

Effects of monitoring and incentives on supplier performance: an agency theory perspective

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Abstract

This study empirically investigates the relationship between two key supplier performance measurement and management practices (i.e. monitoring and incentives) and suppliers' operational performance. Grounding on agency theory, a theoretical framework is proposed identifying the mediation effect of goal congruence and supplier opportunism within the direct relationship between monitoring/incentives and suppliers' operational performance. Related hypotheses are tested by applying structural equation modelling on a final sample of 305 responses, collected from a cross-country survey. Results uncover a nuanced and insightful picture: both monitoring and incentives positively affect the suppliers' operational performance. Goal congruence does not result as a significant mediator whereas supplier opportunism effectively mediates the monitoring-performance relationship but at the same time ineffectively mediates the incentives-performance relationship. Indeed, providing incentives to suppliers might increase the chances of opportunistic behaviours. While the key while empirical evidence supports the general positive impact of monitoring and incentives on performance, incentives configure as a critical tool, offering inputs for further research.

Keywords: Monitoring; incentives; supplier performance measurement and management; agency theory; survey

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1. Introduction

As firms increasingly rely on extended networks of suppliers to sustain their operations and deliver value to customers, extending management vision and control upstream in the supply chain (SC) is becoming critical (Li et al., 2005; Barratt and Barratt, 2011; Barratt and Oke, 2007; Huo et al., 2012; Kouvelis et al., 2006). In this scenario, supplier performance measurement and management is a strategic and time-consuming task, usually performed by the purchasing function (Kannan and Tan, 2002; Luzzini et al., 2014; Hald and Ellegaard, 2011). Recent technological innovations facilitating primary data collection (e.g. RFID, Internet of Things, Borgia, 2014), data rationalization and analysis (e.g. Big Data and advanced analytics; Trkman et al., 2010; Souza, 2014; Crawley and Wahlen, 2014), performance data storage and reporting (e.g. Web or Cloud platforms; Acito and Khatri, 2014) have been predicted to motivate buyer firms to increase their effort on supplier performance measurement and management in the recent future (Nudurupati et al., 2011; Melnyk et al., 2014; Franco-Santos et al., 2012).

The present study specifically addresses two fundamental practices within supplier performance measurement and management, namely *monitoring* and *incentives*. The former refers to the buyer measuring suppliers' performance by means of specific metrics (Heide et al., 2007). The latter refers to an external stimulus (generally in the form of monetary reward) that motivates suppliers' behaviours (Bernstein and Nash, 2008; De Toni and Nassimbeni, 2000). Both practices are instrumental to control and orchestrate the supply base, favouring suppliers' behaviour alignment to the buyer's needs (Anderson and Parker, 2013; Handley and Gray, 2013). Traditionally, supplier performance measurement and management literature has focused on the design process of monitoring and incentives, thus addressing how to select critical metrics (Kannan and Tan, 2002; Simpson et al., 2002; Gunasekaran et al., 2004; Bhagwat and Sharma, 2009; Cai et al., 2009), and how to design contractual rewards based on targets achievement (De Toni and Nassimbeni, 2000; Choi et al., 2012a). Nonetheless, research assessing the outcomes of monitoring and incentives is still scarce and the empirical evidence is not univocal (Heide et al., 2007). Authors have referred to the concept of "performance measurement paradox" (Micheli and Manzoni, 2010; Choi et al., 2012b; Gittel, 2000; Nixon and Burns, 2012) to

indicate unintended consequences of the performance measurement and management processes, including local optimisation, lack of strategic focus, opportunistic behaviours, trust and collaboration reduction between the evaluating and the evaluated parties (Franco-Santos et al., 2012; Melnyk et al., 2014).

All in all, open questions remain about the performance measurement-performance link and the relevant intervening mechanisms. This study digs into such paradox by tackling the agency problem that characterizes buyer-supplier relationships, where the supplier – agent – works on behalf of the buyer – principal – and directly affects the supply chain effectiveness (Ketchen and Hult, 2007; Rungtusanatham et al., 2007). Specifically, through the theoretical lens of agency theory (Jensen and Meckling, 1976), we examine the effect of monitoring and incentives on the supplier performance generated for the buyer and the intervening effect of *goal congruence* (between buyer and supplier) and *supplier opportunism*.

To this end in the next section we review the literature on supplier performance measurement and management and later develop our conceptual framework that integrates a set of six research hypotheses. In the third section we describe the cross-country survey conducted to collect data suitable to test the hypotheses. The fourth section is devoted to the findings, followed by a critical discussion of main results. Conclusions end the paper.

2. Literature Review and Theoretical Framework

In this section, we provide a synthetic overview of extant academic literature dealing with supplier monitoring and incentives, followed by a specific discussion of agency theory and its application to buyer-supplier relationships and performance management, thus leading to introduce our theoretical framework. The following section is devoted to discuss each specific research hypotheses.

2.1 Monitoring

We identified three main research streams that emphasize the importance of monitoring suppliers (see Table 1). Firstly, studies on supplier (or supply chain) performance measurement systems, which

propose sets of metrics for active supplier monitoring (e.g. Maestrini et al., 2017; Gunasekaran et al., 2004; Tannan and Kan, 2002). Secondly, studies on supplier development (e.g. Krause et al., 2007; Petersen et al., 2005) suggest monitoring to be the pre-requisite for assessing suppliers and later select those deserving specific relational investments. Finally, studies on supplier selection (e.g. Huang and Heskari, 2007; Ittner et al., 1999) suggest that monitoring is instrumental to the sourcing process. Extant studies spanning across previous streams are mostly focused on the design of the monitoring system, i.e. the proposal of conceptual frameworks and the choice of performance metrics (Kannan and Tan, 2002; Simpson et al., 2002; Giannakis, 2007; Mondragon et al., 2011; Kim et al., 2010; Luzzini et al., 2014) thus neglecting the actual consequences of monitoring practices.

In this study, rather than studying the “what to monitor” issue, we wonder upon the consequences of monitoring. Even though empirical evidence is limited, early studies have shown supplier monitoring to be positively related to the quality of the buyer–supplier relationship, which eventually leads to improved buyer performance (Carr and Pearson, 1999). Other authors have explored how the monitoring characteristics influence the supplier’s behavior, considering the content and frequency (Prahinski and Fan, 2007) or the output vs. behavioral monitoring (Heide et al., 2007). Finally, other variables have been studied in connection to monitoring practices, such as supplier commitment (Prahinski and Benton, 2004), various components of the buyer-supplier collaboration (Mahama, 2006), and socialization mechanisms (Cousins et al., 2008).

2.2 Incentives

Contractual incentives have been proposed as one of the mechanisms that stimulate supplier development (Krause et al., 2000; De Toni and Nassimbeni, 2000; Lee and Ansari, 1985) or the supplier commitment to quality programs (Handley and Gray, 2013; Anderson and Parker, 2011). Nevertheless, only recently authors have started to investigate the actual effectiveness of incentives. For example, Terpend and Krause (2015) distinguish between competitive incentives (based on performance comparison among different suppliers) and cooperative incentives (based on sharing benefits from an over-performing buyer-supplier relationship) and test their link with performance under various

conditions of buyer-supplier dependence. Empirical evidence show that competitive incentives are particularly effective when mutual dependence is moderate; cooperative incentives instead are only fruitful when mutual dependence is high. Furthermore, scholars suggest monitoring and incentives to be complementary practices in the context of quality (Handley and Gray, 2013) or sustainability programs (Porteous et al., 2015).

While the empirical investigation of incentives in the supply chain literature is relatively new, the debate is well developed in the performance management literature focusing at the individual level. The evidence is mixed though: while incentives clearly stimulate higher performance standards, counterproductive effects like opportunistic behaviors or relationship stiffening may arise (Choi et al., 2012b; Jensen and Murphy, 1990; Bonner and Sprinkle, 2002). It is therefore worth paying attention to possible unintended effects of incentives even in the context of buyer-supplier relationships, especially considering the possible intervening mechanisms that explain why and how monitoring and incentives lead to certain performance outcomes.

Table 1: Monitoring and incentives literature at the SC level

Research stream	References
Monitoring	Supplier (or supply chain) performance measurement system Carr and Pearson (1999); Kannan and Tan (2002); Simpson et al., (2002); Prahinsky and Benton (2004); Mahama (2006); Prahinsky and Fan (2007); Heide (2007); Wickramatillake et al., (2007); Giannakis (2007); Cousins et al., (2008); Chae (2009); Mondragon et al., (2011); Hald and Ellegaard (2011); Luzzini et al.,(2014); Terpend and Krause (2015)
	Supplier development Handfield et al. (2000); Krause et al. (2000); Humphreys et al. (2004); Petersen et al. (2005); Krause et al. (2007)
	Supplier selection DeBoer and Wan der Wegen (2003); Humphreys (2003); Huang and Keskar (2007); Van der Rhee et al. (2009); Ho et al. (2010); Carter et al. (2010); Igarashi et al. (2013)
Incentives	Incentives design Lee and Ansari (1985); De Toni and Nassinbeni (2000); Krause et al. (2000); Cachon and Lariviere (2001) – (2005); Cachon (2004); Netessine et al. (2006); Anderson and Parker (2011); Handley and Gray (2013)
	Incentives outcomes Krause and Scannel (2002); Modi and Mabert (2007); Kumar et al. (2011); Handley and Gray (2013); Terpend and Krause (2015); Porteous et al. (2015)

2.3 Agency theory and framework design

Besides investigating the effects of monitoring and incentives on supplier performance this study aims to uncover some relevant intervening mechanisms, thus helping managers and researchers to better understand how to get the most of the buyer-supplier relationship.

To this end, we ground on agency theory (Jensen and Meckling, 1976) that has been applied to model a hierarchical principal–agent relationship where authority delegation is necessary to complete the task. The so-called agency problem may arise whenever the two parties have conflicting goals and subsequently the agent does not work entirely on the principal’s behalf (Mahaney and Lederer, 2003) taking advantage of the information asymmetry (Lassar and Kerr, 1996). In the performance measurement literature, agency theory has been used to show that (i) multi-criteria performance measurement systems enhance business performance by reducing information asymmetry between top management (the agent) and shareholders (the principal) (Stede et al., 2006; Dossi and Patelli, 2010); and that (ii) monitoring and incentives increase the goal congruence between agent and principal (Burney and Widener, 2007). In the supply chain literature only few studies exploit agency theory (see Fayezi et al. 2012 for a comprehensive review) and mostly deal with the risks and outcomes connected to outsourcing decisions (e.g. Zsidisin and Ellram, 2003; Heide et al., 2007; Rossetti and Choi, 2008).

In this study we model the buyer-supplier dyad as a principal-agent relationship and argue that the buyer’s adoption of monitoring and incentives towards the supplier would reduce the information asymmetry between the buyer and the supplier and stimulate the supplier towards the achievement of superior operational performance. Moreover, an agency path in-between monitoring/incentives and supplier performance is identified, relying on the mediation effect of *goal congruence* (i.e. the compatibility of the buyer’s and supplier’s objectives) and *supplier opportunism* (i.e. the supplier behaving for his own gain). Such theoretical framework is shown in Figure 1 and the related research hypotheses are discussed in the next section.

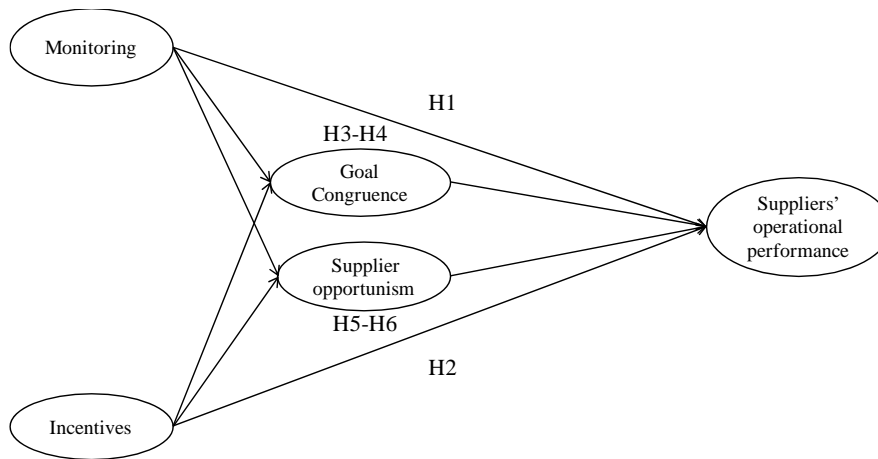


Figure 1: Research Framework

3. Hypotheses development

3.1 Monitoring, incentives and supplier's performance

The relationship between the adoption of (internal) performance measurement and management practices and performance improvement has long been debated in both accounting and operations management literature (see Franco-Santos et al., 2012 for a recent literature review on the topic). Performance measurement and management is inherent to the resource orchestration process: Melnyk et al. (2004) argue that the “performance measurement and management is ultimately responsible for maintaining alignment and coordination” (p. 213). Indeed, it yields information regarding the functioning of resources under scrutiny, which allows managers to make crucial adjustments and mobilize resources as conditions change (Koufteros et al., 2014). As a consequence, over the last three decades many firms have invested significant amounts of capital, time, and effort into developing and implementing monitoring procedures, performance measurement systems, incentives, penalties and other performance measurement and management related activities (Melnyk et al., 2014; Micheli and Manzoni, 2010). Yet, extending the measurement and management of performance outside the firm’s boundaries requires to focus on inter-firm processes and buyer-supplier relationships (if not the entire supply network). In fact, supplier performance measurement and management still offers relevant research gaps (Hald and Ellegaard, 2011; Terpend and Krause, 2015). For this reason, we ground on

some key results related to (internal) performance measurement and management to discuss the role of monitoring and incentives for the case of supplier performance measurement and management.

The majority of studies tend to have a positive view of performance measurement and management effectiveness (Ittner et al., 2003; Davis and Albright, 2004), thereby assuming a direct positive association with performance improvement. In this respect, Stede et al. (2006) find that, regardless the strategy, organizations with more extensive and mature monitoring schemes display better overall performance. However, other studies suggest that this is not always straightforward (De Leeuw and van den Berg, 2011; Bourne et al., 2013; Henri, 2006; Widener, 2007) introducing the concept of “performance measurement paradox”, which emphasizes the unintended consequence of performance measurement.

As for incentives, evidence is also mixed. The topic has been extensively analyzed in accounting (Bonner and Sprinkle, 2002; Bailey et al., 2002; Bonner et al., 2000), general management (Wright, 1992; Knight et al., 2001), and organizational behavior literature (Riedel et al., 1988; Wright et al., 1990), mainly referring to monetary rewards for management compensation. Prior research suggests that a variety of mechanisms determines how incentives affect performance, ranging from personal variables to task variables as well as environmental and incentive design variables (Bonner and Sprinkle, 2002). Failing to address these intervening elements may complicate the path between incentives and performance improvement, thus explaining counter-intuitive findings reported by some authors (Bonner et al., 2000; Young and Lewis, 1995; Camerer and Hogarth, 1999).

All in all, the general message emerging from the literature is that monitoring and incentives (as fundamental performance measurement and management practices) are key enablers of strategy execution, but managers should carefully take care of the adoption process in order to maximize benefits and avoid pitfalls. Supplier monitoring and incentives (shifting from intra-firm to inter-firm scenario) make no exception. Indeed, previous studies have highlighted quite a tortuous path towards performance improvement (e.g. Mahama, 2006; Cousins et al., 2008), which deserves further attention. In this paper the buyer–supplier relationship is framed applying the theoretical lens of agency theory, with the buyer playing the role of the principal and the supplier acting as the agent. We expect that in this agency situation the adoption of monitoring and incentives by the buyer company allows reducing

the information asymmetry and aligns the interests of both parties. On the one hand, monitoring is a critical control mechanism enabling the buyer to improve the supplier's performance and capabilities to meet current and future needs (Prahinski and Benton, 2004). On the other hand, incentives are generally thought to stimulate a proactive behavior of the supplier and previous studies converge towards a positive impact on performance (Terpend and Krause, 2015; Porteous et al., 2015; Handley and Gray, 2013). Therefore, we can introduce the following two hypotheses:

H1 Supplier monitoring positively influences supplier's operational performance

H2 Supplier incentives positively influences supplier's operational performance

3.2 The mediating role of goal congruence

Goal congruence is defined as the extent to which two actors perceive the possibility of achieving compatible, if not identical, objectives (Eliashberg and Michie, 1984). Whenever cooperating parties differ in their vision of labour, goal conflicts can facilitate shirking and moral hazard (Bergen et al., 1992). Agency theory studies often refer to goal congruence in order to examine complex contracting problems. Within a contractual relationship, the goal congruence measures the degree to which the agent's goals are satisfied by the contractual terms. The greater the goal congruence between the agent and the contract, the more likely the agent will meet the terms of the contract (Rossetti and Choi, 2008). In a typical buyer–supplier relationship, the objectives of the two parties are naturally at odds with each other: buyers desire more (quality, service level, innovation, sustainability, risk avoidance) for less (lower price); suppliers strive to meet the requirements with the highest profit margins or revenue potential (Jap and Anderson, 2003). At the same time, the two parties share the common interest for a successful transaction. In order to cope with such contrasting objectives, both monitoring and incentives might play an important role, representing a way to reduce information asymmetry and facilitate the identification of congruent goals. As a matter of fact, monitoring and incentives design may provide the supplier with formal objectives and targets that would otherwise remain ambiguous. Consequently, the supplier will be committed to work towards compatible goals rather than simply pursuing his self-interest. The possibility of achieving goal congruence can create a new space for win-win outcomes and

stimulate the search for solutions that increase the returns for both parties. In particular, it is expected that the greater the goal congruence, the better the supplier's operational performance experienced by the buyer. Thus, looking at the role played by goal congruence, the following two hypotheses are proposed:

H3 Goal congruence mediates the impact of monitoring on supplier's operational performance.

H4 Goal congruence mediates the impact of incentives on supplier's operational performance.

3.3 The mediating role of supplier opportunism

Opportunism is defined as self-interest seeking with guile (Williamson, 1975). In buyer–supplier relationships, opportunism occurs when one party unilaterally behaves for its own gain (Tangpong et al., 2010). Hawkins et al. (2008) identified four main antecedents of opportunism: dependence, formalization, relational norms, and uncertainty. Though causes and context variables could change, the authors suggest that opportunism always leads to relationship performance reduction, at least in the long term. In the relationships with external partners, opportunism can encompass a wide range of behaviors (Wathne and Heide, 2000; Carson et al., 2006), some of which may be passive (e.g. quality shirking and capabilities exaggeration), while others may be active (e.g. contract breaching and violation of agreements). Opportunism can even result in production disruptions, causing SC inefficiencies and negative economic impacts (Morgan et al., 2007). In addition, the formation of SC alliances between firms may fail due to the fear of opportunistic behaviors by potential partners (McCarter and Northcraft, 2007). These adverse consequences of opportunism on firm and SC performance emphasize the need to prevent and control for occurrences of opportunism in buyer–supplier relationships (Morgan et al., 2007). Grounding on previous agency-theory studies (Jap and Anderson, 2003; Morgan et al., 2007), supplier performance measurement and management practices are thought to reduce the chances of supplier opportunism and consequently improve the supplier's performance experienced by the buyer. On the one hand, monitoring the supplier against performance dimensions that interest the buyer will decrease the chances of purely self-interested actions. On the other hand, associating an incentive scheme to the same performance dimensions will further motivate

the supplier to take actions that will benefit himself and the buyer as well. In line with this argument, the following hypotheses are stated:

H5. Supplier opportunism mediates the impact of monitoring on supplier's operational performance.

H6. Supplier opportunism mediates the impact of incentives on supplier's operational performance.

4. Methodology

4.1 Survey Development, Sampling, And Data Collection Procedures

The hypotheses were tested using data collected in the second half of 2014 through a collaborative project involving supply management researchers in four European countries (Finland, Germany, Italy, and Ireland). The research project utilised an online survey questionnaire about purchasing/SC priorities, practices, and performance using constructs derived from the literature. Since both the survey design and data collection involved multiple countries, a common methodological toolkit was developed in order to provide guidance to partner institutions throughout the project duration. The survey was developed in English starting from the main theoretical frameworks that inspired the study. Given the diverse interests of each research partner in terms of research topics, a method team selected a few grand theories after a review of the most important and promising theories in purchasing and supply management literature, including agency theory. All the constructs investigated through the survey have been organised into a construct book, reporting the construct name and typology, definitions, survey items, scales, underlying theory, and corresponding references. A particular aspect of the survey is that it benefits from the adoption of a category-level perspective. In fact, strategies are never truly implemented until they are integrated at the category or product family level (Handfield et al., 2005), and these different categories often adopt different managerial approaches (Gelderman and Van Weele, 2005).

The English version of the questionnaire was translated into different languages using the TRAPD (Translation, Review, Adjudication, Pre-testing, and Documentation) procedure (Harkness et al., 2004) and subsequently tested by submitting it to a couple of purchasing executives in each country to check

the clarity of the questions. Before and during the pre-testing phase, special emphasis was placed on the quality of the question formulation in order to reduce potential bias resulting from respondents' misleading cognition (Poggie, 1972; Schwarz and Oyserman, 2001). In particular, we concentrated our questions on observable data and excluded possible scope of interpretation. The final version of the survey tool was uploaded onto the project website and made visible only to respondents selected in the sampling procedure. The Internet survey offers higher levels of accuracy and reduces missing values due to either the respondent or some data entry mistakes (Boyer et al., 2002).

In each country, firms were randomly sampled from a national, publicly available database. Sampling criteria were pre-agreed among the participating researchers: only firms with more than 50 employees from the manufacturing (ISIC codes from 10 to 33) and professional service firms (ISIC codes from 62 to 66, and from 69 to 75) were included in the sample. Next, each country worked to recover contacts of key informants at the sampled firms. The paper authors were in charge of the data collection in Italy.

Respondents were firstly contacted over the phone to determine their availability to give answers and to provide guidance for the survey completion. A script for the telephone call with respondents was provided within the method toolkit as well as a draft text of subsequent e-mails. After a respondent agreed to participate, he or she was contacted via a customised e-mail including the survey link. Reminder e-mails and telephone calls were made to those who had not responded. Following similar key-informant-based research studies (Cini et al., 1993; Cousins, 2005), the goal was to find the right person within the organisation who was able to respond to all the questions about the purchasing/SC strategy, the buyer-supplier relation, purchasing practices, and performance. For this reason, mostly CPOs, VPs of Purchasing/SC, Purchasing/SC Directors, and Purchasing/SC Managers were involved. The respondents consisted of highly qualified purchasing/SC professionals who had played important roles in the purchasing functions of their firms.

The databases across all four countries included a total of 20,515 companies that fit our sampling criteria. Of these, 3,068 were selected through random sampling, and out of these 3,059 were contacted (some companies were noticed after sampling to not fit the criteria, e.g. the company moved abroad, was no longer in the industry specified, or no longer fit the criterion for at least 50 people). Out of these,

1,059 were contacted via phone (for those not reached, either a suitable respondent was never located in the company or the suitable respondent never answered our calls, despite multiple attempts). A total of 656 companies agreed to participate, and out of these, 305 useable responses were received. Thus, the response rate considering companies that received the link for the questionnaire was relatively high at 46%. Considering all the companies reached via phone, the resulting response rate was 28.8%.

After the data collection process, each country cleaned its own data in accordance with a common agreement and conducted tests regarding non-response bias. Non-respondent bias was tested by ruling out the differences in terms of size and sector distributions between respondents and non-respondents (Scott and Overton, 1997).

Given that we relied on a single respondent design, we controlled for common method bias in two ways: through the design of the study and through statistical control (Podsakoff et al., 2003). Regarding the survey, the research project was labelled as a broad overview of purchasing/SC management: no explicit reference to the intention to test antecedents of supplier performance was evident. Thus, the respondents' attention was not drawn to the relationships being targeted in this study. Questions including items and constructs related to each other in the general model were also separated in the questionnaire in order to prevent respondents from developing their own theories about possible cause-effect relationships. Furthermore, the questionnaire was carefully created and pre-tested and respondents were assured of strict confidentiality. Finally, we used different scales and formats for the independent and criterion measures (Podsakoff et al., 2003). As a second mean to ensure against common method bias, we examined the unrotated factor solution for the constructs included in our model (Podsakoff and Organ, 1986), checking that neither a single nor a general factor was likely to account for the majority of the covariance among the measures.

Table 1: Sample descriptive

Descriptive	Freq.	%	Descriptive	Freq.	%
<i>Country</i>			<i>Industry Sector</i>		
Italy	99	32.5	Manufacturing	234	76.7
Germany	70	23	Information and comm.	23	7.6
Finland	84	27.5	Finance and insurance	19	6.2
Ireland	52	17	Professional, scientific, and technical activities	29	9.5

<i>Purchasing categories</i>			<i>Respondent position</i>		
Raw materials	125	41	Purchasing director	53	17.4
Components and supplies	90	29.5	Purchasing manager	153	50.2
IT services	28	9.2	Senior, Project buyer	34	11.1
Logistics services	16	5.2	Buyer, Purchasing agent	28	9.2
Office equipment and supplies	19	6.2	Other	32	10.5
Maintenance and cleaning	27	8.9	Missing	5	1.6
<i>Employees</i>					
Medium (50–249)	150	49.1			
Large (250–1000)	78	25.6			
Very large (> 1000)	75	24.6			
Missing	2	0.7			
Total	305	100		305	100

4.2 Measures

The operationalization of the constructs was based on existing measures. The emphasis on *supplier monitoring* was adapted from the three-item scale reported by Heide et al. (2007). Respondents were asked to provide answers on a Likert-like scale ranging from 1 (“Totally disagree”) to 6 (“Totally agree”). The survey questions reflecting each item are shown in Table 2. Similarly, the presence of *incentives* for suppliers was based on De Toni and Nassimbeni (2000). *Goal congruence* and *supplier opportunism* were adapted from Jap and Anderson (2003) and Morgan et al. (2007). Finally, *suppliers’ operational performance* was assessed following the production competence framework adopted by Gonzalez-Benito (2007). Respondents were asked to what extent category performance has met management’s expectations on a Likert-like scale from 1 (“Far below expectations”) to 6 (“Far above expectations”) in relation to operational performance including *quality, delivery, innovation and sustainability*. Later, we measured *suppliers’ operational performance* through a second-order construct consisting of those four dimensions, following the example of some previous studies (Kortmann et al., 2014; Chen et al., 2013). All the manifest variables used to measure the latent variables are shown in Table 3.

In addition to the main variables in the model, industry (manufacturing vs. service) and company size (operationalised through a dummy variable reflecting the EU classification of small vs. large firms) were included as control variables over supplier performance.

5. Findings

To test our research model, we employed structural equation modelling (SEM) with the maximum likelihood (ML) estimation method. Most SEM applications described in the literature are analyzed with this methodology. The hypothesized model was tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it was consistent with the data. Where goodness-of-fit is adequate, the model can be considered as a plausible explanation of postulated interactions between constructs. The research model is analyzed and interpreted sequentially: first the assessment of the reliability and validity of the measurement model and secondly the assessment of the structural model. The R software (<https://cran.r-project.org>) was used to estimate both the measurement model and the structural model. The ML algorithm was used to obtain the paths, the loadings, the weights, and the quality criteria.

5.1 Measurement Model

Table 3 shows the measurement scales of the reflective constructs investigated by our research model. The measurement model consists of seven multi-item constructs with a total of 24 indicators. We used several tests to determine the convergent and discriminant validity of the constructs. We controlled through an exploratory factor analysis that all item loadings between an indicator and its posited underlying latent variable were greater than 0.6 — with no relevant cross-loadings. Next, all the measurement scales of the reflective constructs have been tested through confirmatory factor analysis (CFA). We verified the measures by assessing reliability and unidimensionality of each of the seven constructs, i.e. item-to-total correlations within each construct were examined. The measures also meet discriminant and convergent validity requirements: both composite reliability (CR) and average variance extracted (AVE) were above the recommended threshold of 0.7 and 0.5, respectively (Fornell and Larcker, 1981). In particular we checked that the squared correlation between each pair of latent constructs does not exceed their AVE estimates (see Table 4). Finally, we evaluated the overall model fit in two ways (Hu & Bentler, 1998): with the chi-square goodness-of-fit statistic (which should be <2) and with other absolute and relative fit indices, namely we considered the comparative fit index (CFI)

and Gamma hat or root mean square error of approximation (RMSEA). Overall the CFA reveals a sufficient model fit attested through such fit indices for the measurement model: $\chi^2=400.211$; $\chi^2/\text{d.f.}=1.76$; RMSEA=0.053; CFI=0.952.

Table 3: Measurement properties of reflective constructs from CFA

Constructs	Items (corresponding to the survey questions)	Loading	CR	AVE
Monitoring	We monitor product/service quality for major suppliers of this category	0.820	0.878	0.705
	We monitor delivery timeliness for major suppliers of this category	0.896		
	We monitor order accuracy for major suppliers of this category	0.807		
Incentives	The contract drawn up with our major suppliers generally stipulates rewards for increases in the quality of the supplies	0.780	0.896	0.744
	The contract drawn up with our major suppliers generally stipulates rewards for a reduction in the component development and delivery time	0.861		
	The contract drawn up with our major suppliers for this category generally stipulates rewards for respecting agreed delivery times	0.950		
Goal congruence	My company and the major suppliers in this category share the same goals in our relationships	0.836	0.862	0.645
	My company and the major suppliers in this category have compatible goals	0.690		
	My company and the major suppliers in this category support each other's goals	0.818		
	My company and the major suppliers in this category have compatible views on how to achieve our goals	0.890		
Supplier opportunism	Major suppliers of this category have tried to deceive us on several occasions	0.890	0.802	0.577
	Major suppliers of this category act to benefit themselves at our expense	0.767		
	Major suppliers of this category lack integrity when they are not closely monitored	0.626		
Quality Performance	Features and functionality of purchased products or services	0.651	0.880	0.656
	Durability of purchased products or services	0.904		
	Reliability of purchased products or services	0.899		
	Fit between purchasing specifications and purchased products or services	0.730		
Delivery performance	Short internal order processing times	0.617	0.845	0.584
	Short delivery times by suppliers	0.758		
	Fulfilment of agreed schedules by suppliers	0.871		
	Fulfilment of agreed delivery terms by suppliers (e.g. quantity, quality, format)	0.761		
Flexibility performance	Widening the range of product or service versions, options, and features offered by our suppliers	0.770	0.848	0.652
	Supplier capability to introduce (customized) changes in products or services	0.841		
	Supplier rate of introduction of new products (updated and leading products)	0.801		

Fit indexes: chi-square=400.211; p-value=0.000; chi/d.f.=1.76; CFI=0.952; RMSEA=.053

Table 4: Correlation matrix

Variables	1	2	3	4	5	6	8
1. Monitoring	0.840						
2. Incentives	0.030	0.862					
3. Goal congruence	0.304	0.176	0.815				
4. Supplier opportunism	-0.209	0.197	-0.298	0.760			
5. Quality performance	0.165	0.149	0.213	-0.157	0.810		
6. Delivery performance	0.137	0.183	0.162	-0.144	0.552	0.764	
7. Flexibility performance	0.100	0.203	0.150	-0.199	0.358	0.418	0.808

The square root of the average variance extracted (AVE) is shown in bold on the diagonal. Correlations are in the lower triangle of the matrix.

5.2 Structural Model

In order to test our hypotheses, we separately tested two path models through SEM.

The first model tests the direct effect of *monitoring* and *incentives* on *suppliers' operational performance*. Table 6 shows the PLS results, including standardised path coefficients, with the significance based on two-tailed t-tests for our hypotheses. In line with H1 and H2, more emphasis on *supplier monitoring* and *incentives* leads to better *supplier performance* (H1a is supported with $\beta=0.222$ and H1b is supported with $\beta=0.224$).

The second models includes the latent variables altogether and tests the mediation effect of *goal congruence* (H3-4) as well as *supplier opportunism* (H5-6) in the relation between *monitoring*, *incentives* and *suppliers' operational performance*. Results do not support the hypothesized mediation effect of *goal congruence*: despite both *monitoring* ($\beta=0.331^{***}$) and *incentives* ($\beta=0.147^*$) positively affect *goal congruence* as expected, the latter does not significantly affect *suppliers' operational performance* ($\beta=0.081_{ns}$). Instead, the mediation effect of *supplier opportunisms* seems confirmed, with some interesting insights that will be discussed in the next section: *monitoring* ($\beta=-0.221^{**}$) and *incentives* ($\beta=0.219^{**}$) significantly affect *supplier opportunism*, which in turn negatively affects *suppliers' operational performance* ($\beta=-0.232^{**}$). Still, incentives maintain a direct positive effect on *suppliers' operational performance* ($\beta=0.260^{**}$) whereas the direct effect of *monitoring* is not significant ($\beta=0.122_{ns}$). Interestingly, *incentives* seem to increase (rather than reducing) *supplier opportunism*, which will be commented in the next section. All in all, in presence of all predictors

suppliers' operational performance is significantly affected only by *incentives* and *supplier opportunism*.

To further test the mediation effect, we followed some of the most recent recommendations (Rungtusanatham et al., 2014; Preacher, 2015). Since *goal congruence* does not significantly affect *suppliers' operational performance* (cf. Model 2 in Table 6) we did not follow this up. Instead we tested for the mediation effect of *supplier opportunism* in the monitoring-performance and incentives-performance links. Although different testing methods usually provide similar results, each method has its advantages and disadvantages. Therefore, we assessed the reliability of our results through multiple criteria (see Table 7). First, we applied the classical Baron and Kenny method (1986). We checked the following: i) the direct effect of monitoring and incentives on performance without mediator (c) and with mediator (c'); ii) the direct effect of monitoring and incentives on the mediator (a); iii) the effect of the mediator on suppliers' operational performance (b); and iv) the total effect of monitoring and incentives ((a*b)+c'). Second, we tested the indirect effect through bootstrapping analyses by considering bias-corrected and accelerated confidence intervals (97.5%) for indirect effects. Mediation is said to occur if the derived confidence interval does not contain zero. All of the aforementioned tests confirmed the results reported below.

Overall, our findings do not support H3-4 but do support H5-6. Indeed, the path linking *monitoring* and *incentives*, *goal congruence* and *suppliers' operational performance* is only partially significant whereas *supplier opportunism* seem to mediate the relationship between the postulated antecedents (i.e. *monitoring* and *incentives*) and *suppliers' operational performance*.

As a final note to Table 6, results regarding control variables (i.e. industry and size) are never significant.

Table 6: Path analysis parameter estimates from SEM

<i>Dependent variables</i>	Model 1	Model 2		
	Suppliers' operational performance	Goal congruence	Supplier opportunism	Suppliers' operational performance
<i>Independent variables</i>				
Monitoring	0.192* (2.429)	0.331*** (4.160)	-0.221** (-3.214)	0.122 _{ns} (1.442)
Incentives	0.230** (2.897)	0.147* (2.219)	0.219** (3.241)	0.260** (3.103)

Goal congruence	—	—	—	0.081 _{ns} (1.000)
Supplier opportunism	—	—	—	-0.232** (-2.674)
<i>Control variables</i>				
Manufacturing	-0.105 _{ns} (-1.458)	—	—	-0.104 _{ns} (-1.443)
SMEs	0.044 _{ns} (0.615)	—	—	0.023 _{ns} (0.328)
<i>Fit indexes</i>				
χ^2	245.51			469.51
$\chi^2/d.f.$	1.69			1.66
RMSEA	0.050			0.050
CFI	0.960			0.947

***p-value<0.001; **p-value<0.01; *p-value<0.05; _{ns}p-value>=0.05
The values of t statistics are shown in brackets.

Table 7: Test for mediation

Path analyzed	Direct effect coefficients (β)				Indirect effect (mediation)		Total effect (a*b) + c'
	c	c'	a	b	ab	Bootstrapping confidence intervals	
Monitoring → Supplier opportunism → Suppliers' operational performance	0.192* (2.249)	0.156* (2.002)	-0.193** (2.865)	-0.280*** (-3.201)	0.054* (2.163)	(0.002; 0.055)	0.210** (2.657)
Incentives → Supplier opportunism → Suppliers' operational performance	0.239** (2.897)	0.253** (3.110)	0.264*** (3.944)		-0.074* (2.489)	(-0.044; -0.005)	0.179* (2.332)

6. Discussion

The present study aims at empirically validating the role of *monitoring* and *incentives* for the improvement of *suppliers' operational performance* by means of a cross-country survey. We mainly ground on agency theory as well as on the monitoring and incentives literature in both the (internal) performance measurement and supply chain management domains. The findings described in the previous section contribute to the debate about the effect of monitoring and incentives in buyer-supplier relationships by offering some empirical evidence that is partially in line with our initial hypotheses and partially offers unexpected yet relevant results.

We substantially confirm our first research hypotheses (H1 and H2) as both *monitoring* and *incentives* positively influence *suppliers' operational performance* (cf. Section 4.2 and Table 6). This first result supports and extends earlier findings on the relationship between supplier performance measurement and management (e.g. Prahinski and Benton, 2004; Prahinski and Fan, 2007; Cousins et al., 2008) by assessing the distinct effect of monitoring and incentives and by explicitly focusing on the

suppliers' operational performance rather than the overall business performance on the buyer or supplier's side.

The following hypotheses (H3-6) reveal some significant intervening mechanisms that explain the monitoring/incentives–performance relationship, focusing on two agency constructs (i.e. *goal congruence* and *supplier opportunism*).

We cannot support the mediation effect of *goal congruence* (H3-4), which is significantly increased by *monitoring* and *incentives* but in turn does not improve *supplier's operational performance* (cf. Model 2 in Table 6) as it is not significant in presence of the other predictors. These results seem to partially disconfirm previous theoretical contributions claiming that goal congruence should enhance exchange outcomes by providing directions for the activities and efforts of the dyad (Eliashberg and Michie, 1984; Schmidt and Kochan, 1977). Yet, Jap and Anderson (2003) indicated that the relationship between goal congruence and operational performance is not so straightforward; in particular, they discovered that goal congruence has a positive impact on operational performance only when facing ex-post opportunism. There might be several interpretations of our results. Firstly, the compatibility of a buyer's and supplier's goals does not necessarily imply that the supplier is acting in the buyer's interest; it might simply indicate that the supplier is able to find a way to pursue his own goals without conflicting with the buyers'. As a result, significant performance improvement will not show up. Secondly, goal congruence might not affect the operational performance in the short term, yet it might have an effect in the long run. It can be considered a strategic orientation of the buyer–supplier relationship, empowering collaboration capabilities and leading to long-term performance improvement.

As for the mediation effect of *supplier opportunism* (H5-6) the findings fully support H5 that assumes *supplier opportunism* to mediate the *monitoring–performance* relationship (see Table 6 and 7). In other words *monitoring* significantly reduces *supplier opportunism* and therefore improves *suppliers' operational performance* (being supplier opportunism negatively related to performance). These results confirm previous empirical evidence (Wahne and Heide, 2000; Morgan et al., 2007). It is therefore interesting to note that *monitoring* represents a viable strategy to improve *suppliers' operational performance* both directly and indirectly (i.e., through the reduction of *suppliers' opportunism*).

Considering H6 that assumes *supplier opportunism* to mediate the *incentives-performance* relationship our results do support a significant mediation effect that is actually contrary to our expectations (see Table 6 and 7). Indeed, our results suggest that *incentives* actually increase the likelihood of *supplier opportunism*, which in turn worsens the *suppliers' operational performance*. This seems to disconfirm the agency argument that incentives ensure that an agent adheres to agreements (Bergen et al., 1992). We believe this result can be interpreted in several ways and that actually open avenues for further research. One interpretation might be that when specific targets are associated to incentive schemes, suppliers are also more incentivised to circumvent the performance measures to their own benefit, ultimately decreasing their performance from the buyer's perspective. This can happen by blindly working to achieve formal contractual targets while ignoring other objectives that are relevant for the buyer or worse by adopting unethical behaviours, such as declaring results that are not real. As anticipated in the introduction, the unintended consequences of incentives are also acknowledged in the performance management literature: when the achievement of performance targets is linked to monetary compensation managers can develop a positive motivation but – at the same time – the risk of opportunistic behaviours increases (Micheli and Manzoni, 2010). Furthermore, these findings suggest that when an agency problem exists in buyer-supplier relationships, setting incentives might be challenging. In fact, the counterproductive effects might also depend on wrong incentives schemes (i.e., incentives that do not take into account the supplier's perspective or that are perceived as unfair). As a result of that, the supplier would be forced to protect what he believes is the right way to proceed possibly neglecting the buyer's interest.

Despite the negative influence of supplier opportunism, incentives maintain a direct positive effect on suppliers' operational performance (cf. Model 2 in Table 6) that explains why the overall effect of incentives is positive (cf. Model 1). Our results reveal that supplier opportunism partially counterbalances the positive effect of incentives that otherwise would be even more relevant.

All in all, our exploration on the mediating effect of *goal congruence* and *supplier opportunism* provides some answers to the debate about the unclear link among incentives, effort, and performance (Bonner and Sprinkle, 2002). Indeed, we show that *incentives* influence *suppliers' operational performance* through two paths that could even exist simultaneously (i.e., they positively influence

performance directly but also negatively influence performance through *supplier opportunism*). For this reason, scholars argue that managers should carefully design incentives to take full advantage of potential benefits and avoid pitfalls (Choi et al., 2012). Certainly, as the incentives-performance link still exists in presence of both goal congruence and opportunism, future research might explore other intervening mechanisms than those addressed in this study.

7. Conclusions

In this study, an agency path between monitoring/incentives and supplier performance has been proposed, identifying goal congruence and supplier opportunism as possible mediators. Empirical evidence shows a direct positive effect of both monitoring and incentives on supplier performance and the mediation effects have been partially confirmed compared to expectations.

The findings have important implications for research and practice. From the theoretical standpoint, knowledge on agency theory has been expanded to frame the buyer's adoption of monitoring and incentives for suppliers control and orchestration. This theoretical contribution arises from the convergence of agency studies on buyer–supplier relationship management and on performance measurement and management. Moreover, empirical evidence has been reported on the outcomes of critical supplier performance measurement and management practices (i.e. monitoring and incentives): while the positive impact on performance highlighted in past studies (Cousins et al., 2008; Mahama et al., 2006; Heide et al., 2007) has been confirmed, incentives result particularly critical in the sense that they seem to stimulate supplier opportunism.

These results are also relevant from a managerial standpoint, suggesting managers that it is worth investing in supplier performance measurement and management practices, considering the positive impact on diverse performance dimensions. While monitoring does not seem to have any negative collateral effect, managers should be aware about the twofold effect of incentives: they tend to improve supplier performance but also may increase supplier opportunism.

Further avenues for future research derive from the limitations of this study. For example, data are only collected from the buyer's perspective, while future studies might address the supplier or even the

buyer-supplier dyad as units of analysis. Moreover, other intervening variables within the direct relationship between monitoring/incentives and performance may be identified, outside the agency theory scheme. Finally, qualitative research might provide more in-depth investigation regarding the way incentives are defined and used, aimed at understanding how it is possible to take the most from their application, thus leading to performance improvement without stimulating supplier opportunistic behaviour.

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