Wage Dynamics and Economic Development

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Should wages grow at the same rate as GDP?

\[
\frac{Y}{N} = \frac{L}{N} \left[ s_1 w_1 + (1 - s_1) w_2 + \frac{\pi}{L} \right]
\]

- \(Y\) = GDP
- \(L\) = Labor Force
- \(N\) = Population
- \(s\) = share of labor force employed in sector
- \(w\) = wage of the sector
- \(\pi\) = profits
Figure 1

The graph shows a linear relationship between the log of annual income of Janitors (in USD) and the log of GDP per worker (in USD) across various countries.

Countries are labeled on the graph, including but not limited to:
- Denmark
- Costa Rica
- Australia
- Netherlands
- Japan
- Taiwan
- Vietnam
- Thailand
- Brazil
- Malaysia
- Greece
- Portugal
- Argentina
- Poland
- United States
- India
- Indonesia
- China
- Russia
- Ukraine
- Zimbabwe
- Mexico
- Egypt
- Bulgaria
- Venezuela
- Slovakia
- Czech Republic
- Hungary
- Ukraine
- Iceland
- Luxembourg
- Austria
- Switzerland
- Belgium
- France
- United Kingdom
- Japan
- Norway
- Sweden
- Finland
- Canada
- Brazil
- Mexico
- Egypt
- Zimbabwe
- Vietnam
- Thailand

The graph indicates a stronger income for Janitors in countries with higher GDP per worker.
Figure 2

Log of annual income of Drivers (in USD) vs. Log of GDP per worker (in USD)

Countries represented in the diagram include:
- Argentina
- Australia
- Brazil
- Bulgaria
- Chile
- Colombia
- Costa Rica
- Denmark
- Ecuador
- Egypt
- Finland
- France
- Germany
- Greece
- Guatemala
- Hungary
- India
- Indonesia
- Ireland
- Israel
- Italy
- Japan
- Jordan
- Korea
- Luxembourg
- Malaysia
- Mexico
- Netherlands
- New Zealand
- Norway
- Pakistan
- Philippines
- Poland
- Portugal
- Puerto Rico
- Russia
- Singapore
- Slovakia
- South Africa
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
- Turkey
- Ukraine
- United Kingdom
- United States
- Vietnam

The data suggests a strong positive correlation between the log of annual income of drivers and the log of GDP per worker, indicating that countries with higher GDP per worker tend to have higher annual incomes for drivers.
Figure 3

Log of annual income of Secretaries (in USD) vs. Log of GDP per worker (in USD) for various countries.
Hourly Wages at McDonalds Franchises -vs- GDP per worker

Source: Ashenfelter and Jurajda (2002)
Hourly wages in Textiles and GDP per person, 2002

\[ \ln(W) = 0.7641 \ln(Y) - 5.5471 \]

\[ R^2 = 0.8847 \]
Hourly wages in apparel and GDP/person

\[ y = 0.6319x - 4.6446 \]

\[ R^2 = 0.7295 \]
Wages for 'field crop farm worker' vs GDP/worker

\[ y = 0.9175x - 2.9221 \]

\[ R^2 = 0.9149 \]

Source: Freeman and Oostendorp
BLS wages in manufactures and GDP per capita, USA 1975-2002

United States

8.93165

1.85003

3.06199

10.4971

lgdppcd
BLS wages in manufactures and GDP per capita, France 1975-2002
\[ Y = AK^\phi L_u^\alpha (L_s H)^\beta \]

\[ \ln(\nu_s) = \ln(\beta) + \ln(Y / L) - \ln(H) - \ln(s_s) \]

\[ \ln(\nu_u) = \ln(\alpha) + \ln(Y / L) - \ln(1 - s_s) \]

Y=GDP
L=labor
H=skills Index
S=labor shares across sectors
<table>
<thead>
<tr>
<th></th>
<th>Janitor</th>
<th>Driver</th>
<th>Secretary</th>
<th>Mid-manager</th>
<th>Top manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln(GDP/L)</td>
<td>0.94</td>
<td>0.89</td>
<td>0.91</td>
<td>1.03</td>
<td>1.02</td>
</tr>
<tr>
<td>(13.01)**</td>
<td>(14.76)**</td>
<td>(11.21)**</td>
<td>(10.80)**</td>
<td>(9.29)**</td>
<td></td>
</tr>
<tr>
<td>Skills</td>
<td>-0.05</td>
<td>-0.08</td>
<td>-0.27</td>
<td>-0.63</td>
<td>-0.68</td>
</tr>
<tr>
<td>(0.42)</td>
<td>(0.80)</td>
<td>(2.12)*</td>
<td>(4.22)**</td>
<td>(3.95)**</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.66</td>
<td>0.21</td>
<td>0.44</td>
<td>0.13</td>
<td>0.84</td>
</tr>
<tr>
<td>(0.99)</td>
<td>(0.37)</td>
<td>(0.59)</td>
<td>(0.14)</td>
<td>(0.82)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.90</td>
<td>0.92</td>
<td>0.84</td>
<td>0.78</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Source: Author’s calculations using raw data from the Executive Opinion Survey conducted by the World Economic Forum, 1999.

* Significant at the 5 percent level.

** Significant at the 1 percent level.

a. The capital-labor ratio is used as an instrument for GDP per worker. Absolute value of t statistic is in parentheses.
Table 6. OLS Regressions of Median Wages (Second Specification)*

<table>
<thead>
<tr>
<th></th>
<th>Janitor</th>
<th>Driver</th>
<th>Secretary</th>
<th>Mid-manager</th>
<th>Top manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln(capital-labor ratio)</td>
<td>0.85</td>
<td>0.81</td>
<td>0.82</td>
<td>0.93</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>(11.99)**</td>
<td>(13.57)**</td>
<td>(10.53)**</td>
<td>(10.22)**</td>
<td>(9.02)**</td>
</tr>
<tr>
<td>Skills</td>
<td>0.05</td>
<td>0.01</td>
<td>-0.18</td>
<td>-0.52</td>
<td>-0.58</td>
</tr>
<tr>
<td></td>
<td>(0.40)</td>
<td>(0.14)</td>
<td>(1.39)</td>
<td>(3.52)**</td>
<td>(3.44)**</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.77</td>
<td>0.10</td>
<td>0.33</td>
<td>0.00</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>(1.05)</td>
<td>(0.16)</td>
<td>(0.41)</td>
<td>(0.00)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>Observations</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.88</td>
<td>0.90</td>
<td>0.82</td>
<td>0.75</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Source: Author’s calculations using raw data from the Executive Opinion Survey conducted by the World Economic Forum, 1999.

** Significant at the 1 percent level.

a. Absolute value of t statistic is in parentheses.
Table 7. Regressions of Median Wages with Additional Variables

<table>
<thead>
<tr>
<th></th>
<th>Janitor</th>
<th>Driver</th>
<th>Secretary</th>
<th>Mid-manager</th>
<th>Top manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln(GDP/L)</td>
<td>1.03</td>
<td>1.08</td>
<td>1.15</td>
<td>1.54</td>
<td>1.70</td>
</tr>
<tr>
<td></td>
<td>(4.39)**</td>
<td>(5.52)**</td>
<td>(4.96)**</td>
<td>(5.55)**</td>
<td>(5.31)**</td>
</tr>
<tr>
<td>Minimum wage</td>
<td>0.15</td>
<td>0.11</td>
<td>0.09</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(2.38)*</td>
<td>(2.02)*</td>
<td>(1.39)</td>
<td>(0.73)</td>
<td>(0.42)</td>
</tr>
<tr>
<td>Competition</td>
<td>0.34</td>
<td>0.36</td>
<td>0.31</td>
<td>0.33</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>(2.58)*</td>
<td>(3.26)**</td>
<td>(2.41)*</td>
<td>(2.13)*</td>
<td>(1.88)</td>
</tr>
<tr>
<td>Foreign language (FL)</td>
<td>0.68</td>
<td>0.75</td>
<td>1.18</td>
<td>1.72</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>(1.74)</td>
<td>(2.29)*</td>
<td>(3.06)**</td>
<td>(3.72)**</td>
<td>(4.00)**</td>
</tr>
<tr>
<td>ln(GDP/L) × FL</td>
<td>−0.06</td>
<td>−0.07</td>
<td>−0.10</td>
<td>−0.16</td>
<td>−0.20</td>
</tr>
<tr>
<td></td>
<td>(1.34)</td>
<td>(2.00)</td>
<td>(2.32)*</td>
<td>(3.06)**</td>
<td>(3.33)**</td>
</tr>
<tr>
<td>Skills</td>
<td>0.08</td>
<td>0.05</td>
<td>−0.10</td>
<td>−0.41</td>
<td>−0.42</td>
</tr>
<tr>
<td></td>
<td>(0.82)</td>
<td>(0.63)</td>
<td>(1.04)</td>
<td>(3.51)**</td>
<td>(3.14)**</td>
</tr>
<tr>
<td>Constant</td>
<td>−4.24</td>
<td>−3.97</td>
<td>−4.83</td>
<td>−7.65</td>
<td>−8.65</td>
</tr>
<tr>
<td></td>
<td>(2.08)*</td>
<td>(2.33)*</td>
<td>(2.41)*</td>
<td>(3.17)**</td>
<td>(3.12)**</td>
</tr>
<tr>
<td>Observations</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.94</td>
<td>0.95</td>
<td>0.92</td>
<td>0.88</td>
<td>0.85</td>
</tr>
</tbody>
</table>

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a. The capital-labor ratio is used as an instrument for GDP per worker. Absolute value of t statistic is in parentheses.
Wage Determination - results

• Capital Labor ratio
• Skills Index
• Skills premium declines with GDP
• Wage inequality declines with GDP
• Language skills and manager salaries