Structural Change, Misallocation, and Aggregate Productivity

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(1) Large differences in income per capita across countries mostly accounted for by total factor productivity (TFP)
   - What accounts for these productivity differences?

(2) Simple framework to discuss potential channels:
   - technology
   - selection
   - misallocation

(3) What are the specific policies/institutions that generate misallocation?

(4) Broader consequences of misallocation via effects on selection and technology
(1) TFP and Income Differences

- Cross-country income differences mostly accounted for by TFP (e.g. Klenow and Rodriguez-Clare 1997; Jones 2015)
  - Similar conclusion when accounting for human capital quality differences (e.g. Erosa et al 2010; Manuelli and Seshadri 2014)

- Sectoral labor productivity differences (levels and growth) account for cross-country and time-series patterns of structural change and aggregate outcomes (e.g. Gollin et al 2002; Restuccia et al 2008; Duarte and Restuccia 2010)
  - Productivity gaps largest in agriculture and services, smaller in industry
(1) **TFP and Income Differences**

- Agriculture key in rich/poor aggregate productivity differences

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<thead>
<tr>
<th></th>
<th>Rich</th>
<th>Poor</th>
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<tbody>
<tr>
<td>Labor Productivity in Agriculture</td>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>Labor Productivity in Non-Ag</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Aggregate Labor Productivity</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Employment Share in Agriculture</td>
<td>5%</td>
<td>85%</td>
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- Standard sectoral framework: \( Y_a = AL_a = \bar{a} \) or \( L_a = \frac{\bar{a}}{A} \) implies:
  - (a) over time, growth in productivity \( (g_A) \) allows reallocation of labor away from agriculture
  - (b) across countries, low A countries (poor) allocate more of their labor in agriculture
Agriculture across Countries

Restuccia
Aggregate Productivity
World Bank & ECB
What accounts for productivity differences across sectors and countries?

Restuccia and Rogerson (2016): Single good produced by $N$ potential heterogeneous production units indexed by $i$ according to

$$y_i = A_i \cdot f(k_i, h_i)$$

where $A_i$ reflects differences in productivity across producers.

Fixed cost of operation $c$ in units of output.

Efficient allocation: Given aggregate capital $K$ and labor $H$, there is unique threshold $\bar{A}$ such that producers with $A_i > \bar{A}$ operate; and producers with higher $A_i$ are allocated greater amounts of capital and labor.
(2) Simple Framework of TFP Differences

- Consider economies with the same amount of aggregate resources: capital $K$, labor $H$, and number of potential production units $N$.

- Three channels account for aggregate TFP differences across countries:
  - Distribution of $A_i$’s differ across countries (technology).
  - Countries choose different set of producers to operate (selection).
  - Countries allocate inputs of capital and/or labor differently across producers (misallocation).

- Key: specific policies/institutions generating misallocation can have larger effects on TFP by affecting technology/seLECTION channels.
(3) **Causes of Misallocation**

- **Indirect approach** (e.g. Restuccia and Rogerson 2008; Hsieh and Klenow 2009): assess extent of misallocation without identifying underlying source, pointing to large TFP loses from misallocation.

- Approach helps identify relevant patterns (within industry, across industry, across time and space, across occupations, etc.) but is silent about the specific sources of misallocation.

- Identifying causes of misallocation key for policy analysis.

- **Direct approach**: quantifies role of specific policies/institutions creating misallocation, e.g.
  - Regulation and discretionary provisions
  - Selective industrial policy
  - Financial frictions
  - Trade restrictions
(3) **Causes of Misallocation**

- Challenge of direct approach
  - There is not a single source generating the bulk of misallocation and productivity differences across countries
  - Role of misallocation from specific policies quantitatively limited
  - Many different policies/institutions needed to account for the data

- Some notable exceptions:
  - Land market institutions in agriculture ([Adamopoulos and Restuccia 2014](#))
  - Changes in policy over time in specific contexts
Land institutions in poor countries characterized by:

- Lack of well-defined property rights over land
- Land use-rights are distributed in a fairly egalitarian basis...
- ...coupled with difficulty of adjusting operational scales

As a result, land is not allocated to best use, leading to small operational scales, preventing the adoption of best practices and investment in farm operations

Evidence points to substantial land (and factor) misallocation in agriculture in poor and developing countries
Land Misallocation in Malawi

- **Restuccia and Santaeulalia-Llopis (2015):** Efficient factor reallocation increases aggregate agricultural productivity by 3.4-fold
Land Misallocation in China

Implicit Agricultural Distortions in China

Large implied distortions in agricultural sector $\sigma(\log(\text{TFPR}))=0.97$, $\rho(\log(\text{TFPR}),\log(\text{TFP}))=0.88$
Aggregate Implications

- Aggregate impact of distortions:
  - Take US manufacturing distribution of $A_i$’s from Hsieh-Klenow
  - Apply US and China/India distortions in manufacturing from Hsieh-Klenow
  - Result: relative TFP gain 1.3-fold
  - Instead apply China distortions in agriculture
  - Result: relative TFP gain 4-fold
  - Take away: much larger distortions (misallocation) in agriculture

- Remark: heavier distortions to more productive units prevalent in poor countries, key for broader implications of misallocation
Changes in Policy in Specific Contexts

(1) Land reform in Philippines (Adamopoulos and Restuccia 2015)

- Cap in farm size + gov. intervention in the land market (direct excess land to landless/smallholders, restrict reallocation)
- Reform reduces farm size (34%) and aggregate productivity (17%), gov intervention key as market reallocation of excess land generates only 1/3 of the negative effects

(2) Trade reform in Chile (Pavnick 2002)

- Liberalized trade reform on productivity using plant-level data, exploiting differential exposure to external competitive pressure
- Plants in import competing sectors grew 3-10% more than plants in the non-traded sector
- Reallocation of resources from less to more efficient plants and through plant exit contributed substantially to aggregate productivity growth during the period
(4) **Broader Consequences of Misallocation**

- Early misallocation analysis: given a fixed productivity distribution common across countries, assess quantitative impact of factor *misallocation* (e.g. Restuccia and Rogerson, 2008)

- Recent work considers dynamic implications of misallocation

- Policies/institutions causing misallocation can generate larger effects on aggregate productivity by altering the productivity distribution via *technology* and *selection* channels

- This is important because:
  - Distribution of $A_i$’s differs across countries
  - A rough TFP decomposition in manufacturing reveals: misallocation (1/4) + selection (1/4) + technology (1/2)
  - Substantial shifts in the productivity distribution via technology required
Figure 35: The Distribution of TFPQ in 4-digit Manufacturing Industries

Note: This is the average distribution of TFPQ within 4-digit manufacturing industries for the U.S. in 1997, China in 2005, and India in 1994, computed as described in the text. The means across countries are not meaningful. Source: Hsieh and Klenow (2009); data provided by Chang Hsieh.
Some illustrative examples (misallocation + selection):

- **Financial frictions** (Buera et al 2011; Midrigan and Xu 2014)
  - Distorts entrepreneur-worker choices in addition to misallocation
  - Generates large negative effects on productivity
  - Can account for 40% of non-agricultural productivity differences across countries

- **Imperfect land markets** (Adamopoulos et al 2016)
  - Implicit distortions affect sector choice of highly productive farmers in addition to misallocation
  - In China a 1.8-fold TFP gain in agriculture from eliminating misallocation translates into a 15-fold gain when accounting for selection
(4) Broader Consequences of Misallocation

Some illustrative examples (misallocation + technology):

- Idiosyncratic distortions and technology adoption (Ayerst 2016)
- Productivity investment and firm dynamics
**Productivity Investment and Firm Dynamics**

- **Bento and Restuccia (2016)** Standard monopolistic competition framework extended to include: endogenous entry and entry-level and life-cycle productivity investment

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<tr>
<th>Productivity</th>
<th>US (0.09)</th>
<th>India (0.50)</th>
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<tbody>
<tr>
<td>Average Establishment Size</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>Entrant Productivity</td>
<td>1.00</td>
<td>0.42</td>
</tr>
<tr>
<td>Life-cycle growth (%)</td>
<td>5.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Prod. investment share (%)</td>
<td>13.5</td>
<td>5.4</td>
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Decomposition of agg. output:

- (a) Static misallocation | 1.00 | 0.63 |
- (c) Endogenous life-cycle growth | 1.00 | 0.70 |
- (d) Entrant investment | 1.00 | 0.47 |
Conclusion

- Productivity at the core of cross-country differences in economic structures, structural change, and aggregate outcomes
- Misallocation quantitatively important in accounting for productivity differences but...
- ...there is not a single source of misallocation that can account for the bulk of differences
- Current work shows important link between misallocation and technology/selection channels in accounting for productivity differences