

Infrastructure and growth

Key points

- Infrastructure enhances productivity, boosts competitiveness, facilitates trade and contributes to economic cohesion. Addressing climate change would require additional infrastructure spending.
- Despite these growing needs, infrastructure investments have been declining in many countries in the UNECE region.
- The focus should be not only on increased infrastructure spending but also on raising efficiency as a way to enhance the impact on growth.
- Regulatory and management changes influencing the use of existing infrastructure can also increase the positive effect on growth.

Summary

Long-term trends suggest that there has been an overall decline in the availability of infrastructure. In a number of developed countries, perceptions on the quality of infrastructure have deteriorated. However, infrastructure cannot be neglected as it has a positive impact on productivity and competitiveness. It contributes to economic cohesion and opens new possibilities for economic activity. Addressing climate change would require an additional 5% on top of almost \$90 trillion infrastructure investment required to maintain current growth paths up to 2030, according to some estimates. While the impact of infrastructure on growth is generally positive, studies show important differences. Countries with particularly poor infrastructure benefit the most from improved provision but these differences can also be explained by variations in the efficiency of spending. Moreover, better infrastructure services result not only from increased capacity but also from regulatory and management changes leading to new use patterns. A key policy focus remains the creation of an environment that sets the right incentives for raising the amount and the quality of infrastructure in both the public and the private sectors.

Infrastructure trends

There has been a long-term decline in the availability of infrastructure, according to the IMF. The stock of public capital (which is closely related with infrastructure) as a share of output has fallen over the past three decades across advanced, emerging market economies and low income countries.ⁱ

Infrastructure investment was part of stimulus packages at the beginning of the crisis in 2008. In the EU, this push represented around 0.25% of GDP.ⁱⁱ However, as fiscal consolidation took hold,



these initial efforts stalled in many countries. The comparison of public investment before and after the crisis shows a variety of situations across countries. Overall investment (public and private) remains below pre-crisis levels in many countries in the ECE region. In particular, investment in inland transport infrastructure in OECD countries fell to a record low 0.8% of GDP in 2013, while investment in Central and Eastern Europe almost halved in real terms since 2009ⁱⁱⁱ.

There are strong differences in the availability and quality of infrastructure across ECE members. There are however, indications that these differences have narrowed (Figure 1). In the EU, the new member States have been catching up with older members. In the ECE region, the recent dynamics of perceptions on the quality of infrastructure compiled by the World Economic Forum show that progress has been more rapid in countries that had a worse initial situation in South Eastern Europe and the CIS. By contrast, this subjective indicator also suggests that in a number of advanced countries the quality of infrastructure has deteriorated due to insufficient maintenance spending and the ageing of networks.

More disaggregated analysis shows differences across sectors. A recent study from the European Commission^{iv} presents evidence of insufficient investment in the core countries of the Euro area in both road and rail infrastructure. The stock of infrastructure in new EU member States is still lower than the EU average, despite significant investment in recent years, but the railway network appears overdimensioned in view of the dynamics of rail traffic.

Why it matters

A well-developed infrastructure is a key requirement for a competitive modern economy which brings multiple benefits and avoids costs:

- Infrastructure investment makes a direct contribution to GDP and it is also a necessary input in the production processes of other sectors.
- The availability of infrastructure influences the production costs of companies and therefore has an impact on competitiveness. Inadequate infrastructure imposes congestion costs. For example, it is estimated that inadequate infrastructure costs families in the United States more than \$120 billion in extra fuel and lost time^v. Poor infrastructure can also have detrimental effects for human life and health.
- Infrastructure facilitates productivity gains in different sectors, reducing transaction costs and making possible a more efficient use of resources.
- It creates new opportunities for investment and therefore increases aggregate demand in the short-run and promotes economic diversification over longer time horizons. Once the necessary infrastructure is in place to facilitate access to

customers and suppliers, other investments are possible.

- It facilitates economic interaction and therefore contributes to reap the benefits from increased trade and heightened competition, including in a transboundary context.

Infrastructure has also geographical dimension. The location of infrastructure influences agglomeration and dispersion forces determining the distribution of economic activity over the territory as a result of the decisions of households and firms. This has not only an economic impact but also significant social and environmental implications.

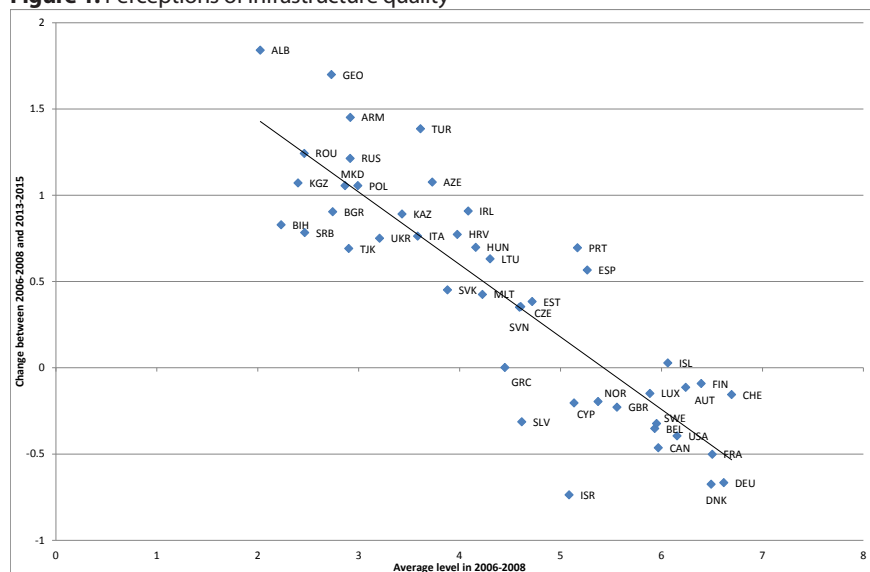
Infrastructure can also serve to overcome the natural disadvantages that landlocked countries face in economic development. Infrastructure facilitates integration into regional and global supply chains by offsetting the negative impact on trade costs that results from an adverse geographic position. But appropriate responses to these difficulties require effective transboundary coordination of efforts, as countries depend on the situation in their neighbours^{vi}.

Infrastructure development has also a strategic, long-term significance:

- Facilitating cross-border transport and energy connections is necessary to reap the rewards of integration agreements. Benefits derived from increased competition and market size depend on the existence of a well-developed infrastructure that avoids the persistence of fragmentation across national lines. The “cost of distance” is inversely related to the availability and quality of infrastructure. This is relevant for the construction of the EU internal market but also for the more recent initiative to create a Eurasian Economic Union and any efforts to facilitate pan-European integration. UNECE is actively engaged in developing transport backbone networks in Central and Eastern Europe and Central Asia and the Caucasus, identifying main road and rail routes for priority development and thus facilitating investment. The ambitious “One Belt, One Road Initiative”, which UNECE also supports, is a good example of a development and integration strategy that is underpinned by infrastructure initiatives to facilitate increased connectivity.

- Moving towards a low-carbon economy and addressing climate change challenges will require substantial infrastructure investments. According to a report issued by the Global Commission on the Economy and Climate^{vii}, the world economy may need almost \$90 trillion in infrastructure cumulatively to maintain current growth trajectories in the period up to 2030. In addition to this business-as-usual scenario, the transition to a low-carbon economy may require an additional 5% upfront investment. The shift towards renewable

Figure 1. Perceptions of infrastructure quality



Note: Higher values indicate better perceptions of infrastructure quality
Source: World Economic Forum, The Global Competitiveness Report, various issues, own elaboration

UNECE and transport infrastructure

UNECE hosts the only intergovernmental body on transport, the Inland Transport Committee. It contributes to the development of coherent international networks for road, rail, inland water and combined transport, including through a number of international agreements:

- The European Agreement on Main International Traffic Arteries (AGR)
- The European Agreement on Main International Railway Lines (AGC)
- The European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), and
- The European Agreement on Main Inland Waterways of International Importance (AGN)

For more information on transport infrastructure development, please visit

<http://www.unece.org/?id=9893>

and low-carbon energy is encouraging strong infrastructure investment in this area, in contrast with more subdued activity in other sectors in the post-crisis period.

How much it matters?

There is a large body of literature that has estimated the impact of infrastructure on economic performance. The evidence presented is mixed but most studies show a clear positive effect of infrastructure on economic growth and productivity. However, there are a few instances where the estimated impact is weak or negative. Overprovision of infrastructure, which diverts resources from other uses that are more necessary, can have a detrimental impact on growth. Moreover, there are large variations on the estimated effects of infrastructure on output, which are partly a reflection of differences in periods and countries covered. Earlier studies tend to typically show stronger impacts than more recent research using more refined methodological approaches and improved econometric techniques.

Some examples of recent findings include:

- In a World Bank review of 64 papers between 1989 and 2007^{viii}, almost two thirds of the studies found positive and significant links between infrastructure and some development outcome.
- A study^{ix} of OECD countries to capture the effects of physical infrastructure levels since 1960 found very large differences across countries and sectors, regarding both the size and the sign of the impacts. More infrastructure does not always have a positive influence on growth, as a result of overinvestment, high costs or poor decisions on investment location. Positive effects are stronger if physical stocks are lower.
- A meta-regression analysis of 68 studies for the 1983-2008 period in OECD countries^x produced an estimated implicit marginal return of public capital of 16%. Assuming a depreciation rate of around 10% and given the current low long-term real interest rates in advanced economies, this would suggest the underprovision of public capital. The mid-point estimate from these studies on the elasticity of GDP to infrastructure capital was about 0.15, which means that doubling infrastructure capital would increase GDP by around 10 per cent. This, however, only captures the direct effects of infrastructure on output.
- A recent cross-country study of the impact of infrastructure on growth^{xi}, using a synthetic index covering transportation, power and telecommunication, concluded that a 10% increase in infrastructure assets may raise output per worker by 0.7% to 1%. Returns are higher where current endowments are lower. The study also shows that infrastructure has a higher contribution to growth than other forms of capital, which is consistent with

the existence of multiple benefits derived from infrastructure investment.

Why impacts are different

The variation of results suggests the importance of country-specific factors, in particular the existing level of provision. The positive effects of infrastructure are more often found in developing countries, i.e. where infrastructure shortages are more likely to act as a constraining factor on economic growth.

Cross-country dispersion regarding the efficiency of public investments can help to explain the different impact of infrastructure investment on economic performance. Higher infrastructure investments may have limited influence on output if there are significant shortcomings in the investment process, which impair the translation of spending into useful infrastructure assets. These deficiencies may result from high costs in the design and implementation of projects or poor decisions regarding the location, sequencing and complementarity of infrastructures. The IMF has estimated that only around half of the increased government investment in emerging market and developing economies in 1980-2012 led to higher productive capital. Eliminating inefficiencies by 2030 in emerging economies would be equivalent to raise government investment by 5 percentage points of GDP.^{xii} Improving the effectiveness of public infrastructure policies appears as necessary as increasing infrastructure investment.^{xiii}

A related policy question is the introduction of changes in the use of existing infrastructure, as an alternative to build additional physical capacity. These changes may come out as the result of new pricing schemes that encourage more efficient use and modify demand patterns or improved standards and regulations that facilitate transport flows.^{xiv} UNECE work on Intelligent Transport Systems is a good example of how technological and organizational systems, applications and services can be deployed to reduce congestion and promote safer and cleaner transport.

The overall impact of infrastructure depends on the macroeconomic conditions under which the investment effort is undertaken. If there is economic slack, the positive demand of increased infrastructure investment will be stronger. Current concerns over stagnation or sluggish growth amid low financing costs have increased policy attention on the potential role of infrastructure to promote economic expansion.^{xv} However, countries differ widely on the existence of a fiscal space for increased spending, the expected return of higher infrastructure investment and their administrative capacity to undertake investment efforts.

Public and private provision

Government spending has become an increasingly inaccurate measure of overall infrastructure provision, given the more prominent role of the private sector as a result of privatization and liberalization initiatives. The focus is now on the creation of an institutional, regulatory and policy environment that defines appropriate incentives to raise the amount and quality of infrastructure investment both in the public and the private sectors.

However, the involvement of the public sector remains essential. Infrastructure provision needs spare capacity to ensure reliable supply and facilitate expansion. Private agents will not operate deliberately under conditions of excess supply, so government interventions are required to create appropriate frameworks to make this possible. Private financing is necessary to meet infrastructure spending needs but the fiscal costs that may emerge over the medium to long-term as a result of private involvement should not be neglected.

REFERENCES

- ⁱ International Monetary Fund (2014), *World Economic Outlook*, October, Washington D.C.
- ⁱⁱ European Commission (2014), "Infrastructure in the EU: Developments and Impact on Growth", *Occasional Papers*, No. 203.
- ⁱⁱⁱ International Transport Forum (2015), *Statistics Brief. Infrastructure Investment*, July.
- ^{iv} European Commission (2014), *ibid.*
- ^v The White House (2014), *An economic analysis of transportation infrastructure investment*, July.
- ^{vi} World Bank and United Nations (2014), *Improving Trade and Transport for Landlocked Developing Countries. A Ten Year Review.*
- ^{vii} Global Commission on the Economy and Climate (2014), *Better Growth, Better Climate. The New Climate Economy Report*, accessed at <http://newclimateeconomy.net/>
- ^{viii} Straub, S. (2008), "Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges", *World Bank Policy Research Working Paper*, No. 4460.
- ^{ix} Egert, B., Kozluk, T. and Sutherland, D. (2009), "Infrastructure and Growth: Empirical Evidence". *OECD Economics Department Working Papers*, No. 685, OECD Publishing.
- ^x Bom, P. and Ligthart, J.E. (2014), "What have we learned from three decades of research on the productivity of public capital?", *Journal of Economic Surveys*, Vol. 28, No. 5.
- ^{xi} Calderón, C.E, Moral-Benito E., and Servén, L. (2014), "Is Infrastructure Capital Productive? A Dynamic Heterogeneous Approach", *Journal of Applied Econometrics*, Vol 30, Issue 2.
- ^{xii} International Monetary Fund (2014), *Fiscal Monitor*, April, Washington D.C.
- ^{xiii} OECD (2014), *Perspectives on Global Development. Boosting Productivity to Meet the Middle-Income Challenges*, OECD Publishing, Paris.
- ^{xiv} OECD (2015), *Economic Policy Reforms 2015: Going for Growth*, OECD Publishing, Paris.
- ^{xv} International Monetary Fund (2014), *World Economic Outlook*, October, Washington D.C.

Sustainable Development Briefs are summaries of sustainable development knowledge generated as part of the UNECE programmes.

Information Service
United Nations
**Economic
Commission for
Europe**

Palais des Nations CH -
1211 Geneva 10,
Switzerland
T: +41(0)22 917 44 44

info.ece@unece.org
www.unece.org