● Public capital = core public infrastructure assets.

● Public capital stock:

\[ K(t+1) = (1 - \delta)K(t) + I(t) \]

● \( \delta \in (0,1) \): depreciation rate.

\[ K(t+1) = (1 - \delta)K(t) + \alpha I(t) \]

● \( \alpha \in (0,1) \): efficiency/governance indicator.
● What matters is the **flow** of services produced by the **stock** of public capital…

● …not the flow of investment itself.

● Issue further discussed below.
Conventional Channels
Public investment in infrastructure

Efficiency

Public capital in infrastructure

Productivity /cost effects

Private capital

Market production

Complementarity effect

Private Investment in physical capital

Crowding-out effects
New Channels
Book: provides an overview, with new results. Theoretical and empirical contributions scattered in professional journals…

…and official publications (World Bank, UN, etc.).

All these channels were not “suddenly” discovered; for some of them, strong *micro evidence* has been available for quite some time.

Macroeconomists have only recently started to integrate them systematically in their theoretical and applied models.
Public investment in infrastructure

Efficiency

Public capital in infrastructure

Network effects

Production of education services

Effective labor

Maintenance

Production of Health services

Market production

Rate of time preference

Consumption saving decisions

Private capital

Investment in physical and human capital
Examples of impact on education and health:

1. Water and sanitation—increase in enrolment rates (especially for girls, rural areas).

2. Electricity—allows hospitals and schools to function properly.

3. Roads—easier for patients/students, and teachers/medical workers to get to school/medical facilities.
Stylized View of Network Effects

Efficiency of public capital

Congestion effects

Stock of public capital
- Impact on innovation (both ability to innovate and diffusion of innovations).

- Role of public capital in the transition from imitation (adaptation of existing products or ideas)...

- to true innovation (creation of new products).

- Requires shift from “basic” infrastructure (roads, fixed and mobile phones) to broadband.

- Generation/distribution of information and ideas.
Ministerial report on the OECD Innovation Strategy

Innovation to strengthen growth and address global and social challenges

Key Findings
Impact on **income distribution**. Improved access to infrastructure may reduce inequality.

- Possible reason: improved access benefits the poor more than proportionally; if inequality is bad for growth (e.g., due to credit market imperfections), then indirect effect on growth.

- However, causality can go both ways.

- More research is needed.
Impact on women’s time allocation.

Women bear the brunt of domestic tasks in many developing countries.

Improved access to infrastructure allows them to reallocate their time to other activities—market work, but also taking better care of themselves and their children.

With health persistence: the latter can be productive and growth promoting.
Gender Dimension of Infrastructure

Access to infrastructure services

- Time allocated to home production
- Time allocated to own health
- Time allocated to market production
- Time allocated to child rearing

- Women’s health
- Productivity
- Children’s health education

- Health persistence

- Market production
- Family resources
- Wage income

Intra-household Bargaining
- Negative externalities.

- Environmental damage, pollution.

- Negative effect on growth, both directly (loss of physical assets important for production) or indirectly (adverse effect of pollution on health and labor productivity).

- Creates trade-off for infrastructure investment...

- …which must be internalized.
Policy Implications
• 1. Investment spending is a **poor proxy** for the accumulation of public productive assets.

• Possible to have at the same time negative impact of the flow (crowding-out effect), and positive impact of the stock, on growth…

• …important for assessing the fiscal stance (size of deficits/debt sustainability).

• 2. Accounting for **quality** of stocks and **congestion effects** is important.
● Inverse correlation between investment efficiency/quality of infrastructure and level of corruption.

● Scaling-up of public investment must be accompanied by improvements in selection, implementation, and monitoring of investment projects.

● Need to go beyond discussions of spending levels and address issues of the broad institutional framework underpinning provision of investment.
3. Beyond productivity/cost effects: critical to capture the various externalities associated with public capital…

…including network externalities and threshold effects in elaborating investment programs.

Also important in current debate about fiscal consolidation in both industrial and developing countries.

4. Account for both “old” and “new” channels in applied macro models.
5. Investing in infrastructure is as much about promoting markets as it is about achieving health/education targets and empowering women.

Implication for public expenditure allocation; best way to improve education/health outcomes could be to spend more on infrastructure.

This is not to deny the importance of challenges specific to these sectors.

Implication for the selection of infrastructure projects; in addition to IRRs, account for benefits in terms of health/education.