The findings and results of this paper do not represent the views of the World Bank, its Executive Directors, or the countries they represent.
US-China Trade, 1995 and 2010

- **US imports from China**
- **US exports to China**

<table>
<thead>
<tr>
<th>Year</th>
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</tr>
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<tbody>
<tr>
<td>1995</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>2010</td>
<td>400</td>
<td>250</td>
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Domestic value added in Chinese exports may be far less than actual gross exports.
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- This paper takes a ground-up approach: we use transaction-level trade data and firm-level production data to assess the domestic value added in Chinese exports from 2000 to 2006.
How is it done?

1. Identify a set of firms that only participated in processing exports in a single HS 2-digit industry: all imports are used to produce processing exports within the industry.

2. Merge these firms to their production data from China’s NBS.

3. Compare import to export ratio of customs data to material to sales ratio of production data.

4. Weed out firms that specialized in importing or exporting.

5. Use the clean sample to compute a firm’s domestic value added ratio (DVAR) of the year, which simply equals the ratio of net exports to gross exports at the firm level.

6. Aggregate up all the firms in our clean sample to the HS 2 industries they are operating to calculate the industry DVAR based on the firms' exports and imports data.

7. Use export weighted average of the industry DVARs to figure out the domestic value added of firms operating across multiple industries.

8. Aggregate up all firms to calculate domestic value added by export destinations.
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Kee and Tang (WB and Tufts) Domestic Value Added in Chinese Exports 12/11 8 / 32
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- Such increase is wide spread across HS-2 industries as well as across destination countries.

-- Firm level regressions confirm that export processing firms substitute imported materials with domestic materials which explains the rising DVAR. Rising DVAR is not driven by rising domestic production costs. This result suggests that China may be moving up the global production chain and is no longer only responsible for the final stage of production.

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Road Map Ahead

- Data
- Methodology
  - Multiproduct firms
  - Negative domestic value added
- Results
- Conclusions
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The data set contains detailed information for about 100 variables, including firm ID, address, ownership, output, value added, four-digit industry code (480 categories), six-digit geographic code, exports, employment, original value of fixed asset, and intermediate inputs.
Figure 1: Chinese exports by type, 2000-2006

China's Aggregate Exports by Type

- Total Processing Exports
- Processing Share
- Regular Exports
- Total Exports

Kee and Tang (WB and Tufts)
Domestic Value Added in Chinese Exports
Table 1: Top 10 Destinations for Chinese Processing Exports

<table>
<thead>
<tr>
<th>Rank</th>
<th>2000</th>
<th>2003</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share $ (Bil)</td>
<td>Share $ (Bil)</td>
<td>Share $ (Bil)</td>
</tr>
<tr>
<td>1</td>
<td>United States</td>
<td>0.25</td>
<td>United States</td>
</tr>
<tr>
<td>2</td>
<td>Hong Kong</td>
<td>0.22</td>
<td>Hong Kong</td>
</tr>
<tr>
<td>3</td>
<td>Japan</td>
<td>0.18</td>
<td>Japan</td>
</tr>
<tr>
<td>4</td>
<td>Korea</td>
<td>0.04</td>
<td>Germany</td>
</tr>
<tr>
<td>5</td>
<td>Germany</td>
<td>0.04</td>
<td>Netherlands</td>
</tr>
<tr>
<td>6</td>
<td>Singapore</td>
<td>0.03</td>
<td>Korea</td>
</tr>
<tr>
<td>7</td>
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<td>0.03</td>
<td>Singapore</td>
</tr>
<tr>
<td>8</td>
<td>UK</td>
<td>0.03</td>
<td>UK</td>
</tr>
<tr>
<td>9</td>
<td>Taiwan</td>
<td>0.02</td>
<td>Taiwan</td>
</tr>
<tr>
<td>10</td>
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<td>0.02</td>
<td>France</td>
</tr>
</tbody>
</table>

Total 101 198 449

Kee and Tang (WB and Tufts) Domestic Value Added in Chinese Exports 12/11 13 / 32
Figure 2: Share of processing exports in top 10 destinations

Share of Processing Exports by Top 10 Destinations

Kee and Tang (WB and Tufts)
Domestic Value Added in Chinese Exports
Figure 3: Shares of processing exports in HS 2 industries

Graphs by group_desc

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- For many industries, such as Electronics, Transportation, Plastic Products, Toys, processing trade is the main form of exports from China.
- Given the high imported content in processing exports, any analysis based on gross trade flows can be highly misleading.
Methodology

- Start with a textbook identity, where the total revenue of a firm ($PY$), consists of the following components: profits ($\pi$), wages ($wL$), cost of capital ($rK$), cost of domestic material ($P^D M^D$) and cost of imported material ($P^I M^I$)

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- Domestic value added ratio ($DVAR$) is therefore

$$DVAR = \frac{DVA}{EXP} = \frac{EXP - IMP}{EXP} = 1 - \frac{IMP}{EXP}$$
Two Important Assumptions

1. we assume that there is no imported content in domestic materials, such that $P^D M^D$ embodies purely domestic contents.

2. we assume that imported materials have no Chinese contents, such that $\text{IMP}$ is completely foreign made.

If violated, the first assumption will lead to an over-estimation of $DVA$. If violated, the second assumption will lead to an under-estimation of $DVA$. The overall bias due to the two assumptions is not clear, but there is nothing we can do at this stage to assess the direction of bias.
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- Example of HS 2 industries: Woven apparel products (HS 62), Non-woven apparel product (HS 61), Footwear, gaiters and the like (HS 64), Electrical machinery and equipment and parts (HS 85), Toys, games and sports requisites (HS 95).
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- For these set of single HS 2 industry processing firms, all its imports are for exports within their HS 2 industry \( \Rightarrow \) estimate the average \( DVA \) for each HS 2 industry using the sample of single-HS2 exporters.

Kee and Tang (WB and Tufts)
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2. Inventory management
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- For those firms that operate across multiple HS 2 industries, we apply the export weighted average $DVA$ ratio of the industries they are in to obtain their firm level $DVA$ ratio.
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But this may not be a big problem, as once we weed out firms with excessive imports, $DVA$ are mostly positive.
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Rising DVAR is observed across industries and across destinations.
Figure 5: Estimated average domestic value added ratio in Chinese exports

Average domestic value added ratios of processing exports

Kee and Tang (WB and Tufts)
Figure 6: Estimated domestic value added ratios by HS 2 industries

Graphs by group_desc

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Figure 6: Distributions of domestic value added ratios

Distribution of domestic value added, all sectors

- Blue line: 2000
- Red line: 2003
- Green line: 2006
Figure 7: Domestic value added vs capital intensity

DVA Ratios and Capital Intensity (2006)

slope = -0.045; t stat = -1.62; N=56

Kee and Tang (WB and Tufts) Domestic Value Added in Chinese Exports 12/11 27 / 32
Why is domestic value added ratio rising?

- It could be due to rising production costs in China $\Rightarrow$ China is losing competitiveness
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- It could be due to rising production costs in China $\Rightarrow$ China is losing competitiveness
- It could be because firms substitution imported materials with domestic materials $\Rightarrow$ China is moving up the value added chain in global production network
Dependent variable: domestic value added ratio

<table>
<thead>
<tr>
<th>Sample</th>
<th>(1) all</th>
<th>(2) all</th>
<th>(3) all</th>
<th>(4) all</th>
<th>(5) all</th>
<th>(6) private</th>
<th>(7) dom. private</th>
<th>(8) foreign</th>
<th>(9) High K/L</th>
<th>(10) Low K/L</th>
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</thead>
<tbody>
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<td>$\alpha_{2001} - \alpha_{2000}$</td>
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| ln(wage rate)  | 0.002   | 0.002   | 0.002   | -0.010  | 0.002   | 0.001       | 0.001          | 0.001       |
|                | (0.60)  | (0.44)  | (0.46)  | (-0.61) | (0.43)  | (0.15)      | (0.13)         |             |

| wage bill/Rev. | 0.006   | 0.013   | 0.013   | -0.028  | 0.016   | 0.003       | 0.016          |             |
|                | (0.83)  | (0.66)  | (0.65)  | (-0.34) | (0.78)  | (0.05)      | (0.77)         |             |

| Mat./Rev.      | -0.000*** | -0.000*** | -0.000*** | -0.037 | -0.000*** | -0.000*** | -0.075*** |
|                | (-6.34)   | (-6.44)   | (-6.46)   | (-0.83) | (-6.87)   | (-20.19)   | (-5.60)     |

N               | 54071     | 53205     | 54060     | 54071   | 53194     | 53046      | 6216       | 46154      | 8620        | 44874       |
R-sq            | 0.0547    | 0.0547    | 0.0547    | 0.0549  | 0.055     | 0.0555     | 0.0486     | 0.0573     | 0.0568      | 0.0718      |

Note: Firm and year fixed effects are always included. Data set: merged NBS and customs data. “High K/L” means all HS2 industries that have average ln(K/L) above the median of all HS2. “Low K/L” includes all HS2 below the median.
Dependent variable: import to material ratio

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<td>all</td>
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<td>-0.026***</td>
<td>-0.026***</td>
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<td>(0.56)</td>
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<td>-0.040***</td>
<td>-0.040***</td>
<td>-0.039***</td>
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<td>(-8.18)</td>
<td>(-8.55)</td>
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<td>-0.059***</td>
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<td>-0.060***</td>
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<td>-0.089***</td>
<td>-0.090***</td>
<td>-0.089***</td>
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<td>-0.012***</td>
<td>-0.010</td>
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<td>(0.46)</td>
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</table>

Kee and Tang (WB and Tufts)
Domestic Value Added in Chinese Exports

12/11 30 / 32
Regression results suggest that processing firms are substituting imported materials with domestic materials.
In Summary

- Regression results suggest that processing firms are substituting imported materials with domestic materials.
- Evidence of China moving up the value added chain and no longer only responsible for the final assembly of products.
Conclusions

- We assess domestic value added in Chinese exports based on customs transaction data.
Conclusions

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- We assess domestic value added in Chinese exports based on customs transaction data.
- Our results are similar to those existing papers that use aggregate input-output table.
- Domestic value added only consists of about 60 percent of Chinese exports.
- Bilateral imbalance between US and China could be grossly overestimated based on gross trade figures.