Decomposing the Change in GDP per capita

Examining changes in Rwanda, Nicaragua, Indonesia- 1997 to 2000, and South Asia

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Decomposing change in GDP per capita

\[ Y/N = (Y/E)(E/A)(A/N) \]

GDP (value added) per capita can be decomposed into 3 parts:
- Output per worker
- Employment to (Working Aged) Population Ratio
- Working Aged Population to Total Population

Decomposition of the change in GDP uses Shapley approach to divide each component

As with all such decompositions, this does not provide a direct causal interpretation.
Data Needs

1) Population Data for Entire Population and Working Aged (Census)

2) GDP Value Added by Sector from National Accounts

3) Micro-level Employment Data by Sector
   - Need these for two points in time
Basic Trends in Rwanda, 2000-2006
Source: MINECOFIN (GDP), eicv1 & eicv2 (Employment and Population)

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2006</th>
<th>Δ</th>
<th>% Δ</th>
<th>Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita</td>
<td>80,987 (US$)</td>
<td>97,847 (US$)</td>
<td>16,859 (US$)</td>
<td>20.8%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Employment (1000s)</td>
<td>3,495</td>
<td>4,002</td>
<td>507</td>
<td>14.5%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Poverty Headcount</td>
<td>.604</td>
<td>.569</td>
<td>-.035</td>
<td>-5.9%</td>
<td>-1.0%</td>
</tr>
</tbody>
</table>

* 94 2001 RWF = $1 US (PPP)
Decomposing change in GDP per capita

\[ \Delta(Y/N) \]
Change in GDP per capita
+16,859
(100%)

\[ \Delta(Y/E) \]
Change in output per worker
+20,487
(122%)

\[ \Delta(E/A) \]
Change in Emp-to-working age pop ratio
-6,023
(-36%)

\[ \Delta(A/N) \]
Change in working age to total population
+2,395
(+14%)

- Increased share of the population was working aged (15-64)
Decomposing change in GDP per capita

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• Lower participation is associated with a sizable decline in GDP per capita of 6,023 RWF
  – 7.4% of GDP per cap in 2000; 36% of the \( \Delta \) in GDP per capita
  – This was driven by 15 to 24 year-olds (This age group also had sizeable gains in enrollment rates)
Decomposing change in GDP per capita due to employment changes

\[ \Delta(E/A) = -6,023 (-36\%) \]

- **Primary**
  - \(-15,693 (-93\%)\)

- **Secondary**
  - \(+2,711 (+16\%)\)

- **Tertiary**
  - \(+6,959 (+41\%)\)

Note: Values represent the contribution to the change in GDP per capita. Percentage values are in percent of total change in GDP per capita.
Decomposing change in GDP per capita

\[ \Delta(Y/N) \]
Change in GDP per capita

+16,859
(100%)

\[ \Delta(Y/E) \]
Change in output per worker

+20,487
(122%)

\[ \Delta(E/A) \]
Change in Emp-to-working age pop ratio

-6,023
(-36%)

\[ \Delta(A/N) \]
Change in working age to total population

+2,395
(+14%)

- Notice the increase in output per worker. This drives growth in GDP per capita.
  - 25% of GDP per cap in 2000; 122% of the \( \Delta \) in GDP per capita
Decomposing change in GDP per capita due to changes in output per worker

\[ \Delta (Y/E) \]
\[ +20,487 \]
\[ (+122\%) \]

Inter-sectoral Shifts
\[ +38,740 \]
\[ (+230\%) \]

Primary
\[ +8,105 \]
\[ (+48\%) \]

Secondary
\[ -10,662 \]
\[ (-63\%) \]

Tertiary
\[ -15,698 \]
\[ (-93\%) \]

Note: Values represent the contribution to the change in GDP per capita. Percentage values are in percent of total change in GDP per capita.
Changes in Value Added and Employment across sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>2000</th>
<th>2006</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>254.5</td>
<td>322.0</td>
<td>26.5%</td>
</tr>
<tr>
<td>Secondary</td>
<td>93.1</td>
<td>147.8</td>
<td>58.8%</td>
</tr>
<tr>
<td>Tertiary</td>
<td>297.3</td>
<td>459.0</td>
<td>54.4%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>644.8</td>
<td>928.7</td>
<td>44.0%</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Sector</th>
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<th>2006</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>3,097,241</td>
<td>3,068,009</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Secondary</td>
<td>65,012</td>
<td>204,734</td>
<td>214.9%</td>
</tr>
<tr>
<td>Tertiary</td>
<td>333,237</td>
<td>729,283</td>
<td>118.8%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,495,491</td>
<td>4,002,026</td>
<td>14.5%</td>
</tr>
</tbody>
</table>
Further analysis- details in guide

• Examine inter-sectoral changes accounted for by sector

• Decompose into changes in output per worker (within sectors) into TFP and capital-labor ratio components
  – Need information on:
    • share of national income going towards capital
    • Capital STOCK
Can it be done in practice???

This decomposition sounds complicated!

Will it be time-consuming to compute???

LET’S SEE
First, get JoGGs

- See where to download on web
  - www.worldbank.org/employment/

- Actually have this in folder on desktop
  - Go to Desktop/Labor Market/JoGGs folder
  - Open JoGGs Decomposition Tool 1-0.xlt
  - Nicaragua data (2001-2005) is pre-loaded
Nicaragua

• **Notice:**
  - more detailed sector breakout
  - Information on capital

• **Press Generate**
  - Figure 1/Table 2: demographics vs employment participation vs productivity
  - Table 6a/6b: why output per worker declined...
  - Fig 5 (w/ capital info) decline assoc. with TFP
  - Table 10a/10b: putting it all together
Now, let’s look at a crisis situation
Indonesia, 1997 - 2000

• Work with partner

• Take 5 minutes, get a feel for what drove changes in 1997 to 2000 period
  – Focus on:
    • Figure 1/Table 2
    • Table 6a/6b
    • Table 10a/10b
Recent work from PREM for South Asia flagship report

• Review some of key results quickly

• These data are in South Asia folder
  – but we will not look at now
Growth Decompositions

Per capita Value Added

- Nepal (1999-2001)
- India (1994-2002)
- Bangladesh (1996-2005)
- Pakistan (1997-2005)

Output per Worker

- Nepal (1999-2001)
- Bangladesh (1996-2005)
- India (1994-2002)
- Pakistan (1997-2005)

- Growth linked to output per worker
- Growth linked to changes in the share of population of working Age
- Contributions of Inter-sectoral Shifts (%)
- Contribution of within sector changes in output per worker (%)

Source: WDI and GDF database, World Bank, 2009; for India’s employment Institute of Applied Manpower Research, for Maldives’ value added unstats.un.org

• Nepal and Bangladesh growth is mostly explained by inter-sectoral shifts.
• In India, Pakistan, Sri Lanka and Maldives the growth is driven by the contribution of output per worker within sector.
Concluding remarks on South Asia

- Countries in SA show a steady GDP growth.
- Labor productivity growth is high.
- Employment gap increasing since 2000s, except in India.
- Nevertheless, poverty has decline.
- The increase in productivity and the decline in poverty seem to be associated with sectoral shifts of labor away from agriculture into services.
Concluding remarks on South Asia (cont.)

In India, Sri Lanka and Pakistan:
- Over 30% of the growth has been associated with labor productivity in the services sector, and the increase in employment rate in industry (10% in average).

In contrast, in Maldives, Bangladesh and Nepal:
- The growth in productivity is larger in agriculture reflecting the shift in employment into higher productivity sectors. More than 30% of the growth is due to employment rate in services.
Final comments on JoGGs

• Remember it’s a starting point
• Analysis is descriptive
• Follow where it takes you