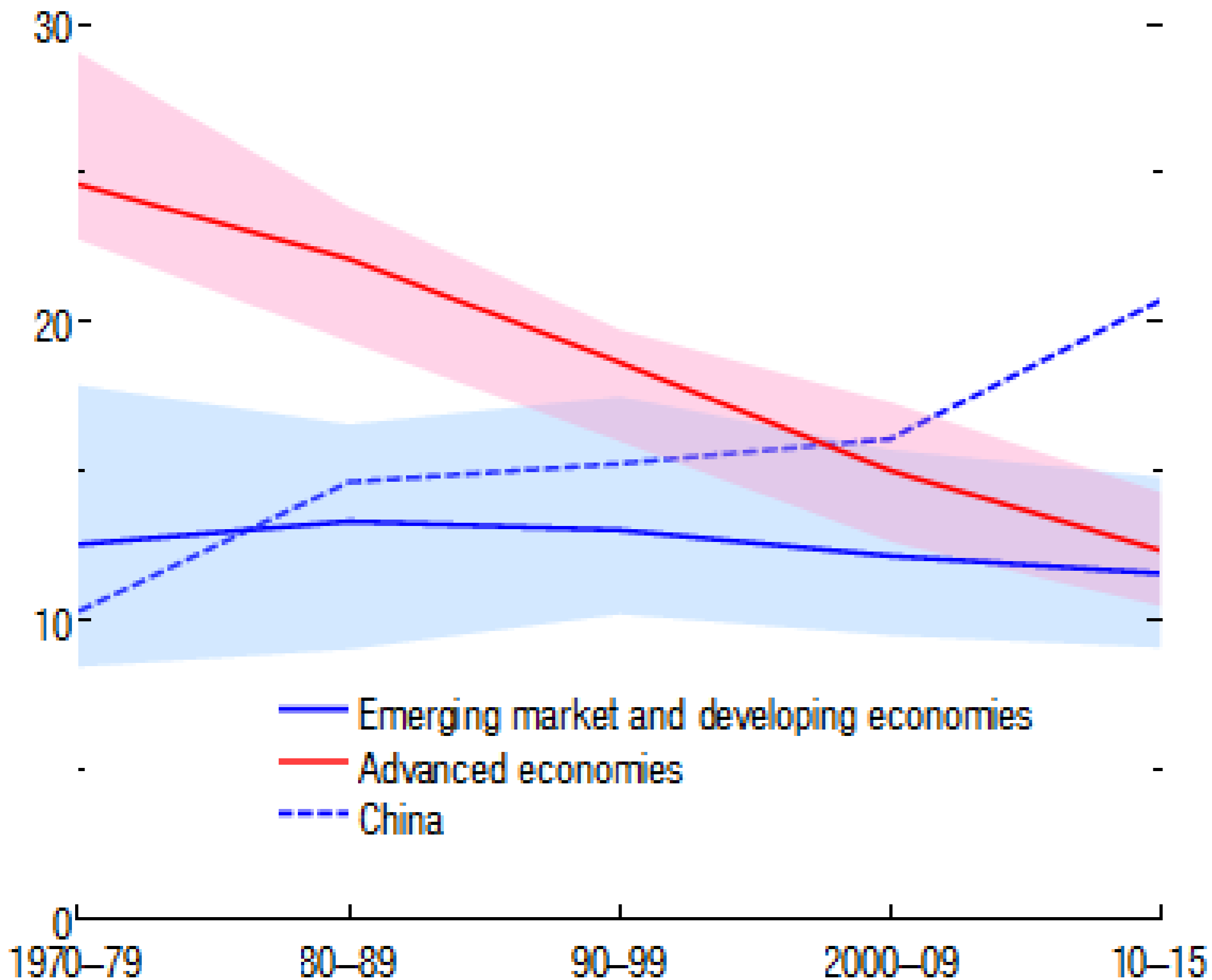# Manufacturing Jobs: Implications for Productivity and Inequality

Wenjie Chen, Bertrand Gruss, Nan Li, Weicheng Lian, Natalija Novta, and Yu Shi,
with support from Felicia Belostecinic, Hao Jiang, Evgenia Pugacheva, and Jilun Xing

Share of Manufacturing in Aggregate Employment
(Percent)

Emerging market and developing economies
Advanced economies
China

The share of manufacturing in employment has fallen significantly in AEs…

…and remained relatively low in most EMDEs—as workers are shifting from agriculture to services, bypassing the manufacturing sector.

Manufacturing employment is peaking earlier and at lower levels than in the past (Rodrik 2016)

**Peak of Manufacturing Employment Share**
(Percent)
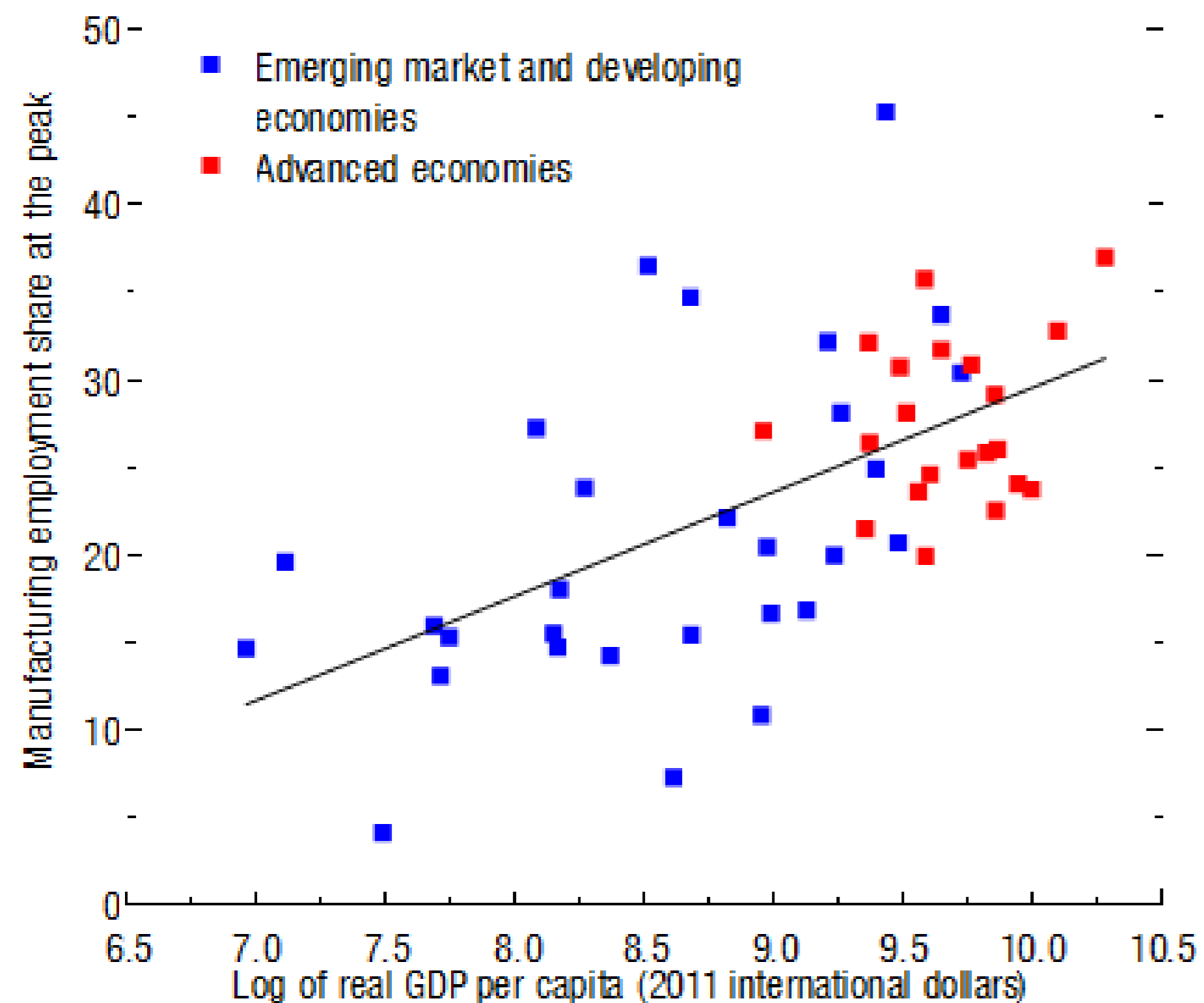
- Productivity tended to slow as resources switched from manufacturing to services (Baumol 1967)

- Strong expansion of manufacturing employment and exports in successful convergence cases (Jones and Olken 2005; Johnson et al. 2007)

- Evidence of unconditional convergence of productivity to global frontier in manufacturing (Rodrik 2013)

Disappearance of "high-quality" manufacturing jobs may have worsened income inequality in AEs.

Changes in Manufacturing Employment Share and Inequality, 1980—2010
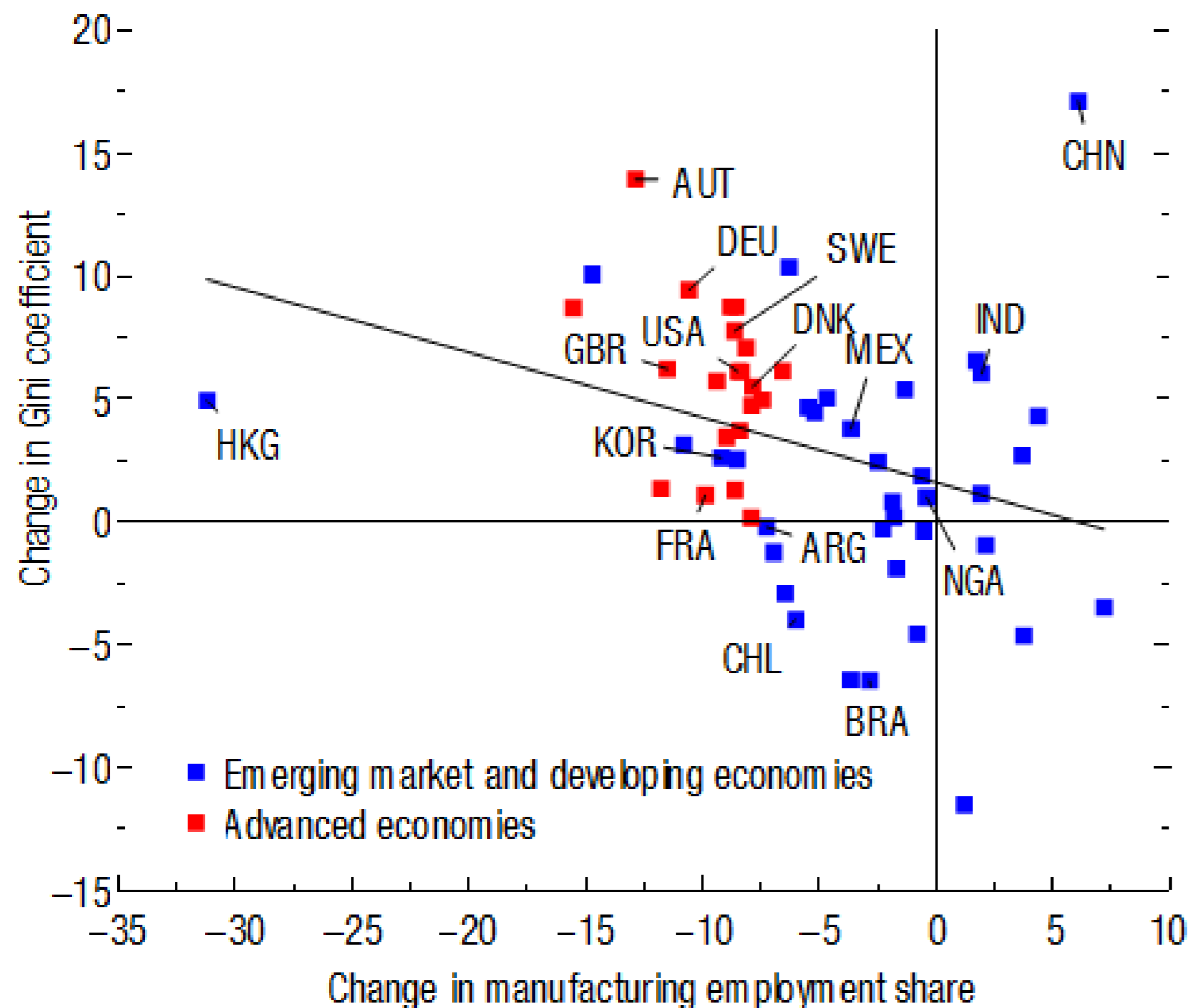
- Less-skilled workers traditionally earned higher wages in manufacturing than in services (Helper, Krueger, and Wial 2012).

- Shift of displaced manufacturing workers to low-skill and low-wage service jobs may contribute to "hollowing out" of the income distribution and higher earnings inequality.

Main questions

- **Trends and drivers** - How have manufacturing employment and output shares evolved since the 1970s and which service sectors expanded?

- **Per capita income growth** – Would skipping a traditional industrialization phase hinder economy-wide productivity growth and income convergence prospects of EMDEs?

- **Income inequality** – Is pay higher and more evenly distributed in manufacturing than in services? Can the decline in manufacturing jobs explain changes in aggregate inequality?

Preview of key findings

- Global manufacturing (real) output and employment shares are not lower than four decades ago. But this masks pronounced changes at the country level.

- Leveling-off / decline in manufacturing employment **need <u>not</u> hurt growth and income convergence**:

  - Some service sectors can match productivity level and growth rate of manufacturing…

  - … and exhibit evidence of convergence to the global frontier.

  - Shift of labor from agriculture to services since 2000 boosted growth in EMDEs; shift from manufacturing to services in AEs did not weighed significantly on growth.

- Decline in manufacturing jobs **need <u>not</u> raise earnings inequality** in AEs:

  - Labor earnings in manufacturing are somewhat higher and more evenly distributed than in services.

  - But changes in aggregate inequality are mainly explained by rising inequality within all sectors.

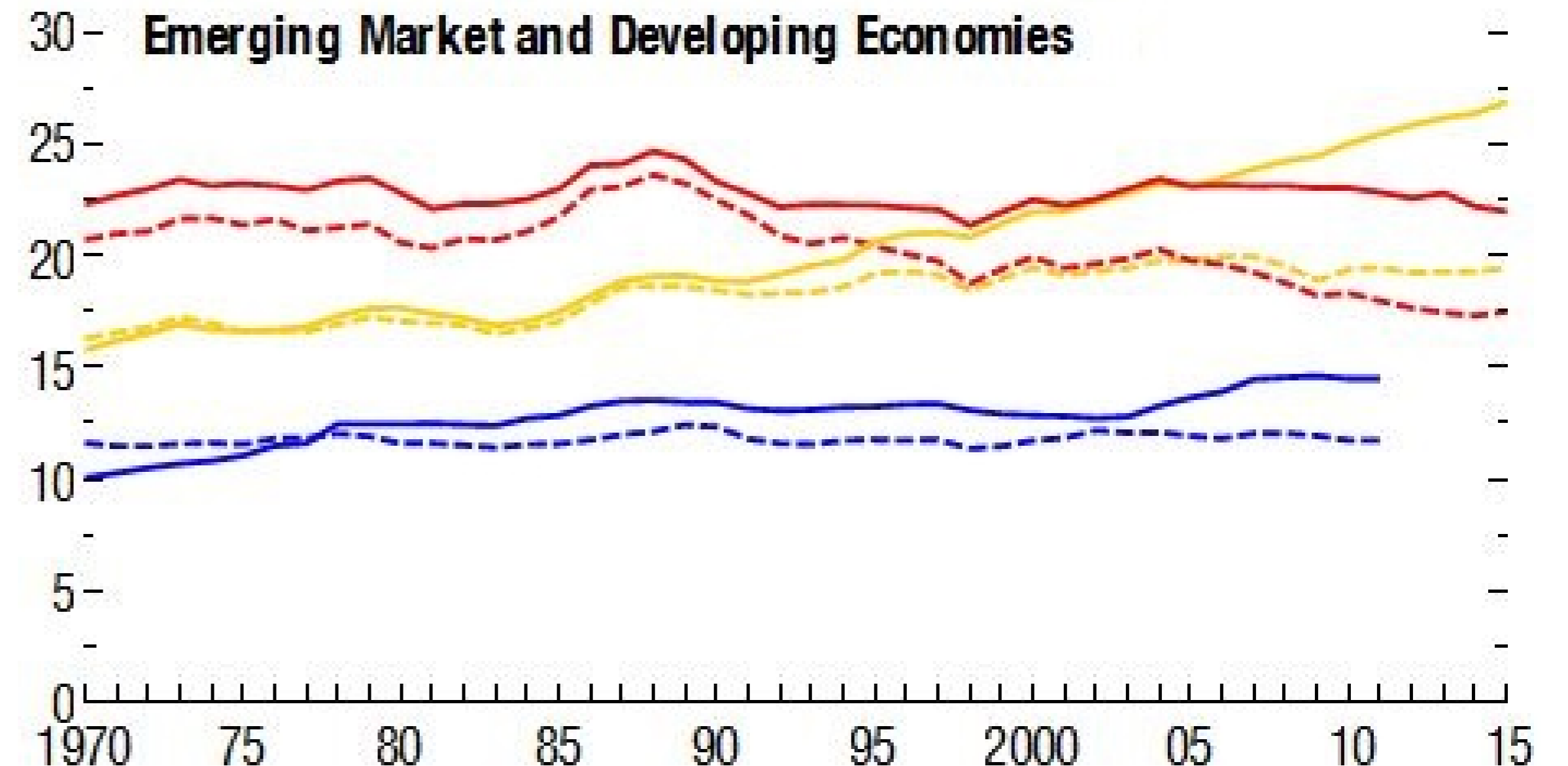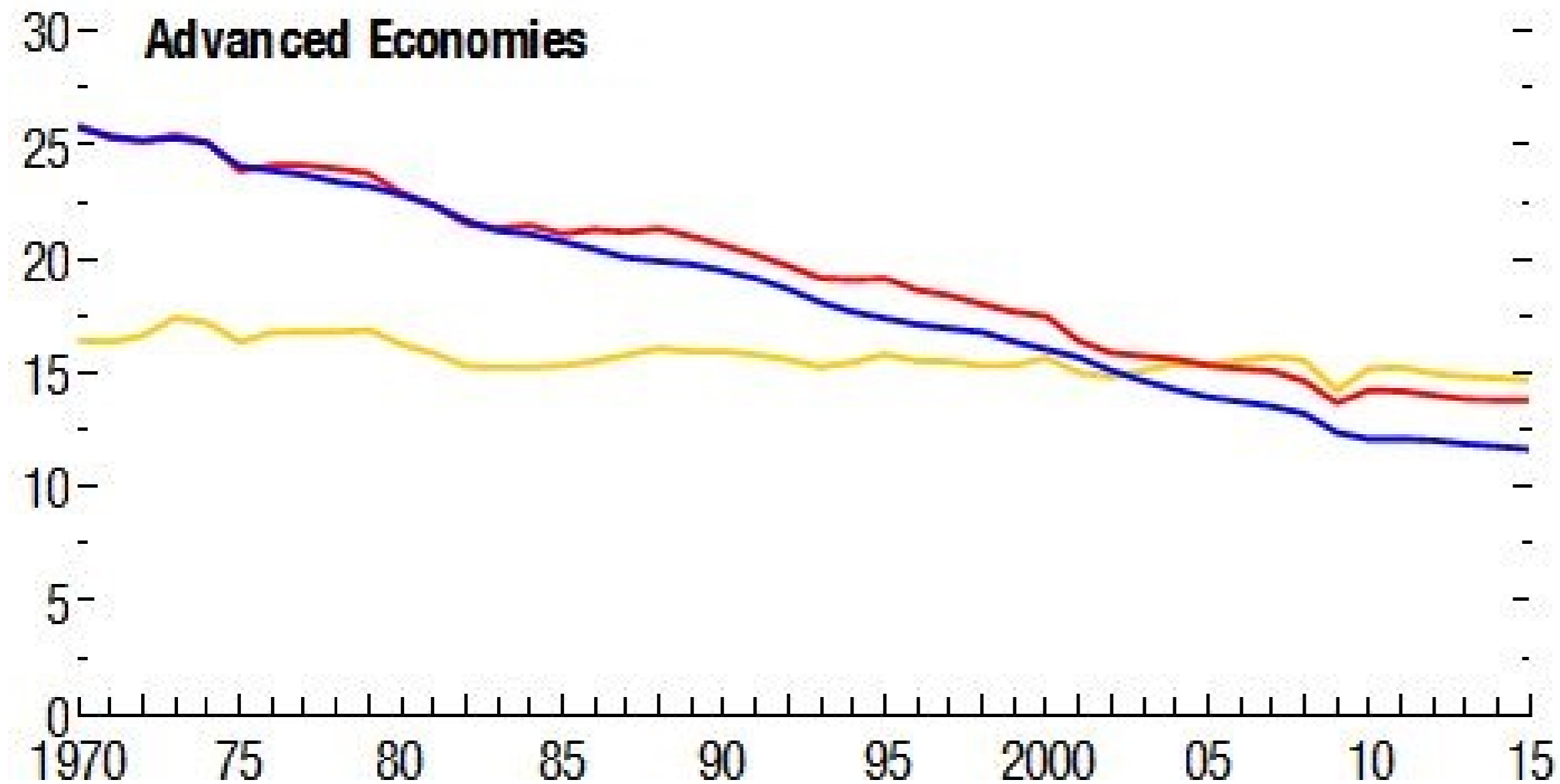# How have manufacturing employment and output shares evolved?

The share of manufacturing in global employment and output has been broadly stable …

Share of Manufacturing in Aggregate Employment and Output
(Percent)
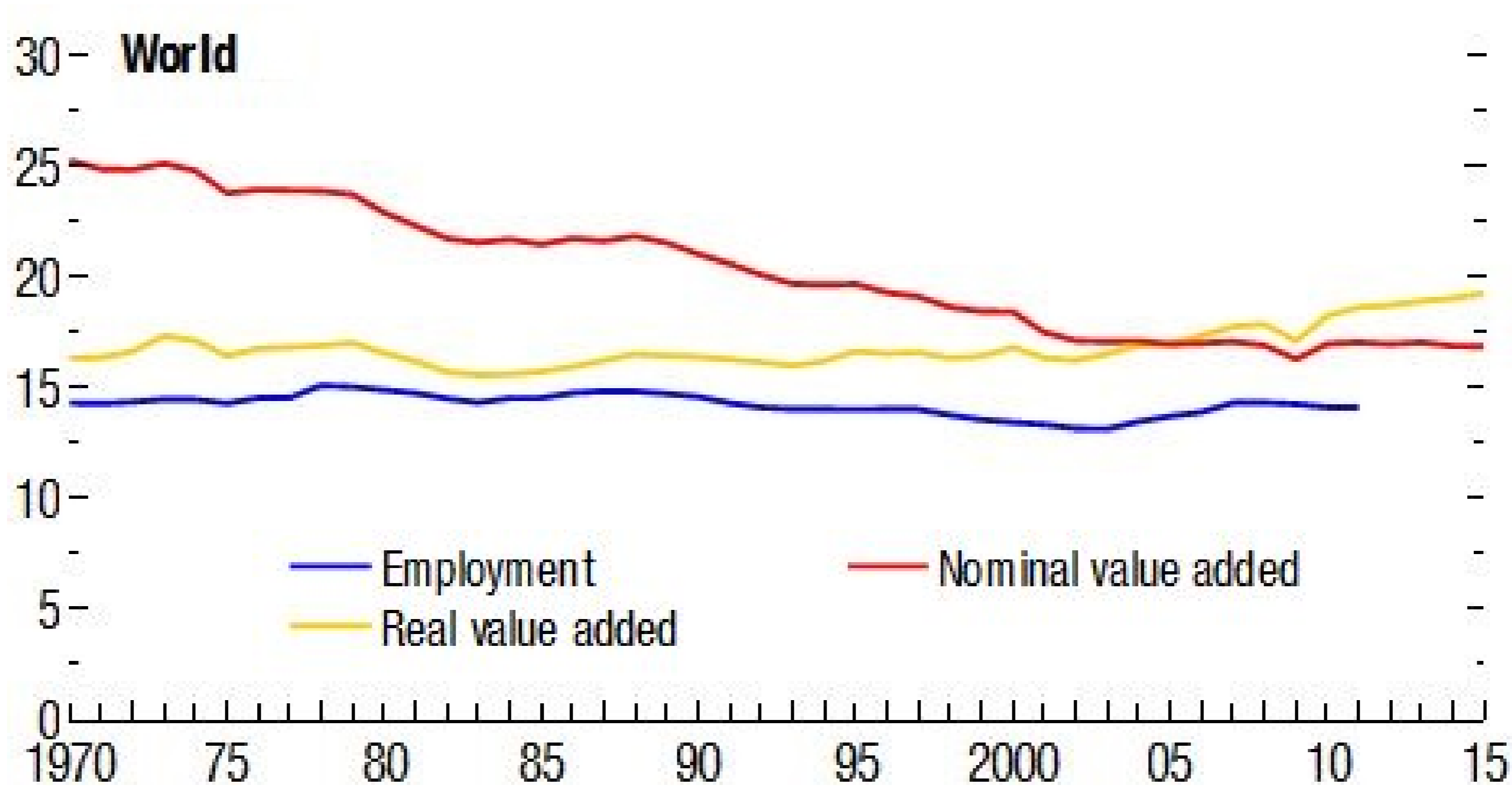
Share of Manufacturing in Aggregate Employment and Output
(Percent)

Note: Dashed lines in RHS panel denote emerging market and developing economies excluding China.

Estimated Trends in Manufacturing Employment and Output Shares, 1960—2015
(Percentage points per year)

Employment in market services expanded rapidly, especially among EMDEs

Sectoral Employment Shares
(Percent)
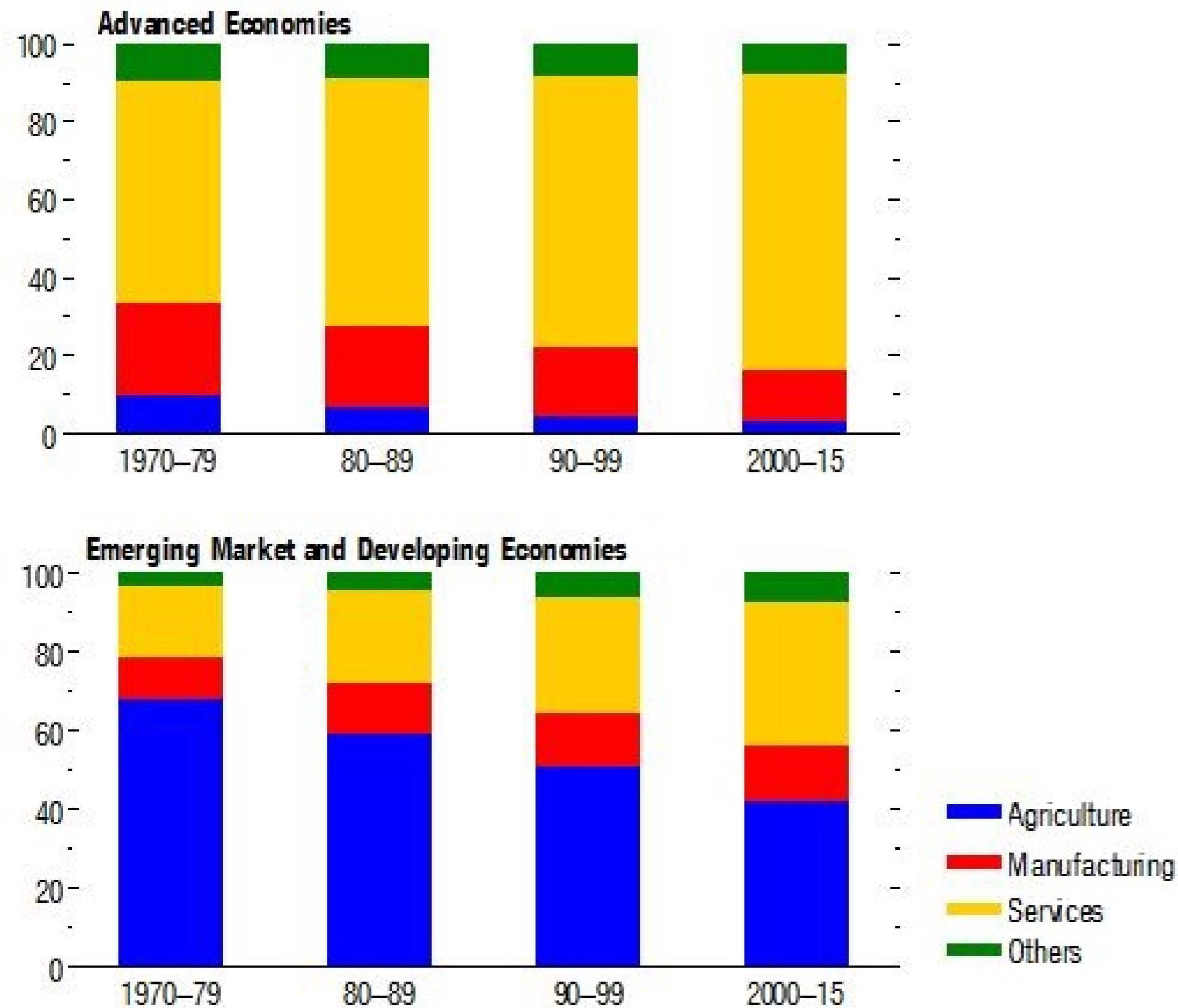
Changes in Services Employment Share, 1970-2015
(Cumulative change, percentage points)
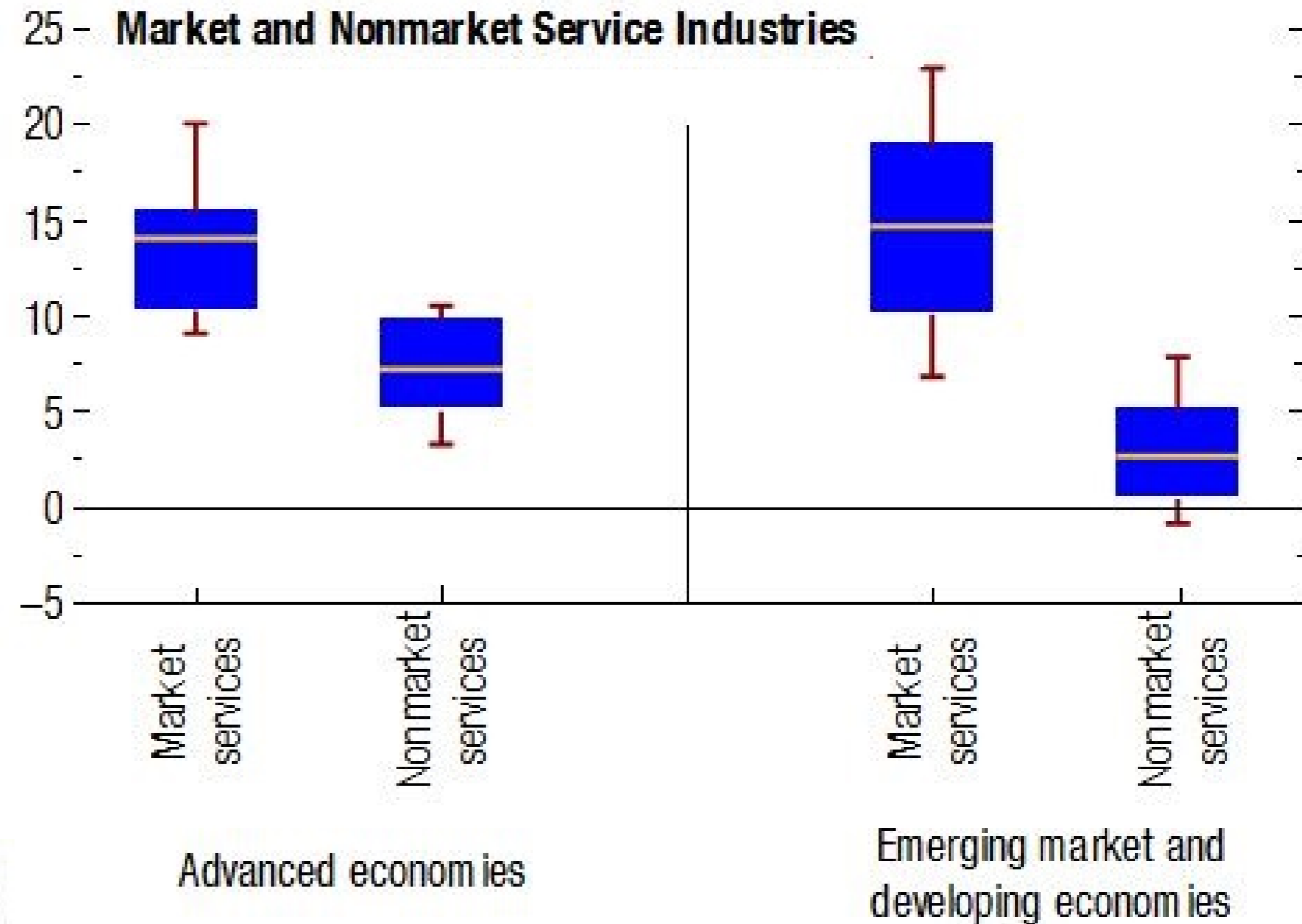
Note: The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles.

Implications for productivity

Implications for productivity growth and convergence – Empirical approach

(1) *Do some service industries show evidence of strong labor productivity growth?*

- Stylized facts at different levels of sectoral disaggregation

**(2)** *Has structural transformation since 2000 weighed on aggregate labor productivity growth?*

- Decomposition analysis following McMillan and Rodrik (2011); Diao, McMillan and Rodrik (2017)

(3) *Do services exhibit unconditional convergence—like manufacturing?*

- Test whether productivity growth in a sector is faster when initial productivity gap vis-à-vis technological frontier is larger (Bernard and Jones 1996; Sorensen 2001)
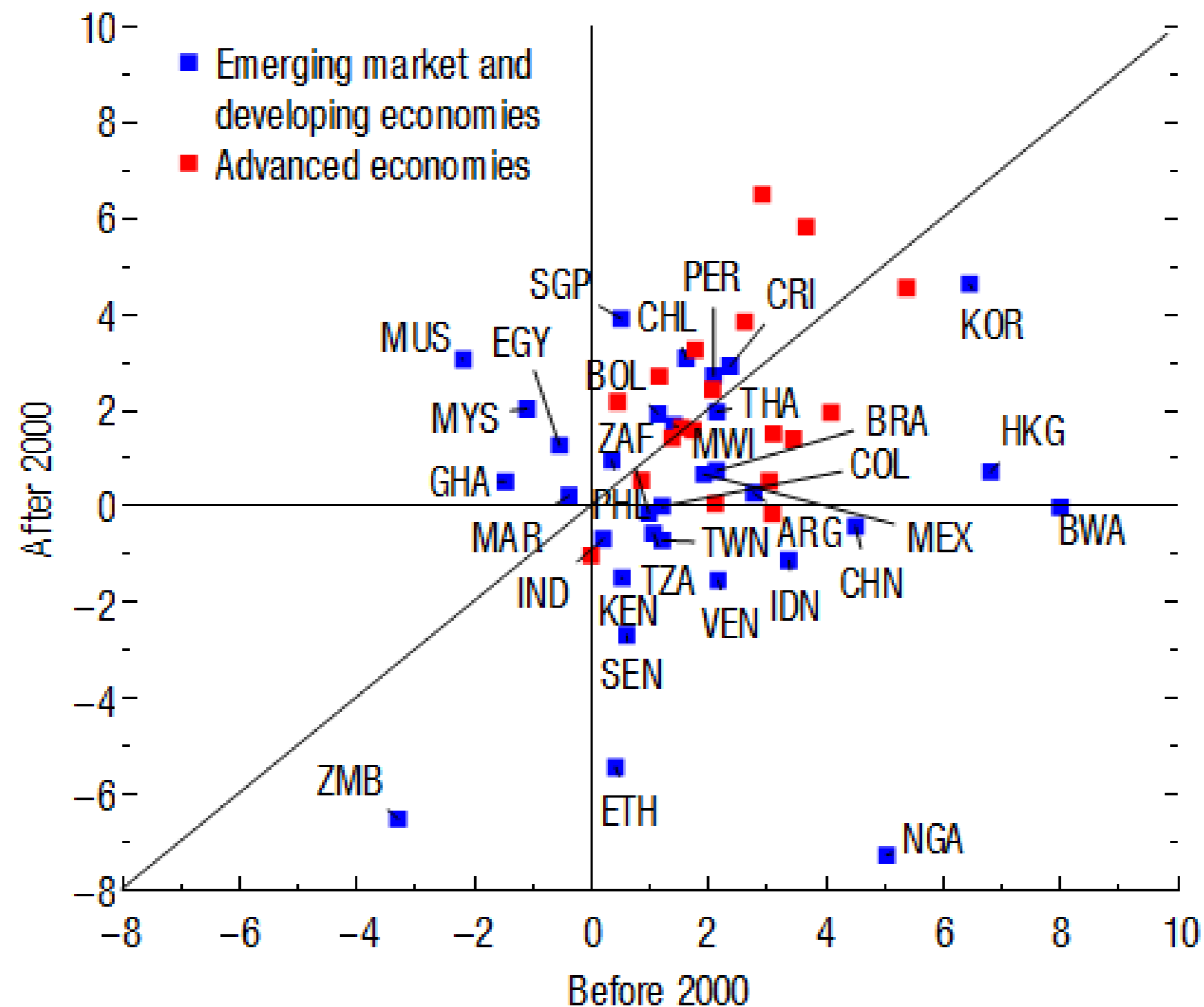
Difference in Labor Productivity Growth Between Manufacturing and Services, before and after 2000
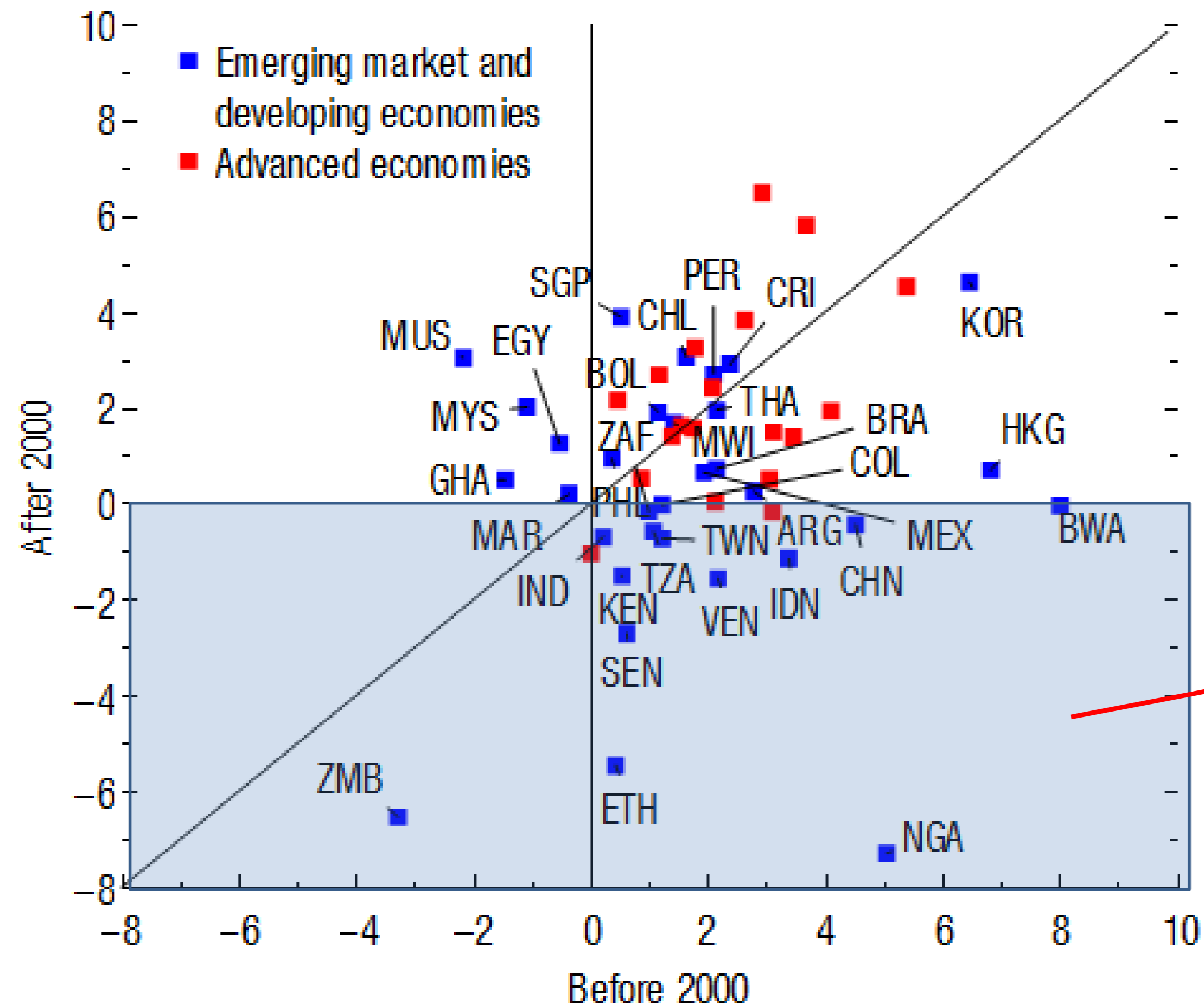(Percentage points)

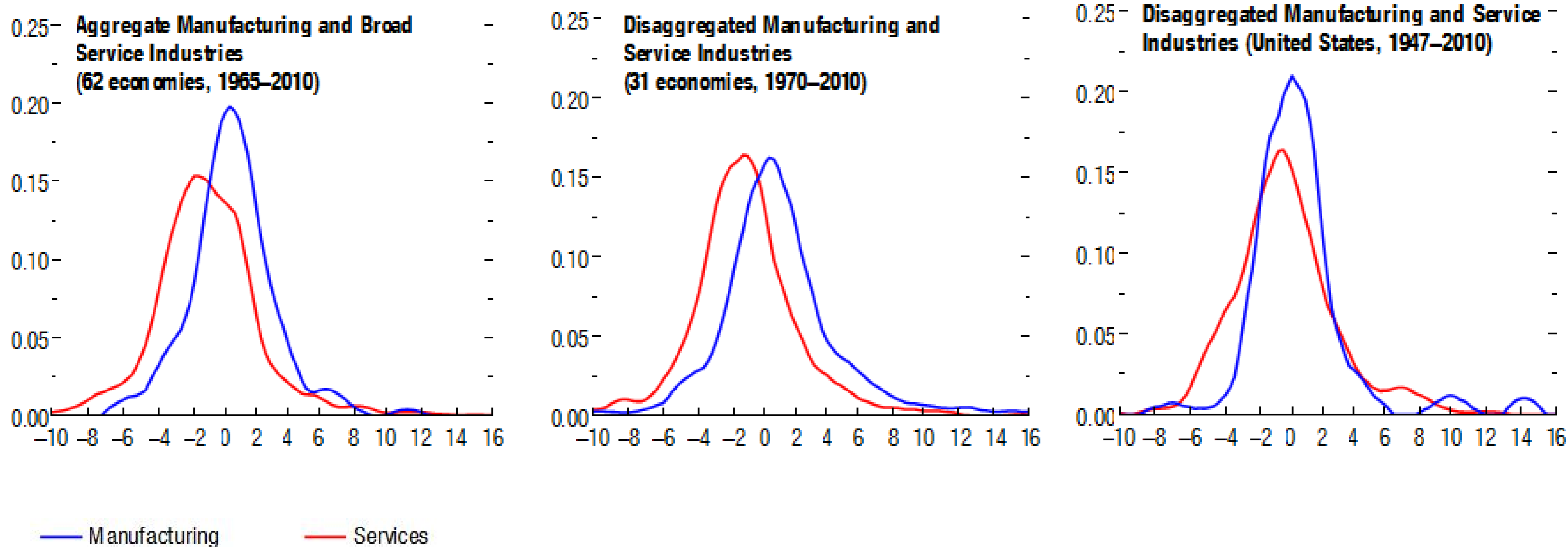**Difference in Labor Productivity Growth Between Manufacturing and Services, before and after 2000**
(Percentage points)
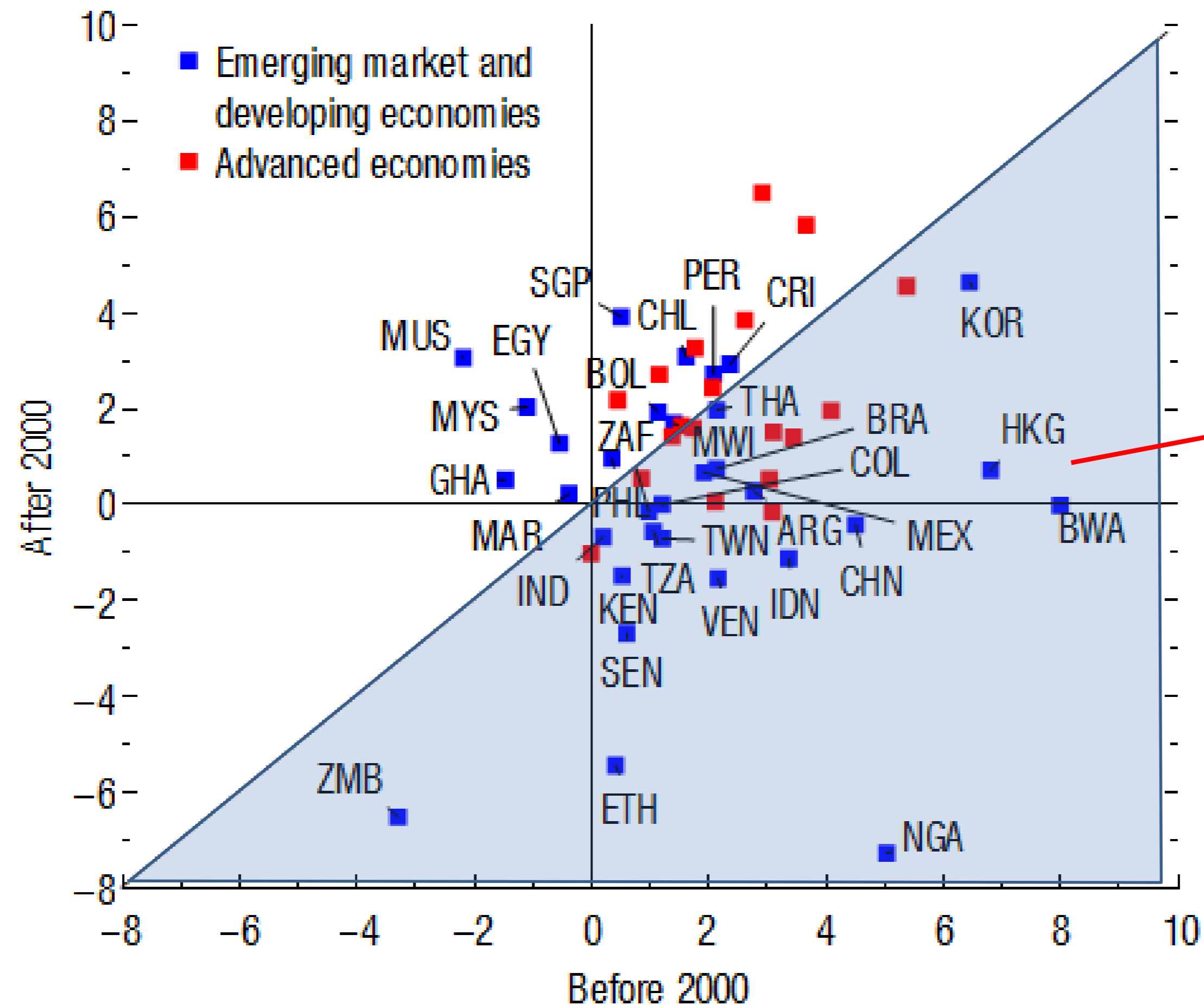
Difference between productivity growth in manufacturing and services has shrunk since 2000 in many economies…

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Difference in Labor Productivity Growth Between Manufacturing and Services, before and after 2000
(Percentage points)

…and productivity growth in services has recently exceeded that in manufacturing in many economies

Distribution of Labor Productivity Growth of Individual Industries
(Kernel density)

Sectoral Labor Productivity, 2005
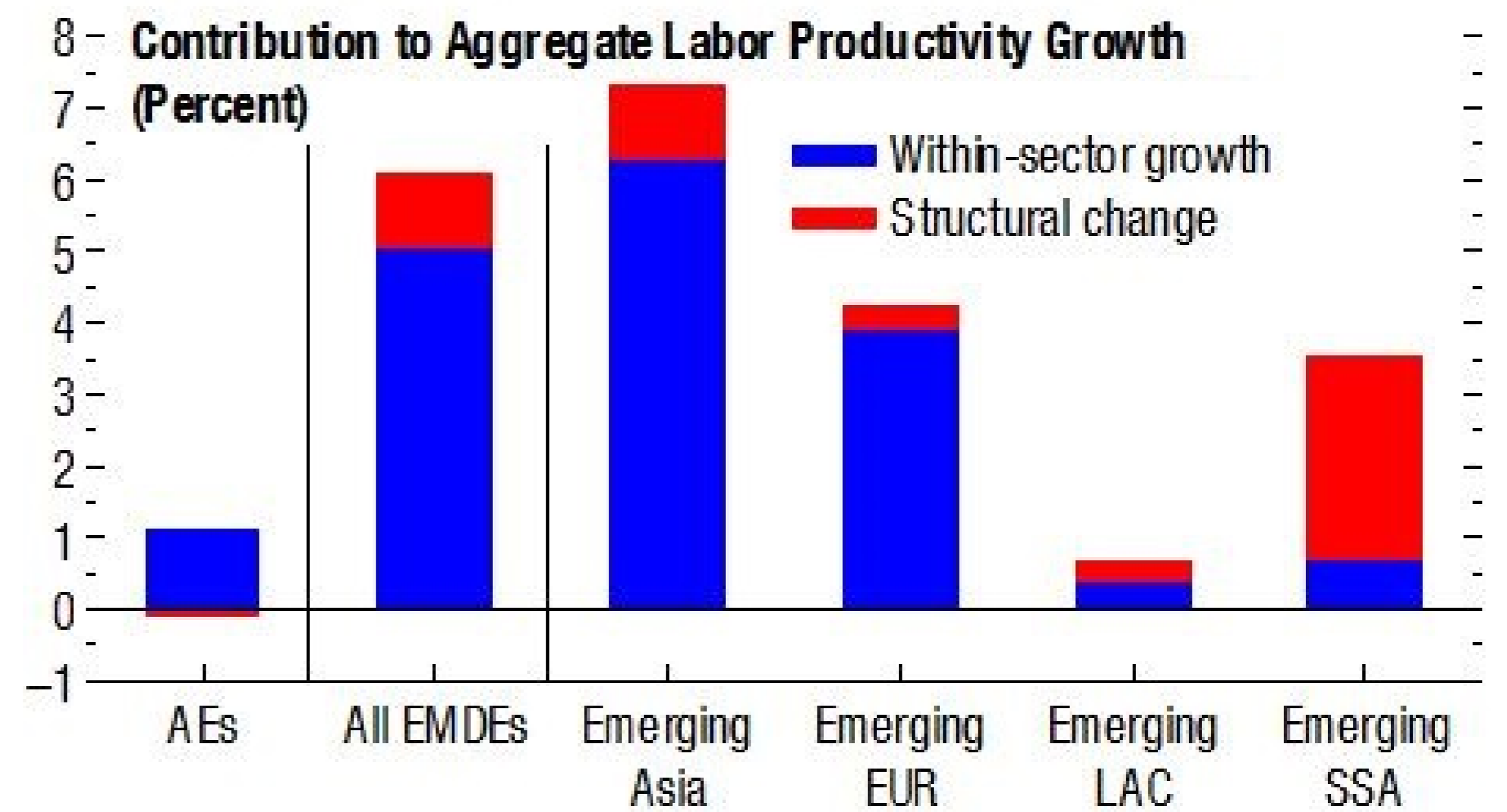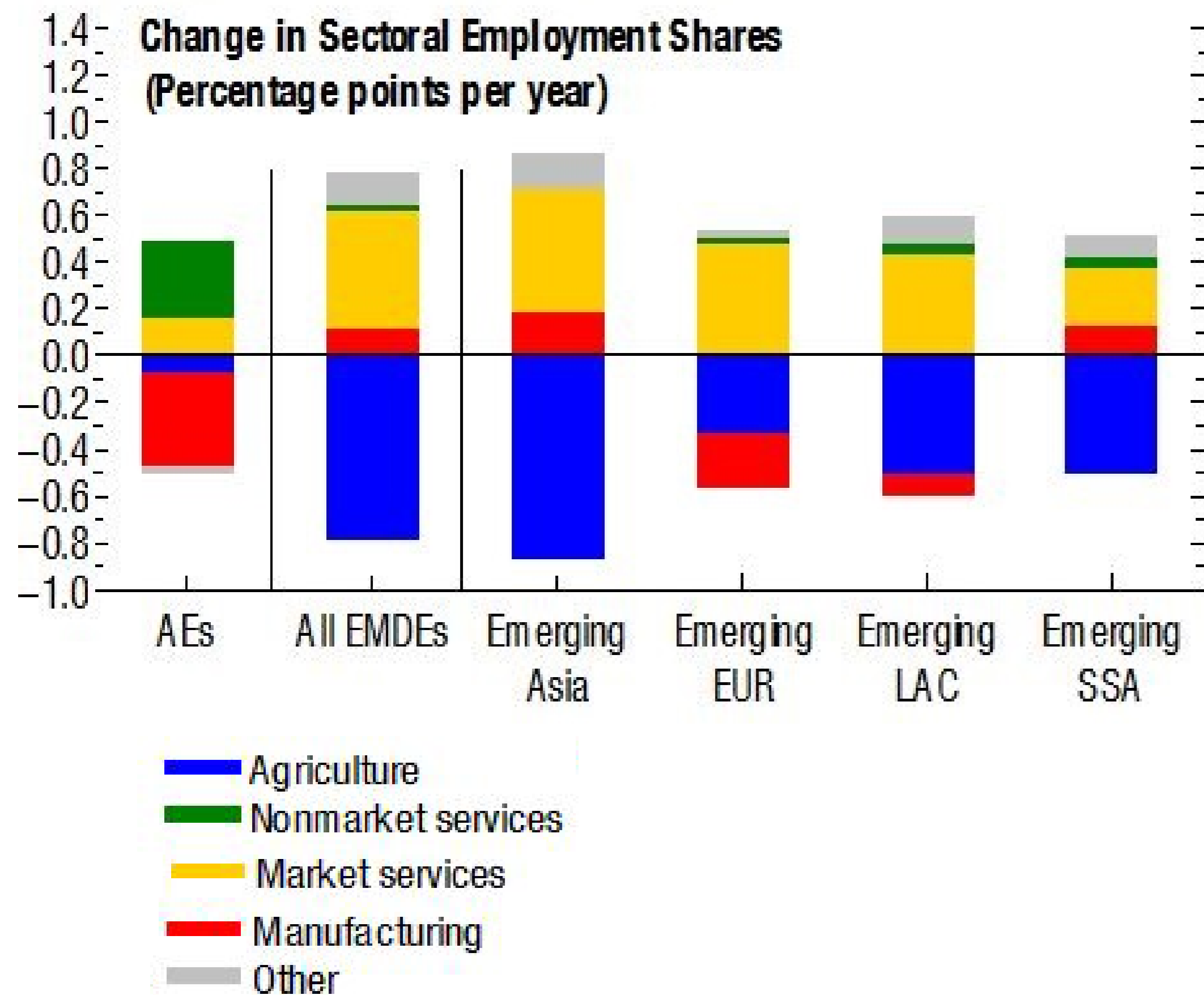(Difference with respect to economy-wide labor productivity; percentage points)
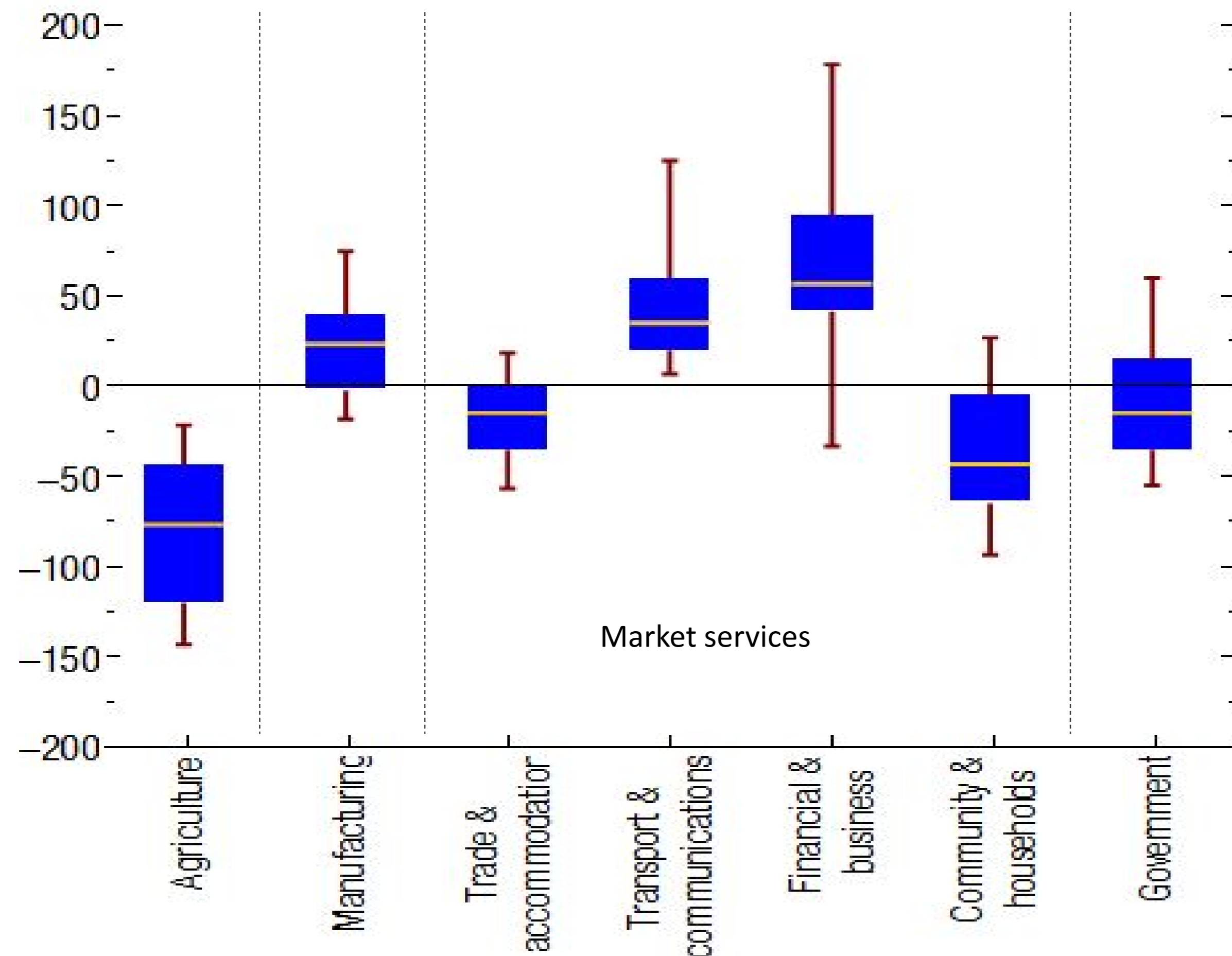
Sectoral Labor Productivity, 2005
(Difference with respect to economy-wide labor productivity; percentage points)

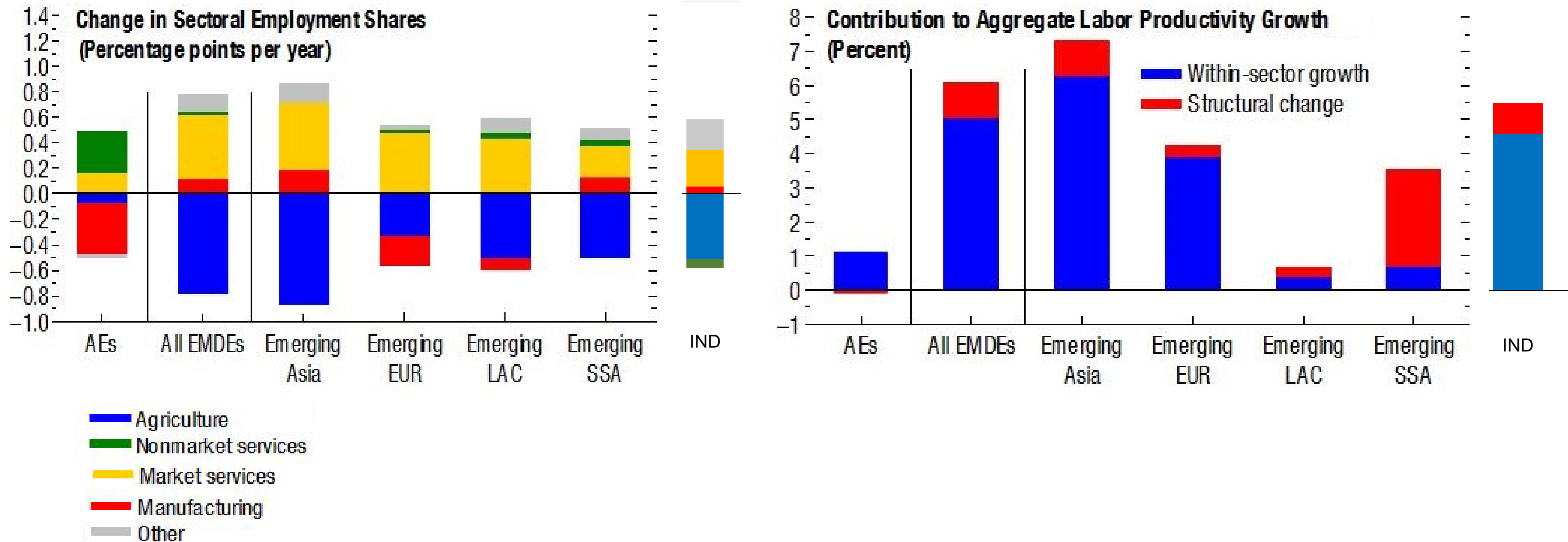**Structural Transformation and Aggregate Labor Productivity Growth, 2000-10**

Structural Transformation and Aggregate Labor Productivity Growth, 2000-10

Unconditional cross-country productivity convergence in several market service industries

$$\hat{P}_{i,t} = \alpha + \beta \ln P_{i,t} + D_t + \varepsilon_{i,t}$$

- $\hat{P}_{i,t}$: trend growth rate of productivity for a given sector in country i relative to the U.S. over time period t

- $P_{i,t}$: initial sector-specific PPP-adjusted productivity level in country i relative to the U.S.
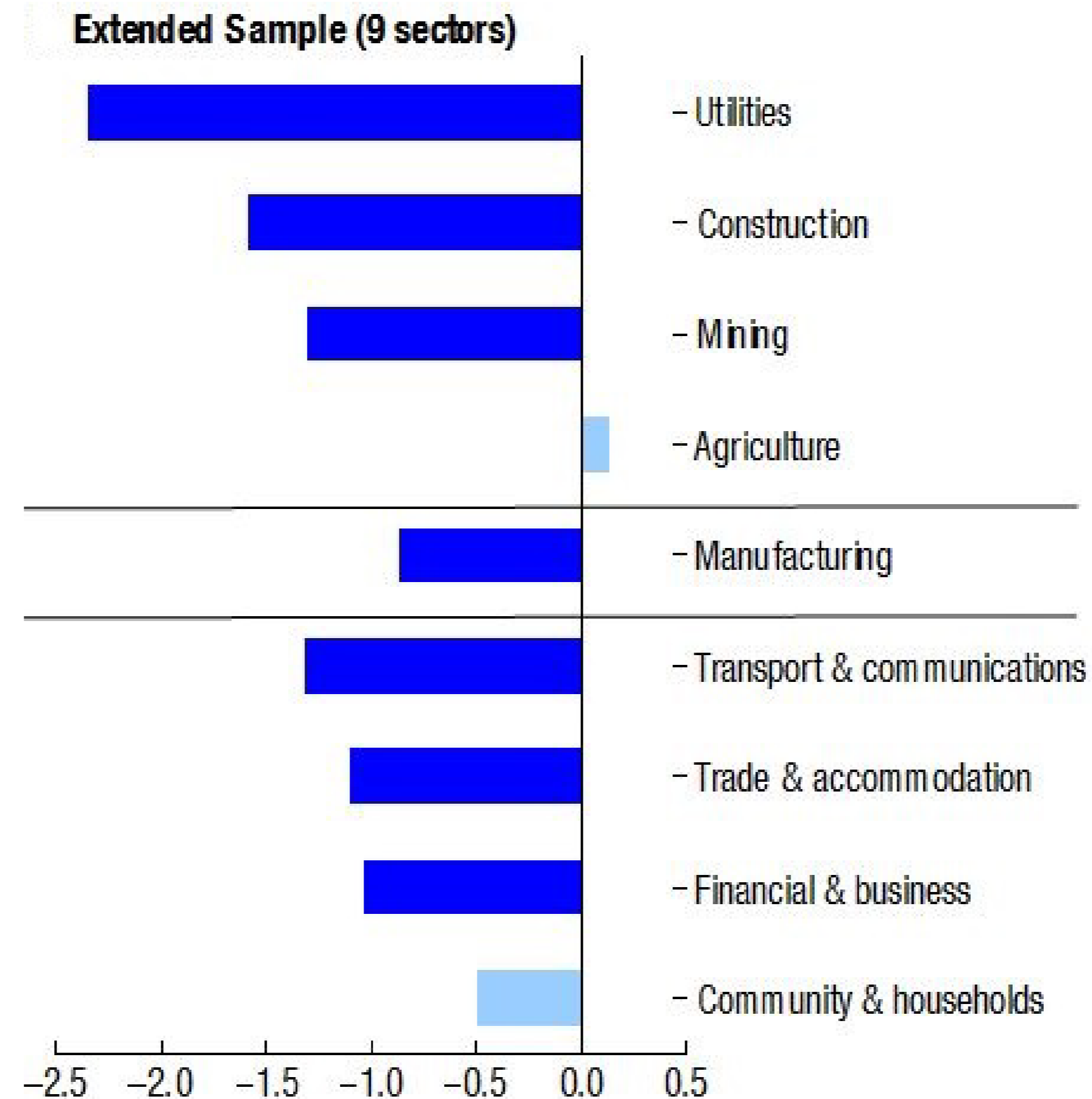
- D_t : period dummy

Two samples:

- *Extended sample*: 19 AEs and 20 EMDEs, 9 market sectors, 1965-2015

- *Reduced sample*: 19 AEs and 11 EMDEs, 26 market sectors, 1970-2010

Robustness exercises:

- Cross-sectional analysis

- TFP growth

Estimation Results, Coefficient of β-convergence

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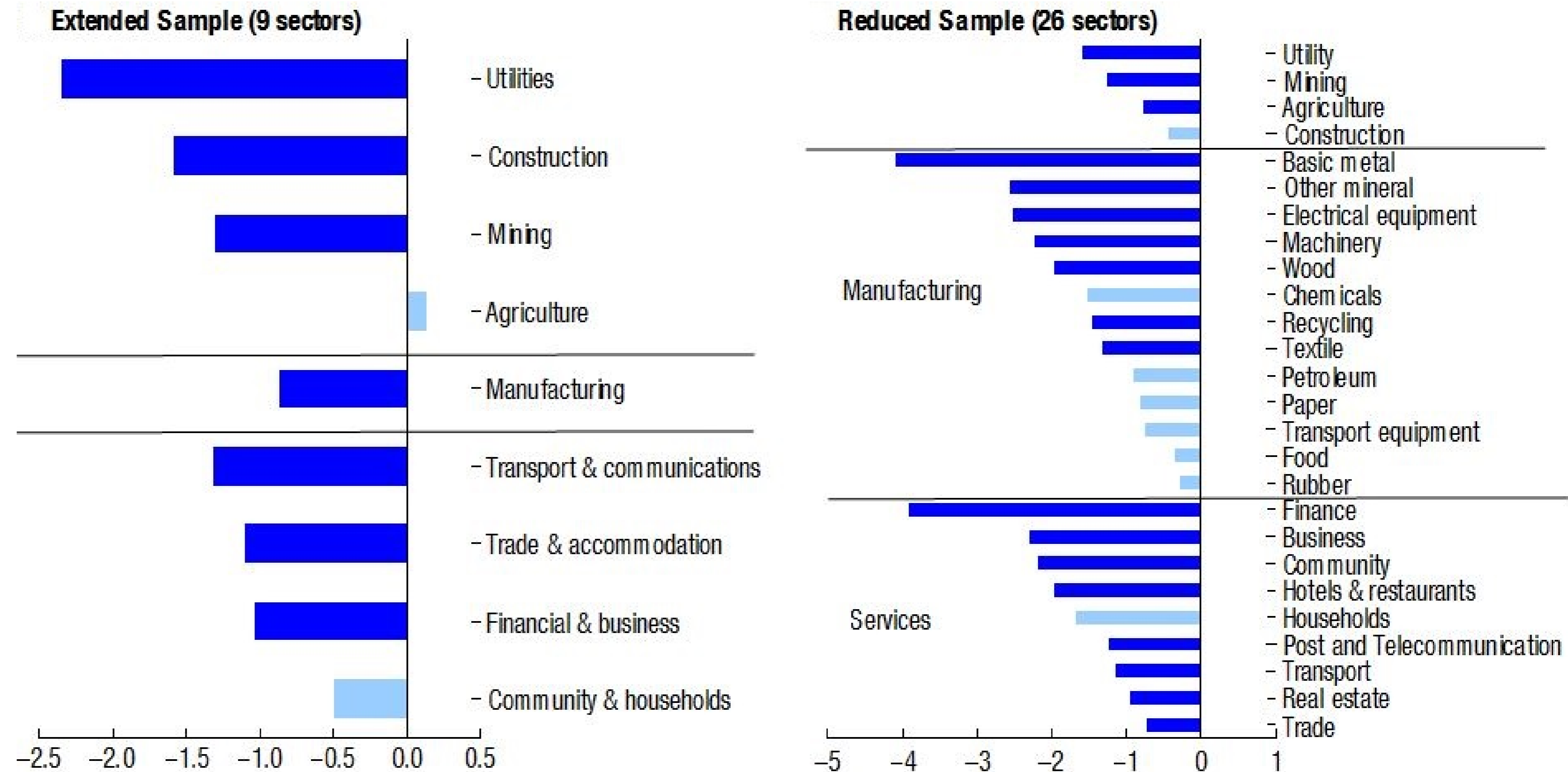
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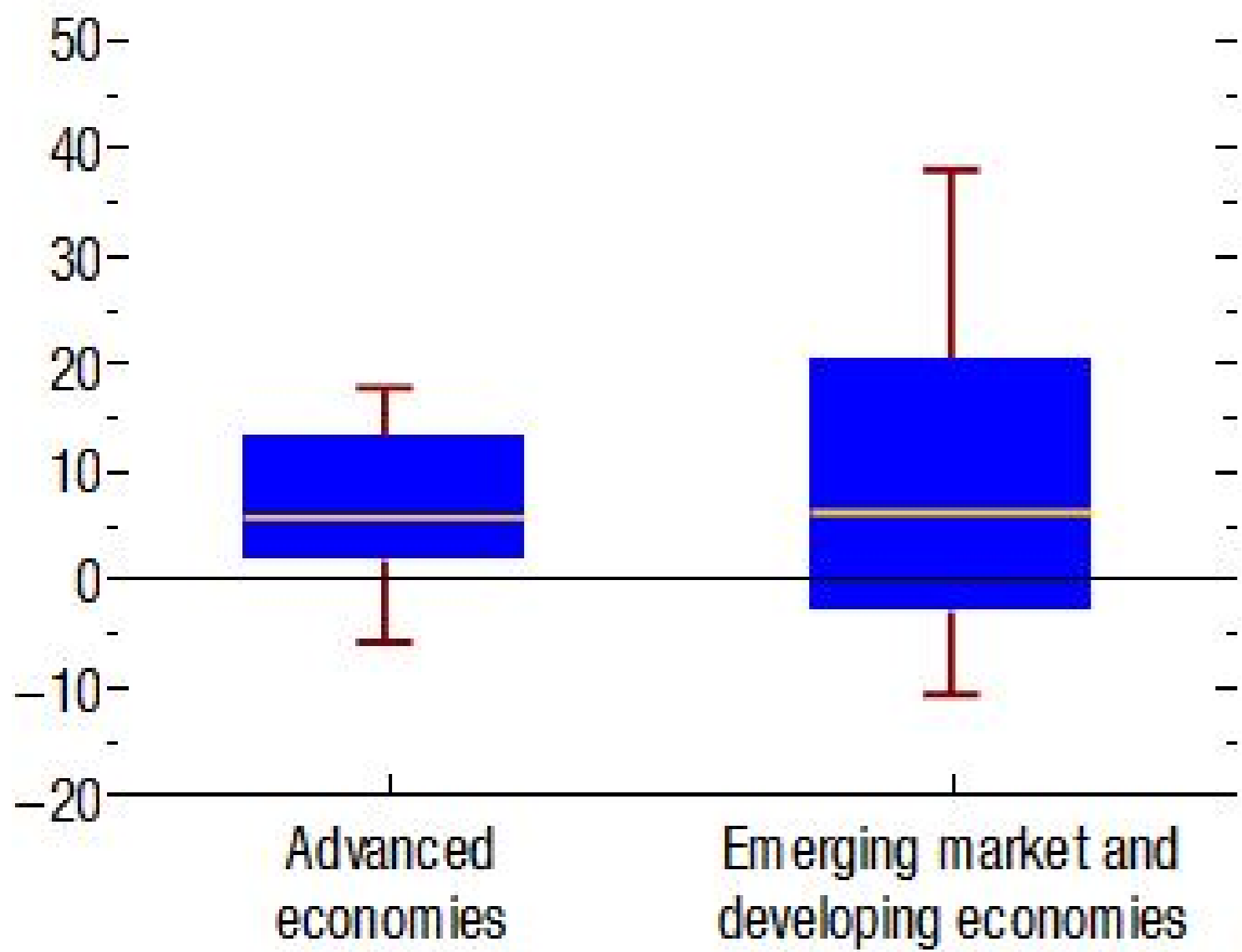
Robustness exercises:
- Cross-sectional analysis
- TFP growth

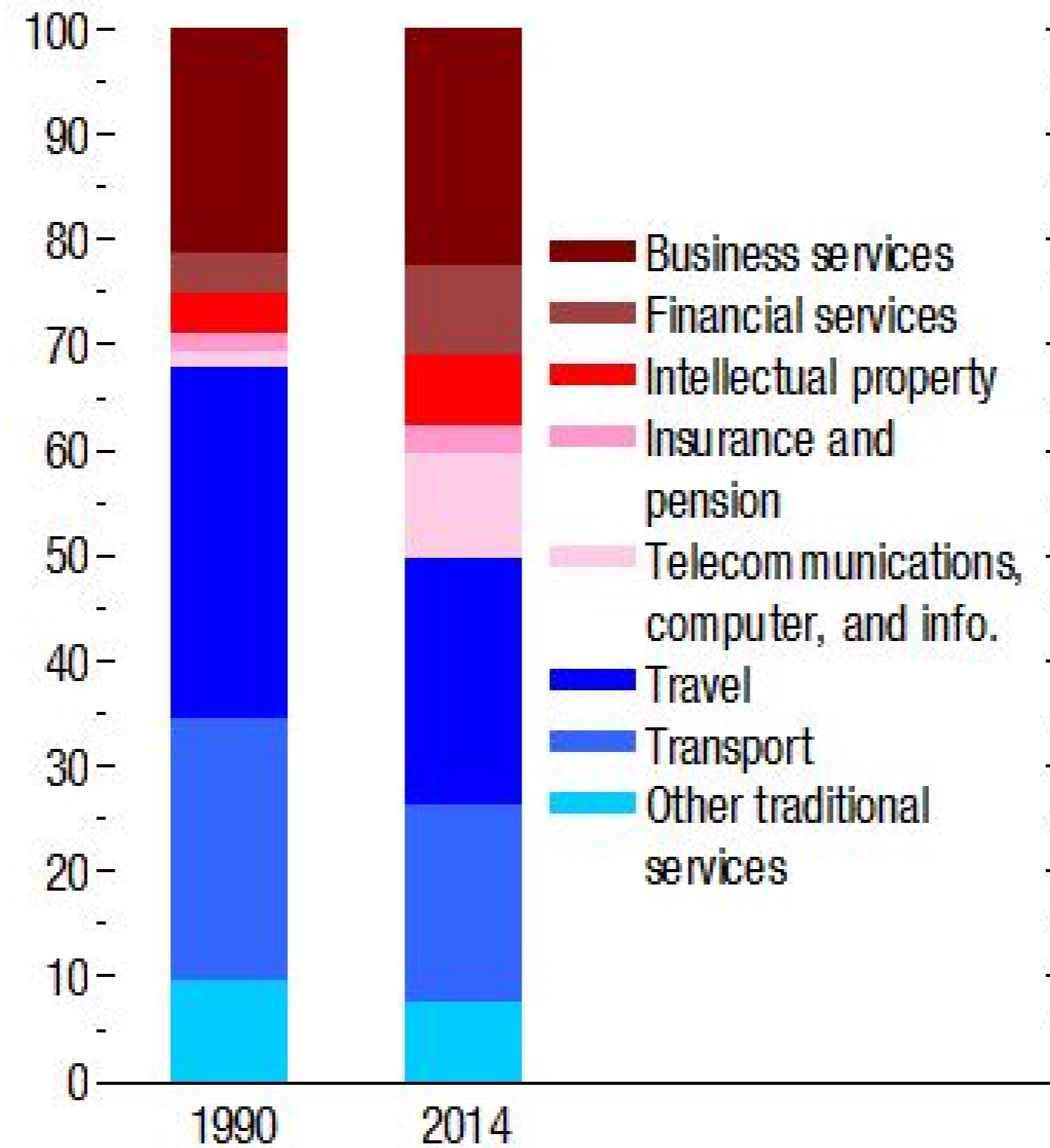**Estimation Results, Coefficient of β-convergence**

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Change in Share of Services in Exports, 1980-2014
(Percentage points)

Services Exports by Industry, 1990-2014
(Percent)

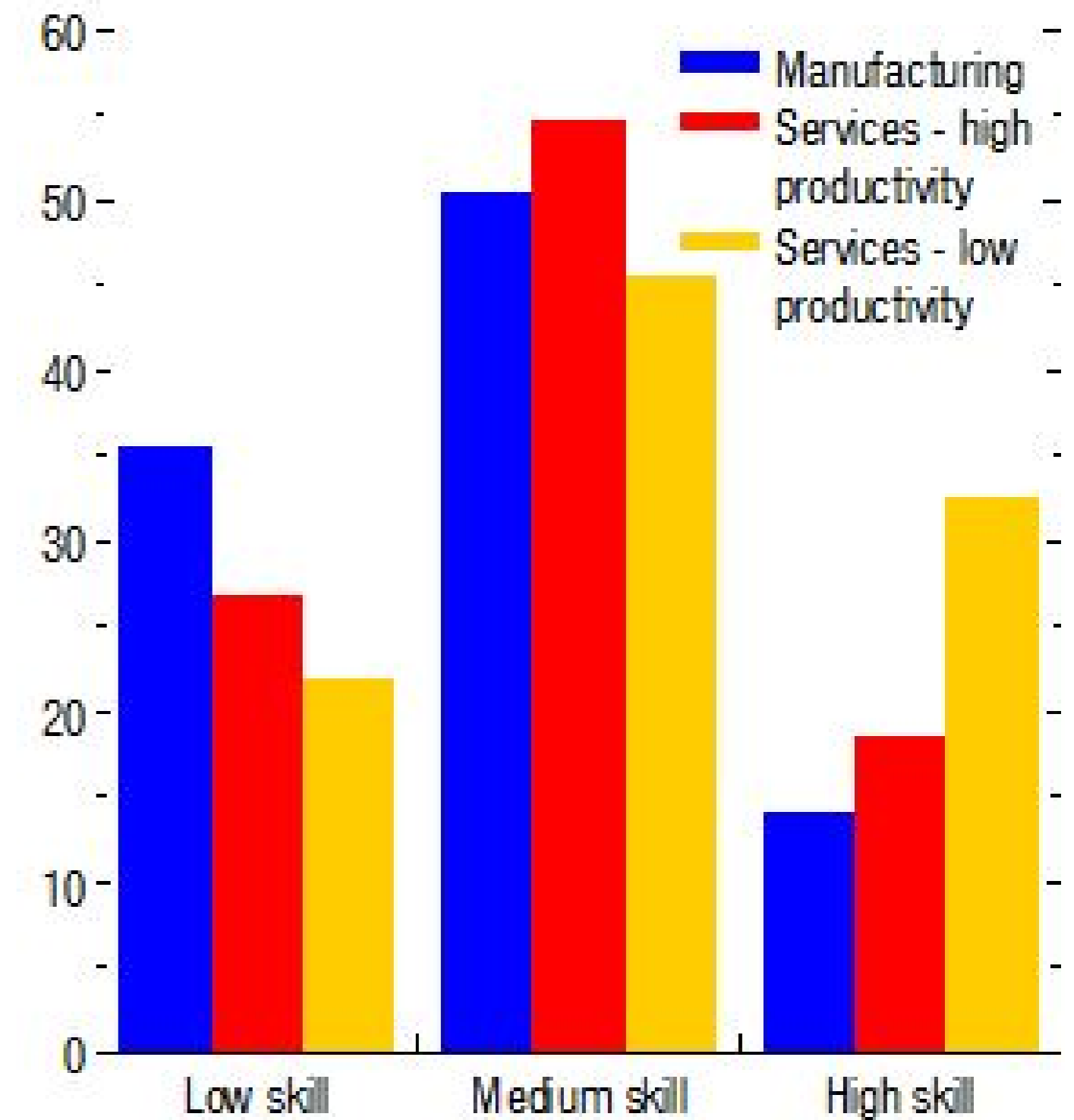**Skill Composition, 2000-07**
(Share of workers, percent)

Note: The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles.

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Implications for inequality

Implications for inequality – Empirical approach

- Use micro-level data (Luxembourg Income Study database) covering labor income from household surveys in an unbalanced panel of 20 AEs since the 1980s to answer:

(1) *Are labor earnings higher and more evenly distributed in industry than in services?*

- Sectoral measures of (i) average gross wages by skill level and (ii) labor income inequality

(2) *How did the shift of workers between industry and services affect the distribution of labor income?*

- Decomposition analysis to assess how shifts in sectoral employment shares contributed to aggregate labor income inequality

- Stylized exercise assuming that all manufacturing jobs lost since the 1980s correspond to middle-skilled workers who moved to low-skill and low-wage jobs in services

Average Gross Wages in Industry and Services in the 2000s
(Difference with respect to average economy-wide labor earnings, percentage points)
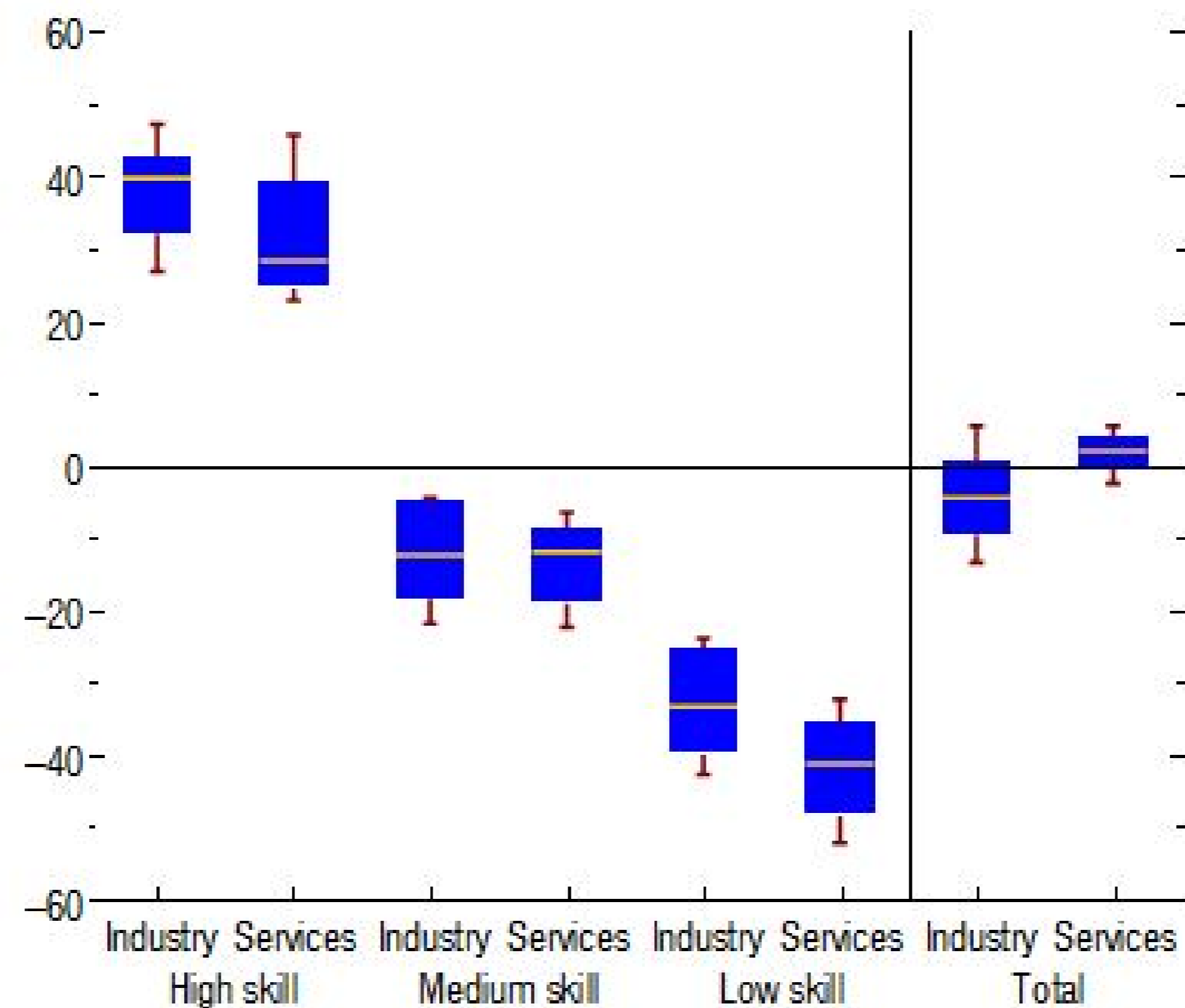
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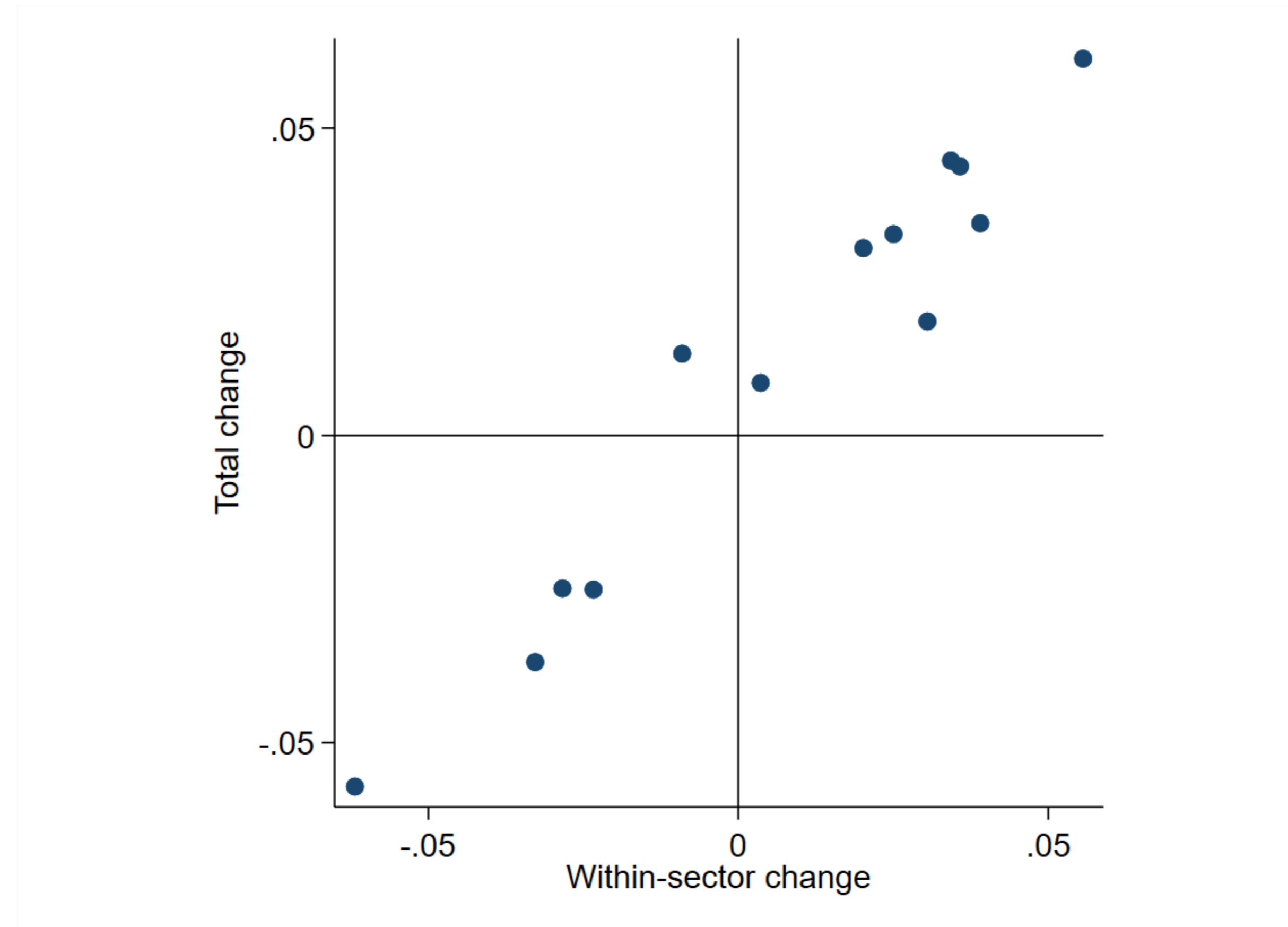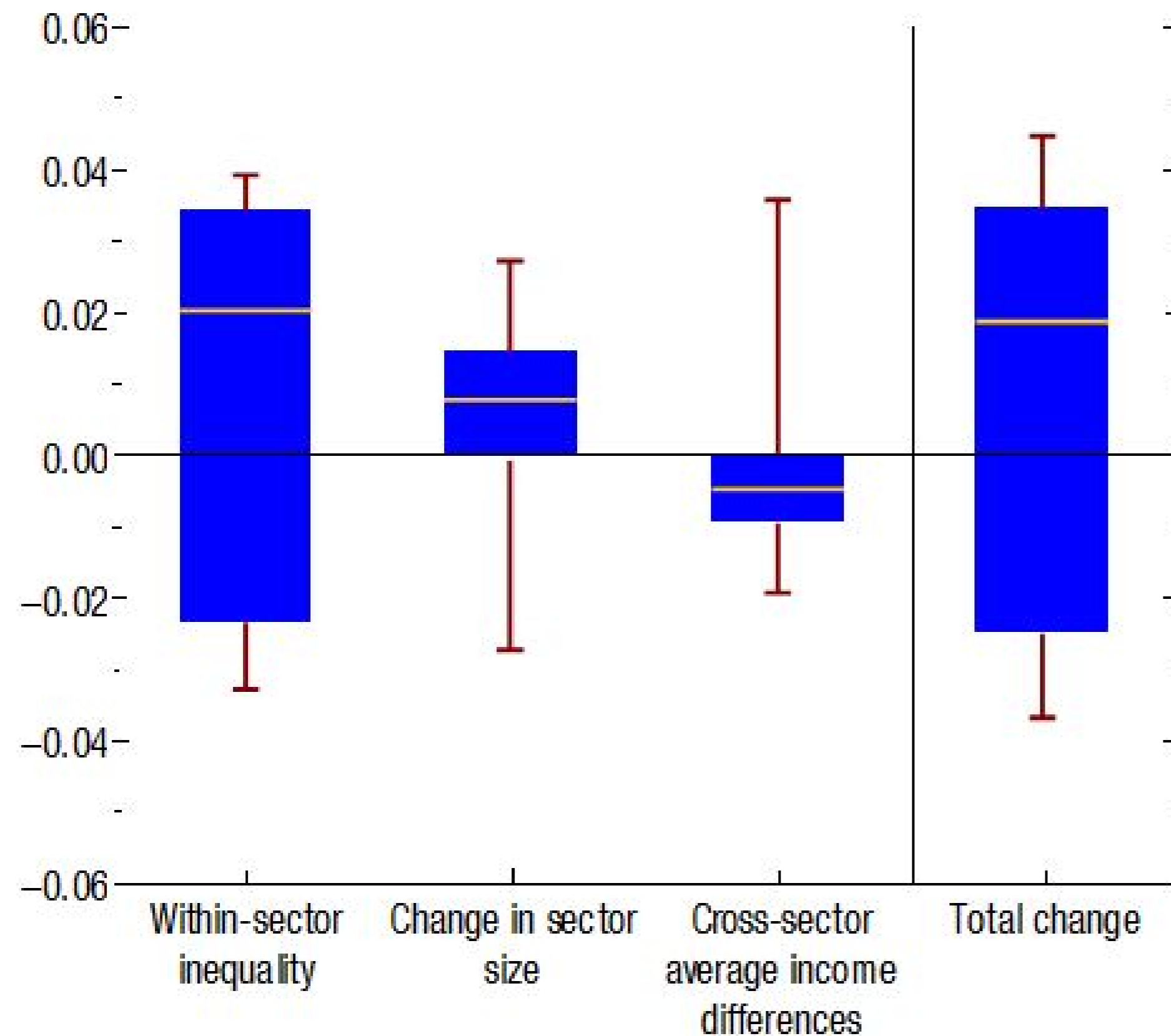
Labor Income Inequality in the 2000s
(Points)
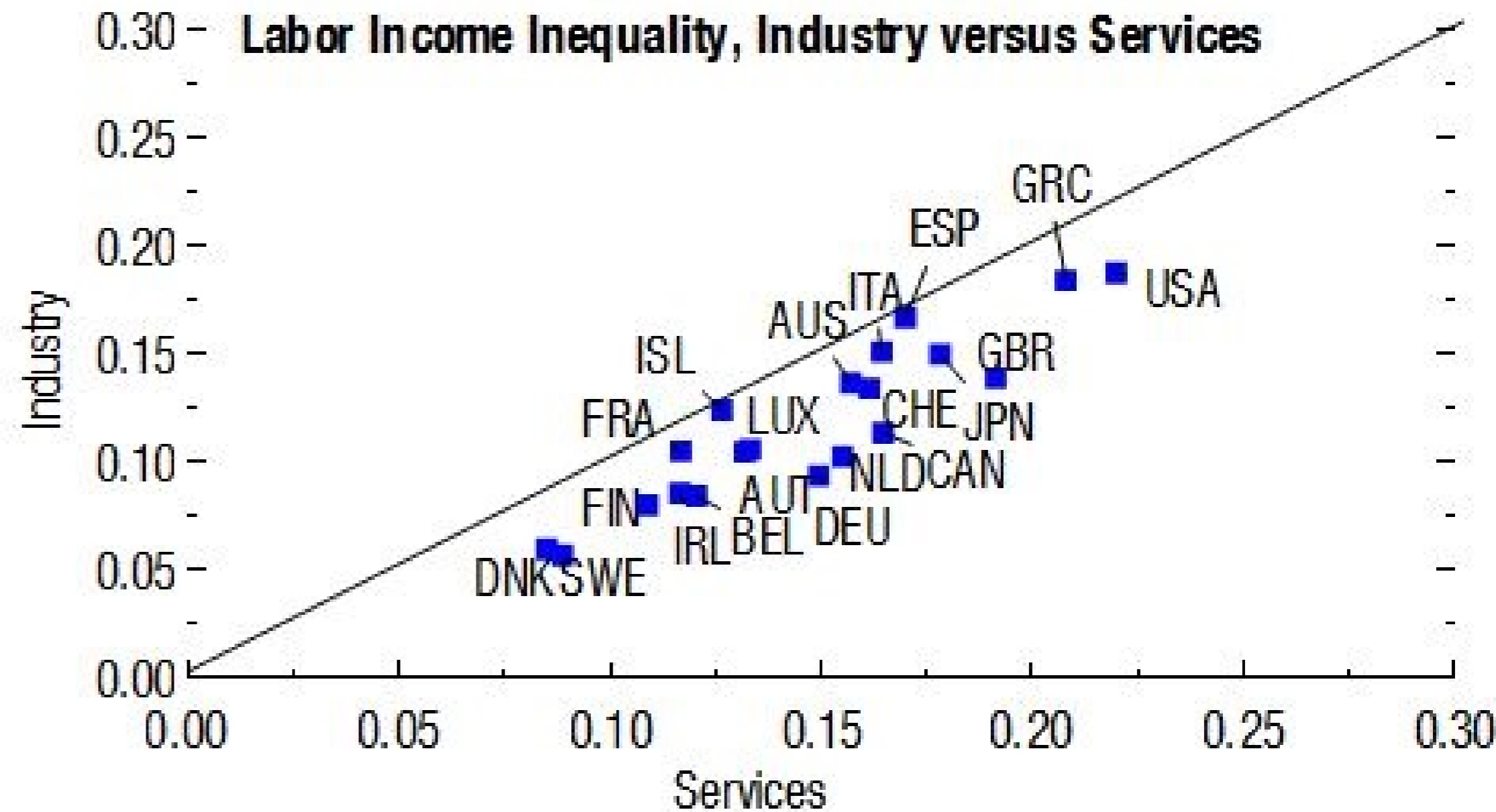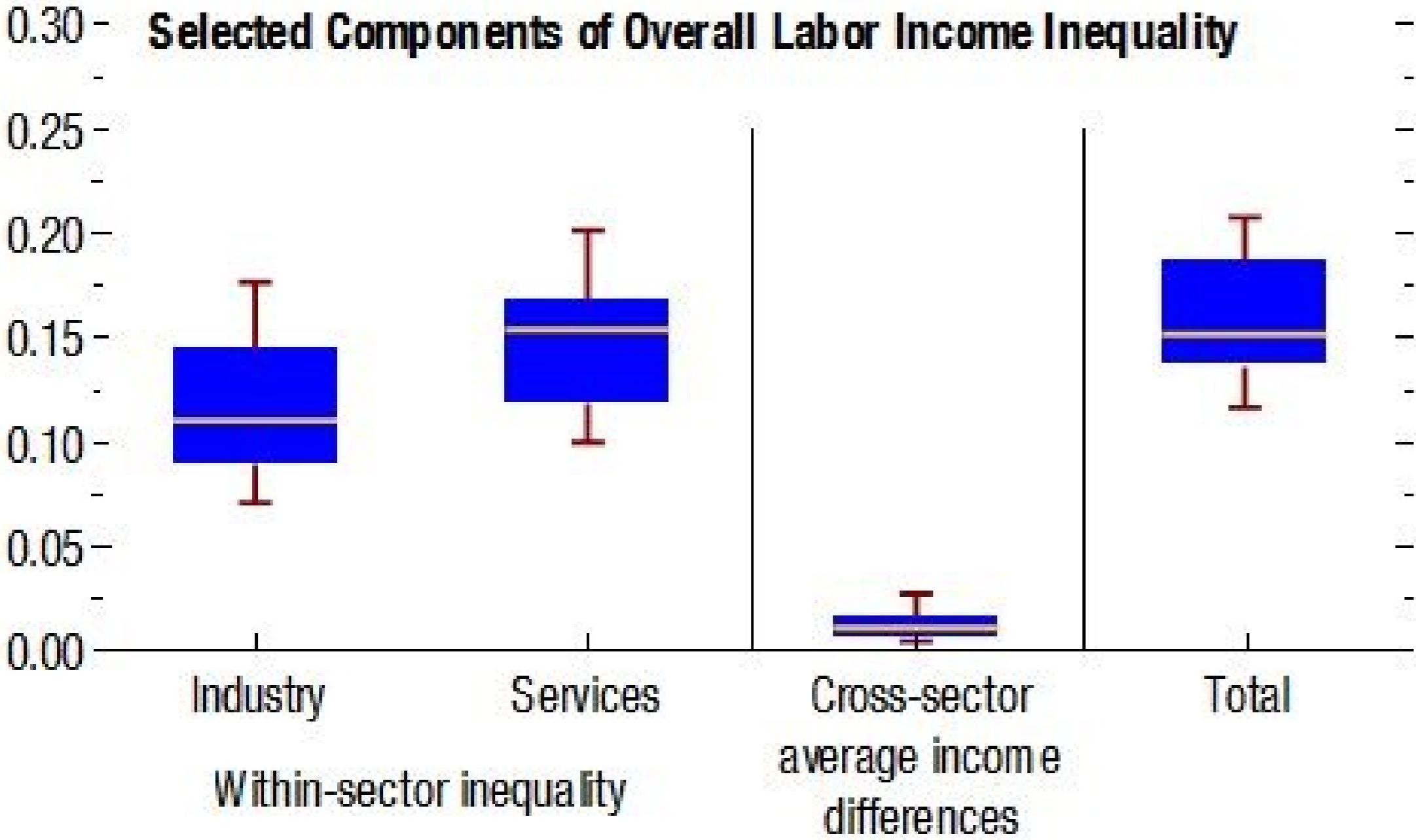
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Contribution to Change in Overall Labor Income Inequality Between 1980s and 2000s
(Points)

Note: The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles.

Conclusion and policy implications

The decline in manufacturing jobs need not hurt growth, convergence, or inequality.

- Labor productivity in some service sectors is comparable to manufacturing and tends to converge across countries. Expansion of service employment since 2000 benefited aggregate productivity in many EMDEs.

    Policy priorities:

    - remove barriers to entry and trade in services,

    - skill development,

    - reforms to boost productivity in all sectors.

- Higher inequality in AEs is mostly due to rising inequality in all sectors.

    But loss of manufacturing jobs can hurt individual workers and their communities. Policy priorities:

    - reskilling of displaced workers and reducing reallocation costs,

    - strengthen safety nets and targeted redistribution policies.

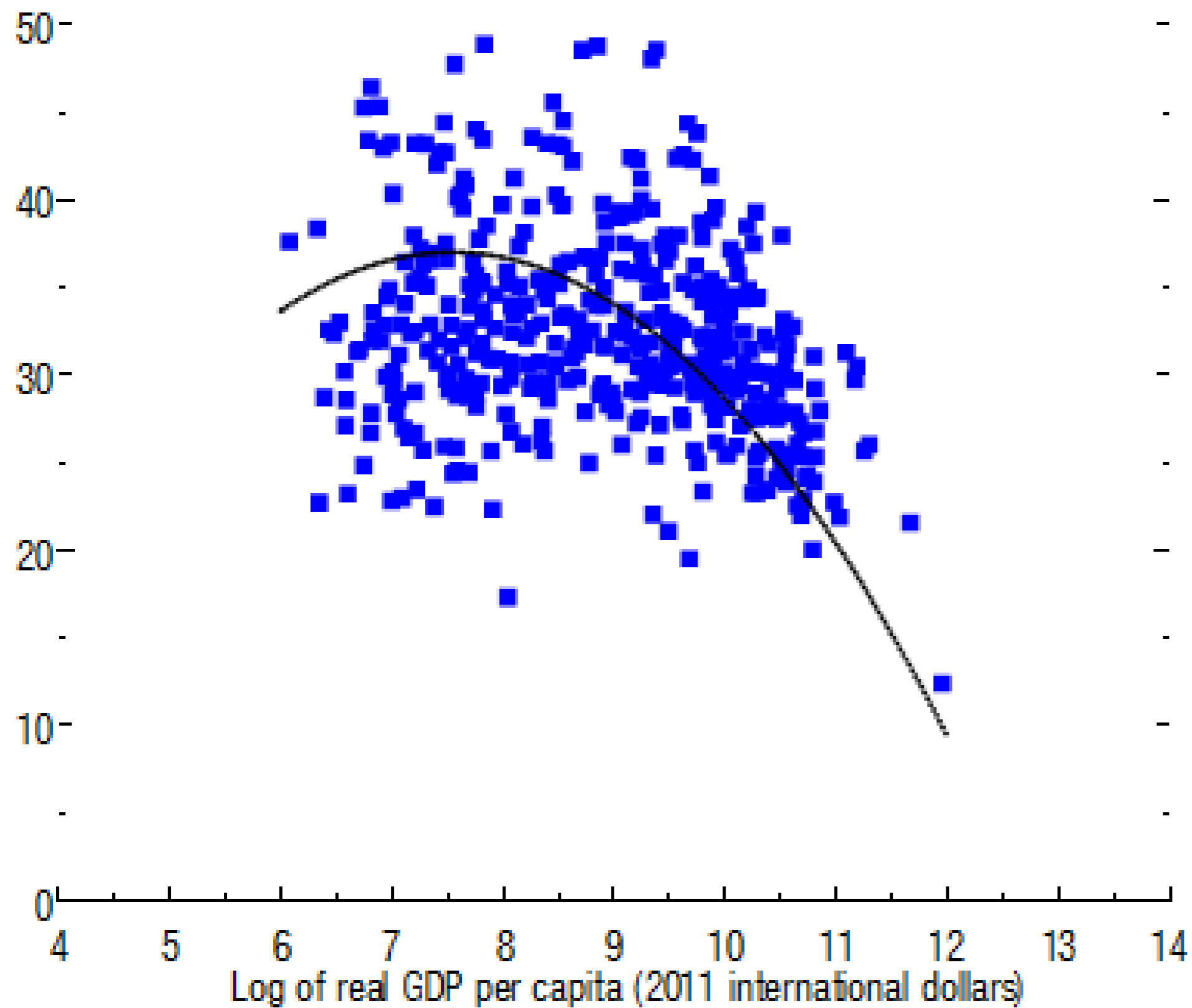**Manufacturing Jobs: Implications for Productivity and Inequality**

Thank you!

Estimated Trends in Manufacturing Employment and Output Shares, 1960—2015
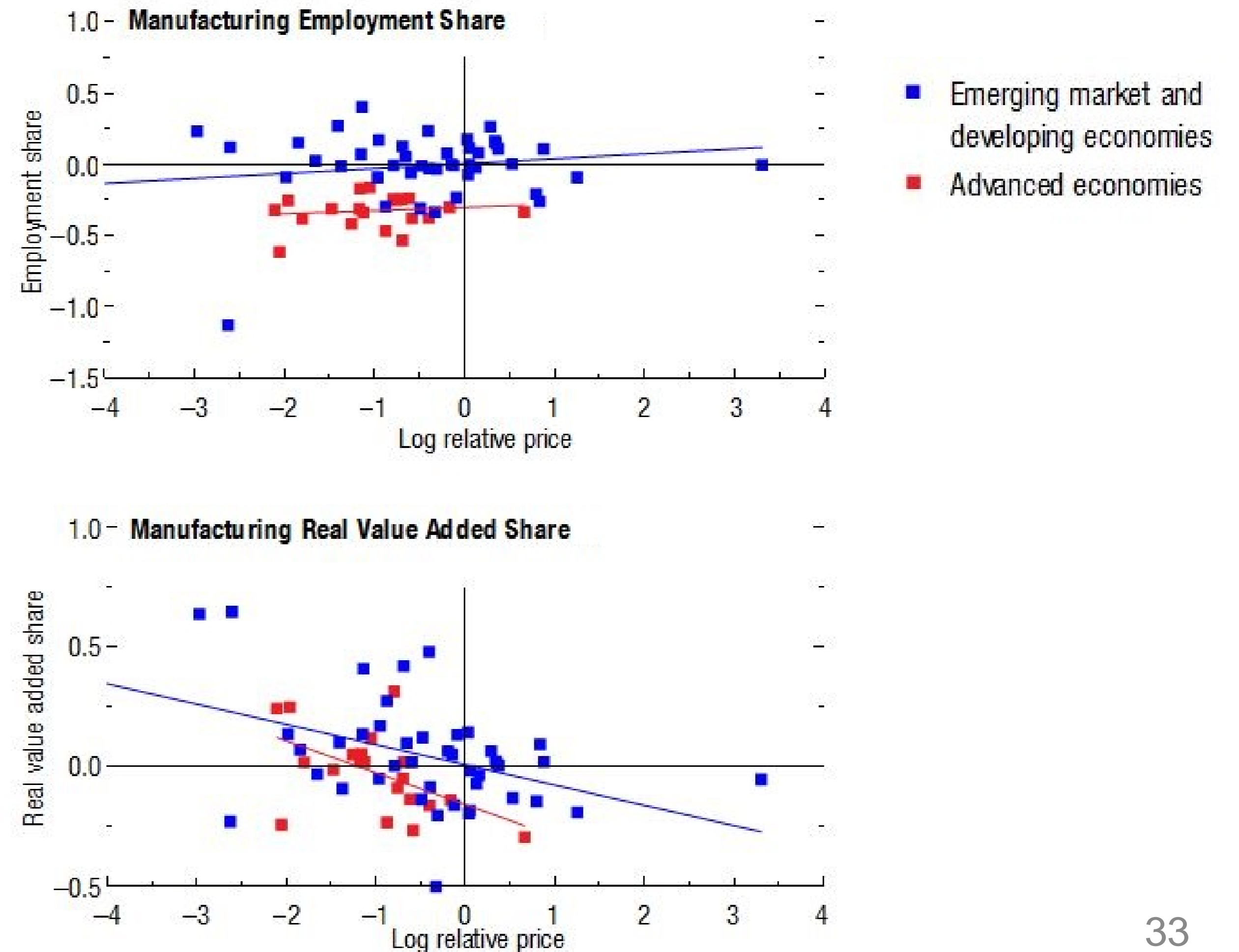(Percentage points per year)

Share of Manufacturing in Final Consumption versus Income per Capita, 1980—2011
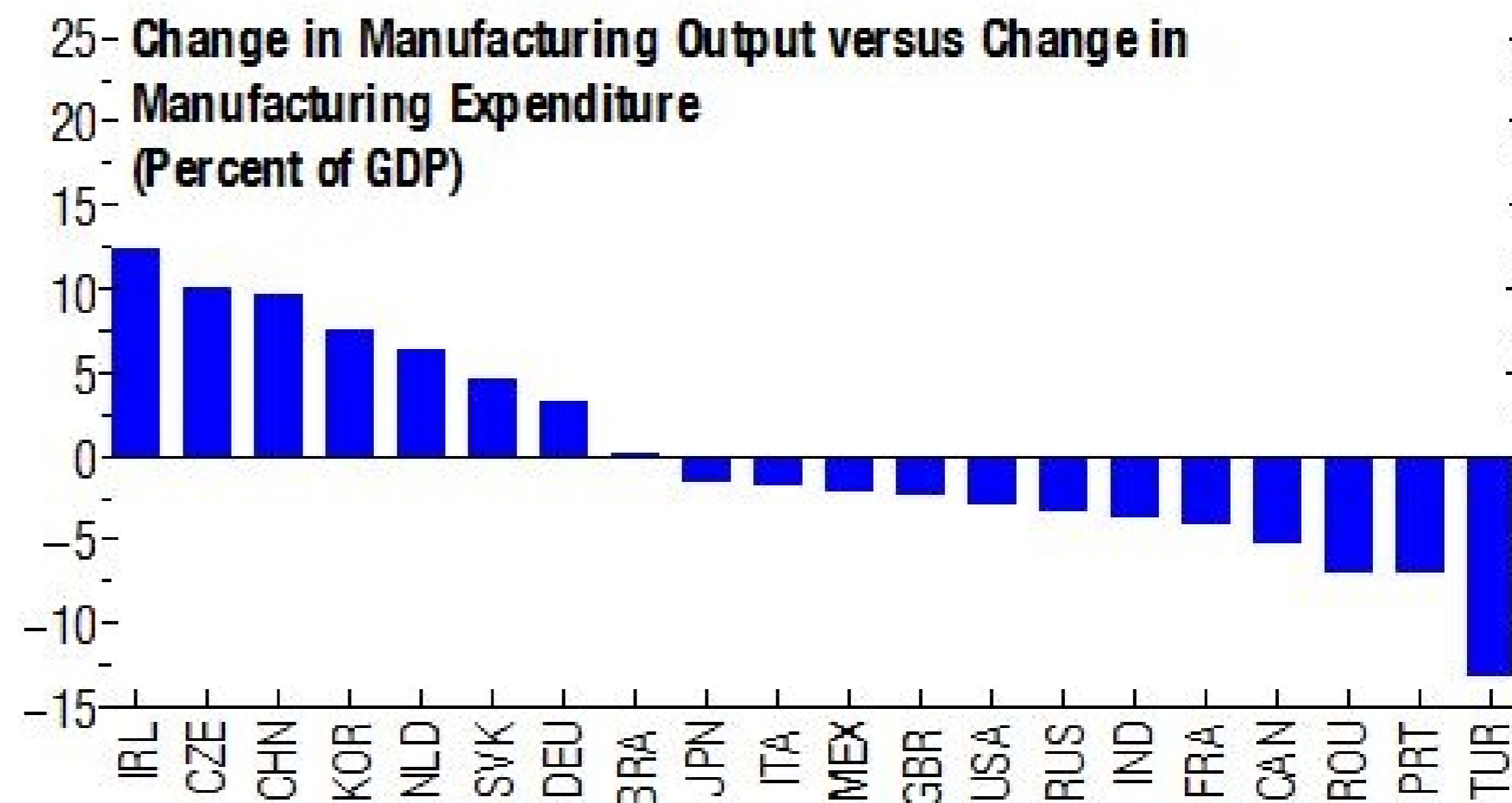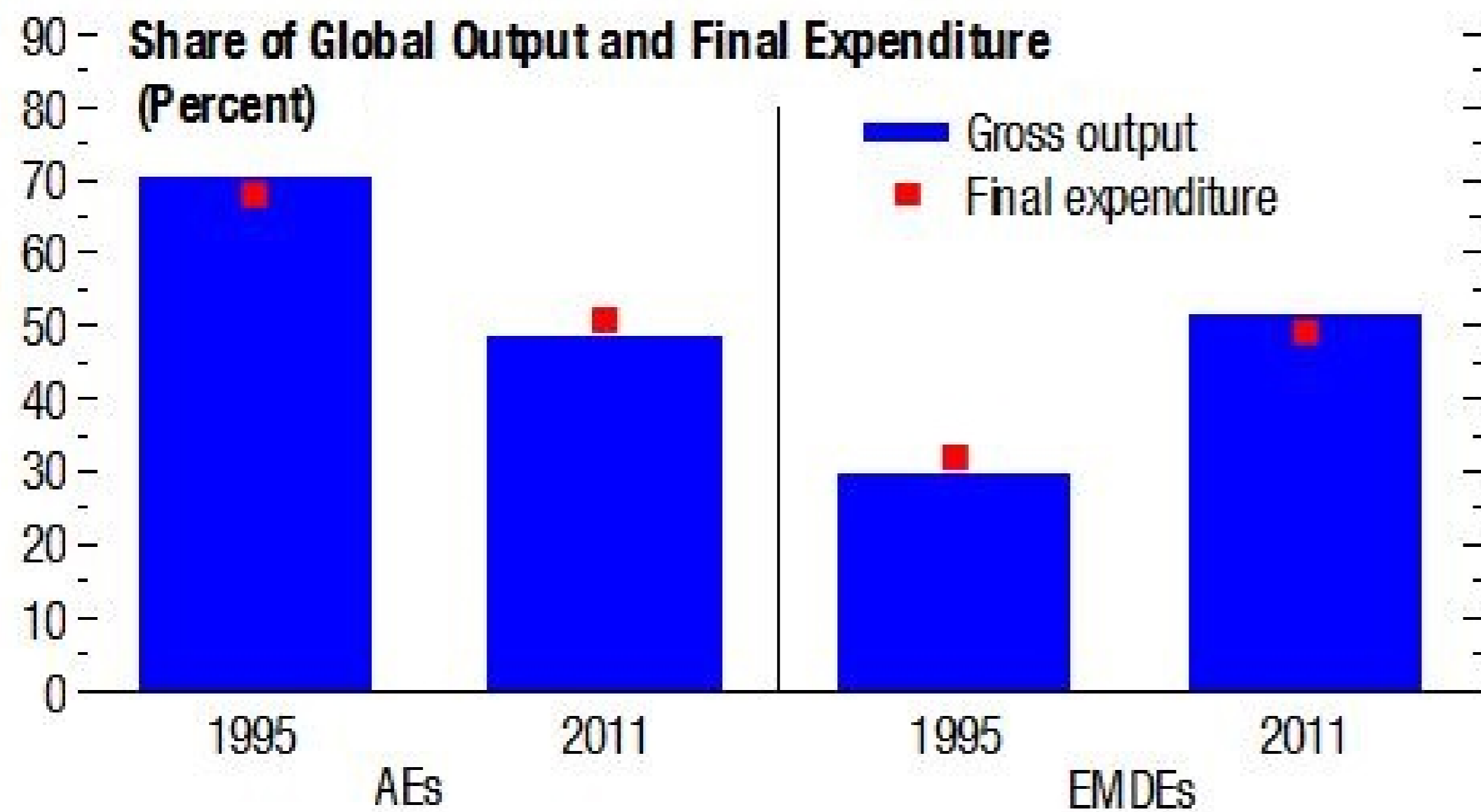(Percent)
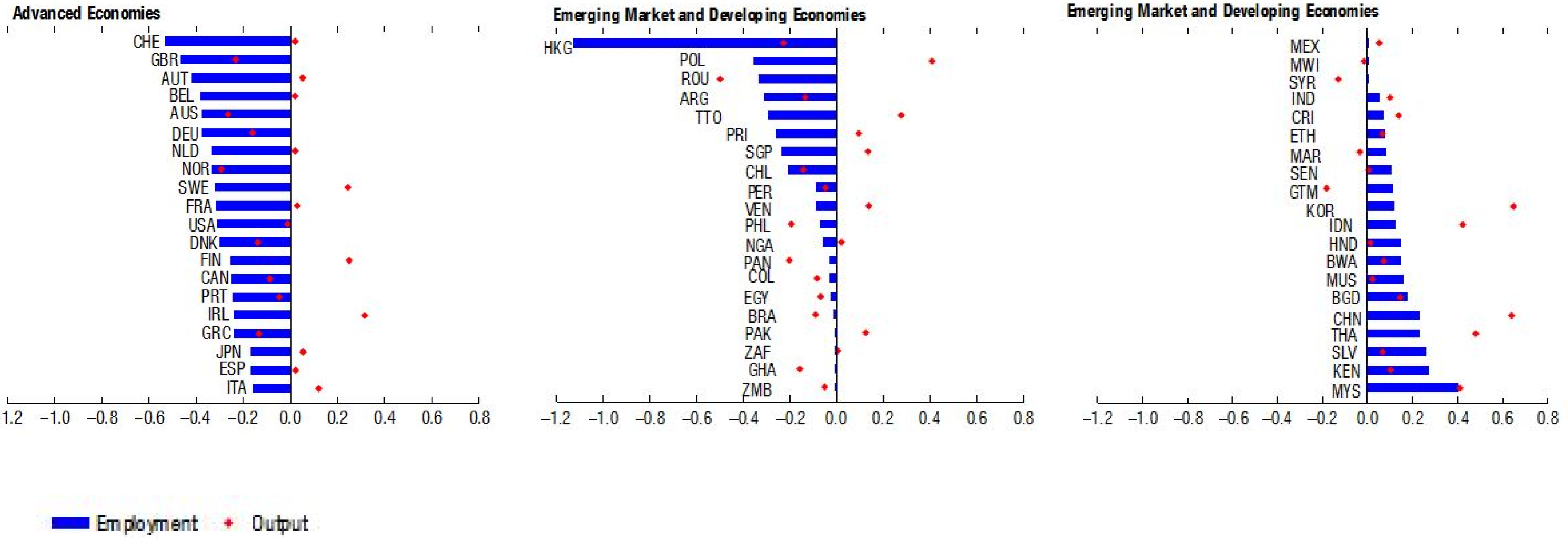
Estimated Change in Manufacturing Shares and Relative Prices, 1960—2015
(Percentage points per year)

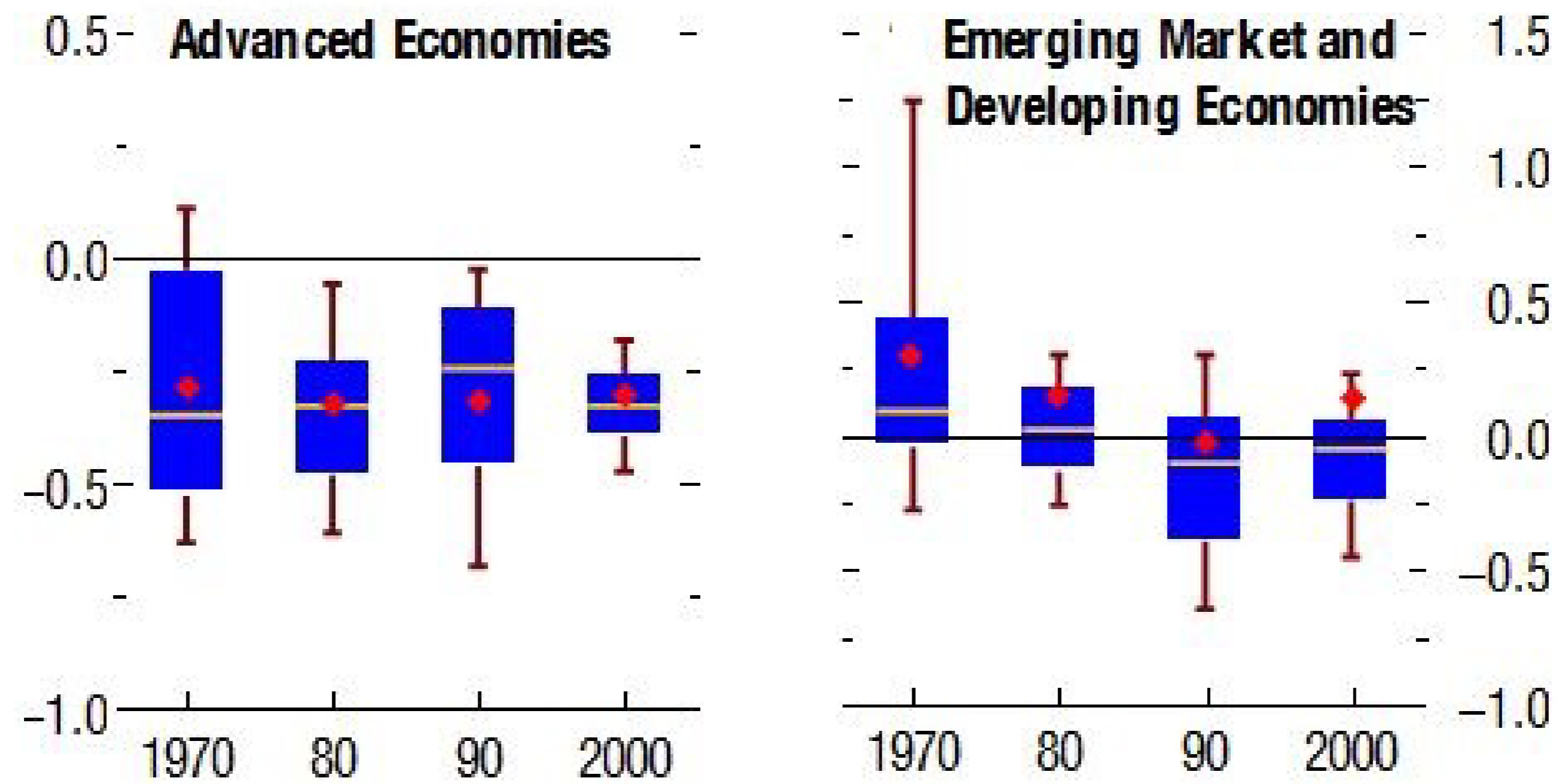# …but also some reallocation of production across countries

Manufacturing Gross Output and Final Expenditure on Manufacturing Goods, 1995—2011

Cross-Country Distribution of Estimated Trends in Manufacturing Employment Shares, 1970-2015
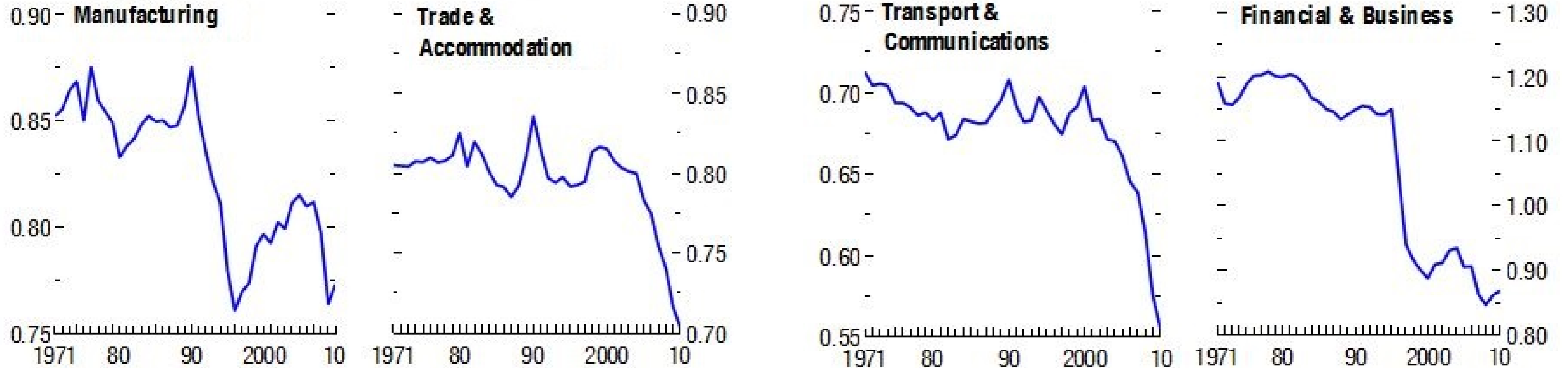(Percentage points per year)

Convergence in service sectors has accelerated

Sigma-Convergence
(Standard deviation of log labor productivity, PPP adjusted)

Productivity Gap in 2005
(Difference in productivity level with respect to the United States, percentage points)