Editor's introduction

1. Infrastructure, growth and cohesion

It is impossible to imagine a modern economy functioning without transport connections, electricity grids and water networks. Given that infrastructure is so indispensable to our lives, it is tempting to conclude that adding more infrastructure to still-growing economies must be good – if not the best – use of money. As a significant share of infrastructure is owned by the government, higher taxes and government deficits are seemingly easy to justify as long as the proceeds are used for government investment. Yet government investment is a mixed bag that includes many things some of which are not even meant to foster growth or economic efficiency.

So first of all, what does government investment actually consist of? What is the share of (transport) infrastructure in government investment, or in total investment? These questions seem to be simple but the available statistical material is patchy, not disaggregated enough and of heterogeneous quality. As a consequence, disentangling government infrastructure investment from official statistics is not as straightforward as one may think. More specifically, determining the amounts invested in transport infrastructure and the respective shares of the government and the private sectors therein can be a daunting task.

Once some light has been shed on the volume and composition of government investment, a second important issue is whether government investment – or the infrastructure part therein – is really the best use of money. In fact, infrastructure might not escape the powerful law of decreasing marginal productivity that applies to most economic goods and services. In other words: Having a highway network is undoubtedly better than not having one; yet having a bigger one than today may or may not be good. Over the past two decades economic research has made progress in measuring the productivity of government and infrastructure capital. The issue has been looked at from various methodological angles (production-function, cost-function, vector-auto-regression and cross-sectional approaches) each of which has its merits and shortcomings. Following Romp and de Haan (2007),[1] the empirical literature may be summarized as follows. There is now more consensus than in the past on government investment yielding positive long-run effects on output but these effects are much smaller than those reported in the seminal paper by Aschauer (1989).[2] Finally, there remains considerable heterogeneity in the empirical estimates depending on the countries and time periods under study, possibly indicating that asset-quality issues, complementarities with other production factors, non-linearities due to the network character of infrastructure, and larger policy and institutional factors still need to be better understood.

Third – and indirectly related to the productivity discussion, the government is not a profit maximizer. Hence, it is not necessarily realistic to assume that rate-of-return considerations drive government infrastructure investment. But what, then, determines government investment in general and public infrastructure projects in particular? Two different approaches to this question are presented in this volume. One highlights the influence of how decision powers are allocated across different levels of government. Decentralization implies that regions or municipalities compete for (new) firms and the employment and tax revenues they ensure, which should have an effect on the volume and structure of countrywide government investment. The other approach looks beyond the boundary

1 "Public capital and economic growth: A critical survey". *Perspektiven der Wirtschaftspolitik*, (8:Special issue), pp. 6-52. The article is an updated version of the survey the authors contributed to the 2005 EIB Conference (see *EIB Papers*, (10:1), pp. 40-71).

2 "Is public expenditure productive?". *Journal of Monetary Economics*, (23:2), pp. 177-200.

of economics into the political-science literature. This allows generating hypotheses on the political-economy and 'purely political' variables that can be tested with the help of electoral data.

Fourth, government investment has broader public-finance implications. Discussing whether government spending should be on, say, roads or something else implies that the government has raised funds in the first place, be it through taxing today or issuing debt (which means taxing tomorrow). An important fact often neglected in this respect is that raising funds costs society more than the proceeds of taxes. This is because of the excess burden of taxation, that is, the welfare loss brought about by distortionary taxes. The bad news is that the excess burden tends to increase as tax rates increase. A related dimension of public finance is that countries might face a difficult trade-off between government investment and fiscal consolidation. This is especially the case for some of the new member states that have incurred large deficits during their economic transition while at the same time pursuing the ambitious infrastructure investment agenda implied by EU membership.

Finally, infrastructure investment affects the spatial distribution of economic activity. In this respect the new-economic-geography literature holds two main policy lessons. First, infrastructure that facilitates interregional trade increases national economic growth but also tends to increase concentration of economic activity and, hence, production gaps between lagging and leading regions within countries. And second, improved intraregional transport infrastructure can help foster spatially balanced economic development but this could stifle national economic growth if the improvement takes resources away from investing in higher-return infrastructure in or between economically more successful regions. Reflecting this distinction, things are relatively clear conceptually: Society should position itself with respect to the efficiency-equity trade-off and set interregional (or 'global') and intraregional ('local') infrastructure priorities accordingly. However, an economically meaningful distinction between global and local infrastructure can be complicated in practice because the spatial extent of an infrastructure asset can be very different from the geographic scope of its economic effects.

While the knowledge on the issues outlined above is impressive, the organizers and speakers of the 2008 EIB Conference in Economics and Finance are convinced that there is scope for pushing the frontiers of knowledge. This is important for public policy in general and for the EIB that holds two-thirds of its loan portfolio in infrastructure. Advancing on each of the five themes outlined above promises significant policy insights (see Section 4).

Before browsing through the individual contributions to this volume, it is useful to clarify the notions 'government investment', 'public investment' and 'infrastructure investment'. First, only investment directly financed from the budget of the government – be it at the central or lower levels – qualifies as government investment. Second, public investment is a larger concept because it additionally includes investment by entities that can be owned or controlled by the government (*e.g.* a national railway company) but that are commercially run and, hence, classified as corporations in the national accounts. Third, it is true that a significant share of government investment is allocated to infrastructure (such as roads) and that, in turn, the government is an important player in total infrastructure investment. But that does not mean that government investment is identical with infrastructure investment. Examples of infrastructure investment erroneously taken for government investment include investment by energy companies in generation capacity or by rail companies in rail infrastructure.

On our guided tour through this year's *EIB Papers*, the next section discusses the composition and growth effects of government and infrastructure investment as well as their fiscal context, reflecting the content of Issue 1. Section 3 turns to the economics of regional transport infrastructure investment, the theme of Issue 2. Finally, Section 4 summarizes the main economic-policy messages conveyed in the articles and at the EIB Conference in Economics and Finance.

2. Government and infrastructure investment: Composition, growth effects and fiscal constraints

The first article of this volume by **Juan Gonzalez Alegre**, **Andreas Kappeler**, **Atanas Kolev** and **Timo Välilä** sets the scene by analyzing the composition of government investment in Europe, focussing on infrastructure in general and transport infrastructure in particular. They find that traditional infrastructure accounts for about one-third of overall government investment in the EU on average and slightly more than that in the cohesion countries (Greece, Ireland, Portugal and Spain). The share of transport in government infrastructure investment can only be estimated using proxies, each having specific drawbacks. Still, combining their knowledge of what the proxies contain with a number of sensible economic assumptions and official pre-1993 data on government transport investment, the authors conclude that transport accounts for about 80 percent of government infrastructure investment in the EU on average. Transport infrastructure has been fairly stable relative to total government investment and has not carried a disproportionate burden of improving fiscal balances.

Of particular interest is the related analysis of how the distribution of spending powers across levels of government affects the level and composition of government investment. Contrary to the widespread fear of a 'race to the bottom' in tax rates as smaller territorial entities compete for firms and workers, the authors find empirical support for a broader concept of fiscal competition whereby private economic agents also attach value to the public capital that regional and local authorities put in place. Indeed, decentralization is associated with more government investment overall, with a stable share devoted to infrastructure; a higher share to hospitals and schools; and a lower share to investment with a redistributive character.

Looking at all government functions taken together and at the capital stock rather than investment flows, **Richard Jong-A-Pin** and **Jakob de Haan** analyze the long-run impact of government capital on output. They present new empirical results for 21 OECD countries over the period 1960–2001 based on vector auto-regressions (VARs). They show to what extent the impact of government capital on output differs across countries and to what extent it differs over time.

The long-run effect of government capital on output differs considerably across countries. Estimating a VAR for each country and simulating country-specific shocks to government capital, the authors find the long-run effect to be significantly positive in eight countries but insignificant in ten others and even negative in three. Taking the benchmark in this literature[3] as a starting point, the authors change the specification of labour inputs, which they more accurately measure by total hours worked in the economy rather than the number of persons in employment. The estimation results turn out to be sensitive to this improvement. The output effect of government capital tends to be lower the higher the government-capital stock is relative to the private-capital stock. This suggests that beyond a certain point, further additions to the stock of government capital should wait until the business sector has 'grown into the new shoe size' and new bottlenecks appear.

The authors then apply two methods to analyze how the long-run impact of government capital on output has evolved over time. Both suggest that it has declined. One method lumps all countries together (panel VAR), estimates the model for the period 1960–1979 and then gradually carries that 20-year 'time window' forward. While declining, the long-run impact is found to be positive. The other method retains the country-specific focus: The VAR is estimated country by country from 1960 to 1989

3 Kamps, C. (2004) "The dynamic effects of public capital: VAR evidence for 22 OECD countries". Kiel Working Paper No. 1224, Institute for the World Economy.

then the observation period is gradually extended up to 1960–2001. Most of the seven countries with a decreasing GDP impact reduced government investment during the 1990s, possibly reflecting a rational reaction to saturation.

Armin Riess considers the marginal economic cost of public funds, an important aspect on the financing side of government investment. He discusses two approaches and their implications for cost-benefit analysis. The 'conventional' approach suggests that for a project to be economically viable, its direct benefits must be larger than its direct costs to make good for the excess burden of taxation. For example, if the economic cost of raising one euro *via* taxation is EUR 1.2 – consisting of an opportunity cost of one euro and the excess burden of 20 euro cents – the direct benefits of a project must exceed its direct costs by at least 20 percent. However, a government project might boost the economic activity that taxation curbs ('spending effect'), thereby counteracting the excess burden of taxation. The 'modified' approach takes a simultaneous look at raising taxes and spending the money on a government project. As a result, the modified excess burden, which 'nets out' the excess burden and the spending effect could be negative depending on the project. In that case, a project might be welfare enhancing even if its direct benefits fall short of its direct costs.

In principle, both approaches lead to the same project decision. To avoid errors, however, practitioners need to know whether the cost-of-funds estimate they use in appraising a project reflects the conventional or the modified economic cost of public funds. The marginal excess burden of taxation is an economy-wide parameter, specific to the tax that is increased to finance a government project, whereas the spending effect is project specific and can vary even within the same spending ministry. Therefore, using conventional cost-of-funds estimates and assessing spending effects separately for each project at hand is more appropriate than applying the modified approach on the erroneous assumption that it fits all projects. The empirical estimates reviewed by the author suggest that the economic cost of raising one extra euro from labour taxes in Europe ranges from about 1.3 in the United Kingdom and in the southern EU-15 countries to slightly over 2 in Belgium and in the Nordic countries. Therefore, the economic cost of public funds is too important to be disregarded in the appraisal of government investment projects.

The paper concludes with two extensions on user fees and inter-temporal considerations, respectively. If user fees for infrastructure services contribute to covering the direct costs of an infrastructure project, the need for revenues from distortionary taxes decreases and so does the economic cost of public funds relevant to the project. However, full cost recovery is usually not socially optimal – be it due to average costs exceeding marginal costs or due to positive externalities (think of positive network externalities in telephone networks, for instance). This suggests a trade-off between welfare losses from distortionary taxation and those from over-pricing the public service. This trade-off also opens a fresh perspective on the privatization of public services and the contractual design of public-private partnership (PPP). When switching to multi-period analysis, additional parameters enter the scene, such as the social discount rate and the interest rate on government debt. In any case, there is no escape from the excess burden of taxation as servicing the debt will ultimately require additional tax revenues or expenditure cuts.

Such a need for fiscal consolidation continues to prevail in the new member states of the EU to ensure high sustainable growth and, hence, income convergence with the EU-15 according to **Gerd Schwartz**, **Ana Corbacho**, **Qiang Cui**, **Giovanni Ganelli** and **Paolo Manasse**. In their multi-faceted review of macro-fiscal policy challenges, the authors argue that the often-claimed trade-off between fiscal consolidation and infrastructure investment in these countries is not overly severe. First, and foremost, economic growth in the new member states has been driven by total factor productivity (TFP) rather than capital deepening over the past 15 years. This also shows the way ahead: Simulation results

suggest that halving the income gap in a reasonable time frame is possible, without increasing investment-to-GDP ratios further, by maintaining the average TFP growth rate observed for the region in the first half of this decade. By contrast, the same catching-up path would require drastic increases in total investment were TFP growth to converge to the pace seen in the least-performing new member states in the 2000-04 period. Second, countries most successful in terms of fiscal consolidation reined in government consumption rather than investment. Third, private investment increased faster and foreign capital was easier to attract in countries with better fiscal positions than elsewhere. Finally, in surveys businesses do not identify infrastructure networks as a major factor constraining their development.

This is not to deny substantial infrastructure investment needs in the new member states. Infrastructure density is below the EU-15 average, notably in telecommunications and Internet use but also with respect to road networks. As it is impossible to close the gap in the short run, projects should be prioritized using macro-fiscal frameworks and social-returns analyses. Against this background, the authors discuss two additional sources of infrastructure finance – EU funds and PPPs. While EU funds provide welcome supplementary resources, they also imply specific challenges, such as higher fiscal deficits due to co-financing and additionality rules; lacking absorption capacity, *i.e.*, the weak ability of administrations to handle project supervision; and efficient implementation. A new financing opportunity coming with new challenges – this also summarizes the assessment of PPPs in the new member states. Governments should first see if a project is worthwhile and only then decide whether to undertake it as a PPP. They also need to tackle the considerable fiscal risks implied by PPPs, both by strengthening the legal and institutional framework to curb excessive renegotiation and by imposing adequate fiscal reporting.

As manifold as the reasons for the rather mixed evidence on the long-run impact of government capital on output may be – too little private (relative to public) capital; preference for redistributive investment; and political bias towards neglecting maintenance of existing infrastructure and the economic cost of raising public funds – the four contributions to Issue 1 hold one important insight: Having the sticker 'government investment' attached to it does not make a project growth- or welfare-enhancing. Rather, efficient supply of the right infrastructure in the right place is more important for economic growth than the amount of money spent. In other words, project selection and prioritization are paramount.

Identifying the projects with the highest economic value added requires magnifying glasses and a refined toolbox. One way of becoming more specific is to look at regional rather than national economic and infrastructure data. A second way is to model and measure the typical microeconomic reactions to changes in infrastructure endowment and to figure out their implications for national economic growth and regional convergence. Issue 2 of the *EIB Papers* goes down both roads.

3. The economics of regional transport equipment

In his literature review of infrastructure and economic geography, **Gianmarco Ottaviano** sets the tone for the second issue of the volume, arguing that the assessment of new infrastructure projects needs to take into account the microeconomic reactions of economic agents, most notably their (re-)location decisions. He starts by recalling some fundamental economic-geography insights. For one, in the presence of transport costs, firms want to locate close to large markets. For another, when there are increasing returns to scale in an industry, the firms of that industry can cut production costs by locating close to each other. However, the stronger competition resulting from agglomeration lowers firms' profit margins. This gives rise to an anti-agglomeration force that matters more for less

productive firms than for industry leaders and is stronger when transport costs or other trade barriers are relatively high. Relocation of a firm affects both the supply and the demand sides of the regional economy. Indeed, newly arriving firms lower average production costs in the industry while at the same time bringing along workers, generating additional consumption demand. Demand- and cost-linkages make the process of agglomeration endogenous: Relocation can open up differences in market size that trigger further relocations to the same region and thus agglomeration.

Shrinking transport costs lead to agglomeration as long as the supply of production factors and non-tradable goods keeps pace with the increasing demand for them. If this is not the case, for example because labour is not sufficiently mobile or zoning restrictions lead to space shortages, prices for non-tradables might rise to a point where the productivity advantage of the centre is more than undone and production would eventually spread out to the periphery. This, however, has hardly been observed so far in the EU. So long as workers do not move to where job opportunities are and land rents keep climbing in central regions, any given increase in the concentration of production has more severe effects on interregional income inequality than if factors were flexible – a point made by Diego Puga whose paper is summarized below.

To put the most important lesson upfront: Agglomeration of production is economically efficient – at least up to a point. But there may be a trade-off between national or EU-wide economic growth and interregional income convergence. The above economic-geography insights provide for a healthy dose of scepticism against claims that new or improved long-distance transport infrastructures automatically foster interregional income convergence. In all likelihood they do not. But it is necessary to identify the sources of agglomeration economies to determine the strength of infrastructure-related economic effects. Traditional sources include knowledge spillovers, labour-market pooling, more efficient sharing of other inputs (*e.g.* infrastructure capital), and 'urban consumption opportunities' such as public transport. While the empirical literature is supportive of productivity-enhancing spillovers in denser areas, knowledge spillovers fade away quite quickly with distance.

When location decisions are endogenous, how a region fares depends not only on the scale of its production but also on its relative position with respect to other regions. Specifically, the appeal of a region depends on its 'attraction' (*i.e.*, relative size) and its 'accessibility' (*i.e.*, centrality in the network of trading markets). Different types of infrastructure have different agglomeration/dispersion effects: Local infrastructure acts on attraction, global infrastructure on accessibility. Attraction and accessibility combine to 'market potential', a powerful empirical measure to explain actual agglomeration patterns: It expresses the sum of expenditures in all regions, weighted by some measure of relative cost of shipping goods from a given region to each other region. According to the evidence, market potential variations explain 35 percent of cross-country income variations.

Achim Kemmerling and **Andreas Stephan** take a macro-economic approach and look at the determinants and productivity effects of regional transport infrastructure investment in France, Germany, Italy, and Spain. They estimate productivity effects with regional production functions for each country and find elasticites of output with respect to transport-infrastructure capital in the range from 0.05 to 0.20, in line with earlier studies. To control for the potential endogeneity of public infrastructure investment, they specify an equation system that jointly determines regional output and transport-infrastructure investment. The latter is determined both by traditional political-economy variables – the 'normative principles' efficiency, equity, and redistribution – and by factors borrowed from the political-science literature such as electoral competition and electoral rents. Efficiency and redistribution are found as the normative principles driving transport infrastructure investment whereas spatial equity in endowments does not play a significant role.

The results on 'purely' political factors are more scattered, reflecting the diversity of political systems. The traditional claim that left parties increase taxes and the size of the government, thereby also boosting infrastructure investment, is confirmed for France and Italy. In a federalist country like Germany, however, the political congruence between the federal and a regional government (same ruling party) is more relevant; also, a large lead of the biggest party over the second-biggest in a region (incumbency) affects investment expenditure positively. A very small lead does the same, suggesting a U-shaped relationship between investment and the degree of electoral competition. Slightly different from incumbency, the idea that investment should be higher in regions that are strongholds of the central-government party is reflected in the data for Spain and Italy. Finally, a significant influence of regional parties is only found in Italy.

Riccardo Crescenzi and **Andrés Rodríguez-Pose** analyze the effect of road infrastructure on the growth in regional GDP per capita. Unlike Jong-A-Pin/de Haan and Kemmerling/Stephan, they use physical proxies of infrastructure endowment and investment – kilometres of motorways per 1000 inhabitants and the change therein, respectively. They control for other drivers of growth, such as human capital and research and development (R&D), as well as for initial wealth, the size of the regional economy and the national growth rate. The analysis accounts for spatial interactions between different regions in the form of spillovers and network externalities.

The authors find a positive impact of infrastructure endowment on regional economic performance but a weak contribution of additional investment. Regions having good transport infrastructure endowment and being well connected to regions with similar endowments tend to grow faster. However, investment in infrastructure within a region or in neighbouring regions seems to leave especially peripheral regions more vulnerable to competition. The positive impact of the level of infrastructure on growth tends to wane quickly and is weaker than that of human capital. The results for the infrastructure variables are robust to the introduction of additional variables; moving from static to dynamic specifications; and alternative standardizations of the infrastructure variable (motorway kilometres per region area and per GDP, respectively).

Diego Puga looks into the specificities of cross-border infrastructure against the backdrop of theory and evidence on the spatial economic effects of changes in infrastructure. Empirical analyses of international trade have traditionally found large 'border effects'. In the EU, for instance, the border effect makes within-country trade six times larger than international trade for comparable distance and country size. As trade policies, language, legal barriers and differences in doing business cannot fully account for the trade gap, newer explanations rest on firms having the national border in mind already when making their location choices. In other words, sectors do not spread out within countries proportionately to population but firm density declines close to national borders. Transport infrastructure networks, most of which were built mainly with national markets in mind reflect these reduced cross-border flows. Given the path dependency of agglomeration patterns and locational cost advantages, even the best Trans-European Network is unlikely to bring substantial new economic activity to depressed border regions.

Still, there are reasons to believe that cross-border infrastructure links are suboptimal. As production is becoming more international, national infrastructure networks are becoming increasingly inadequate. Furthermore, as the distribution of investment costs of cross-border projects may differ from that of their economic benefits, these projects are prone to under-investment from an international viewpoint. This holds especially if the 'winning' country is not willing to compensate the country incurring the larger cost burden. A variation of this failure is that even with symmetric costs and benefits, long-distance infrastructure projects crossing two and more constituencies typically suffer from coordination failure, providing a role for supra-national institutions such as the European Commission and the EIB to overcome these failures.

Puga also describes the sometimes surprising effects of supposedly local infrastructure on the interregional distribution of economic activity. For example, the M-40 circular road around Madrid has not only alleviated congestion in the Spanish capital. It has also changed travel times and shipment costs throughout the country, thereby leading to substantial redeployment of firms throughout Spain. Conversely, long-distance transport links crossing big cities, such as highways and high-speed railways, are heavily used by commuters and, hence, have significant local effects. To sum up, the defining characteristic of cross-border infrastructure is not what it is but what it does. In other words, what matters is that economic effects are felt across borders, not that the asset itself crosses regional borders.

The final contribution on the 'death of distance' by **David Brown**, **Marianne Fay**, **Somik Lall**, **Hyoung Gun Wang** and **John Felkner** shows new economic geography in action by looking beyond the eastern border of the EU, on Russian regions. Their empirical results on the productivity effects of transport improvements suggest that Russia still has large efficiency gains to reap from stronger agglomeration of economic activities. Simulating the effects on firm productivity of 10-percent decreases in travel times from each district to all others as well as to the Trans-Siberian railway and a port, they find that the strongest gains in productivity (*i.e.*, firm-level TFP) would occur in the Central region (including Moscow) whereas the effect would be only half as strong in the North-western region (including St. Petersburg) and the Far-eastern region and weaker still in the other regions.

History and natural geography go a long way in explaining why Russia has not come anywhere near to optimal – let alone excessive – agglomeration of production. Central planners distributed economic activity relatively evenly across the territory, thereby disregarding the cost of remoteness and leaving many people in very cold places. They also had an incentive to vertically integrate production to increase their political power. While some integration and larger-than-average inventories may be warranted under harsh climatic conditions to avoid disruptions in production, the absence of market mechanisms led to huge multi-product conglomerates that have jeopardized productivity as the authors show. As the descriptive statistics on new *versus* old firms over the past 15 years show, firm entry and survival have been very strong nearby large markets by historical standards, but weak in peripheral areas. That is, entrepreneurs prefer setting up production close to large markets. The empirical results therefore reveal a severe trade-off between boosting national economic growth and promoting spatial equity through major infrastructure projects.

Can these interesting conclusions be transferred to the EU? The speculative answer to this is yes but to a lesser degree than observed in Russia. The results should – at least qualitatively – apply to the new member states in Central and Eastern Europe where production patterns previously determined by central-planning decisions have been and are still being corrected, too. This has led to increasing interregional income differences within countries, strongly favouring capital regions and the regions bordering EU-15 countries. One should not be overly surprised if the gradual completion of modern and reasonably dense infrastructure backbones were to bring about further regional income divergence. Implementing additional infrastructure projects with the primary focus on regional convergence is likely to be at the expense of national and EU-wide economic growth. In this respect one can only reiterate Crescenzi's and Rodríguez-Pose's recommendation of more human-capital based development strategies. It is also worth recalling that fostering labour mobility and removing infrastructure and other bottlenecks in congested areas is a safer cushion against the divergence in regional per-capita incomes than large transport infrastructure projects.

As far as the EU-15 is concerned, it is also true that Trans-European Transport Networks have not reduced regional income inequalities so far. Nonetheless, concentrating infrastructure investment on metropolises is less certain to yield the highest benefits from a countrywide perspective. The reason

for this is the concern of excessive economic dominance by the leading city ('urban primacy') pointed out by Puga. From a short-term perspective, removing congestion around big cities may yield the highest benefit just because society's time-loss from daily congestion is substantial under the *status quo*. The removal of bottlenecks should not, however, come at the expense of connecting big cities with specialized cities of intermediate size. In fact, recent empirical results for the United States and Japan surveyed by Puga suggest that corporations reap substantial efficiency gains by locating research and development, early-stage production, management and administrative services in large diversified cities but large-scale manufacturing in specialized cities of intermediate size. Global transport infrastructure is needed to enable such a balanced urban system to come into existence.

4. The main policy messages

The articles contained in this volume provide a number of policy implications. First of all, the policy debate needs to keep in mind that governments have direct responsibility only for a fraction of infrastructure investment and that, in turn, government investment comprises many things other than infrastructure (*e.g.* schools, police, and social housing). Policymakers may therefore want to differentiate statements about the effects of infrastructure when in fact most of the available information refers to total government investment.

Then take the productivity of investment. The empirical evidence presented in this volume strongly supports the view that 100 kilometres of highway built in the 1960s were more productive than 100 kilometres added today because the investment back then established the most crucial links. Given the path-dependency of economic geography, transport backbones would roughly look the same if they had to be built from scratch today. As a consequence, new investment projects, which tend to be more appealing to politicians, should not come at the expense of proper maintenance of existing infrastructure.

As to the determinants of government investment, the fear that fiscal competition leads to a race to the bottom in tax rates and jeopardizes the supply of government infrastructure and public goods is not confirmed even though the volume does not empirically answer the question to what extent planning at the regional level leads to under-provision of cross-border links – be it between regions or countries.

Looking at investment determinants from the political-economy angle shows that both economic-efficiency and income-redistribution considerations are driving regional investment in transport infrastructure. The volume has merit in making transparent the impact of political factors, enhancing our understanding of the constraints under which politicians operate. While these factors do not necessarily lead to economically optimal investment decisions, they are part of the game in representative democracies. The best economists can do is to inform society about the costs of these decisions.

Keeping in mind the economic costs and benefits is also key regarding the fiscal implications of government investment. Large new infrastructure projects are appealing to decision makers. Indeed, they provide high political visibility as huge amounts are spent in a short time, suggesting activism. They also have strong economic effects – if not always the desired ones – and are relatively easy to manage once the road is up and running. Thus, there is an incentive to neglect or play down the economic cost of raising funds, leading to over-provision of infrastructure from a welfare perspective. As argued in the volume, this cost should not be ignored. Moreover, it would be unwise to let large government investment projects lead to soaring public-debt levels because in that case the macroeconomic benefits from the investment risk being more than undone by less private investment and lower foreign capital inflows.

Finally, the contributions on infrastructure and economic geography show the need for better aligning government interventions (infrastructure *versus* other policies) with the stated economic-policy objectives. In particular, transport infrastructure is a double-edged sword in promoting economic development in that it is unlikely to reduce interregional income inequalities, an insight on which micro-economic and macro-regional analyses agree. Rather, regional convergence requires balanced strategies that combine local infrastructure assets with efforts to boost peripheral regions' human-capital endowment and technological absorption capacity. More fundamentally, policymakers should not undermine national growth strategies over legitimate concerns with regional development. The empirical study on Russia in this volume demonstrates that the productivity effects can be greatly different depending on whether new transport infrastructure connects vibrant markets with high potential or remote regions with low potential.

Trans-European Networks are likely to enhance growth by removing still-acute cross-border infrastructure bottlenecks even though it is probably misleading to advertise them under the heading of regional convergence. International investment efforts should focus more on improving cross-country interconnections in order to reflect the growing internationalization of production; internalize cross-border spillovers; and reduce the risk of excessive urban primacy within countries.

Taken together, this volume combines new empirical results, updates on recent developments in several infrastructure-related fields of economics, and key principles easily forgotten in politics. We do hope that the articles provide valuable inputs for policymakers, policy advisors and project practitioners alike.

Hubert Strauss