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PPPs, infrastructure and the economy

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PPPs, Infrastructure & The Economy

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1. Introduction

What is infrastructure?

Infrastructure (or social overhead capital) refers to the assets, networks and management that facilitates economic development, social & economic activity within an economy.

Social infrastructure – urban development, health, education, public housing

Economic infrastructure – land, sea and air transport, water, energy, urban transport, resource industry services & communications.
What is the role of infrastructure in developed economies?

- Productive capacity & output
- Economic growth
- Capital and labour productivity
- Reduces private sector transaction costs, improves returns
- Catalyst for private sector investment *(Regan 2004).*
THE STATE
- Public Policy
  - Federal-State Relations (VFI)

THE ECONOMY
- Public Goods
- Microeconomic Reform
  - (De) Regulation
  - Privatisation
  - Competition Policy
- GBEs

INFRASTRUCTURE
- Quasi-Public Goods
  - General Characteristics
  - Industry Structure
  - Specific Characteristics
  - Water
  - Energy
  - Rail
  - Telecommunications
  - Ports, Airports

Input-Output Analysis
- CBA

Other

Institutional Investors

Infrastructure Economics 0814h
In transition economies:
1. Stimulates private investment
2. Regional economic development, growth and industry specialisation
3. Affects the spatial distribution of industry and urban development
4. Uneven industry return distribution
5. Competitive advantage
6. Indirectly, affects social development.
Against this evidence, what do empirical and theoretical growth frameworks tell us about the importance of:

1. The quantum of public investment
2. The level of private sector participation
3. The targets that yield highest economic and social returns?
4. The growth evidence.
1. Public investment – the evidence indicates:
   – The importance of long-term integrated planning
   – GDP targets around 8% GDP subject to efficiency criteria – the effectiveness of investment and operation more important than the quantum
   – Private sector participation improves economic & social returns

The growth evidence …
2. The level of private participation
Benefits occur in areas of competitive advantage:

- Private goods and services
- Output-specified public goods
- Investment that features innovation and new technology
- Industries with high levels of competition.
3. The primary short-term investment targets:

- Land transport (road, rail freight)
- Telecommunications, information technology
- Sectors with concomitant factors such as high urbanisation rate, public policy support, favourable relative factor prices.
4. Economic growth theory

Why is understanding growth important?

Adam Smith (Wealth of Nations 1776) founded the *classical* school of growth theory. He viewed the engine of growth to be:

- the division of labour
- the accumulation of capital, and
- technical progress.

It requires a certainty (a legal framework) within which the market could function. International free trade would allow poorer countries to catch up with industrialised ones.
Ricardo added the diminishing returns rule in the early 1800s. Karl Marx 50 years later argued that diminishing returns would eventually lead to market destruction. However, marxism was a political and social movement. In 20th Century, neoclassical growth theory represented that growth is a product of four endogenous factors:
1. The level of capital stock
2. The level of labour input
3. The productivity of capital
4. The productivity of labour.

These growth drivers were said to be *endogenous*.

Neoclassical (or neo-Schumpeterian) growth theory assumes perfect competition which is rarely the case in factor markets. It also assumes diminishing returns.
Keynes

Keynes was a highly influential economists whose theories about macroeconomic management were the most important influence of the 20th Century.

Keynes led the view that the state should intervene in the economy to compensate for market failure & downturns in the business cycle. Interventions include:
• Deficit spending to stimulate employment & incomes (fiscal policy)

• Welfare economics – asset allocation & public spending to those activities offering high social utility

• A central role for state control of money supply and interest rates (monetary policy) in the operation of the economy.
Evolution of the neoclassical growth model. Solow (1956) & Swan (1956) identified:

- Conditional convergence ie. The lower the starting level of per capita GDP (relative to the long-run steady state position), the faster the growth rate

- Growth will slow (diminishing return) in the absence of technology growth. This has not occurred in many economies, so the model treated technology (and population growth) as exogenous (outside the model).
ECONOMIC GROWTH

NEO-CLASSICAL (EXOGENOUS) GROWTH THEORY
(Solow 1956, Swan 1956, Meade 1961).

• An economy will move toward a steady state (conditional convergence). In this state, growth depends only on the rate of technical progress (an element outside the model).
• Policy measures (tax cuts, public spending) have little (if any) effect.

The Solow model shows how savings (or investment), population growth and technological progress affect output & growth over time (Mankiw 2005 Macroeconomics, 5th. edn., Worth Publishing).

ENDOGENOUS (LONG-RUN) GROWTH THEORY
Helps to explain the rate of technical progress using investment in R&D.
• The production of new technologies is central (R&D, public & private research spending, preferences), population growth (fertility rate), human capital (labour force health, education & literacy) are key factors.
• Effective policy measures include increased public expenditures on infrastructure, systematic research and both the creation & deployment of new technology.
• New growth spillovers/externalities.

Measurement
Comparison of GDP per capita

International PPP

Issues
Where does technology come from & why?
Recent research explains international variation in living standards using capital accumulation metrics and efficient capital use (capital productivity).

Issues
• Willingness to save (invest) in R&D
• Rate of growth depends on various characteristics of preferences & technology including the level of production, cost of R&D and scale of the economy (Barrow & Sala-i-Martin 2003).
This limitation overcome by Cass (1965) & Koopmans (1965) who provided an endogenous determination of the saving rate.

Can we fit technology into the model? Its hard because of the model’s competitive assumptions.
Recent work in the 1980s by Romer (1986), Lucas (1988) & Rebelo (1991) argued that growth may be indefinite because the returns to investment capital goods do not necessarily diminish. The reason - spillovers of knowledge across producers and external benefits from human capital.

This work laid foundations for new growth theory (NGT).
Romer (1987, 1990) incorporated theories of R&D and imperfect competition into the model. Technology comes from R&D and the reward is monopoly power. New technology may drive the growth rate indefinitely.

However, to do so, other things come into play – taxation, level of capital market development, the rule of law (property rights), provision of infrastructure, regulation & openness of markets etc.
This suggests an important role for state policy and institutional frameworks.

Population is also bought into the model via incorporating an analysis of fertility choice and other labour supply variables – retirement (pension schemes), migration, labour/leisure choices etc. (*Barro & Sala-i-Martin* 2001).
“For given values of per capita GDP and human capital, growth depends positively on the rule of law and international openness and negatively on the ratio of state consumption to GDP and the rate of inflation. Growth increases with favourable movements in the terms of trade and declines with increases in the fertility rate.

The relationship between growth and the investment ratio is positive but weak (adjusted for lag) when the variables already mentioned are held constant” (Barro & Sala-i-Martin 2001).
Endogenous Economic Growth: The Drivers

An empirical analysis of growth rates using international panel data.

Conditional Convergence: Developed economies converge to similar steady-state levels of per capita income.

Absolute Convergence: Developing economies start from a lower base and grow faster than developed economies.

- Agenor & Monteil 1996
  - Democracy
  - Initial GDP per cap.
  - Education
    - Export volume growth
    - Life expectancy

- Barro & Sala-i-Martin 2001
  - International Openness
  - Terms of Trade
  - Rule of Law
  - Rate of Inflation
  - Government FCE
  - Fertility rate
  - Capital: output Ratio
  - Investment (Public & Private)

- Capital Markets
- Infrastructure
- Financial Intermediation
- Savings (GFCF) or investment
- Government FCE
The drivers of economic growth:

- Policy & institutional frameworks
- An open and competitive economy
- A high score on the liberalisation index
- Human capital – education, health, training
- Investment in R&D and innovation
- Adequate infrastructure, efficient resource allocation & use of capital stocks.
The evidence suggests that investment in infrastructure has a correlation with economic development and growth. The causal connection flows from investment to growth and is significant (Sanchez-Robles 1998). However, intermediate drivers such as productivity may play a key role (Erenburg 1993, 1994; Louca 2003; PC 1999; Aschauer 1989-1998).
Issues

• The relationship between growth, human capital, productivity and capital deepening
• Public capital, “crowding out” or “crowding in” (deadweight effect of public capital investment)
• Embedded technology
• Demand drivers – static or dynamic?
Summary

1. Investment in economic infrastructure can make a significant contribution to medium-term economic growth. The returns are greatest (and sustainable) if investment is made in dedicated industrial infrastructure linked to the traded goods sector (destination railways, ports, land transport, communications).
2. Returns are lower for “soft” economic and social infrastructure – water, domestic energy, public transport. However, investment in social infrastructure is necessary to lift economic and social performance in the long run and sustain the primary driver of economic development – population growth, education and health standards.
3. Long-run sustainable economic growth requires strong institutional frameworks:

- Reduced direct state interventions
- Rule of law, property rights, enforceable contracts
- Sound and neutral policy & regulatory frameworks
- Market reforms – competition policy (aimed at distinctive international competitiveness, the elimination of market distortions, liberalisation of capital and trade flows)
Sound institutional frameworks:

• Independent central bank
• Macroeconomic stability
• Policies that favor innovation, foreign investment, reduction in transaction costs and corrections for market failure.
In Queensland, infrastructure spending will contribute around 1.9-2.2% growth in GSP 2006-2007. The long-run contribution is estimated at 0.7% pa over 20 years.

Private investment generally shows a higher return than public investment suggesting a much greater role for PPPs to around 15% of State GFCF in the forecast period 2007-2026. PPPs are the most efficient form of private sector investment in the economy.
Commonwealth Secretariat Mirvac School of Sustainable Development, Bond University

PUBLIC PRIVATE PARTNERSHIPS
Executive Leadership Program
3-14 December 2007
Bond University and the Holiday Inn, Surfers Paradise
Gold Coast, Australia

PPP Economics

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1436
The time value of money & discounted cash flow (DCF) analysis. Why do we discount?

• Lost opportunity to put money to work
• Economic growth
• Future uncertainty
• Utility growth factor
• Intergenerational equity considerations.
Financial modelling using discounted cash flow (DCF) methods:

- Assumptions & forecasts
- Values – real or nominal
- Discount rate
- Asset residual value
- Embedded options.
### FINANCIAL FORECAST: INVESTMENT RATE OF RETURN

**AUD000s**

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<th>Forecast d</th>
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<td>Internal rate of return (IRR)</td>
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Characteristics of Capital Intensive (PPP) Assets:

- Capital intensity (CIR)
- High level of CSOs
- Significant sunk costs
- Elements of limited competition
- An essential service/externalities
- Output an input to other industries
- A component of complex supply chains
- High levels of vertical integration
- Networked
- Low returns, low risk (low beta)
- Stable (indexed) revenue stream
- Limited role of market economics
- Assets are site and use specific
- Regulated
- Distinctive demand characteristics
- Finite tenure, ownership interests
- Long-term investment horizon with well defined revenue “ramping up” stages
- Large number of users, transactions
- Output pricing may not reflect real cost
- Likelihood of policy intervention
- An asset or a business?
- Major industry differences.
VFM using DCF analysis tracks differences between the state incurring up-front capital expenditure on assets & services (PSC) and:

1. the state undertaking to make availability payments over time *or*

2. the state making no payment when the private bidder assumes market risk.
PPP & TRADITIONAL PROCUREMENT
Net Present Value of Payment Streams

Preparation  Commissioning  Service Delivery

Traditional Procurement

PPP – Availability Payment

PPP – Market Risk
Methods of providing public services:

• User pays arrangements (tollways, public transport)
• Shadow tolls, capital availability payments (UK motorways)
• General community charge (local and national taxation)
• Subsidised public services (CSOs, transfer payments or service provider financial subsidy).
# Study of the Infrastructure Sector

Australia, 2002

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<th>ROR %</th>
<th>GOM %</th>
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*Source*: Regan 2003 Annual Reports 2003
## GOVERNMENT BUSINESS ENTERPRISES

### Return on Assets % pa

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### NOTES

a Average 30 June

### SOURCE


RBA 10 Year Bond Yields 1992-2005
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