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CONTRACT STABILITY IN EUROPEAN ROAD INFRASTRUCTURE PPPS: How does governmental PPP support contribute to preventing contract renegotiation?

Raden Murwantara Soecipto[ab] and Koen Verhoest[ab]

[a] Research Group on Public Administration & Management, Department of Political Sciences, University of Antwerp, Antwerp, Belgium (Sint-Jacobstraat 2)

[b] Authors are listed alphabetically and contributed equally

Corresponding author: Koen Verhoest (koen.verhoest@uantwerpen.be)

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Abstract

In the last decade a considerable number of PPP contracts in Europe turned out to be instable and were renegotiated. This paper studies which combinations of conditions in terms of macro-level business environment and governmental PPP support and at project-level (remuneration scheme, risk allocation, project age and contract duration) contribute to avoid contract renegotiation, by conducting a qualitative comparative analysis of 25 European road infrastructure projects. Results show that although the broader macro-level business environment has a clear contribution, contract stability can benefit from an availability-based remuneration scheme and a well-developed governmental PPP support in combination with other conditions.

Key words: Public-private partnerships, governmental PPP support, contract renegotiation, Qualitative Comparative Analysis (FsQCA), Risk allocation

INTRODUCTION

Public private partnerships (PPPs) as alternative funding for infrastructure development have become increasingly popular across the world. As a typical PPP contract is long-term, complex and inherently incomplete, the potential for contract renegotiation is always present. The literature on explaining PPP contract renegotiation is expanding with both quantitative and qualitative studies, resulting in relevant determinants at very different levels (e.g. Cruz and Marques 2013a; Mladenovic et al., 2013; Makovsek et al. 2015; Guasch et al. 2014; Sarmento and Renneboog 2016). Basically, these factors can be situated at three mutually influencing levels: (1) the overall institutional, political, macro-economic and financial context in a country, which we will refer to as macro-level business environment; (2) the specific arrangements and frameworks which a government uses to support PPPs (meso-level); and (3) project- and contract-specific factors (micro-level).

However, this literature suffers from three main shortcomings, which this paper aims to address. First, most contract renegotiation studies, and in particular the ones using quantitative studies, consider factors at these different levels to have independent effects on contract renegotiation. However, the different levels might be nested, meaning that factors at one level (e.g. macro or meso) may influence factors at another level (e.g. micro). Moreover, these factors may combine in specific ways when inducing contract instability. Therefore this paper aims to shed more light on these combined effects by applying configurational analysis (fuzzy-set qualitative comparative analysis fsQCA).

Second, the effect of the meso-level factors in terms of governmental PPP support remains largely understudied. However, international organisations and consultancy firms have voiced normative ideas about how governments should enhance PPP take-up, quality and

performance in their infrastructure sectors (EIB 2011, EPEC 2011, World Bank 2006). Following the conceptualisation by Verhoest, Petersen, Scherrer and Soecipto (2015), this internationally propagated ideal-type of *governmental PPP support* entails three mutually reinforcing dimensions: (a) affirmative policies and political commitment regarding PPP; (b) a well-developed regulatory framework with respect to public procurement procedures and PPP-specific legislation; and (c) PPP-specific supporting arrangements (such as PPP units, ex ante evaluation instrument and standardisation) (see also Jooste, Levitt and Scott 2011; Matos-Castaño et al., 2014). The contribution of governmental PPP support schemes to the contract stability of PPPs has not been studied as such (except for very specific elements, e.g. PPP units, see Domingues and Sarmento 2016).

Third, studies have mainly focuses on Latin-American cases or on individual European states (Domingues and Zlatkovic 2014). By studying 25 road infrastructure PPPs in 10 European countries, this study expands the comparative knowledge regarding European practices.

In order to fill these gaps, the purpose of this paper is to investigate *how governmental PPP support (meso-level) affects contract stability in PPPs in European countries, how it combines with the macro-level business environment, and factors at the project level (micro-level).*

CONCEPTUALISING CONTRACT RENEGOTIATION AND CONTRACT STABILITY

Contract renegotiation is understood as re-opening a contract and making changes to its provisions in terms of, for example, risk assignment, conditions, and project scope (Makovsek et al. 2015; Guasch et al. 2014). In line with Guash et al. (2014) and Domingues and Sarmento (2016: 82) a contract renegotiation involves ‘a change in the original contractual terms and

conditions, *as opposed to an adjustment that takes place under a mechanism defined in the contract'*. Original contracts might establish specific conditions for changes based on forecasts such as traffic volumes, allowing for modifications e.g. in output specifications or re-financing (Domingues and Zlatkovic 2014). However, contract renegotiation in this paper is about making changes to contractual terms *beyond* changes that are permitted under the original contract (Domingues and Zlatkovic 2014). The extent to which PPP contracts are renegotiated should not be underestimated. Studies point at occurrences between 40% and 75% (Sarmento and Renneboog 2016; Guasch et al. 2014).

In the perspective of relational contracting, flexibility in dealing with long-term contracts may provide the ability to better cope with unforeseen events (Guash and Straub 2006). However, Domingues and Zlatkovic (2014) highlight that flexibility is more likely to contribute to the project's success when implemented *in* the contract design, whereas contract renegotiation refers to flexibility *beyond* the original contract. The possibility of such contract renegotiation is considered in most literature to have mainly negative impacts. First, it weakens the incentives of the private contractor to perform. Second, it may create serious distortions at the tender stage, stimulating bidders to act strategically (Iossa 2014) and bid aggressively, as they might expect that the contract will be renegotiated ex post anyway, so that they can recoup their profit margin. Moreover, transaction costs generated by contract renegotiations are high, and they eliminate the effect of competition (Domingues and Sarmento 2016). Guasch et al. (2014) state that 'renegotiations on average have been by and large the critical problem facing PPP'. There is some evidence of contract renegotiations resulting in benefits for users and governments, but these are generally considered to be rare, and very demanding in terms of information, expertise and trust for the contracting authorities involved (see e.g. Guash et al. 2014; Domingues and

Zlatkovic 2014). Mostly they result in 'improvement of the terms of the operator and / or investors, reduction of efficiency, reduction of quality for users and adverse fiscal impact, including increases in direct and contingent liabilities' (Guasch et al. 2014: 12; Sarmento and Renneboog 2014).

Hence, it is crucial to understand the factors triggering contract renegotiation or, oppositely framed, the factors enhancing contract stability in PPPs. In the context of this paper, contract stability is defined in terms of PPPs not experiencing a renegotiation of the initially concluded contract between the public contracting authority and the private consortium. The paper proceeds by theorising the contribution of macro-, meso- and micro-level factors to contract stability. Subsequently the case selection, methodology and data are described. In the results section of the paper, the findings of the fsQCA are reported, which are subsequently discussed.

MACRO-, MESO- AND MICRO-LEVEL DRIVERS FOR CONTRACT STABILITY

The arguments in this section regarding the most crucial factors at macro-, meso- and micro-level will allow us to formulate directional expectations, which we use in the fsQCA analyses. One particularity is that for fsQCA we can only include six factors, given the number of projects in our sample (25 projects, see Marx and Dusa 2011: 114-115). As our analyses should also allow to study how factors across levels combine when affecting contract stability, we select rather comprehensive composite factors at the macro- and meso-level, which aggregate several underlying factors mentioned in the literature. The meso-level factor, governmental PPP support, as main factor of interest, is however broken down further into its sub-dimensions in the second analysis in this paper.

Macro-level business environment

Research has shown that the macro-level business environment in a country influences private sector involvement in infrastructure provision and the take-up of PPPs (Mota and Moreira 2015; Galilea and Medda 2010). However, it also affects whether PPP contracts remain stable after conclusion and contract renegotiation is avoided (Mladenovic et al. 2013). The macro-level business environment in a country is defined as the climate or set of conditions – economic, social, political and institutional – in which business operations are conducted (Weimer 1970; Kaplan and Norton 2000). It refers to factors that are external to private companies and beyond their control, and is similar for all companies in a country, encompassing both the macro-institutional, political, economic-financial and technological environment, as well as more sectoral policies, such as labour market and innovation policies. The nature of the business environment is aggregative, as several of its interdependent, dynamic elements jointly influence business decisions in a specific country or region (Weimer 1970; Kaplan and Norton 2000). In line with Makovsek et al. (2015) we argue that this macro-level context and its contribution to contract stability should be analysed comprehensively. In search for an aggregate concept that would enable us to capture this general business environment in a certain country, we suggest to use the concept of *national competitiveness*, as defined by Schwab (2014: 3) as 'the set of institutions, policies, and factors that determine the level of productivity of a country', as well as the return on investment rate and economic growth. Hence, one might expect that when road infrastructure PPPs are located in countries with relatively high levels of national competitiveness, this will contribute to their contract stability.

Literature provides strong support for the importance of a favourable macro-level business environment. A high quality institutional and political environment makes the initial allocation of risk and the way challenges to a PPP contract are handled predictable (Makovsek et al. 2015). Literature refers to the quality of the legal and judicial system (rule of law, regulatory quality, predictability and transparency of contract enforcement), low levels of corruption, government efficiency and bureaucratic quality (Guash et al. 2008; Dominques and Sarmento 2016) as well as political and social stability (Iossa et al. 2007; Montecinos and Saavedra 2014; Sarmento 2014; Dominques and Sarmento 2016). Also, the macro-economic and financial situation of a country is crucial; a downturn might trigger contract instability of PPPs, because if demand and traffic risks become unbearable, the costs of privately financed infrastructure projects may increase (Iossa et al. 2007; Cruz and Marques 2013a; Makovsek et al. 2015). Literature points at GDP decline (e.g. Guash and Straub 2009; Montecinos and Saavedra 2014; but see Sarmento 2014), higher levels of public debt and budget deficit (Domingues and Sarmento 2016; Guash et al. 2008), as well as increasing exchange rates and interest rates (Montecinos and Saavedra 2014; Estache et al. 2003).

Meso-level factors related to governmental PPP support

The internationally propagated ideal type of PPP support that a government should develop in order to stimulate and strengthen PPPs refers to a mutually reinforcing set of policies, regulatory frameworks and supporting arrangements. However, governments have adopted such schemes in very differentiated ways (see Verhoest et al. 2015). Table 1 presents the different components of an ideal type governmental PPP support scheme, and provides an explanation of why each element may be expected to enhance contract stability.

[INSERT TABLE 1 AROUND HERE]

Literature on contract renegotiation has examined several of the above elements, but in a rather fragmented way. We argue that one should study this governmental PPP support in its entirety. We expect that when road infrastructure PPPs are located in countries with relatively well-developed governmental PPP support in terms of PPP-enhancing policies and political commitment, legal and regulatory frameworks and supporting arrangements, this will contribute to their contract stability.

Micro-level factors related to contract-specific features

We focus on four factors related to contract design and management, which are frequently mentioned in both qualitative and quantitative studies.

Secureness of the remuneration scheme

The remuneration scheme or payment mechanism represents the various income sources with their assessed risk and potential cost coverage, or in other words their secureness (i.e. user charges, shadow toll, availability payment etc.) (Roumboutsos et al. 2015). PPPs will have a higher probability of contract renegotiation when featuring more uncertain and unpredictable revenue streams, with revenues being dependent upon demand and traffic flows (e.g. toll charges) and being paid by users instead of by public actors (Iossa et al. 2007; Cruz and Marques 2013a). We expect that when transport infrastructure PPPs have a relatively secure remuneration scheme, e.g. based on availability payments by public actors, this will contribute to their contract stability (Sarmento 2014).

Appropriateness of risk allocation

Appropriate risk allocation between the public and the private partner is crucial for successful PPP projects, as it provides incentives to deliver in time and on budget, reduce long-term costs and improve quality of services (Iossa et al. 2007; Mota and Moreira 2015). However, empirical studies show that risk misallocation is an important factor that induces contract renegotiation (Estache et al. 2003; Guasch et al. 2014), (a) in case the private partner assumes all risks, and an adverse economic-financial context or other reasons causes financial problems for the PPP, and (b) when the risks are allocated or shared on the basis of a too rigid set of constraints (i.e. traffic band definitions of upper and lower limits or caps in interest rates) (Cruz and Marques 2013a). We expect that when road infrastructure PPPs have a relatively more appropriate risk allocation (in line with standard risk allocation schemes), this will contribute to their contract stability.

Short contract duration

Based on contract theory, long-term contracts will more often tend to lead to contract renegotiation due to the uncertainties and difficulties in such forecasts, particularly as far as traffic demand is concerned, and due to contractual provisions that are ill-suited for changing contexts over extended periods (Cruz and Marques 2013a; Guasch 2004; Cruz and Marques 2013b; Domingues and Sarmento 2016).

Young project age

Empirical studies on PPP contract stability face the problem that most of the studied projects are still ongoing, simply because most PPP projects have long-term contracts. However, studies do not take the project age into account, i.e. the time between contract closure and the moment of measurement, when explaining the occurrence of contract renegotiation. Projects that have been

ongoing for a long time are more likely to have faced one or more contract renegotiations than projects that started only recently, merely because of the longer time span that has passed. We expect that a limited project age will contribute to contract stability.

DATA AND METHODOLOGY

Case selection and data

This paper seeks to explain contract stability among a sample of PPP projects in road infrastructure within 10 European countries, using fsQCA. In studies using QCA methodology, cases are carefully chosen so as to maximise the diversity on factors of interest and minimise the variation on contextual conditions (Yamasaki and Rihoux 2009). The sample includes countries representing a considerable variation, both in levels of country competitiveness (Schwab 2014) and governmental PPP support (Verhoest et al., 2015): the UK, the Netherlands, Belgium, Spain, Portugal, Greece, Italy, France, Norway and Finland. Also, selected PPP projects should vary regarding remuneration scheme, contract duration and risk allocation scheme. Variation on contextual conditions was minimised by focusing on road infrastructure PPPs instead of transport infrastructure PPPs in general, and by only including cases from EU or EEA member states, as EU membership also brings more similarities, e.g. in terms of public procurement and contract legislation.

Data were collected on 74 transport infrastructure projects by country teams in the COST Action TU 1001 and within the H2020 project BENEFIT, by means of desk research and interviews with practitioners within the involved public contract authorities Within the subset of 42 PPP transport infrastructure projects, 25 projects in 10 European countries were road projects,

of which 13 were renegotiated (for project details see Table A in the supplemental online information).

Methodology

We use a fuzzy-set Qualitative Comparative Analysis (fsQCA) in order to study whether governmental PPP support might have a conjunctural effect in combination with other conditions. The method allows to study which (set of) conditions are necessary and sufficient to bring about a certain outcome (Rihoux and Ragin 2009). The assessment of causal complexity in set-theoretic methods is based on the assumptions of conjunctural causation – a condition only has an effect in combination with other conditions-, equifinality – multiple, mutually non-exclusive paths lead to the same outcome – and causal asymmetry – the presence of an outcome may have other explanations than its absence. Fuzzy-set QCA is highly appropriate for analysing medium N cases (12 to 70 cases).

The interpretation of the results is mainly based on the consistency and coverage values indicated in the solutions. Consistency shows the extent to which the involved solution path is consistent with reality, or in other words the extent to which this solution path leads to the outcome. Coverage, by contrast, assesses the degree to which a cause or causal combination accounts for an outcome. Hence, coverage reports the proportion of membership to the outcome explained by the overall solution term, indicating the percentage of the cases covered.

Several methodological choices were made. First, the threshold for the consistency ratio is set to no less than 0.80 (Rihoux and Ragin 2009) and the frequency cut-off is 1. Second, while fsQCA software (fsQCA 2.5) delivers three types of solution formulae (complex, parsimonious and intermediate), we apply the intermediate solution, which is in-between the conservative and

the most parsimonious solution in terms of complexity (Ragin 2008). The correctness of the intermediate solution depends strongly on the quality of the counterfactuals, or simplifying assumptions, employed in the minimisation process to deal with the limited diversity. If such simplifying assumptions are solidly grounded, Ragin suggests (2008; Rihoux and Ragin 2009: 118) the intermediate solution as the main point of reference for interpreting QCA results. The arguments in the theoretical sector allow us to formulate directional expectations, which we use as simplifying assumptions in the FsQCA minimisation process. We are careful to include only simplifying assumptions that are built on substantive empirical or theoretical knowledge, giving a clear notion of how a condition contributes to the outcome (see the notion of 'easy counterfactuals', Ragin and Sonnett 2005). In our analyses, the use of the intermediate solutions mainly reduced the complexity relating to the presence of the outcome (contract stability). The tables also show the parsimonious solutions. We also checked the results by re-conducting the analyses using R-software.

Operationalisation and calibration

This section explains how each factor was operationalised and measured, and how values were assigned in the calibration process. The calibration of sets of membership should be based on theoretical and empirical studies (Rihoux and Ragin 2009). Table A in the supplemental online information shows all calibration values for outcome and conditions.

Contract stability as outcome

Contract stability is the absence of contract renegotiation. The calibration of contract stability includes a time perspective, based on the following theoretical considerations. First, as PPP

contracts are by definition incomplete, contracts that have been running for a longer time are inherently more likely to be in need of renegotiation. Second, contract renegotiation occurring soon after contract closure indicates serious distortions in the contract, not only in terms of difficulties in adapting to changes in external environments, but also in terms of inherent shortcomings of the contract design (Guasch et al. 2014). Empirical studies show that contract renegotiation happens on average within three years or sooner after contract award (Engel et al. 2014; Glifford et al. 2014; Sarmento 2014; Bitran et al. 2013; Guasch et al. 2008). Hence, we calibrated the 'contract stability' outcome into three values: (1) the occurrence of contract renegotiation within less than three years after contract closure = 0 (full out), (2) within three years or more = 0.4 (more or less out), (3) no contract renegotiation during the project's life span= 1 (fully in).

Conditions

(1) Country competitiveness (COMP) as measurement of macro-level business environment: Being a proxy of the macro-level business environment in a certain country, we used the Global Competitiveness Index (GCI) developed by the World Economic Forum (Schwab 2014), which is available from 1997 onwards and has been used by academics and practitioners (see e.g. Pérez-Moreno et al. 2015). The GCI includes a macro-economic pillar, capturing government budget balance, inflation, general government debt and country credit rating, as well as a financial market development pillar, measuring among others the availability and affordability of financial services, soundness of banks, and venture capital availability. But this index also includes information on the institutional-political context, with proxies for rule of law, corruption, and government efficiency, among others. Furthermore, it refers to contextual

elements and policies supporting investments and economic activity, such as labour market efficiency, technological readiness, health and education, market size, business sophistication, and innovation in a country. This GCI encompasses 12 pillars and is calculated based on a weighted average of sub-indicators. Just like other composite global governance indicators, the GCI has been criticised in terms of methodology and underlying theoretical model (see e.g. Lall 2001) which have not been fully dealt with in later refinements. However, its comprehensiveness and availability are an asset in this paper.

We calculated the country competitiveness based on two events. When projects were subject to contract renegotiation, the country's GCI was measured by taking an average of the value at the moment of contract closure and the value at the moment contract renegotiation took place. In the case of no contract renegotiation, we used the average value from the value at the moment of contract closure, and the moment of evaluation by BENEFIT. This single value (1 to 7) was then normalised to a total score on a scale between 0 and 1.

To assign set membership for fsQCA, we used direct calibration. Based on a review of the GCI score in the 10 European countries from 2001 to 2014, we found an average around 0.60; the lowest and the highest score were 0.40 and 0.80 respectively. We then set the following thresholds: 5% percentile as the threshold for non-membership = 0.40; 50% percentile as the cross-over point = 0.60, and 95% percentile as the threshold for full membership = 0.80.

(2) Governmental PPP support (PPPGS):

The governmental PPP support was measured, following Verhoest et al. (2015), by sub-indicators related to three dimensions, namely PPP-enhancing policies and political commitment, PPP-enabling legal and regulatory frameworks, and supporting institutional arrangements. The

value of the sub-indicators varied between 1 (the lowest) and 4 (the highest). The data on governmental PPP support per country as used in this paper were collected by country teams as part of the BENEFIT case template per project at the moment of contract closure. The data were then validated by cross-checking them with other sources such as the COST Action TU1001 country templates and narratives, as well as data from EPEC and EBRD. We also applied an alternative procedure by using the 2013 value as a benchmark (see Verhoest et al. 2015) and tracing changes in the years before up to the moment of contract renegotiation. In order to avoid the construction of a single composite index and related problems of aggregating ordinal values and arbitrary weighting decisions (Nardo et al. 2015), we performed hierarchical cluster analysis on the set of sub-indicators, resulting in six clusters ranked from low to high (see Soecipto et al. 2016). Hence, we calibrated 'Governmental PPP Support' into a six-value set membership: (1) Cluster 1 scored 1 (fully in), (2) Cluster 2 scored 0.8 (mostly, but not fully in), (3) Cluster 3 scored 0.6 (more or less in), (4) Cluster 4 scored 0.4 (more or less out), (5) Cluster 5 scored 0.2 (mostly, but not fully out), and (6) Cluster 6 with the value 0 (fully out). For the second analysis, in which we studied the influence of the three sub-dimensions of governmental PPP support, we also applied hierarchical cluster analysis to these sub-dimensions and calibrated them in a similar way.

(3) Appropriateness of risk allocation (RISK):

During data collection in the BENEFIT project, country teams mapped the actual allocation of risks for each transport infrastructure PPP to the public partner, private partner or shared between both, taking five major risks into account: design, construction, financial, regulatory and force majeure risks. The 'appropriateness of risk allocation' was measured by the conformity of the

actual risk allocation with the standard risk allocation, taking the type of project into account (BOT vs. DBFO/M), as suggested by literature and (Iossa et al. 2007; Bing et al. 2005; Ke et al. 2010). Hence, the appropriateness of risk allocation did not measure whether such allocation improved the social welfare or financial project stability. In the case of Build-Operate-Transfer contracts, a standard risk allocation would retain most risks with the public partner, but the private partner should bear the construction risk (Iossa et al. 2007). Conversely, in the case of Design-Build-Finance-Operate/Manage contracts, most risks would by default be borne by the private partner, but the regulatory risk should be retained by the public partner. Moreover, financial and force majeure risks should be shared (Iossa et al. 2007). The higher the number of risks for which the actual risk allocation in a specific project matches the standard risk allocation for those risks as suggested by Iossa et al. (2007), the higher the calibrated value we assigned to the condition: (1) 'all risks are appropriately allocated' scored 1.00 (fully in) (2) '4 out of 5 risks are appropriately allocated' scored 0.8 (mostly but not fully in), (3) '3 out of 5 risks are appropriately allocated' scored 0.6 (more or less in), (4) '2 out of 5 risks are appropriately allocated' scored 0.4 (more or less out), (5) 'only 1 of 5 risks is appropriately allocated' scored 0.2 (mostly but not fully out), and (6) 'no risk is appropriately allocated' scored 0.0 (fully out).

(4) Remuneration scheme (REM):

The remuneration scheme refers to how and by whom the partner responsible for the investment and/or operation in the infrastructure is paid. Both the remuneration method (availability-based or usage-based payment) and the nature of the funding agents (public actor versus end users) determine whether a remuneration scheme is more or less secure (i.e. with a low risk profile) for the private partner (Perkins 2013; Roumboutsos and Pantelias 2015). The remuneration scheme

was classified and calibrated into six values, in order of decreasing certainty : 1) availability-based payment scored 1.00 (fully in), (2) fixed subsidy scored 0.8 (mostly but not fully in), (3) quality-based payment scored 0.6 (more or less in), (4) usage-based payment (user charges/toll charges) funded by the government as shadow toll scored 0.4 (more or less out), (5) usage-based payment with mixed funding from a public partner and end users scored 0.2 (mostly but not fully out), and (6) usage-based payment (user charges/toll charges) funded by end users scored 0.00 (fully out).

(5) Short contract duration (SHORT):

The 717 PPP projects in the United Kingdom contracted until March 2012 indicate that contract duration ranges between 10 and 50 years, with an average of 26 years (HM Treasury 2012). In our sample, several of the projects from the UK, Greece, France and Portugal had a contract duration of more than 40 years. Hence, we calibrated the duration of contracts into four values: (1) more than 40 years as 0 (fully out), (2) 26-40 years as 0.33 (more out than in), (3) 16-25 years as 0.66 (more in than out), and (4) less than 15 years as 1 (fully in).

(6) Young project age (YOUNG):

Project age represents the number of years between contract closure and the moment of measurement, i.e. 2015. As PPP activity in Europe took off mainly after 1990, and projects are thus currently below 25 years in terms of project age, we scored and calibrated the projects in terms of young age, using direct calibration as in the following thresholds: 5% percentile being the threshold for non-membership = 25, 50% percentile being the cross-over point = 12.5, and 95% percentile being the threshold for full membership = 0. In our sample of 25 projects,

projects are between 6 and 25 years old, with an average of 13.3 years. For one project that is 28 years old (and thus above the maximum of 25 years) we scored 0.

RESULTS

Does governmental PPP support matter in interaction with macro and micro conditions?

A first step is the necessity analysis for both the presence and absence of contract stability (see Table B in the supplemental online information, second and third column). This analysis shows that *a less certain remuneration scheme (~REM) is a necessary condition for explaining the absence of contract stability for road infrastructure projects*. This implies that all renegotiated PPP projects in our sample are funded by usage payment schemes, making revenues dependent on traffic flows.

We now turn to the analysis of sufficient conditions for the presence of contract stability as well as its absence. The truth table is shown in the supplemental online information (Table 3a). In producing the intermediate solutions, we expected the following conditions to contribute to the outcome 'presence of contract stability': being in a country with a high level of competitiveness (COMP), a high level of governmental PPP support (PPPGS), a secure remuneration scheme (REM), an appropriate risk allocation scheme (RISK), a short contract duration (SHORT), and a young project age (YOUNG). We set the cut-off consistency ratio at level 0.85.

[PLEASE INCLUDE TABLE 2 HERE]

Table 2 shows four solution paths with specific combinations of conditions that are sufficient to explain contract stability, representing an overall solution consistency ratio (0.93) and an overall solution coverage ratio of 0.50. The overlap between the solution paths is high, and three cases can be explained by these paths. None of the reported solutions in Table 2 and 3 have deviant cases with inconsistency in kind.

Road projects have stable contracts if they rely upon more secure remuneration schemes (REM) like availability payments, are set in a favourable macro-level business environment (COMP), are young as regards project age (YOUNG), and have either a more appropriate risk allocation (RISK) (solution 1a) or high levels of governmental PPP support (PPPGS) (solution 1b). However, as solution 2 with the highest raw coverage shows, road projects also experience stability, even with longer contracts (~SHORT) when they are in a country with high levels of competitiveness (COMP) and despite being young projects (YOUNG). Projects with a less appropriate risk allocation (~RISK) and longer contract duration (~SHORT), but that are in a country with a favourable context (COMP) and well-developed governmental PPP support (PPPGS), also avoid contract renegotiation (path 3).

The analysis of the absence of contract stability (see Table 2, right column) yields less robust results, with a moderate overall solution consistency (0.89) and a rather low coverage ratio (0.39). Again, the cut-off consistency ratio is set at level 0.85. Road infrastructure PPPs, even with a younger contract age (YOUNG) and shorter contract duration (SHORT), face contract renegotiations when they are in countries with low levels of competitiveness (~COMP) and weakly developed governmental PPP support (~PPPGS), are funded by a less secure remuneration scheme (~REM), and have a less appropriate risk allocation (~RISK). However,

the number of cases covered by this path is low. Moreover, it is clear from the truth table (see the supplemental online information, Table 3b) that contract renegotiation can go together with many different combinations of conditions, but these combinations have in common that renegotiated projects were funded by less secure usage-based payment schemes. Moreover, nine out of 13 renegotiated projects were in an unfavourable macro-level business environment.

Which sub-dimensions of governmental PPP support matter in interaction with macro and micro conditions?

But if governmental PPP support plays a role, is this due to the joint effect of its three sub-dimensions, i.e. the presence of PPP-enhancing policies and political commitment, a PPP-specific legal and regulatory framework, and well-developed PPP-supporting arrangements? Do they combine when avoiding contract renegotiation, as we expect them to (see Table 1)? We ran additional fsQCA models in which we brought in the three sub-dimensions of governmental PPP support as conditions, together with the macro-condition 'level of country competitiveness' and two of the micro conditions, the 'secureness of the remuneration scheme' and 'young project age'. These conditions were retained because they are important in the paths we discussed in the previous section, with a less secure remuneration scheme even being a necessary condition for contract renegotiation.

Interestingly, the necessity analysis (see the lower part of Table B in the supplemental online information) shows that weakly developed PPP support arrangements are *almost* a necessary condition for explaining the absence of contract stability for road infrastructure projects (consistency 0.89). Thus, all renegotiated PPPs have a less secure remuneration scheme and are all, except one, located in a country in which PPP units, PPP project appraisal

instruments and procedures as well as the standardisation of contracts are absent or weakly developed.

[PLEASE INCLUDE TABLE 3 HERE]

The truth table is shown in the supplemental online information (Table 3c). In producing the intermediate solutions, we expected the following conditions to contribute to the outcome 'presence of contract stability': being in a country with a high level of competitiveness (COMP), PPP-enhancing policies and political commitment (POL), PPP-enabling legal and regulatory framework (LEG), supporting arrangements (SUPP) and a secure remuneration scheme (REM), and a young project age (YOUNG). As shown in Table 3, two configurations are produced with a high overall solution consistency (0.94) but they only cover 38% of this outcome.

First, road PPPs projects with a younger project age (YOUNG) with a more secure remuneration scheme (REM), in a country with higher levels of competitiveness (COMP) experience contract stability. However, the second solution provides more insight into how the different dimensions of governmental PPP support matter for avoiding contract renegotiation. A younger project age (YOUNG), but in settings where there is a highly developed PPP-supporting arrangement (SUPP), in combination with PPP-enhancing policies and political commitment (POL), while being in countries with high levels of competitiveness (COMP), will also experience contract stability. In these solution paths, a PPP-specific legal and regulatory framework does not play any role in enhancing contract stability.

When analysing the projects that have been renegotiated (absence of contract stability) we find one path with a solution consistency of 0.86 and a coverage ratio of 0.56 (Table 3 – right column). In this analysis we set the cut-off consistency ratio lower than 0.85 (0.820), however, this ratio is still higher than the required level 0.75 (Schneider and Wagemann 2012). Despite being in countries with rather well-developed PPP policies (POL) and PPP-specific legal and regulatory framework (LEG), projects in less favourable macro-level business environments (~COMP), with weakly developed supporting arrangements (~SUPP) and with a less secure remuneration scheme based on usage payments (~REM) face contract renegotiation. As previously and more generally stated, all renegotiated projects in our sample have less secure usage-based remuneration schemes, and all but one are in settings with weakly developed supporting arrangements.

DISCUSSION AND CONCLUSION

In this paper we studied the combined contributions of macro-, meso- and micro-level factors to contract stability of road infrastructure PPPs. We are particularly interested in the extent to which governmental PPP support and its sub-dimensions in a country matter for contract stability, and how they combine with the macro-level business environment (measured by country competitiveness) and micro-level conditions, such as the secureness of the project-related remuneration scheme, the appropriateness of the risk allocation, a short contract duration, and a young project age.

What are the main findings? First, while the found solution paths mostly have rather high consistency levels, their empirical relevance was rather modest. Hence, the variety in combinations is quite large and common patterns are rather hard to find. Alternatively, other

important explanatory factors may not be included in the study (e.g. the extent of competition in bidding and the quality of tendering, see Domingues and Sarmento 2014).

Second, in the cases we *can* explain, we see the different ways in which macro-, meso- and micro-level conditions combine. Contract stability was found in projects in which a favourable macro-level business environment (high level of country competitiveness) joined up with a secure remuneration scheme and a young project age, combined with either well-developed governmental PPP support or appropriate risk allocation. But even when specific micro-level conditions are absent, a favourable macro-level context and well-elaborated governmental PPP support can go together with contract stability.

Third, all these renegotiated projects were funded by usage-based payment systems, as a less secure remuneration scheme is a necessary but not sufficient condition for contract renegotiation (Cruz and Marques 2013a; Sarmento 2014). Most often (in 10 out of 13 projects) this is combined with an unfavourable or worsening macro-level business environment (i.e. level of country competition), with shrinking traffic flows leading to financial difficulties (see e.g. Makovsek et al. 2015; Guasch and Straub 2009). It is striking that the presence of both of these conditions is included in solutions for contract stability, and their absence in the solution for contract renegotiation.

The contribution of other micro-level conditions, such as appropriateness of risk allocation and contract duration, is less straightforward to interpret. Project age in specific combinations with other conditions clearly matters for contract stability. However, young projects in an unfavourable macro- and meso- context with fewer favourable micro-level conditions will face contract renegotiations anyway. Four out of 13 projects that were renegotiated have a young project age whereas four with an old project age above 12.5 years) did

not experience any contract renegotiation. Nevertheless, future studies should more explicitly take the project age into account.

Fourth, the role of governmental PPP support with respect to contract stability was studied in this paper (Verhoest et al. 2015). Aspects of this government support are said to significantly influence contract renegotiation (Sarmento 2014; Domingues and Sarmento 2016; Montecinos and Saavedra 2014; Cruz and Marques 2013a: 2013b). Governmental PPP support in a country does not directly affect contract stability, only in combination with other factors. Moreover, together with a favourable macro-level business environment, it may yield contract stability even in combination with less optimal project-level features such as less appropriate risk allocation and longer contract duration. However, well-developed governmental PPP support is not strictly needed for contract stability, as long as other conditions are favourable, which is shown for example in the Finnish E18 Muurla Lohja project.

Fifth, the paper also considered the role of the three sub-dimensions of governmental PPP support in fostering contract stability, i.e. policies and political support, legal and regulatory framework, and supporting arrangements. Clearly, the most relevant dimension is the existence of well-developed supporting arrangements, in the form of *a strong PPP unit, standardised ex ante evaluation instruments and standardised contracts*. In a favourable macro-level business environment, and together with clear PPP-advocating policies and political commitment, this leads to PPP contracts being stable. More importantly, the absence of such supporting arrangements is common to all but one of the renegotiated projects. Even with the presence of PPP-advocating policies and strong political commitment, as well as a PPP-specific legal and regulatory framework, an unfavourable macro-level business environment, lack of supporting arrangements and a less secure remuneration scheme leads to contract renegotiation. Some of the

Spanish and Greek user-funded toll road projects in our sample were driven towards contract renegotiation by the global financial crisis, and could not be reversed due to failing supporting arrangements. PPP units acting as regulatory bodies, standardised ex ante evaluation instruments, and the existence of standardised contracts are indeed said to help to select PPP projects achieve good viability, avoid political biases, draft and manage contracts, and structure PPPs in a resilient way (Guasch et al. 2008; Sarmento 2014; Domingues and Sarmento 2016; Montecinos and Saavedra 2011; Cruz and Marques 2013a: 2013b).

However, in our sample, in contrast to literature (Domingues and Sarmento 2016; Cruz and Marques 2013b), neither the presence of a well-developed PPP-specific legal and regulatory framework, nor PPP-promoting policies and political commitment safeguard PPP projects from being renegotiated in case these projects have usage-based remuneration schemes in an unfavourable macro-level business environment. However, one could argue that particularly due to the strong political support for PPPs, problematic PPPs are given the opportunity for renegotiation, because politicians do not want them to fail. Likewise, PPP-specific legislation may include provisions that regulate under which circumstances contract renegotiations are allowed, and how such renegotiations should be organised, to enhance benefits for society and to avoid a decrease in value for money.

This paper however has some limitations. First, due to the limitation in number of conditions allowed in the analyses we used compound or composite factors, such as the level of country competitiveness as measurement of the macro-level business environment. Indeed, the macro-level business environment is considered in literature to be aggregative, as several interdependent, dynamic elements together influence business decisions (see also Makovsek et al. 2015). Hierarchical clustering in the case of governmental PPP support avoids the biases from

which composite indices might suffer. Nevertheless, studying larger samples of PPP projects would allow to increase the number of conditions, allowing us to further de-compose these concepts and study the interaction of their components, like we already did for governmental PPP support. Moreover, larger samples would allow to introduce additional micro-level conditions, or to study differences across PPPs for different kinds of infrastructure or different sectors.

Moreover, our study does not take the past experience with PPPs or contract renegotiation within countries into account as conditions, although this would be recommendable for future studies. Alternatively, a time-series study would allow to incorporate such an experiential dimension and to study whether and how a gradual expansion of the governmental PPP support in a country increasingly safeguards PPP contracts from being renegotiated over time.

Practitioners should take from this study that no single factor in itself will enhance contract stability or lead to contract renegotiation. It is the conjunction of specific macro-, meso- and micro- factors that counts. However, choosing a user-paid toll-based remuneration scheme in a country with a potentially worsening macro-level business environment, and where PPP-supporting arrangements (like a PPP unit, standardised ex ante evaluation instruments and standardised contracts) are missing, significantly increases the likelihood of contract renegotiation.

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Table 1. Key dimensions and indicators of governmental PPP-support and their relevance for contract stability (Based on Verhoest et al. 2015)

Dimension	Indicators	Sub-indicators	Contribution to PPP contract stability
Policy and political commitment	Existence of strategy document formulating explicit PPP policy	Existence, time of issue and frequency of updates	A clear PPP strategy, programme and political support that is stable over time brings clear prospects of future PPP for private partners and reduces the incidence of contract renegotiation, because of the likelihood of repeated business reducing motives for opportunistic behaviour (Cruz and Marques 2013a) and because of improved relations between interested sectors and government actors (Ho and Tsui 2009; Sarmento 2014).
	Existence of general PPP programme (incl. time schedule)	Existence, time of issue and frequency of updates	
	Political support for PPPs	Level and evolution over time	
Legal and regulatory framework	Specific PPP or concession law: (a) existence	(1) General PPP or concession law; (2) PPP law in transport; (3) procurement law; (4) in line with EU regulations	A better PPP regulatory environment helps governments to reduce uncertainty and asymmetric information (by reducing public sector difficulties in assessing PPPs), thus leading to a

	Specific PPP or concession law: (b) scope regarding definitions of four items	Definition of (1) PPP; (2) eligible sectors and types of infrastructures; (3) contracting authorities; (4) eligible private party	better negotiating position for the public sector (Domingues and Sarmento 2016; Guasch et al. 2014).
	Elements provided in the general legal framework (including public procurement law)	4 sub-indicators covering procedures and recommendations, 5 sub-indicators about mandatory provisions in PPP contract	
PPP-supporting arrangements	Acting public institutions/PPP-supporting units	Existence of PPP support unit and time	The existence of a PPP unit, as a strong regulatory body, improves the ability to deal with PPP complexity and the supervision of ex ante evaluation, the tendering and award process, as well as contract design and management
		Legal and organisational basis of PPP support unit	

		General functions PPP support unit (dissemination, policy function and green lighting)	(Domingues and Sarmento, 2016; Cruz and Marques 2013a; Montecinos and Saavedra 2011; Ho and Tsui 2009; Estache et al. 2009; Guasch et al. 2008).
		Staff size of unit	
	Procedures for PPP project appraisal and prioritisation	Existence of standard ex ante evaluation instruments	The use of standard ex ante evaluation instruments improves the accurateness of PPP-assessment and of traffic volume estimates and avoids biases (political bias, optimism bias) (Cruz and Marques 2013a; 2013b; Nikolaidis and Roumboutsos 2013).
		Use of standard ex ante evaluation in PPP projects	
		Existence of third-party scrutiny and approval of PPP projects before project on tender	
	Standardised processes and documents for PPPs in transport	Existence of third-party scrutiny and approval of PPP projects before final contract is signed	Standardised contracts rely on tested and optimised contractual practices, which reduce the chances of contract misspecification.

Table 2 Solution formula for the presence of contract stability as an outcome for road infrastructure projects

	Outcome: Presence of Contract Stability				Outcome: Absence of Contract Stability (occurrence of contract renegotiation)
	Solution 1a	Solution 1b	Solution 2	Solution 3	Solution 1
Solution terms	COMP*__REM__*RISK *YOUNG	COMP*PPPGS*__REM__*YOUNG	__COMP__*__~SHORT__*__YOUNG__	COMP*__PPPGS__*__~RISK__*__~SHORT__	__~COMP__*__~PPPGS__*~REM*~RISK__*SHORT__*__YOUNG__
Consistency	0.92	0.89	0.92	0.89	0.89
Raw coverage	0.28	0.21	0.40	0.31	0.39
Unique coverage	0.03	0.00	0.05	0.07	0.39
Projects	Via-Invest Zaventem, E18 Muurla Lohja,	Via-Invest Zaventem, M80 Haggs, M-25	Via-Invest Zaventem, Coen Tunnel, M80 Haggs,	M80 Haggs, A19 Dishforth	Attiki Odos Athens Ring Road

	M-25 Motorway London Orbital	Motorway London Orbital	M-25 Motorway London Orbital, E39 Orkdalsvegen Public Road	to Tyne Tunnel	
Overall solution consistency	0.93				0.89
Overall solution coverage	0.50				0.39

Note: The table only includes the intermediate solution terms. The bold conditions are core conditions included in the parsimonious solution terms.

Note 2: Solution 1b has no unique coverage and is not reported when conducting the analysis with R-software.

Table 3 Solution formula for the presence of contract stability as an outcome for road infrastructure projects with sub-dimensions of governmental PPP support

	Outcome: Presence of Contract Stability		**Outcome: Absence of Contract Stability** (Occurrence of contract renegotiation)
	Solution 1	Solution 2	Solution 1
Solution terms	COMP *__REM__*YOUNG	__COMP__*SUPP*__POL*YOUNG__	__~COMP*__ __POL*LEG__*~SUPP*~REM
Consistency	0.92	0.91	0.86
Raw coverage	0.30	0.26	0.56
Unique coverage	0.12	0.09	0.56
Projects	Via-Invest, E18 Muurla, M80 Haggs, M-25 M	Via-Invest, Coen T, M80 Haggs, M-25 M	Ionia Odos, Central Greece, Radial 2, Eje Aeropuerto, Elefsina K., Moreas
Overall solution consistency	0.94		0.86

Overall solution coverage	0.38	0.56

Note: The table only includes the intermediate solution terms. The bold conditions are core conditions included in the parsimonious solution terms