

Productivity Change in non- OECD public sector health systems, 1946-2002

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Outline

Rationale

Study

Results

Conclusion

Rationale

- Productivity change has been a major resource enabling expansion of service provision in OECD health systems given budget constraints
- Well documented to occur in OECD nations, but no documentation in developing economies
- Major topic of research in OECD countries, but almost never examined in developing economies, where fiscal constraints are tighter

Background Literature

- **Learning-by-doing hypothesis - provides expectation of productivity growth**
 - Learning-by-doing early explanation for unknown variance in growth models (Arrow, 1962)
 - Learning of organizational knowledge stored in routines, protocols, norms, methods of organization, etc
 - *A priori* expectation for medical services given complex nature of production
 - Learning-by-doing -> Cost of production ↓ ≡ Productivity improvement
 - Cost reduction enables societies to consume increased volumes of medical services (whose quality is improving) → Mortality ↓
- **Empirical evidence**
 - No previous literature on productivity change over time in developing countries - some evidence for OECD nations
 - Null finding reported by Commission on Macroeconomics & Health

Study Objectives

- To estimate long-term trends in productivity in developing country health systems (1901-2002)
- To develop appropriate methods and identify suitable data sources

Study Methodology

- Productivity measured using index approach
 - Econometric approaches not suitable for historical time-analysis; also problem with consistency of results
 - Index is inverse of unit costs
 - Non-quality adjusted (Quality = clinical efficaciousness)
 - Functionally similar to that recommended by Eurostat
- Index measure

$$\text{Cost index, } I_t = \frac{X_t \div Y_t}{\sum_{r=1}^2 Z_{rt} W_r}$$

- X_t = Expenditure at time, t ; Y_t = GDP per capita at time, t
- Z_{rt} = Vector of outputs (inpatient + outpatient episodes)
- W_r = Cost weights for outputs

Data: Variables

- Restriction to public sector
 - For many countries >90% of inpatient modern care, and bulk of outpatient modern care prior to 1970s
- Variables
 - Annual number of outputs
 - ☞ inpatient admissions
 - ☞ outpatient visits/attendances
 - Expenditures
 - ☞ Expenditures at facility level
 - ☞ Total expenditures of health ministries
- Data sources
 - Archive collections in London, Cambridge and Cambridge - Administrative reports of health departments, national statistical publications
 - Common datasets - Mitchell (2003), Maddison PPP database, WB WDI
 - Ad-hoc studies of cost shares + assumptions

Data: Countries

- Americas
 - Bahamas, Jamaica
- Europe
 - Cyprus, Malta (England & Wales, Scotland, Northern Ireland)
- Africa
 - Botswana, Kenya, Malawi, Mauritius, Seychelles, Somaliland, Sudan, Swaziland, Tanzania, Uganda
- Asia
 - Hong Kong, Malaysia, Singapore, Sri Lanka
- Middle East
 - Bahrain, Tunisia
- Oceania
 - Fiji, Tonga (Australia)

Data: Coverage

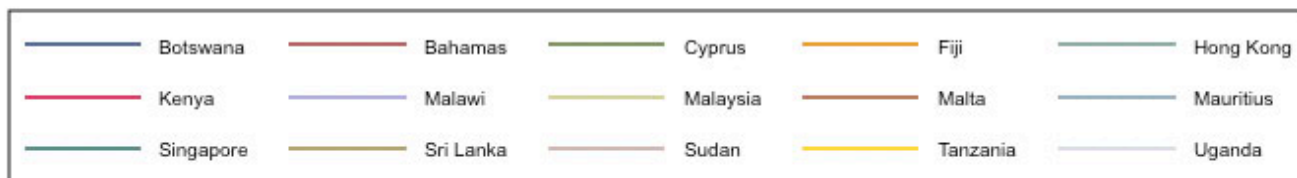
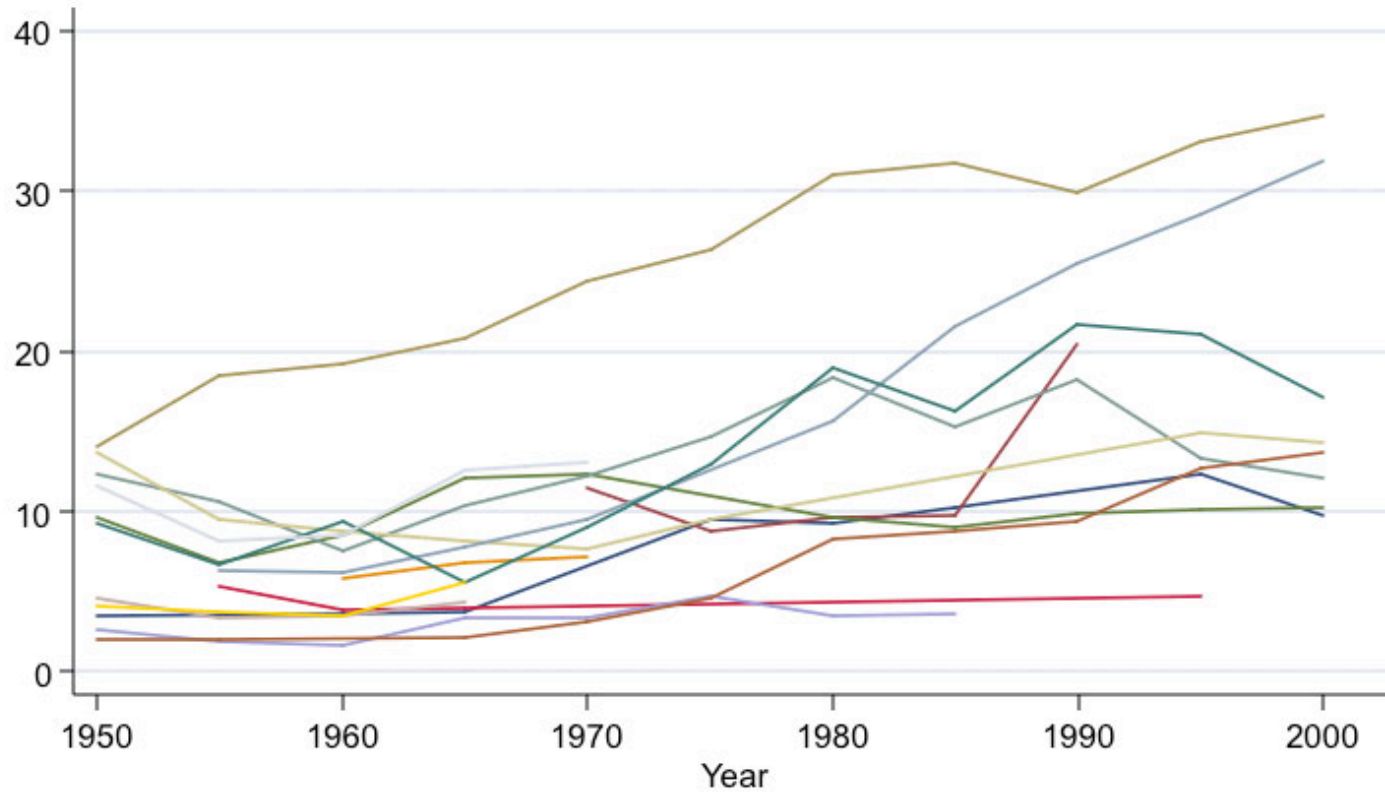
- Nominal productivity data
 - 23 countries
 - Time-span 1927-2002
- Final productivity data set smaller owing to lack of GDP data
 - 21 countries
 - Time span 1927-2002
 - 837 country-years
 - Predominantly ex-British Crown Colonies

Results

- Sustained productivity trends observed at country level
 - Rates of change typically sustained for 3-4 decades
 - Pattern consistent with incremental productivity growth through learning-by-doing
 - Range of -1.3% – +4.3% (mean 0.8%) during 1946-2002
 - 20% of sample have negative trends
 - Rest have zero or positive trends (up to 4.3%)
 - Distribution of results [-1.3% to +4.5%]
 - Normal distribution overlapping zero - common in firm studies
 - Mean=0.8% is substantial - implies halving of unit costs every 80 years

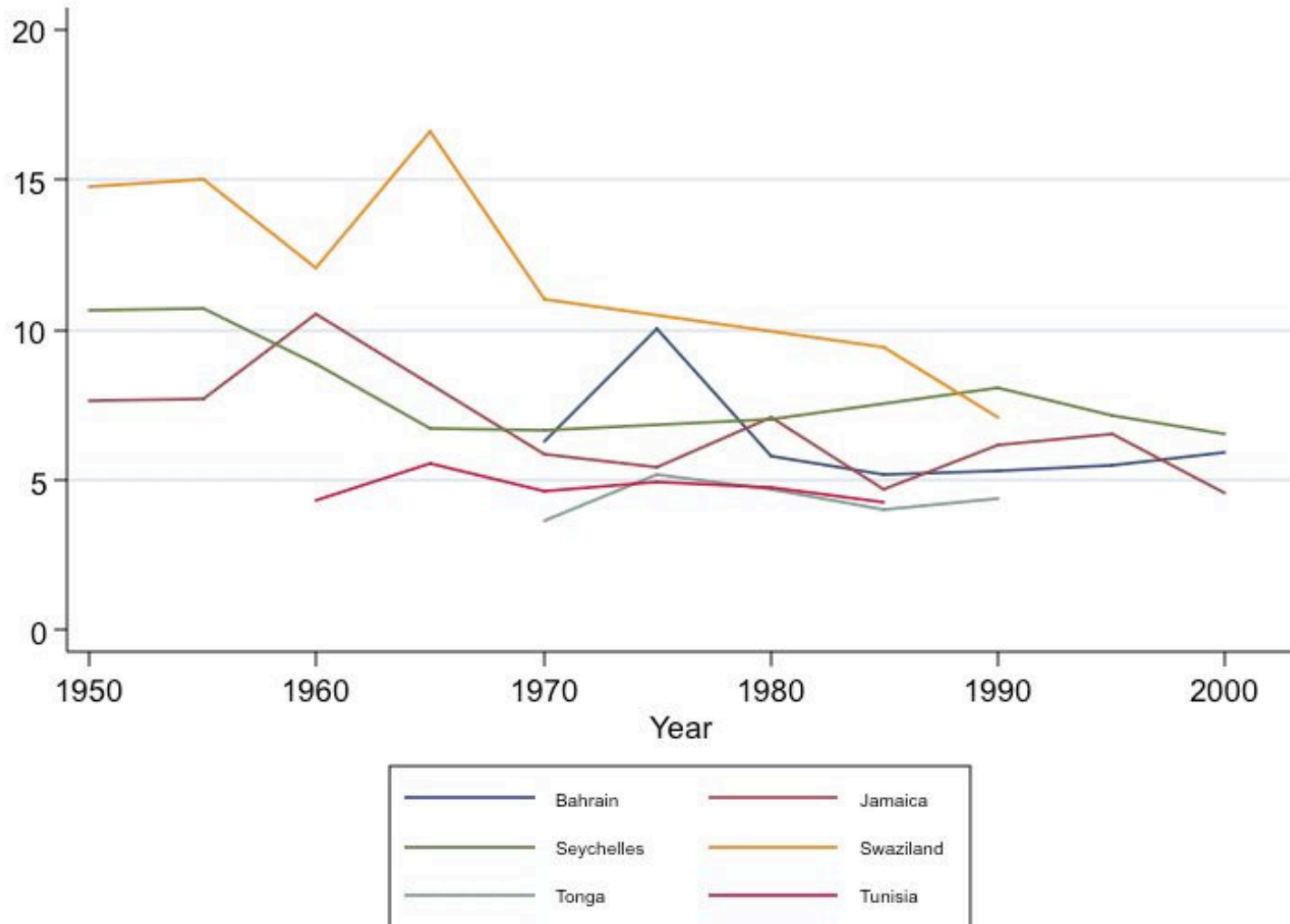
Productivity trends 1946-2002

Countries where trend was positive



Productivity trends 1946-2002

Countries where trend was negative

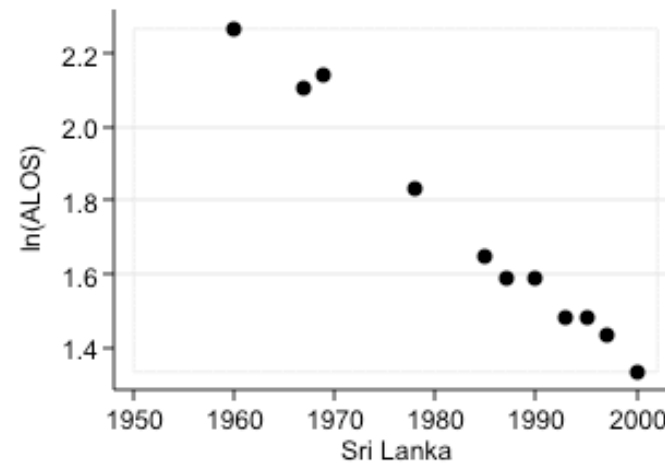
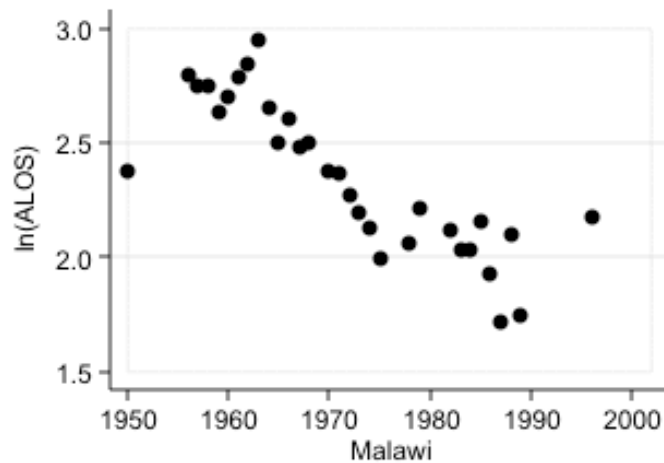
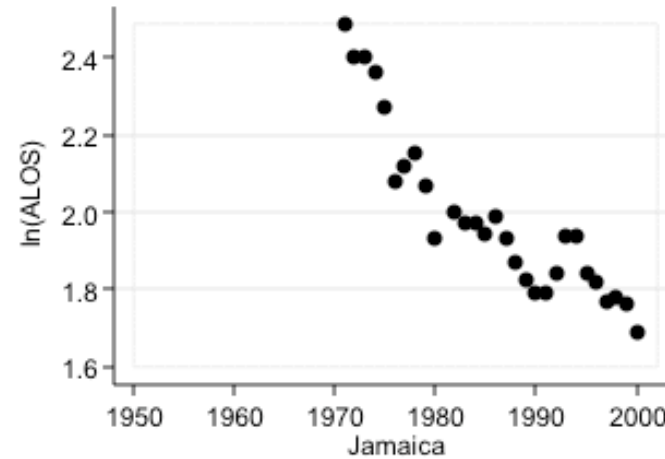
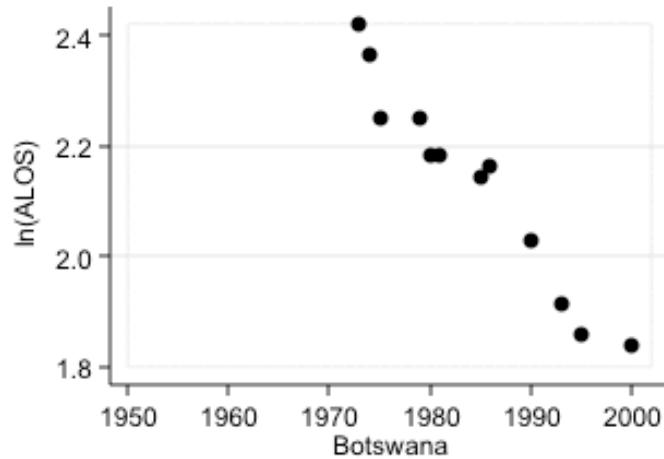


Results

- Indirect productivity indicators reinforce evidence of productivity improvement
 - Declining ALOS despite constant bed-occupancy rates
 - Increasing bed throughput rates
 - Declining case fatality rates (>1945)

ALOS 1950-2002

Trends in Log(ALOS) for selected countries

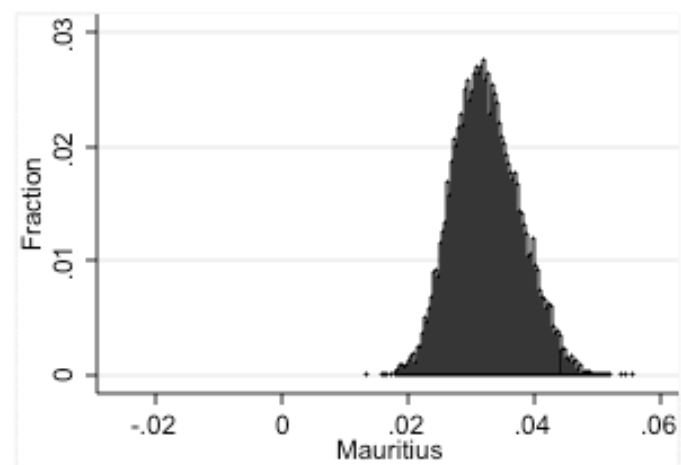
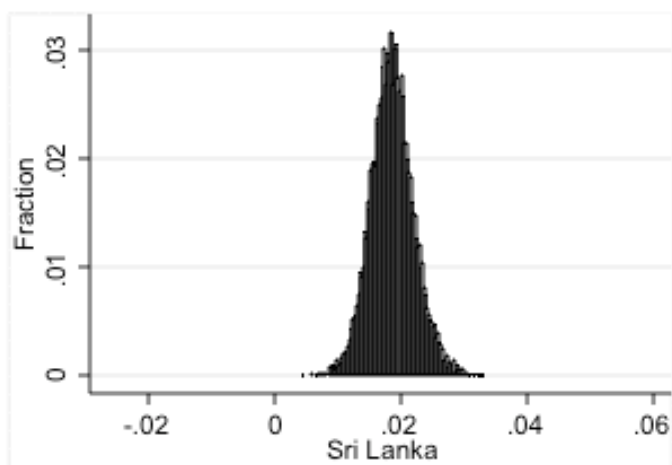
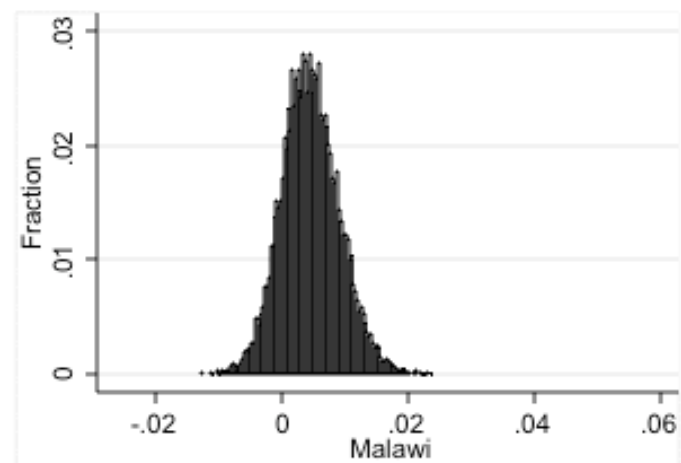
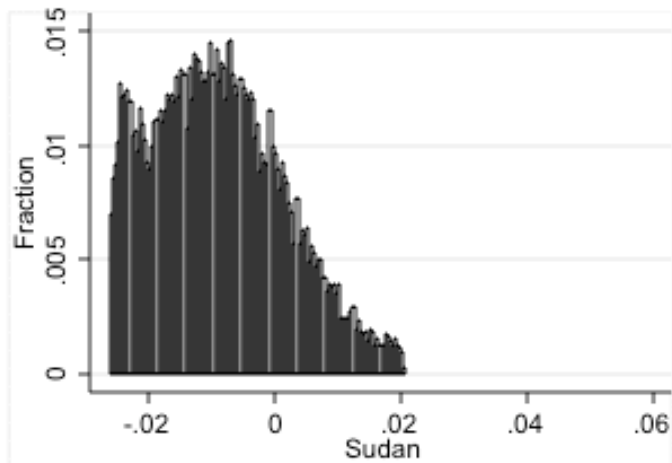


Problems

- Failure to adjust for quality
 - Biases results downwards - quality can be assumed to have increased
- Income per capita in index maybe confounder
 - Explains 76% of variance in cross-section (Adam & al, 2003)
 - ☞ Tested using random-effects model with time and per capita income as covariates: half of increase remains, coefficient on Y is 0.72
- Potential bias from assumptions about cost shares
 - Facility share of budgets, Inpatient share of facility costs
 - ☞ Investigated by Monte Carlo analysis: Replaced shares by random-walks (100,000 trials)
 - ☞ Results robust in MC

Robustness of cost shares:

Simulated Monte Carlo estimates of productivity trends



Conclusions

- Evidence for substantial and sustained increases in productivity in many developing countries during mortality decline
 - Annual rates of change(0%-5%) comparable to those reported in OECD
 - Generalizability limited by nature of sample
- Cost reduction associated with quality improvement:
 - Continuous reductions in ALOS
 - Continuous improvements in case-fatality rates
 - Continuous increases in bed-turnover rates
- Implications
 - Cannot assumed fixed unit costs in developing countries (typical CMH/Scaling-up assumption)
 - Cost-reduction significant enabler of expansion in services
 - Cost estimates (mostly public sector) of achieving MDGs, ICPD-5, 3 by 5, etc exaggerated