A. Dementiev,
A. Loboyko

National Research
University Higher School
of Economics

ORGANISATIONAL CHOICE IN THE PUBLIC SECTOR[1]

1. Introduction

In many countries suburban railway transport are running on losses and are seeking alternative delivery models to lessen the subsidy burden on local governments, and Russia is not an exception. At the regional level such services have been provided by the local divisions of "Russian Railways" JSC (RZD), a vertically integrated infrastructure monopoly that also serves the markets for cargo and passenger rail transportation. As tariffs are set by the local regulating authorities at a socially desirable level, passenger services traditionally experience negative operating profits. What makes the financial perspectives of railway undertakings even worse is the fact that a significant share of concessionary passengers (about 10−30%) is only partially compensated by federal and regional budgets, not to mention a widespread fare-evasion activities (another 10−30% of patronage).

The ongoing railway reform in Russia called for explicit Public Service Obligation (PSO) compensation contracts for the support of social requirements of suburban passenger transport. However, adequate sources for local budgets were never clearly defined and provided. In these circumstances RZD initiated the process of establishment Suburban Passenger Companies (SPCs) in the form of joint ventures with local authorities. Essentially, RZD offered local authorities a share in the charter capital of newly created companies, thus proposing a specific form trusting partnership (see [Stanley, Hensher, 2008] for the definition). This form of cooperation has been proposed by RZD as an optional alternative delivery model in the sector. The observed variety of shareholding structures of 28 existing SPCs provides the relevant factual background and poses a number of questions: Why did some regional authorities have agreed to partner with the service provider while other not? What factors affect the probability of creating a trusting partnership and how?

We build a formal model where, first, a standard regulator's objective function puts a lower weight on the firm's profit, reflecting certain redistribution concerns of

the government. Second, we impose budget constraint on the local government and assume it to be binding, reflecting the case where a lack of public funds affects organizational choice in the sector. By further introducing information asymmetry of the firm's costs, we create room for bargaining between the firm and the regulator. In the end, we define the conditions for trusting arrangements to become equilibrium in the bargaining game mentioned above and then discuss its implications.

2. The model

The proposed model has been inspired by several seemingly unrelated streams of studies. We incorporate the idea of "selling authority" from [Lim, 2012] into the standard regulatory framework of [Armstrong, Sappington, 2006], which emphasize the role of imperfect information in a regulatory game. We modify this approach by establishing trusting partnerships as an organisational alternative that will ultimately reshape the political and institutional environment of the standard regulatory game. In particular, similar to [Laffont, 1999; 2000] we understand trusting partnerships as a better-informed decision maker with specific objective functions. With this option, regulator as a benevolent social welfare maximiser can choose whether or not to delegate the contracting process to the trusting partnerships, including tariff setting.

As a benchmark and a basis for welfare comparison, we use the case of the status quo in which local authorities (the regulator) are obliged to undertake a public service project (suburban transportation by rail) for its social benefits. The regulator can employ two delivery models: 1) centralised contracting in the form of a Public Service Obligation (PSO) in which a monopoly service provider is regulated through tariffs and lump-sum transfers, and 2) delegated contracting in which tariff setting is determined by a joint venture of the public and private sectors. The joint venture is established voluntarily in the form of a trusting partnership with an objective to maximize a linear combination of social welfare and profit.

2.1. Public Service Obligation

PSO is modelled as a regulated contract for transport service provision. The monopoly service provider is obligated to serve all customers at the regulated unit price, P. The demand curve for the single homogenous product is common knowledge and assumed to be linear: $Q(P) = a - bP$. The firm is assumed to incur unit cost of production θ and no fixed cost[2]. The regulator sets both unit price, P, and determines a lump-sum transfer payment, T_{RS}, from taxpayers to the firm.

---

[2] The assumption of no fixed cost is common to the literature on optimal regulation. Moreover, existing regulatory stimulus in the passenger railway transport in Russia allows Suburban

The firm maximises its profit $\pi = Q(P) \cdot [P - \theta] + T_{RS}$ while the benevolent regulator pursues the goal of maximizing the expected value of social welfare, $W = V(P) - [1 + \lambda] T_{RS} + \alpha \pi$. $V(P)$ denotes consumer surplus, which is reduced by the transfer payment $[1 + \lambda] T_{RS}$ estimated at the social cost of public funds, $\lambda \geq 0$. Regulators often have implicit distributional concerns and value the consumer surplus more than the producer surplus, i.e. $\alpha \leq 1$. This parameter plays a crucial role in our further analysis.

The following assumptions capture the basic institutional features of the PSO delivery model in the context of multiproduct vertically integrated regulated monopoly which operates on systemic losses covered from corporate sources rather than public funds.

Assumption 1. For the multiproduct monopoly regulated in separate markets, participation constraint in a single market may not be binding, so the firm may operate with losses.

Assumption 2. Lump-sum transfer, T_{RS}, from the regulator to the firm is insufficient to fully compensate for the firm's operating losses so the hard budget constraint $T_{RS} \leq T$ becomes binding.

The welfare optimisation problem of the benevolent regulator can be written as:

$$W = V(P) - [1 + \lambda] T_{RS} + \alpha \left[Q(P) \cdot [P - \theta] + T_{RS} \right] \xrightarrow{P \geq 0} \max.$$
$$s.t.\, T_{RS} \leq T$$

Socially optimal tariff $P = (a - \alpha b \theta - \alpha a)/b(1 - 2\alpha)$ is positive when $\alpha > 1/2$ (see the proof of this and other formulas in the full version of the paper). When the relative weight of the producer surplus in the social welfare function is too low, the regulator effectively defends the interest of consumers who always seek a "free-lunch". Indeed, one can prove that Lemma 1 holds:

Lemma 1. In a complete information framework (unit cost of production θ is known), socially optimal tariff increases with the relative weight put on the producer's surplus in the social welfare function, i.e. $\partial P / \partial \alpha > 0$.

Still, if it is below the marginal cost and the lump-sum transfer from the budget is insufficient to compensate for the negative margin, a positive tariff does not guarantee that the firm will break even. The regulator's preferences for redistribution make it optimal to set the tariff at the level below one that is economically sound in order to maximise social welfare. Thus, Lemma 2 holds:

Passenger Companies to pay symbolic 1% of the infrastructure access charge and save up to 50% of their total cost. Thus the assumption of fixed costs to be virtually zero is also relevant for the case studied.

Lemma 2. When $1/2 < \alpha < 1$ the socially optimal tariff is set at the level below marginal cost, $0 < P < \theta$.

Once tariff revenues are insufficient to fully cover all the costs incurred, it is vital for the regulated firm to be adequately compensated through the mechanism of lump-sum transfer. When local budgets lack funds, the regulated firm operates on a loss, so Assumptions 1 and 2 are fully justified in the case of complete information.

A closed form solution can be useful for the welfare function in the case of a PSO, with complete information as a criterion for a comparison of social welfare among different organisational alternatives:

$$W^{PSO} = V(P) - [1+\lambda]T + \alpha\pi = -\alpha^2 (a - b\theta)^2 / 2b(1-2\alpha) - (1+\lambda-\alpha)T. \quad (1)$$

The analysis of the PSO case with full information shows that the relative size of the redistribution parameter α and the shadow cost of public funds λ have a direct welfare implication. In particular, when welfare losses caused by distortionary taxation pose a serious problem for the economy (λ is high), and redistribution concerns are very pronounced (α is low), condition $\lambda > \alpha$ is likely to hold, meaning that compensatory transfers from the local budgets to the firm are not desirable from a social perspective.

When cost can not be directly observed by the regulator, though the density function $f(\theta)$ at the support $[\underline{\theta}, \bar{\theta}]$ is known, the regulator's problem leads to the same solution for the optimal tariff in expected terms: $P = (a - \alpha bE\theta - \alpha a)/b(1-2\alpha)$,

where the cost parameter, θ, is substituted by its expected value: $E\theta \equiv \int_{\underline{\theta}}^{\bar{\theta}} \theta f(\theta)d\theta$.

Again, optimal tariff can be set at the level below marginal cost, $0 < P < \theta$, when the relative weight of profit in the welfare function is larger than that of consumers:

$1/2 < \alpha < 1 - \dfrac{b(E\theta - \theta)}{a - b\theta + b(E\theta - \theta)}$.

Theoretically, when the regulator is poorly informed of the firm's actual cost parameter θ, the optimal tariff for the purpose of social welfare maximization may turn out to be too high. In the context of very efficient firm, when revealed cost is below its expected level, $\theta < E\theta$, the tariff may exceed its monopolistic level: $\theta < \dfrac{a - 2\alpha bE\theta}{b(1-2\alpha)}$. Hence, a cost-efficient firm benefits from revealing its cost to the regulator.

Generally speaking, asymmetric information creates distortions which lead to lower social welfare, W_0^{PSO}. Once such an asymmetry is mitigated (as in the case of trusting partnership) the firm's profit and social welfare can be improved:

$$\pi_0^{PSO} = \pi^{PSO} - \left(\alpha(a - b\theta)(\theta - E\theta) + \alpha^2 b(\theta - E\theta)^2 \right) / (1-2\alpha)^2 \quad (2)$$

254

$$W_0^{PSO} = W^{PSO} + \alpha^2 b(\theta - E\theta)^2 / 2(1 - 2\alpha) < W^{PSO}. \qquad (3)$$

The expressions (2) for profit and (3) for the welfare function are identical to the case of complete information subject to θ substituted by its expected value, $E\theta$.

2.2. Trusting partnership

Trusting partnerships arise when public and private agents agree to delegate the decision-making process to an entity with a specific corporate structure that reflects both the regulator's benevolent objective function and the firm's profit. [Bennett, Iossa, 2006] develop this idea in the context of public-private partnership, so we use the notation PPP for trusting partnerships hereinafter. The objective function of a trusting partnership, U_{PPP}, is a linear combination of social welfare and monopoly profit: $U_{PPP} = \omega W + (1 - \omega)\pi$, where ω represents the relative weight of the regulator's interest in the partnership's composite objective function. These weights reflect the share structure of the joint venture that the regulator may agree to establish based on the initiative of the service provider. The firm's profit maximisation problem remains unaffected in the absence of a profit distribution concerns or a rule of dividend sharing.

We consider a "regulatory bargaining game with a delegation" with the following timing of the negotiation process. First, the firm makes an offer regarding ω; second, the regulator decides whether to accept or reject the offer. If the offer is accepted, a trusting partnership is formed (thus greater weight is placed on the firm's profit) and information about cost is revealed. Finally, tariff is determined according to the new weights in the joint objective function. If the offer to form the trusting partnership is rejected, tariff setting is not delegated to it, so regulator's objective function remains intact while information about the firm's cost is undisclosed. Other things being equal, social welfare decreases with ω, while elimination of information asymmetry (as shown in formula (3)) proves to be ex ante welfare improving. Thus, there exists a non-empty set of possible values of ω, $\omega \in [\underline{\omega}, 1]$, when the partnership establishment is ex ante perceived by the regulator as social welfare improving, hence the firm's offer is accepted.

Naturally, a partnership's objective function represents the monotonic transformation of the regulator's objective function where the relative weight of the firm's profit, α, is replaced by the new weight, $\psi = (1 - \omega(1 - \alpha))/\omega = \alpha + ((1/\omega) - 1)$. Hence, the expression for the optimal tariff can be written by plugging $\psi \geq \alpha$ instead of α in the previous formula: $P = (a - \psi(b\theta + a))/(b - 2\psi b)$. The firm's profit under a trusting partnership arrangement, $\pi_{PPP} = -\psi(a - b\theta)^2(1 - \psi)/b(1 - 2\psi)^2 + T$, decreases with ω, so $\partial \pi_{PPP}/\partial \omega < 0$. Thus the firm would offer the lowest possible share ω in the partnership that is accepted by the regulator. Ultimately, the formation of a partnership depends on the decision of the regulator.

2.3. The regulator's choice

The timing of the model implies that the firm's offer to establish a partnership is considered by the regulator prior to information disclosure. Elimination of information asymmetry would increase social welfare, since $EW(P(\theta)) > W(P(E\theta))$. The scope of information asymmetry is measured by the standard deviation of the unit cost, σ_θ. It's important to emphasize here that the regulator makes the organisational choice dealing with the expected values when comparing the social welfare function under asymmetric information (W_0^{PSO}) with the expected welfare function under a partnership (EU^{PPP}):

$$W_0^{PSO} = \frac{-\alpha^2(a-bE\theta)^2}{2b(1-2\alpha)} -$$

$$-(1+\lambda-\alpha)T \vee \omega\left(\frac{-\psi^2\left[b^2\sigma_\theta^2+(a-bE\theta)^2\right]}{2b(1-2\psi)}-(1+\lambda-\psi)T\right) = EU_{PPP}.$$

In order to study the welfare implications of trusting partnership, one should compare the benchmark case for the actual social welfare under complete information before the establishment of a partnership (W^{PSO}) and social welfare under complete information after the establishment of a trusting partnership (U^{PPP}):

$$W^{PSO} = \frac{-\alpha^2(a-b\theta)^2}{2b(1-2\alpha)} - (1+\lambda-\alpha)T +$$

$$+\frac{\alpha^2 b(\theta-E\theta)^2}{2(1-2\alpha)} \vee \omega\left(\frac{-\psi^2(a-b\theta)^2}{2b(1-2\psi)}-(1+\lambda-\psi)T\right) = U_{PPP}.$$

In the full version of the paper we consider the two extensions of the basic model to formulate the following propositions:

Proposition 1. Uncertain demand of concessionary transportation makes the organisational choice of trusting partnership less likely.

Proposition 2. Tougher budget constraint for compensation of concessionary passengers makes the organisational choice of trusting partnership more likely.

We discuss implications of the two propositions in the concluding section of the paper.

3. Discussion and conclusions

The establishment of SPCs in the form of trusting partnerships between local authorities and RZD has become an alternative to vaguely determined and weakly

enforced PSO compensation contracts for suburban operations. These delivery models vary across Russian regions in terms of the share of operator losses that Federal and local governments de facto compensate for (see Table 1) as well as the ownership structure of SPCs which has been gradually changing for the last 15 years in Russia.

Table 1.   Compensation of losses from suburban railway passenger services in the Russian regions

The scope of compensation from the local budges	Number of regions (73 in total)		
	2011	2012	2013
No compensation required	6	5	6
100% compensated	16	16	6
>50% compensated	13	14	21
<50% compensated	34	34	37
No budget for compensation	4	4	3

Source: Federal State Statistics Service.

Our paper develops a conceptual framework for the analysis of the establishment of trusting partnerships in the form of PPP in Russia's suburban railway passenger sector. We contribute to the existing literature on PPP by making an organisational choice endogenous in the sense that local authorities are free to accept or reject the offer to partner with the regulated service provider. This modelling approach differs from the story of regulatory capture, because tariff setting is delegated to a third agent (a partnership) that has no private interest. In essence, trusting partnership is viewed as a specific institutional arrangement that aims to maximize the composite objective function to determine tariff and reveals the firm's hidden characteristics based on the trusting relationships within PPP. Setting optimal tariff with hidden information of the firm's cost becomes a subgame of the 'regulatory bargaining game with delegation'. In particular, under certain conditions benevolent local authorities may find that a switch from PSO delivery model to PPP will improve social welfare. In other words, the organisational choice is made first, then information structure is determined, and finally socially optimal tariffs are set.

It should be noted that the firm is always better off when the actual number of concessionary passengers is unknown to the regulator ex ante. An illustration would be the so-called monetisation reform in the suburban railway passenger sector in Russia in 2005. Non-monetary benefits in the form of various concessions were substituted by explicit compensatory schemes. In particular, Federal Government committed to cover RZD's losses associated with transportation of privileged passengers that is mandated at the national level. With additional funds coming from the federal level, regional budget constraints relaxed. One would expect that the future plans about monetisation

reform could have affected the pace of the organisational transformation in the sector. Indeed, after a jump-start in 2003 when three SPCs were established the development of trusting partnerships slowed down on the eve of reform, and no partnerships were established in 2004. So, this is what Proposition 2 implies: softer budget constraint made the organisational choice of trusting partnership less likely.

Monetisation reform implemented in 2005 in Russia revealed actual demand of privileged passengers of almost all the categories for public transport. In terms of our model that would mean elimination of information asymmetry about the demand of concessionary passengers. With more certain demand, as Proposition 1 implies, the chances for trusting partnerships increased. So in 2005—2006 we observed an increase in the number of SPCs from 4 to 10.

The model sheds some light on the process of forming a trusting partnership. It rationalizes two important reasons for the delay in implementating reforms of Russia's suburban passenger transportation at the regional level. We claim that in the regions where the status quo is retained, the offer to establish trusting partnerships was either not made by RZD or rejected by the local authorities. The model also explains how different ownership structures in the existing SPCs may be formed[3].The descriptive power of the model goes beyond the case of suburban railway in Russia. Taking into account the diversity of different organizational choices in this sector, the model has broader applications and implications. In particular, the proposed analytical framework allows us to account for the diversity of organizational choices in the public sector that seem to be socially optimal ex ante and prove to be ambiguous in terms of welfare ex post.

References

Armstrong M., Sappington D.E.M. Regulation, Competition, and Liberalization // Journal of Economic Literature. 2006. Vol. 44. No. 2. P. 325—366.

Bennett J., Iossa E. Delegation of Contracting in the Private Provision of Public Services // Review of Industrial Organization. 2006. Vol. 29. No. 1—2. P. 75—92.

Laffont J.J. Political Economy, Information and Incentives // European Economic Review. 1999. Vol. 43. No. 4—6. P. 649—669.

Laffont J.J. Incentives and Political Economy. N.Y.: Oxford University Press, 2000.

Lim W. Selling Authority // Journal of Economic Behavior & Organization. 2012. Vol. 84. P. 393—415.

Stanley J., Hensher D.A. Delivering Partnerships for Route Bus Services: A Melbourne Case Study // Transportation Research. Part A: Policy and Practice. 2008. Vol. 42. P. 1295—1301.

---

[3] The welfare comparison of alternative delivery models produces ambiguous results. Service provider will be better off by establishing trusting partnerships with desired (and proposed) ownership structure in all three cases, while consumers will suffer in most cases (with one exception when the service provider turns out be extremely cost-efficient). Correspondingly, tariffs will increase in most cases and decrease if the firm is very cost-efficient.