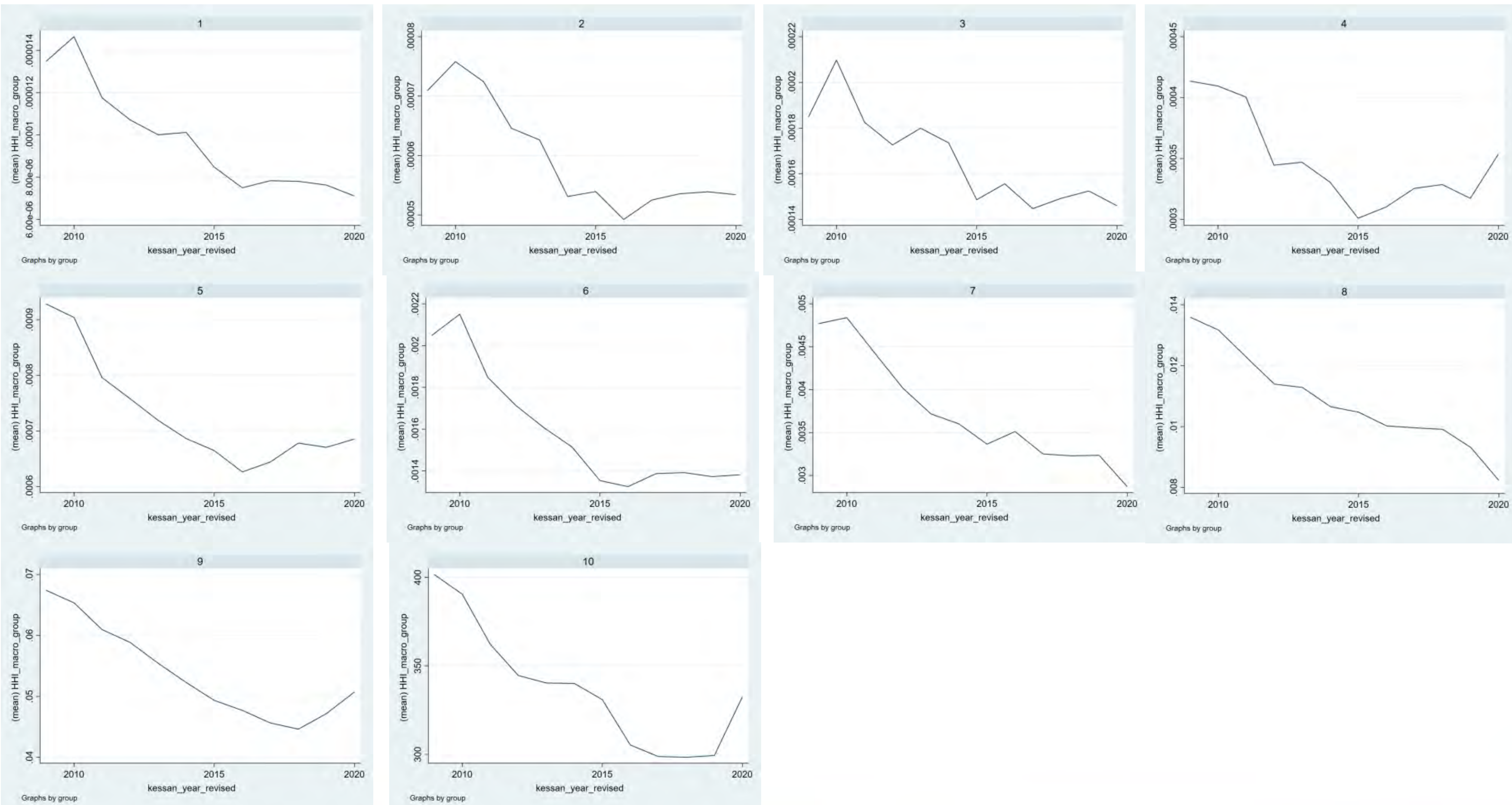
1. For each industry in each year, construct 10 equal-number groups of firms from top decile to bottom decile

2. Compute HHI for each decile × ind × year

3. Compute HHI for each decile × year by using industry sales share as weight

# X1. Concentration

- HHI of sales: Decile × Year



# X2. Model

## Model Setup

- There are continuum of industry $i \in [0, 1]$. Final goods markets are competitive.
- In industry $i$ at time $t$, there are $n_{it}$ intermediate goods produced by monopolistically-competitive firms.
- Intermediate goods firms can improve productivity by R&D investment.

# X2. Model

## Households

- Utility:

$$\int_0^\infty e^{-\rho t} \ln C_t \, dt,$$
$$\ln C_t = \int_0^1 \ln Y_{it} di.$$

- Set $P_{it} Y_{it} = 1$ for any $i$ and $t$.
- Inelastic labor supply, $L$.

# X2. Model

## Firms

- Final goods firms, $i \in [0, 1]$: Perfect competition, intermediate goods as input
- Intermediate goods firms, $j \in \mathcal{J}_{it}$:
  - final-goods specific
  - monopolistic competition
  - R&D (productivity improvement)
  - entry/exit

# X2. Model

## Final Goods Firms

- $\mathscr{J}_{it} \subset \mathbb{R}$: set of active firms (= varieties)
- $x_{ijt}$, $p_{ijt}$: output and price of intermediate good $j$ in industry $i$ at time $t$.
- Final goods Production:

$$Y_{it} = n_{it}^{\varepsilon} \left[ \int_{\mathscr{J}_{it}} x_{ijt}^{\frac{\sigma-1}{\sigma}} dj \right]^{\frac{\sigma}{\sigma-1}}, \qquad \sigma > 1, \varepsilon \in \left[ -\frac{\sigma}{\sigma-1}, 0 \right]$$

- Demand for intermediate goods:

$$x_{ijt} = n_{it}^{\varepsilon(\sigma-1)} P_{it}^{\sigma} Y_{it} p_{ijt}^{-\sigma}$$

# X2. Model

## Intermediate Goods Firms: Production

- Production: $x_{ijt} = z_{ijt}\ell_{ijt}$
- Operational fixed cost, $\kappa_o$, in the labor unit
- Instantaneous profit

$$\max \underbrace{\left(p_{ijt}z_{ijt} - w_t\right)\ell_{ijt}}_{\pi_{ijt}} - \kappa_o w_t$$

$$p_{ijt} = \frac{\sigma}{\sigma-1}\frac{w_t}{z_{ijt}}, \qquad \pi_{ijt} = \frac{s_{ijt}}{\sigma},$$

where $s_{ijt}$ is relative productivity (= sales),

$$s_{ijt} \equiv \left(\frac{z_{ijt}}{Z_{it}}\right)^{\sigma-1}, \quad Z_{it} \equiv \left[\int_{\mathscr{J}_{it}} z_{ijt}^{\sigma-1}\,dj\right]^{\frac{1}{\sigma-1}}.$$

# X2. Model

## Intermediate Goods Firms: R&D

- Fixed R&D cost in the labor unit, $\kappa_r$.
- $z_{ijt}$ evolves such that

$$\text{R\&D investment} \quad \Rightarrow \quad z_{ijt+dt} = \begin{cases} (1+\gamma)\, z_{ijt} & \text{w.p. } \lambda\, dt, \\ z_{ijt} & \text{w.p. } 1-\lambda\, dt. \end{cases}$$

- Dynamics of $z_{ijt}$: Poisson jumps
- Dynamics of $s_{ijt}$: Poisson jumps with negative trend
  - The negative trend is determined by industry-level R&D efforts,

$$\theta_{it} \equiv \frac{(\dot{Z_{it}^{\sigma-1}})}{Z_{it}^{\sigma-1}} = \lambda\, \gamma_\sigma \left( \int_{\mathscr{J}_{it}^R} s_{ijt}\, dj \right), \qquad \gamma_\sigma \equiv (1+\gamma)^{\sigma-1} - 1$$

  - $\mathscr{J}_{it}^R$: set of R&D firms

# X2. Model

## R&D Threshold, $\hat{s}_{it}$

- HJB equation:

$$
\begin{aligned}
r_t v(s_{ijt}, n_{it}, w_t) = \max \Big\{ 0, \frac{s_{ijt}}{\sigma} - \kappa_o w_t \\
&+ \max_{\chi \in \{0,1\}} \mathrm{E}_t \big[ v_s(s_{ijt}, n_{it}, w_t) \dot{s}_{ijt}|_{\chi=0}, \\
&\qquad - \kappa_r w_t + v_s(s_{ijt}, n_{it}, w_t) \dot{s}_{ijt}|_{\chi=1} \big] \\
&+ v_n(s_{ijt}, n_{it}, w_t) \dot{n}_{it} + v_w(s_{ijt}, n_{it}, w_t) \dot{w}_t \Big\}
\end{aligned}
$$

**Proposition**

*Given $\theta_{it} \geq 0$. There exists a unique threshold $\hat{s}_{it} > 0$ above which a firm invests in R&D.*

$$
v_s(\hat{s}_{it}, n_{it}, w_t)\, \hat{s}_{it} = \frac{\kappa_r w_t}{\lambda \gamma_\sigma}
$$

# X2. Model

## Exit Threshold, $\bar{s}_{it}$

- $v(\bar{s}_{it}, n_{it}, w_t) = 0$ & $v_s(\bar{s}_{it}, n_{it}, w_t) = 0$ imply

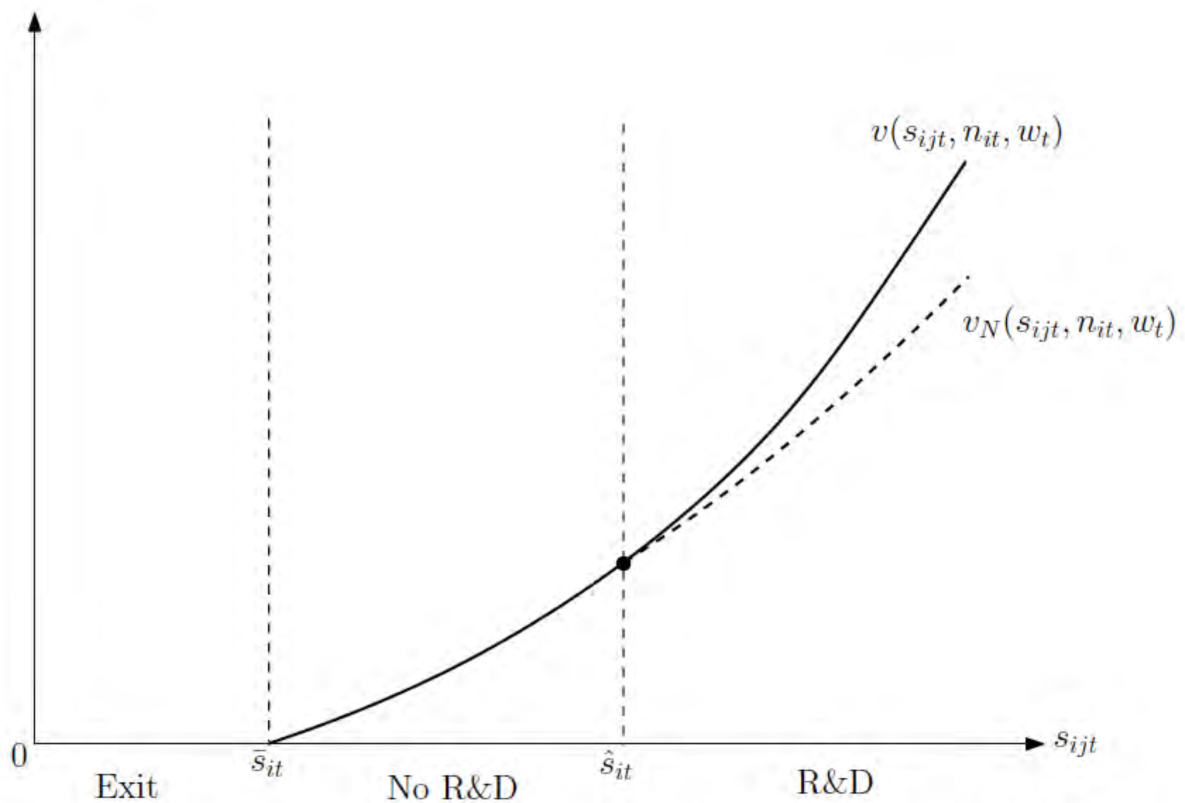
$$0 = \frac{\bar{s}_{it}}{\sigma} - \kappa_o w_t + v_n(\bar{s}_{it}, n_{it}, w_t)\dot{n}_{it} + v_w(\bar{s}_{it}, n_{it}, w_t)\dot{w}_t$$

- In a stationary state ($\dot{n}_{it} = \dot{w}_t = 0$),

$$\bar{s}_i = \sigma \kappa_o w$$

# X2. Model

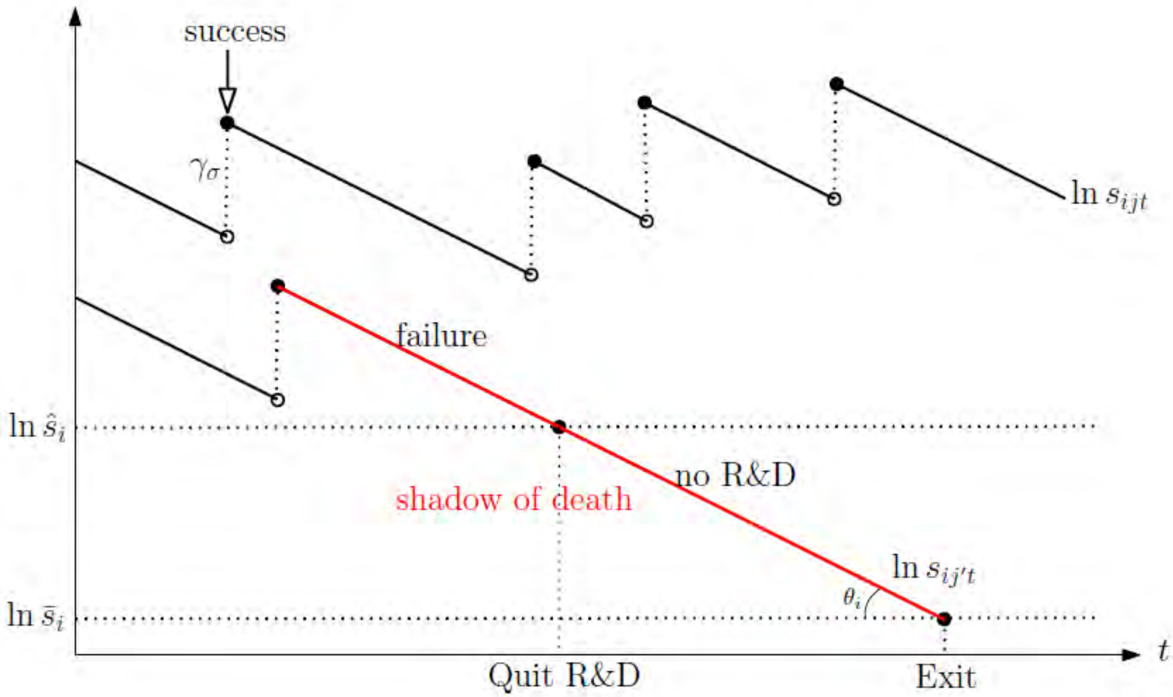
## Firm Value




$v_N(s_{ijt}, n_{it}, w_t)$: Firm value when committing non-R&D.

# X2. Model

## Dynamics of Relative Productivity



# X2. Model

## Firm Entry and Labor Market Clearing

- Fixed entry cost, $\kappa_e$, in the labor unit.
- An entrant draws $s$ from distribution $F_0$.
  - An entrant drawing $s < \bar{s}_{it}$ exits immediately.
- Free entry condition:

$$\int_{\bar{s}_{it}}^{\infty} v(s, n_{it}, w_t) dF_0 = \kappa_e w_t$$

- Labor market clearing condition:

$$L = \frac{\sigma - 1}{\sigma w_t} + \int_0^1 n_{it} \left[ \kappa_o + \kappa_r \left( 1 - F_{it} \left( \hat{s}_{it} \right) \right) + \kappa_e \mu_{it} \right] di$$

# X2. Model

## Stationary Equilibrium

- Stationary distribution, $F_i$
- Stationary equilibrium: $\{\bar{s}_i, \hat{s}_i, n_i, \theta_i, \mu_i, \delta_i\}_{i\in[0,1]}$ and $w$ that satisfy
  - Households' optimization: consumption
  - Firm's optimization: production, R&D, exit
  - Free entry
  - Labor market clearance

# X2. Model

## Equilibrium Values

- Industry level:

$$\theta_i = \lambda \gamma_\sigma n_i \int_{\hat{s}_i}^{\infty} s dF_i, \qquad n_i = \frac{1}{\int_{\bar{s}}^{\infty} s dF_i}$$

$$\delta_i = \theta_i \bar{s} f_i(\bar{s}) = \mu_i [1 - F_0(\bar{s})]$$

$$Y_{it} = \frac{\sigma-1}{\sigma} \frac{n_i^{\varepsilon} Z_{it}}{w}, \qquad g_i = \frac{\theta_i}{\sigma-1}$$

- Aggregate level:

$$g = \frac{1}{\sigma-1} \int_0^1 \theta_i di$$

$$\ln C_0 = \ln \frac{\sigma-1}{\sigma w} + \int_0^1 [\ln Z_{i0} + \varepsilon \ln n_i] di$$

$$U = \frac{\ln C_0}{\rho} + \frac{g}{\rho^2}$$

# X2. Model

## Exit Distortion

- Degree of exit distortion: $\tau$

$$\bar{s}_i = (1-\tau_i)\sigma \kappa_{o,i} w \quad \Rightarrow \quad (1-\tau_i)\sigma = \frac{\bar{s}_i}{\kappa_{o,i} w}$$

  - Higher exit distortion lowers exit thresholds.
- Assuming that the elasticity of substitution, $\sigma$, is constant across industries, the dispersion in the exit threshold relative to fixed cost, $\frac{\bar{s}_i}{\kappa_{o,i} w}$, implies the dispersion of exit distortions across industries.
  - We can infer such distortion exists if we observe significant dispersion.
- Exit distortion also affects R&D thresholds.
  - e.g., Higher exiting firm's value $\Rightarrow$ Less incentive to escape from the shadow of death $\Rightarrow$ low $\theta_i$ $\Rightarrow$ weak declining trend during the shadow of death $\Rightarrow$ exiting firms survive longer

# X2. Model

## Distortion 1: Exit Cost

- Suppose an exiting firm get $K < 0$ at exit. (Direct or indirect costs)
- Exiting firm's value:

$$v(s) = v_N(s) + e^{-\frac{r}{\theta}\ln(s/\bar{s})} K \qquad \text{for } s \in [\bar{s}, \hat{s})$$

- Exit threshold:

$$\bar{s} = (1-\tau)\sigma\kappa_o w, \qquad \tau = -\frac{rK}{\kappa_o w} > 0$$

- R&D threshold:

$$\frac{1}{r+\theta_i}\left(\frac{\hat{s}_i}{\bar{s}} - \left(\frac{\hat{s}_i}{\bar{s}}\right)^{-\frac{r}{\theta_i}}\right) = \frac{1}{1-\tau}\frac{\kappa_r/\kappa_o}{\lambda\gamma_\sigma}.$$

- For given $\theta_i$,

$$\tau\uparrow \quad \Rightarrow \quad \bar{s}\downarrow, \hat{s}\downarrow, \frac{\hat{s}}{\bar{s}}\uparrow$$

# X2. Model

## Distortion 1: Exit Cost

- Due to exit cost, firms delay exit even with negative profit flows. ($\bar{s} \downarrow$)
- Longer duration of shadow of death. ($\frac{\hat{s}}{\bar{s}} \uparrow$)
- However, they have more incentive to do R&D to escape from exit. ($\hat{s} \downarrow$)

# X2. Model

## Distortion 2: Size-dependent Subsidy

- Subsidy $K < \kappa_o w$ is given to a firm with $s_{ijt} \le \tilde{s}$ in each unit of time. Assume $\tilde{s} < \hat{s}$.
- Exiting firm's value:

$$v(s) = \begin{cases} v_N(s) + \frac{K}{r}\left(\tilde{s}^{\frac{r}{\theta}} - \bar{s}^{\frac{r}{\theta}}\right) s^{-\frac{r}{\theta}} & \text{for } s \in [\tilde{s}, \hat{s}] \\ v_N(s) + \frac{K}{r}\left(1 - \bar{s}^{\frac{r}{\theta}}\right) s^{-\frac{r}{\theta}} & \text{for } s \in [\bar{s}, \tilde{s}] \end{cases}$$

- Exit threshold:

$$\bar{s} = (1-\tau)\sigma\kappa_o w, \qquad \tau = \frac{K}{\kappa_o w}$$

- R&D threshold:

$$\frac{1}{r+\theta_i}\left(\frac{\hat{s}_i}{\bar{s}} - \left(\frac{\hat{s}_i}{\bar{s}}\right)^{-\frac{r}{\theta_i}}\right) - \frac{\tau}{1-\tau}\frac{1}{\theta_i}\left(\frac{\hat{s}_i}{\tilde{s}}\right)^{-\frac{r}{\theta_i}} = \frac{1}{1-\tau}\frac{\kappa_r/\kappa_o}{\lambda\gamma_\sigma}.$$

- For given $\theta_i$,

$$\tau\uparrow \quad \Rightarrow \quad \bar{s}\downarrow, \hat{s}\uparrow, \frac{\hat{s}}{\bar{s}}\uparrow$$

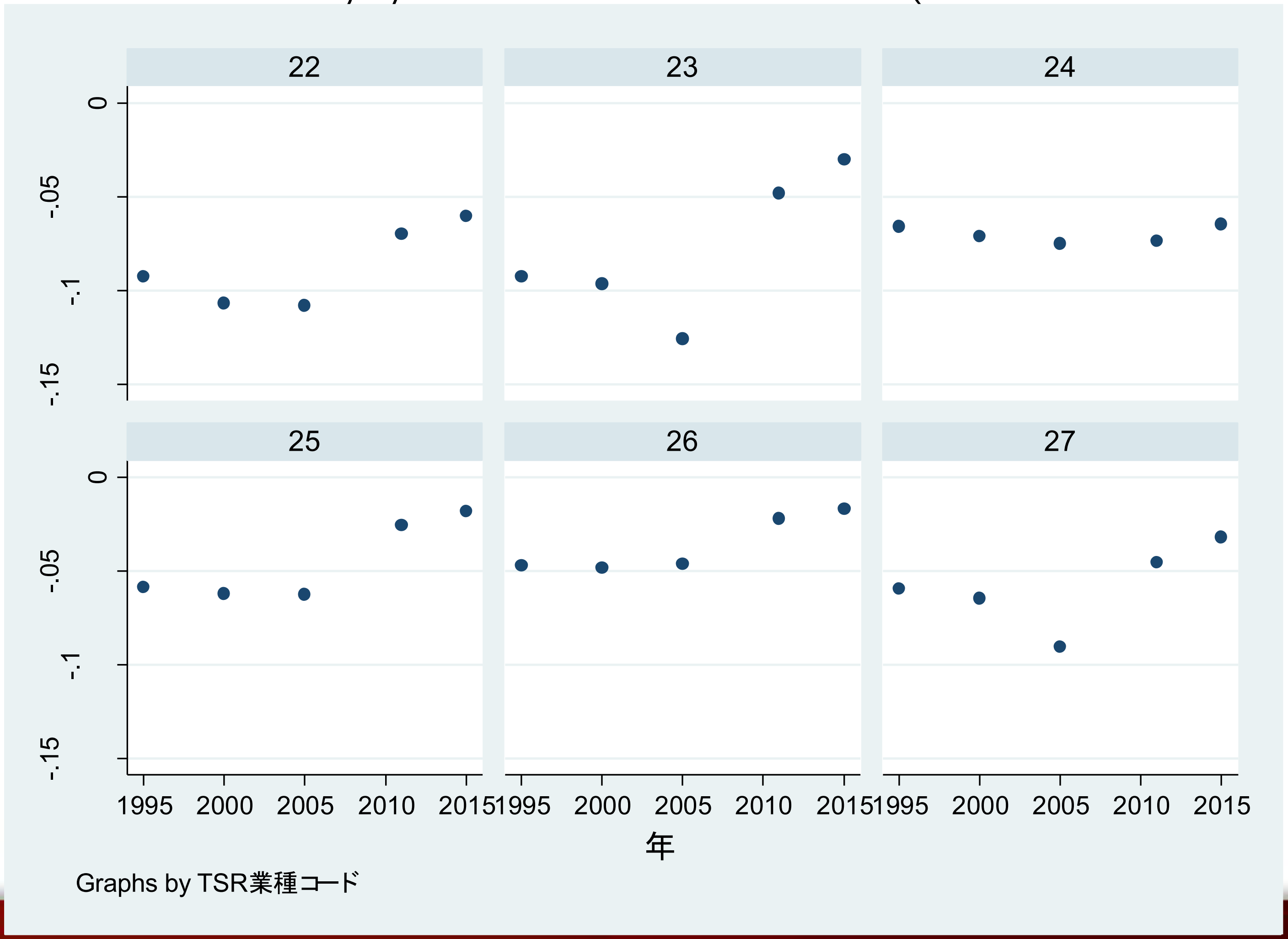
# X2. Model

## Distortion 2: Size-dependent Subsidy

- Under size-dependent subsidy, small firms can survive longer. ($\bar{s}\downarrow$)
- Longer duration of shadow of death. ($\frac{\hat{s}}{\bar{s}}\uparrow$)
- Further, such subsidy reduces incentives for R&D. ($\hat{s}\uparrow$)

# X3. Empirical analysis

- Net subsidy / Value-added (manufacturing)



# X3. Empirical analysis

- Net subsidy / Value-added (non-manufac)

<Contact information>

Daisuke Miyakawa Ph. D.

Associate Professor
Hitotsubashi University Business School (HUB)

E-mail: dmiyakawa@hub.hit-u.ac.jp

Web: https://sites.google.com/site/daisukemiyakawaphd