Evolution and assessment of economic regulatory policies for expressway infrastructure in China

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Abstract: The primary goal of this paper is to illustrate the development of economic regulatory policies in China that have been aimed at accelerating the process of expressway infrastructure construction. Although China's expressway infrastructure originates from June 1984, this relatively late initiation still clearly demonstrates the characteristics of rapid expansion, which forms an interesting context for an analysis of regulatory policies. Based on levels of economic development and geography, China can be divided into three macro regions, i.e. eastern, central and western regions. The rapid development of expressway infrastructure, the pattern of investment, the sources of financing and regional differences in investment in the three macro regions are described. Finally, an ex-post evaluation of the principles underpinning the evolution of regulatory policies for expressway infrastructure in China is carried out, based on a qualitative equity and economic efficiency framework.
Keywords: Economic regulation; Transport Infrastructure; Expressway; NTHS; China

Acronyms

Policy measures (Acronym and formal title):

ALP: Anti-monopoly Law of the People's Republic of China

ARE: Administrative Rules on Establishment of Permanent Representative Offices on Foreign Waterway and Highway Transport Enterprises

CCC: Circular of the State Council Concerning Several Policies on Carrying out the Development of China's Vast Western Regions

CGF: Catalogue for the Guidance of Foreign Investment Industries

CMF: Circular of the Ministry of Foreign Trade and Economic Cooperation Concerning Absorption of Foreign Investment by Means of BOT

CFO: Circular on Further Opening the Investment Field of Road Transport to Foreign Investors

DSC: Decision of the State Council on Reforming the Investment

HLP: Highway Law of the People's Republic of China

IPG: Interim Provisions on Guiding Foreign Investment Direction

PAR: Provisions on the Administration of Road Transport Services with Foreign Investment

PLP: Pricing Law of the People's Republic of China

RAT: Regulation on the Administration of Toll Roads

RTS: Road Traffic Safety Law of People's Republic of China

RII: Rules for the Implementation of the Income Tax Law of the People's Republic of China on Enterprises with Foreign Investment and Foreign Enterprises

TFY: The 11th Five Year Plan on Foreign Capital Utilization

Others:

BOT: Build-Operate-Transfer

BT: Build-Transfer

BOO: Building-Owning-Operate

CNHs: China National Highways

FDI: Foreign Direct Investment

FETC: Foreign Economic Relations and Technological Cooperation

MOC: Ministry of Commerce

MOT: Ministry of Transport

MFTEC: Ministry of Foreign Trade and Economic Cooperation

NBSC: National Bureau of Statistics of China

NDRC: National Development and Reform Commission

NTHS: National Trunk Highway System

PFI: Private Finance Initiatives

PPP: Public-Private Partnerships

TOT: Transfer-Operate-Transfer

1. Introduction

Transport infrastructure is widely understood to refer to roads, railway, airports, bridges, ports, and associated facilities. The availability of efficient and reliable transport infrastructure services is an important determinant of the pace of market development, output growth, access to equitable, affordable and sustainable transport infrastructures services and improvements to social welfare. The development of an effective economic regulation system is important in achieving the transport infrastructures services needed to deliver these benefits.

The development of expressways is a fairly recent addition to the road transport infrastructure in China. The national road network consisted of a system of 'at-grade' China National Highways (CNHs), following plans formed in 1981. China's expressway infrastructure originates from June 1984 with the construction of the Shengyang-Dalian Expressway connecting Shangyang and Dalian of north China and now forming part of the lengthy Shengyang-Haikou Expressway (G15). Later that year, construction began on the Shanghai-Jiading Expressway, which was opened in October 1988. This 17.37 kilometres (10.79 mi) expressway now forms part of Shanghai's expressway network and became the first completed expressway in mainland China. In December 2004 the State Council of China approved the principle of "planning the National Trunk Highway System (NTHS)', which aimed to build an expressway network of 85,000 kilometres over three decades, connecting all provincial capitals and cities with over 200,000 residents. The NTHS (see Fig. 1), currently consists of 7 radial expressways, 9 north-south expressways and 18 east-west expressways. It forms the backbone of the national expressway network and is known as the "7918" network.

Fig. 1 Map of the National Trunk Highway System (NTHS, modified based on Wikipedia (2013))

Expressways are defined as high capacity, high speed, multi-lane roadways with full access control in both urban and rural settings (Ieda, 2010). Concerning nomenclature, generally, "highway" refers to the China National Highways and "expressway" is used for both expressways and express routes, where express routes are similar to expressways but mainly refer to expressways within cities. The expressways network of China forms the world's longest expressway system. By 2012, the total network length was 95,600 kilometres, of which 11,000 kilometres were built in that year alone. Despite China now having the world's largest expressway network, it still faces the challenge of unequal regional development. According to the NBSC (2012), China can be divided into three macro

regions (Eastern region, Central region and Western region) [1], based upon economic development and geographic position (see Fig.1). A detailed discussion of the development of expressway infrastructure based on regional differences is given in Section 2.

Although expanding infrastructure can be only part of the answer to traffic congestion management and road expansion in an era of fiscal austerity needs to be considered carefully (Grant-Muller and Xu, 2014), economic regulation provides an important way for effective and efficient transport infrastructure development. Economic regulation includes many types of taxes and subsidies as well as explicit legislative and administrative controls over rates, entry and other facets of economic activity (Posner, 1974). Numerous economic measures have been developed and applied in the field of infrastructure regulation. However, those concern transport and in particular with focus on national case studies are scant. Current literature on the economic regulation of transport infrastructure includes a body of work concerned with the effects of regulatory measures on the development of transport infrastructure (e.g. Edwards et al., 1999; Guasch and Hahn, 1999; Estache, 2001; Harris, 2003; Yang, 2007; Fan and Chan-Kang, 2008; Xu et al., 2010; Yang and Zhang, 2012; NERA, 2009; Wang et al., 2014). It also covers transport infrastructure financing including efficiency (Helm and Thompson, 1991) and the assessment of PFI and PPP (for example, Glaister, 1999; Mu, et al., 2008; Cruz and Marques, 2011; Kirkpatrick et al., 2006; Perkins, 2013). Examples of work concerning the relationship between regulation and the level of FDI includes work by Dean et al., (2009) and Hong (2007), whilst particular case studies are given in Hayashi et al. (1998) and Beria and Ponti (2009). Gillen (1996) provides a detailed review of the relationship between transport infrastructure development and economic growth, whilst other work outlines a broader set of case studies (e.g. Fleisher and Chen, 1997; Grant-Muller et al., 2005; Kitamura and Mohamad, 2009), and the relationship between sustainable development and the economic regulation of transport infrastructure (e.g. Phang, 2003; Short and Kopp, 2005; Sohail et al., 2006; Beria, 2007; Curties, 2008; Ieda, 2010; Sand, 2012; Xu et al., 2015).

Although there are some studies of the impacts of transport infrastructure on regional economic growth in China (e.g. Mody and Wang, 1997; Demurger, 2001; Ma and Li, 2001; Lou, 2003; Zhang, 2007; Wu, 2009; Hong et al., 2011; Yu et al., 2012a, 2012b), few studies have extensively focused on economic regulation policies for expressways infrastructure in China. Existing studies that relate to this topic include Mu et al. (2008), who investigated strategic behaviour during PPPs for expressways in China, and pointed out that the lessons and necessary legal safeguards are underway but are not yet in place. Zhou and Sheate (2011a) pointed out the Strategic Environmental Assessment (SEA) practice in the expressway infrastructure planning field has a number of problems in China, and the existing shortcomings directly lead to poor quality SEA and consequently weaken the effectiveness of SEA's. Zhou and Sheate (2011b) further discussed how to deliver better decision-making and ultimately improving the environmental performance of expressway infrastructure in China.

In general, there is less evidence of literature on economic regulation than for other transport infrastructure related issues, and work on the economic regulation of expressways based on country case studies is even rarer. This sets the background for the research in this paper, which focuses on the economic regulatory policies of expressway infrastructure in the case of China. Case studies are valuable in informing economic regulatory agencies on best practices and their potential outcomes,

[1]The definition of three macro regions: **Eastern Region**: consisting of 9 provinces (including Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi, Hainan) and 3 municipalities (Beijing, Tianjin, and Shanghai); **Central Region**: consisting of 9 provinces, including Heilongjiang, Jilin, Shanxi, Henan, Anhui, Jiangxi, Hubei, Hunan, Inner Mongolia; **Western Region**: consisting of 9 provinces (including Ningxia, Gansu, Qinghai, Sichuan, Yunnan, Guizhou, Shaanxi, Xinjiang, Tibet) and 1 municipality (Chongqing).

whilst effective economic regulatory policies have played an important part in the rapid development of the expressway infrastructure in China. This forms the rationale for the research in this paper, where we focus on regulatory policies and practices for expressway infrastructure within China. Firstly, the background to the development of expressway infrastructure in three major regions of China is given in Section 2. This is followed by a study of the patterns in economic regulation of expressway infrastructure in China (Section 3) and the evolution of regulatory policies (Section 4). An ex-post evaluation of economic regulatory policies according to a framework for sustainability (including efficiency and equity considerations), is presented in Section 5. Finally, conclusions are given with recommendations on future research for a more efficient economic regulatory approach.

2. Background to expressway infrastructure development in the different regions of China

2.1 Development of expressway infrastructure

The development of expressway infrastructure construction has been a key focus for the government in China and included in the economic development initiatives within the Five-Year Plans. Fig. 2 presents regional variations in expressway length in the three macro regions from 1988 to 2012 (source: official statistics), whilst Fig. 3 shows annual variation in the ratio of expressway length with respect to the regional total road length (i.e. total length of expressway and different grade roads[2]). As shown by Fig. 2 and Fig. 3, there are clear differences in road infrastructure development in the three regions. In general, expressway mileage in the eastern region is higher than that for the central and western regions, although the gap in expressway mileage between the eastern and central regions is seen to gradually decrease from 2005. Whilst the western region shows an increasing trend in expressway construction, the gap between the western region and the other two regions still remains. At the same time, the ratio of expressway mileage to the regional total road length is low (generally < 5%, although the ratio for the eastern region reaches 5.35% in 2012). The ratio (shown in Fig. 3) highlights the rapid development of the 'grade roads' in the three macro regions alongside the growth in expressway infrastructure.

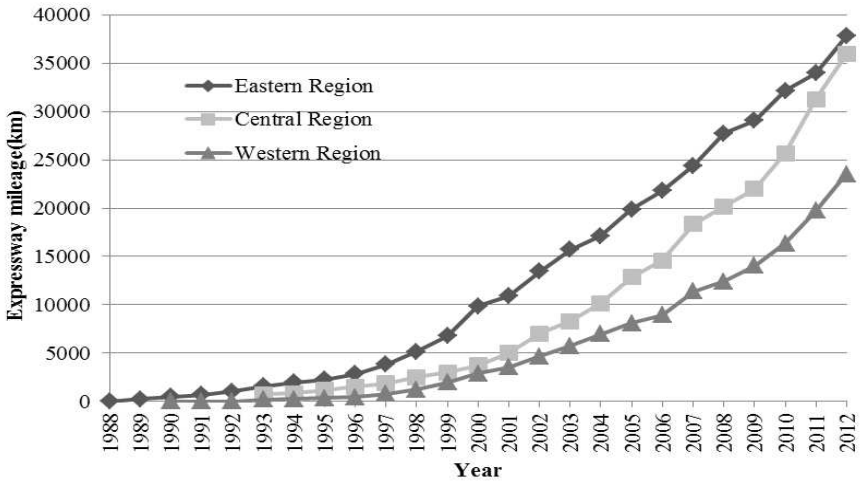

Fig. 2 Regional variation in expressway length in China (unit: km)

[2]The definition of grade roads is based on the Chinese official file (no. JTJ001-1997) of 'Technical Standard of Highway Engineering in China': Expressway: average daily volume is 25,000–100,000 cars. Grade roads include four grades according to their average daily volume. Grade 1: average daily volume is 15,000–55,000 cars; Grade 2: average daily volume is 3000–7500 medium-duty trucks; Grade 3: average daily volume is1000–4000 medium-duty trucks; Grade 4: average daily volume is 200–1500 medium-duty trucks; substandard: average daily volume is less than 200medium-duty trucks.

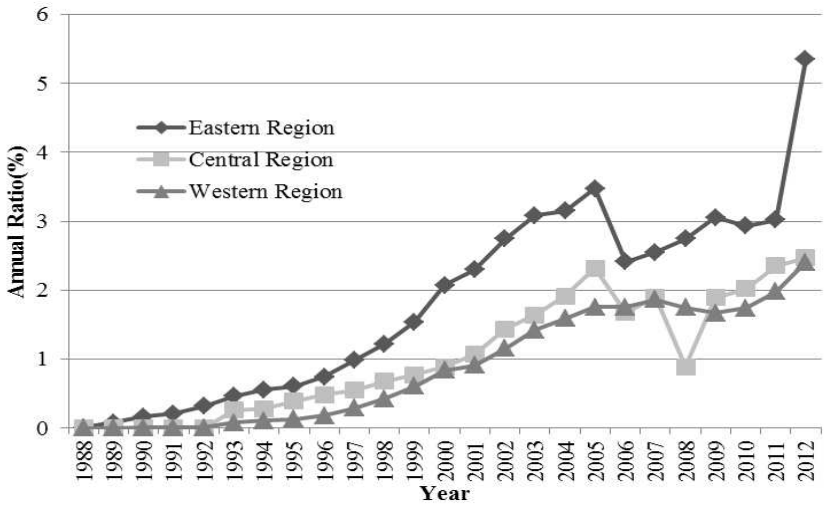

Fig. 3 Annual ratio of expressway length to total road length in three macro regions

2.2 Expressway infrastructure investment

The rapid development of expressway infrastructure brings huge costs relative to right-of-way acquisitions. The total costs of the "7918" network are estimated at 2 trillion Yuan (about 24.63billion Euro). According to the 2005 National Expressway Network Plan, from 2005 to 2010 annual investment was planned at 140 billion - 150 billion Yuan, whilst from 2010 to 2020, it is planned at around 100 billion Yuan. Fig. 4 reflects the growth in expressway infrastructure investment from 2001 to 2012 (source: China Statistical Yearbook, 2001-2012). Following a 4 trillion Yuan (RMB) government stimulus package announced in late 2008, total investment in highway fixed assets reached 865.8 billion Yuan in 2009 and by the end of 2010 the NTHS network exceeded 74,000 km. The 12th Five-Year Plan (2011 ~2015) outlined further plans for expansion, targeting an increase in the NTHS to 83,000 km by 2015. A slowdown in economic growth from 2010 was accompanied by a decrease in the proportion of road investment; however, the tendency was still for growth.

The expressway infrastructure financing structure includes domestic bank loans, local funding, vehicle purchase tax, company investment, government budget, national debt and others. An example for 2010 is shown in Fig. 5 (source: China Statistical Yearbook of 2010). The huge investment brings huge demand of budget, and almost all of expressways on the NTHS are toll roads run by firms owned by central/local governments. The structure of expressway infrastructure investment is highly affected by the pattern of regulatory policy, which is therefore described in more detail in Section 3.

To illustrate investment patterns for the three macro regions, investment data for 27 provinces and 4 municipalities were collated from their respective Bureau of Statistics. Based on the availability of full data for different provinces and municipalities, Fig. 6 demonstrates regional variations in road infrastructure investment from 2000 to 2012. In addition, Fig. 7 shows regional variation in the share of road transport infrastructure investment within the three macro regions. As can be seen from Fig. 6 and Fig. 7, transport infrastructure investment in the western region continued to grow from 2000. This is most probably a result of the strategy of the "Circular of the State Council Concerning Several Policies to Carry out the Development of China's Vast Western Regions" (2000, see Table 1 in Section 4). The Eastern and Central regions also show a trend for growth, however, the annual ratios change according to regional differences in total road investment.

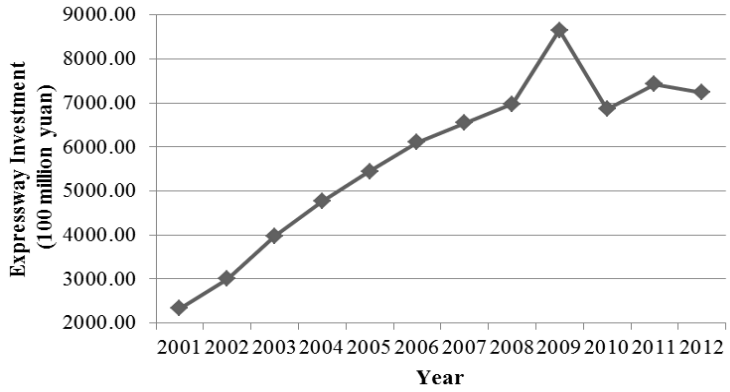

Fig 4. Annual expressway infrastructure investment (2001-2012)

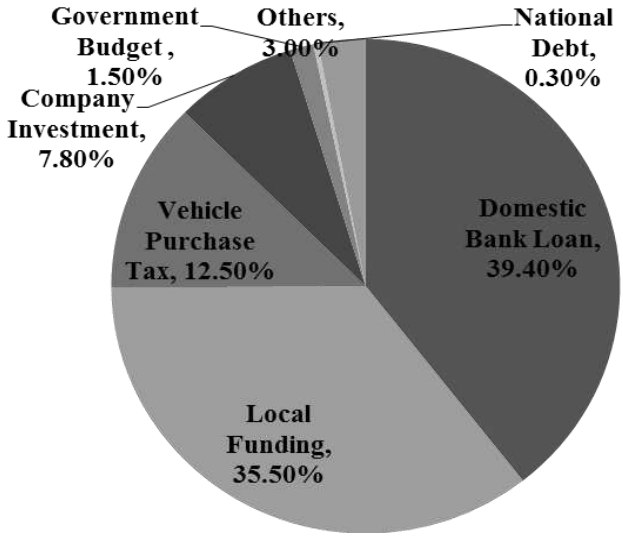

Fig 5. Expressway infrastructure financing structures in 2010

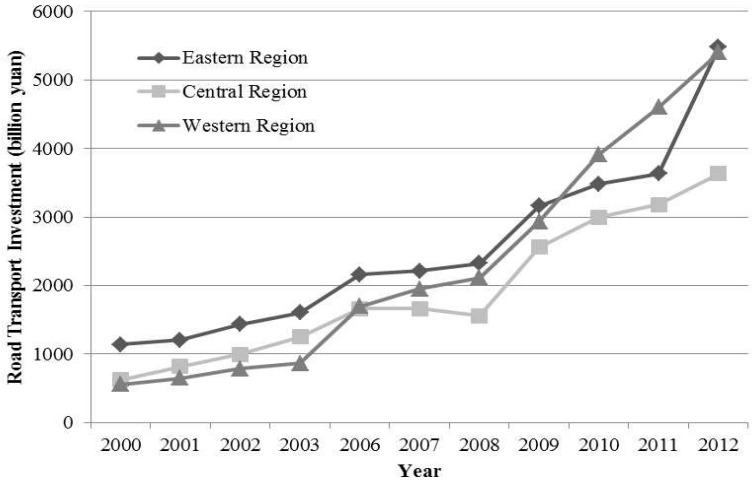

Fig.6 Regional variation in road transport infrastructure investment

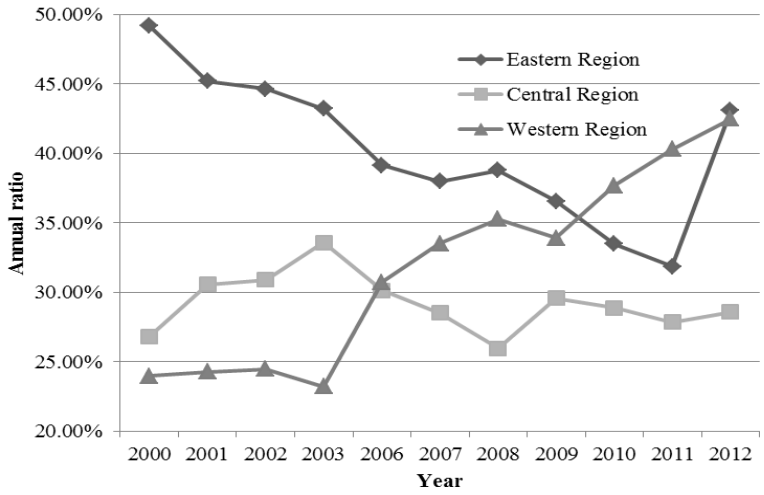

Fig.7 Annual share of road investment to total road investment in three macro regions

3. Economic regulation of expressway infrastructure: pattern of regulatory development

In China, expressway planning is a function of the Ministry of Transport. Most of China's expressways are not directly state owned, but rather are owned by profit-making corporations. These corporations have varying degrees of public and private ownership and can borrow money from banks or the securities markets based on projected revenues from tolls. The process of establishing corporations is outlined below and a reason for this ownership model is that Chinese provinces (responsible for road construction) have limited powers to tax or borrow.

The MOT sets policies, standards and provides investment support for construction. While expanding the inter-provincial NTHS, the government decided to adopt a toll-based network which would be predominantly financed by debt. The rapid development of expressway infrastructure is a result of substantial investment. For example, the financing structure of expressway infrastructure in the year 2010 (shown in Fig. 5), includes domestic bank loans, vehicle purchase tax, company investment and national debt. The main capital for the expressway is raised by the provincially-owned expressway corporation. The government has adopted a distinctive form of PPP financing for some expressway projects, given that one of the purposes of PPP is to share risks for a capital intensive project. Following completion of construction of a toll expressway, the provincial government then establishes the expressway corporation as a public limited company listed on the stock exchange. It then invests the money paid by the shareholders into the construction of new toll roads. It therefore follows a one-road-one-company model, allowing for joint ventures, securitized ownership, direct private sector investment and different forms of leasing and concessions.

As shown in Fig. 6, the overall level of investments/expenditure has increased rapidly since 2007. The primary financing modes in the PPP framework for expressway construction include BOT (Build-Operate-Transfer), BT (Build-Transfer), TOT (Transfer-Operate-Transfer) and BOO (Building-Owning-Operate). BOT and BT are mainly used for highway construction although more state-owned enterprises than foreign-funded (or private) enterprises use BOT. TOT is mainly applied to the transfer of toll road operation rights, whilst BOO is mainly used for the construction of transport stations. Examples of expressways with BOT arrangements include the Guangzhou-Shenzhen-Zhuhai Expressway (opened in 1999 with a 30 year concession period) and the Beijing-Chengde expressway (opened in 2006 with a 30 year concession period). Examples of expressways built in 2010 and using

the PPP framework include the Lok-Yi Expressway, the Qionglai-Ya'an Expressway, the Leshan-Yibin Expressway and the Wuyishan-Shaowu Expressway, all of which have a maximum concession period of 30 years. Although PPP toll expressways have always been firmly supported in China, the number and size of investment in this type of project has declined since 2011 with other forms, e.g., PFI (Private Finance Initiative) and ABS (Asset Backed Securitization), becoming more popular in recent times. Considering the rapid development of the expressway infrastructure, these financial modes are good exemplars that could indicate possible directions for investment and financing system reform in the wider public investment fields. It should also be noted that in China, these financial modes can be seen as still being in their initial stages of evolution and therefore further challenges to improve these regulatory approaches remain.

4. Economic regulation of expressway infrastructure: the evolution of regulatory policies

Different approaches can be taken to implement economic regulation in the context of expressway infrastructure. These include specific mandatory laws or measures that impact on social behaviour and the activities of companies, organizations or individuals, e.g. through taxation, subsidies, contractual requirements, licensing and franchising. Economic regulation of expressway infrastructure has clearly evolved in tandem with accelerated social development. For the period following initiation of China's reform process (with a new 'Open-Door Policy'), a summary of the relevant policies on expressway infrastructure is given in Table 1. As shown in Table 1, the government has focused on transport infrastructure development together with amended laws based on economic development. A number of different departments concerned with the development of transport infrastructure (including the State Council, MOT, NDRC, MFTEC, FETC, MOC and associated departments in the Provinces) have been involved. Financing investment in expressway infrastructure is a crucial factor for each department involved and eleven regulatory policies focus on this aspect. The government has also addressed the need to attract foreign investment, for example, the law on attracting foreign capital to infrastructure construction through BOT (CGF) and special support for the vast western regions (CCC).

Generally, the development of expressway infrastructure can be separated into three phases based on the amount of annual mileage opened:

> **Phase I (1988-1992)**: opening of the first expressway in mainland China in 1988. The annual mileage opened was between 50km and 250km;
> **Phase II (1993-1997)**: a fast development period with annual mileage opened between 450km and 1400km;
> **Phase III (1998-now)**: the golden stage of expressway infrastructure development. Annual mileage opened ranges from 3000km to 10000km, with active governmental financing support.

The distribution of regulatory policies is listed in Table 1 and summarized in Fig. 8. The "Highway Law of the People's Republic of China (HLP)" covered three stages with amendments in 1997, 1999 and 2004. Similarly CGF was amended in 2004 and therefore reappears in Phase III. As can be seen, the regulatory policies in Phase I focus on guaranteeing the normal development of the transport infrastructure. In Phase II, more specific policies concerning financing investment for expressway infrastructure were proposed. This is more clearly seen in Phase III with further targeted regulatory policies, for example:

- specific support for the vast western regions (CCC),

- regulation of tolled roads (PLP; RAT),
- safety regulation (RTS).

Regulatory policies concerning investment financing for expressway infrastructure in the three phases include: ARE, RII, CMF, IPG, CGF, CCC, PAR, CFO, DSC, TFY and ALP. The adoption and implementation of these policies accompanied the development of the primary financing modes, including the PPT, PFI and ABS, as mentioned in Section 3.

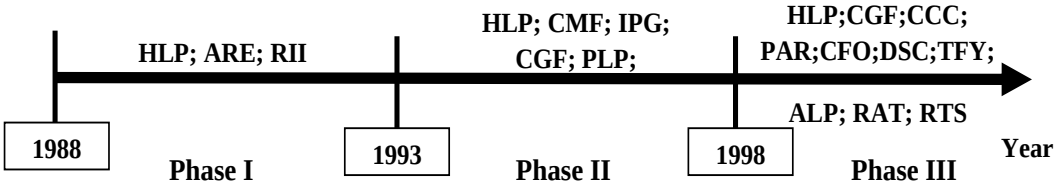

Fig. 8 The distribution of regulatory policies over three phases

5. Ex-post assessment of regulatory policies in China

5.1 An ex-post assessment framework

Different approaches exist for the assessment of transport infrastructure and the related literature is extensive, however other notable examples of ex-post assessment of large transport infrastructure include the case of the Trans-European Network (TEN's) (see Thomopoulos and Grant-Muller (2013) for an illustration). Concerning methodology, recent examples include Beria and Ponti (2009), who focused on the relationship between regulation and social profitability, Thomopoulos and Grant-Muller (2013) developed an equity based framework, and Sullivan et al. (2010) focused on maximising service level and minimising cost. There is currently no specific assessment framework for expressway infrastructure, so for the ex-post assessment of regulatory policies for expressway infrastructure discussed here, a combined framework is used utilising both equity and economic efficiency impacts. More details for equity aspects can refer to Thomopoulos and Grant-Muller (2013) and more details for economic efficiency aspects can refer to Manikonda et al. (2001), Southworth et al. (2004), Moudon et al. (2005) and Sullivan, et al. (2010). The framework is based on the following principles:

a) Equity Principles

- EP1 – Equal shares policy principle
  Distributes an equal share of all benefits of expressway infrastructure to all regions impacted
- EP2 – Rawlsian policy principle
  Distributes expressway infrastructure benefits to the least advantaged regions until those reach the level of the most advantaged regions
- EP3 – Egalitarian policy principle
  Reduces pre-existing inequalities between regions by distributing all expressway infrastructure benefits to the least advantaged regions
- EP4 – Minimum floor policy principle
  Distributes a minimum level benefits of expressway infrastructure to all regions
- EP5 – Maximum range policy principle

Sets a maximum range of benefits of expressway infrastructure to be distributed to each region and distributes benefits to all regions respectively

b) Economic Efficiency Principles

- EEP1- Minimizing cost principle
  Aims to minimise costs to achieve benefits for different stakeholder groups involved in expressway infrastructure
- EEP2- Utilitarian maximization
  Aims to maximise the net benefit for all regions impacted by the expressway infrastructure, disregarding the distribution of benefits
- EEP3- Maximizing service level
  Aims to maximized service level to improve transport efficiency

Here a qualitative ex-post assessment only is undertaken to indicate the guiding ethos behind the regulatory policies. Further work may be concerned with a more quantitative measurement.

5.2 Assessment of Regulatory Policies

The short ex-post assessment here is intended to give a first indication of the guiding ethos behind the regulatory policies and how this ethos has developed through the Policy Phases. In general, the highway management law (HLP) focuses on a general equal shares policy principle (EP1). The same principle is also demonstrated by the "Rules for the Implementation of the Income Tax Law of the People's Republic of China on Enterprises with Foreign Investment and Foreign Enterprises(RII)" (during Phase I), "Interim Provisions on Guiding Foreign Investment Direction (IPG)" and "Catalogue for the Guidance of Foreign Investment Industries (CGF)" (during Phase II), and CGF, "Anti-monopoly Law of the People's Republic of China (ALP)", "Pricing Law of the People's Republic of China (PLP)" and "Regulation on the Administration of Toll Roads (RAT)" (during Phase III). "Circular of the Ministry of Foreign Trade and Economic Cooperation Concerning Absorption of Foreign Investment by Means of BOT (CMF)" demonstrates the principles of economic efficiency (EEP1, EEP2 and EEP3). The implementation of the "Circular of the State Council Concerning Several Policies on Carrying out the Development of China's Vast Western Regions (CCC)" is supported by a Rawlsian policy principle (EP2) and Egalitarian policy principle (EP3). The implementation of "Decision of the State Council on Reforming the Investment (DSC)" also demonstrates a minimum floor policy principle (EP4), as does the presentation of "Provisions on the Administration of Road Transport Services with Foreign Investment (PAR)" and "Circular on Further Opening the Investment Field of Road Transport to Foreign Investors (CFO)" during Phase III. There is still a lack of regulation serving to satisfy the maximum range policy principle (EP5), however, more regulatory policies are anticipated that may follow this principle. "Administrative Rules on Establishment of Permanent Representative Offices on Foreign Waterway and Highway Transport Enterprises (ARE)" (Phase I) and "The 11th Five Year Plan on Foreign Capital Utilization (TFY)" (Phase III) satisfy the principles of maximizing service level and maximizing utilitarian of economic efficiency. An overview of the guiding ethos of policies, based on the equity and economic efficiency framework is provided in Table 2.

The initial assessment of the regulatory policies implemented in China provides a potential framework to the policy development and improvement for the policy decision makers. Comparing single assessment framework, the proposed combined framework can provide a more comprehensive appraisal. While there are positive characteristics associated with the presented framework, some practical issues remain unsolved, and a quantitative assessment framework needs to be further

developed for the practice. Furthermore, on the basis of the missing requirements and considering the state of the art, we conclude that there is still room to improve the current regulatory policies.

6. Conclusion and discussions

In this paper we have described the evolution of economic regulatory policies for expressway infrastructure in China. An ex-post assessment of expressway infrastructure development, based on the principles of equity and economic efficiency is presented. On the basis of economic development and geographic position, the country is separated into three macro regions and an overview of the rapid development of expressway infrastructure in these three regions is given. Behind the rapid development in the expressway infrastructure lays a huge investment in the transport infrastructure. The pattern of investment, the sources of finances and regional differences in investment are summarised. It was found that investment in the western region showed rapid growth from 2000, and total road infrastructure investment matched that for the eastern region in 2012. In general, accelerated growth in investment within the three macro regions continues, although the relative ratios between the regions change through time.

In each region, whilst the ratio of the total length of expressway to the regional total road length (covering all grade roads), is very low, the trend for rapid development is clear. In general, expressway mileage in the eastern region is higher than that in the central and western regions. However, the difference in expressway mileage between the eastern and central region has decreased in recent years and is particularly small from 2012. The rapid development and the reduction of this gap between the three regions both depend on the implementation of regulatory policies concerning investment financing for expressway infrastructure. There are still relative differences among the three regions, although there has been a faster rate of growth in the western region since 2004. It is expected that the gap between the western region and the other two regions will be reduced in time. These apparent (but decreasing) regional differences are related to higher level policies designed to boost investment in particular regions.

Finally, an ex-post assessment is given of the regulatory policies concerning expressway infrastructure that have evolved through three phases in time. This is a qualitative assessment based on a proposed equity and economic efficiency framework and it should be noted that some principles are mutually exclusive. Generally it can be seen ex-post that the design of different policies has drawn on different underlying principles concerning equity and economic efficiency, whilst one certain key principle (i.e. EP 5) has still not been applied.

Concerning directions for future research into policy development, the economic regulatory framework for expressway infrastructure in China still needs to be improved with a focus on reform of the investment and financing system, which would involve a continuation of the work in Section 3. The ex-post assessment framework for expressway policies has only been presented in a preliminary form here. It needs further development to incorporate qualitative and quantitative approaches, and to be able to more fully capture understanding of how economic infrastructure regulation works in practice.

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Table 1 Relative Regulation polices for expressway infrastructure in China

Item	Key factors	Characteristic/remarks
Highway Management Law		
HLP	▪ General rules of the planning, construction, maintenance, administration of expressways; ▪ General rules for toll roads; ▪ General provisions for supervision and inspection; ▪ Definition of legal responsibility.	• Originated the "Regulations Governing Management of Highways in China", issued by MOT on 1st January, 1988, and the formal version issued on 1st January, 1997; The amendment decisions separately issued on 31st October, 1999 and on 28th August, 2004, and the updated version issued on August, 2004 (2004 Revision).
Financing investment on expressway infrastructure		
ARE	▪ Apply for establishment of permanent offices in China have to be approved by the MOT; ▪ When a permanent representative office intends to employ a Chinese citizen to work for it, it must entrust the department appointed by the local government to manage the employment and report in time to MCT.	• Issued on 1st March, 1990; • The rules fit for transport enterprises invested by overseas Chinese, Hong Kong and Macao compatriots or Sino-foreign transport joint ventures.
RII	▪ The definition and formula for taxable income; ▪ Foreign air transportation and ocean shipping enterprises engaged in international transport business shall use 5% of the gross revenues from passenger and cargo transport and shipping services arising within China as taxable income.	• Issued on 30th June, 1991.
CMF	▪ Projects of the eastern region with an investment worth over 30 million US dollars and projects of the central and western regions with an investment worth over 10 million US dollars should be examined and approved by the central government; ▪ Government agencies generally should not provide guarantee or commitment of any kind.	• Issued by MFTEC on 16th January, 1994; • If a guarantee is really a necessity for the project, the consent of competent state authorities should first be obtained in order to make the commitment.
IPG	▪ The catalogue for the guidance of foreign investment industries according to these provisions and the development of the country's economy and technology.	• Issued FETC on 1st January, 1995.
CGF	▪ The catalogue for encouragement, restricted and prohibited foreign investment industries.	• Issued on 31st December, 1997 and amended on 30th November, 2004; • Issued by FETC, amended version issued by the NDRC and MOC.
CCC	▪ Land used for construction of national highways and provincial highways in the western regions may be exempted from cultivated land occupancy tax.	• Issued by State Council on 26th October, 2000; • Special support for vast western regions and series policies on increasing financial inputs and investment environment, etc.

PAR	▪ Generally the operating term of a road transport enterprise with foreign investment shall not be longer than 12 years. ▪ Road transport enterprises apply for the extension of operating period, and the operating period extended each time may not exceed 20 years.	• Issued by the MOT and the FTEC on 20th November, 2001; • If more than 50% of the investment has been used in the construction of infrastructure of the passenger and goods transport stations and sites, the operating period may be as long as 20 years.
CFO	▪ By taking the form of Chinese-foreign equity joint ventures, the ratio of foreign investment may reach to 75%; ▪ In the newly established Chinese-foreign equity joint road transport enterprises, the ratio of foreign investment may not be lower than 25%.	• Issued by MOT on 28th November, 2002.
DSC	▪ Highways for the development of western areas, national speedway networks, and trans-province (district or city) projects shall be subject to the approval of the competent investment department of the State Council, other projects subject to the approval of the competent investment departments of local governments; ▪ Chinese party's overseas investment projects with the total investment of 30 million Dollars or more subject to the approval of the NDRC.	• The projects in the class of encouragement and permission with the total investment (including capital increase) of 0.1 billion Dollars or more shall be subject to the approval of the NDRC; • The projects in the restricted class with the total investment (including capital increase) of 50 million Dollars or more shall be subject to the approval of the NDRC; • Issued by State Council on 16th July, 2004.
TFY	▪ Puts forward the guiding ideology, strategic objective, key tasks, corresponding policy measures for foreign capital utilization in China;	• Issued by NDRC on 10th November, 2006, and guideline of the foreign capital utilization work during the 11th Five-year Plan.
ALP	▪ Monopoly agreements, abuse of dominant market position, and abuse of administrative power to eliminate or restrict competition; ▪ Investigation into suspected monopolistic conducts.	• Adopted at the 29th Meeting of the Standing Committee of the Tenth National People's Congress on 30th August, 2007.
Regulation Policies on Toll Roads		
PLP	▪ Pricing way by the manager, pricing by the government; ▪ Rules for controlling of the general price level.	• Adopted at the 29th Meeting of the Standing Committee of the Eighth National People's Congress on 29th December, 1997.
RAT	▪ Standards about the construction of toll roads and setup of toll booths; ▪ Transfer of rights and interests, and management rules of toll roads.	• Adopted at the 61st executive meeting of the State Council on August 18, 2004, and go into effect on 1st November, 2004.
Expressway Safety		
RTS	▪ Speed limit nationwide from 110 km/h to 120 km/h; ▪ Overtaking on the right, speeding, and illegal use of the emergency belt (or hard shoulder) cost violators stiff penalties; ▪ A minimum speed limit is in force of 70 km/h. On overtaking lanes, however, this could be as high as 100 km/h to 110 km/h.	• Issued on1st May, 2004; • "New drivers" (i.e., those with a Chinese driver's licence for less than a year) are allowed on expressways, something that was prohibited in the mid-1990s; • Penalties for driving both below and in excess of the prescribed speed limits are enforced.

Table 2 Assessment of regulatory policies on expressway infrastructure of China

Index		Phase I (1988-1992)			Phase II (1993-1997)			Phase III[3] (1998-Now)		
		ER	CR	WR	ER	CR	WR	ER	CR	WR
Equity	EP1	HLP; RII	HLP; RII	HLP; RII	HLP; IPG; CGF	HLP IPG; CGF	HLP IPG; CGF	HLP; CGF; ALP; PLP; RAT	HLP; CGF; ALP; PLP; RAT	HLP; CGF; ALP; PLP; RAT
	EP2	-	-	-	-	-	-	-	-	CCC;
	EP3	-	-	-	-	-	-	DSC	DSC	CCC; DSC
	EP4	-	-	-	-	-	-	PAR; CFO; DSC	PAR; CFO: DSC	PAR; CFO; DSC
	EP5	-	-	-	-	-	-	-	-	-
Economic Efficiency	EEP1	-	-	-	CMF	CMF	CMF	-	-	-
	EEP2	ARE	ARE	ARE	CMF	CMF	CMF	TFY	TFY	TFY
	EEP3	ARE	ARE	ARE	CMF	CMF	CMF	TFY	TFY	TFY

Notes: EP: Equity Principles; EEP1: Economic Efficiency Principle-Minimizing Cost; EEP2: Economic Efficiency Principle-Utilitarian Maximization; EEP3: Economic Efficiency Principle-Maximizing Service Level; ER: Eastern Region; CR: Central Region; WR: Western Region

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[3] RTS is excluded in Table 3 since it focuses on the safety measure.

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