

# Motorways economic regulation: A worldwide survey

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## 1. Introduction and aims

The need for regulation is crucial in all network industries, where natural monopoly conditions often exist and where the heritage of legal monopolies is still deeply present and governing the sector. In the field of transport, the presence of vertical integration between infrastructure and services, the complexity of the networks and the relationship between state intervention and privatisation tendencies, make regulation even more complicated. The basic principles of the theory of market regulation in the transport sector are quite homogeneous (De Palma et al., 2011), even if there is not only one possible orientation. To the contrary, practical applications are strongly differentiated and influenced by many factors such as the historical and political context, the status quo, or the presence of powerful private operators.

In general, the way in which the principles of regulation in transport sector are actually applied in the world, at present, seems substantially unknown in a systematic way. This paper aims at shedding a light on the different ways motorway infrastructures<sup>1</sup> are regulated across a sample of 21 countries.

The paper is structured as follows. In Section 2 we briefly recall the previous studies on this topic. In Section 3 we introduce the three parts of the desk survey conducted and the chosen sample of countries. Sections 4–6 discuss, in a comparative way, the results obtained for the 21 countries surveyed. Finally, Section 7 provides some additional considerations deriving from the analysis of the data.

As the cases will show, no dominant model exists. Rather, a broad range of different and contrasting solutions is found, ranging from free public provision to totally privatised natural monopolies.

## 2. Existing comparative studies

To back our survey, here we will limit our review to case studies and comparative studies only, leaving theoretical contributions or policy papers to other works.

Comparative studies based on surveys are particularly helpful to provide a common field for research and to drive more effectively the work to the most significant best practices. For a regulator, moreover, they can also be useful as the starting point to better study the sector. However, while in literature there is a large number of studies dealing with economic regulation including some on single countries' practices (see further in the text for single references), comparative works on groups of countries are instead scant.

Concerning Europe, Bousquet and Fayard (2001) review road

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<sup>1</sup> Following OECD Glossary, we consider roads reserved for specific categories of vehicles, with separate carriageways, minimum two traffic lanes for the two directions of traffic with no at level intersections, no traffic signals, strict control over entry (commercial businesses and homes cannot be accessed directly). In the case of Brazil, China, India and Mexico all double carriage roads have been taken into account.

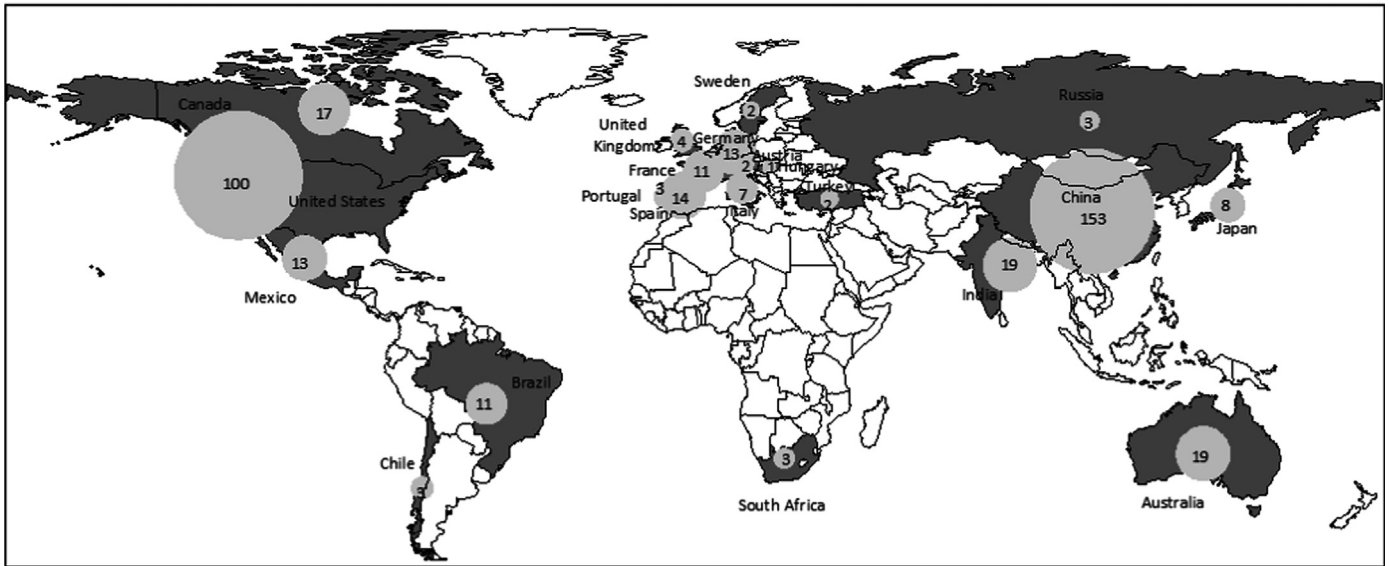


Fig. 1. Countries surveyed and length of the motorway network [000 km].

infrastructure concession practices in light of examples of public authorities acting as concession authorities. Ragazzi and Rothen-gatter (2005) analyse in detail the shortcomings and caveats of concession schemes introduced in Europe for managing and financing motorways. Albalade et al. (2009) describe current trends in toll motorway privatisation in Europe as an illustration of the paradox of simultaneous deregulation/privatisation and reregulation. Outside Europe, Engel et al. (2003) review the Latin American experience with highway privatisation during the last decade of the XX century.

The work of Queiroz and Kerali (2010) reviews the institutional arrangements for road asset management. Brown et al. (2006) provide guidance on conducting independent and public evaluation of regulatory systems for infrastructure sectors.

For statistical data, otherwise specified, we referred to ASECAP (2013), the European Association of Operators of Toll Road Infra-structures, which provides a yearly updated "National report" for each country which contains the main information about the length of the network, investments, tolling and safety.

However, to our knowledge, no comprehensive analysis of the regulatory framework in a large group of countries has been carried out so far, resulting in a substantial ignorance on the overall picture of world motorways regulation.

### 3. The framework of the survey and the sample

We built a database on motorway regulation now including 21 countries from all continents. The database is structured in three parts, focused on:

1. general and quantitative aspects of road infrastructure, including which regulatory mechanisms are used;
2. specific regulatory aspects, i.e. how regulatory mechanisms work;
3. regulatory bodies, i.e. who regulates.

The collection of the information derived primarily from the analysis of existing literature sources. We used institutional data (e.g. governmental websites, national agencies reports, etc.) or academic documents (papers, presentations, etc.). We tried to find up-to-date data in order to present the most recent information and scenarios in the regulatory field for each country. In addition,

for most of the countries, at the end of the process the data collected have been reviewed by a national expert.

The countries have been chosen considering the relevance of their motorway network, of their economy, their peculiar regulatory features, their geographical location and, in some cases, the availability of information.

We gathered data for the following countries (Fig. 1): Austria, Brazil, Canada, Chile, China, France, Germany, Great Britain, Hungary, Italy, India, Japan, Mexico, Portugal, Russia, Spain, South Africa, Sweden, Turkey and United States. In these countries lives the majority (55%) of the world population and they represent the main economies of the world. Moreover these countries have the largest motorway networks accounting in total for 415.000 km.

### 4. General aspects

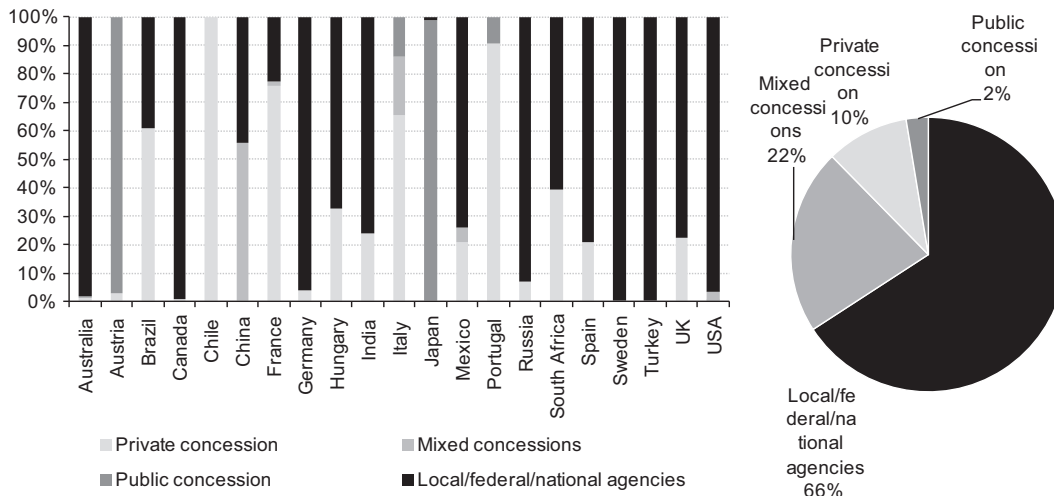
In the United States, Canada, Western Europe, Japan and Australia the construction of a nation-wide motorway network began approximately after the World War II. In the remaining countries, most of the present network has been built in the last twenty years also thanks to international co-financing. This is the case of the European Union in Spain, Portugal and Poland, as support to economic development.

#### 4.1. Regulatory framework and network management models

In almost all countries the majority of the network was built and maintained with public funds and managed directly by the State or by means of a national or local road agency.<sup>2</sup>

The only relevant exceptions have been Italy, France and Spain, where the tool of concession was used since the beginning, often by private or public-private enterprises. The concession model refers to the existence of a subject entitled to manage the infrastructure, the *concessionaire*, for a given period of time. In exchange of certain obligations (e.g. network construction or expansion), it is granted with the right to collect fees, typically from the users of the infrastructure, in order to recoup its investment and make some profit. The concession can be given to a private

<sup>2</sup> Also Japan and Austria belong to this group, while using different models of public concessions



**Fig. 2.** Mix of highway networks management models [% of extension per country and total].  
 Source: Our elaborations.

subject (and we will refer as “*private concession*”), to a state-owned company (“*public concession*”) or to a mixed ownership company (“*mixed concession*”).

In Italy, motorways have been initially built by several private companies, under concession by the state (Greco and Ragazzi, 2005) then, to save licensees from bankruptcy, a government agency took over the majority of them. But at the end of the nineties the picture changed again and, in order to collect resources to face the huge public debt, Italy privatised the biggest of these motorway concessionaires (2854 km).

In France, between the 1950s and the late 1960s, toll road concessions were awarded to state-owned firms or mixed public-private companies responsible for building and operating the roads (Bel and Foote, 2007). The Government provided initial financial assistance by guaranteeing the loans and providing cash (30–40% of construction costs).

Spain chose a privately tolled motorway concession model to develop the first expansion of the highway network in the sixties and early seventies (Bel and Fageda, 2005).

In Turkey the existing network has been publicly funded and built. More recently a first tender for the privatisation of 2.000 km of state owned toll roads has been issued, but it was then cancelled in 2013 because the government had higher expectations for the privatisation. A new one may be launched soon for separate packages.

In the early 1990s a heavy reduction in public expenditure capability led both developed and emerging countries to move towards private toll roads in order to meet their transport infrastructure needs. At the beginning this phenomenon mainly involved Latin America and Eastern Europe, then it spread to countries in Asia, North America and Western Europe, both due to privatisations or project financing schemes.

The result today is the co-existence of public and private models also inside single countries.

Fig. 2 details the mix of ownership, weighted by total network extension, for the countries surveyed. Those with the longest mixed ownership networks are China (85,000 km), USA (3500 km) and Italy (1400 km). The longest privately managed networks are in France (8700 km), Brazil (6800 km), India (4700 km), Italy (4400 km) and Portugal (2700 km). Chile is the only country without public motorways (3300 km of private concessions).

Privately owned roads, not conceded, exist only in the USA, but in some other cases the concession is so long (see below) that one can consider them as virtually privately owned.

When looking at tolled motorways only, the picture slightly changes (Fig. 3). All countries have at least a few km of tolled motorways, ranging from Canada and Sweden, which have 0.9% each, to Austria, Chile, Hungary, Japan and India with 100%. Germany has free motorways for cars, but tolls apply for trucks on the entire network.

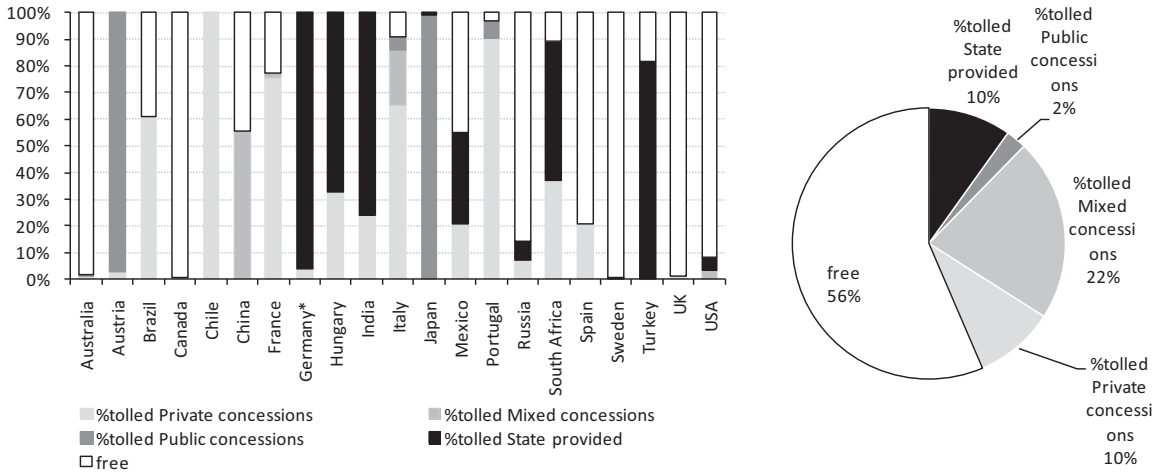
Consequently, with respect to the entire network, the share of State provided toll motorways remains significant only in six countries (Germany, Hungary, India, Mexico, South Africa, Turkey), plus some negligible cases such as in Italy or USA. In other countries toll roads are mainly in the hands of concessionaires, mixed or private, and the rest of the network is managed by a *state agency*.

Even if *private concessions* account for a minority of conceded km, their number tends to be high (Fig. 4) in countries where the model is more used, resulting in a situation of small concessions. These often are the most recent PPPs, associated to single projects rather than to a network concession as happened in the past. This is probably due to the fact that, whereas the network has already been built, further additions are of small dimension and more and more based on project financing (PF) schemes.<sup>3</sup>

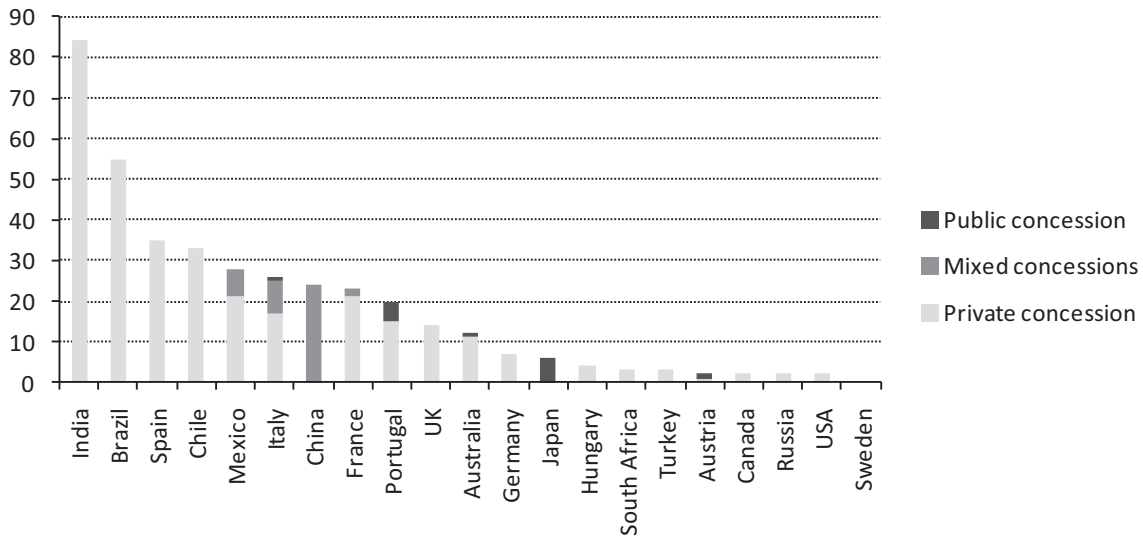
PF schemes are not found only in Sweden and Japan. All other countries experienced at least one. An interesting case is that of South Africa where, in order to facilitate the private sector investment in toll roads, National Roads Agency (SANRAL) developed an “Unsolicited Proposal Policy” scheme. Through this, the private sector can autonomously submit unsolicited proposals for the private development, maintenance, and operation of sections of the national roads and funding from toll collections (SANRAL, 2008).

The model used in Japan is worth to be mentioned. It was implemented in 2005, when existing network was privatised. Despite from that, the role of the public sector is still strong due to the presence of a specific agency which bears both the debts inherited from former public corporations and the new debt determined by the six network operators, whose shares moreover remain largely public (Laurino and Grimaldi, 2010).

<sup>3</sup> We consider here the PF as the “financing modality where the lenders look to the project’s cash flows to repay the debt and to the project’s assets for security” (Public Private Infrastructure Advisory Facility).



**Fig. 3.** Share of toll highways and management model, per country and total. (\*Germany: tolls are applied to trucks only.)  
 Source: our elaborations.



**Fig. 4.** The number of concessions, according to ownership.  
 Source: Our elaborations.

#### 4.2. Types of concessions

The types of concessions vary according to the country traditions, the period in which the concession are assigned and the power of the regulator.

The majority of the motorways are managed by public subjects and built according to the traditional model of tendering the sole construction (65% of the sample). PPP schemes overall account for approx 35% of the total, represented mainly by BOT<sup>4</sup> and OT models, while ROT models are increasingly used in the last years.

Nonetheless many variants also exist.

In China, a rather unique form of PPP scheme exists. A provincial government build a new toll expressway and then, once construction and traffic risks have matured, it sets up an “expressway corporation” as a public limited company. The company is then listed on the stock exchange and the government sells its shares. The shareholders earn dividends on their shares – with profitability depending primarily on the growth of traffic, inflation

and approved toll increases – while the provincial government invests the money raised mainly to expand the network (Queiroz and Kerali, 2010).

In France, a 2000 reform ended the system of ‘backing’, consisting in partly financing new motorway sections with toll income from existing sections (generally already amortised) operated by the same company and whose concession was extended for the purpose. With this scheme, larger concessionaires had an advantage in the form of a hidden subsidy that can translate in unequal opportunities for all candidates in a call for tenders (Bousquet and Fayard, 2001). This mechanism, to the contrary, is still broadly used in Italy (Laurino et al., 2010).

In Brazil, concession schemes focus on transferring the operation and maintenance of existing highway segments plus the restructuring or the extension of some parts of the network (Véron and Cellier, 2010). This approach of valuing the current network has been applied also for some Mexican motorways (Engel et al., 2009).

<sup>4</sup> BOT – Build Operate Transfer, OT – Operate Transfer, ROT – Rehabilitate, Operate, Transfer.

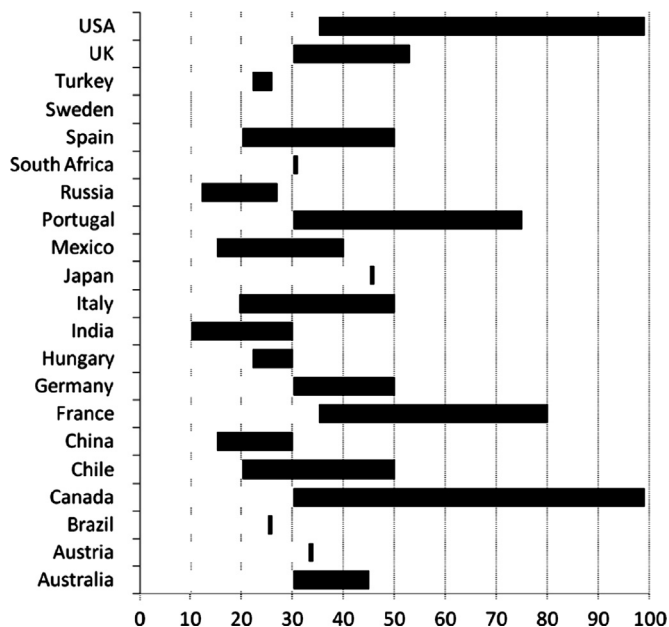


Fig. 5. Duration of concessions.  
Source: Our elaborations.

#### 4.3. The duration of concessions

The duration period is a key factor for the financial sustainability of a concession and, ultimately, for its suitability to the financing of the infrastructure.

Fig. 5 shows how the length of the concessions varies according to the country and to the local conditions. Russia, India, Mexico and China have concessions shorter than 20 years. Usually the maximum duration is around 50 years, but in USA, France and Canada concessions exist which last between 80 and 99 years. In this case, the concept of “transferring” back the natural monopoly to the State loses meaning making these concessions more similar to money-raising operations (see Section 7.3).

Counter-intuitively, our sample suggests also how the concession model barely influences the duration. There are, in fact, OT concessions lasting up to 99 years (Canada), despite the absence of the building phase, and BOT concessions lasting 15 years (Mexico).

#### 4.4. Tolling

The share of tolled motorways substantially varies according to the countries. In none of the countries surveyed all motorways are free, however in Sweden, Turkey, Canada, Australia, UK only very short sections are tolled. In total, more than 50% of the sampled motorways are free or mainly free (Fig. 6). Tolled motorways are the norm in many other countries, with Austria, Chile, Hungary, Japan and India reaching 100%. However, different types of tolls exist. The most common typology is *distance based tolling*, in some cases substituted with *fixed tolls*, typically applied when tolled segments are short and continuous (especially in USA). Austria and Hungary apply a “vignette” system, i.e. a yearly (or shorter period) toll which allows the vehicle to use the entire national network.

In Hungary, private concessionaires who manage the network are paid with *shadow tolls* or availability fees, financed by the vignette. Portugal planned to extensively use shadow tolling, too, but in 2002 it was converted to real toll paid by users (Fernandes and Viegas, 2005). The “shadow toll” model (see Section 5.3 for further details) consists in the remuneration of the concessionaire by the Government, principally on the basis of the real traffic observed on the motorway. So, the final cost is borne by the

taxpayers and not by the users, for whom the infrastructure is free. This has various consequences. From a welfare point of view, it maximises the surplus for the users, which are not excluded from the infrastructure because of tolls. Moreover, shadow tolling allows to deal with possible insufficient traffic revenues for the concessionaire, without losing its commitment to efficiently deliver the service. In addition, shadow tolling is also used to cap the financial effort of the Government and to artificially distribute commercial risk (Fernandes and Viegas, 2005; Shaoul et al., 2006; Abdel Aziz, 2007).

Germany is the relevant exception, with the entire network free for cars and electronically tolled for trucks and heavy duty vehicles (HDV) in general. In addition, the so-called “A model”, introduced to facilitate private investments to increase the capacity adding more lanes, are financed through revenues from the HGV-motorway toll as a shadow toll or an availability fee.

### 5. Regulatory issues

Regulatory rules are crucial to explain and understand the framework, the strengths and the weaknesses of a country. In this section we analyse the regulation in place according to some relevant aspects, integrated with countries specific focuses.

#### 5.1. The competition for the award of concessions

A first issue shaping regulation and highway performances is the presence or not of tendering procedures to award concessions.

Fig. 7 shows how, in the majority of cases, concessions are awarded through tendering procedures. Direct negotiation, despite present, covers a minority of concession cases: the most significant exception is the Russian Highways Corporation (Avtodor) which is free of any obligation to contract out the planned work through bids. The majority of non-tolled roads and some tolled ones are directly provided by public agencies (e.g. ANAS motorways in Italy).

The issue is very important, as the absence of competition jeopardises the effectiveness of PPPs in obtaining more efficiency and better performances. However the formal presence of competition through tendering is not, *per se*, guarantee of actual competition among players.

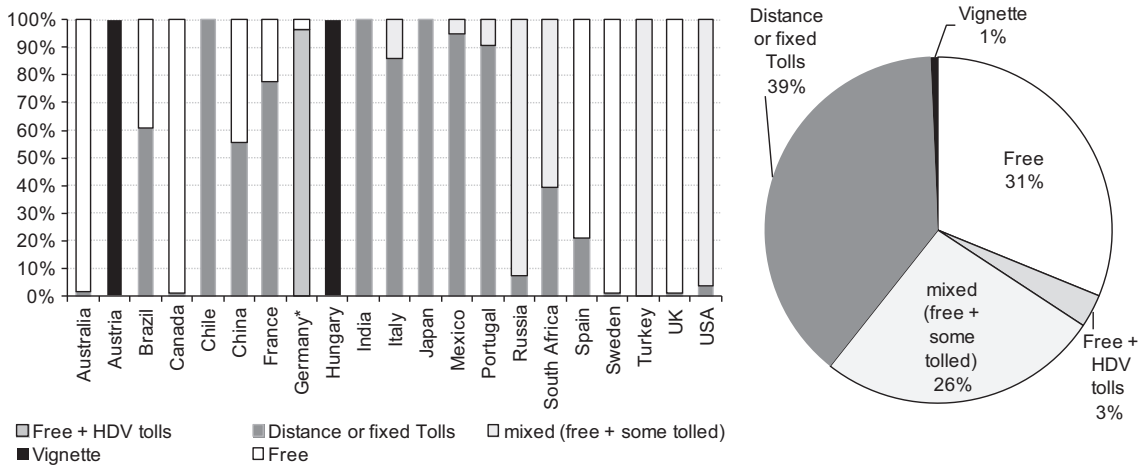
#### 5.2. Toll regulation

The concurrent conditions of natural monopoly, private ownership, externalities and high willingness to pay of users, make the issue of regulation of tolls crucial (Gómez-Ibáñez, 2003; Albalade et al., 2009; Macário, 2010). In fact, high tolls might be accepted by the market in absence of actual alternatives, but this generates welfare losses without jeopardising the financial sustainability of some infrastructure (Subprasom and Chen, 2007).

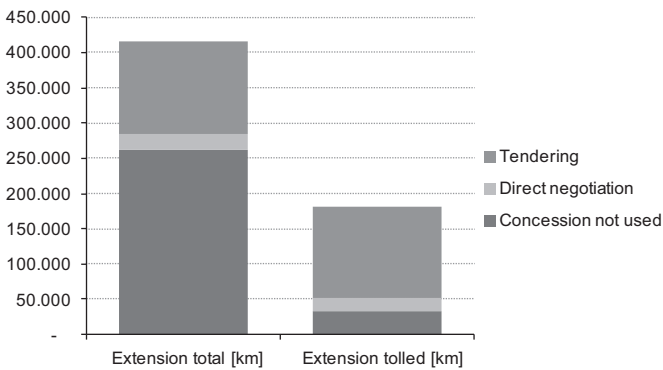
In the sample we found a broad range of toll setting approaches<sup>5</sup> (see Fig. 8):

1. No regulation: tolls are set freely by the concessionaire. This category includes both competitively awarded private concessions (like the M6 in UK) with public free alternatives, together with actual monopoly situations. In some cases tolls are defined using non-economically based principles (South Africa sets tolls as the 80% of calculated users’ benefits from using that road, (SANRAL, 2008)).

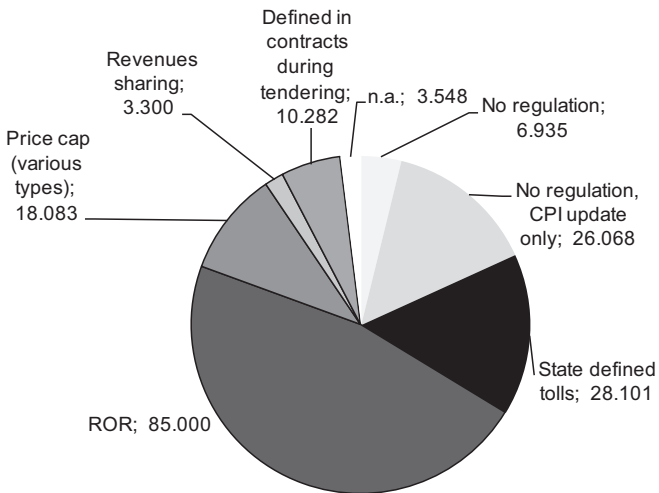
<sup>5</sup> Mexico is the only country of the sample in which different regulatory tools are used.



**Fig. 6.** Share of toll motorways and toll types, per country, plus total extension.  
Source: Our elaborations.



**Fig. 7.** Approaches to competition.  
Source: Our elaborations.

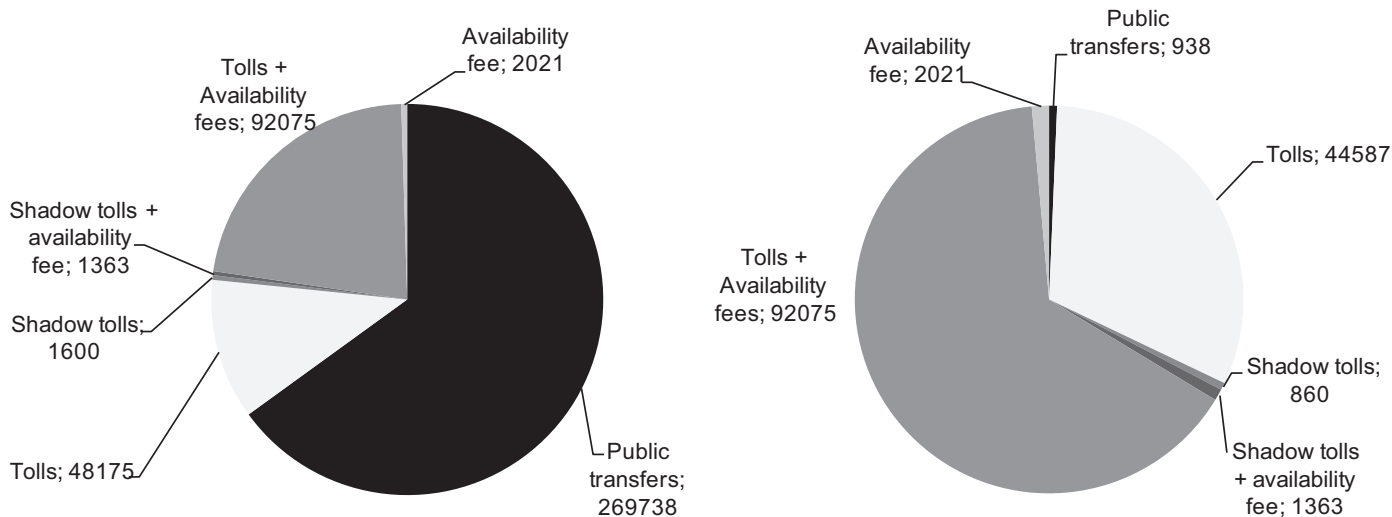


**Fig. 8.** Toll setting approaches – kilometres total.  
Source: Our elaborations.

2. **CPI update:** in many cases tolls are set initially (usually to comply with the business plan) and the only variation admitted considers the consumer price index or a fraction of it (e.g. 70% of CPI as in some Italian concessions).
3. **State defined tolls:** in some countries, the State directly defines the level of tolls for the motorways. Some countries have vignette or homogeneous tolls (Austria, Hungary) with private concessionaires usually remunerated through shadow tolls. In

- other countries motorways are directly managed by public agencies or companies (Turkey, Germany, Japan).
4. **Defined in the tendering contracts:** the toll level and its variation are pre-defined in the contracts following the tendering procedures. For example, in France the variation formula is pre-defined and may take into account a number of different parameters. However, at the end of the initial 5 years period, the final toll becomes fixed and indexed to CPI only. The mechanism is similar in Turkey, Russia and Mexico.
  5. **Rate of Return Regulation:** applied in China where tolls are set to guarantee the return on the investment with reasonable profits (CPCS, 2006).
  6. **Revenues sharing:** applied only in the “concession” model in Chile, foresees that profits or losses due to a pre-defined toll trend are shared between the concessionaire and the State, as a risk-mitigation tool.
  7. **Price cap:** is a regulatory toll aimed at promoting efficiency by setting a capped trend of tolls defined by two basic parameters, the CPI and the X factor. The X parameter, in the basic formula, is set by the regulator and defines a dynamic of efficiency. The price cap requires a periodic revision of toll, to reassess the concessionaire’s productivity and profitability stance for the next period and to recover, in form of lower future tolls for consumers, some or all of the efficiency gains of the previous period (Cowan, 2002). In our sample, “price cap” regulation is applied in Italy, France, Spain and Brazil. However, both in Italy and France, the “price cap” is only by name, as there is no periodic revision of efficiency gains and, moreover, the X is not dealing with efficiency (Albalade et al., 2009; Ragazzi, 2008).<sup>6</sup> Applied price caps include further elements, like corrections between forecasted and actual traffic or automatic remuneration of concessionaire’s investments. In conclusion, excluding China which is regulating rate of return of investment, properly said toll regulatory tools (tendering, price cap or other mechanisms) are used only for one third of the surveyed network. The rest of highways have unregulated tolls. At the same time, no country, with the exclusion of few operate-only concessions, regulates non-tolled networks (typically the public ones).

<sup>6</sup> Italian former model explicitly took into account efficiency, but its practical application was biased and the formula has now been revised for many concessions, totally losing the concept of price cap (Beria and Ponti, 2009).



**Fig. 9.** Sources of revenues for the infrastructure manager, all motorways (left) and concessions only (right).  
 Source: Our elaborations.

### 5.3. Types of revenues and cost coverage

Besides the direct toll collection there are many different ways to attribute resources to the infrastructure manager, also in the case of private concession.

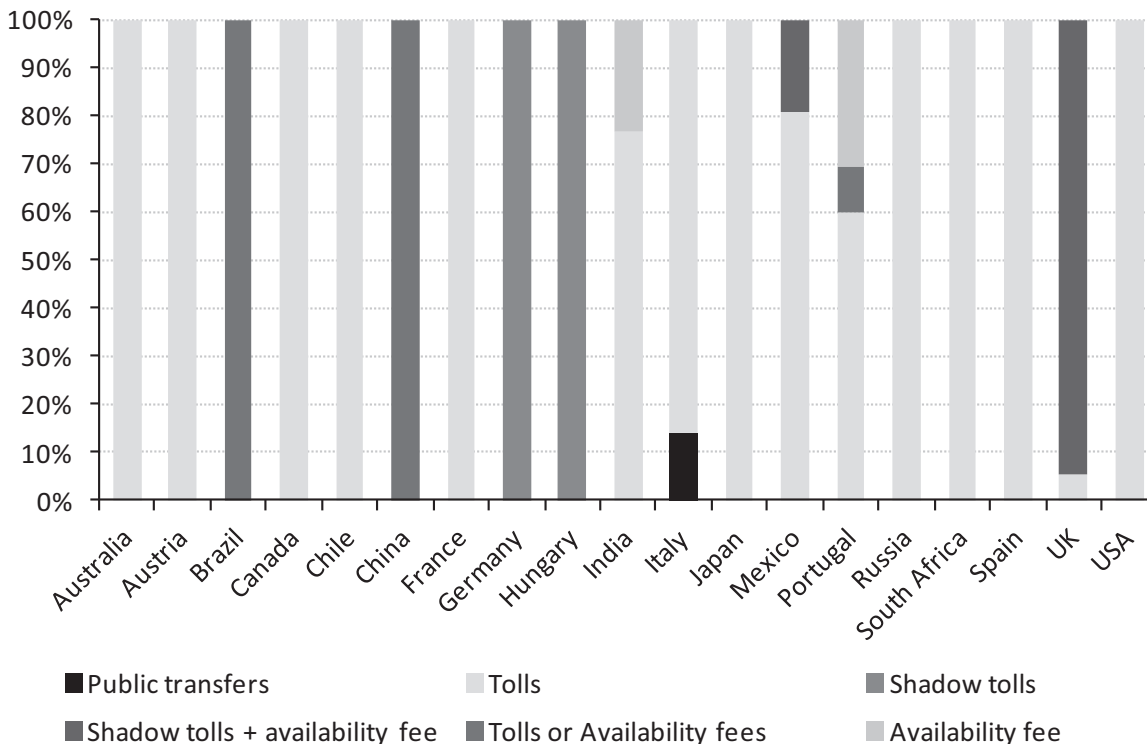
Considering the sample surveyed, *public transfers* represent the main source of financing for nearly 65% of km. This amount includes, for example, 100,000 km of USA motorways (both freeways and expressways) and all Chinese separate lanes roads paid with fuel duties or other taxes.

However, looking at concessions only, the picture changes (Fig. 9, right). *Real tolls* are the only source of revenues for just approx. 30% of the network. The countries (Fig. 10) with the

longest networks financed with tolls are France, India, Italy, Japan, Spain, USA, etc. The largest part of the other networks are however paid with a mix of *tolls and availability fees* (mainly in China and Brazil). *Shadow tolls* (see also Section 4.4) are used in some countries to remunerate concessionaires whatever motorways are free (e.g. Germany) or tolled (e.g. Portugal). A case of *public funding* is Italy, with a sub network of 900 km free motorways including A3, managed by a public concession.

Cost coverage is another important issue which can have various options, ranging from the coverage of operating costs only, to the full cost coverage including a concession fee paid to the regulator.

Less than 15% of the networks surveyed (not single motorways



**Fig. 10.** Sources of revenues for the concessionaires.  
 Source: our elaborations.

or single concessions, however) apply a full building and operating costs coverage tolls.<sup>7</sup> Of these, a small part is also capable of generating a fee, usually thanks to the extension of the concession over the recovery period, as done in some privatisation cases (Canada, Mexico, USA. See Section 7.3). In some cases the extension of the concession is allowed to finance other roads (Hungary, Italy), but this introduces cross subsidy practices which sometimes (like in Italy, Ragazzi, 2006; Laurino et al., 2010) distort the market and reduce transparency. In the majority of cases, approx. 85%, concessionaires receive a subsidy, in various forms, as discussed above.

#### 5.4. Social marginal cost pricing

Approx. 6.7% of the networks surveyed apply some principles of social marginal cost pricing, which is rarely a “full” SMCP including both emissions and congestion. In France and Spain (plus few km in UK, Australia and Canada) there is a form of congestion pricing (during peak hours) for 12,000 km of networks. HOV lanes are common in USA, but not all of them are priced. Germany is the only country where SMCP, limited to trucks, is applied on the entire network (> 13,000 km). In Austria and French Alpine tunnels, tolls depend on emission class of HDV.

#### 5.5. The allocation of risks

The issue of risks allocation has been extensively discussed in the literature (for a recent review see Cruz and Marques (2013) or Rouboutsos and Macario (2013)). Generally speaking, risks should be borne by the agents most capable of addressing them. Even when a risk premium is introduced in contracts, unbearable risk factors, such as technological or political changes, easily become a barrier to private financing (Macario, 2010). Whenever risks are not properly assigned, need for renegotiation may arise or cause the concessionaire bankruptcy.

In our sample a broad range of risk sharing strategies, in particular those dealing with traffic risk, is present.

For example the ANTT (Land Transport Regulatory Agency) in Brazil, in order to face the allocation of the construction risk and to increase concessionaires’ responsibility on it, makes a distinction between the works to be realized during the concession period: (i) non-mandatory works that must be realized to comply with the contracts’ performance targets and are within the full technical and financial responsibility of the concessionaire, and (ii) mandatory (improvement) works, such as third lanes, whose timing is defined by the ANTT and whose costs are based on kilometeric prices defined in the initial commercial proposition (Véron and Cellier, 2010). The concessionaire thus bears the construction risk and is incentivised to be efficient in construction. Moreover, to deal with events outside the control of the concessionaires, real traffic flows and market prices are taken into account to rebalance the contract (Barbo et al., 2010).

In Chile, many renegotiations have been carried out, mainly due to the recession experienced between 1998 and 2002 which caused traffic reduction, and in part due to the needed additional investments. Today, Chile applies three mechanisms, not mutually exclusive, (Vassallo, 2005, 2006; Carpintero and Barcham, 2012) to mitigate traffic risk, as summarised in Table 1.

## 6. Regulatory institutions

The analysis is completed by the collection of data concerning the existing regulatory institutions. We identify four typologies (Fig. 11), similar to those in Ocaña (2002), namely absence of

regulator, presence of an independent regulatory agency with factual regulatory powers, line ministries retaining all regulatory functions, autonomous ministerial agencies subordinated to the Ministry (Table 2).

Only in Brazil and Portugal an independent highway regulatory institution exists. In Italy the regulator of existing roads is part of the Ministry of Transport.<sup>8</sup> For the remaining countries, the regulatory tasks (typically: award concessions or set the tolls) are managed by public agencies or directly by the ministries.

Clearly, the absence of an independent regulator and the attribution of regulatory tasks to road agencies (often the national road managers, possibly determining a conflict of interest), cannot guarantee transparency and independency.

## 7. Additional lessons learned

In this section some additional relevant elements of highway regulation, arisen during the survey, are discussed.

### 7.1. Unused regulatory tools

The survey clearly shows that many regulatory tools found in the theory and commonly used in other industries, are seldom adopted in the highway sector. Moreover even when applied, the mechanism does not act in the sense of achieving a “normal” level of profit for the concessionaire.

Only in France, Japan and Mexico the network division seems to be based, at least in part, on an economic evaluation of a minimal efficient dimension.

A substantial price cap is seldom used and in no case periodical revision or claw-back are foreseen. While concessions are usually assigned through tendering, periodical renewals are more often agreed through direct negotiation.

### 7.2. Excess profits and/or losses?

Regulation of motorways is usually deemed necessary to prevent firms from earning excessive monopoly profit.<sup>9</sup> A strong record of profitability has, for example, characterized the motorway business in Spain since the early 1990s (Bel and Fageda, 2005). The Italian company Autostrade, conceived as an instrument for building motorways on behalf of the state, had become highly profitable in the 1990s and distributed large dividends (Greco and Ragazzi, 2005). After the privatisation, Autostrade obtained large extra profits compared to the original financial plan for the period 1998–2002 (Ragazzi, 2006). Also in France after the privatisation the concessionaires earned very high profits.

However, our analysis clearly shows that also the opposite case is very frequent. Almost in every country there have been cases of bail-out of concessionaires: Italy in the late 1930s (Greco and Ragazzi, 2005), France in 1982 (Fayard et al., 2004), Spain in the 1980s (Bel and Fageda, 2005), Mexico in 1997 (Carpintero and Barcham, 2012), Hungary in 1999 (Siposs, 2005), Chile in 2000–2002 (Carpintero and Barcham, 2012), Japan in 2005 (JEHDRA, 2011), Portugal in the late 2000s (ASECAP, 2013; Fernandes and Viegas, 2005)

In conclusion, the financial sustainability of motorways concessions seems to be a problem at least as important as that of monopoly power. Both suffer from the lack of a sound regulation

<sup>8</sup> In 2013 the new independent Italian Transport Authority has been established. It will define the concession schemes and price cap formulas for greenfield projects only. The ministry agency will instead award and monitor concessions.

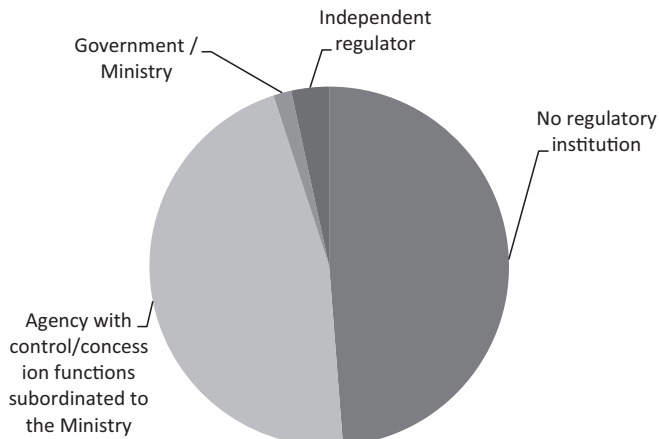
<sup>9</sup> According to Moody’s (2006): “toll road operators typically exhibit very high profit margins and high cash flow conversion”.

<sup>7</sup> Not taking into account fuel taxes, like in the USA.



**Table 1**  
Mechanisms to mitigate traffic risks in Chile.  
Source: Adaptation from Vassallo (2006).

Minimum income guarantee (MIG)	The government guarantees to the concessionaire a fixed level of revenues (equal to 70% of investment plus maintenance costs), in order to lower risk premium paid to the lender and reduce the financial cost of the road. If revenues are higher, excess revenues are shared with government.
Revenue distribution mechanism (RDM)	An ex-post mitigation of traffic risk, by means of a modification of contract terms.
Least present value of the revenues (LPVR)	A procurement mechanism rather than a risk mitigation tool: the concession is awarded to the bidder offering, with pre-fixed tolls, the least present value of the accumulated revenues – discounted at pre-fixed rate defined in the contract. The concession ends when that LPVR is reached. The duration of the concession initially calculated is extended/reduced if real traffic volume is lower/higher than expected.



**Fig. 11.** Regulatory institutions, in km.  
Source: Our elaborations.

**Table 2**  
Regulatory institutions.  
Source: Our elaborations.

No regulatory institution	China, Australia, Canada, Germany
Agency with control/concession functions subordinated to the Ministry	USA, India, Spain, Mexico, France, Japan, UK, South Africa, Chile, Russia, Turkey, Sweden, Austria, Hungary
Governmental/Ministry regulator	Italy
Independent regulator	Brazil, Portugal

and from a coherent and conscious risk management approach.

### 7.3. End of tolls or more tolls?

Looking at long term dynamics of tolling, two different tendencies can be observed concerning how revenues are regulated at the end of the first concession period. In some countries, expired and fully repaid concessions, actually moved back to the State administration and became free. This is the case of Australia's M4 Western Motorway or of the majority of Canada former toll roads that became free between the 1970s and the 1980s.

However, often states prefer not to lose the money rising capacity of some infrastructures, which are kept tolled also after the initial investment is totally repaid. There are three main typologies:

- i. revenues are kept by the public operators which took over the expired concession (as for example in Italy with the Padova – Mestre section which has been “passed” to a joint company between State and Region)
- ii. the road is conceded to a new subject (with or without tender) in change of a fee. For instance this is the case of the Highway 407 in the Greater Toronto Area which has been leased to a

conglomerate of private companies for 99 years for 3.1 billion following a worldwide competitive bidding process. Similarly, in the US, the Chicago Skyway, financed and constructed by the City of Chicago in the mid-1950s, was leased in 2004 to a private operator for 99 years (Bel and Foote, 2007) to raise substantial money to the public purse. In Turkey, 2000 km of state owned toll motorways have been assigned in 2011 to a private group, but the tender was finally cancelled for the insufficiency of the bid. In France, three large concessions (ASF, APRR and Sanef) were privatised in 2006 to raise financial resources. With the same purpose, in Italy, two concessions under expire should be soon tendered out again.

- iii. The road is left to the concessionaire (usually without any public procedure), in exchange of the extension/upgrade of other infrastructures.<sup>10</sup> This is, for example, the case of almost all Italian concessions expired in the Nineties.

## 8. Conclusion and further research

The survey aimed at gathering some preliminary elements to start building a database on highways economic regulation.

The first results show a complex picture in terms of network management models, pricing, size and durations of the concessions. In general, the regulatory tools and institutions seem to be in a very early stage of implementation, especially if compared with other infrastructure sectors. Excluding some countries with a long concession tradition, the state involvement is still very broad, both in developed and developing countries. Only few countries apply more complex regulatory tools, especially related to risk sharing.

A trend toward a larger involvement of private capitals is also evident, mainly due to the scarcity of public funds rather than to the willingness to achieve greater efficiency. However, an element emerging from the survey is the instability of the regulatory framework which may hold back such private investments. Concerning private concessions, along with cases of high profits earned by concessionaries, there is also a large number of cases of project failures because of wrong cost and traffic forecast.

The collected information could become the basis for further studies, leading to a comprehensive evaluation of the relative efficiency of the different systems. Moreover, the gap between the regulatory framework and the way rules are practically applied is worth to be explored. A further question to be addressed is whether there is a single optimal model of regulation to be ideally applied everywhere or if different models should be adapted by countries experiencing different needs and showing different institutional capabilities.

<sup>10</sup> The issue has already been discussed in Section 5.3.

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