

Funding of Federal Trunk Roads in Germany

An Institutional Analysis of Current Deficits and Future Perspectives

by

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Abstract

One of the main shortcomings of the current system for the provision and funding of federal trunk roads in Germany is too low investments for capacity extension projects which would significantly reduce traffic bottlenecks. Furthermore, new built and extension projects of federal trunk roads are often realized only in bits and pieces. In this paper, we analyze the current system and reform options for the provision and funding of the German federal trunk roads on the basis of new institutional economics. We suggest stronger political self-commitments within the public sector. For this purpose funds for capacity extension projects with a high priority particularly on federal motorways, and the maintenance as well as the operation of the existing network should be fixed for more than a year (e.g. for five years). This approach could be realized by law or through a contract between the government and a public enterprise. In addition, the fixation of funds can be combined with the earmarking of road user payments.

Keywords: roads, infrastructure, funding, public expenditures, institutional economics, political commitment, road fund

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1 Introduction

In Germany, as well as in many other countries, a significant traffic growth is expected within the next 20 years. According to the long-term forecast of the German federal ministry of transport, building and urban development (BMVBS) the passenger traffic within the road sector will reach 1,029.7 bn. passenger-kilometers (pkm) until the year 2025 (see BMVBS, 2009, pp. 15-6). This would be an increase of 16.7% compared to 2006. The growth of road freight traffic in the same period is expected to be even much higher with round about 60.4%. This would mean a total freight traffic level of approx. 704.3 bn. tonne-kilometers (tkm) on German roads in 2025. The major share of this traffic growth (passenger as well as freight traffic) will concentrate on the network of motorways and trunk roads.

These traffic forecasts indicate considerable challenges regarding the future road transport infrastructure in Germany. However, the consequences of a new debt rule in the German constitution and the European fiscal pact make it more challenging for the public sector to provide sufficient funding for the (road) infrastructure. In the light of these developments, there is an ongoing debate about the funding of the federal trunk roads. In this context, the term “funding” refers to several aspects with regard to the financing of road infrastructure. For example, the design of the funding system concerns the question which sources of revenue are used to cover the expenditures for the federal trunk roads. Another aspect is related to the design of the institutional solution which allocates these funds to specific areas of expenditures (e.g. construction, maintenance, and operation). The institutional setting also affects the possibilities of debt financing.

This paper focuses on the institutional aspects of funding systems for road infrastructure. With regard to Germany, we scrutinize the current system and reform options for the provision and funding of the federal trunk roads. The sources of revenue are only considered when relevant interdependencies with the institutional solution exist. The analysis is mainly based on new institutional economics and political economy considerations. Furthermore, semi-structured interviews with several stakeholders from the political arena (e.g. experts from ministries, MPs) have been conducted to ensure the policy relevance of the research.

The German network of the federal trunk roads consists of the federal motorways with a length of approx. 12,700 km and the federal roads with a length of approx. 40,200 km in total (see BMVBS, 2011, p. 177). The funding of the federal trunk roads mainly occurs through the public budget. Generally, the German budget law prohibits the earmarking of funds. However, according to further legal provisions the revenues of the distance based HGV toll collected on federal motorways and some federal roads have to be used for investments in the federal trunk roads. The current funding system provides approx. €6 bn. per year for the federal trunk roads (see BMF, 2011, p. 27). This amount already contains the funds spent from the earmarked toll revenues (€3.31 bn. in 2011). Although all expenditures are accounted for in the federal budget, the revenues from the HGV toll are finally distributed by a state-owned transport infrastructure financing agency (Verkehrsinfrastruktur-

finanzierungsgesellschaft (VIFG)). For this purpose, the VIFG receives these funds from the ministry of finance.

The funding system in place has attracted much criticism. Among the main deficits stated by many stakeholders is the insufficient extension of existing motorways where road users regularly suffer from heavy congestion. Furthermore, new construction and extension projects are often only realized in bits and pieces. Moreover, there are disadvantages regarding the financial management.

In the light of these shortcomings and the forecasted traffic growth, several reform options are subject to a current debate. Among the suggestions made is the introduction of a tolling system for passenger cars in terms of a time based vignette. Further reform proposals concern the earmarking of user payments or the implementation of a road fund by developing the VIFG into a more independent agency which gets the legal capacity to borrow funds on the capital market. All these reform options are not mutually exclusive and might even complement each other.

The policy debate often focuses on the introduction of user fees or the overall level of road user payments, respectively. Likewise, the scientific discussion in transport economics deals mainly with issues strongly related to pricing. For example, various contributions examine the optimal level of road user payments or the acceptability of road pricing. But only few publications consider the impact of the institutional setting for the provision and funding of road infrastructure in detail (see, for example, Proost et al., 2006; de Palma et al., 2007). In our opinion, in-depth analyses based on new institutional economics are even completely missing.

Although the public and scientific discussion usually disregards the institutional solution for the provision and funding of road infrastructure, it is crucial for the success of a funding system. As the introduction of the HGV toll on German motorways has already shown, the design of the institutional solution is at least as important for the total amount of funds dedicated for road infrastructure as the level of revenues collected from road users. Before the HGV toll on German motorways was implemented in 2005, the federal government had announced that the generated toll revenues would be additionally spent for important transport infrastructure investments. In fact, the expenditure level for transport infrastructure has basically remained the same except from a slight rise in the year of the toll's introduction. This development has been mainly a result of an inappropriate institutional setting.

The purpose of this paper is to examine the current system for the provision and funding of the German federal trunk roads in order to identify potential for improvements of the institutional setting from the perspective of new institutional economics. This could also provide valuable insights for the appropriate design of funding systems in other countries. The outline of the paper is as follows: Section 2 initially structures the dimensions of funding systems for road infrastructure. Furthermore, we derive criteria for the evaluation of institutional solutions for the provision and funding of road infrastructure. Afterwards, section 3 provides an overview of the current funding system for the German federal trunk roads. Section 4 describes the main deficits of the system currently in place and specifies the main reasons for the identified shortcomings. In section 5, we present a reform model

suitable for improving the effectiveness as well as the efficiency of the current funding system. In section 6, we discuss the main results and compare the suggested reform model with further reform options which are subject of the political debate. Section 7 concludes and discusses the significance of the results for other countries.

2 Importance of the institutional design of funding systems

2.1 Dimensions of funding systems for road infrastructure

A funding system for road infrastructure consists of several elements. Although the following systematization considers the road sector, the general structure could also be applied to other infrastructure sectors. Generally, one can distinguish three main dimensions: As depicted in figure 1, these are (i) the sources of revenue, (ii) the institutional solution, and (iii) the areas of expenditures.

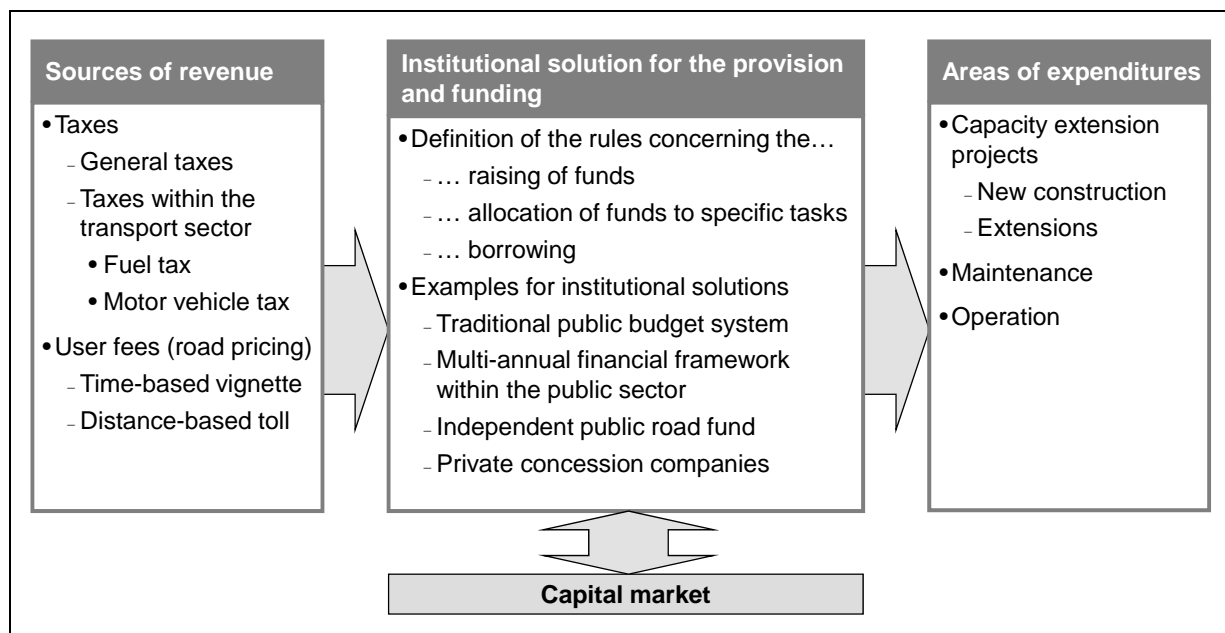


Figure 1. Dimensions of funding systems for road infrastructure

AREAS OF EXPENDITURES

The latter dimension, the areas of expenditures, concerns the question what the funds are eventually spent for. With regard to the road sector, that means, for example, how much funds are used to finance capacity extension projects or the maintenance and operation of the existing road infrastructure. The amount of funds dedicated for these tasks strongly influences the capacity and quality of the infrastructure provided.

The evaluation of alternative funding decisions could be based on welfare economics. For example, the net benefit of investment projects can be evaluated by undertaking cost-benefit-analyses. Beyond

the allocative effects incorporated in a cost-benefit-analysis, (road) infrastructure projects may induce further effects which could be relevant when deciding about the realization of (road) infrastructure projects. For example, some (road) projects shall secure a minimum supply of infrastructure in some areas or contribute significantly to the regional development. Therefore, allocative efficiency is not always the sole concern of road infrastructure policy. Rather, distributive goals are often not of minor importance (see Ostrom et al., 1993, pp. 16-7).

Particularly in the light of scarce financial resources, there exists usually a conflict between allocative and distributive goals. This trade-off cannot be solved from a scientific point of view as this requires the making of value judgments. Scientists should only illustrate the consequences of different policy measures (see Dixit, 1996, pp. 147-8). But an ultimate decision regarding the assessment of distributive policy measures must be made by citizens or their representatives, respectively (see Ostrom et al., 1993, p. 117). Therefore, a political decision about the importance of distributive goals is often inevitable.

However, independent from the eventual weighting of distributive goals, we assume that projects with a very high priority from an allocative point of view should be realized in any case. These are mainly the projects urgently needed to reduce significant traffic bottlenecks. At least in Germany, this is a consensus across all political parties represented in the German parliament. Therefore, we regard this objective as set by policy. With this approach we do not dispute the legitimation of distributive goals. In case of a binding budget constraint, instead of lower funds for distributive purposes additional revenues could be raised to finance the realization of projects which are allocative efficient. Hence, the realization of welfare-enhancing projects with a high priority does not necessarily contain value judgments or conflict with distributive goals.

SOURCES OF REVENUE

The left box in figure 1 shows the sources of revenue that can be used to finance the tasks related to the provision of road infrastructure. Possible sources of revenue are taxes as well as user fees. Among the taxes one can further differentiate between general taxes and taxes collected within the road transport sector; e.g. fuel taxes or the motor vehicle tax. With regard to road pricing, user charges could be raised in terms of a time-based vignette or a distance-based toll.

Different sources of revenue have different allocative and distributive effects which should be taken into account when deciding about the structure of revenues. With regard to the allocative effects, these decisions should especially incorporate the marginal costs of public funds caused by the collection of funds through the government (see Dahlby 2008). The marginal cost of public funds measures the welfare loss due to the raise of additional revenues. The value of the marginal costs of public funds depends – among other things – on the type of revenue and its (country-)specific design (see Proost et al., 2007). However, minimizing welfare losses is often not the sole criterion evaluating fiscal and tax policy. Equity and distributional concerns are also very important aspects that could significantly influence the choice and structure of revenues.

INSTITUTIONAL SOLUTION FOR THE PROVISION AND FUNDING

The focus of this paper, the institutional solution for the provision and funding of road infrastructure, is depicted in the middle of figure 1. In general, an institutional solution is usually made up of several institutions which interact with each other. According to North (1990a, p. 3; 1991, p. 97) institutions are the humanly designed constraints that shape interaction between individuals. They consist of formal rules (e.g. laws, contracts) and informal rules (e.g. custom) as well as mechanisms for their enforcement. Thus, institutions could also stipulate the involvement of organizations by assigning responsibilities to them (see North, 1990a, pp. 4-5; Ostrom, 2005, pp. 179-80).

In the context of this paper, the institutional solution defines the rules concerning the raise of funds and the allocation of these funds to specific tasks related to the provision of road infrastructure. Therefore, the design of the institutional solution is crucial for the outcome of these policy issues. Furthermore, the institutional solution regulates the possibilities of debt financing on the capital market. The borrowing of external capital allows the intertemporal transfer of financial burdens on future generations.

Political decision-makers can create a great variety of institutional arrangements for the provision and funding of road infrastructure. Traditionally, in many countries the funding of roads takes place within the public budget system. But several European countries have established alternative institutional solutions to overcome the shortcomings of annual budgets. For example, Switzerland created some kind of a multi-annual financial framework within the budgetary system. Other countries developed institutional solutions where core elements are even beyond the public budget system (see Proost et al., 2011, pp. 165-6). In Austria, public authorities have delegated the responsibility for the funding of the motorways and trunk roads to a state-owned entity organized under private law, the so-called ASFiNAG (Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft). The ASFiNAG is an example for a widely independent road fund as its financial flows are completely separated from the budgetary system (see Beckers et al., 2006). An even stronger degree of political autonomy can be observed in countries like France and Italy where private concession companies are responsible for huge parts of the road network (see Albalade et al., 2009; Ragazzi, 2006).

The before-mentioned examples for ideal-typical institutional solutions could be modified by varying several parameters or rules of the institutional solution. Therefore, a careful examination of an institutional solution must incorporate its numerous features in detail. Another consideration when analyzing or designing institutional solutions is that pricing issues, revenue allocation and expenditure decisions are interdependent. For example, the establishment of institutional solutions beyond the budgetary system, e.g. independent road funds or private concession companies, usually requires the refunding of expenditures via user charges.

2.2 Criteria for the evaluation of an institutional solution

Before we focus on the German situation, we derive some general criteria for the evaluation of institutional solutions for the provision and funding of road infrastructure. As the institutional solution determines the design of mechanisms to reach decisions concerning the areas of expenditures and the means to be used to finance these expenditures, the following evaluation criteria are strongly related to these issues.

One of the primary objectives against which an institutional solution should be evaluated concerns the allocation of funds to specific areas of expenditures. It should facilitate the realization of projects which are allocative efficient or set by policy due to distributive motives. According to our assumption, this includes in any case the realization of important extension projects mitigating significant traffic bottlenecks. Moreover, it should provide an efficient level of funds for the maintenance and operation of the existing network. Another primary objective concerns the sources of revenue used to finance these tasks. The institutional solution should enable the use of funds causing low welfare losses due to the raise of revenues in compliance with the distributive goals related to fiscal policy.

However, the level of achievement of these primary objectives, i.e. the effectiveness of an institutional solution, should not be the sole criterion for the evaluation of alternative institutional solutions. Another important aspect is the efficiency of the coordination. This can be measured by the level of transaction costs which is needed to accomplish the primary objectives (see North, 1990b). With regard to the transaction costs of an institutional solution, one can differentiate between several categories. In this paper, we distinguish mainly between ex post and ex ante transaction costs which occur after or before the implementation of an institutional solution. The ex post transaction costs contain, for example, costs for the coordination between the involved actors (coordination costs) as well as strategic costs which may result from opportunistic behavior of stakeholders (see Ostrom et al., 1993, pp. 119-21). Examples for ex ante transaction costs are costs needed for the design and the implementation of an institutional solution. Moreover, in case of modifications of the existing institutional setting transaction costs incur for reaching a political decision in favor of the preferred institutional solution.

During the analysis conflicts between the effectiveness and the efficiency of an institutional solution may occur. For example, the full achievement of primary objectives could cause very high transaction costs. In this case a partly achievement of primary objectives could be superior, if this allows a substantial reduction in transaction costs. This shows that possible trade-offs between primary objectives and the efficiency of the coordination have to be solved.

3 Current provision and funding of federal motorways

3.1 Annual public budget as institutional solution

In Germany, road transport infrastructure is traditionally funded through the general public budget. On the federal level, the budgetary legislator, i.e. the German parliament, eventually decides about the expenditures related to federal trunk roads together with the other areas of public expenditures. The current funding system provides approx. €6 bn. per year for the federal trunk roads (see BMF, 2011, p. 27).

In the past years, the traditional system for funding the federal trunk roads has been modified in some ways by introducing additional institutions and rules, respectively. Generally, the German budget law prohibits the earmarking of funds. But according to further legal provisions, the HGV toll act (Bundesfernstraßenmautgesetz - BFStrMG), the net revenues of the distance based HGV toll collected on federal motorways and some federal roads have to be used for improvements of the federal trunk roads. In 2011, the revenues of the HGV toll contribute approx. €4.44 bn. to the federal budget. After deducting the operating costs for the tolling system and further expenditures for measures compensating the German goods transport industry, the remaining toll revenues of approx. €3.31 bn. were spent for investments in federal trunk roads. These revenues are eventually distributed by the state-owned transport infrastructure financing agency (VIFG) which receives these funds from the ministry of finance. Despite this earmarking the overall level of funds for the federal trunk roads is still determined by Parliament by enacting the federal budget as the total amount of funds provided for the federal trunk roads (ca. €6.0 bn. in 2011) exceeds the level of earmarked funds significantly. Therefore, the annual public budget is still the decisive institution for the provision and funding of the federal trunk roads.

3.2 Planning framework and role of the federal states

Before the German parliament decides every year about the funds for investments in the federal trunk road network, every project has to pass an assessment process. This procedure consists of several steps which constitute some kind of a strategic investment planning. Among other things, the responsible Federal ministry of transport, building and urban development (BMVBS) develops a long-term orientated federal transport infrastructure plan (BVWP). The transport infrastructure plan contains a list of the proposed investment projects and their evaluation. The project appraisal consists of a cost-benefit-analysis complemented by an analysis of the environmental risks and a spatial impact analysis. As a result the proposed projects are classified into two categories with different priorities. After amendments of the project priorities taking into account political interests, the transport infrastructure plan is eventually approved by the parliament. For the realization of the transport infrastructure plan the transport ministry subsequently formulates an investment plan with a five-year time horizon. However, this investment plan has only a non-binding character.

During the planning process the transport ministry depends on the support of the federal states which are responsible for several planning activities. According to the so-called federal order administration stipulated in article 90 of the German constitution, the federal states carry out the project planning as well as the construction, maintenance and operation of the federal trunk roads on behalf of the federal level. Nevertheless, the responsibility for the funding of these tasks remains with the federal level. Due to their active role the federal states can significantly influence the outcome of the investment planning process, e.g. by varying the pacing of their planning activities. Furthermore, the federal states play an important role when allocating the funds to individual projects. Before Parliament eventually decides about the allocation of funds to the projects, the federal states prepare this decision jointly with the transport ministry during a consultation process. Additionally, the investment funds are distributed between the federal states according to a quota system. These quotas are orientated at the relative share of a federal state in investment projects with a high priority according to the project appraisal of the transport infrastructure plan, but are also a matter of political negotiations.

An overview of the current funding system for the German federal trunk roads is provided by figure 2.

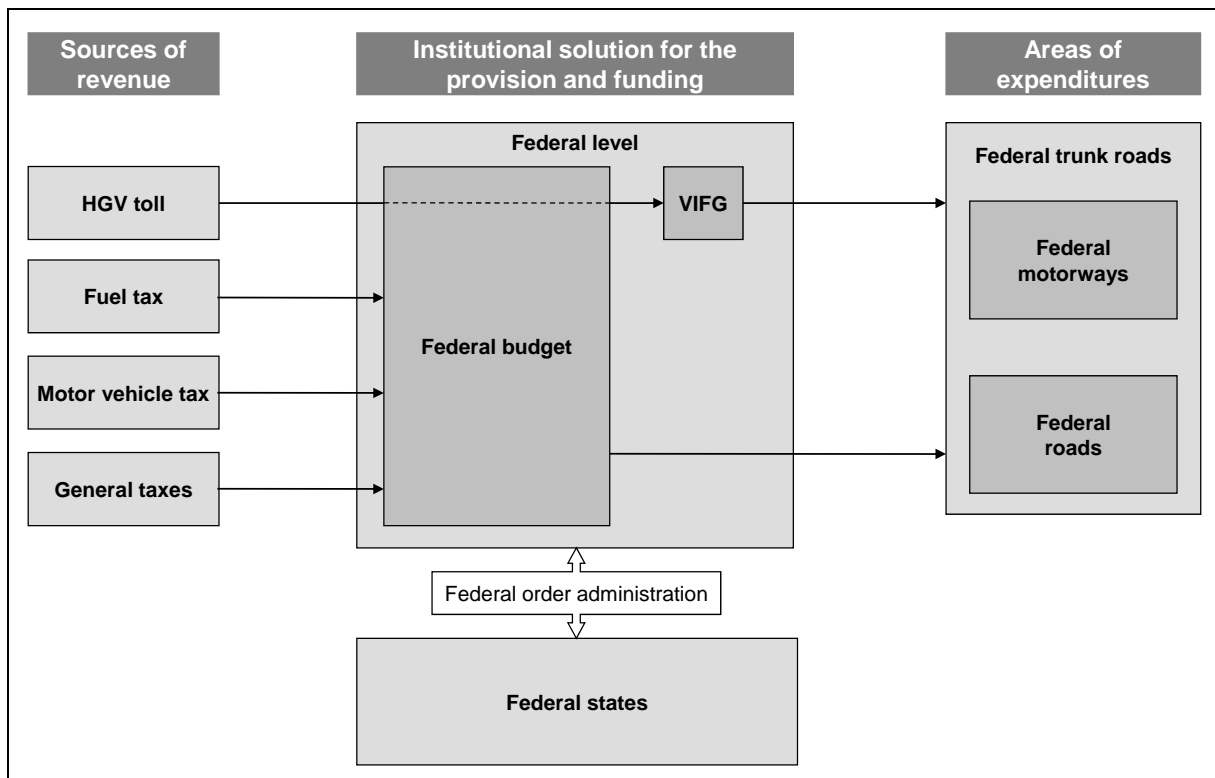


Figure 2. Current provision and funding of federal trunk roads in Germany

4 Main deficits of the current system

Generally, the current funding system facilitates the provision of a functional federal trunk road network. Nevertheless the funding system currently in place is often subject to criticism. Although there might be room for improvement in several aspects, this section concentrates on the most

important deficits of the current funding system. These are the insufficient realization of important capacity extension projects (section 4.1) and the piecemeal realization of projects (section 4.2).

4.1 Insufficient realization of important projects

The institutional solution currently in place provides insufficient financial means for projects urgently needed to reduce severe traffic bottlenecks. This deficit concerns even projects whose realization is generally political non-controversial. Thus, important capacity extension projects, especially on the motorways, are not realized (early enough). In the light of the expected traffic growth within the next years, the consequences of this deficit will be even worse. For the analysis of this deficit's reasons, we distinguish two possible explanatory approaches: The funds available for investments in federal trunk roads are either generally too little or they are allocated to the wrong projects.

Assuming generally too little funds for investments in federal trunk roads means that some projects which support mainly distributive goals are beyond question. This implies the need for additional financial means in order to realize the important capacity extension projects as well. But within the current institutional solution for the provision and funding of federal trunk roads, the budgetary system, the modification of spending decisions usually requires high transaction costs. The rise of expenditures for additional road infrastructure investments at the expense of other investments or consumption would nearly always cause the resistance of other MPs or affected stakeholders.

To avoid such conflicts the additional expenditures could be financed by raising additional revenues. According to the pay-as-you-use-principle the beneficiaries of the additional spending, i.e. the road users, could pay higher user fees or road transport taxes (e.g. motor vehicle tax or fuel tax), respectively. But within the current institutional solution such approach would encounter heavy resistance from road users. While the laws establishing higher user payments are generally valid indefinitely, within the annual public budget as institutional solution Parliament normally enacts additional expenditures for road infrastructure investments only for one year. From the second year on, the additional revenues could also be used for other purposes than investments in roads. Even an earmarking of these revenues would not necessarily avoid such developments as the remaining funds originally spent for road infrastructure could be dedicated to other areas of expenditures as well. This could have been observed, for example, after the introduction of the HGV toll on the German motorways. It can be expected that the road users would anticipate such behavior. Therefore, the lack of political commitment within the annual public budget hampers the implementation of such a concept.

Alternatively to a general lack of funds for investments in federal trunk roads, the insufficient realization of important capacity extension projects could be considered as a wrong allocation of the funds currently available for federal trunk roads. In this case, the distribution of investment funds between the federal states according to quotas and the significant influence of the federal states during the investment decision process are the main reasons for the misallocation of funds. The quota system hampers the allocation of investment funds to the federal states which suffer mainly from

congestion on their motorways (e.g. Bavaria, Hesse, Lower-Saxony, and North Rhine-Westphalia). Furthermore, the federal states use their scope of action during the planning process in order to pursue their own interests. Hence, due to a coordination problem, the investment funds available in each federal state are often not used sufficiently for the important capacity extension projects as these projects do not necessarily generate the highest benefits for the federal state's population. Especially on the main transport routes of the federal motorways network frequently facing congestion the share of national and international traffic is high while the local traffic is comparatively low.

4.2 Piecemeal realization of projects

Another central deficit of the current funding system is the piecemeal realization of investment projects. With the (limited) funds available for investment projects, the federal states realize too many projects at the same time. As the volume of funds is usually not sufficient for all projects started, it takes a lot of time until a project is entirely open for traffic. These delays in project realization cause higher construction costs. Moreover, they lead to lower benefits in relation to the volume of funds already invested as the traffic bottleneck often remains until the entire project is finally completed.

The main reason for the piecemeal realization of projects by bits and pieces is the strong regional influence in combination with an insufficient political commitment within the current institutional solution for the provision and funding of the federal trunk roads. Generally, the federal states and the regions within a federal state seek to get as many projects started as possible. Once the construction phase of a project has begun, its complete realization can be expected. Therefore, a reform of the current institutional solution should facilitate a more sequential realization of investment projects. The cost savings and increased benefits resulting from an adequate sequential project realization could be used to compensate the federal states or regions whose projects are postponed. But within the current institutional solution, there is a lack of rules preventing short-term orientated behavior of the federal states. The annual budget without sufficient supplementary institutions does not provide any credible political commitment regarding the future funding of investment projects.

5 Reform option: Multi-annual political commitments

As the analysis of the current institutional solution for the provision and funding of the federal trunk roads has shown, a stronger political commitment should be a core element of a structural reform. In this section, we discuss the potential of multi-annual political commitments for the provision and funding of federal trunk roads. In section 5.1, we derive a basic model for the implementation of a multi-annual political commitment. This basic model could be combined with the earmarking of road user payments which is analyzed in section 5.2.

5.1 Basic model

5.1.1 Description of the model

A stronger political commitment could be achieved by fixing the funds for some tasks concerning the federal trunk roads for more than one year. These multi-annual political commitments should contain the important extension projects on the motorways network as well as the maintenance and operation of the existing roads. In contrast, new construction projects would not be incorporated into this multi-annual commitment.

However, every investment decision would still be made by Parliament. Moreover, the funding of the federal trunk roads would also remain completely within the public budgetary framework. The main improvement would be the prioritization of specific tasks. The described model would implement a two-step procedure for the allocation of funds for the federal trunk roads. In a first step Parliament would decide about the funds for the important extensions projects on the motorways for a period of several years. Furthermore, the funds for the maintenance and operation of the existing road network would be fixed for the duration of the political commitment. Only in a second step Parliament would yearly allocate the remaining funds to new construction projects and other areas of expenditures not included in the multi-annual political commitment.

An appropriate duration of the multi-annual political commitment could be approximately five years. In this case, the political commitment could be combined with the transport infrastructure plan and its revision which is carried out every five years. The political commitment could also already contain an outlook on possible future projects which could be subject of a subsequent political commitment.

Concerning its implementation the multi-annual political commitment could be realized by adapting the existing legal framework. A law, e.g. the federal trunk roads extension act (Fernstraßenausbaugesetz – FStrAbG), should contain a list with the extension projects and their financial volume. Alternatively, the political commitment could be stipulated in a contract closed between the federal government and a public enterprise, e.g. the VIFG. In both cases amendments of laws on a meta-institutional level, e.g. the road construction funding act (Straßenbaufinanzierungsgesetz – StrFinG), could ensure the enduring implementation of such political commitments by defining an appropriate process. This could reduce transaction costs to reach multi-annual political commitments in the future.

5.1.2 Analysis

ADVANTAGES

A multi-annual political commitment as described above facilitates the provision of an appropriate funding level for motorway extension projects urgently needed and the maintenance and operation of existing roads. The two-step procedure for the allocation of funds establishes an institutional setting favoring these areas of expenditures. The sequence of decisions solves a coordination problem as it separates provision and funding decisions concerning the before-mentioned tasks from the other

areas of expenditures. This separation of decisions avoids a direct conflict between important extension projects on motorways and, for example, new construction projects which may be mainly motivated by political-economy reasons. Furthermore, it is more worth to accept the transaction costs to reach a political agreement regarding the funds for important extension projects when these decisions concern a period longer than one year.

In addition to a higher prioritization of extensions on the motorways mitigating traffic bottlenecks, a multi-annual political commitment could reduce the inefficiencies due to the piecemeal realization of extension projects. It would provide a credible commitment regarding the funding of investment projects for the duration of the political commitment. Therefore, it facilitates long-term planning and in return for a complete project realization in the foreseeable future, federal states and regions will be more willing to accept a slight postponement of “their” project. Moreover, the multi-annual fixation of financial means facilitates more cost-efficient maintenance strategies as well as an improved financial management.

DISADVANTAGES

The main drawback of the institutional solution described is related to the usual trade-off between commitment and flexibility (see Dixit, 1996, pp. 62-71). Normative public finance theory often suggests that the allocation of funds should be kept flexible as spending priorities could change over time in ways that cannot be foreseen. However, the disadvantages resulting from the multi-annual political commitment are negligible. First, the loss of flexibility due to the multi-annual commitment is limited as its duration does not exceed a medium-term time period (five years). Second, the multi-annual fixation of funds is restricted to extensions on motorways and to the maintenance and operation of existing roads. Motorway extension projects mitigating traffic bottlenecks mostly have a high benefit-cost-ratio. Therefore, these projects with a high priority should be usually realized in any case – even when unexpected changes of the environment occur. Likewise, the provision of funds for the maintenance and operation of the existing road network is generally uncontroversial.

5.2 Combination with the earmarking of user payments

5.2.1 Description of the model

The multi-annual political commitment discussed in the section before could be combined with the earmarking of road user payments. For example, the revenues of the HGV toll or of the taxes collected within the road transport sector, i.e. the fuel tax or motor vehicle tax, could be dedicated to the expenditures incorporated in the multi-annual commitment. In this case the amount of earmarked user payments must at least correspond to the volume of the expenditures stipulated in the political commitment. According to the pay-as-you-use-principle this institutional solution would establish some kind of a financial circuit within the road sector.

In all other important aspects this model complies with the model of multi-annual commitments without the earmarking of road user payments. That means the funds would still be part of the public budget.

But due to transparency and accountability reasons the funds used for the multi-annual political commitment should be shown separately from the rest of the budget. This could be pointed out e.g. by introducing some kind of mark-ups on the existing fuel or motor vehicle tax, respectively, instead of using directly these taxes. In combination with the revenues from the HGV toll these mark-ups could be the source of funds for the financial circuit. In case of changes concerning the volume of the multi-annual commitment in subsequent periods the tariff structure of the sources of revenue involved in the multi-annual commitment must be modified according to the financial needs.

5.2.2 Analysis

As the combination of a multi-annual commitment with an earmarking of user payments is basically only an extension of the basic model discussed in section 5.1, the following analysis concentrates on the differences resulting from the earmarking of user payments.

In general, the earmarking of user payments means a deviation from the fiscal principal of non-allocation of revenue. Economists' attitude differs about the usefulness of earmarking in general and the earmarking of road user payments in specific. The main rationale for the earmarking of road user payments in the way described would be the reduction of transaction costs. A variation of the financial volume of the multi-annual political commitment would lead to an adaption of the tariff structure of the earmarked revenues. Correspondingly, an increased financial volume of the multi-annual political commitment would neither directly affect other sources of revenue nor other areas of expenditures. This could lower the transaction costs reaching a political agreement about the adequate financial volume of the multi-annual political commitment. Moreover, implementing a standard process for variations of the financial volume in future periods contributes to a reduction of transaction costs within the budgetary framework. Furthermore, the earmarking of user payments could make such a policy reform more acceptable.

On the other hand, the combination of the multi-annual commitment with the earmarking of user payments creates an additional loss of flexibility compared to the basic model without the earmarking of user payments. If additional expenditures for important extension projects or the maintenance and operation of the existing network lead to tariff increases of the earmarked revenues, this will reduce the public sector's potential to raise revenues for the funding of other areas of expenditures. The higher user payments in terms of tolls and taxes collected within the road transport sector reduce the residual tax basis for the public sector. This aspect becomes more important with increasing financial burdens of taxpayers and increasing marginal costs of public funds, respectively. However, the drawbacks due to the loss of flexibility are – like in the basic model – still negligible. Here the same reasons apply: Firstly, the duration of the financial commitment is still limited (e.g. 5 years). Secondly, the multi-annual political commitment includes only areas of expenditures with a really high priority which is not expected to change in the near future.

Overall, the combination of the multi-annual political commitment with the earmarking of user payments could lead to a further reduction in transaction costs and the additional loss of flexibility could be neglected.

6 Discussion

The analysis of the current funding system for German federal trunk roads has shown that a higher degree of political commitment is needed to overcome the main shortcomings of the current institutional solution. In our view, this is only one example which shows the relevance of political commitments with regard to the provision and funding of infrastructure in general. The effective and efficient funding of infrastructure requires a certain degree of planning reliability as infrastructure projects usually have a long-term time horizon. Therefore, a sufficient political consensus leading to a reliable political commitment is often needed for an effective and efficient funding system for infrastructure. In countries with a federal structure and shared possibilities – as it is the case in Germany – this aspect is even more important.

The institutional solution for the provision and funding of (road) infrastructure should provide the optimal degree of political commitment. The traditional budgetary system with its annual allocation of funds to specific areas of expenditures often fails to be an appropriate institutional solution giving credible commitments. But that does not necessarily mean that institutional solutions beyond the budgetary system must be established to overcome the shortcomings of the traditional budgetary system. Every institutional solution has its strengths and weaknesses. Mostly, there exists no perfect institutional solution and trade-offs must be solved. In this context, new institutional economics show that the performance of an institutional arrangement depends heavily on the particular design and the details of the institutional solution.

With regard to the German federal trunk roads, we suggest the introduction of a multi-annual political commitment within the budgetary framework. The existing institutional solution should be modified by introducing an additional institution which stipulates the multi-annual fixation of funds for important motorway extension projects and the maintenance and operation of the existing network. This would support the provision of an appropriate funding level for these areas of expenditures. Furthermore, such a multi-annual political commitment could reduce the inefficiencies due to the realization of extension projects only by bits and pieces. Although the introduction of a multi-annual political commitment could significantly contribute to the overcoming of the current deficits, the institutional modifications would cause only low ex ante transaction costs compared to a radical change of the existing institutional solution.

The multi-annual political commitments could be combined with the earmarking of user payments. As we have shown this could contribute to a further reduction of transaction costs. Generally, every kind of user payment could be used for the earmarking as the institutional solution suggested remains within the budgetary framework. Therefore, we do not discuss whether road pricing revenues or taxes paid by road users (e.g. fuel tax) should be earmarked within the multi-annual financial framework as

this is beyond the scope of this paper. That such an approach could be generally successfully implemented – even in countries with a federal structure – shows the example of Switzerland. The Swiss government has established some kind of multi-annual financial commitments for the funding of their transport infrastructure and integrates the earmarking of revenues into these institutional frameworks. In the case of road infrastructure, a revenue mix of road pricing and fuel taxes as well as some kind of mark-ups on fuel taxes are used to finance capacity extensions projects as well as the maintenance and operation expenditures.

However, potential modifications of the current institutional solution for the provision and funding of federal trunk roads should not establish a too high degree of political commitment. This aspect becomes especially relevant when institutional solutions beyond the budgetary system shall be introduced. In Germany, some reform proposals concern the implementation of a widely independent road fund (see, e.g. Hartwig and Huld, 2009). This solution could be created by developing the VIFG into a more independent agency which gets the legal capacity to collect user fees and borrow funds at the capital market beyond the budgetary framework.

The main advantage of such an institutional solution would be the earlier realization of urgently needed investment projects as the level of expenditures could be varied to low transaction costs. The implementation of a financial circuit within the road sector would facilitate the adaption of revenues according to the financial needs. However, the enhanced possibility of debt financing would enable a significant increase in expenditures for road infrastructure. Therefore, this institutional solution is very interesting for short-term orientated political decision-makers (see Brennan and Buchanan, 1985, pp. 93-4). But in this case the economic advantage of this development is debatable as additional debts would imply significant distributional effects between current and future generations.

However, this institutional solution would in any case involve a significant loss of political flexibility due to the long-term delegation of a significant degree of responsibility to an organization outside of the budgetary framework. Among other things, the implementation of such a road fund requires the long-term transfer of responsibilities for the collection of user fees to the road fund. This would reduce the potential for revenue collection through the public sector. In this context it is also important to recognize that high road pricing charges reduces the residual tax basis for the public sector. This could increase *ceteris paribus* the marginal cost of public funds for other sources of revenue. Furthermore, requirements of the capital market generating revenues to maintain the financial stability of the road fund could imply a tariff structure for the user charges causing inefficient traffic evasion on the subordinated road network. Therefore, the flexibility regarding pricing issues in transport policy could be reduced as well. Further potential drawbacks are overinvestments in the road network due to self-interested actors of the road fund and the pressure of several stakeholders. This could lead to a too high quality of the road infrastructure from an economic point of view. Moreover, an independent road fund would have higher capital costs compared to an institutional solution within the budgetary framework.

In order to minimize such welfare losses the details of the institutional framework need to address these problems. But the institutional challenges to limit the problems of this institutional solution are considerably high. The implementation of an appropriate institutional framework would at least cause transaction costs to a significant degree, if not even prohibitive high one. Therefore, we suggest the implementation of multi-annual political commitments within the budgetary framework instead of a widely independent road fund.

7 Conclusions

One of the main shortcomings of the current system for the provision and funding of federal trunk roads in Germany is too low investments for capacity extension projects which would significantly reduce traffic bottlenecks. Furthermore, new construction and capacity extension projects of federal trunk roads are often realized only in bits and pieces. Moreover, there are disadvantages regarding the financial management.

To overcome these shortcomings, we suggest stronger political self-commitments within the public sector. For this purpose, funds for capacity extension projects with a high priority particularly on federal motorways, and the maintenance as well as the operation of the existing network should be fixed for more than a year (e.g. for five years). This approach could be realized by law or through a contract closed between the government and a public enterprise. In addition, the fixation of funds can be combined with the earmarking of road user payments.

In contrast, we have some reservations against institutional solution for the provision and funding of the German federal trunk roads which are beyond the budgetary system, e.g. a widely independent road fund. Besides several further drawbacks this institutional solution would lead to a significant loss of flexibility due to the long-term delegation of responsibilities to a widely independent organization.

With regard to the significance of the results for other countries, we have to state that there is no “one-size-fits-its-all-solution”. Rather, it is important to consider path dependencies. New institutional economics show that the existing institutional framework and the specific circumstances in each country influence the optimal institutional arrangement significantly (see North, 1990b, pp. 364-5). Although no general recommendations for the optimal design of the institutional solution for provision and funding of trunk roads could be made and a case-by-case approach is needed, some general conclusions could nevertheless be drawn. In cases where the public budget is still the relevant institutional solution for the provision and funding of road infrastructure one should at least be careful to delegate these tasks to widely independent organizations beyond the budgetary framework. Such approaches are usually characterized by a high degree of irreversibility and cause long-term losses of flexibility. Instead of such radical changes it may sometimes be more reasonable to modify only some central parameters of the existing institutional solution in order to improve its performance. The transaction costs of such minor reform measures are usually lower than for a complete modification of the institutional solution.

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