

# Reforming Russian Railways Introduction of Competition and New Regulatory Challenges

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## Abstract

Railway reform in Russia aims at opening the room for competition. The paper assesses the impact effect of new tariff structure on internal on-track competition and investigates its' state at the early stage of reform. It shows that lack of tariff flexibility makes the emerged industry structure unsustainable when vertically integrated state-owned infrastructure company serves the downstream market. This provides strong incentives for the infrastructure owner to establish 'daughter' (unregulated) train operating companies in order to prevent cream-skimming by competitive fringe. Thus the industry structure gravitates toward complete vertical separation with access to infrastructure charged likewise Ramsey formula and the final services being unregulated.

JEL classifications: D4, L1, L9, O1, P2

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А.В.Дементьев

**Реформа российских железных дорог:  
организация конкуренции и новые проблемы  
регулирования**

**Аннотация**

Реформа железных дорог в России призвана открыть возможности для развития конкуренции. В работе оценивается краткосрочный эффект введения новой структуры тарифов на состояние конкуренции на рынке железнодорожных перевозок на ранней стадии реформы. Отсутствие гибкости регулируемых тарифов в условиях существования государственной вертикально-интегрированной инфраструктурной компании, занимающейся также перевозочной деятельностью, обуславливает неустойчивость возникающей структуры отрасли. В этом случае владелец инфраструктуры имеет стимулы ограничивать долю конкурентного окружения на наиболее доходных сегментах рынка перевозок путем создания дочерних компаний-операторов, тарифы для которых не регулируются. В результате, структура отрасли эволюционирует в сторону полного вертикального разделения, при этом плата за пользование инфраструктурой в целом соответствует принципам рамсеевского ценообразования, а конечные тарифы (за перевозку) не регулируются.

## Introduction

The need to reform vertically integrated railway monopoly has been traditionally substantiated by its' poor financial and market performance. Being supported by the state to guarantee the supply of socially important services (though often of insufficient quality) this industry put a burden on government budgets.

To remedy the situation different reforming policies have been implemented worldwide. State interventions take the form of regulation of industry *structure* or *price* system. What has become a commonplace in the majority of reform packages is changing industries structures and imposing internal competition rather than intensifying regulatory pressure on tariffs (Pittman, 2003a). An overview of the reform approaches undertaken in different countries is presented in Cheviakhova et. al (2004). International experience appeared to be quite ambiguous both in terms development of competition in and efficiency of the sector. Competition issues and corresponding regulatory challenges are covered by Jensen (1998) and Campos (2001) provided a complex approach for the analysis of reform policies undertaken in the Latin American privatized rail industries.

Russia has been following its' own reform plan that calls for partial vertical integration of infrastructure with the transportation services (see Pittman (2003b), Pittman (2004)). Alternatively to the complete separation this way of inducing competition proves to be more regulatory intensive than Western European or American models with complete vertical (as in former case) or horizontal (as in latter case) separation. Guriev et.al (2003) argued that introduction of competition between at least two vertically integrated railway companies is technical feasible in Russia and probably desirable due to various imperfections of Russian regulatory system.

In this paper we analyse the ways in which Russian railway transport reform package (including institutional, structural and regulatory reforms) affect the 'competitive processes' in the sector. The major problem to concern is what are the mechanisms necessary to stimulate the desirable competition in Russian railway industry *given* the partially vertically integrated structure of the sector. These mechanisms may include efficient access pricing rule, namely pricing of the natural monopoly input needed by both its owner – Russian Railways Co. (RZD) – and its competitors in the final-product market. The other 'pro-competitive' regulatory instrument could be capping the price of the final product supplied by the vertically integrated company. Additional question here is whether the implemented regulatory

system sustainable and of sufficiently high quality to enforce the option of incomplete vertical restructuring with competition.

### **Russian Railway Reform**

After the financial crisis in August 1998 Russia has faced an unprecedented economic upheaval with the annual GDP growth averaged by 6.7%. Despite recovery being accompanied with the rise of investment and structural changes in the economy (the latter are mainly explained by import substitution effects after the sharp devaluation of the local currency), it still retains huge non-market sectors, namely *infrastructures*, that could potentially either hinder or foster the revival of economic activity in the country depending on their efficiency. According to Global Competitiveness Report 2003-2004 Russia has index of general infrastructure quality (including railroad development, port, air transport and telephone infrastructure quality, electricity and postal efficiency) ranked 60 among 102 listed countries. Poor overall infrastructure quality in Russia would undermine fast economic recovery unless serious improvements requiring huge investments are made. What makes the role of infrastructures very peculiar is the country size, climate and geography, so these sectors constitute the core rather than barely serve the rest of economy.

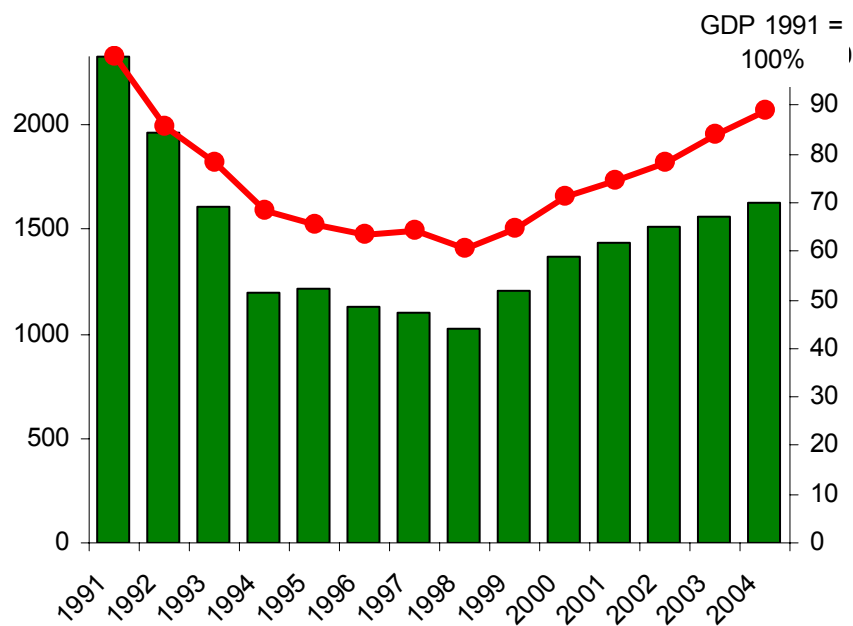
Notable exclusion is railroad infrastructure that proved to be better developed (ranked 17) than in the United States (21) or United Kingdom (30). Indeed the Russian rail system is one of the largest and most intensively operated in the world. It is second to the US Class I railroads in network size and average length of freight movement, and third in ton-km (after USA and China). Russian railway transport accounts for 21.6% of the world railway freight ton-kilometres and 7.6% of railway passenger ton-kilometres (correspondingly, 71.4% and 26.4% of European railways).

Configuration, capacity and density parameters of railroad transport infrastructure have been to a great extent inherited from the Soviet times where production and consumption structures were politically rather than economically determined. During all the period of transition there was no infrastructure capacity constraints faced by the economy which size was nearly halved (see Figure 1 below). Yet quality of services, productivity and effectiveness of production left much to be desired.

Rail accounts for over 80% of total freight ton-kilometres in the inland transport market (excluding pipe-lines). Road haulage account for six times the tonnage of the railways, however, the distance is generally short. In the European Russia road haulage accounted for 40% of t-km and that share is

predicted to increase in line with improvement of quality of road. However, East of the Urals railways has almost monopolistic position in transport area.

**Figure 1. Non-passenger railway ton-kilometres, bln t-km, and GDP growth index (right scale) in 1991-2004**



Russian Railways have the highest modal share of surface freight transport of any railway. The share of passenger as opposed to freight in Russian rail is smaller – around 40% - comparing to the EU railways average around 50%)<sup>†</sup>. The railway in Russia performs very important role. It is viewed as one of the defence assets. The peculiarities of geographical position and the climate aspects make the European and the Asian part of the sys-

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<sup>†</sup> From OECD report at European Conference of Ministers of Transport, Regulatory reform of Railways in Russia, 2004.

tem very different with railroads noticing almost no competition from the road transport in the East.

The main freight commodities carried by the railway are the following. Coal accounts for the largest part of traffic (29% of t-km and 24% of tones carried), followed by crude oil and oil products. 22% of coal tonnage is carried distances of less than 100 km and half under 550 km. Nevertheless 20% of the total is carried distances of between 3000 and 5000 km. Ferrous metals and miscellaneous category (higher value manufacturing goods and containers) travel relatively long distances.

It is worth mentioning that during all the post-crisis period (except 2002) railway transport, namely 'Russian Railways' (Rossiiskie Zheleznnye Dorogi – RZD), have been demonstrating positive profits with virtually no direct subsidies from the government (the indirect government support of the industry mainly takes the form of debt to the government budget or payment arrears). Nevertheless neither such a fairly comfortable financial position (comparing to, for instance, some European railroads) reflects the genuine profitability of the main activity no the situation with the network assets of railway transport.

**Table 1. MPS and RZD Investment Programmes, mln. USD**

	2003	2004	2005
Total investments	4609	4252	5318
including			
Train service safety and labor protection	158	173	226
Resource saving	83	117	
Functioning optimization and exploitation management	1040	1464	
Freight rolling-stock	339	490	1038*
Railway infrastructure renovation and development	493	546	3314
Electrification	465	385	136
Passenger complex development	518	701	1056

\* Not directly comparable with previous years

Source: MPS, RZD

Basically speaking, the question about the real level of deterioration and obsolescence of infrastructure remains unanswered due to the lack of thorough professional expertise (owing to missing technical monitoring competency of regulatory agencies) and insufficient transparency of the monopo-

lists. The railways accounted for 5% of Federal Government budget in 1999 and contributed 3.7% to GDP. The national railway is the largest of the state-owned monopolies in Russia with 1.2 million employees and assets amounting to between 4 and 15% of all assets in the economy.

Bearing in mind the information asymmetry we notice here that these figures reveal some information on the investment policy and, to a larger extent, on the depreciation policy in the past but cannot be considered as a serious economic argument in favour of demand for new investment, converting the disputes about the need for infrastructure investments from the economic ground to the political one. Nevertheless it is commonly asserted that railway transport has not been serving customers as well as it could have. To fight with those problems Putin's Government initiated the natural monopolies' reform, specifically in such sectors as rail transport and electric power, so that they provide their goods and services more effectively and more according to the wishes of consumers.

### **Political economy of railway transport reform**

Railway transport structural reform appeared to be a part of the broad agenda of natural monopolies' reforms. It was restructuring of railroad industry and other (energy and gas) infrastructure sectors but not a mere redirection of the ownership rights from the public domain into the private domain as in case of privatisation that was viewed (at least in the Anglo-Saxon tradition) as a 'natural' way to eliminate inherited inefficiencies. In practice, however, when economic rhetoric adverts to such vertically-integrated industries as 'natural monopolies' the restructuring policy meaning disintegration of something monolithic may be perceived as 'unnatural' policy measure (see Schröder (1998) for the formal analysis of inefficient state-owned enterprises restructuring).

Until October 2003 no separation between state and railroad industry had occurred that helped Ministry of Railways (MPS) to resist every effort to impose any competition or increase transparency. It is the change of political configuration (after new president being elected in 2000) that made railway transport reform politically feasible. Essential rotation of political elites and strengthened state decreased the political resistance to reforms. Being preconditioned by the achieved macroeconomic stability the new window of options for the market oriented reforms opened. It took another three years for the railroad reform package to have been pushed through the parliament.

Tangible signs of economic recovery revealed the main infrastructural problems: lack of investments, low quality of services and absence of internal incentives to minimize costs. To remedy the situation a 'new' reform strategy was proposed for all the three natural monopolies including deregulation and

unbundling of vertically integrated services. To encourage competition where possible was the leitmotif of reforms in case of rail and electricity sectors. Major priorities, goals and set of measures appeared to be in line with international experience of natural monopolies' reforms with special attention paid to stability preservation via gradual approach (see von Hirschhausen and Waelde (2001) for the institutional interpretation of energy sector reform in Eastern Europe and the CIS). Admitting the importance of such measures one cannot but recognise as necessary establishing a new regulatory system to accompany rather than substitute this pro-competitive policy. However little concrete could be found in reform packages about the way it should be organised. Nevertheless during the initial stage of reforms, period of search for optimal reform package, natural monopolies (including railway transport) were subject to tariff and non-tariff regulation.

The potential for developing competitive markets in transition economies has been inhibited by the inadequacy of both institutional and physical infrastructure inherited from the planned economy. Physical infrastructure, such as railway transport, had been designed to meet the needs of a highly vertically integrated production and distribution system. The current (in the mid-2004) situation in Russian railway system is marked by a number of acute problems, which can only be overcome through major transformations.

The period between 1997 and 1999 saw a change of priorities in the government's approach to reform. While previously the main goal of reforming the railway industry was to bring the price of cargo carriage down, now another goal has come to the fore: encouraging competition and ensuring solvent demand for cargo carriage. This is not accidental, because there is at present a real danger that the railways won't be able to handle cargo due to the extreme wear and tear of rolling stock and infrastructure, which in turn is due to the lack of investment. The current state of railway transport may soon become an infrastructural impediment for economic growth.

The railroad sector in Russia will continue to have market power over shippers for the foreseeable future: shipment distances are long - in part because decisions concerning enterprise locations were typically made using non-economic criteria - and the roads are so poor that many commodities that would travel by truck in the West must travel by rail in Russia. The distances of haul are so great relative to the likely volume of traffic that unexhausted economies of density will likely prevent meaningful competition among competing train operators in most regions, and the poor quality of the regulatory and telecommunications systems mean that it would be very difficult to detect and prevent discrimination against unintegrated train operators by an integrated track and train operator.



So structural reform should on the one hand seek to put an end to the shortage of resources and, on the other, create conditions for switching cargo and passenger transport (and other sectors) to competitive principles. The most difficult thing in this situation is to strike a balance between priorities, not allowing the implementation of some important goals to stand on the way of achievement of other goals. The major political economy constraint turned to be avoidance of either structural or price shocks to this crucial sector of the economy.

### **Means and ends of reform**

The officially adopted railway reform programme specifies separating the functions of the state body from those of business entity to create the best conditions for promoting competition in cargo and passenger transport, and in repair of the rolling stock, as well as ensuring guaranteed and non-discriminatory access to the infrastructure of the federal railway network for independent cargo and passenger-carrying operators. In order to improve financial performance of the industry the government was planning to implement several steps.

Cost effectiveness had to be improved by separating non core activities from the railway (however, there are still a lot of non-core organizations at the balance of the RZD, which account for more than a half of all the activities at the balance), there should be contracting for public service requirements and creation of legal and tariff frameworks for shippers and industrial customers to invest in private wagons and locomotives. The plan also provided for the creation of new general freight carriers to compete with the existing state-owned freight carriers and considered competition creation as the prior task in the framework of the efficiency increase of the RZD activities.

The Law on Regulation of Natural Monopolies defines 'natural monopoly' as a situation on a goods market where from technological point of view (decreasing average costs of production) demand is satisfied more effectively in the absence of competition and there are no close substitutes for the goods produced by the subject of natural monopoly, so demand is inelastic in price. It is worth mentioning here that neither returns to scope nor subadditivity of cost functions are ever used in legislature to define the borders of natural monopoly as a firm. Instead, it is stated in the law (original version dates back to August 1995) that the following particular spheres of natural monopolies' activities are regulated on the federal level:

- trunk pipeline transportation of oil and oil-products,
- pipeline transportation of gas,
- services for electric and heat energy transmission,

- carriages by rail,
- services of transport terminals, ports and airports services, postal services.

The last but one version of the law (March 2003) distinguished between services for electric energy transmission, electric energy dispatching and heat energy transmission. What can be observed from the very list of regulated spheres is the fact that with one exception they all refer to infrastructure services. Only in September 2004 railroad infrastructure services were added to the list, however the price for the whole bundle of vertically integrated services is still regulated (both RZD end-user charge and access charge paid by private operators. An intriguing amendment was 'railroaded' through the parliament in January 2003 – it constitutes a period of transition from the final (or end-user) price regulation to regulation of railway infrastructure services. But what makes this situation peculiar is the lack of explicit criteria to detect the end of such a period of transition. It is worth mentioning here that the only provider of infrastructural services in Russia – RZD – has never get the necessary licence and only huge inertia of railway transport and reputation of RZD workers enables railways to operate with this lack of formal (necessary) institution.

Without loss of generality one may argue that the prevailing rule of rail tariff regulation is the cost-based regulation. As it is stated in the Law on Regulation of Natural Monopolies when assessing the validity of costs regulator takes into account

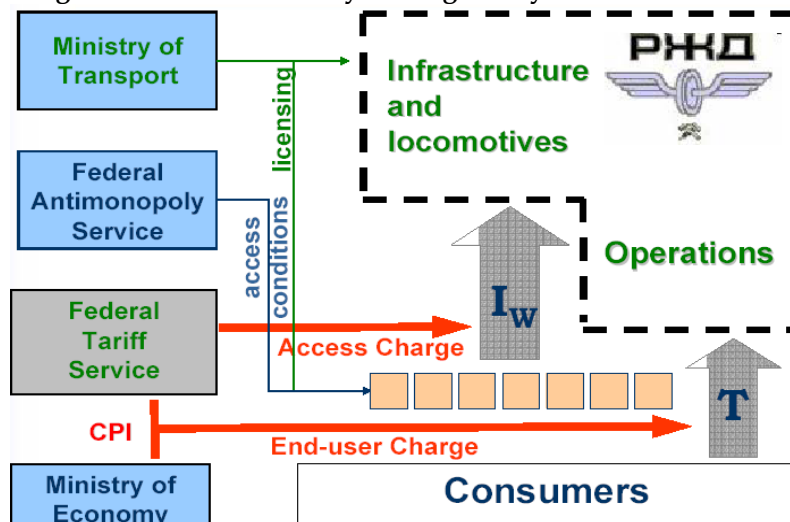
- production costs, including wages, raw materials and overhead costs,
- taxes and other payments,
- value of capital, demand for investment necessary for reproduction, depreciation,
- forecasted profit,
- remoteness of consumer groups from the area of production,
- adequacy of quality of services to consumer needs,
- subsidies and other measures of the state support.

This method of regulation requires very detailed information about performance of the regulated entity and results in the particular formal procedures to be implemented. There is a list of special requirements for the natural monopolies to follow when submitting information to regulator. What needs to be emphasised here is the information on investment demand and necessity for extended reproduction.

Since internal funds historically proved to be the major source for investment in railways (94.0% in 1999) tariff policy is organised in such a way that the planned profit included in regulated prices is determined by the planned (declared) investment but not by the cost of used capital. On the contrary, additional internal sources for investment are created via inclusion of specific 'investment component' on the tariff base.

That makes reasonable for the regulated industry to lobby for the huge investment programmes, manipulate with accounting, make threatening gestures about the increasing risk of destabilisation, etc. Comparing to the case of over-investment in the presence of rate-of-return regulation (so called Averch-Johnson effect) we have here diffusion of investment between uncompleted projects as a result of such a 'cost-plus-investment based' regulatory practice.

Figure 2. Railroad industry and regulatory structure in Russia



Since it is not very difficult for the monopolist to justify the need for investment if regulator is poorly informed about the real state of affairs in the industry it has become the prevalent practice to inflate the investment programmes. One must admit the importance of emergence of several different approaches to regulation, namely three-year price caps or rate-of-return regulation. Nevertheless 'cost-plus-investment' principle in tariff setting until recently dominated others.

Figure 2 above illustrated the state of affairs in terms of structure and regulatory institutions in the industry as they appeared to be a year in October 2004. The following section addresses regulatory reform issues.

## **Regulatory reform**

The main law that constitutes all the regulatory system was issued on 17 of August 1995 – several months after the Presidential Decree on the establishment of the Federal Energy Commission (FEC) as a regulatory agency in energy (gas, oil and oil-products, heat and electricity) sectors. It took one year for the FEC to start its work in August 1996 and two years for the Federal Service for Regulation Natural Monopolies on Transport (FSEMT) as a transport regulator in September 1997. After a year of functioning immediately after the August 1998 financial crisis FSEMT was liquidated and its functions were passed to the Ministry for Antimonopoly Policy (MAP). Interestingly in May 1999 FEC was abolished by the Yeltsin's Presidential Decree but this decree was interrupted by in June 1999.

The 'new' approach to regulatory policy was clearly declared in one of the government enactments in just two months after Putin started his work as a prime-minister. The Government Enactment # 1158 in October 1999 (On provision of economically sound principles of pricing natural monopolies' services) said that in order to *moderate inflation process* in the economy and provide economically reasoned principles of pricing natural monopolies' services Government assigns Ministry of Antimonopoly Policy and FEC to set these prices on the basis of *costs* of production, investment demand, depreciation, forecasted profits, distances to final consumers, correspondence of quality to consumers' needs, as well as government subsidies and other measures of state interventions in natural monopolies' activities. This enactment commemorated the end of prohibitively restrictive policy of 'freezing tariffs' that took place in Russia in 1997- October 1999 and was aimed at stopping the inflationary processes and providing an additional push to national industries (along with sharp currency devaluation), and meant the return to principles stated in the Law on Natural Monopolies.

In September 2001 Presidential Decree transferred additional regulatory power to FEC extending it to natural monopolies on transport, particularly railway transport. In practice, however, all the important tariff decisions were prepared by the Government Commission on Railway Tariffs headed by the first deputy premier-minister. FEC only legitimized the enactments on this commission. In February 2004 the reorganization of the Government liquidated FEC and established Federal Agency on Tariffs. The first decision of the new agency (about the level of tariffs for railway transport in 2005-

2006) was made in August 2004 – 7.5% increase in rail tariff was allowed for the 2005 with CPI forecasted at 8% level for that year.

### **A simple model of induced competition**

From the theoretical point of view the problem of encouraging competition in the infrastructure industries can be resolved in the following ways. The first option is the vertical separation of the infrastructure services that poses the natural monopoly properties and the potentially competitive activities (transportation) as in the UK railways. The second option is the horizontal separation and introduction of competition between vertically integrated railway companies (as in the US and Mexico). Russia has chosen the third way with vertical integration of the infrastructure and part of the final services (transportation) being retained. That alternative to the complete separation (either vertical or horizontal) seems to be the most ‘regulatory intensive’ in terms of providing some scope for competition. The central issue of Russian antitrust and regulatory authorities is how to combine the necessary regulation of the natural monopoly component (infrastructure) with the organisation of competition in activities which use the network as an input and are potentially competitive.

Sidak and Spulber (1998) address the question of rising access to the network facilities of an incumbent firm after deregulation. They emphasize that access prices should be set such that they satisfy an individual rationality condition for the incumbent firm so that access is granted voluntarily. They examine the effects of the voluntary access condition on incentives for entry and show that properly chosen access prices provide incentives for efficient entry using several alternative competition models: Bertrand-Nash, Cournot-Nash and Chamberlin competition with differentiated products.

Economides, Lopomo, and Woroch (1996) evaluate the effectiveness of several pricing rules intended to promote entry into a network industry dominated by an incumbent carrier. Drawing on the work of Cournot and Hotelling, they develop a model of competition between two interconnected networks. In a symmetric equilibrium, the price of cross-network calls exceeds the price of internal calls. This ‘calling circle discount’ tends to ‘tip’ the industry to a monopoly equilibrium as would a network externality. By equalizing charges for terminating calls, reciprocity eliminates differences between internal and cross-network prices and makes monopoly less likely. Imputation counteracts an incentive by the dominant network to ‘price squeeze’ a rival by eliminating differences in the wholesale price of termination and the implicit price for internal use. By increasing profits of rival networks and increasing their subscribers’ surplus, imputation supports additional entry. Finally, an unbundling rule reduces termination fees charged by a dominant

network that was engaging in pure bundling. Again, entry will be facilitated as rival networks offer potential subscribers a more attractive rate schedule.

Gans (2001) analyzes optimal pricing for access to essential facilities in a competitive environment. He focus is on investment incentive issues arising from regulation under complete information. To that end, examining the provision of a natural monopoly infrastructure with unlimited capacity, it is shown that the fixed component of a regulated access price can be structured so as to induce a "race" between market participants to provide the infrastructure. An appropriate pricing formula can ensure that a single firm chooses to invest at the socially optimal time (taking into account producer and consumer surplus) despite the immediate access granted to rivals and the non-existence of government subsidies. Under the optimal pricing formula, firms choose their investment timing based on their desire to pre-empt their rivals. This pricing formula is efficient (a two part tariff), implementable ex post, and robust to alternative methods of asset valuation (replacement or historical cost). When firms are not identical, the access pricing formula resembles, in equilibrium, a fully distributed cost methodology.

Estache and Valetti (1999) discuss in detail the importance of access pricing in the context of: 1) a liberalized and vertically separated industry, 2) liberalized but vertically integrated industries, 3) unregulated access (private negotiations).

We attempted at modelling the tariff reform designed to introduce competition with vertically integrated provider of essential facility (infrastructure owner) on the downstream market. We show that under certain conditions there could emerge 'managed' competition (policy-induced) when detailed cost structure remains unknown (probably even for the monopolist itself) and several external constraint are imposed by the regulator (Government). The model considered below addresses the possibility of introduction of 'managed' competition in the downstream market when end-user tariff for vertically integrated essential facility (infrastructure) owner is regulated while access charge is not.

Several assumptions are to be made in order to reflect conditions faced by the monopolist. Initially the vertically integrated monopolist (RZD) provides  $\bar{Q}$  units of final service (homogeneous cargo transportation) for regulated tariff  $T$ . Then reform for competition in the downstream market is declared by the government. Monopolist faces the following problem: how to set charge 'for the use of infrastructure',  $a$ , paid by the new entrant and guarantee that his entry decision is compatible with the incentives to earn non-negative profit. The end-user tariff charged by the monopolist is still regulated at the previous level  $T$  because government is extremely anxious about inflation. The total demand for the final service is assumed to be fixed at

level  $\bar{Q}$  and inelastic since we consider only short-term consequences of a new tariff system introduction. It means that new entrant is only able to undercut the incumbent but never set the price above the regulated level  $T$ . In turn the monopolist is bound to set access charge  $a$  subject to the constraint  $a < T$ .

We address here the question of whether there exist any reasonable access charge to guarantee the emergence of new competitors on the downstream market. Alternatively, what  $a < T$  could support the downstream market (equilibrium) structure when the quantities produced by the competitor and the monopolist are both positive, that is, correspondingly,  $q > 0$  and  $Q > 0$ , subject to  $q + Q = \bar{Q}$ . We also assume that since all the demand  $\bar{Q}$  is to be satisfied there are only variable costs  $VC(\bar{Q} - q)$  incurred by the monopolist on the downstream market and all the infrastructure costs  $FC$  are fixed. For simplicity sake we assume no fixed costs<sup>‡</sup> incurred by the new entrant (let's denote variable costs for competitor as  $VC_c(q)$ ) who maximizes his profit subject to 'voluntary entry' (non-negative profit) condition:

$$\max_{q>0} [(P - a)q - VC_c(q)], \text{ s.t. } (P - a^*)q^* - VC_c(q^*) \geq 0,$$

where  $P$  is the (unregulated) price charged by the competitor at the downstream market.

From the competitor's profit maximization problem we find his reaction function  $q = q(a)$  and check whether entry decision is incentive compatible. Taking into account this reaction function that exhibits the standard property  $q'(a) < 0$ , monopolist solves the following problem:

$$\max_{0 < a < T} [T(\bar{Q} - q(a)) + aq(a) - VC(\bar{Q} - q(a)) - FC]$$

From the first order condition we deduce the relationship between access charge  $a$  and output produced by the competitor:  $q = q'(a)(T - a - VC'(\bar{Q} - q(a)))$ . If monopolist is free to choose  $a$  but has to guarantee  $q > 0$ , access charge should satisfy  $T - VC'(\bar{Q} - q) < a \leq P - VC'_c(q)$ .

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<sup>‡</sup> The possibility of leasing wagons from RZD or private owners (thus incurring only variable costs) makes this assumption less unlikely to hold in practice.

Since there is the supplier that guarantees provision for the final service for the piece equal to  $T$ , the derived competitor's demand for the infrastructure service should take into account the so called 'no arbitrage condition' for end-user price charged by the competitor:  $P \in [0; T]$ . So under our assumptions competitor may always do better by setting  $P = T$  this inequality holds when  $VC'_c(q^*) < VC'(\bar{Q} - q^*)$ .

If monopolist has now estimates for the competitor's cost function other than his own variable costs  $VC'_c(q) = VC(\bar{Q} - q)$ ,  $\forall q \in [0; \bar{Q}]$  and marginal cost function is increasing, he would set  $a$  such that  $q^* < \bar{Q}/2$ . On the other hand, competitor may occupy more than half of the final service market had it turned to be more efficient than monopolist in terms of marginal costs of producing final service.

As it is prescribed by the Plan private companies would be allowed to use up to 50% of the wagon fleet in cargo transportation. Eventually (probably in 2010) private companies may replace RZD in executing these functions, leaving to RZD only general control over the infrastructure network, which they could rent.

For incentive compatibility constraint of the monopolist to satisfy and the new regulatory scheme to be pro-competitive we should compare the monopolist's profits before and after the reform. One should know the particular functional form of monopolist cost function. Under a wide range of assumptions about competitors' cost functions such a 'rigid' regulatory framework turns out to be unsustainable since unregulated competitive fringe has good incentives to exhibit cost-minimising efforts and outperform the monopolist in the future.

In case of multiproduct monopoly the same analysis applies for each commodity pricing controlling for the overall break-even constraint of the regulated firm. The usual solution to this problem corresponds to Ramsey formula when third-degree price discrimination means subsidisation of one commodity by the others. Next two sections reveal the nature of cross-subsidisation in Russian railways.

### **'Old' rail tariff structure and cross-subsidies**

It is worth considering the tariff structure in detail to see what this structure promotes and whether it impedes the reform objectives in some respect.

The newly adopted Price List 10-01 was hugely based on the 1989 version of the same tariff schedule which in turn borrowed almost all the



main principles from the late 60-s vision on the centrally planned economy and the role of transport in that economy. For example, coal and aluminium industries in Central Siberia could only survive if tariffs for transportation would have been low in order to control, respectively, price to consumer (coal in the European Russia) or input price (bauxites shipped from the Pacific coast ports). As a consequence the very structure of the Price List 10-01 appeared to reflect industrial policy of the state. In addition, being based on the fully distributed cost principle with highly differentiated internal structure that implies higher charges for higher value commodities it gave rise to several types of cross-subsidies associated with the railway transport.

First, by distinguishing between *three classes of commodities* relative to their value added and taking into account shipment size, routings, distance and speed, the monopolist with huge fixed costs was able to meet its budget constraint. Given equal conditions of carriage the third class commodities (ferrous and non-ferrous metals or chemicals) with higher tariff subsidised the first class commodities (coal, ore, timber) because incremental costs for both carriages were exactly the same. Very approximate estimation demonstrated the variation of different carriages profitability ranging from -50% to 200%.

Second, *export-import carriages* subsidised domestic ones because exporters sold their products at higher prices than domestic producers. So by charging lower tariffs for domestic transportation railway transport subsidises domestic consumers from its export revenues.

Third, *geographical cross-subsidization* comes from different costs of service for European and Siberian parts of Russia. Unified tariff schedule implies that Siberian shipper should pay for congestion problems in Moscow region. Similarly with the absence of peak-load pricing principles such a 'smooth' tariff schedule allowed for *seasonal cross-subsidisation*.

Some long-distance passenger and freight carriages *subsidised suburban passenger services* that earned negative profit because of public service obligations. This consideration that to some extent affected the design of reform package came from social attitude towards services provided by railway transport as public good. For decades economic agents get used to consume those services without taking into account their price (because it was low enough not to bother about) considering them as a natural duty of the state. Hence, remaining vital in providing necessities of life to people and being key input to the rest of the economy railway transport deserves a special attention when regulated. It is not clear then what is the 'fair' price for such services from the socio-economic point of view because the criteria of fairness remain unclear (even theoretically) and are not stated explicitly in the law. What makes them biased in Russia is the very nature of regulation in-

tended for balancing conflicting interests and taking into account electoral behaviour of the consumers.

Another type of cross-subsidies also has much to do with *politics*. For instance, mass-scale granting of individual tariffs, departmental telegrams and instructions on particular tariffs of the Ministry of Railway Transport (which until September 2003 combined economic and administrative functions), and anti-competitive behaviour of railroads (delaying or even refusing the provision of access to the essential facilities) have been creating unequal conditions for independent operators, forwarding agents, proprietors of the rolling stock, and have been infringing the interests of economic entities and citizens (see Dementiev and Doronkin (2001) for the detailed analysis). From the political economy point of view such a 'flexible' tariff policy could be viewed as an outcome of a political bargaining between regulator, Railway Ministry and powerful pressure groups and could be justified as a 'rational outcome' in this sense. In addition it turned out to be 'rational' from the government's point of view because liquidation of cross-subsidies in these sectors would inevitably increase on-budget expenditures that could be undesirable for the government seeking fiscal stability (budget surplus, foreign debt repayments) and viewing it as a key to growth and necessary precondition to stay in power.

Indeed, Russian railway transport *de facto* subsidised the rest of the economy in an implicit manner through low tariffs and enterprise arrears. Again the final outcome of the regulatory process can be viewed as a resultant force of different interest groups' pressures.

### **Tariff structure 'perestroika'**

The development of the new freight tariff lasted about 3 years. In its development, besides the Russia Railways Ministry, took part the Federal Energy Commission, the Ministry of Economic Development and Trade, the Ministry of Finance, the Ministry of Antimonopoly Policy and Business Support, the Ministry of Transport, and also the customers of railway transportation on behalf of whom acted, in particular, the Union of metallurgists and Commercial and Industrial chamber. The development of the new freight tariff project was supervised by the Commission of the Russian Federation Government on matters of tariff regulation on the Federal railway transportation under the direction the vice-president of the Government of the Russian Federation. However the most significant role in the elaboration and adoption of the new Price List 10-01 played the former MPS manager who worked for the FEC during these years and quickly returned to RZD in September 2003. It would not be an exaggeration to say that at the moment there are virtually no specialists on railway transport among civil servants, so the problem with

lack of professional expertise and asymmetric information in tariff setting procedures retains.

Freight Tariff 10-01 "Tariffs for cargo transportation and infrastructure services carried out by the Russian railways " (Price List) was authorized by the decision of FEC then registered by the Ministry of Justice.

The development of new freight tariffs uses some basic principles:

1) The split of tariffs into two components - the payment for wagon fleet usage and the payment for infrastructure and locomotive traction usage. The wagon usage component is on average the constant figure determined as 15.5 % from the tariff, without differentiation between classes of cargo, and covering expenses on technical service, repair and amortization. The volume of the wagon component is a reference point to the shippers of economic feasibility of their own fleet of wagons;

2) The differentiated approach for payment for cargo transportation depending on the volume of a loading and a route;

3) Encouragement of shipper's interest to use several types of rolling stock;

4) Revision of the so-called minimal loading weight norms of wagons (in particular, toughening of the control over filling of tank-wagons for oil products transportation);

5) Regulating of transportation payment system of the export-import cargo, transported via border rail stations;

6) Levelling of cargo transportation conditions for all regions of the country.

The list of the 1-st tariff class cargoes includes coal, coal-coke, nepheline ores and their concentrates, bauxites and aluminium ores, mineral and building materials, ores and concentrate of nonferrous metals, saw-timbers, lumber (except shoring timber), gasoline, etc.;

The list of the 2-nd class cargoes includes crude oil, black and coal oil, mineral fertilizers, mineral and building materials, etc.;

The list of the 3-rd class cargoes includes oil products, nonferrous metals and products made from them for industrial purposes, ferrous metals, etc.

This approach discriminates between various consumers with different elasticities of demand functions charging higher prices for those with higher willingness to pay (so called *Ramsey pricing*) in order to cover its fixed costs. That is transportation of oil subsidies coal. Good example of such a policy is the schedule of railway tariffs (Price List #10-01) that for example considers beer as a third class cargo while mineral water as a second class.

According to Ramsey formula the mark-up between marginal costs of access to infrastructure ( $MC_w$ ) and infrastructure charge ( $I_w$ ) should increase

if shadow price of public funds increase (distortions of tax system  $\lambda \approx 0.5$ ) and rail tariff elasticity of demand for transportation ( $\eta$ ) decreases:

$$\frac{I_w - MC_w}{I_w} = \frac{\lambda}{1 + \lambda} \frac{1}{\eta(I_w)}$$

Table 2 illustrates how close are the differences in rail tariffs for a number of commodities to the proportional relationship with the inverse elasticity of demand for transportation of such a commodity.

Generally speaking, current regulatory framework in Russia leaves the infrastructure monopoly with principal possibility to (price)-discriminate potential competitors when charging the access to infrastructure (rails and locomotives). In effect Russian railway monopolist seems to be allowed to price its 'access service' on a discriminatory basis, namely it sets the higher price for the goods with less elastic demand (with respect to the railway tariff) and *vice versa*.

**Table 2. Price discrimination between different tariff classes**

	Tariff class	Share in loading, %	Share in ton-kilometres, %	Share in revenues, %	$\sim \eta$ , (T/P) %
Ore minerals	I	10.3	8	5.6	31
Coal	I	22.9	28	13.4	26
Mineral and construction products	I-II	19.6	7	6.8	15
Oil	II-III	17.7	16	29.6	8*
Ferrous metals	III	6.3	18	11.6	4
Total		76.8	77.0	66.6	

### Do tariffs promote competition?

The emergence of on-track competition will significantly depend on the incentives provided by the reformed tariff structure set up by the Price List # 10-01 (introduced in August 2003). In the absence of any reliable data on RZD cost structure we thoroughly simulate different situations basing on the Price List to address the following question:

- 1) Is the newly introduced tariff structure reputed to be 'pro-competitive' as it was declared in the Plan?

- 2) Does additional competition in railways undermine seriously the financial stability of RZD?
- 3) What are the most attractive niches for competitive fringe to emerge?
- 4) How does the tariff structure influences the railway transport market structure?

Hereinafter we compare transportation costs incurred by anyone who wants to carry his commodities by rail in Russia.

There are four principal ways to do this depending on the ownership of locomotives and wagons:

- Use RZD locomotives and wagons and pay to RZD the end-user tariff comprised by so called 'infrastructural and locomotive' ( $I$ ) component and 'wagon' component ( $W$ ) (Scheme I1+B3 or B4 depending on wagon type);
- Use RZD wagons and private locomotives and pay to RZD 70% of  $I$  ( $I_L$ ) for the access of locomotive plus payment to private carrier for its locomotives (Scheme I1·0.7+B3 or B4 depending on wagon type);
- Use RZD locomotives and private wagons and pay to RZD for its infrastructure and locomotives for the access of wagons ( $I_w$ ) and to private operator for its wagons (Scheme 8);
- Use private locomotives and private wagons and pay to RZD for its infrastructure ( $I_{WL}$ ) and to private carrier(s) for locomotives and wagons (Scheme 110, 111, 112 for electric locomotive and Scheme 113, 114, 115 for diesel locomotive)

These four schemes are summarized in Table 3 below.

**Table 3. Tariff calculation schemes and ownership of carriages and locomotives.**

Locomotive \ Wagons	Private (Rented)	RZD
Private (Rented)	$I_{WL}$ Scheme 110-112 for electric locomotive Scheme 113-115 for diesel locomotive	$I_w$ Scheme 8
RZD	$I_L+W$ Scheme. 0.7(I1)+B3(or B4)	$I+W$ Scheme I1+B3(or B4)

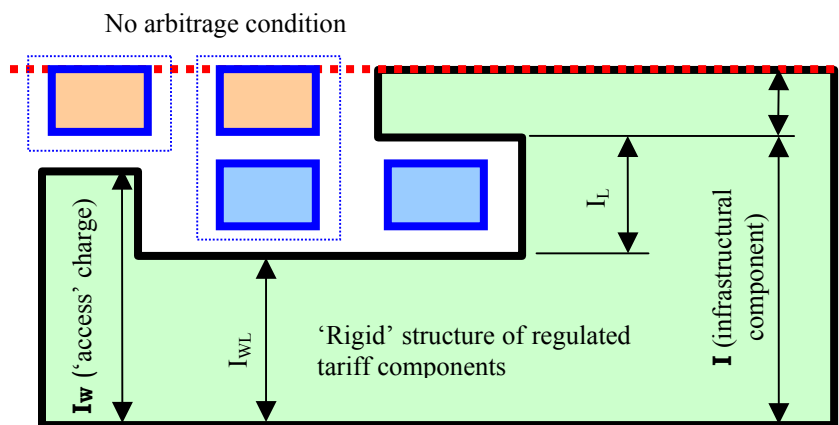
Source: Price List # 10-01.

Levine (2002) points out that not only is price discrimination very often welfare-enhancing (for instance as Ramsey pricing suggests it is for natural monopolists), it is not evidence of the unilateral or collusive power to affect industry output, which is at the heart of the ‘monopoly power’ or ‘market power’ concepts. Price discrimination also helps to explain and justify network pricing behaviour that has been accused of being predatory.

RZD end user tariffs ( $T$ ) seem to be well above comparing to infrastructure charge for car operators ( $I_w$ ) and carriers with own locomotives and cars ( $I_{wL}$ ) (see the example of the charge for train of fifty 66 ton general freight cars in the Appendix). All calculations are based on the Price list # 10-01, which is used to determine payments for all agents, who use Russian Railroad System (RZD) to carry cargos or who wish to use its infrastructure to transport his own wagons and locomotives. These payments are subject to distance, weight of the cargo and type of the cargo; further, the tariff schemes depend on the owner of locomotives and carriages. Russian railroads also outline three classes of cargos (1st, 2nd and 3rd) and use adjustment coefficients to take into account these classes. Besides this specific adjustment coefficients are used for some goods such as, for instance, crude oil.

At the graphs presented in the end of the paper we compare payments, which private company will have to make to use RZD infrastructure to transport cargos, using its own carriages and locomotives, with payments, which one would need to carry the same cargo in RZD wagons and by RZD locomotives. Additionally we compare these payments with payments, which private company have to make if it chooses to transport its carriages with locomotive of RZD.

**Figure 3. New tariff structure in freight railways according to the Price List 10-01**



For each tariff class we draw several graphs to compare different tariff schemes under several assumptions. It can be clearly seen from the graphs that infrastructural component (I) in the end-user RZD tariff (I+W) is higher for the third class commodity with lower share of transportation cost in the final price. Moreover the share of infrastructural component is also higher for the third class commodities<sup>§</sup>. Bearing in mind the transport tariff elasticity of demand for infrastructure service one could judge that this system resembles Ramsey pricing approach. Note that so called ‘wagon component’ in the final price is unique for different classes of commodity and almost flat with respect to distance of haulage.

## First results

Russian Railway transport reform proves to be making progress comparing to other infrastructural reforms in the country as well as in the light of international comparison. Some results are already evident, with significant investment in rolling stock by private operators following creation of the necessary legal framework and modifications to rail tariffs. Though these results are intermediate and do not guarantee the success of reform at the final stage.

First consider the impact on prices. The Railway Commission was scheduled to make proposals for improving tariff regulation in December 2003, including minimization of barriers to market entry for new carriers. The August 2003 version of Price List 10-01 "Tariffs for cargo transportation and infrastructure services which are carried out by the Russian railways" aimed at promoting private investment in wagons and locomotives for private carriers. Its impact in relation to stimulating the emergence of new general freight carriers is much less clear. It seems likely that the tariff schedule will need to evolve over the next years as its impact on this second kind of private operator becomes apparent and the objectives for competition policy are clarified.

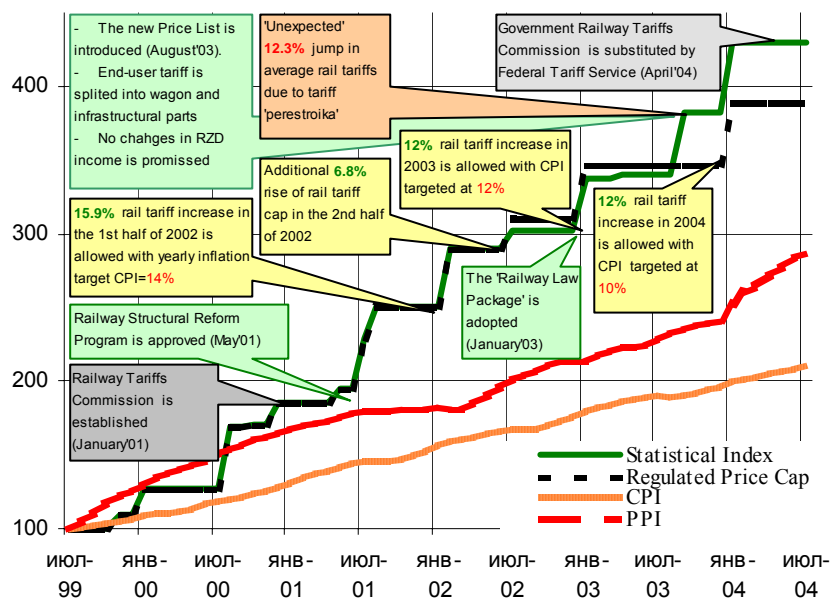
A month after the introduction of new tariff plan RZD income practically did not change but prices in railway sector jumped 12.3% up. Three months after the introduction of The Price List 10-01 RZD managers reportedly declared that incomes of RZD had not increased. The initial analysis of changes in the situation on the rail transportation market gives the grounds to believe, that as a whole the introduction of new tariff system solved the tasks

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<sup>§</sup> See Figure 4.5 in OECD (2004) for the share of transport cost in commodity prices

assigned to its developers by the Government. There was an increase in oil and oil products transportation costs. Such a decision was made by the Federal Energy Commission in coordination with the Government in order to compensate the loss of the Russian railways (about 300 million rubles) that originated after the decrease of the tariffs for coal, metals and other cargoes transportation in the direction of ports with the purpose of regular distribution of freight flows and the maximum loading of the Far East seaports.

**Figure 4. Tariff dynamics and major institutional measures during reform**



As a whole in Freight Tariff 10-01 there was decrease of tariffs by 4 % for the 1-st class cargo, increase of tariffs by 3 % for the 2-nd class cargo, tariffs for cargo transportation of the 3-rd class remained without changes. In the first half of 2004 RZD increased its freight traffic (by 8.7%) and volumes of loadings (by 5.9%), however, the main profit was provided due to low profitable cargoes such as coal, so there was a decline in revenue per to-km.



The freight traffic growth did not lead proportional increase of the company's profit.

### Changes in railroad industry structure

It is important to note that competition in wagon operation emerged *de facto* well before the adoption of the New Price List 10-01.

The period of underinvestment in rolling-stock in mid-90s led to quality reduction of existing car fleet together with shrinking of its size. Accompanied by economic downturn it had not been imposing any supply-side constraints on transportation until the start of recovery in 2000. Led by ruble devaluation and oil price shock Russian economy started to demand for higher transportation volumes mainly to export its mineral resources (crude oil in particular). However the potential for growth driven by oil-exporting sector was limited by the existing pipe-line infrastructure capacity. The only reasonable alternative for oil exporters proved to be transportation by rail (despite rail tariffs for them being tied to foreign currency and exhibited almost direct pass-through after devaluation).

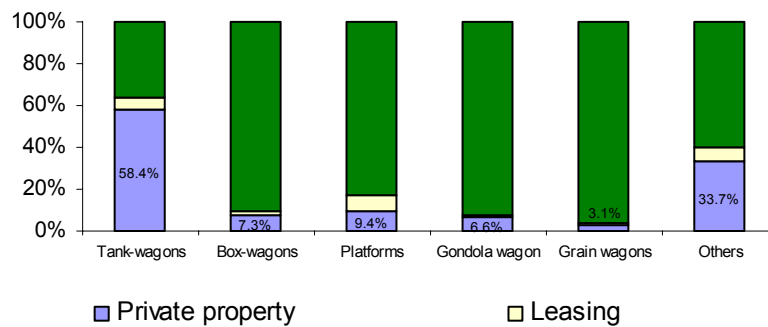
It was the lack of sufficient amount of tank wagons that initially made investment in private rolling stock attractive. Transportation divisions of vertically integrated oil-producing companies (as well as metallurgical holdings) became major wagon owners. They had to pay for the access to infrastructure (though having obvious competitive advantage comparing to other shippers) but there were no legal basis for that. The adoption of new tariff plan filled this gap.

**Table 4. Changes in private rolling stock**

	01/2001	01/2002	01/2003	01/2004	06/2004
Wagon owners	1500-2000			2450	
Private wagons, including	157773	173301	194127	223501	239623
Tank-wagons	96272	103075	113545	131330	137170
Open-wagons	8819	12629	16331	22423	30946
Licensed Wagon Operating Companies		34	70	85	85
Private locomotives		-	-	5	40
Licensed Rail Carriers		0	0	11	29
Infrastructure owners		3	4	4	3
Licensed Infrastructure service providers		No license is given yet			

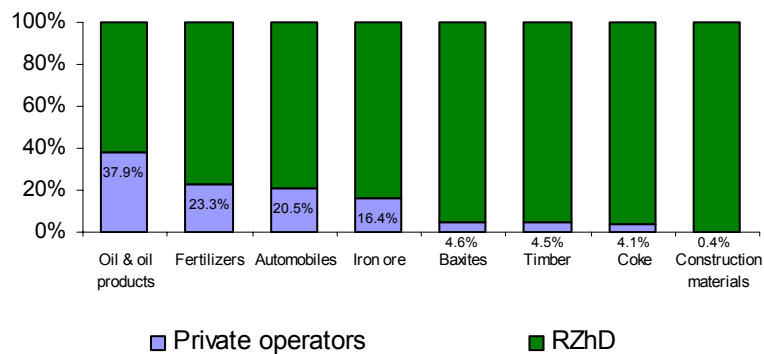
Source: RZD

**Figure 5. Structure of ownership in freight rolling-stock in 2003**



Source: RZD

**Figure 6. Structure of some niche markets for freight carriages in 2003**



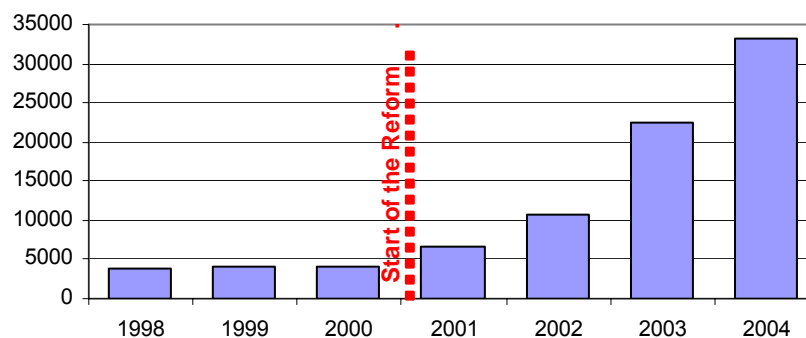
Source: RZD

Different estimates show that the share of private railroad operators in cargo transportation made up from 26% to 31% in the first half of 2004. At the same time freight wagon fleet grew substantially to reach almost 240 thousand, or about 25% from total (including RZD).

The dramatic upheaval of domestic car-building industry was primarily induced by the increased demand from independent car-owners, who

bought 87% of 26.5 thousand new cars in 2003 (91% of 16.7 thousand in the first half of 2004). In this sense the emergence of on-track competition

**Figure 7. Freight wagons yearly built in Russia**



### **Lessons and conclusions**

The progress of Russian railway transport structural reform is related to emergence of on-track competition with vertical integration of infrastructure and part of the final services (transportation) being retained. That alternative to the complete separations seems to be the most ‘regulatory intensive’ in terms of providing some scope for competition. The paper shows that the lack of tariff flexibility forces the system to evolve towards complete vertical separation when access to infrastructure is charged in accordance with Ramsey formula and final services are unregulated.

Since RZD is bound to stick to Price List #10-01 in terms of tariff structure (relative levels of infrastructure payment and end-user tariff are fixed) the only ‘moderate’ tariff level indexation is left for the company to suppress competition. It is worth mentioning here that Russian government could favour such an instrument because it enables it to moderate inflation in the economy. There are also non-tariff instruments to deal with competition such as capturing rolling-stock suppliers by signing long-term contracts with them, as well as establishing RZD operating ‘daughter’ companies that have to be unregulated on the final market to prevent cream-skimming on the most lucrative markets (first of all transportation of oil and class 3 commodities).

The above analysis has shown that Russian railways face figuratively speaking ‘oil’-induced internal competition stimulated by the limited capacity of pipe-lines and high price of crude oil. Current regulatory system favours

complete vertical separation of regulated infrastructure and unregulated operations like in Western Europe. What makes the situation in Russia more complicated is the principal possibility left to the infrastructure monopoly to (price) discriminate potential competitors when charging the access to infrastructure (rails and locomotives). In effect Russian railway monopolist seems to be allowed to price its “access service” in accordance to Ramsey formula. In other words it sets the higher price for the goods with less elastic demand (with respect to the railway tariff) and *vice versa*.

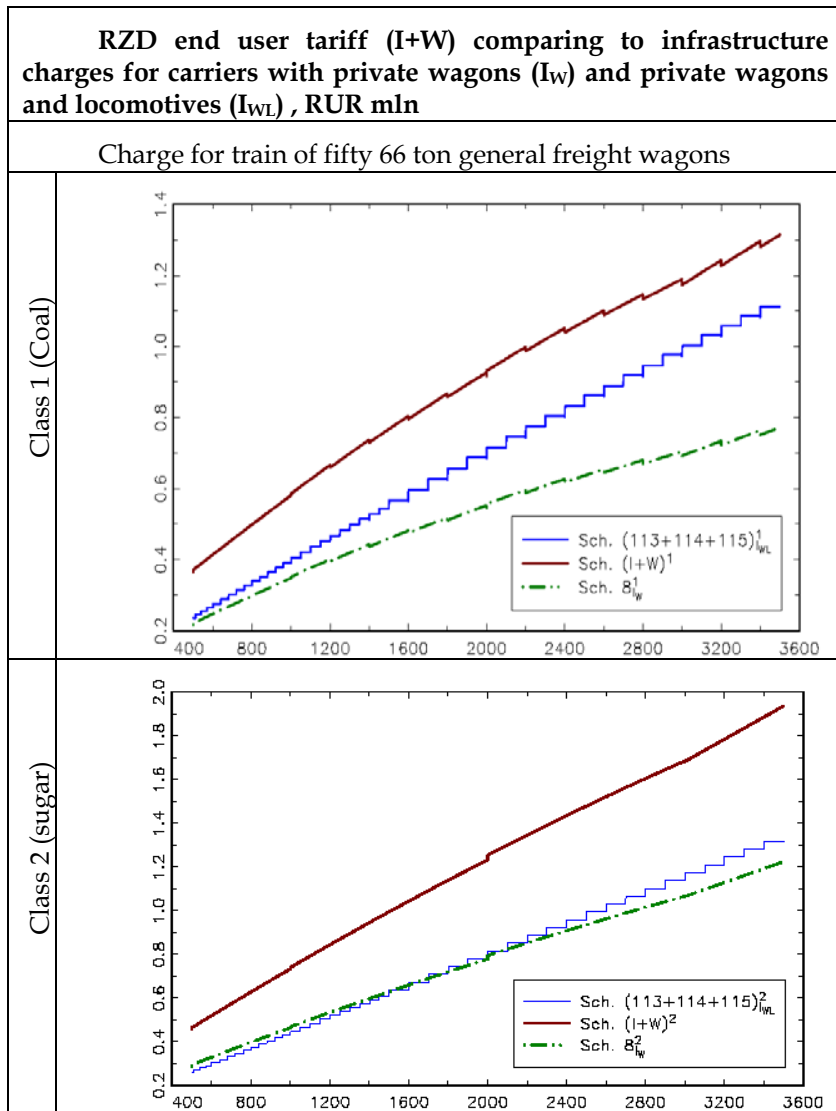
On the one hand this practice helps the overall budget constraint to be satisfied (and thus the huge fixed costs to be covered). On the other hand it does not guarantee the “fairness” of access to the railway infrastructure of the independent operators.

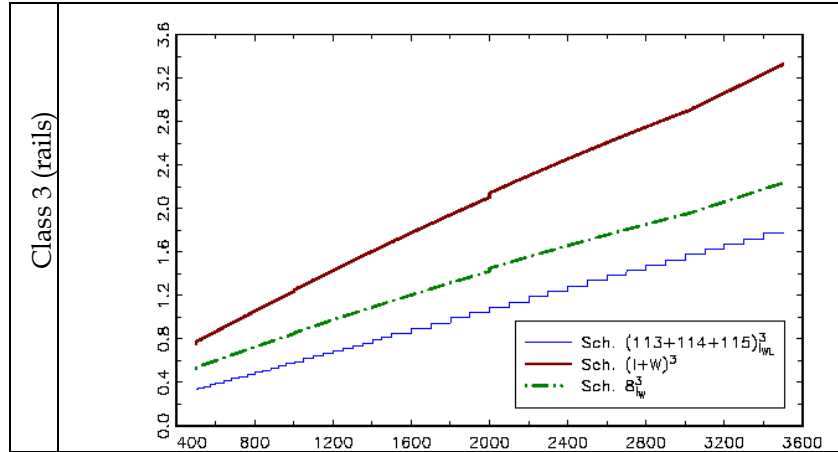
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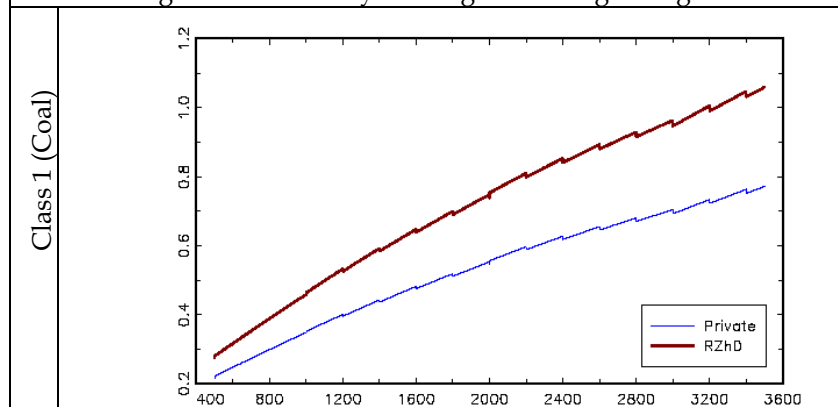
## Appendix



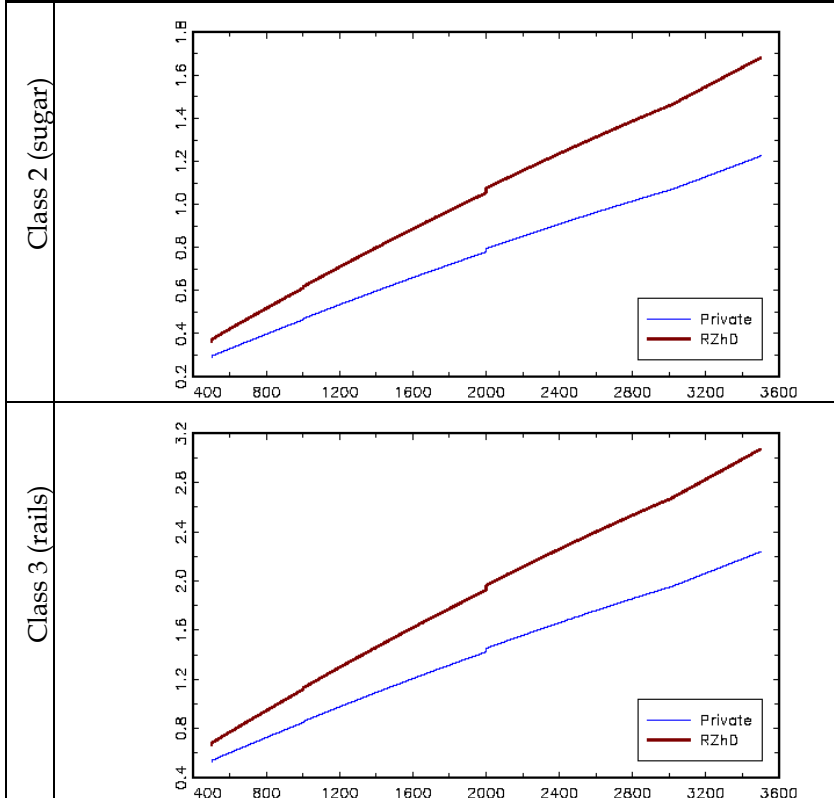


**'Infrastructure and locomotive' component (I) comparing to infrastructure charges for carriers with private wagons ( $I_W$ ), RUR mln**

Charge for train of fifty 66 ton general freight wagons



**'Infrastructure and locomotive' component (I) comparing to infrastructure charges for carriers with private wagons (I<sub>w</sub>), RUR mln**

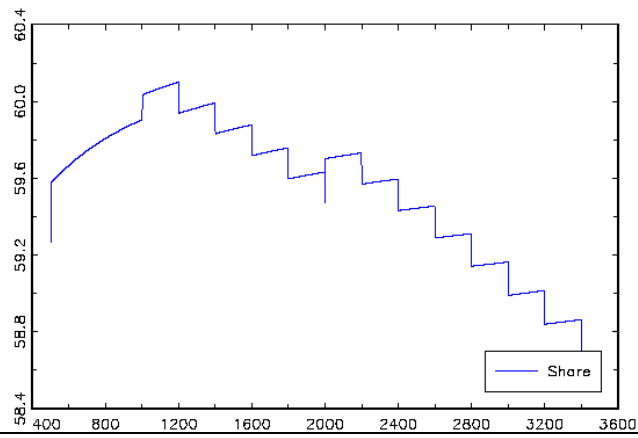




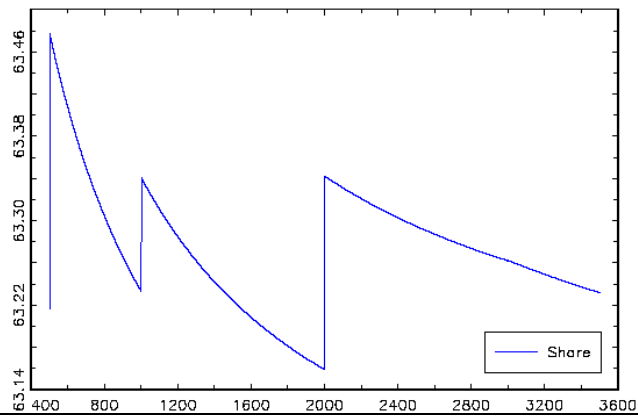
**The share of infrastructure charge for wagon owner ( $I_w$ ) in RZD end user tariff ( $I+W$ ), %**

Charge for train of fifty 66 ton general freight wagons

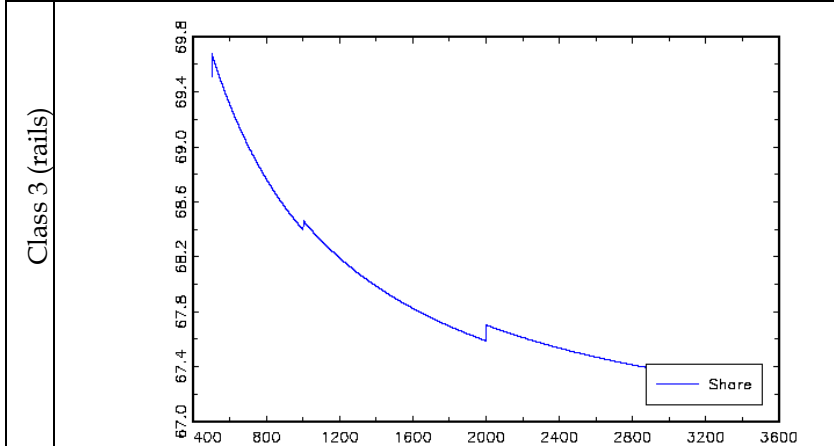
Class 1 (Coal)



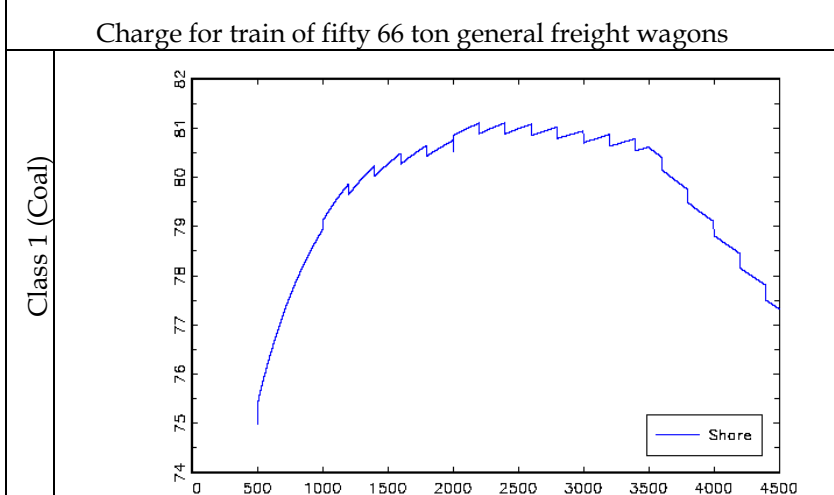
Class 2 (sugar)



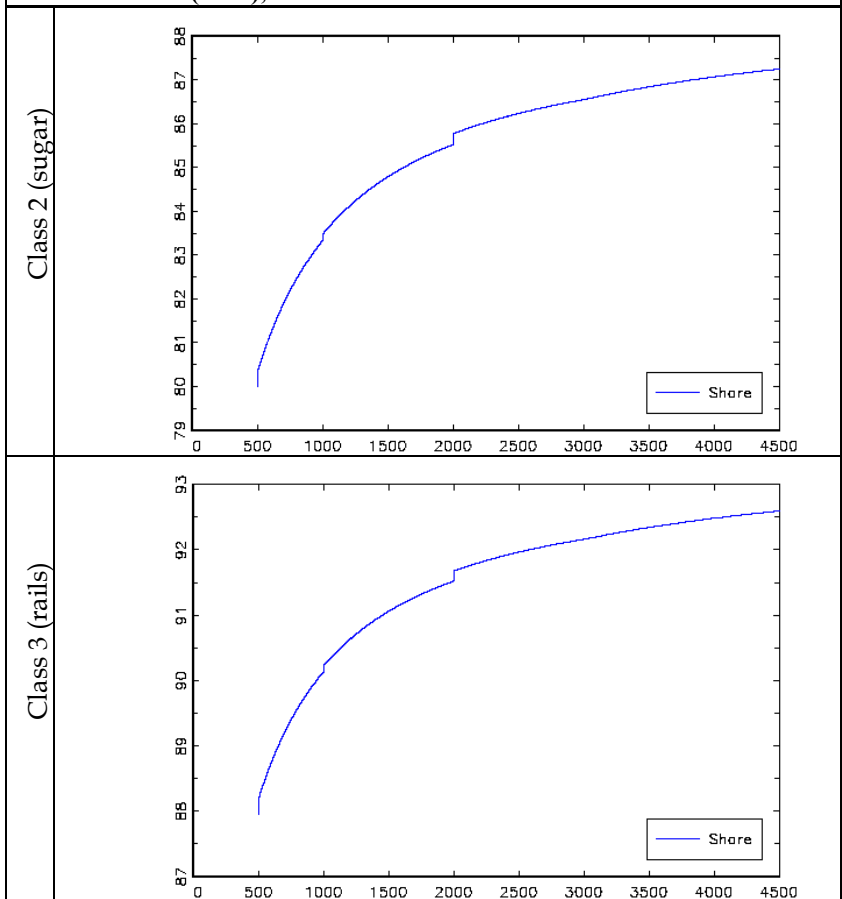
**The share of infrastructure charge for wagon owner ( $I_w$ ) in RZD end user tariff ( $I+W$ ), %**



**The share of 'infrastructure and locomotive' component (I) in RZD end user tariff ( $I+W$ ), %**



The share of 'infrastructure and locomotive' component (I) in RZD end user tariff (I+W), %



**'Infrastructural and locomotive' (I) and 'wagon' (W) components for 3 classes of commodity**

