INTERNATIONAL JOURNAL OF STRATEGIC PROPERTY MANAGEMENT
ISSN 1648-715X print / ISSN 1648-9179 online

2011 Volume 15(2): 173–188
doi: 10.3846/1648715X.2011.582750

COMPARING RISK TRANSFERS UNDER DIFFERENT PROCUREMENT ARRANGEMENTS

Emlyn WITT [1] ✉ and Roode LIIAS [2]

[1] *Department of Building Production, Tallinn University of Technology, Ehitajate St. 5, EE-19086 Tallinn, Estonia*
E-mail: emlyn.witt@ttu.ee
[2] *Department of Building Production, Tallinn University of Technology, Ehitajate St. 5, EE-19086 Tallinn, Estonia*
E-mail: roode@staff.ttu.ee

Received 20 November 2009; accepted 27 October 2010

ABSTRACT. Public Private Partnerships (PPPs) may be considered to represent a range of procurement routes characterized by the integration of many project elements into a single contract with an output-based pricing mechanism. At the other end of the same continuum of procurement routes are less integrated arrangements with more input-based pricing ('traditional' procurement). Risk transfer from the client to the contractor should vary with procurement route attribute values: with greater integration and more output-based pricing an increase in risk transfer would be expected. The more risk transferred to the contractor, the greater the incentive for the contractor to deliver the project efficiently. The paper proposes indicators of risk transfer and delivery efficiency which are then used in modeling the relationships between risk transfer, efficiency and procurement route attributes. The proposed model enables the microeconomic assumptions which underlie PPPs to be tested with data from historical construction projects in order to cast light on the effectiveness of the PPP approach.

KEYWORDS: Public Private Partnerships; Procurement; Risk management; Risk transfer

1. INTRODUCTION

Since their emergence two decades ago, public private partnerships (PPPs) have been hailed by some commentators as a means of capturing public benefits from private sector investment opportunities while derided by others as being no more than an ultimately expensive accounting trick for avoiding government expenditure controls. They have also stimulated debate regarding the role of the public sector and the relative efficiencies of private sector and public sector provision of goods and services. Reflections of this debate may be seen in the academic literature from a wide range of disciplines including public policy and administration, micro- and macroeconomics, finance, accounting, construction economics and management, education and health. From the construction economics and management perspective, the rise of PPPs has contributed to a proliferation of procurement routes (Design-Build-Finance-Operate, Lease-Develop-Operate, Buy-Build-Operate, etc.) and a heightened interest in risk and risk transfer in construction projects.

This paper draws on the literature to illustrate the relationship between procurement routes and risk transfer. It argues that the risk transfer assumptions which underlie the PPP approach may be represented in the form of an 'eventuated risk' model which can then be tested with empirical evidence from historical projects. The proposed model is articulated and testable hypotheses to which it gives rise are noted. These are then tested on the basis of an initial data set to establish the efficacy of the proposed model and its representation.

2. CONTEXT AND PROBLEM DESCRIPTION

2.1. The historical context of PPPs

A PPP is a form of public procurement which comprises a long-term contractual arrangement between a public authority and a private sector entity. Under a typical PPP, the private sector partner finances, designs, constructs and operates a capital asset such as infrastructure or public buildings in order to provide public services that have been defined by the public sector partner who has a long-term commitment to purchase them. It should be noted, however, that the term “public private partnership” may be applied to a considerable range of procurement routes so that its formal definition is problematic (Kyvelou and Karaiskou, 2006; European Commission DGRP, 2003 p.16).

Such privately financed projects and the particular types of contract which they entail, for example concession contracts and lease agreements, have been in existence for considerable time (see Irwin, 2007 p.12). Government programs to promote the use of private finance in the delivery of public infrastructure and services have, however, emerged as part of wider privatization and outsourcing strategies notably in Chile in the 1970s and the United Kingdom in the 1980s (European Investment Bank, 2005; Estache, 2005; Sadka, 2006). By the late 1990s, PPPs had become an established means of securing private capital and management expertise for infrastructure projects (International Monetary Fund, 2004) and an increasingly popular procurement option for governments globally and particularly within the European Union.

The European Commission itself has somewhat embraced the PPP concept and, since 1999, there has been a clear policy to increase the level of private funding in the procurement of economic and social infrastructure as well as support for using the PPP mechanism to do so (European Investment Bank, 2005; Barrett, 1999). In March 2003 it published “Guidelines for Successful Public-Private Partnerships” (European Commission DGRP, 2003) in particular response to the benefits it perceived that the PPP approach could offer the then Accession Countries with their requirements for improved infrastructure. This was followed up with further practical guidance in the form of the “Resource Book on PPP Case Studies” in June 2004 (European Commission DGRP, 2004). In the same year a “Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions” was issued (Commission of the European Communities, 2004).

2.2. Justification of the PPP approach

At a macroeconomic level, proponents have attempted to justify PPP procurement in terms of its providing finance for investment which the public sector is unable to afford (Edwards et al., 2004 p.17; Broadbent and Laughlin, 2002; European Commission DGRP, 2003). For example, in the context of the European Union, Burnett (2007) refers to a “funding gap” between the financing needed to implement EU policies and the funds available from national and EU budgets. Similar arguments have been made by Yuan et al. (2010) with regard to Chinese PPPs and Jun (2010) with reference to the South Korean context. The PPP approach is considered to achieve this by distinguishing between the provision of public services (for example, with regard to road access, healthcare or education) and the capital assets which the delivery of such services relies on (the highways, hospitals and school buildings). In a typical PPP, the private sector partner is contracted to deliver services rather than to provide the underlying assets and the public sector purchases these services as they are delivered. In this way, some or all of the functions of provision, ownership and operation of the assets are outsourced to the private sector and thus, the "up-front" capital expenditure of traditional public procurement is replaced with operational expenditure when the services are purchased under a PPP. However, the provision of the assets by the private sector is typically contingent upon a long-term obligation for the public sector to purchase the resulting services and this obligation often covers the entire cost of providing the underlying assets. The net effect on public finances may therefore be the same and claims of any lasting macroeconomic gains have been dismissed by some as spurious (Grout, 1997; Spackman, 2002). Thus, from a macroeconomic perspective, the advantage of PPPs appears to lie in the greater (political) acceptability of future purchase obligations as compared to higher levels of debt in the present. It is a function of accounting treatment and the expenditure constraints to which the public sector is subject. For example, the Maastricht criteria limiting budget deficits and overall government debt for European Monetary Union (Broadbent and Laughlin, 1999).

Edwards et al. (2004 p. 17-19) note that the PPP approach is increasingly justified in terms of a microeconomic argument which contends that the private sector is able to provide services more efficiently and effectively than the public sector. PPPs can therefore deliver better value for money (VfM) in the form of lower discounted financial costs over the life of the project compared with the cost of traditional, public procurement. The key to achieving VfM is the appropriate allocation of risk between the public and private sectors (National Audit Office, 1999). In transferring risk to the private sector, the public partner seeks to put in place incentives for the private contractor to perform efficiently but also endeavors to minimize risk premiums by limiting risk transfers to those risks which the private sector is best placed to manage (European Commission DGRP, 2003). Justifications for PPP procurement along these lines have also been reported by Cheung et al. (2010) in the context of the public sectors in Australia and Hong Kong and Tieva and Junnonen (2009) with reference to Finnish PPPs.

In addition, the greater certainty of outcome which arises from risk transfer is generally considered as a benefit to the public sector and, by extension, to the taxpayer. However, the value of this increased certainty is obscure. It relates to the level of risk neutrality or risk aversion of the public sector, the correlation of the transferred risks with overall market risk and with other risks to which the public investment portfolio is exposed. This, in turn, leads into a wider debate regarding the comparative costs of public and private project finance. For further details of these considerations see, for example, Klein (1996), Grout (1997), Iossa and Martimort (2008). Irwin (2006 p.56) provides further details of the principles underlying optimal risk allocation.

Beyond arguments relating to the relative efficiency of PPP procurement, there is also a considerable body of literature dedicated to the development of the PPP approach in order to maximize the benefits which may arise from the cooperation of the public and private sectors and, in some cases, communities. Leung and Hui (2005), Majamaa et al. (2008), Lahdenperä (2009) and Kuronen et al. (2010) offer some examples of such developments in relation to urban planning and redevelopment.

2.3. Problem description and purpose of this paper

With an appropriate transfer of risk from the public to the private partner, PPP proponents contend that the greater efficiencies and effectiveness of the private sector will be invoked and, together with an advantageous exposure of the public sector to risk, this will result in better VfM.

A number of models have been developed including those of Davies (2006) and Iossa and Martimort (2008) to represent this microeconomic argument and to derive the conditions under which it might be valid. There is, however, a lack of convincing empirical evidence to support it and the opacity which surrounds the details of individual PPP agreements in the name of commercial confidentiality exacerbates this (Hood et al., 2006).

This paper adopts the view that the key microeconomic heuristic of the form: *"through risk transfer to the private sector => the public sector achieves better VfM"* has already been assumed in pro-PPP policy. While it has a "common sense" appeal since it aligns responsibilities with the rewards (or punishment) for their successful (or unsuccessful) management, it is dependent on two conditions:

1) that the intention to transfer risk is effective in practice; and,
2) that benefits arising from efficiency gains are captured by the public sector.

It is the authors' intention to test the validity of these with empirical evidence from historical construction projects.

To achieve this, PPP procurement arrangements are first related to the wider range of construction procurement routes and are shown to be characterized by a relatively higher intended transfer of risk to the private sector contractor. Indicators for both risk transfer and project delivery efficiency are derived. The assumed relationships between these variables are articulated and represented in the form of a model which enables their convenient testing.

3. PROCUREMENT ROUTES AND RISK TRANSFER

PPPs refer to a range of procurement routes. The procurement route for a construction project describes its overall management arrangement. According to Ireland (1985), procurement routes differ in terms of the following variables:

- the roles and relationships of the parties involved,
- the process structure (i.e. the level of integration or 'packaging' of project elements (design, finance, construct, operate, maintain, etc.),
- the basis for selection of contractors,
- the basis for payment of contractors,
- the contractual details.

The choice of procurement route for a particular project depends on numerous factors, including:

- project characteristics – for example, the relative importance of time, cost, quality or performance levels, associated uncertainty or risk,
- client characteristics – including time and cost requirements, financial possibilities and limitations, expertise, experience and traditions, policies.

Since projects are unique and clients differ, this implies that no single procurement route would be the most suitable choice in all cases (Nahapiet and Nahapiet, 1985). Additionally, procurement routes cannot be adequately defined and are not discrete as a consequence of the variables inherent in each route which may take any value while only a few of these variables are unique to any particular procurement route. Therefore, Ireland (1985) advocates defining the values taken by each of a number of variables in preference to the use of overall procurement route descriptions (such as Design-Bid-Build or Build-Own-Operate).

A number of these variables can be seen to be directly related to risk transfer. For example, as procurement routes become more integrated and the responsibility for more elements of project delivery is passed to the contractor, the scope for risk transfer to the private sector (the contractor) increases (Witt, 2008). Similarly, as the basis for payment of contractors becomes less input- (or cost-) based and more output- (or price-) based the greater the degree of risk transference. Given that the range of procurement routes referred to as PPPs are highly integrated and entail an extreme form of output-based payments (the basis for payment tending to be the price of the services arising from the operation of the capital assets) it follows that these arrangements would represent a greater transfer of risk than other, traditional procurement routes. This is generally supported by both the theoretical literature, for example, Davies (2006) and reports of empirical studies, for example, National Audit Office (2003).

In this way, examples of procurement routes may be considered to populate a continuum as in Figure 1. The more integrated and output-based the payment mechanism becomes, then, in general, the more risk is transferred to the private sector contractor.

4. IDENTIFYING EVIDENCE OF RISK TRANSFER FROM HISTORICAL CONSTRUCTION PROJECT FINANCIAL DATA

4.1. The risk transfer problem

A number of problems arise when attempting to put an *ex ante* assessment of optimal risk transfer into effect. Most fundamentally, the source of all risk lies in the inability to fully anticipate future eventualities. Therefore, the full definition and quantification of risks is itself impossible and contracts are necessarily incomplete. Since (incomplete) contracts are the formal mechanism by which risk is transferred, it follows that the intention to transfer risk is unlikely to match the actual transference.

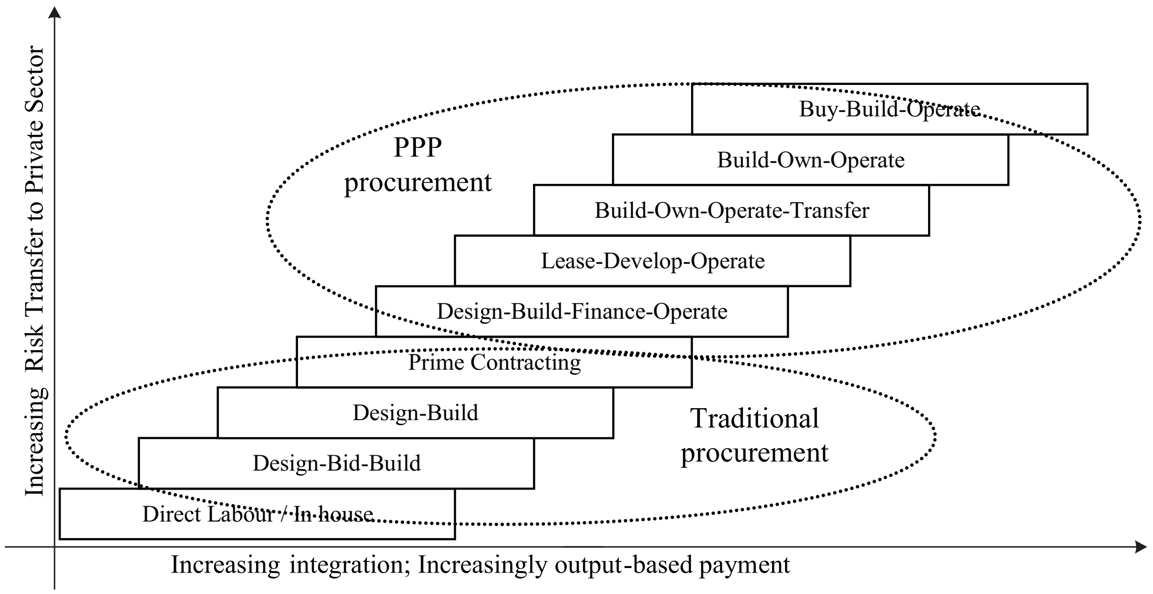

Figure 1. Procurement continuum showing the conceptualized "traditional" and PPP procurement regions

Further difficulties emanate from the communication, interpretation and understanding of both the underlying risks and the contracts which seek to transfer them and the willingness or reluctance of different parties to accept risk transfer (Gao and Handley-Schachler, 2004). In light of this, an *ex post* evaluation of risk transfer is preferable.

4.2. Construction price certainty as an indicator of risk transfer

A commonly cited measure for evidence of successful risk transfer in PPP projects has been construction price certainty (National Audit Office, 2003; Nisar, 2007) in the sense that the greater tendency for PPP project construction to be completed within the budgeted price compared to traditionally procured construction reflects a successful transfer of (construction) risk to the private sector. Since any variation in construction price is revealed early in the PPP project (often within the first 3 years of typically 15–40 year PPP agreements) and, in PPP contracts, construction risk is nearly always fully assigned to the private sector partner and is considered to represent a substantial proportion of the overall risk transfer achieved in a PPP, it seems to be a convenient indicator (European Commission DGRP, 2003). There is evidence, however, that a considerable premium has been paid in some cases to achieve this risk transfer (Edwards et al., 2004 p. 83, 96) which serves as a reminder that risk transfer does not necessarily indicate VfM.

If consideration is given to a wider range of procurement routes than just PPPs, the construction price certainty indicator of risk transfer becomes more useful since the only project element common to all construction procurement routes is the construction element. As discussed above, under PPP projects, the intention is usually to fully transfer construction risk to the private sector contractor whereas, in the case of some forms of traditional procurement, relatively little construction risk would be transferred to the contractor.

4.3. Construction cost certainty as an indicator of project delivery success

If a project's final construction *price* to the client remains unchanged from what it was anticipated to be prior to the start of construction then this indicates that the client has not been affected by any variations in the *cost* of construction. It implies that, if any cost variations have occurred, then these have been accommodated by a change in the contractor's profit margin. It does not, however, give any indication of whether any cost variations actually occurred. In this way, although 'price certainty' indicates a lack of risk for which the client takes financial responsibility, it illuminates neither the extent to which risk eventuates nor the contractor's exposure to risk.

If we accept that both client and contractor seek to fulfill their initial financial expectations in terms of price and margin respectively, then any variation in the construction cost can be seen to represent risk eventuating during the course of construction. It should be noted that both 'downside' and 'upside' risks would occur and that the final, agreed cost at the end of construction would amount to an aggregate position summing the financial impacts of all the risks which eventuated whether they individually caused an increase or decrease in the construction cost. Thus, construction cost certainty reflects the fulfillment of both parties' expectations and may be taken as an indicator of project delivery success. Note also that, since this measure is relative, it enables the convenient comparison of projects which differ in size, type, etc.

Taken together, these indicators provide the possibility to model the relationship between risk transfer and project delivery success under different procurement regimes and thus to test whether the risk transfer – VfM assumption underlying the microeconomic justification for the PPP approach is verified by empirical project data.

5. AN EVENTUATED RISK MODEL

Ginevičius and Podvezko (2008) advocate the effectiveness of a graphical (geometrical) representation of multicriteria evaluation results and it is with this in mind that the authors adopt a geometric representation of the model from the outset.

5.1. Description of terms

The terms under consideration are the cost variance, ΔC and its two components: price variance, ΔP and margin variance, ΔM for the construction phase (only) of projects involving construction.

Where $\Delta C \neq 0$ then the change in cost must be accommodated either by a change in the price paid for the construction by the client (i.e. a change in price, ΔP) or by a change in the margin earned by the contractor (i.e. a change in margin, ΔM) or by both. This is simply another way of expressing the relationship:

$$\textit{price, } P = \textit{cost, } C + \textit{margin, } M \tag{1}$$

so that:

$$P_0 - C_0 = M_0 \tag{2}$$

and:

$$P_1 - C_1 = M_1 \tag{3}$$

where: P_0, C_0, M_0 represent respectively the construction price, cost and margin prior to the start of construction and P_1, C_1, M_1 the price, cost and margin as determined (and agreed) after the completion of construction.

$$\Delta C = C_1 - C_0 = (P_1 - M_1) - (P_0 - M_0) = \Delta P - \Delta M \tag{4}$$

To allow the comparison of different projects $\Delta C, \Delta P, \Delta M$ are most conveniently expressed as percentages of the initially expected cost:

$$\Delta C = \frac{C_1 - C_0}{C_0} \times 100\% \tag{5}$$

$$\Delta P = \frac{P_1 - P_0}{C_0} \times 100\% \tag{6}$$

$$\Delta M = \frac{M_1 - M_0}{C_0} \times 100\% \tag{7}$$

5.2. Representation of construction projects

In terms of these quantities, any conceivable project performance may be represented by a point with co-ordinates $(\Delta M; \Delta P)$ on the graph shown in Figure 2.

5.3. Project delivery efficiency

Project delivery efficiency is indicated by a project's co-ordinates in relation to the origin. An efficiently delivered project is one which satisfies both parties' expectations by achieving its anticipated price, cost and margin so that $\Delta P = \Delta M = \Delta C = 0$ and the project co-ordinates are $(0; 0)$ that is, they are at the origin of the axes shown in Figure 2.

Therefore, in a general sense, the greater the distance of a project's co-ordinates from the origin, then the less efficient was its delivery.

For example, "Example project 2" in Figure 2 is more efficiently delivered than "Example project 1". And, despite its anticipated margin being exceeded ('bettered') and the anticipated price being undercut ('bettered'), "Example project 2" is less efficiently delivered than a hypothetical project located at the origin.

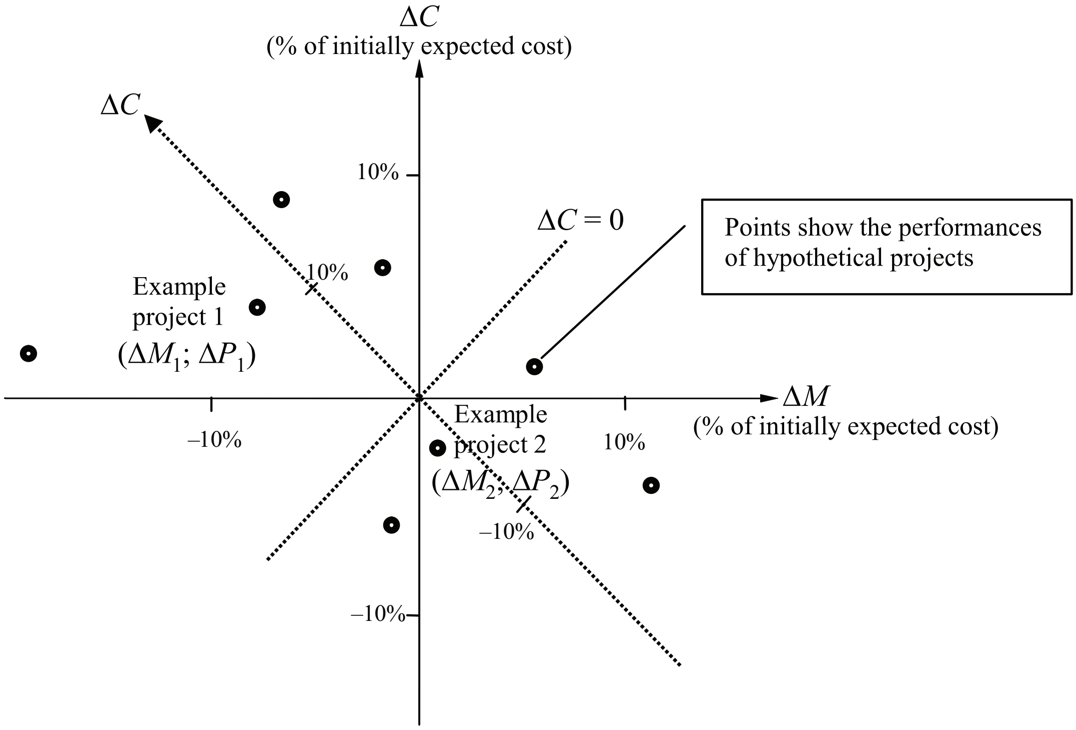

Figure 2. Graph of ΔM versus ΔP showing ΔC and hypothetical project performances

5.4. Eventuated risk

The aggregate eventuated risk (the arithmetic sum of the cost impacts of all the risk events which actually occur) is reflected by the cost variance, ΔC. In general and with other factors being equal, a relatively "risky" project would be one with large ΔC and "less risky" project would exhibit a small ΔC value. In this way, "Example project 1" on the graph exhibits greater eventuated risk than "Example project 2".

5.5. Risk transfer

Risk transfer is indicated by a project's co-ordinates in relation to the ΔP and ΔM axes.

If all of a change in a project's cost, ΔC is accommodated by a change in price and there is no associated change to the contractor's margin (i.e. $\Delta C = \Delta P$ and $\Delta M = 0$) then it follows that no transfer of risk from the client to the contractor has occurred. On the other hand, if all of ΔC is accommodated by a change in the contractor's margin and the price remains unchanged ($\Delta C = \Delta M$ and $\Delta P = 0$) then all of the risk that eventuated in the project has been transferred to the contractor.

In this way, for any given value of ΔC there is a line which represents all the possible $(\Delta M; \Delta P)$ co-ordinates which could arise from such a value of ΔC. The dashed diagonal lines passing through the co-ordinates of Example project 1 and Example project 2 in Figure 3 indicate all the risk transfer combinations possible under these respective values of ΔC. The further towards the top and right of the diagonal the more the contractor benefits and the further to the bottom and left the more the client benefits.

The quadrant of the graph in which the project is positioned according to its $(\Delta M;\Delta P)$ co-ordinates is also noteworthy. Where a cost increase causes the price to rise and margin to fall, both parties share in the adverse effects and a project located within this quadrant would therefore be indicative of "pain share". Conversely, shared benefits of cost decreases would locate the project in the "gain share" quadrant. However, two further quadrants exist – the "contractor only benefits" quadrant where a margin increase occurs in the context of a price increase; and a "client only benefits" quadrant where a price decrease is achieved in the context of a reduced margin. These are shown on the graph in Figure 3.

6. APPLICATIONS, VALIDATION, LIMITATIONS AND RESEARCH DIRECTIONS

6.1. Historical project data for validating the model

Historical project data to validate the model are to be obtained, in the first instance, from Estonia's major construction contractors. The data requirements include the financial (cost, price, margin) data, details of client types (public or private sector) and procurement route variables (level of integration and basis of payment).

It is anticipated that, with an adequately large data set, relationships between variables will be revealed and the $(\Delta M;\Delta P)$ co-ordinates for projects with similar attributes will exhibit tendencies to group in certain regions of the graph.

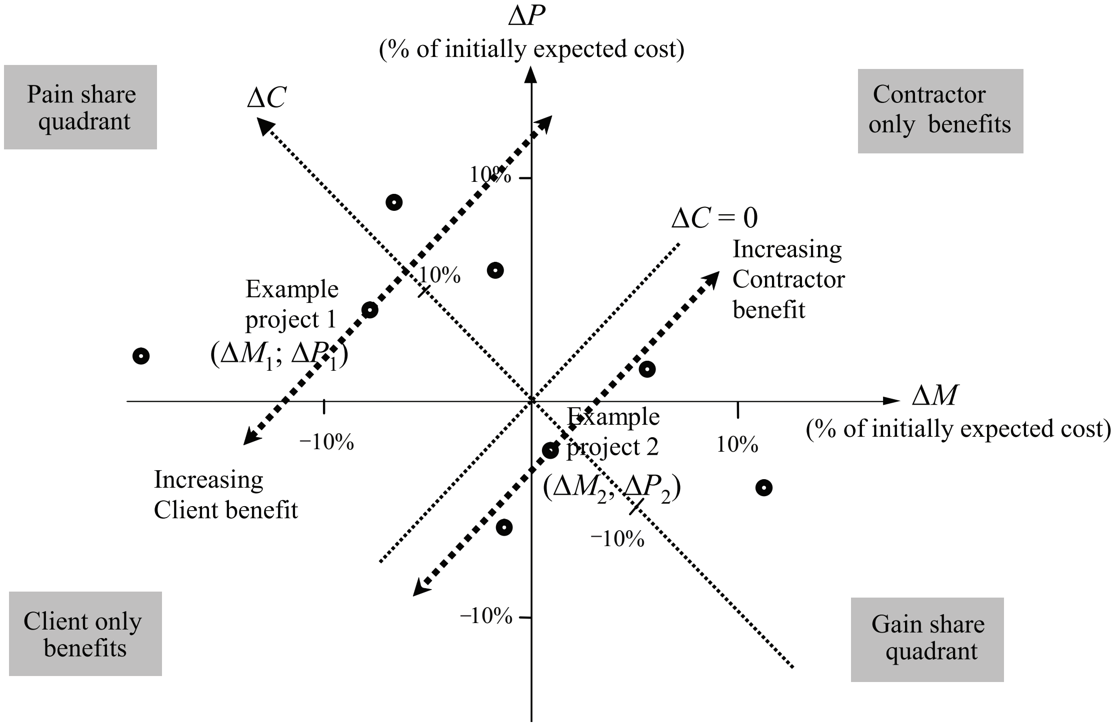

Figure 3. Geometrical representation of benefits from risk transfer and the meaning carried by a project's location

An initial data set comprising 68 historical construction projects started and completed between 2001 and 2007 by a single, large Estonian construction contractor was used to validate the proposed risk eventuation model. The projects ranged in value from less than 1 million to more than 23 million euros with a mean value of 3.5 million euros (Witt, 2010). Client types and details of procurement route variables for this initial data are given in Table 1.

6.2. Testable hypotheses

A number of hypotheses relating to the fundamental microeconomic arguments for PPPs (indicated in section 2.3 above) are directly testable on the basis of the proposed model. These include:

Hypothesis 1 greater risk transfer from the client to the contractor is associated with greater project delivery efficiency.

Hypothesis 2 private sector clients achieve better project delivery efficiency than public sector clients.

Hypothesis 3 more integrated procurement routes are associated with more risk transfer to the contractor.

Hypothesis 4 more output-based contractor payment mechanisms are associated with more risk transfer to the contractor.

6.3. Analysis of the initial data set

Analysis of the initial data set allows these hypotheses to be tested. As argued in section 5.5, risk transfer is indicated by a project's co-ordinates in relation to the ΔP and ΔM axes. The degree of risk transfer achieved in any project is indicated by the relative proximity of the $(\Delta M; \Delta P)$ co-ordinates of that project to either the ΔP axis or the ΔM axis. A project with co-ordinates closer to the ΔP axis than the ΔM axis would therefore exhibit relatively low risk transfer and project co-ordinates closer to the ΔM axis than the ΔP axis would indicate relatively high risk transfer.

Project delivery efficiency is indicated by a project's co-ordinates in relation to the origin. The greater the distance of a project's co-ordinates from the origin, then the less efficient was its delivery (as in section 5.3 above).

With representative quantities derived:

$$\text{Degree of risk transfer } = |\Delta M| - |\Delta P| \tag{8}$$

and:

Project delivery inefficiency

$$= \sqrt{(\Delta M)^2 + (\Delta P)^2} \tag{9}$$

the data may be conveniently subjected to statistical analysis and the hypotheses may be tested. In each case, an unpaired, one-tailed Student's t-test was performed to determine whether the two data ranges significantly differed. Table 2 summarizes the results of the statistical analysis.

Table 1. Description of initial data set

Client type	No. of projects	Level of integration	No. of projects	Payment basis	No. of projects
Private sector client	32	Higher (design & build)	30	Output based (fixed price)	60
Public sector client	26	Lower (build only)	30	Input based (cost plus)	3
Other (e.g. own organization as client)	10	Other (e.g. finance & design & build)	8	Other (e.g. unit rate)	5
Total no. of projects	68		68		68

At a notional significance level of α = 5%, hypothesis 1 is supported (P = 0.037): greater risk transfer from the client to the contractor does indeed appear to be associated with greater efficiency of project delivery. If allowance is given for the small population size, then, although its calculated P value slightly exceeds an α of 5%, hypothesis 3 also appears to be supported (P = 0.067) by the initial data. That is, more integrated procurement routes do appear to be associated with more risk transfer to the contractor.

Hypothesis 2 is challenged – public sector clients achieve significantly (P = 0.020) better project delivery efficiencies than private sector clients according to this data. The data is insufficient to provide any indication of the validity of hypothesis 4 as there are too few (only 3) projects with input-based contractor payment mechanisms in the sample.

Most importantly, the statistical analysis summarized in Table 2 provides evidence that hypotheses of this nature are directly testable on the basis of the proposed representation of project data and, in this sense, validates the model.

Figure 4 shows the $(\Delta M; \Delta P)$ co-ordinates of all the projects in this initial data set. Their tendency to group in a particular region

Table 2. Summary of statistical analysis of data set

Data range descriptions	No. of projects	Mean project delivery inefficiency $\sqrt{(\Delta M)^2 + (\Delta P)^2}$	Degree of risk transfer $\lvert\Delta M\rvert - \lvert\Delta P\rvert$	Standard deviation	Significance (probability of difference occurring by chance)
Hypothesis 1. Greater risk transfer from the client to the contractor is associated with greater project delivery efficiency.					
Higher risk transfer projects $\lvert\Delta M\rvert - \lvert\Delta P\rvert > 0$	40	0.12	–	0.10	P = 0.037
Lower risk transfer projects $\lvert\Delta M\rvert - \lvert\Delta P\rvert < 0$	27	0.22	–	0.27	
Hypothesis 2. Private sector clients achieve better project delivery efficiency than public sector clients.					
Private sector clients	32	0.19*	–	0.21	P = 0.020 *
Public sector clients	26	0.10*	–	0.08	
Hypothesis 3. More integrated procurement routes are associated with more risk transfer to the contractor.					
More integrated projects (Design and Build)	30		0.03	0.12	P = 0.067
Less integrated projects (Build only)	30		–0.05	0.25	
Hypothesis 4. More output–based contractor payment mechanisms are associated with more risk transfer to the contractor.					
More output–based contractor payment (fixed price)	60		0.005	0.16	P = 0.220
More input–based contractor payment (cost plus)	3		–0.305	0.56	

* This result indicates that public sector clients achieved significantly better project delivery efficiency than private sector clients in the sample projects.

of the graph (the "contractor only benefits" quadrant) is notable as is the implication that less risk transfer is achieved in the context of cost increases than under cost decreases. When $\Delta C > 0$ (i.e. an overall cost increase) then 12 projects are closer to the ΔM axis (higher risk transfer) compared with 25 projects closer to the ΔP axis (lower risk transfer) but when $\Delta C < 0$ (overall cost decrease) then 28 projects are closer to the ΔM axis (higher risk transfer) compared to 2 projects being closer to the ΔP axis (lower risk transfer). This would challenge the notion that risk transfer is predetermined (for example by contractual stipulation of risk ownership) and suggests the possibility that contractors may avoid downside risk while capturing upside risk during the course of construction.

6.4. Limitations

In order that projects may be compared to each other, the approach described here adopts a high degree of generalization - the uniqueness of the projects and their specific, individual details are necessarily ignored.

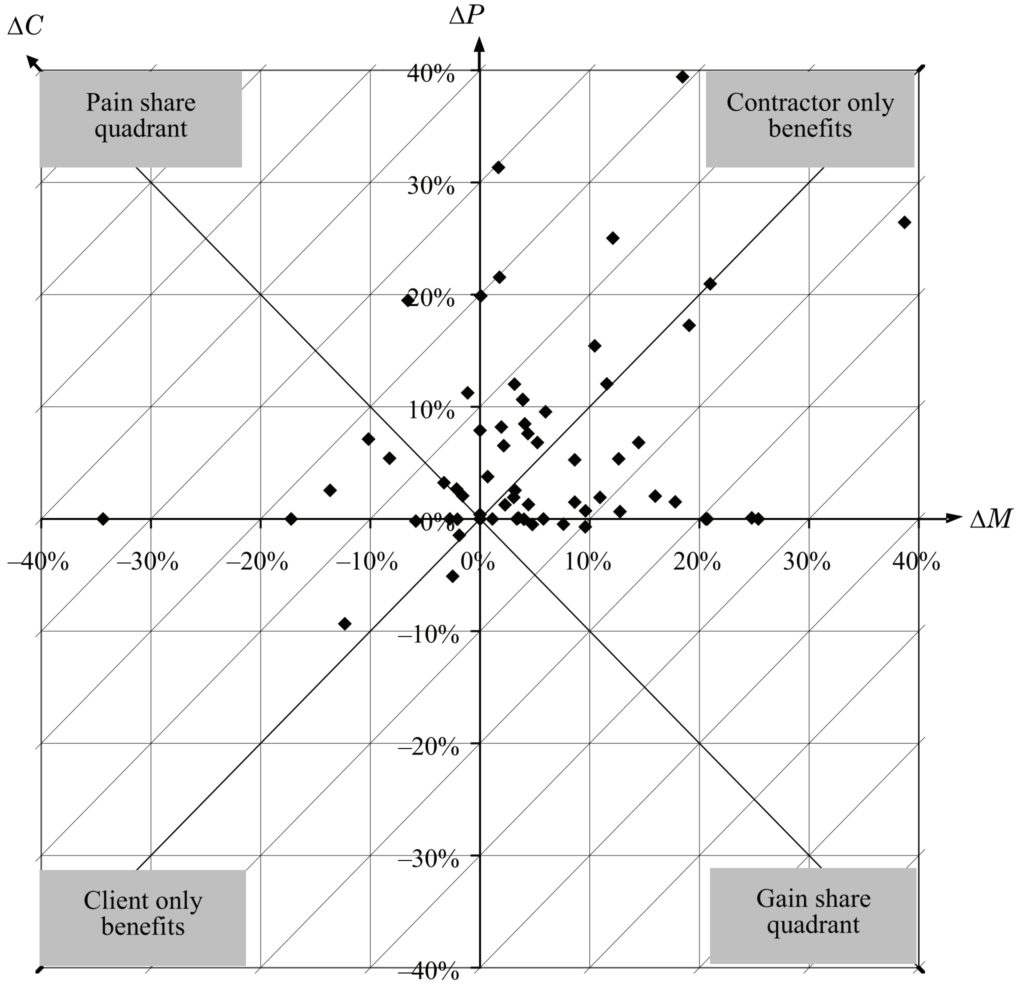

Figure 4. Graphical representation of the initial data set

The authors acknowledge that the variables under consideration are by no means the only ones determining either project delivery efficiency or risk transfer. Numerous "hard" determinants such as specific contractual clauses, environmental, economic and legal conditions as well as "soft" factors (for example: project team communications, motivation levels of personnel, etc.) come into play. Lill (2009) notes, for instance, that a significant contribution to construction project performance is made by the behavior of individuals. Consequently, the project parameter values under consideration tend to vary considerably from project to project leading to a large number of projects being required in order to establish statistically significant findings.

The relative measure of project delivery success employed – the achievement of both the client's price expectation and the contractor's margin expectation – does not give any indication as to whether the price corresponding to any particular project reflects value for money in an absolute sense. This effect is somewhat counteracted by the context in which the contracts are agreed – often with price competition in the selection of the contractor and, typically, between a knowledgeable contractor and a knowledgeable client. The eventuated risk model may also enable the measurement of this effect if the level of price competition in the award of contracts is considered as a variable.

Only the financial dimension (cost) is taken into consideration. Time and quality, which are often referred to as being separate dimensions of project success are considered here to be adequately accounted for within the cost dimension. If time and quality are of particular importance, then this will be reflected in the cost through time- or quality-related penalties and incentives.

6.5. Anticipated further research directions

It is likely that indications of relationships derived at this overall project level will require further, more detailed investigation to determine the intra-project mechanisms underlying them through, for example, case studies.

The finding that public sector clients achieve better project delivery efficiencies than private sector clients in the Estonian context is worthy of international comparison. Empirical evidence comparing the performance of private sector construction clients with their public sector counterparts is sparse but, for example, Plebankiewicz (2010) reports in a Polish study that private sector clients tend to use more sophisticated contractor selection criteria than those used by public sector clients. This suggests the private sector may have an advantage in terms of efficient project delivery in Poland.

In addition, a large database of overall project financial data supported by project, procurement route and client attributes represents a valuable research resource and offers numerous possibilities for initiating investigations into related areas including price / cost certainty, client performance comparisons, contractor performance comparisons and contractors' margins.

7. SUMMARY AND CONCLUSIONS

The microeconomic argument underlying the PPP approach contends that the private sector is able to provide services more efficiently and effectively than the public sector and that greater VfM is achieved through a more appropriate allocation of risk between the public and private sector parties.

By considering PPP procurement within the context of a range encompassing all forms of construction project procurement, the PPP procurement routes are shown to involve greater intended risk transfer to the private sector than traditional procurement routes.

For PPP procurement to offer greater VfM than traditional forms of procurement implies the satisfaction of the conditions:

1) that the intention to transfer risk is effective in practice;

2) that benefits arising from efficiency gains are captured by the public sector.

Through the derivation of indicators for risk transfer and for project delivery efficiency (a proxy for VfM) from historical project finance data, an eventuated risk model is presented. This model articulates the assumed relationships between these variables and procurement route attributes and enables the empirical testing of hypotheses relating to the arguments for PPPs such as:

Hypothesis 1	greater risk transfer from the client to the contractor is associated with greater project delivery efficiency.
Hypothesis 2	private sector clients achieve better project delivery efficiency than public sector clients.
Hypothesis 3	more integrated procurement routes are associated with more risk transfer to the contractor.
Hypothesis 4	more output-based contractor payment mechanisms are associated with more risk transfer to the contractor.

The initial data presented in this paper verify hypotheses 1 and 3 above. Hypothesis 2 is rejected – it is found that public sector clients achieved significantly better project delivery efficiency than private sector clients in the historical projects under consideration. The initial data are insufficient to test hypothesis 4.

In the sense that hypotheses of this nature are directly testable on the basis of the proposed representation of project data, the eventuated risk model is validated and is shown to enable the empirical testing of the microeconomic justification for PPPs and thus their effectiveness as a procurement route for public services.

REFERENCES

Barrett, T. (1999) *Public-private partnerships in the financing of European transport infrastructure*, Seminar on Public-Private Partnerships (PPPs) in Transport Infrastructure Financing, European Conference of Ministers of Transport. Paris, France.

Broadbent, J. and Laughlin, R. (1999) The private finance initiative: clarification of a future research agenda, *Financial Accountability & Management*, 15(2), pp. 95–114. doi:10.1111/1468-0408.00076

Broadbent, J. and Laughlin, R. (2002) Accounting choices: technical and political trade-offs and the UK's private finance initiative, *Accounting, Auditing and Accountability Journal*, 15(5), pp. 622–654. doi:10.1108/09513570210448948

Burnett, M. (2007) *Public-private partnerships – a decision makers guide*, European Institute of Public Administration, EIPA Publications Service, Maastricht, the Netherlands.

Cheung, E., Chan, A. P. C. and Kajewski, S. (2010) The public sector's perspective on procuring public works projects - comparing the views of practitioners in Hong Kong and Australia, *Journal of Civil Engineering and Management*, 16(1), pp. 19–32. doi:10.3846/jcem.2010.02

Commission of the European Communities (2004) *Green paper on public-private partnerships and community law on public contracts and concessions*, COM (2004) 327 final, Brussels. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0327:FIN:EN:PDF [accessed 10 November 2009]

Commission of the European Communities (2005) *Commission staff working paper - report on the public consultation on the green paper on public-private partnerships and community law on public contracts and concessions*, Brussels. Available at: http://ec.europa.eu/internal_market/publicprocurement/docs/ppp/ppp-report_en.pdf [accessed 10 November 2009]

Davies, J. (2006) *Risk transfer in private finance initiatives (PFIs)*, Industry Economics and Statistics Directorate Working Paper, Department of Trade and Industry, United Kingdom Government, URN: 06/843. Available at: http://www.berr.gov.uk/files/file26074.pdf [accessed 10 November 2009]

Edwards, P., Shaoul, J., Stafford, A. and Arblaster, L. (2004) *Evaluating the operation of PFI in roads and hospitals*, Association of Chartered Certified Accountants Research Report No.84, Certified Accountants Educational Trust, London. Available at: http://image.guardian.co.uk/sysfiles/Society/documents/2004/11/24/PFI.pdf [Accessed 10 November 2009]

Estache, A. (2005) *PPI partnerships versus PPI divorces in LDCs*, World Bank Policy Research Working Paper 3470. Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/01/19/000160016_20050119104213/Rendered/PDF/WPS3470.pdf [accessed 10 November 2009]

European Commission DGRP (2003) *Guidelines for successful public-private partnerships*, Directorate General Regional Policy - DGRP, Brussels. Available at: http://ec.europa.eu/regional_policy/sources/docgener/guides/ppp_en.pdf [accessed 10 November 2009]

European Commission DGRP (2004) *Resource book on PPP case studies*, Directorate General Regional Policy - DGRP, Brussels. Available at: http://ec.europa.eu/regional_policy/sources/docgener/guides/pppresourcebook.pdf [accessed 10 November 2009]

European Investment Bank (2005) *Evaluation of PPP projects financed by the EIB*, Evaluation Report. Available at: http://www.eib.europa.eu/Attachments/ev/ev_ppp_en.pdf [accessed 10 November 2009]

Gao, S. S. and Handley-Schachler, M. (2004) Public bodies' perceptions on risk transfer in the UK's private finance initiative, *Journal of Finance and Management in Public Services*, 3(1), pp. 25–39.

Ginevičius, R. and Podvezko, V. (2008) Multicriteria graphical-analytical evaluation of the financial state of construction enterprises, *Technological and Economic Development of Economy*, 14(4), pp. 452–461. doi:10.3846/1392-8619.2008.14.452-461

Grout, P. A. (1997) The economics of the private finance initiative, *Oxford Review of Economic Policy*, 13(4), pp. 53–66. doi:10.1093/oxrep/13.4.53

Hood, J., Fraser, I. and McGarvey, N. (2006) Transparency of risk and reward in UK public-private partnerships, *Public Budgeting and Finance*, 26(4), pp. 40–58. doi:10.1111/j.1540-5850.2006.00861.x

International Monetary Fund (2004) *Public private partnerships*, Fiscal Affairs Department, International Monetary Fund Available at: http://www.imf.org/external/np/fad/2004/pifp/eng/031204.pdf [accessed 10 November 2009]

Iossa, E. and Martimort, D. (2008) *The simple micro-economics of public-private partnerships*, Centre for Market and Public Organisation, Working Paper No. 08/199, Bristol Institute of Public Affairs, University of Bristol. Available at: http://www.bristol.ac.uk/cmpo/publications/papers/2008/wp199.pdf [accessed 10 November 2009]

Ireland, V. (1985) The role of managerial actions in the cost, time and quality performance of high-rise commercial building projects, *Construction Management and Economics*, 3(1), pp. 59–87.

Irwin, T. C. (2007) *Government guarantees - allocating and valuing risk in privately financed infrastructure projects*, The World Bank, Washington, D.C.

Jun, J. (2010) Appraisal of combined agreements in BOT project finance: focused on minimum revenue guarantee and revenue cap agreements, *International Journal of Strategic Property Management*, 14(2), pp. 139–155. doi:10.3846/ijspm.2010.11

Klein, M. (1996) *Risk, taxpayers and the role of government in project finance*, Policy Research Working Paper 1688, The World Bank Private Sector Development Department. Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1999/08/15/000009265_3970311115003/Rendered/PDF/multi_page.pdf [accessed 10 November 2009]

Kuronen, M., Junnila, S., Majamaa, W. and Niiranen, I. (2010) Public-private-people partnership as a way to reduce carbon dioxide emissions from residential development, *International Journal of Strategic Property Management*, 14(3), pp. 200–216. doi:10.3846/ijspm.2010.15

Kyvelou, S. and Karaiskou, E. (2006) Urban development through PPPs in the Euro-Mediterranean region, *Management of Environmental Quality: An International Journal*, 17(5), pp. 599–610. doi:10.1108/14777830610684567

Lahdenperä, P. (2009) Phased multi-target areal development competitions: Algorithms for competitor allocation, *International Journal of Strategic Property Management*, 13(1), pp. 1–22. doi:10.3846/1648-715X.2009.13.1-22

Leung, B. Y. P. and Hui, E. C. M. (2005) Evaluation approach on public-private partnership (PPP) urban redevelopments, *International Journal of Strategic Property Management*, 9(1), pp. 1–16. doi:10.1080/1648715X.2005.9637522

Lill, I. (2009) Multiskilling in construction - a strategy for stable employment, *Technological and Economic Development of Economy*, 15(4), pp. 540–560. doi:10.3846/1392-8619.2009.15.540-560

Majamaa, W., Junnila, S., Doloi, H. and Niemistö, E. (2008) End-user oriented public-private partnerships in real estate industry, *International Journal of Strategic Property Management*, 12(1), pp. 1–17. doi:10.3846/1648-715X.2008.12.1-17

Nahapiet, H. and Nahapiet, J. (1985) A comparison of contractual arrangements for building projects, *Construction Management and Economics*, 3(3), pp. 217–231.

National Audit Office (1999) *Examining the value for money of deals under PFI*, Report by the Comptroller and Auditor General, HC 739, Session 1998–1999, The Stationery Office, London.

National Audit Office (2003) *PFI: construction performance*, Report by the Comptroller and Auditor General, HC 371, Session 2002-2003, The Stationery Office, London.

Nisar, T. M. (2007) Value for money drivers in public private partnership schemes, *International Journal of Public Sector Management*, 20(2), pp. 147–156. doi:10.1108/09513550710731508

Plebankiewicz, E. (2010) Construction contractor prequalification from Polish clients' perspective, *Journal of Civil Engineering and Management*, 16(1), pp. 57–64. doi:10.3846/jcem.2010.05

Sadka, E. (2006) *Public-private partnerships: a public economics perspective*, IMF Working Paper WP/06/77, Fiscal Affairs Department, International Monetary Fund. Available at: http://www.imf.org/external/pubs/ft/wp/2006/wp0677.pdf [accessed 10 November 2009]

Spackman, M. (2002) Public-private partnerships: lessons from the British approach, *Economic Systems*, 26(3), pp. 283–301. doi:10.1016/S0939-3625(02)00048-1

Tieva, A. and Junnonen, J. (2009) Proactive contracting in Finnish PPP projects, *International Journal of Strategic Property Management*, 13(3), pp. 219–228. doi:10.3846/1648-715X.2009.13.219-228

Witt, E. (2008) A framework for the comparison of infrastructure procurement strategies. In: *Proceedings of the BuHu 8th international postgraduate research conference*, Prague, Czech Republic, 26-27 June 2008, pp. 217–225.

Witt, E. (2010) Comparing risk transfers under different procurement arrangements - initial evidence from Estonia. In: *Proceedings of the 10th international conference on Modern building materials, structures and techniques*, Vilnius, Lithuania, 19-21 May 2010, Selected Papers, Vol. 1, pp. 549–556.

Yuan, J., Skibniewski, M. J., Li, Q. and Shan, J. (2010) The driving factors of china's public-private partnership projects in metropolitian transportation systems: public sector's viewpoint, *Journal of Civil Engineering and Management*, 16(1), pp. 5–18. doi:10.3846/jcem.2010.01

SANTRAUKA

RIZIKOS PERKĖLIMO, TAIKANT SKIRTINGAS PIRKIMŲ TVARKAS, PALYGINIMAS

Emlyn WITT, Roode LIIAS

Privataus ir viešojo sektorių partnerystė (angl. *PPPs*) gali būti svarstoma kaip pirkimo būdas, kuris nusakomas įvairių elementų įtraukimu į vieną sutartį, paremtą gamybos apimčių kainodaros mechanizmu. Kitame šios nenutraukiamos pirkimų srautų virtinės gale yra ne tokie kompleksiniai susitarimai, paremti sąnaudų kainodaros principais („tradiciniai“ pirkimai). Rizikos perkėlimas nuo kliento prie rangovo turi skirtis priklausomai nuo pirkimų srautų savybių vertės: taikant platesnį kompleksiškumą ir gamybos apimčių kainodarą, tikėtina padidinti ir rizikos perkėlimo galimybę. Kuo didesnė rizika perkeliama rangovui, tuo efektyviau jis stengiasi įgyvendinti projektą. Straipsnyje siūlomi rizikos perkėlimo ir įgyvendinimo efektyvumo rodikliai, kurie vėliau yra pritaikyti modeliuojant rizikos perkėlimo, efektyvumo ir pirkimo srautų savybių tarpusavio priklausomybes. Siūlomas modelis leidžia patikrinti mikroekonomikos prielaidas, sudarančias privataus ir viešojo sektorių partnerystės pagrindą, naudojant istorinius statybos objektų duomenis, ir atskleisti privataus ir viešojo sektorių partnerystės požiūrio efektyvumą.