OPPORTUNISM IN PUBLIC-PRIVATE PROJECT FINANCING

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Abstract

Opportunism, either governmental or private, may become a powerful deterrent against public-private project financing, especially considering the scale of the investment in infrastructure. The parties can however secure themselves against the counter-party’s possible opportunism by assigning the investor an exit (put) option and the public agent a bail-out (call) option on the private investor’s shares. This paper presents a mechanism for converting natural monopolies into contestable markets using over-the-counter option contracts that combine the stability of long-term contracts and the flexibility of short-term contracts. The exit/bail-out option mechanism reduces entry barriers by streamlining incomplete long-term contracts and avoiding contractual problems related to bounded rationality and opportunism.

JEL Classification: C72, D23, D42, G32, G38, H54

Keywords: Opportunism, Public-Private Partnerships, Infrastructure, Natural Monopolies, Contestable Markets, Exit and Bail-out Options, Game Theory.

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OPPORTUNISM IN PUBLIC-PRIVATE PROJECT FINANCING

1. Introduction

Public-private partnerships are gaining momentum as hybrid project financing structures become better able to efficiently provide public services. However, the risk of opportunistic behavior on either side – the private partner by lowering quality; the government by capping prices or expropriation – has been a deterrent to many could-be successful public-private ventures.

In this paper I model public-private partnerships as a strategic game between investors and public agents. The model allows us to identify plausible challenges to sustainable public-private partnerships in infrastructure projects and public utility companies.

In order to lessen both private investors’ and public agents’ risk aversion to opportunistic behavior when engaging in a public-private partnership, I introduce over-the-counter contracts similar to call and put options of the private investor’s shares. The adoption of such options would improve liquidity and market contestability, and thus would increase social welfare, while opportunistic risks involved would be mitigated for both parties.

2. Framing Natural Monopoly in Public Utility Companies As a Strategic Game

The efficiency of co-financing investments by both public and private capital is not the decisive factor in establishing public-private partnerships. Behavioral factors which influence the way the risk is perceived are of much greater importance.

I present a simple, non-cooperative non-zero-sum game, where each player is interested solely in her own payoffs, interests are totally or partly opposed, players do not communicate with each other and their agreements are not binding (Sulejewicz, 1994, p. 24). The equilibrium achieved in such games is a Nash equilibrium, i.e., each player chooses such a strategy that she finds beneficial and is unwilling to change, irrespective of strategies implemented by other players (Mas-Colell, Whinston, and Green 1995, p. 246). It is an

1 Opposed interests occur in zero-sum games or in ones that can be normalized to zero-sum games. Non-zero-sum games allow for cooperation and do not exclude agreement between players (Sulejewicz, 1994, p. 27). The description of the natural monopoly in the public sector as a strategic game conforms to the latter case.
equilibrium between actions and expectations (Varian, 1992, p. 265). I benefited from David Newbery (2000); however, he describes the dichotomy, “invest – not invest,” and does not devote attention to either the public agent’s alternative, “regulate – not regulate,” or to the possibility of “penalizing” the private investor. On the other hand, he considers demand as an external stochastic player, achieving a Nash equilibrium in mixed strategies. I purposely disregarded demand stochasticity to keep the model simple. Demand stochasticity is of little importance to this model, as the level of demand from utilities is constant and consumers bear fixed fees irrespective of their level of consumption.

The private investor’s strategies are: “invest” or “not invest.” If she decides to invest and engage in a monopoly, the next set of strategies is “contract fulfillment” (keeping contracted quality and price at the agreed level) or “profit maximization” (by lowering quality or increasing prices). The public agent’s (e.g., a local government’s) set of strategies consists of: “lack of regulation,” “regulation” (i.e., enforcement of contract specificity, quality standards and marginal cost pricing), or “penalization” (transfer from the monopoly to the public agent, including full expropriation). Due to information asymmetry (the public agent is unaware of whether the monopoly fulfills the contract or maximizes its profit), all decisions are simultaneous and each player chooses her strategy independently of the other player’s strategy.

If investors decide not to invest, they receive a zero payoff. The public agent, who maximizes consumer surplus and does not care about private profit, gets utility $U_{pu}$. The consumer’s utility amounts to $U$ provided the investor cooperates, i.e., invests in technology and infrastructure, operates efficiently, abides by the terms of the contract, and there are no regulation costs. This would be a first-best equilibrium; in practice an unattainable benchmark. The difference between $U$ and $U^{m}_{in}$ stems from higher operating costs of the public natural monopoly when the company is run by the public agent, which in turn affects the consumer through higher prices and lower demand.

If the investor opts for “profit maximization” and she is not regulated in any way by the public agent, she will reap monopoly profits $\pi_{m}$ by limiting production and increasing prices. The consumer’s utility will drop to $U^{m}$, where $U^{m} < U_{re}$.

\[2\] First, I analyze only boundary strategies, although there exists a continuum between profit maximization and contract fulfillment.

\[3\] Pongsiri (2001, pp. 15–16) points to incremental expropriation and Spiller (2008, p. 7) refers to “subtle works of administrative process” as possible penalties for preventing the investor from achieving a fair payoff for incurred costs and risk.

\[4\] The “penalty” strategy may also be understood as a harsh form of regulation, for instance, by setting prices which are below the equilibrium level and enforcing higher quality levels or new regulations. It seems that this strategy is particularly alluring for public agents in pre-election periods; however, public governance and public choice theory are not the subject of this paper.

\[5\] Because it either cannot or is unable to.
The public agent who regulates the utility company can force the profit to drop to \( \varepsilon \), where \( \varepsilon \) is a minimal economic profit higher than zero.\(^6\) The consumer’s utility is then diminished by regulatory cost, which in turn leads to higher price and, consequently, lower demand. Of course the “penalty” will increase the public agent’s payoff by \( A \) at the expense of the investor’s payoff (see Figure 1).

**Figure 1**
Investor and public agent in a regulation strategic game

The “invest” subgame can also be presented in the form of a matrix of the players’ payoffs.

**Table 1**
Payoff matrix of the “invest” subgame

<table>
<thead>
<tr>
<th>Public agent</th>
<th>Not regulate</th>
<th>Regulate</th>
<th>Penalize</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private investor</strong></td>
<td><strong>Contract fulfillment</strong></td>
<td>((0, U^*))</td>
<td>((0, U))</td>
</tr>
<tr>
<td></td>
<td><strong>Profit maximization</strong></td>
<td>((\pi, U))</td>
<td>((\varepsilon, U))</td>
</tr>
</tbody>
</table>

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\(^6\) As perfect regulation (no information asymmetry) is hardly possible, I assume that profit exceeds 0.
Payoffs can be simplified and normalized by assuming that the utility lost due to regulation cost equals \( G \) (i.e., \( U - U_m = G \)) and then subtracting the vector \((0, U_m)\) from each term of the payoff matrix.\(^7\)

**Table 2**

Normalized payoff matrix of the “invest” subgame

<table>
<thead>
<tr>
<th>Private investor</th>
<th>Public agent</th>
<th>Not regulate</th>
<th>Regulate</th>
<th>Penalize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract fulfillment</td>
<td>((0, G))</td>
<td>((0, 0))</td>
<td>((-A, A))</td>
<td></td>
</tr>
<tr>
<td>Profit maximization</td>
<td>((\pi, U - U))</td>
<td>((\epsilon, 0))</td>
<td>((\epsilon - A, A))</td>
<td></td>
</tr>
</tbody>
</table>

As the investor’s strategy “profit maximization” dominates the “contract fulfillment” strategy, the public agent’s best response strategy is to “penalize.”\(^8\) “Penalize” will be a dominating strategy if \( A > G \). The investor’s best response strategy would then be “profit maximization.” This game resembles the classic “prisoner’s dilemma.” “Profit maximization – penalization” is the equilibrium in this one-shot non-cooperative subgame, although with cooperation (“contract fulfillment – lack of regulation”) the payoffs for the players would have been higher. The equilibrium of the whole game is “not invest,” as it ensures that the investor will at least not incur loss. However, the public agent will not benefit from the management and know-how advantage of the private sector.

Some scholars (Axelrod, 1984, chapters 6–7; Brandl and Brooks, 1982; Kay, 1993; McQuaid, 1999) present Build-Operate-Transfer contracts (BOT) as an example of “the prisoner’s dilemma.” The underpinning assumption of their works is that both parties gain considerably more if they cooperate rather than maximize their profit, irrespective of the other party. On one hand, regulation leads to smaller payoff for the investor and higher payoff for the public agent.\(^9\) On the other hand, regulation is costly and the public agent may be able internalize part of the producer surplus in other ways. The comparative statics between regulation cost and internalized profit will set the equilibrium.

Even if the game is repeated a finite number of times (long-time licenses, successive Own-Operate-Transfer contracts, etc.), “profit maximization – penalty”\(^10\) will still be the subgame equilibrium. Complex contracts with warranties obliging the public agents to stable regulation

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\(^7\) Actually, there are two payoff matrices – one for each player.

\(^8\) Of course, it has to be assumed that the utility lost due to the monopoly exceeds the cost of regulation \((U - U < 0)\). It is, however, possible that regulating, rather than not regulating, the natural monopoly would be a far better consumer’s utility maximizing strategy for the public agent.

\(^9\) This point is of greatest importance in the case of natural monopolies, as their activity consists mainly of substantial investments in specific non-liquid assets. What follows is that any changes in the contract introduced after the money has been invested may substantially decrease future profit.

\(^10\) The reason is simple – in a repeated game, the players get to know each other. They might start cooperating and might assume the other player’s attitude from the last game – cooperate, if she cooperated (that is “contract fulfillment” – “not regulate”), or cheat, if she cheated (“profit maximization” – “penalize”). As there is no risk involved of being “penalized” in the last move (e.g., the last year of the franchise), each player will attempt to maximize profit through cheating. Secondly, as each player is well aware of the other player’s intentions, the players will try to discount it in the penultimate move. This will continue until the first, also non-cooperative, move. This type of reasoning is referred to as backward induction. The term was first formulated by Zermelo (1913) and extended by Selten (1965). See Rubinstein (1998, pp. 130-131) and Kreps (1990, p. 89).
may lead to “profit maximization – regulation.” However, this is an equilibrium only in mixed strategies, as the risk of opportunism\textsuperscript{11} is always high, i.e., penalization or expropriation carried out by the public agent counter to prior promises (Spiller and Tommasi, 2007, p. 16).\textsuperscript{12}

\textbf{3. Designing Public-Private Partnerships As an Internalized Repeated Game}

Designing a natural monopoly as a public-private partnership considerably changes the game’s character. First, the public agent is now a shareholder in the monopoly company. The choice of a strategy is consequently a result of an internalized game (negotiations) between the private investor and the public agent. The dichotomy in the company’s strategy – “contract fulfillment” on the one hand and “profit maximization” on the other – is transformed into a continuum between “welfare maximization” and “profit maximization.”\textsuperscript{13} Second, information asymmetry ceases to exist, i.e., the public agent knows more about both marginal cost and the quality of goods and services provided by the utility company than in the case of sole regulation of the private monopoly. Such a game becomes a quasi-non-cooperative or quasi-cooperative game.\textsuperscript{14}

The strategy of the public-private utility company will be the result of negotiations between its partners over their capital and profit share ($\theta$ for the private investor and $1 – \theta$ for the public agent), price and investment with the resulting quality level.

\textsuperscript{11} In this paper I concentrate on government opportunism. A theory of third-party opportunism of public contracts is presented in Spiller (2008) and (Moszoro and Spiller, 2010).

\textsuperscript{12} This may be the reason why BOT investments are rarely employed in developing countries and why it is difficult to conclude such agreements from the legal point of view. The rule of law is one of the prerequisites of long-term contracting.

\textsuperscript{13} This continuum is also present in the case of private monopolies; however, there is a strong tendency for polarization towards “profit maximization.”

\textsuperscript{14} Mixed motive games were first introduced by Schelling (1960). Sulejewicz (1994, p. 25) presents the games’ scope in the following way:

<table>
<thead>
<tr>
<th>Communication Level</th>
<th>Lack</th>
<th>Partial</th>
<th>Perfect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agreements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binding</td>
<td></td>
<td></td>
<td>Classical cooperative games</td>
</tr>
<tr>
<td>Conditionally binding</td>
<td>Quasi-no-cooperative games</td>
<td>Quasi-cooperative games</td>
<td></td>
</tr>
<tr>
<td>Not binding</td>
<td>Classical cooperative games</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In public utility companies, which are also public monopolies, binding agreements and effective communication occur, at least theoretically, in the case of public companies. The lack of binding agreements and weak communication would be typical characteristics of private monopolies. This does not mean that they do not communicate at all, but rather that some objective hindrances occur which justify the assumption of the existence of the information asymmetric. Analogically, the lack of any binding agreements does not signify that players do not communicate with each other.
In this game the investor will propose such strategies which, while increasing the economic profit over 0, will also increase the public agent’s payoff through savings in regulatory cost, efficiency and public agent’s share in profit $(1 - \theta) \pi$.\footnote{If the $\alpha$ part of the private investor’s profit also constitutes social surplus, it has to be added to the public agent’s payoff, i.e., $\alpha \cdot 0 \cdot \pi$.}

In public-private partnerships, payoffs and penalties are divided between both public agents and private investors in proportion to their share in the enterprise (see Figure 2).

**Figure 2**
Public-private partnership as a strategic game

“Mixed strategy” consists of achieving a compromise on prices and quality levels in a way that would prove satisfactory to both parties: public-private joint venture profit $\pi_{jv}$ should be positive and welfare should be bigger than in the case of both public monopoly and regulated private monopoly. The two goals – welfare maximization and profit – are obviously contradictory. The outcome of the negotiations will be visible in both the capital structure and distribution of profit, i.e., $e \leq \theta \leq 1 - h$, where $e$ is the minimum share required by the private investor to transfer its know-how and $1 - h$ is the minimum required by the public agent to exercise sufficient control over internal processes within the company.\footnote{This problem could, therefore, be perceived as a multi-criterion optimization task. One of the methods of dealing with it is to include those criteria in one objective function whose values are measured by a given ratio. In the proposed simplified model, objective functions are measured as shares in both the capital and the profit sharing $\theta$.}

Table 3 shows the payoff matrix for the “invest” subgame.
Table 3
“Invest and enter into a public-private partnership” subgame payoff matrix

<table>
<thead>
<tr>
<th>Private investor</th>
<th>Contract fulfillment and welfare maximization</th>
<th>Mixed strategy</th>
<th>Profit maximization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not regulate</td>
<td>Regulate</td>
<td>Penalize</td>
</tr>
<tr>
<td>Profit maximization</td>
<td>(0, G)</td>
<td>(0, 0)</td>
<td>(–A/2, A/2)</td>
</tr>
<tr>
<td>Mixed strategy</td>
<td>(G/2, G/2)</td>
<td>(ε/2, ε/2)</td>
<td>(</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(ε/2, A +</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ε + A)/2)</td>
</tr>
<tr>
<td>Profit maximization</td>
<td>(πm/2, Ujv) – Ujv + πm/2)</td>
<td>(ε/2, ε/2)</td>
<td>(</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(ε/2, A +</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ε + A)/2)</td>
</tr>
</tbody>
</table>

Note: \( \pi_m \) – monopoly profit; \( \pi_{jv} \) – regulated monopoly profit; \( \pi_j \) – public-private joint venture profit.

Again, payoffs can be normalized by assuming that the utility lost due to regulation cost equals \( G \) (i.e., \( U - U_{jv} = G \)), utility from a public-private joint venture company equal utility from a regulated monopoly (i.e., \( U_j = U_{jv} \)), profit \( G \), and public and private share in the partnership are equal (i.e., \( \theta = 1 - \theta = 0.5 \)), and then subtracting the vector \((0, U_{jv})\) from each term of the payoff matrix (see Table 4).

Table 4
Normalized “invest and enter into a public-private partnership” subgame payoff matrix

<table>
<thead>
<tr>
<th>Private investor</th>
<th>Contract fulfillment and welfare maximization</th>
<th>Mixed strategy</th>
<th>Profit maximization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not regulate</td>
<td>Regulate</td>
<td>Penalize</td>
</tr>
<tr>
<td>Profit maximization</td>
<td>(πm/2, Ujv) – Ujv + πm/2)</td>
<td>(ε/2, ε/2)</td>
<td>(</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(ε/2, A +</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ε + A)/2)</td>
</tr>
</tbody>
</table>

“Profit maximization” is also a dominating strategy\(^{17}\) for the investor in the public-private partnership. Nevertheless, the public agent is aware of the strategy to be implemented by the investor. Through backwards induction, this game is simplified to a straightforward choice of

\(^{17}\) Or weakly dominating strategy if \( \varepsilon = 0 \).
strategies made by the investor, in which payoffs would correspond to the most effective protective strategies chosen by the public agent (see Table 5).

**Table 5**

Normalized “invest and enter into a public-private partnership” subgame payoff matrix. It takes into account backwards induction, as well as the most effective protective strategies implemented by the public agent and different levels of penalties.

<table>
<thead>
<tr>
<th>Private investor</th>
<th>If</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$G &gt; \varepsilon + A$</td>
</tr>
<tr>
<td></td>
<td>$A/2 &lt; G &lt; \varepsilon + A$</td>
</tr>
<tr>
<td></td>
<td>$G &lt; A/2$</td>
</tr>
<tr>
<td>Contract fulfillment and welfare maximization</td>
<td>$(0, G)$</td>
</tr>
<tr>
<td>Mixed strategy</td>
<td>$(G/2, G/2)$</td>
</tr>
<tr>
<td>Profit maximization</td>
<td>$(\varepsilon - A)/2, \varepsilon + A)/2$</td>
</tr>
<tr>
<td></td>
<td>$(\varepsilon - A)/2, \varepsilon + A)/2$</td>
</tr>
<tr>
<td></td>
<td>$(\varepsilon - A)/2, \varepsilon + A)/2$</td>
</tr>
</tbody>
</table>

Notes:

a) Assuming $U_m - U_{re} + \pi/2 < (\varepsilon + A)/2$.

b) Cases of weak inequalities have been disregarded.

**Corollary 1:** In a one-shot game the best strategy for the private investor consists either of investing and implementing a mixed strategy, if $G > \varepsilon + A$, or completely refraining from investing in all other cases. As $A$ may assume any value (although common sense indicates that the investor would not pay penalties that would exceed sunk cost $I$), then if $G < \varepsilon + A \leq I$, the private investor would not invest and would not enter into a public-private partnership.

**3.1. Financial Standing of Public Utility Companies and Public Agent’s Opportunism in Public-Private Partnerships**

The public agent takes into account that, if the private investor refrains from investing, she incurs cost $U_{pu} - U^*$ due to inefficient management of public infrastructure (for simplification $U_{pu} = U_{re}$ and, consequently, $K = G$, where $K$ is the cost of inefficient public management compared to private management). Therefore, the best strategy for the public agent is to “not regulate” the utility company.

Consequently, an important question arises: how to convince the investor of the public agent’s intention of neither regulating nor penalizing the utility company?

One of the most often referenced arguments in the game theory literature is the unprofitability of opportunism in one period if future losses were to be considered in a sequential game (Martin, 2001). In the analyzed example, the public agent would gain $A/2$ for only one period of time and then get $-G$. Opportunism is thus a profitable strategy for a public agent if:

$$0 \cdot A - \sum_{t=1}^{\infty} \frac{G}{(1 + r_{pu})^t} > 0 \quad (1)$$

$$0 \cdot A - \frac{G}{r_{pu}} > 0 \quad (2)$$
where $r_{pu}$ is the discount rate for the public agent.

As $A \leq I$,$^{18}$ inequality (3) can be formulated as:

$$I > \frac{G}{\theta \cdot r_{pu}}$$  \hspace{1cm} (4)

A proxy for economic profit $G$ is Economic Value Added (EVA), i.e., Net Operating Profit After Tax (NOPAT) less the Weighted Average Cost of Capital multiplied by invested capital ($WACC \cdot I$), where the WACC for a public agent would be the discount rate not smaller than the interest rate $r_{pu}$.\(^{19}\)

$$G = NOPAT - r_{pu} \cdot I > 0$$  \hspace{1cm} (5)

Replacing $G$ in inequality (4):

$$I > \frac{NOPAT - r_{pu} \cdot I}{\theta \cdot r_{pu}}$$  \hspace{1cm} (6)

$$(1 + \theta) \cdot I > \frac{NOPAT}{r_{pu}}$$  \hspace{1cm} (7)

$$r_{pu} > \frac{1}{1 + \theta} \cdot \frac{NOPAT}{I}$$  \hspace{1cm} (8)

**Corollary 2:** The public agent’s likelihood of opportunistic behavior increases in investment $I$, public discount rate $r_{pu}$, and investor’s share $\theta$, and it decreases in Net Operating Profit After Taxation (NOPAT).

The higher $r_{pu}$ or the lower NOPAT/I ratio, the stronger the public agent’s tendency for opportunism. The fact that public opportunism decreases in NOPAT contradicts what is intuitively understood as rent appropriation in private opportunism.

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$^{18}$ $A = I$ would be synonymous with expropriation. I did not explicitly mention the possibility of renegotiation of prior agreements by introducing new competitors. It is implicitly included as a follow-up to the strategy of penalizing the player by expropriation ($A = I$) or beginning the game once again.

$^{19}$ Economic Value Added – EVA methodology was introduced by Stern Stewart and Co (see www.eva.com). It gained popularity in late 1990. Fernández (2001) distinguishes EVA from the economic profit and explains why neither of them can be used to measure the value added for shareholders. Nevertheless, his arguments pertain to accounting techniques and exceed the subject of this paper.
The profitability of Polish public utility companies classified by the Central Statistical Office (GUS) in the category “Production and distribution of electricity, gas and water” was relatively low during systemic transformation years (see Table 6).

### Table 6

Profitability ratios of electricity, gas and water utility companies in years 1995–2001 (in %)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating profit margin</td>
<td>6.4</td>
<td>4.3</td>
<td>4.1</td>
<td>1.8</td>
<td>1.3</td>
<td>0.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Return on Sales</td>
<td>3.5</td>
<td>2.0</td>
<td>2.3</td>
<td>0.7</td>
<td>0.2</td>
<td>–0.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>


Although water companies reported higher profitability than the mean for the whole utilities category, they have not generated positive economic profit (see Table 7).

### Table 7

Financial standing of water utility companies responsible in years 1997–2001 (in million PLN)

<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues from the business activity, including:</td>
<td>3,310.4</td>
<td>3,739.3</td>
<td>4,296.1</td>
<td>4,815.0</td>
<td>5,424.6</td>
</tr>
<tr>
<td>– Revenue from goods and services</td>
<td>2,959.6</td>
<td>3,431.5</td>
<td>3,952.4</td>
<td>4,380.1</td>
<td>4,983.2</td>
</tr>
<tr>
<td>– Revenue from items and materials</td>
<td>52.7</td>
<td>43.4</td>
<td>42.1</td>
<td>51.7</td>
<td>61.3</td>
</tr>
<tr>
<td>– Financial revenues</td>
<td>143.6</td>
<td>75.9</td>
<td>67.5</td>
<td>101.3</td>
<td>123.9</td>
</tr>
<tr>
<td>Tax deductible costs, including:</td>
<td>3,128.3</td>
<td>3,589.5</td>
<td>4,141.2</td>
<td>4,768.3</td>
<td>5,308.1</td>
</tr>
<tr>
<td>– Cost of goods sold</td>
<td>2,921.8</td>
<td>3,394.9</td>
<td>3,916.4</td>
<td>4,314.4</td>
<td>4,979.6</td>
</tr>
<tr>
<td>– Cost of items and materials sold</td>
<td>51.5</td>
<td>83.8</td>
<td>36.5</td>
<td>46.1</td>
<td>48.1</td>
</tr>
<tr>
<td>– Financial costs</td>
<td>91.5</td>
<td>26.6</td>
<td>65.9</td>
<td>264.1</td>
<td>117.8</td>
</tr>
<tr>
<td>Operating profit</td>
<td>182.1</td>
<td>149.8</td>
<td>154.9</td>
<td>46.7</td>
<td>116.5</td>
</tr>
<tr>
<td>Extraordinary profit</td>
<td>6.6</td>
<td>2.7</td>
<td>6</td>
<td>0.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Extraordinary loss</td>
<td>21.1</td>
<td>10.7</td>
<td>12</td>
<td>3.5</td>
<td>3</td>
</tr>
<tr>
<td>Income before taxes</td>
<td>167.8</td>
<td>141.8</td>
<td>148.9</td>
<td>43.9</td>
<td>115.1</td>
</tr>
<tr>
<td>Gross profit</td>
<td>184.8</td>
<td>179.8</td>
<td>209.3</td>
<td>263.8</td>
<td>217.8</td>
</tr>
<tr>
<td>Gross loss</td>
<td>96.3</td>
<td>38</td>
<td>60.4</td>
<td>219.9</td>
<td>102.7</td>
</tr>
<tr>
<td>Taxes &amp; fees</td>
<td>65.7</td>
<td>51.7</td>
<td>64.3</td>
<td>137.4</td>
<td>91.9</td>
</tr>
<tr>
<td>– Income tax</td>
<td>59.5</td>
<td>46.1</td>
<td>56.5</td>
<td>131.9</td>
<td>87.1</td>
</tr>
</tbody>
</table>

Example:

In 2002, the city of Poznan was considering a possible partial privatization of Poznanskie Wodociagi i Kanalizacja Sp. z o.o. (Poznan Water and Sewage Company) and at the same time was one of a few whose financial statements were publicly available (www.pwik.poznan.pl, accessed June 13, 2003), which makes it a good case study of potential public opportunism after the private investment.

Taking into account that in 2002 the WACC for the city of Poznan was 6.65% and assuming $\theta = 0.5$, the NOPAT / I ratio should have been above 9.975% for opportunism not to be a profitable strategy for the public agent. Thus low profitability and high public opportunistic likelihood could have been a substantial deterrent for the private investor in the privatization process.
<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income after taxes</td>
<td>102.1</td>
<td>90.1</td>
<td>84.6</td>
<td>-93.5</td>
<td>23.2</td>
</tr>
<tr>
<td>Net profit</td>
<td>119.7</td>
<td>128.4</td>
<td>145.6</td>
<td>130.6</td>
<td>126.5</td>
</tr>
<tr>
<td>Net loss</td>
<td>17.6</td>
<td>38.3</td>
<td>61</td>
<td>224.1</td>
<td>103.3</td>
</tr>
<tr>
<td>Operating profit margin</td>
<td>5.1%</td>
<td>3.8%</td>
<td>3.5%</td>
<td>0.9%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Return on sales</td>
<td>3.1%</td>
<td>2.4%</td>
<td>2.0%</td>
<td>-1.9%</td>
<td>0.4%</td>
</tr>
<tr>
<td>NOPAT = operating profit + financial costs – taxes and fees</td>
<td>207.9</td>
<td>124.7</td>
<td>156.5</td>
<td>173.4</td>
<td>142.4</td>
</tr>
<tr>
<td>I = net value of fixed assets (a)</td>
<td>20,244.4</td>
<td>22,062.8</td>
<td>23,892.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted Average Cost of Capital WACC = r_{pu}</td>
<td>16.80%</td>
<td>18.06%</td>
<td>11.52%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVA = NOPAT – WACC · I</td>
<td>-3,244.6</td>
<td>-3,811.1</td>
<td>-2,610.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOPAT / I</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Working Capital data not disclosed; if assumed positive, then EVA would be even lower.

Source: GUS (1993-2002) and my own calculations.

Among publicly traded municipal companies in Poland, only Bedzin SA achieved Return on Equity (ROE) exceeding 10% from the third quarter of 2002 to the second quarter of 2003: 13.9%, with low leverage (Debt to Assets ratio was 9.9%). Other companies achieved ROE well below their cost of capital: Aqua 5.7%, Kogeneracja 2.0%, MPEC 0.1%, Wodkan 2.4%, and ZOIGO MZO 0.0%. 22 ergo, they did not make economic profit. Even Poznanskie Wodociagi i Kanalizacja, whose operating profit margin was above average and whose cost of capital was relatively low (in 2001 the city of Poznan, the main shareholder in PWiK, 21 issued five- and six-year bonds at 40 basis points above 52-week Treasury bond reference rate), did not achieve economic profit (see Table 8).

Table 8
Economic value added for Poznanskie Wodociagi i Kanalizacja Sp. z o.o. in years 2001–2002

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating profit margin</td>
<td>8.8%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Return on Sales</td>
<td>6.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>NOPAT = operating profit + financial costs – income tax</td>
<td>18,751,374.28</td>
<td>11,926,444.24</td>
</tr>
<tr>
<td>WACC = r_{pu} = 7.52 + 0.4%</td>
<td>11.24%</td>
<td>6.21%</td>
</tr>
<tr>
<td>I = equity + long-term debt + credits and loans</td>
<td>535,601,241.16</td>
<td>909,610,974.67</td>
</tr>
<tr>
<td>EVA = NOPAT – WACC · I</td>
<td>-3,244.6</td>
<td>-3,811.1</td>
</tr>
<tr>
<td>NOPAT / I</td>
<td>-3,460,205.23</td>
<td>-4,460,397.29</td>
</tr>
<tr>
<td>NOPAT / I</td>
<td>3.5%</td>
<td>1.3%</td>
</tr>
</tbody>
</table>


There is an investment paradox in public-private partnerships: on the one hand, public-private partnerships may improve profitability; on the other hand, because public utility companies’ profitability is low before engaging the private sector, public agents are prone to behave

21 As of October 18, 2002, six municipalities were shareholders in Poznanskie Wodociagi i Kanalizacja Sp. z o.o.: Poznan 3,749,184 shares, i.e., 81.5% at nominal value of PLN 187,459,200; Lubon 3.77%; Mosina 4.02%; Murowana Gosлина 3.15%; Puszczykowo 2.55%; Swarzedz 5.01%. In July 2003 the company changed its name to Aquanet.
opportunistically. As the cost of capital in emerging economies decreases with development, the conditions for public opportunism – i.e., inequality (8) – will become more difficult to satisfy, and thus investors should be more inclined to invest.

3.2. Minimizing the risk of public opportunism through bail-out and exit options

One of the mechanisms of minimizing the risk of public opportunism is to specify contractual provisions for subsidies from the public agent when profit falls below the expected profit of the public-private joint venture $\pi_{jv}$. This mechanism might, however, place the public agent in an ambiguous position and make it the judge in its own case. Even if there is a higher court to appeal to, the private investor may deter from investing due to the time necessary for the judiciary to execute court decisions.

Proposition 1: A perpetual exit (put) option at a striking price equal to the annualized investment, where the public agent is short and the private investor long, offsets the gains from public opportunism against the private investor in a public-private joint venture and thus reduces ex ante the probability of public opportunism as well as the factors that deter the private investor from entering into that joint venture.

Proposition 1 concerns the contractual creation of an exit option which allows the private investor to opt out of a public-private investment (Copeland, Koller, and Murrin 1994, p. 456, abandonment option; Zerbe Jr. and Dively, 1994, pp. 387-388, bail-out option).

In order to streamline calculations, I assume a two-part tariff where capital costs are covered by fixed fees $f(q)$, $q$ being the level of quality dependant on $l$, i.e., $ql(l)$ (Moszoro, 2010), the nominal value of the shares remaining at their initial level, and a dividend for the shareholders paid from profit. This proposition is therefore convergent with Posner’s (1972, pp. 98-129) suggestion which takes into account the initial investment, improvements and depreciation.

European options can be executed only at a specified moment. American options can be executed at any given moment preceding expiration. The postulate for perpetual put options is aimed at avoiding reverse induction and ineffective equilibria.

An option is a right, but not an obligation, to undertake certain activities in the future, e.g., to buy or sell a given basic instrument (shares, bonds) in specified quantities at a set price and within a specified time (or by a specified date). An exit option contract on shares of a public utility company has features of both financial and real options. Tadeusz Jajuga (2002, pp. 311-313) enumerates eleven differences between financial and real options. The following outline characterizes a private investor’s exit options in a public-private partnership (the first is a basic difference concerning the underlying asset; the next are from Jajuga’s listing):

1. **Underlying asset**: the shares in the public-private utility company, i.e., an instrument subject to trade. In this regard these options are similar to financial options.

2. **Form of the contract**: in the case of real options, contracts are non-existent (there is no issuer or short-seller), and their expiration date and strike price are dependent on the option holder and the circumstances. Real options must therefore be identified or

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22 It is obvious that the full valuation of the company would be more complex, especially when considering the level of replacement investments. I assume both parties have an interest in maintaining investments at the assets’ depreciation rate.

23 Sequential options renewed annually would yield the same result.
created by the asset holder – only then can they be described. Financial options are standardized. In the case of options for shares in a public-private utility company, the options are the outcome of a formal contract, as in the case of financial options; however, they are characterized by unique or quasi-unique features, as in the case of real options.

3. **Pricing of the underlying asset**: pricing options for shares in a public-private partnership is closer to real options valuation, as public utility companies are not usually traded in stock exchanges and there is no market valuation. Discount or book methods are most often employed to carry out such valuations, which – contrary to real options – do not take into account flexibility in the decision-making process.

4. **Risk**: the value of the options for shares in a utility company is determined both by market risk – irrespective of the management – and specific risk, which can at least be partially controlled by active management, as is the case of both real and financial options.

5. **Decision method for executing an option**: in a public-private partnership, option pricing and decision-making are not based on a simple comparison between the market price and the strike price of the underlying asset; hence there are more similarities to real options. Nevertheless, in the model presented below, the exit option is of positive value when there is an economic loss, thus the decision method is simple comparison.

6. **Option incidence**: financial options occur singularly, while real options linked with a given investment project usually form a sequence of options (i.e., the execution of one option creates a further set of different options) or an option portfolio. In the mechanism presented, not executing the exit option creates the possibility of undertaking further common investments and guarantees other public agents that such cooperation with the private investor is possible.

7. **Possibility of managing options and influencing their value**: in public-private partnerships it is expected that the private investors perform active management, which causes the put option to resemble a real option. Active management can influence the cash flows, the cost of capital and, as a result, the entire present value of the company and the underlying asset. The expiration date is subject to change, e.g., in the course of negotiations, which has a positive effect on the value of the option.

8. **Option type**: in most cases, the real options are American options. Issuing an exit option to a private investor is reasonable only if the option can be executed at any time or at the end of any period.

9. **Accessibility**: financial options are generally accessible, while real options must be identified or created. Entering a public-private partnership requires a non-standard innovative approach in each case.

10. **Valuation model**: binomial option pricing model is a more useful means of options pricing in a public-private partnership, as it is based on the description of an underlying instrument over a discrete period of time (lattice model) rather than a single point in a continuous-time data set.

11. **Complexity level**: options in a private-public partnership are more complex than standard financial options.
12. **Exclusive right to execute options**: as in financial options, only the option holder decides if and when the option is to be executed.

### 3.3. Pricing Exit Options in a Public-Private Partnership

The value of exit options may be determined by using a binomial tree (Cox, Ross, and Rubinstein, 1979; Cox and Rubinstein, 1985, chapter 5). This method consists of identifying options, placing them on a tree diagram and calculating the expected value of the modified tree (Zerbe Jr. and Dively, 1994, pp. 386-390). The difference between the expected value without the option and the expected value of the enterprise with the option amounts to the value of the option.

Determining the value of the option is quite simple in the case of a one-shot game. Assuming the likelihood of the public-private partnership generating an economic profit $G$ is $\sigma$ and the likelihood of generating an economic loss $-A$ (this might also be a penalty or restrictive regulation) is $1-\sigma$, the Net Present Value (NPV) of the investment in a public-private utility company for the private investor is equal to:

$$NPV_{pr} = \theta \cdot \left[ -I + \sigma \left( \frac{G + r_{pr} I + I}{1 + r_{pr}} \right) + (1-\sigma) \left( \frac{-A + r_{pr} I + I}{1 + r_{pr}} \right) \right] \quad (9)$$

i.e., at the beginning of the period, the investor invests $\theta \cdot I$, and at the end of the period the investor receives a return on invested capital $\theta \cdot r_{pr} \cdot I$, generates profit or loss ($\theta \cdot G$ or $-\theta \cdot A$) and owns shares $\theta \cdot I$.

Simplifying terms:

$$NPV_{pr} = \theta \cdot \left[ \frac{\sigma \cdot G - (1-\sigma) \cdot A}{1 + r_{pr}} \right] \quad (10)$$

Assuming that if the utility company incurs a loss of $-A$, the private investor will be able to sell her shares to the public agent at their nominal value and receive a return equal to the cost of capital, the exit option price equals:

$$NPV_{pr_{-put}} = \theta \cdot \frac{\sigma \cdot G}{1 + r_{pr}} \quad (11)$$
**Figure 3**

Expected value of investment for an investor with and without an exit option in a one-shot game

The value of the exit (put) option equals:

\[
V_{\text{put}} = \text{NPV}_{pr \_put} - \text{NPV}_{pr}
\]

(12)

\[
V_{\text{put}} = \theta \frac{(1-\sigma) \cdot A}{1 + r_{pr}} - \theta \cdot \left[ \frac{\sigma \cdot G - (1-\sigma) \cdot A}{1 + r_{pr}} \right]
\]

(13)

\[
V_{\text{put}} = \theta \frac{(1-\sigma) \cdot A}{1 + r_{pr}}
\]

(14)

**Lemma 1:** An exit option in a public-private company will be of positive value for every \( \theta > 0, \sigma < 1 \) and \( A > 0 \). At the boundaries, i.e., for \( \theta \) or \( A \) equal to zero, or \( \sigma \) equal to 1, the exit option’s value is zero (its execution does not influence the financial position). Therefore an exit option held by the private investor in a public-private company is always of non-negative value.

The tree diagram is more complex in the case of repeated and infinitely repeated games. Figure 4 presents a tree diagram assuming that economic profit equals \( G \) with likelihood \( \sigma \) and \(-A\) with likelihood \( 1-\sigma \).
Figure 4

Expected investment value for an investor without an exit option in an endless repeated game

Note: payoffs in all periods have been simplified to the economic outcome.

The expected value of the game for a private investor without an exit option equals:

\[
\text{NPV}_{pr} = \theta \cdot \left[ \frac{\sigma \cdot G - (1 - \sigma) \cdot A}{(1 + r_{pr})} \right] + \frac{\sigma^2 \cdot G - \sigma(1 - \sigma) \cdot A + \sigma(1 - \sigma)G - (1 - \sigma)^2 A}{(1 + r_{pr})^2} + \ldots
\]  \hspace{1cm} (15)

\[
\text{NPV}_{pr} = \theta \cdot \left[ \frac{\sigma \cdot G - (1 - \sigma) \cdot A}{(1 + r_{pr})} \right] + \frac{\sigma G - (1 - \sigma) \cdot A}{(1 + r_{pr})^2} + \ldots
\]  \hspace{1cm} (16)

\[
\text{NPV}_{pr} = \theta \cdot \left[ \frac{\sigma \cdot G - (1 - \sigma) \cdot A}{(1 + r_{pr})} \right] + \frac{\sigma \cdot G - (1 - \sigma) \cdot A}{(1 + r_{pr})^2} + \ldots
\]  \hspace{1cm} (17)

\[
\text{NPV}_{pr} = \theta \frac{\sigma \cdot G - (1 - \sigma) \cdot A}{r_{pr}}
\]  \hspace{1cm} (18)
**Lemma 2:** If the investor in a public-private company holds an exit option at a strike price equal to the annualized investment, she will execute the option with probability $1 - \sigma - \varphi$ and end up with economic profit equal to zero, where $\sigma$ is the probability of economic profit at least equal to $G$ and $\varphi$ is the probability of positive economic outlook when economic profit is less than $G$. $\varphi$ might also be interpreted as a specific indicator of the investor’s optimism, which causes the investor to refrain from executing the exit option despite incurring a loss in one period.

**Figure 5**
Expected investment value for a private investor with an exit option in an endless repeated game

The expected value of the game with an exit option equals:

$$\text{NPV}_{pr_{put}} = 0 \cdot \left[ \frac{\sigma \cdot G - \varphi \cdot A}{(1 + r_{pr})} + \frac{\sigma^2 \cdot G - \sigma \varphi \cdot A + \varphi \sigma \cdot G - \varphi^2 \cdot A}{(1 + r_{pr})^2} + ... \right]$$  \hspace{1cm} (19)

$$\text{NPV}_{pr_{put}} = 0 \cdot \left[ \frac{\sigma \cdot G - \varphi \cdot A}{(1 + r_{pr})} + \frac{\sigma(\sigma \cdot G - \varphi \cdot A) + \varphi(\sigma \cdot G - \varphi \cdot A)}{(1 + r_{pr})^2} + ... \right]$$  \hspace{1cm} (20)

$$\text{NPV}_{pr_{put}} = 0 \cdot \left[ \frac{\sigma \cdot G - \varphi \cdot A}{(1 + r_{pr})} + (\sigma + \varphi) \frac{\sigma \cdot G - \varphi \cdot A}{(1 + r_{pr})^2} + ... \right]$$  \hspace{1cm} (21)

$$\text{NPV}_{pr_{put}} = 0 \cdot \frac{\sigma \cdot G - \varphi \cdot A}{r_{pr} + 1 - \varphi}$$  \hspace{1cm} (22)
The price of an indefinite exit (put) option amounts to:

\[ V_{\text{put}} = \text{NPV}_{\text{pr}, \text{put}} - \text{NPV}_{\text{pr}} \]  

(23)

\[ V_{\text{put}} = \frac{0 \cdot \sigma \cdot G - \varphi \cdot A}{r_{\text{pr}} + 1 - \sigma - \varphi} - \frac{0 \cdot \sigma \cdot G - (1 - \sigma) \cdot A}{r_{\text{pr}}} \]  

(24)

The riskiness of the investment means that the Net Present Value for the private investor (NPV_{pr}) without an exit (put) option is close to zero.  

This might be the result of economic profit G being too low or too rare (low \( \sigma \)) in comparison to economic loss A, which can occur more often with likelihood \( 1 - \sigma \). One might therefore assume that the value \( \theta \cdot [\sigma \cdot G - (1 - \sigma) \cdot A]/r_{\text{pr}} \) will equal or close to zero.

In the case of \( \theta \cdot (\sigma \cdot G - \varphi \cdot A)/(r_{\text{pr}} + 1 \cdot \sigma - \varphi) \), it is worth noting that for high economic loss A and low likelihood \( \sigma \) of economic profit G, \( \varphi \) will be adequately low. However, the value of this part of equation (24) is always positive. In boundary cases when \( \varphi = 0 \), it becomes obvious that the exit option price is positive for every \( \theta \in (0, 1) \) and for every \( \sigma \in (0, 1) \).

To conclude, the Net Present Value of the investment for the private investor equals:

\[ \text{NPV}_{\text{pr}} = -I + \sum_{t=1}^{T-1} \frac{0 \cdot \pi_{jv}}{(1 + r_{\text{pr}})^t} + \frac{I \cdot (1 + r_{\text{pr}})}{(1 + r_{\text{pr}})^T} \]  

(25)

\[ \text{NPV}_{\text{pr}} = -I + \theta \cdot \left[ \frac{1 - (1 + r_{\text{pr}})^{-T}}{r_{\text{pr}}} \cdot \pi_{jv} + \frac{I}{(1 + r_{\text{pr}})^T-1} \right] \]  

(26)

where \( T \) designates the moment of executing the “option.”

**Corollary 3:** The payoff of a contract with an exit option with a strike price equal to the annualized investment is non-negative. Non-negative economic profit \( \pi_{jv} \) in all periods from 1 to \( T - 1 \) indicates that the cost of capital has been covered, while \( I/(1 + r_{\text{pr}})^T-1 \) ensures that, upon execution of the option during the period \( T \) when economic profit is negative, the cost of capital will be covered.

### 3.4. Minimizing The Risk of Opportunism of The Private Investor With Bail-Out (Call) Options

**Lemma 3:** The opportunism strategy is profitable for the private investor if the expected one-period profit of the monopolist \( \pi_m \) minus the profit generated by fulfilling the contract in terms of quality and price minus discounted future penalties exceeds zero:

\[ 0(\pi_m - G) - \sum_{t=1}^{T} \frac{0 \cdot A}{(1 + r_{\text{pr}})^t} > 0 \]  

(27)

where \( r_{\text{pr}} \) is the cost of capital for the private investor.

---

24 If NPV were of negative value, the investment would not so much be risky, but rather would not be executed by the investor at all.
As the sum of discounted penalties cannot exceed invested capital \((\sum_{t=1}^{T} \frac{1}{(1+r_{pr})^t} \leq I)\), the outcome is the following condition for private opportunism profitability:

\[
\theta(\pi_m - G) - \theta \cdot I > 0 \\
\pi_m - G > I
\]

Replacing \(G\) in inequality (29) by formula (5):

\[
\pi_m - NOPAT - r_{pr} \cdot I > I \\
r_{pr} < \frac{\pi_m - NOPAT}{I} - 1
\]

**Corollary 4:** The higher the potential monopoly profit \(\pi_m\), the more likely the private investor will behave opportunistically, lowering quality and increasing the price towards monopoly price. The higher the value of investment \(I\), interest rates \(r_{pr}\) and Operating Profit After Tax (NOPAT), the less likely the private investor will behave opportunistically.

**Corollary 5:** Low NOPAT / \(I\) ratio increases the likelihood of both private and public opportunism. Therefore, increasing the profitability of the public-private utility company improves the stability of the joint venture.

Analogically to the private investor, who can execute the exit option in order to secure her interests, the public agent, who is concerned about maximizing consumer utility, can secure herself against the risk of opportunism of the private investor (i.e., higher prices and lower quality) by holding a bail-out (call) option. The bail-out option gives the public agent the right to purchase, at the end of each period, the investor’s shares at the strike price \(\theta \cdot (1 + r_{pr}) \cdot I\), i.e., the annualized investment. Taking into account that the public agent executes the bail-out option with a view to reselling the shares to another investor, such options can be compared to options referred to in financial literature as options to expand (Copeland, Koller, and Murrin, 1994, pp. 457-458) or switching options.

The bail-out option might be executed for the following reasons:

a) Lack of fulfillment of contract terms by the private investor, e.g., maintaining low quality of services by the company as a result of not carrying out investments at the agreed-upon level \(I\).

b) The private investor’s reluctance to invest in new technologies or the appearance of a new technology which the incumbent investor lacks and which can notably improve the effectiveness of the utility company. If the new investor can reduce costs due to better know-how, it is profitable for the public agent to repurchase shares in the public-private partnership and enter into a new partnership.

c) The endeavors of the private investor to realize monopoly profit by means of curbing production, lowering product quality or raising prices. In such situations the public-private partnership would become closer to a private monopoly and would be a case of capturing the utility company by the private investor. The public agent might find it profitable to

---

25 Including the option to bail-out a private investor from utility companies by the public agent is not a novel idea. This option is present, e.g., in cable TV license contracts in Los Angeles (Williamson, 1985, pp. 341-342).

26 Assuming the shares in the utility company will be sold at the same or better price.
regulate the monopoly or repurchase shares from the private investor and enter into a new partnership, or create a public monopoly.

Another advantage – quite common, though less formal from the economical point of view – of holding a bail-out option by the public agent is the reduced concerns of the public in general (consumers, voters) about the possible lack of agreement between the public agent and the private investor. The awareness of the existence of the bail-out option might prove an effective social tranquilizer and reduce third-party opportunism (Spiller, 2008).

The value of the bail-out option is dependent on market contestability. Exit and bail-out options, similar to financial put and call options, provide both parties with notable advantages: the private investor obtains the possibility of minimizing economic loss, while the public agent acquires a tool for enhancing the efficiency of utility companies.

4. Option Contracts As a Means to Efficient Public-Private Partnerships: Policy Implications

Designing long-term agreements in natural monopolies, including public-private partnership contracts, is difficult due to bounded rationality and opportunism. These are behavioral assumptions which – contrary to neoclassical orthodoxy – are not ignored by institutional economics. According to Williamson (1985, pp. 66-67), when analyzing the mechanisms of long-term agreements, four cases can be discerned, in three of which contractual difficulties do not arise. The four cases can be described in the following way:

1) Unbounded rationality/non-opportunism – a condition of contractual utopia. 27

2) Unbounded rationality/opportunism – a case where contracts can be made to work well by recourse to comprehensive contracting. Such contracts are referred to as comprehensive or complete contracts and foresee all possible opportunistic actions and their consequences for both parties. 28

3) Bounded rationality/non-opportunism – where contracting works well because of general clause protection against hazards of contractual incompleteness. By signing a “general clause” contract, the parties undertake to reveal all relevant information and cooperate throughout the execution and renewal of the agreement.

4) Bounded rationality/opportunism: in Williamson’s opinion this case corresponds with reality, especially in natural monopolies, and is characterized by the occurrence of all complex problems involved in contracting.

27 Williamson (1985, p. 47) explains that opportunism is not tantamount to simply pursuing one’s interests: “By opportunism I mean self-interest with guile. This includes but is scarcely limited to more blatant forms, such as lying, stealing, and cheating. Opportunism often involves subtle forms of deceit. Both active and passive forms and both ex ante and ex post types are included.”

28 Bounded rationality is considered “a semistrong form of rationality: it is assumed economic actors are in this case ‘intendedly rational, but only limitedly so’” (Williamson, 198, p. 45; the latter part of the quotation after: Simon, 1961, p. xxiv).

However, complete contracts are inaccessible due to the bounded rationality and incapability of predicting all possible circumstances.
Table 9
Classification of contracts according to Oliver Williamson

<table>
<thead>
<tr>
<th>Condition of Bounded Rationality</th>
<th>Absent</th>
<th>Admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>Bliss (1)</td>
<td>“General clause” contracting (3)</td>
</tr>
<tr>
<td>Admitted</td>
<td>Comprehensive contracting (2)</td>
<td>Serious contractual difficulties (4)</td>
</tr>
</tbody>
</table>


The propositions put forward in the related literature (Williamson, 1985, pp. 332-345; Viscusi, Vernon, and Harrington, 2000, pp. 405-408) with the aim to overcome the “serious contractual difficulties” might, in the case of monopolies, be classed as one of the following three types: complete “once-and-for-all” contracts, developed by Stigler (1968), incomplete long-term contracts, preferred by Demsetz (1968), and renewable short-term contracts, presented by Posner (1972).

In the case of a complete “once-and-for-all” contract, the state is the means to carry out a one-time “auction” for the best investor, which results in savings on transaction costs. However, due to claims resulting from unforeseen circumstances, a result of bounded rationality, these contracts are unrealistic and their feasibility is questionable.

Incomplete long-term contracts, which enable renegotiation, are a mechanism of soothing the claims dispute resulting from unforeseen events. However, a number of difficulties arise, e.g., successful bidders may want to renegotiate terms for their own benefit and thus jeopardize the execution of the contracts. Moreover, incomplete long-term contracts, as Williamson accurately points out, differ from regulations only in depth, not in essence. However, in the case of incomplete long-term contracts, a regulatory agent is still required to determine the level of quality and monitor the activities of the investor, as well as to negotiate changes in prices with the utility company.

Posner’s mechanism of renewable short-term contracts is aimed at solving problems with adapting long-term agreements, but the basic assumption of his rationale – the “problem-freeness,” i.e., low transaction cost, equal conditions for incumbent bidders and new bidders

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29 Although Williamson analyzes franchising agreements and focuses rather on services other than public utilities, I believe that the classification is appropriate for analyzing partial or total privatization of natural monopolies. In the public utilities sector, “serious contractual difficulties” have their source in bounded rationality (not so much in intentions as in scope, i.e., developments in technology and changes in the economic environment, etc.), in private and public opportunism, and in the specificity of the assets, since securing these assets triggers the process of concluding contracts.

30 In the opinion of Viscusi, Vernon, and Harrington (2000), such contracts should be designed for the period of 15-20 years. The American Chamber of Commerce in Poland (2002) shows that the duration of agreements is from 10 to 50 years. Guislain and Kerf (1995, pp. 2-3) provide examples of long-term agreements spanning from 10 to 95 years.

31 “At the risk of oversimplification, regulation may be described contractually as a highly incomplete form of long-term contracting in which (1) the regulatee is assured an overall fair rate of return, in exchange for which (2) adaptations to changing circumstances are successively introduced without the costly haggling that attends such changes when parties to the contract enjoy greater autonomy.” (Williamson, 1976, p. 91; 1985, p. 347).
during contract renewals – is at least questionable (Williamson, 1985, p. 346). The incumbent investor has lower cost as he is further along the learning curve (tried and tested technologies, trained staff) and is better informed (acquainted with the specificity of the product and the market), which gives her an advantage over potential competitors contending for the short-term contract. Table 10 summarizes the advantages and disadvantages of different types of contracts as alternative to regulation in natural monopolies.

Table 10
Advantages and disadvantages of contracts as alternative to regulation in natural monopolies

<table>
<thead>
<tr>
<th>Contract type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Once-and-for-all&quot; contracts (Stigler)</td>
<td>a) complete (including claims for unforeseen events)</td>
<td>• very difficult to design, negotiate and execute (practically unfeasible)</td>
</tr>
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<td>a) complete (including claims for unforeseen events)</td>
<td>• very difficult to design, negotiate and execute (practically unfeasible)</td>
</tr>
<tr>
<td></td>
<td>b) incomplete</td>
<td>• the initial criteria of investor selection are usually forced and dubious</td>
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<tr>
<td></td>
<td>• reduce the risk of opportunism: conditions known <em>a priori</em></td>
<td>• plausible problems with executing provisions concerning prices and costs (possible delays and expenses incurred by court proceedings, uncertainty of technologies, demand, local conditions, inflation, indexation mechanisms, etc.) and political problems (the public agent is reluctant to admit it made a mistake)</td>
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<tr>
<td></td>
<td>• take into account the limitations of bounded rationality</td>
<td>• ensuring equal rights for the incumbent investor and new bidders during contract renewal is improbable (economic, administrative, and political benefits for the incumbent investor, switching costs)</td>
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<tr>
<td>Incomplete long-term contracts (Demsetz)</td>
<td>• allow for renegotiation of conditions in compliance with penalty clauses</td>
<td></td>
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<tr>
<td></td>
<td>• provide necessary stimuli in order to invest in long-term assets</td>
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<tr>
<td></td>
<td>• facilitate the continuous decision-making process and the tender mechanism is less limited by bounded rationality (it is not necessary to create the whole long-time decision tree diagram <em>a priori</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• do not need to include unforeseen events, as in long-term contracts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• adaptation only in periods of renewal and only in relation to events which actually took place</td>
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<tr>
<td></td>
<td>• eliminate incompleteness, assuming effective competition during the renewal bidding process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• awareness of having to compete for a new contract deters from opportunism</td>
<td></td>
</tr>
<tr>
<td>Renewable short-term contracts (Posner)</td>
<td>• inequalities between incumbent investor and new bidders</td>
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<td></td>
<td>• human capital is not taken into account</td>
<td></td>
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<tr>
<td></td>
<td>• problems with the valuation of plant and equipment, if the investments are specific</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• possible inefficient investment in facilities and equipment in a short period</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• possible manipulation of costs and accounting procedures (e.g., depreciation) with the aim of reselling at a higher price</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• problem-free transfer of assets described by Posner is unattainable</td>
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</table>


The option mechanism for public-private partnerships combines the advantages of incomplete “once-and-for-all” contracts and long-term contracts with those of short-term contracts. Incentives for long-term investments are at the same time risk deterrents of opportunism. The flexibility of the option contracts enables a continuous process of enhancing cooperation between the investor and the public agent or termination of cooperation without loss for any of the parties. Under this regime, information asymmetries (e.g., on quality or accounting) are less likely to occur, as the public agent is a party to the agreement and has insider information. Furthermore, the issue of problem-free transfer of assets mentioned by Posner de
facto boils down to the purchase of assets at a set price: the strike price of the exit or bail-out option.

The exit/bail-out option mechanism does not eliminate the problem of human capital, transfer of experienced staff and the advantage of the incumbent investor over potential competitors. On the one hand, it reduces entry barriers by streamlining incomplete long-term contracts and avoiding contractual problems related to bounded rationality and opportunism. On the other hand, as a result, a natural monopoly becomes similar to a contestable market.
References


