The Plant-Level View of Korea’s Growth Miracle

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South Korea is one of the rare economies that went from poor to rich in one generation.

Is there a systematic pattern at the micro-level behind the macro-level growth?

Our findings

1. No clear relationship between macro-level growth and the plant size distribution or static measures of allocative efficiency.

2. Growth slowdown coincides with a reduction in dynamism.
Korea’s Economic Miracle

Note: GDP per capita is deflated by GDP deflator (2015=100), and value-added per worker is deflated by manufacturing industry deflator (2015=100).

Graph showing the trends of GDP per Capita and Value-added per worker (mfg.) from 1970 to 2020.
Data

- Newly digitized Mining and Manufacturing Survey (MMS), 1967-2019

Advantages

1. A unique source of plant-level data covering all plants with 5+ workers (10+ from 2007)
2. Detailed information on input and output
3. When aggregated, replicates aggregate statistics

Limitations

1. Panel dimension only after 1981
2. Capital stock is available only in 1968 and after 1978
Plant Size Distribution (Number of Employees)

(a) Avg. of plants w/ 10+

(b) Avg. of plants w/ 5+
Plant Size Distribution

(a) Empl. share of plants w/ 250+

(b) Empl. share of plants w/ 500+

Fraction of plants
Plant Size Distribution

Standard deviation of log employment
Plant Size Distribution (Log-Log Plot)
Plant Size: Comparison with Other Countries

Source: Structural and Demographic Business Statistics (SDBS), OECD
Only plants hiring 10+ included for comparability
Plant/Firm Size and Labor Productivity

Source: Structural and Demographic Business Statistics (SDBS), OECD
Original data in local currency deflated by their own manufacturing deflator and converted into USD using the period-average exchange rate.
Allocative Efficiency

- Hsieh and Klenow (2009)’s methodology of measuring misallocation:

\[
TFPQ_{si} = A_{si} = \frac{(P_{si} Y_{si})^{\frac{1}{\sigma}}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}}
\]

\[
TFPR_{si} = P_{si} A_{si} = \frac{P_{si} Y_{si}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}}
\]

- 4-digit level industries. Plants winsorized at 1 percent.
Allocative Efficiency

\[ \frac{Y}{Y_{eff}} \]

Implied TFP gain
Allocative Efficiency

TFPR-TFPQ elasticity

Year


TFPR-TFPQ elasticity

4 4.5 5 5.5 6
Kim, Lee and Shin (2022) show misallocation across plants within targeted industries/regions got worse during the HCI project (1973-79).
Dynamism 1: Churning

Average size

Divided by avg. size of incumbents
Dynamism 1: Churning

- We calculate the Davis/Haltiwanger/Schuh growth rates of employment (5 years windows)

- DHS growth rates: \[ g_{i,t1} = \frac{\text{emp}_{i,t1} - \text{emp}_{i,t0}}{0.5 \times \text{emp}_{i,t1} + 0.5 \times \text{emp}_{i,t0}} \]
Dynamism 1: Churning

1982~1987

1987~1992

1992~1997

2013~2018
Dynamism 2: Responsiveness to Productivity

- We estimate the responsiveness of businesses to shocks following Decker, Haltiwanger, Jarmin and Miranda (2020).

\[ g_{jt+1} = \beta_0 + \beta_1 a_{jt} + T(a_{jt}, t) + \beta_2 e_{jt} + T(e_{jt}, t) + X'_{jt} \Theta + \varepsilon_{jt+1} \]

- \( g \) is DHS employment growth, \( a \) is log productivity, \( e \) is log employment, and \( X \) is other controls.

- We also used investment as a dependent variable.
## Dynamism 2: Responsiveness to Productivity

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<tr>
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<th>Employment growth</th>
<th>Capital growth</th>
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<tbody>
<tr>
<td><strong>Productivity</strong>: $\beta_1$</td>
<td>0.0274*** (0.0047)</td>
<td>0.2000*** (0.0082)</td>
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<tr>
<td>$\text{prod} \times \text{trend}$: $\delta$</td>
<td>-0.0003 (0.0002)</td>
<td>$-0.0038^{***}$ (0.0003)</td>
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<tr>
<td>$\text{prod} \times 1980s$: $\lambda_{80s}$</td>
<td>0.0199*** (0.0046)</td>
<td>0.1835*** (0.0087)</td>
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<tr>
<td>$\text{prod} \times 1990s$: $\lambda_{90s}$</td>
<td>0.0278*** (0.0057)</td>
<td>0.1508*** (0.0097)</td>
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<tr>
<td>$\text{prod} \times 2000s$: $\lambda_{00s}$</td>
<td>0.0239*** (0.0051)</td>
<td>0.1069*** (0.0064)</td>
</tr>
<tr>
<td>$\text{prod} \times 2010s$: $\lambda_{10s}$</td>
<td>0.0135*** (0.0056)</td>
<td>0.0758*** (0.0051)</td>
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Taking Stock

1. No clear correlation between macro-level growth and the plant size distribution or static measures of allocative efficiency.

2. Growth slowdown coincides with a reduction in dynamism.
   - More data requirement for research
   - Identifying frictions and policy responses
Fraction of Large Plants

![Graph showing the fraction of large plants over the years, with two lines representing different size ranges: 250-499 and 500+.]
Size Distribution: Within vs. Between Industries

- $m_t$ is aggregate average employment defined as the weighted sum of each industry’s average employment:

  $$m_t = \sum_i w_{i,t} m_{i,t},$$
  where $w_i$ is the employment share of industry $i$

- We can decompose $m_t$:

  $$\Delta m_t = \sum_i w_{i,t-1} \Delta m_{i,t} + \sum_i \Delta w_{i,t} m_{i,t-1} + \sum_i \Delta w_{i,t} \Delta m_{i,t}$$

  - The first term is within adjustment, and the second term is between adjustment.
Size Distribution: Within vs. Between Industries

Decomposition of large plants

Avg emp deviated from 1982

By components (Area Chart)

- Within adjustments
- Between reallocation
Decomposition of Change in Large Plant Share
Churning

1997~2002

Share of employment

2002~2007

Share of employment

2008~2013

Share of employment