Nontechnical Summary

1. Aim and Research Design

Qualitative budget consolidation requires shifting public expenditures from consumption to investment. As investments bear future revenue by generating growth, fiscal sustainability and intergenerational fairness should be ensured. Such a strategy, however, requires determining which public expenditures are investments. One way of performing this classification is the following: an expenditure is an investment if there is robust empirical evidence that it causes growth effects. Beyond this classification issue, for planning fiscal policy measures it is necessary to quantify the growth effects of public expenditures. One major block considered as public investment is expenditures in traffic infrastructure.

In this study we try to find empirical evidence for growth and employment effects of investments in traffic infrastructure in Germany, and to quantify these effects as exactly as possible. In doing so, we follow a research design that tries to generate trustworthy results that can be used in planning German fiscal policy measures. As every method has disadvantages, we use three methods of estimation and vary between analyses at the aggregated federal German level and at the disaggregated level of the 16 German Länder (states). The three applied methods are:

- Macro-econometric time series analyses by means of vector autoregressive models (VAR) with macro data of the German state as a whole (Chapt. 4);
- Semi-macro-econometric panel data analyses by means of static and dynamic panel models with disaggregated data of the 16 German states (Chapt. 5);
- Simulation model analyses at the macro level with the RWI business cycle model (extended by a middle-term module) (Chapt. 6).

The effects on GDP, employment and private investment are investigated for the short term as well as for the long term. Moreover, it is checked which regional conditions and characteristics increase or decrease the magnitude of growth effects. In order to get insight into the opportunity costs of traffic infrastructure investments we compare the effects on growth, employment, and public budget with the corresponding effects of three alternative kinds of expenditures. We also illustrate the traffic bottleneck situation in Germany. Finally, in order to discuss the possibility of

decoupling economic development and traffic services, we briefly analyze and estimate the correlation of traffic services and GDP in Germany.

2. Results

Our results can be summarized as follows:

- There is no decoupling of economic and traffic development in Germany. After German reunification the volume of transport traffic has risen and the positive correlation between traffic and GDP is unchanged.
- We find empirical evidence that investment in traffic infrastructure generates economic growth. There are short-term demand as well as long-term supply effects.
- The estimated effects of the VAR model are implausibly high and thus cannot be used to quantify the growth effect. The estimated elasticity within the panel analysis lies (over all estimates) between 0.04 to 0.12%, that is, if the stock of traffic infrastructure is increased by 1%, GDP rises by 0.04 to 0.12% per year. However, quite robustly the results concentrate at the narrow spread between 0.65 to 0.7%. We also found weak evidence for spillover effects, that is, the traffic infrastructure of neighboring states may positively affect a state's GDP.
- Transformed to the growth effect of an increase of the investment by 1 billion Euro the short-term supply effect is roughly 100 million Euro and increases to probably 230 to 250 million Euro per year in the long run. Following our simulation results of the RWI business cycle model, a one-time additional investment of 1 billion € generates in the first year an additional real GDP of 1,1 billion Euro, that reduces to zero after three years. While the panel results cover supply effects, the simulation effects are mainly demand effects.
- In order to calculate the accumulated effect over service life, we assume alternatively a service life of 20, 30 and 40 years. This is necessary because the average service life of the traffic infrastructure as a whole is roughly 30 years but depends heavily on the composition of a particular investment. Moreover, we assume two alternative depreciation patterns (linear depreciation and, more realistic, arithmetic progressive depreciation) and discount the annual effects by the state's average debt interest rate. The most relevant accumulated effect of a one billion Euro traffic infrastructure investment is 3.1 billion Euro, when depreciation is arithmetic progressive and service life is 30 years. Therefore, in Germa-

ny, traffic infrastructure investments seem to have been efficient investments in the past.

- We find evidence in the VAR as well as in the simulation model that public traffic infrastructure investment encourages private investment. Hence, there is no crowding-out but crowding-in of private investment by public investment in traffic infrastructure.
- We find only weak evidence for employment effects of traffic infrastructure investments: There are no significant effects within our VAR analysis and only weak employment effects within our RWI business cycle model. The calculated employment effect of an investment of 1 billion € amounts to only five thousand jobs after three years.
- We find preliminary evidence that the average age of the population weakly impedes the growth effect of traffic infrastructure investments, and that it slightly rises with the density of population.
- Eliminating single traffic bottlenecks not necessarily bears positive growth effects, because the system of traffic bottlenecks at the macro level is complex: after eliminating one current bottleneck another latently existing bottleneck might occur elsewhere, so that, at the federal level, the overall bottleneck situation not necessarily has to be improved.
- Comparing the effects of traffic infrastructure investments on GDP, employment and budget with the alternative expenditures (i) monetary social benefits (retirement payment, child benefit, unemployment benefit, etc.), (ii) decrease of the social health care contribution, and (iii) public expenditure to R&D and education, we find that the real effects on GDP and employment are very similar to investments in R&D or education; the budget burden of public R&D and education expenditures is only slightly lower than that of traffic infrastructure. The effects on GDP and budget of the other alternatives are clearly worse. The highest employments effects are generated by a reduction of the social health care contribution, while the employment effect of traffic infrastructure, though much lower, is the second highest. However, we note that the important long run effects after four years are beyond the horizon of experience of the RWI business cycle model. Therefore, our comparison is only useful for a business cycle policy debate, but not for a debate on growth policy.

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