Adding controls: Do junior managers respond the same as senior managers?

Jan Bouwens*

Amsterdam Business School, University of Amsterdam

Plantage Muidergracht 12, 1018 TV Amsterdam

j.f.m.g.bouwens@uva.nl

Nan Jiang

Amsterdam Business School, University of Amsterdam

Plantage Muidergracht 12, 1018 TV Amsterdam

n.jiang@uva.nl

January 2019

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*corresponding author

This paper has greatly benefited from the helpful comments of Pablo Casas-Arce (discussant), Jeremy Douthit, Sofia Lourenço, Asis Martinez-Jerez, Sander van Triest, David Veenman, and workshop participants at Erasmus University Rotterdam, University of Amsterdam, University of Arizona, Universidad Carlos III de Madrid, University of Melbourne, 2017 EAA Annual Conference, and 2018 AAA MAS Midyear Meeting.

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Abstract

We study, in a construction firm, whether and how project managers who are initially evaluated on their project profitability respond to the introduction of an additional performance measure: working capital levels. Our prediction is that project managers, conditional on their seniority, will respond differently to the new policy. The decision to add the specific performance measure of working capital in addition to the profit measure serves as a natural experiment to test how project managers respond when facing a new condition the firm creates. We predict and document that senior project managers will resist the introduction of the new performance measure, as it infringes on the implicit contract between them and the principal. Our empirical results suggest that senior project managers reject the new performance measure, while junior project managers accept it.

Keywords: Specific performance measure, Authority, Task Knowledge, Relational Contract

I. Introduction

We study, in a construction firm, whether and how project managers who are initially evaluated on their project profitability respond to the introduction of an additional performance measure: working capital levels. Our prediction is that project managers, conditional on their seniority, will respond differently to the new policy.

Principals who want to ensure their agents make the right decisions can take the position that they are using specific performance measures to show, in detail, whether agents took the desired course of action or can use measures as a summary of the decisions their agent made. If a firm uses detailed measures of performance, it more or less tells its agents the desired course of action. This requires the principal to know in advance what the best course of action is. Depending on the knowledge of the agent, using detailed measures can bring costs or benefits to the firm. Agents capable of taking appropriate courses of action may feel their choices are unduly limited. For them, the use of a summary performance measure would allow the discretion to do as they see fit, given the conditions faced by the firm. This would benefit the principal, assuming the agent is motivated to act in the interest of the firm. On the other hand, agents who are uncertain about the best courses of action may be helped by more detailed performance measures, which can guide their choices. Following the course of action described by the set of performance measures will be consistent as long as the conditions facing the firm have not changed. But if conditions change, the uncertain agent may not be able to adapt and may make decisions that, all else equal, differ from the those that would be made by the agent assessed according to the summary measure.

Our study takes issue with these two conditions. We study a construction firm that initially evaluated its project managers on a summary measure: the profitability of their project portfolio. However, shareholders forced the firm to reduce its working capital. Top management responded with the introduction of a working capital measure, on top of the profitability measure. Project managers were instructed to reduce their working capital levels

and were advised that this measure would be included in their performance evaluation. We exploit this change, which is arguably a natural experiment, to assess how agents respond to the introduction of specific performance measures.

Based on theory, we expect that project managers will respond differently to the introduction of the working capital measure, conditional on their seniority. We predict that senior managers are more likely to consider the introduction of the additional measure as a restriction of their decision rights.

To enhance project profitability, project managers negotiate with clients to affect costs levels (e.g., change material specifications compared to the original contract to cut costs) and can push clients to pay their balances or can tolerate delayed payments. The better course of action depends on the specific conditions, and it is likely that agents acquire skills over time to evaluate potential courses of action. To the extent that profitability is the sole measure of performance, agents can decide whether to push clients to pay their balances or to curry favor with clients so as to reduce other costs, while de facto allowing clients to extend their credit term. By telling the agent what to do with these measures (working capital, and profitability), the principal decreases the agent's discretion. We therefore expect that agents who know the best course of action will be less tolerant to the use of these controls than agents who have less experience and fewer skills.

In addition, we argue that the senior project managers and the principal have developed an implicit understanding over time that implies that agents can set their own priorities in terms of selecting what the best course of action is when it comes to pursuing (project) profitability. The very introduction of an additional measure curbs this discretion and infringes on the implicit contract (e.g., Aghion and Tirole, 1997; Gibbons and Henderson, 2012).

We study how project managers respond to this infringement of their decision rights. We predict that senior managers will show their discontent with the restriction of their decision rights and that this sentiment will surface in the extent to which working capital

improvements are achieved. For less experienced project managers, on the other hand, we expect that they are more willing to implement the new policy which will surface in the working-capital level improvement they achieve.

We find evidence that the firm's overall working capital levels decrease significantly after the introduction of the working capital performance measure, which suggests that, at the firm level, the new policy works. However, we observe a dispersion in the way the project managers react to the introduction. Before the new policy, senior managers (measured by their tenure in the firm) had outperformed junior managers in terms of managing their working capital levels and cash conversion cycle. Afterwards, however, junior managers improve their levels of their working capital, while this is hardly the case for the senior managers. These findings suggest that senior managers resist instruction on how they should work.

We apply several robustness tests to examine whether the attribution points to resistance as the explanation for our findings. These tests suggest that the findings are *not* driven by the way the projects are allocated to managers, by how much scope different agents have to improve their performance, or by career concerns. The results suggest that senior project managers consider the introduction of the specific performance measure an infringement of their authority.

Our study contributes to literature in several ways. First, the literature provides evidence on how agents respond to controls. On the one hand, analytical (Frey, 1993), experimental (Falk and Kosfeld, 2006) and archival work (Campbell, Epstein, and Martinez Jerez, 2011) suggests that agents perform at lower levels if their principal imposes controls to monitor their actions. On the other hand, Nagin et al. (2002) find, in their field experiment, that call center employees seek opportunities to shirk when their actions are less likely to be monitored. Hence it is not clear when controls reduce or enhance performance. The findings of our paper

suggests that the answer to that questions depends on the length of the relation of the agent with the firm.

Our second contribution pertains to relational contracting theory. This literature argues that agents and principals develop an understanding over time about how each party will act under differing conditions (Blader, Gartenberg, Henderson, and Prat, 2015; Baldenius, Glover and Xue, 2016; Gibbons and Henderson 2012). This understanding assumes that the individual actions of the principals and agents alike are predictable and are desirable by both parties. Part of the understanding applies to how much freedom each party has in making decisions. In response to the call of Blader et al. (2015) and Gibbons and Henderson (2012), we provide empirical evidence on how agents respond to an unexpected change the principal introduces in their contractual relation. In support of the theory, we find that agents with a longer relationship with the principal resist the introduction of the new specific performance measure in addition to the existing summary measure, while junior agents do not. In addition and related to this, we believe that in our paper we observe an event that would constitute a breach of the implicit nature of the contract where "players observe the non-verifiable performance measure equally and without noise" (Baldenius et al. 2016). In our paper we examine how agents respond to the introduction of a (verifiable) performance measure that gauges a specific aspect (i.e., level of the working capital) rather than that the measure summarizes the full set of tasks (i.e., profitability) the agents and the principal have contracted on. If the firm uses profitability as the exclusive measure of performance, it allows the agent to decide independently how to best improve profitability (e.g. improving working capital or use cheaper inputs or do both). With the introduction of a specific input measure the firm de facto restrains the selection set of the agent of how to enhance profitability and even how much he can improve profitability. We argue that adding the working capital measure to the existing profitability measure can be conceived as a breach of the existing implicit contract.

Our third contribution pertains to the experience of agents. Campbell et al. (2011) show that experienced workers can better explore how to best direct their effort. They find that

performance suffers if a principal curbs the exploration rights of senior agents. This is not the case for junior agents facing equally low levels of the right to explore. Our work relates to this idea. However, unlike in the setting of Campbell et al. (2011), our agents face an unanticipated change in their right to explore how to direct their effort. This allows us to study how such a change affects the effort choice of senior versus junior employees. Related to this argument, Ittner and Larcker (2001) have suggested that research should factor in the multiple objectives performance measure have. We identify conditions where the same performance measures affect the motivation of the agent differently, conditional on their seniority.

Finally, our paper also contributes to the learning literature (Argote and Greve 2007). The conventional understanding is that experienced (senior) agents can adapt more quickly to a new situation than inexperienced (junior) agents. However, our study shows that experience is not a sufficient condition for adaptability; when experienced (senior) agents resist a change, adaptation is less likely to occur. Thus, experience can predict rigidity, not adaptability.

The remainder of the paper develops as follows. In section II, we describe the theory and develop the hypothesis of our study and review the relevant literature. In section III, we introduce our data and research setting as well as the empirical model to test the main hypothesis. We present empirical results and their interpretation in section IV. In section V, we provide additional analyses to address alternative explanations. We conclude our study in section VI.

II. **Literature and Hypothesis**

We follow two lines of arguments about why the tenure of agents matters in their tolerance of the principal imposing additional performance measures. Our first line of reasoning is based on the idea that agents accrue skills over their tenure. This could make the application of additional performance measures less relevant in assuring that agents can make a congruent

decision. Our second line of reasoning relies on relational contracting theory. We argue that, when the principal-agent relations progress over time (in tenure), both parties can develop a better mutual understanding of desired actions. An unexpected implementation of a specific performance measure would breach this understanding and could harm the relationship.

2.1 Skill accumulation and specific measures

Two agents who perform the same tasks may differ in their tolerance for control. Personalities aside, agents will differ in how well they have developed their skills and put them into practice. To the extent that agents have sufficient knowledge to independently make decisions, they would prefer that other people not interfere with their decision-making. Aghion and Tirole (1997) argue that principals who limit their agents' decision rights, despite the fact that these agents know what the best course of actions is, are likely to meet opposition in the form of effort reduction. Ceteris paribus, performance will deteriorate. Typically, application of specific performance measures entails decision right reduction, as they describe desired actions and norms that must be met. Merchant (1985, p. 29) refers to such specific measures as action controls. In their empirical study Abernethy, Bouwens and Van Lent (2004) show that decentralization is positively associated with the use of summary measures, i.e., measures that let the agent decide what the best course of action is.

Agents who have yet to develop the necessary skills will resist less the implementation of additional performance measures that more or less specify desired actions. In fact, the additional performance measures may help them select the right course of action and may help improve their skills. For instance, Dye (2004) argues that individuals can learn from performance outcomes recorded in a set of performance measures, provided that these measures vary cross-sectionally or over time. The introduction of a specific performance measure in addition to a summary measure may elicit a similar effect.

Skills, experience and tenure

Agents typically develop their skills as they accrue experience over their tenure. The literature provides ample evidence that agents with little experience have less knowledge than experienced agents. Hambrick and Fukutomi (1991) argue that a new external CEO lacks knowledge of the task, including facts, trends, contacts, and procedures that pertain to the successful conduct of the CEO's role in the firm but this disadvantage can be overcome with the increase in tenure. In addition, as agents serve their firm, their commitment to the CEO's vision is also more likely to become inculcated as tenure progresses. In a comprehensive meta-study, Sturman (2003) presents an abundance of evidence in support of the idea that organizational experience instills work-related skills and knowledge and that these accumulate with the agent's tenure. Moreover, the longer an agent works for a firm, the more likely it is that the agent understands what matters for the firm's long-term overall progress. Bonner (1990) and Choo and Trotman (1991) provide evidence to suggest that experienced auditors tend to have more task-specific knowledge and a better knowledge structure, which enhances information collection and supports better judgment. Casas-Arce, Martinez-Jerez, and Narayanan (2017) find that inexperienced agents are more likely to rely on new information than seasoned workers. They argue that these agents are more likely to rely on such information because of their lack of experience.

Tenure and control

In a setting where the firm aims to tap the knowledge of its agent and the agent has the necessary skills, it makes little sense to use specific performance measures that impair the potential for agent to fully exploit his knowledge. In fact, it is likely for seasoned agents to resent such specific controls, as their application suggests that the principal knows better than the agent what the best course of action is. For instance, Campbell et al. (2011) find, in their field study, that agents whose decisions rights are trimmed via specific controls are less likely make value-increasing decisions on how to best serve individual clients. This finding is consistent with the work of Aghion, Dewatripont and Stein (2008), who argue that agents may start to look out for other job opportunities when they are no longer free to make

decisions suited to the situation they face. Dewatripont, Jewitt and Tirole (1999a, b) model a similar situation and argue that prescribed tasks may implicitly express insufficient appreciation for the decision-making talent of the agent.

In a similar vein, it is argued that specific performance measures may even negatively relate to the outcome measure (Dewatripont et al, 2000). For instance, input measures that restrict the use of raw materials may harm (the output measure of) profit. In such cases, agents are likely to reduce their effort to make decisions that would improve profit. Principals can restore the link between the existing knowledge level and measured performance if they remove the specific performance measure. Similarly, Dessein (2005) argues that the principal signals her belief to the agent inasmuch as she hands over control. Aghion and Tirole (1997) argue that agents who have the authority to make decisions on their own have incentives to collect and process information. Constraining these agents with specific performance measures could lead them to refrain from information collection, as such detailed controls limit the viable set of decision options.

Specific measures may also entail influence costs (Milgrom 1988). These costs arise because agents may try to convince their principal that the use of the specific measure does not apply or leads to inefficiencies. In the situation that the agent is right, influence costs distract the agents as well as the principal from activities that deserve attention.

However, specific performance measures are not necessarily bad. Less skilled agents are more likely to accept the principal's restriction of decision-making, as they may want to use the mandated measures to help them direct their attention. To the extent that input measures yield desired levels of performance, agents may even be encouraged (Ittner, Larcker, and Randall 2003; Ittner, Larcker, and Meijer 2003; Kaplan and Norton 1992). This is consistent with the idea advanced by Benabou and Tirole (2003), who argue that agents are encouraged to do the right thing if they are helped in arriving at the desired decision. This idea is akin to the work of Holmstrom and Milgrom (1990, 1991), who show that better agents produce better results

if responsibilities for a task are split. By introducing a specific performance measure that tells the agent where to direct attention, the principal de facto imposes a split in responsibilities as the agent can rely on the selection the principal made in advance.

2.2 Relational-contract theory and specific performance measures

Relational-contract theory considers the multi-period nature of relations that exist in firms between agents and principals. The theory describes how the interests of these actors are affected by interactions that occur over several periods. The literature describes how these interactions feed each actor's expectations for future encounters with the same individual (i.e., the principal and the agent). Given the multi-period nature of the relationship between actors, Baldenius et al. (2016) argue that the relational contract serves as a self-enforcing mechanism where the actors commit to an implicit agreement without reneging on it. In a principal-agent relation this feature makes it feasible that the agents get rewarded for results for which it cannot be verified whether these can be attributed to the effort of the agent. To the extent that actors show a commitment to keep promises, for example, the other party will update his or her expectations of future encounters. Over time, these expectations structure how the agent and principal relate to each other.

Gibbons and Henderson (2012) specify two distinct dimensions that determine these relations: credibility and clarity. Clarity refers to the extent to which each party can communicate which actions the other party is expected to take, while credibility refers to the extent to which each party shows it is willing and able to execute the actions desired by the other. Creating clarity and signaling credibility require time. Over time one party will learn whether the other party will reciprocate his actions (e.g., in case that effort cannot be observed directly by the principal, it takes time for the agent to conclude whether his principal will or will not renege on her promise to reward the agent's effort in the future).

Tenure and relational contracts

It takes time for (1) the principal to learn her agent's credibility and clarity to commit to firm objectives and (2) for the agent to learn how credible his principal is and to develop a clear (clarity) understanding of the principal's intentions. Interaction and socialization among agents over time likewise facilitates their understanding and acceptance of the firm's culture and beliefs. Rollag (2004) examined the relation between tenure and socialization among individuals in a firm and finds that an individual's relative position in his firm's tenure distribution explains the individual's status, social network position, and information-providing behavior. Arguably an individual's social position and information exchange affect the mutual understanding among the individuals. Over time, clarity and credibility accumulate to the point where principals and agents enter into a steady state in which both parties know what to expect, even if conditions change. Both the principal and agent benefit from their mutual understanding: the agent then chooses effort levels the principal expects, and the agent knows he or she will be compensated appropriately.

Since clarity and credibility accumulate over time, both parties can disrupt their mutual understanding if one takes actions the other would judge to be outside of the range of expected actions. Such deviations may lead the other party to update expectations such that the relationship and mutual commitment deteriorate (Blader et al. 2015; Gibbons and Henderson 2012). The implementation of a specific performance measure could constitute such a disruption because it allows the principal to observe some specific actions out of the full set of actions the parties have contracted on and for which they develop their mutual understanding over time. By looking at specific actions through the specific performance measure one party seems to no longer expect that the other party will reach at a desired aggregate outcome without the specific performance measure.

2.3 Hypothesis development

The two lines of literature we presented in section 2.1 and 2.2 point in the same direction: As tenure progresses, it becomes less likely for agents to accept the introduction of additional

specific performance measures. As agents accumulate skills, they arguably can better make the necessary trade-offs between different actions to support their decision. Junior agents may still have to develop their skills. We propose that senior agents with more experience have developed more skills than agents with short tenures. Specific performance measures that impair decision rights are therefore less likely to be accepted by senior agents than by junior agents. In addition, specific performance measures may help junior agents to direct their attention to the right course of action. That is, a specific performance measure functions like a predetermined choice to the agent, as such a control, in effect, operates as a norm or even an instruction to the agent (Merchant, 1985). This instruction helps agents because they do not need to tradeoff between the choice underlying the specific performance measure and other opportunities; the choice is already made (by the principal). The specific performance measure thus enables the junior agents to focus on the remaining choices they can make.

In the realm of relational-contract theory, we argue that, as tenure progresses, mutual expectations of the principal and agents accumulate to create a steady state where one party's actions can be predicted under differing conditions. Decisions or actions taken by either party that the other considers to reside outside the range of expected actions would lead to a disruption of the steady state. We propose that the introduction of specific performance measures is more likely to be construed as residing outside the range of expected actions by the senior (longer tenured) agents than by the junior (shorter tenured) agents.

As both lines of literature point in one direction, we express our expectation in the following hypothesis.

H1: Conditional on their tenure, agents respond differently to the introduction of a specific performance measure.

III. Sample and Research Setting

3.1 Research setting Description

The data and operational information for this study were obtained from a large construction firm in Europe, referred to as DC. DC offers a range of activities, including building, mechanical, and electronical construction projects offered to both governments and the private sector. The firm runs simultaneously thousands of projects that vary in scale and scope, where each project is assigned to a project manager. The project managers are responsible for the operational and financial results of their projects, and they are typically engineers holding professional degrees. Some of them have taken courses in accounting and finance. The internal accounting system keeps close track of each project's financial state, including estimated revenue, accumulated costs, and revenue realized by the time. To control its resource consumption, the firm monitors its cash conversion rate and its working capital. However, shareholders and analysts were critical of the working capital level of the firm. This led firm managers to conclude that project managers paid insufficient attention to (on time) cash collection.

To re-direct the attention of its project managers, the firm decided to impose on them a specific performance measure to accelerate the cash conversion cycle. The introduction of the specific performance measure was accompanied by a series of videos. In October 2014, the CEO released a video that called upon all project managers to step up their effort to decrease the working capital level and hence accelerate cash conversion. This video was immediately followed by another one relaying a training course that all project managers had to take. This video explained how project managers could improve their working capital levels and how to best approach the managers of the firms with whom they ran projects. In the meantime, the firm took several measures to make clear to the project managers that they should take working capital levels seriously. During their progress report meetings with financial controllers and supervisors, project managers were expected to be able to explain what they

had done to improve their cash conversion rate. The firm appointed special "cash champion" who report to the COO, to make sure that cash conversion did improve.

It took the firm only two weeks to release the videos, organize the mandatory training, and implement the tighter supervision. In the weeks that followed, project managers did experience these tighter controls, with their supervisors and financial controllers ensuring that they strived to reduce their working capital levels. We refer to these actions as the introduction of the "specific performance measure."

As working capital had been highlighted so prominently, working capital levels had also been made a criterion in performance appraisals (final quarter 2014). The firm decided that it did not want to tie variable pay to working capital performance (nor did they tie project profitability to the variable pay levels). In the previous situation, project managers who reported favorable profit numbers over an extended period would—conditional on client satisfaction—be promoted to a higher fixed salary. This metric was now extended with the measure of working capital level. Hence performance appraisals regarding profit and working capital matter in the longer run.

As financial relations with suppliers are centralized, the major part of the working capital that project managers can manage is accounts receivable. They can do so by sending out invoices more frequently, for instance, with each milestone that is achieved in completing the project. This would lead them to send out invoices more frequently than that they had in the past. As each invoice has a fixed repayment term, project managers would then have to follow up if the client didn't pay promptly. Hence, besides invoicing more frequently, they also have to reach out to their clients more often.

In the spirit of our hypothesis, we expect that project managers respond differently to the introduction of the specific performance measure, conditional on their tenure. Our aims are to examine (1) to what extent the project managers respond to the specific measure and (2) the enforcement (project controllers and supervisors asking project manager to explain what they

did to keep working capital levels low). In addition to project profitability, project managers' performance is indicated by their level of working capital and the speed with which they achieve cash conversion.

Data obtained from DC's internal accounting system allows us to measure several indicators of conversion efficiency: (percentage of) working capital, cash conversion cycle, lead time between when the project is started and the first invoice is released, and the (total) number of invoices issued to the client. The detailed definition of each performance indicator and how each is calculated is reproduced in Table 1.

Our original sample contains all individual projects DC undertook over the period of the first quarter in 2013 to the last quarter in 2015. In the internal accounting system, the first data entry for each project shows the estimated revenue. We use this number to proxy for project size. Some revenue entries show a zero or a negative number for administrative reasons (projects that had been closed in the past but now require re-work for which the client cannot be charged) or pure error. After consultation with the firm, we eliminated zero and negative revenue projects from the sample. In addition, we also eliminated a few observations where realized revenue was missing to ensure the project information was valid. We collected working capital data, invoice data, and data that allowed us to calculate the number of days that the invoice was outstanding. In addition to financial information for each project, we also collected data of the individual project managers who run the projects: their tenure, age, and information on how many projects a manager runs and whether the project is government project (measure of complexity). Due to a system upgrade by the end of 2013, some projects are assigned an invalid project manager identifier. We keep our sample to the observations where we can credibly track to an individual project manager. This resulted in a final sample of 28551 valid project-quarter observations, with 92 unique project managers. Because of the system upgrade, valid observations with project manager information in 2013 are relatively small, compared with those in 2014 and 2015, with the number of observations in each year being 1236, 19218, and 8097, respectively.

3.2 Regression Model Description

Recall that the introduction of the specific performance measure of working capital reduction was issued early October 2014. Project managers were also informed that, starting from that quarter onward, their performance in working capital management would be part of the performance appraisal. As the shareholders prevailed upon the firm to reduce working capital, the executive team had little choice but to follow up with measures that would yield real improvements. Hence, as far as the project managers were concerned, the introduction of the specific performance measure arguably constituted an exogenous shock. In our setting, all project managers were exposed to the introduction of the same specific performance measure. As a consequence, we cannot run an outright difference-in-difference test. We instead consider the study a natural experiment. The data does allow us to study the responses of different agents to the introduction of the working capital measure. That is, we predict and examine whether, conditional on their tenure, agents respond differently to the introduction of the specific performance measure of working capital. We test this expectation with the following regression model:

$$WC\%_{i,t} = \alpha + \beta 1 * Tenure_{i,t} + \beta 2 * After_t + \beta 3 * Tenure * After_{i,t} + \gamma * Controls + \epsilon_{i,t} \quad . \qquad (1)$$

Our dependent variable *WC%* in equation 1 represents the working capital level, scaled by the estimated (budgeted) revenue of the project, and the suffixes of *i* and *t* represent each individual project, and finally *t* represents one of the 12 quarters over the years 2013 to 2015. According to our hypothesis, we expect that WC% will take on different levels, conditional on the tenure of project managers and whether working capital levels are measured before or after the policy change has been implemented. We expect that these two factors interact to reflect that tenure matters in how the policy change affects the effort choice of individual project managers ($\beta 3 \neq 0$). In our robustness tests, we use other measures of working capital efficiency as alternative dependent variables.

Tenure is measured as the total time that has elapsed between the year the project manager joined DC and the end of 2015. The coefficient $\beta 1$ captures any level differences of the trend of working capital management in the period before the specific performance measure was introduced, when comparing the short-tenure and long-tenure groups.

We expect that longer-tenure (senior) project managers will be better at managing working capital than their junior counterparts. Therefore we expect the sign of $\beta 1$ to be negative (i.e., WC% is lower with shorter tenure).

After is a time indicator that takes on the value of 1 for observations later than the third quarter of 2014 and a value of 0 otherwise. We took the fourth quarter of 2014 as the event date, as the policy change and the training program were all organized at the beginning of that quarter and the introduction of the new working capital control took immediate effect. The coefficient on *After*, $\beta 2$, captures the overall change in outstanding working capital before and after the introduction of the specific performance measure. We expect the sign of the coefficient on *After* to be negative (i.e., after the introduction of the policy, WC takes on lower levels than before).

As stated in our hypothesis, we expect that the project managers will respond differently to the new cash collection policy, conditional on their tenure. In our regression model, the coefficient $\beta 3$ of the interaction term *Tenure*After* captures the incremental (or subtractive) sensitivity of the project's outstanding working capital to its manager's tenure. According to our theory, senior managers may resist the introduction of the metric of working capital level, as it constitutes an infringement of their decision rights. We expect the sign on *Tenure* to switch after the working capital level measure was implemented. As we also expect that shorter-tenured project managers will benefit from the program and simultaneously that more senior ones will oppose it, the coefficient on the interaction, $\beta 3$, is expected to be positive. The sensitivity of working capital on project manager's tenure is equal to the sum of $\beta 1 + \beta 3$, where we expect the sum of $\beta 1 + \beta 3 > \beta 1$, as $\beta 1$ is negative and $\beta 3$ is positive.

In addition to *Tenure*, we include other variables that may affect levels of working capital. We include (the overall) *Size* of the project to control for factors other than those reflected in size that affect working capital levels (e.g. a strategic project, which may entail higher working capital levels than projects that are of a less strategic nature). We control for the number of projects, *#proj*, calculated as the total number of projects one project manager is responsible for at the current quarter, to account for the potential that project managers may face descending levels of control over their working capital as the number of projects rises. *Age* is the project manager's age, which reflects the project manager's personal characteristics that may affect working capital levels. In addition, *Age* is arguably related to career potential (high for juniors, low for seniors) and controlling for this factor ensures that it is less likely to explain our main results. The variable *Gov* indicates whether the project is a government project and is included to capture the complexity of the project. From our interviews, we learned that government projects are complex, as they feature much red tape in terms of filing for permits or dealing with delays when citizens challenge permits in court.

VI. Empirical Results

4.1 Descriptive Statistics

We present the descriptive statistics of dependent, independent, and control variables in Table 1. Panel A listed a few indicators of the conversion efficiency of the projects. The (absolute) amount of working capital has an average of 2690.93, with a relatively large dispersion (standard deviation equals 71380), which comes down to an average of 8.43% of the total revenue of the project. The projects have an average cash conversion cycle of a bit less than a month (26.97 days), and this cycle varies noticeably (standard deviation 99.35). The lead time between the date that the project commences and when the first invoice is issued amounts on average to 1.32 quarters, while for most observations, the lead time is one quarter (p75=1).

The number of invoices sent to the client in each quarter is on average 0.78. The total number of invoices sent for each project per year has a mean of 1.65 and standard deviation of 9.08.

(insert Table 1 about here)

Table 1 Panel A and the above interpretations give a general description of the conversion efficiency condition of DC. As the firm presents working capital reductions as a strategic priority, we expect that project managers will on average try to improve their working capital levels. Hence, on average, working capital is expected to decrease after the policy change. We divide the sample into two parts — the observations before the fourth quarter of 2014, when the policy change was implemented, and those of later periods. We present the average values of the different cash conversion efficiency indicators of the two subsamples in Table 2. Note that the number of observations before and after the shock is more or less comparable (around 14000 observations before and after). Consistent with the aim of the firm, the working capital measures indicate a reduction in working capital, following the policy change, with the working capital reduced from 4106.8 to 1861.5 and its percentage from 13.38 to 4.08. What's more, the cash conversion cycle is reduced from 40.24 days to 15.11 days, lead time reduced from 1.35 quarters to 1.28 quarters, and both of the variables of the number of invoices sent to the client increased. All variables change significantly after the policy change, evaluated at 99% confidence level, in the direction consistent with the intended outcome that cash conversion efficiency increases. The change in the average cash conversion efficiency rates suggest that the firm was successful in implementing its working capital policy.

(insert Table 2 about here)

In Table 1 Panel B, we reproduce the descriptive statistics of the project's demographic variables. There are 92 unique project managers in our sample, whose tenure in DC range from two years to 42 years, with an average tenure of 14.49 years (median 10 years). The youngest project manager is 26.9 years old and the oldest 71.4, the average age of the project managers being 47.97 years old. The number of projects each manager is responsible for per

quarter is summarized at manager-quarter level. On average, each project manager is responsible for 59.61 projects per quarter, and the distribution is largely right-skewed: Half of the managers take charge of 11 or less projects per quarter, while the maximum can be 1779 projects. The reason for the large number is that projects are described on a units basis, each representing a separate contract. This is consistent with what we observe in project size: the average project size equals estimated revenue of 49577, while most of the projects are much smaller in scale (p25=430) than the larger ones (p75=7247.9, smaller than 49577). The mean of *Gov* indicates that there is only a small fraction (2%) of projects operated for the government. For analysis later on, *Tenure*, *Age* and *#proj* denote the manager characteristics who runs each specific project, and all variables are at project-quarter level.

The correlation of the above variables is shown in Table 3. The conversion efficiency variables are correlated with each other (the correlations between working capital and working capital percentage and cash conversion cycle are 0.09 and 0.18 respectively, both significant at the 99% confidence level), lending support that these variables are reliable indicators of project conversion efficiency. Note that *Tenure* is significantly negatively correlated with working capital (-0.02, p=0.00) and with cash conversion cycle (-0.03, p=0.00), which provides primary evidence that more senior project managers are in general performing better in terms of conversion management. *Tenure* correlates positively with likelihood to take on governance projects (0.22, p=0.00) and negatively with the number of projects managed at the current quarter (-0.15, p=0.00), which suggests senior project managers are more likely to be responsible for more complex and integrated projects.

(insert Table 3 about here)

4.2 Regression Results

In this section, we summarize the results of our tests. Our main results are reproduced in Table 4. We estimate several specifications of the model, where in all cases *WC%* (working capital scaled by budgeted project size) is the dependent variable. We cluster the standard

errors by individual project to account for autocorrelation over time. In addition, across all specifications we include quarter fixed effect to take into account the seasonal variations due to the construction firm's nature of business. Column (1) presents the result of the baseline regression model with control variables described in the previous section. We examined the variance inflation factor (VIF) to test for potential multicollinearity, and the statistics are well below conventional level to raise multicollinearity concern. The coefficient of $\beta 1$ on *Tenure* is significantly negative (-0.231, p-value=0.00). This is consistent with the predicted sign on *Tenure* and lends empirical support to the idea that, before the introduction of the specific performance measure, managers with longer tenure had been better at controlling working capital levels than their more junior counterparts. The coefficient $\beta 2$ on the time indicator *After* is significantly negative (-15.10, p-value=0.00), which is consistent with our prediction. This evidence, along with the difference of the average working capital level before and after the introduction of the specific performance measure shown in Table 2, suggests that the introduction of the specific performance measure helps reduce working capital on an average basis.

(insert Table 4 about here)

To test our main hypothesis, we turn to the coefficient on the interaction term *Tenure*After*. The coefficient $\beta 3$ of *Tenure*After* is positive and significant (0.563, p-value=0.00). Note that the sign of the coefficient on interaction term switches, compared to the main effect reflected in the coefficient $\beta 1$ on *Tenure* (reflective of the situation before the policy change was implemented), and supports our hypothesis that managers with longer tenure respond differently to the policy change than those with shorter tenure. The coefficients indicate that, while an additional year of experience will, on average, reduce a project's working capital percentage by about 0.23% before imposing the specific performance measure, the effect does not stay the same afterwards; that is, an additional year of experience will instead increase the project working capital percentage by 0.332% (-0.231+0.563), after the new policy takes effect. This implies that the introduction of the specific performance measure does lead

managers to respond differently, conditional on tenure. Note that, *after* the introduction of the working capital metric, working capital decreased on an average basis ($\beta 2<0$). We use this result to estimate how many years of tenure offsets the average improvement. According to the estimated coefficients of the baseline model, the working capital improvements agents achieve over their tenure are neutralized for agents with a tenure longer than 26.82 years (derived from (-0.231)**Tenure*<0.332**Tenure*-15.10). In our sample, 17 out of the 92 project managers have a tenure in DC longer than 26.82 years. The statistical evidence is consistent with our hypothesis that the introduction of the specific performance measure led the senior agents to make less progress than junior colleagues, and for a subgroup of senior managers, their performance with regard to working capital percentage even deteriorates after the specific performance measure of working capital was introduced.

The coefficients on some of the control variables are worth noting. We observe that, on average, projects run for government accumulate 6.187% more working capital than private projects and that projects run by busier project managers entail slightly smaller working capital percentages (coefficient on *#proj* equals -0.005%, p-value=0.00). Note also that, with each incremental year of age, the working capital percentage goes down on average with 0.391% (at 99% confidence level).

We include the *Age* variable to account for the potential career concerns, and the significant coefficient validates the inclusion of age. We believe that career concerns of project managers with similar ages are comparable, and the fact that we find a significant result for the main variables of interest after controlling for *Age* implies that the we can attribute the findings to the project manager's tenure, instead of the possibility that senior managers are less concerned with working capital because it does not affect their career prospects. In our robustness tests, we conduct more sophisticated tests.

We show the results from alternative specifications in the next two columns of Table 4 to examine the robustness of our result. It is reasonable to believe that project manager's

personal characteristics will also contribute to their ability to manage working capital and are not fully captured by the control variables such as *Age* and *#proj*, therefore, we run the baseline regression model with project fixed effect, and the result is presented in Table 4, column (2). Since we use the end of our sample period as the reference point to define *Tenure* and *Age*, these two variables stay unchanged for a specific project manager, and are therefore dropped out in the regression when project manager fixed effect is included. Including project manager fixed effect increases explanatory power of the regression (R-squared 11%) and the sign of most coefficients stays unchanged. The coefficient on our main variable of interest Tenure*After stays positive and significant (0.264, p-value=0.00), and is comparable with the results in column (1) in terms of economic significance (i.e., it takes now 6.171/0.264=23.37 years of tenure to offset the average increase in working capital percentage).This result further sheds light on our hypothesis that agents respond differently to the introduction of the specific performance measure of working capital conditional on their experience.

In Table 4, column (3), we tabulate the regression result including client fixed effect. The main action project managers may take to reduce working capital is issuing invoices more frequently to their clients and following up and urging their clients to pay. The concern that keeps managers from doing so is that clients may get annoyed and become less cooperative about other factors that determine project profitability. We run the regression including client fixed effect (two observations dropped because of missing client identifier), and we observe the result still holds for the main variables. This confirms that our result is indeed driven by managers' response to the introduction of the specific performance measure, rather than that managers would be concerned with any specific clients.

We run additional robustness analysis that we do not tabulate the results. To account for potential concern of extreme values, we winsorized the project size (i.e., replaced the smallest 1% size by the value of the 1% observation as well as the largest 99% by the value of the 99% observation) and run the regression again; the results show that winsorizing the sample leaves the statistical significance of coefficients unaltered. We cluster standard errors by time (year-

quarter), and the results are again consistent with our original results. In addition, to address the potential concern that projects operated for the government are systematically different in terms of cash conversion, we exclude observations which *Gov*=1 and the result still holds.

To summarize, the empirical evidence from our regression models lends support for our hypothesis that project managers with longer tenure differ from managers with shorter tenure in how they respond to the introduction of the specific performance measure. Where managers with shorter tenures improve their performance in cash collection after the introduction of the specific performance measure of working capital, those with longer tenures seem less willing to do so.

V. Discussion and Additional Analysis

5.1 Discussion of empirical results

Our results suggest that, conditional on the agent's tenure, that person responds differently to policy changes that affect his or her decision rights. We argue that senior agents, given their experience and established relationship with their principal, are better positioned to make informed decisions and thus expect the principal to take their decision at face value.

When principals decide to curb agents' decision rights, relational contract theory would predict that the agents would respond negatively. The reason is that the action signals that the principal no longer believes the agent will make the right trade-offs. On the other hand, more junior agents may still have to learn to make the trade-offs and may therefore be less concerned about their relationship with the principal in this situation. In fact, they may feel that the change helps them make better decisions. Our results seem to support these arguments. Senior agents start to perform worse after their decision rights are lessened while the juniors start to perform better.

To enhance understanding of the underlying data structure, we present how working capital levels differ between agents who differ in their tenure over the sample period. We reproduce these results in Figure 1. We divided the observations into senior and junior managers at the median number of *Tenure*, 10 years (grouping managers with an exact tenure of 10 years into either senior or junior does not qualitatively alter the figure). As the number of observations in 2013 is relatively smaller and exhibits a much larger variance, we present the trend figure of average conversion efficiency from 2014 to 2015. (Inclusion of 2013 data does not alter the figure.) It appears from the figures that, for all three measures that proxy for cash conversion efficiency, senior managers perform better on average than their junior counterparts across all quarters until the fourth quarter of 2014, when the policy change is implemented. Afterwards, the average performance of junior managers gradually increases (i.e., outstanding working capital falls). However, senior managers seem to react to the exogenous shock differently. The working capital of projects managed by senior managers rises significantly after the new policy was implemented. The figures though, may be interpreted with caution as they largely reflect seasonal fluctuation due to the nature of the business, which justifies the inclusion of quarter fixed effect in our regression analysis. With that in mind, a more careful interpretation is to compare the numbers of the same quarter. As an illustration, in 2014Q4, the mean working capital percentage (WC%) of all projects are more or less at the same level with that in 2015Q4. When we separately examine the projects run by senior and junior managers however, the working capital percentage of junior managers is slightly higher than that of their senior colleagues in 2014Q4, whereas in 2015Q4 the juniors outperform the seniors and the dispersion is also much larger. Similar comparison can be observed from other time spot and proxies of working capital efficiency. The trend figures in general suggest that senior managers resist being "told what to do."

(insert Figure 1 about here)

In addition to the trend figure, which may be subject to the seasonal fluctuation, we also present in Table 5 the average working capital percentage of projects run by junior and senior

managers, aggregated both before and after the control, respectively. We observe that projects led by senior managers perform significantly better in terms of WC% performance before the specific performance measure was introduced (2.19%) than those led by junior peers (18.18%, difference significant at 99% confidence level). After the working capital measure was introduced, however, junior managers perform significantly better than before (3.16%), while seniors on the contrary, have even higher working capital percentage on average (5.24%, t-stat=2.87). This evidence is again consistent with the discussion above.

(insert Table 5 about here)

5.2 Alternative explanations

Our empirical findings may be subject to alternative explanations, and, in this subsection, we attempt to address them.

Difference in project (re-)allocation. Our results may be due to project assignment in that junior managers get different projects assigned than senior managers, in terms of size or complexity, before and after the control was implemented. The different patterns we observe for senior and junior managers may also be associated with the possibility that, after the policy change, senior managers are (re-)allocated to projects for which it is inherently much harder to reduce working capital, while junior managers get easier projects.

To examine this concern, we first present the descriptive statistics for project size and complexity. From the results presented in Table 6 Panel A, we infer that projects that are run by senior managers are in general comparable in size (mean size for senior managers slightly larger than junior managers but difference is not significant but more complex (proxied by whether it is a government project). This validates the inclusion of project size and government project as control variables in our regression analysis. Furthermore, what matters is, for each subgroup, whether the projects assigned to individual managers are significantly

different before and after the policy change. In Table 6 Panel B, we show the mean size and governance indicator of projects run by senior managers before and after the change as well as the descriptives for projects managed by junior managers. We observe that, the average size and type of projects assigned to junior managers does not show significant change after the policy takes place. For senior managers, projects assigned to them are similar in size (difference in mean insignificant) while are less likely to be government projects (0.053 before and 0.025 after, t-stat=7.39). This is due to the fact that after 2014 quarter four (the policy change), there are fewer projects from the government operated by the firm (272 government projects, or 1.94 in percentage before 2014Q4, and 200 government projects or 1.37 in percentage after 2014Q4). In other words, there is no evidence to believe that the way to allocate the projects are systematically different before and after the policy change. The evidence shows that it is unlikely that project reallocation accounts for our results.

(insert Table 6 about here)

Alternative performance measures. We also provide evidence that other performance outcomes, such as project revenue, do not show patterns of change similar to those we observe in working capital after the specific performance measure of working capital had been introduced. We therefore re-run the regression presented in Table 4 but take realized revenue as the dependent variable. We show the result of specifications with and without project manager and client fixed effects, and we find insignificant coefficients on *Tenure*, *After*, and the interaction term *Tenure*After* (Table 7). The result re-assures that the senior project managers only show resistance with regard to the specific performance measure (working capital) recently introduced, but not that they also give up on what they have always been expected to deliver. Together with our descriptive statistics in Table 6, this additional analysis suggests that project managers did not get assigned different projects in terms of size.

It is worth noting that consistent with the argument we present to develop the hypothesis, that senior managers are better aware of the negative consequence of stepping up the cash

collections process (e.g., the client may get irritated), one may expect that the effect of the interaction term *Tenure*After* on realized revenue in this analysis is positive. The fact that we do not find significant positive coefficient indicates that maintaining a better client relationship have a long-term effect on project revenue, and since we only have up to one year observations after the policy change, the observed effect is still yet to materialize.

(insert Table 7 about here)

Manager's career perspective. Career concerns might also explain our results. That is, responding more to the firm's expectations may benefit junior managers more than their senior colleagues, who are closer to retirement and thus less worried about career advancement. We address this concern by adding a career variable that equals to one for managers closer to retirement (i.e., *Age*>60), and the result on main variables remains unchanged (result untabulated). This evidence shows that managers' career concerns do not explain our findings.

Too good to improve? Another concern may be that senior managers are so good that they have already reached at working capital levels where they simply have less scope to further improve working capital levels. We provide evidence that this argument is unlikely to explain our results. First of all, the economic significance of the coefficients in our main analysis indicates that for a subgroup of senior managers, there working capital performance does not just stay the same but even deteriorates after the policy change. In Table 5, we also see that the mean WC% of senior managers after the new metric was introduced is significantly higher than that of their junior peers (5.24% versus 3.16%, difference t-stat=-2.35). This indicates that there is ample room to improve for senior managers.

To further shed light on this, we compare the relevant information in DC's annual reports and those of another construction firm in the same European country and listed on the same stock exchange. (Note that, in the annual reports, the working capital level and percentage is aggregated at firm level and is therefore not directly linkable to those at project level in our

data.) We find that, for both firms, the percentage of working capital to noncurrent assets has decreased by 27%. (In both firms, working capital is negative, which means the percentage increased in absolute value.) But be aware that DC is three times as large in total revenue and market capitalization, so working capital performance should have been more efficient than it was. Using an industry peer as a benchmark hardly lends support for the belief that, for some managers, their working capital has reached the optimal level. In addition, in 2015, DC reported an achievement of -8.1% working capital percentage (with regard to total revenue) and set a target of -10% for the following year; it beat this target in 2016. This suggests that there exists room to further improve working capital levels for both junior and senior managers.

5.3 Robustness checks of empirical results

Alternative specifications. The empirical evidence presented so far is robust to a number of alternative specifications. We applied four alternative indicators of conversion efficiency as the dependent variable in addition to the WC% measure in our main regression: the natural logarithm of (1+WC%), the absolute amount of working capital (*WC*), cash conversion cycle (*CCC*), and the time that elapses between project initiation and releasing the first invoice (*Pending*). Control variables are included, standard errors are clustered by projects and, for all four regressions, we use the initial (unwinsorized) sample. The regression results using the three alternative dependent variables are presented in Table 8.

(insert Table 8 about here)

As in the previous analyses, a lower amount of all three dependent variables reflects a better cash conversion rate. Hence the prediction of the sign of the coefficients on the three explanatory variables (*Tenure*, *After*, and *Tenure*After*) remains unchanged (negative, negative, and positive, respectively). The regression results are consistent across all

specifications using the alternative measures of working capital percentage (*WC%*) presented in Table 4.

Where does the result become significant? A concern may be that the effect we describe is relevant for only a small group of our sample (e.g., project managers who are about to retire). To see whether that is true, we created dummies to indicate different levels of seniority. We find (untabulated) that the interaction between tenure and the event (after) start to become significant from seniority levels of 10 years and higher. This result does not suggest that it is just the manager who is close to retirement who resents the specific performance measure — indeed half of the population shows some level of resistance. Also, we find the result to surface from year 10 onward, which suggests a learning effect is not driving our results. The results also do suggest that resistance against the introduction of the specific performance measure of working capital is the driving factor. That is, it is more the infringement of the decision rights of the more senior agents that drives our results: After 10 years or more, the agents believe the principal should expect them to do the right thing.

As the results on our interaction start to become significant at the median, we present these results in Table 9, using *WC%, WC,* and cash conversion cycle (*CCC*) as our dependent variables. The results are robust for all specifications, lending support for the idea that it is not just the agents close to retirement who resist the additional control.

(insert Table 9 about here)

***Assumptions of analysis*.** Our analysis is akin to the difference-in-difference method, which assumes that the common trend assumption is met. This assumption requires that all observations follow a similar trend, absent the exogenous shock. In other words, the only reason that individual observations differ is because of the shock. We present preliminary support for whether the data meets this assumption in Figure 1, where the time trend of average *WC, WC%,* and *CCC* of the projects managed by senior and junior managers appear to run basically parallel to each other before the fourth quarter of 2014 (The trend is

decreasing for both junior and senior managers). In addition, we empirically examine the common trend assumption with a placebo test. The idea is to randomly pick an alternative point as a placebo "shock" before the actual policy change takes place, and re-run the regression. We re-run the regression assuming that the shock occurred in the first quarter of 2014, rather than the fourth quarter of 2014 (which is the actual point in time of the shock). The results are reproduced in Table 4, column (4). The coefficients on *Tenure* (0.220, p-value=0.15), After (3.194, p-value=0.24) and the interaction term *Tenure*After* (-0.233, p-value=0.15) turn out to be insignificant. The number of observations in column (4) is smaller because we restrict our sample period from 2013Q1 up until the actual policy change in 2014Q4. The placebo test further confirms that the parallel trend assumption holds and therefore lends support to our empirical evidence.

VI. Conclusion

We employ a unique setting and document how a well-intended change in a control mechanism may be opposed by some agents. We argue and find that junior agents are more likely to respond positively to the introduction of a metric for working capital improvement than their senior colleagues. Our evidence potentially advances understanding of how a uniform implementation of a specific performance measure may produce different effects, depending on an agent's skills and relationship with the principal. That is, our analyses suggest that firms may want to be cautious with reducing the decision rights of senior employees, as they may resist such a change.

We provide two explanations of why agents would resist the introduction of a specific performance measure. The first is that agents believe they know better than their principal how to make a decision, given their experience, and the second is that the introduction of the specific performance measure is considered an infringement of the implicit contract between the two parties. In a statistical sense, the effect we document becomes observable after nine years of experience. According to the firm we studied, managers are considered experienced

after five years. This suggests that it is not so much experience (or acquired skills) that impacts the result but rather the infringement in the relational contract.

As with all studies, ours has limitations. We can only collect some data to control for the (personal) characteristics of the agents included in the study. We do not know, for instance, the individual managers' level of risk aversion. Our relatively short study period also restricts deeper understanding of the before and after effects of the control mechanism. That is, after our sample period, senior agents may have decided to give up their resistance. We leave it to future studies to examine how such factors may relate to the uses of control systems.

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Table 1 Descriptive Statistics

Panel A shows the descriptive statistics of indicators of conversion efficiency, and Panel B shows descriptive statistics of demographic characteristics specific to each project. Observations are at project-quarter level unless indicated otherwise. *WC* is the absolute amount of working capital of each project managed by a project manager, calculated as the sum of accounts receivable and work-in-progress subtracted by accounts payable in the firm's internal accounting system. *WC%* denotes working capital (*WC*) scaled by project size. We keep the observations with *WC%* ranging from -100% to 100%. *CCC* denotes cash conversion cycle, calculated as (days sales outstanding + days inventory outstanding - days payables outstanding) in the firm's internal accounting system. We keep the observations with CCC ranging from -365 to 365. *Pending* represents number of quarters between when the project is initiated and when the first invoice is sent to the client. *#invoice* is number of invoices sent in the current quarter with regard to each project. *#invoices_tt* is total number of invoices sent with regard to each project (since last fiscal year). *Size* is the size of each project, measured as the estimated revenue of the project. *Gov* indicates the project type. It takes the value of 1 if the project is done for the government and 0 otherwise. *Tenure* denotes total time from when the project manager started working for DC till end of year 2015. *Age* represents age of the project manager who runs the project. *Tenure* and *Age* are summarized at the project manager level. *#proj* represents total number of projects one project manager is responsible for at the current quarter, and is summarized at the manager-quarter level.

	N	Mean	min	p25	Median	p75	max	sd
Panel A: Indicators of conversion efficiency								
WC	28551	2,690.93	-4,824,901	-223	52.39	976	2,918,206	71,38
WC%	22696	8.43	-100	-17.8	0	38.23	100	48.65
CCC	23313	26.97	-364.8	0	0	82.03	365	99.35
Pending	28551	1.32	-2	1	1	2	4	0.81
#invoices	28551	0.78	0	0	0	0	145	4.09
#invoices_tt	28551	1.65	0	0	0	1	464	9.08
Panel B: Demographic variables – Project-quarter level								
Size	28551	49,577	0.1	430	1,224.4	7247.9	18,865,759	454,436
Gov	28551	0.02	0	0	0	0	1	0.13
Manager and Manager-quarter level								
Tenure	92	14.49	2	4.5	10	24	42	11.95
Age	92	47.97	26.9	40.3	50.65	54.9	71.4	9.93
#proj	479	59.61	1	2	11	32	1,779	176.4

Table 2 Mean Conversion Efficiency Indicators Before and After the Control

This table presents the mean value of each indicators of conversion efficiency of project-quarter observations before and after introducing the specific performance measure (fourth quarter of 2014). The Difference column shows the result of a two-sided t-test of each variable in the Before and After column. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. *WC* is the absolute amount of working capital of each project managed by a project manager, calculated as the sum of accounts receivable and work-in-progress subtracted by accounts payable in the firm's internal accounting system. *WC%* denotes working capital (*WC*) scaled by project size. We keep the observations with *WC%* ranging from -100% to 100%. *CCC* denotes cash conversion cycle, calculated as (days sales outstanding + days inventory outstanding - days payables outstanding) in the firm's internal accounting system. We keep the observations with CCC ranging from -365 to 365. *Pending* represents number of quarters between when the project is initiated and when the first invoice is sent to the client. *#invoice* is number of invoices sent in the current quarter with regard to each project. *#invoices_tt* is total number of invoices sent with regard to each project (since last fiscal year).

	Before 2014Q4		***After 2014Q4***		***Difference***
	N	Mean	N	Mean	t-value
WC	13980	4106.8	14571	1861.5	2.65***
WC%	10616	13.38	12080	4.08	14.43***
CCC	11004	40.24	12309	15.11	19.43***
Pending	13980	1.35	14571	1.28	7.88***
#invoices	13980	0.71	14571	0.84	-6.72***
#invoices_tot	13980	1.28	14571	2.00	-2.63***

Table 3 Correlation Coefficient of Variables

This table presents the correlation coefficients of variables used in this study. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. The p-value is presented in the parentheses. *WC* is the absolute amount of working capital of each project managed by a project manager, calculated as the sum of accounts receivable and work-in-progress subtracted by accounts payable in the firm's internal accounting system. *WC%* denotes working capital (*WC*) scaled by project size. We keep the observations with *WC%* ranging from -100% to 100%. *CCC* denotes cash conversion cycle, calculated as (days sales outstanding + days inventory outstanding - days payables outstanding) in the firm's internal accounting system. We keep the observations with CCC ranging from -365 to 365. *Pending* represents number of quarters between when the project is initiated and when the first invoice is sent to the client. *#invoice* is number of invoices sent in the current quarter with regard to each project. *#invoices_tt* is total number of invoices sent with regard to each project (since last fiscal year). *Tenure* denotes total time from when the project manager started working for DC till end of year 2015. *Age* represents age of the project manager who runs the project. *Size* is the size of each project, measured as the estimated revenue of the project. *#proj* represents total number of projects one project manager is responsible for at the current quarter. *Gov* indicates the project type. It takes the value of 1 if the project is done for the government and 0 otherwise.

	WC	***WC%***	***CCC***	***Pending***	***#invoices***	***#invoices_tt***	***Tenure***	***Age***	***Size***	***#proj***	***Gov***
WC	1										
WC%	0.09***	1									
	(0.00)										
CCC	0.18***	0.49***	1								
	(0.00)	(0.00)									
Pending	0.01***	0.19***	0.02***	1							
	(0.00)	(0.00)	(0.00)								
#invoices	0.06***	0.02***	0.05***	-0.02***	1						
	(0.00)	(0.00)	(0.00)	(0.00)							
#invoices_tt	0.04***	-0.003	0.03***	-0.01***	0.82***	1					
	(0.00)	(0.68)	(0.00)	(0.00)	(0.00)						
Tenure	-0.02***	0.001	-0.03***	0.03***	0.03***	0.02***	1				
	(0.00)	(0.92)	(0.00)	(0.00)	(0.00)	(0.00)					
Age	-0.01**	-0.04***	-0.09***	-0.04***	-0.009	-0.02***	0.43***	1			
	(0.02)	(0.00)	(0.00)	(0.00)	(0.13)	(0.00)	(0.00)				
Size	0.02***	-0.01*	-0.00	-0.02***	0.16***	0.17***	0.00	-0.03***	1		
	(0.00)	(0.05)	(0.60)	(0.00)	(0.00)	(0.00)	(0.40)	(0.00)			
#proj	-0.03***	-0.05***	-0.09***	-0.04***	-0.13***	-0.12***	-0.15***	-0.06***	-0.05***	1	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Gov	0.004	0.01***	0.000	0.03***	0.01	0.006	0.22***	0.15***	0.14***	-0.10***	1
	(0.48)	(0.06)	(0.93)	(0.00)	(0.09)	(0.27)	(0.00)	(0.00)	(0.00)	(0.00)	

Table 4 Effect of Tenure on WC%

This table presents the empirical results of the following regression:

$$WC\%_{i,t}=\alpha+\beta1*Tenure_{i,t}+\beta2*After_{t}+\beta3*Tenure*After_{i,t}+\gamma*Controls+\epsilon_{i,t}. \quad (1)$$

Details about each specification are included in each column. "Yes" in Quarter FE, Project manager FE, and Client FE indicates the quarter fixed effect, project manager fixed effect, and client fixed effect is included in the specification, respectively. We cluster standard errors by projects across all specifications. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. P-values are presented in the parentheses. The F-stats of testing b1+b3=0 is reported when applicable. *WC%* denotes working capital (*WC*) scaled by project size. We keep the observations with *WC%* ranging from -100% to 100%. *Tenure* denotes total time from when the project manager started working for DC till end of year 2015. *After:* Takes the value of 1 if the observation is on or later than the fourth quarter of 2014 and 0 otherwise. *Age* represents age of the project manager who runs the project. *Size* is the size of each project, measured as the estimated revenue of the project. We include logarithm of the project size (*log(1+Size))* in our regressions. *#proj* represents total number of projects one project manager is responsible for at the current quarter. *Gov* indicates the project type. It takes the value of 1 if the project is done for the government and 0 otherwise. Column (4) shows the result of a placebo test of the parallel trend assumption. *After* takes the value of 1 if the observation is on or later than the 2014Q1 and before 2014Q4, and 0 if the observation is before 2014Q4.

		Dependent Variable: WC%			
	Pred. Sign	(1)	(2)	(3)	(4)
Tenure	-	-0.231***	-	-	0.220
		(0.00)	-	-	(0.15)
After	-	-15.10***	-6.171***	-10.59***	3.192
		(0.00)	(0.00)	(0.00)	(0.24)
Tenure*After	+	0.563***	0.264***	0.234***	-0.233
		(0.00)	(0.00)	(0.00)	(0.15)
Age		-0.391***	-	-	-0.992***
		(0.00)	-	-	(0.00)
Log(1+Size)		-1.769***	-2.715***	-2.459***	-2.106***
		(0.00)	(0.00)	(0.00)	(0.00)
#proj		-0.005***	0.003**	0.000	-0.006***
		(0.00)	(0.04)	(0.80)	(0.00)
Gov		6.187**	8.008*	-	12.04**
		(0.02)	(0.09)	-	(0.01)
Quarter FE		Yes	Yes	Yes	Yes
Project Manager FE		No	Yes	Yes	No
Client FE		No	No	Yes	No
Cluster SE		prj	prj	prj	prj
F-stat (b1+b3=0)		50.82***	-	-	0.03
obs		22696	22696	22694	15925
R^2		0.05	0.11	0.18	0.07

Table 5 WC% Before and After Policy Change for Groups of Managers

This table presents the mean working capital percentage (*WC%*) before and after the introduction of the specific performance measure of working capital, shown separately for the projects managed by junior versus senior project managers. The Diff column shows the result of a two-sided t-test of each group in the Before and After column. The Diff row shows the result of a two-sided t-test of the comparison with Junior versus Senior in each period. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. **Junior** refers to projects managed by junior managers (whose tenure is no more than 10 years), and **Senior** refers to the ones managed by senior managers (whose tenure is longer than 10 years). **Before** accounts for observations from the first quarter of 2013 up until the fourth quarter of 2014, and **After** accounts for the rest of observations.

	Before		**After**		
	#obs	Mean	#obs	Mean	Diff (t-stat)
Junior	7427	18.18	6742	3.16	18.36***
Senior	3189	2.19	5338	5.24	-2.87***
Diff (t-stat)		15.63***		-2.35**	

Table 6 Mean Size and Type of Project Allocated Among Subgroups

Panel A presents the mean statistic of *Size* and *Gov* for projects assigned to Junior and Senior project managers, respectively. Panel B presents for the projects assigned to Junior and Senior managers separately, and the mean statistic of *Size* for observations before and after the specific performance measure. The Diff column shows the result of a two-sided t-test of the two variables in each cell. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. *Size* is the size of each project, measured as the estimated revenue of the project. *Gov* indicates the type of each project. It takes the value of 1 if the project is done for the government and 0 otherwise. **Junior** refers to projects managed by junior managers (whose tenure is no more than 10 years) and **Senior** refers to the ones managed by senior managers (whose tenure is longer than 10 years). **Before** accounts for observations from the first quarter of 2013 up until the fourth quarter of 2014, and **After** accounts for the rest of observations.

Panel A: Mean Size and Gov of projects assigned to each subgroup

	#obs	Mean *Size*	Diff (t-stats)	#obs	Mean *Gov*	Diff(t-stats)
Junior	18484	47907		18484	0.006	
Senior	10067	52644	-0.84	10067	0.036	-19.32***

Panel B: Mean Size and Gov of projects assigned to each subgroup before and after the implementation of the specific performance measure

			Junior		
	#obs	Mean *Size*	Diff (t-stats)	Mean *Gov*	Diff (t-stats)
Before	10012	45734		0.006	
After	8472	50475	-0.68	0.005	0.48
			Senior		
	#obs	Mean *Size*	Diff (t-stats)	Mean *Gov*	Diff (t-stats)
Before	3968	50970		0.053	
After	6099	53733	-0.31	0.025	7.39***

Table 7 Regression Result of Alternative Performance Measure used as DV

This table presents the regression result using realized revenue, which is an alternative performance measure other than the conversion efficiency, as the dependent variable. Details about each specification are included in each column. "Yes" in Quarter FE, Project manager FE, and Client FE indicates the quarter fixed effect, project manager fixed effect, and client fixed effect is included in the specification, respectively. We cluster standard errors by projects across both specifications. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. In the parentheses, p-values are presented. *Realized Rev* is the realized revenue for each project tracked in DC's internal accounting system. *Tenure* is the total time from when the project manager started working for DC till end of year 2015. *After* takes the value of 1 if the observation is on or later than the fourth quarter of 2014 and 0 otherwise. *Age* represents the age of the project manager. *Size* is the size of each project, measured as the estimated revenue of the project. We include logarithm of the project size (*log(1+Size))* in our regressions. *#proj* is the total number of projects one project manager is responsible for at the current quarter. *Gov* indicates the type of each project. It takes the value of 1 if the project is done for the government and 0 otherwise.

	Pred. Sign	**DV: *Realized Rev***	
Tenure	N/A	921.06	-
		(0.40)	-
After	N/A	-1034.79	1893.07
		(0.96)	(0.85)
Tenure*After	N/A	-505.94	-746.25
		(0.62)	(0.30)
Age		-2654.92***	-
		(0.00)	-
Log(1+Size)		63232.2***	40510***
		(0.00)	(0.00)
#proj		-14.32***	1.36
		(0.00)	(0.76)
Gov		14851.6	-
		(0.67)	-
Quarter FE		Yes	Yes
Project Manager FE		No	Yes
Client FE		No	Yes
Cluster SE		prj	prj
obs		28551	28549
R^2		0.09	0.37

Table 8 Regression Results Using Alternative DVs

This table presents the empirical results of the following regression(s):

$$DV_{i,t}=\alpha+\beta1*Tenure_{i,t}+\beta2*After_{t}+\beta3*Tenure*After_{i,t}+\gamma*Controls+\epsilon_{i,t}. \quad (2)$$

The DVs are alternative indicators of conversion efficiency other than WC%. Details of the specification is included in each column. "Yes" in Quarter FE indicates the quarter fixed effect is included in the specifications. We cluster standard errors by projects across all specifications. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. In the parentheses, p-values are presented. *Log(1+WC%)* is the logarithm of 1 plus working capital percentage. *WC* is the absolute amount of working capital of each project managed by a project manager, calculated as the sum of accounts receivable and work-in-progress subtracted by accounts payable in the firm's internal accounting system. *CCC* denotes cash conversion cycle, calculated as (days sales outstanding + days inventory outstanding - days payables outstanding) in the firm's internal accounting system. We keep the observations with CCC ranging from -365 to 365. *Pending* represents *n*umber of quarters between when the project is first initiated and when the first invoice was sent to the client. *Tenure* denotes total time from when the project manager started working for DC till end of year 2015. *After* takes the value of 1 if the observation is on or later than the fourth quarter of 2014 and 0 otherwise. *Age* represents age of the project manager who runs the project. *Size* is the size of each project, measured as the estimated revenue of the project. We include logarithm of the project size (*log(1+Size))* in our regressions. *#proj* represents total number of projects one project manager is responsible for at the current quarter. *Gov* indicates the project type. It takes the value of 1 if the project is done for the government and 0 otherwise.

		Dependent Variables			
	Pred. Sign	**log(1+WC%)**	***WC***	***CCC***	***Pending***
Tenure	-	-0.002*	-512.36*	-0.409***	-0.002**
		(0.06)	(0.07)	(0.00)	(0.01)
After	-	-0.079***	-10351***	-28.82***	-0.324***
		(0.00)	(0.00)	(0.00)	(0.00)
Tenure*After	+	0.005***	541.27*	0.485***	0.010***
		(0.00)	(0.06)	(0.00)	(0.00)
Age		-0.009***	-25.66	-0.977***	-0.003***
		(0.00)	(0.78)	(0.00)	(0.00)
log(1+Size)		-0.003	1750.65	0.294	-0.065***
		(0.36)	(0.14)	(0.47)	(0.00)
#proj		-0.000***	-1.855***	-0.159***	-0.000***
		(0.00)	(0.00)	(0.00)	(0.00)
Gov		0.107**	6524.5*	3.233	0.109
		(0.04)	(0.06)	(0.67)	(0.14)
Quarter FE		Yes	Yes	Yes	Yes
Cluster SE		prj	prj	prj	prj
obs		22301	28551	23313	28551
R^2		0.03	0.01	0.04	0.06

Table 9 Regressions Results by Using Senior as a Dummy Variable

This table presents the empirical results of the following regression:

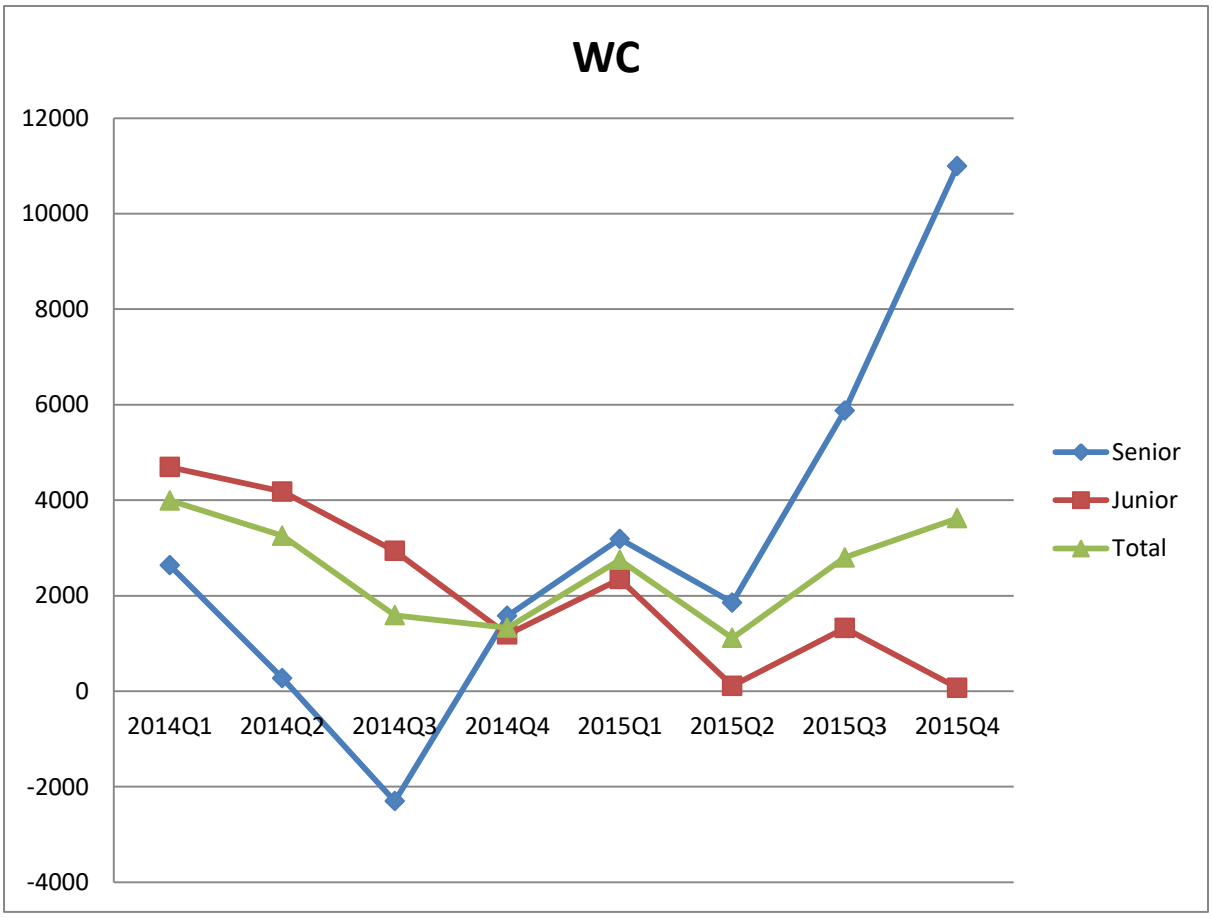
$$DV_{i,t}=\alpha+\beta1*Senior_{i,t}+\beta2*After_{t}+\beta3*Senior*After_{i,t}+\gamma*Controls+\epsilon_{i,t}. \quad (3)$$

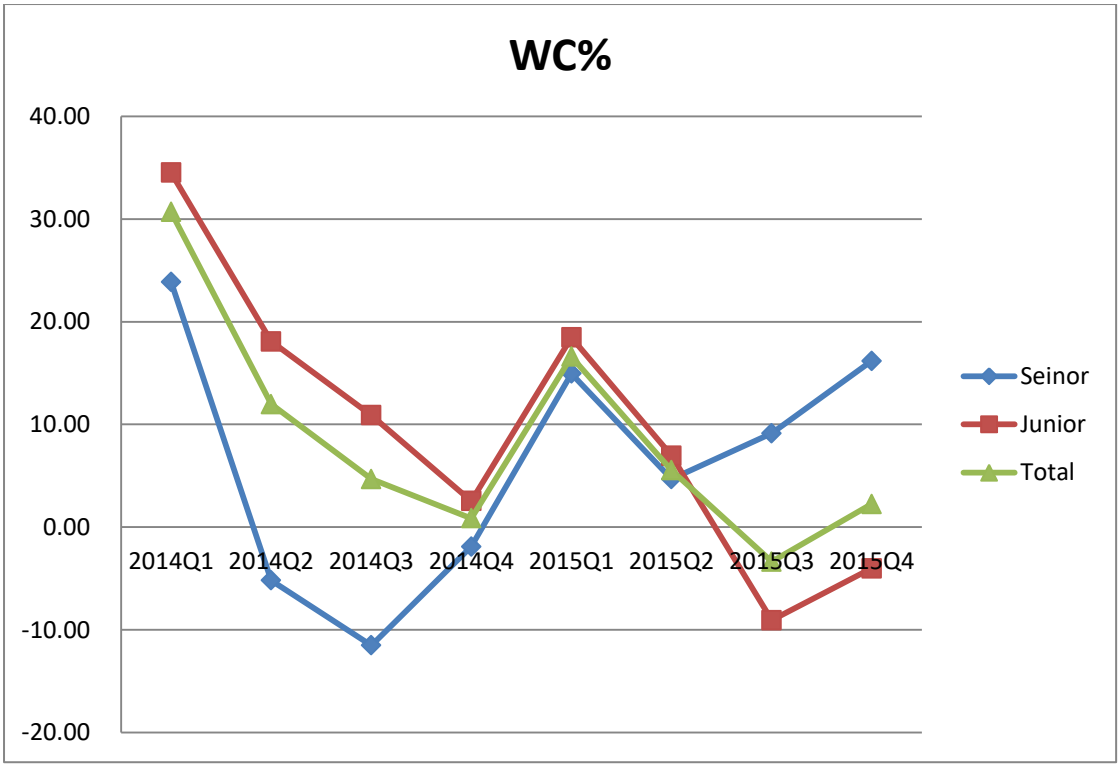
In columns (1) and (2), the DV is *WC%*, in column (3) the DV is *WC* and in column (4) the DV is *CCC*. Details of each specification are included in each column. "Yes" in Quarter FE and Project manager FE indicates the quarter fixed effect, and project manager fixed effect is included in the specification, respectively. We cluster standard errors by projects across all specifications. *, **, *** represent results significant at the 90%, 95%, and 99% levels, respectively. In the parentheses, p-values are presented. The F-stats of testing b1+b3=0 is reported when applicable. *WC%* denotes working capital percentage. We keep the observations with WC% ranging from -100% to 100%. *WC is* absolute amount of working capital of each project managed by a project manager. *CCC is* cash conversion cycle. We keep the observations with CCC ranging from -365 to 365. *Senior* is a dummy variable that takes the value of 1 if the project is managed by a project manager with tenure larger than 10 years and 0 otherwise. *After* takes the value of 1 if the observation is on or later than the fourth quarter of 2014 and 0 otherwise. *Age* represents the age of the project manager. *Size* denotes the size of each project and is indicated by the estimated revenue of the project. We include logarithm of the project size (*log(1+Size))* in our regressions. *#proj* is total number of projects one project manager is responsible for at the current quarter. *Gov* indicates the type of the project. It takes the value of 1 if the project is done for the government and 0 otherwise.

		Dependent Variables			
		(1)	(2)	(3)	(4)
	Pred. Sign	***WC%***	***WC%***	***WC***	***CCC***
Senior	-	-19.78***	-	-	-
		(0.00)	-	-	-
After	-	-15.10***	-8.439***	-4931.12***	-23.05***
		(0.00)	(0.00)	(0.00)	(0.00)
Senior*After	+	19.98***	13.84***	7916.0**	10.41***
		(0.00)	(0.00)	(0.03)	(0.00)
Age		-0.040	-	-	-
		(0.59)	-	-	-
log(1+Size)		-2.026***	-2.656***	1474.2	-1.389***
		(0.00)	(0.00)	(0.20)	(0.00)
#proj		-0.007***	-0.000	-1.877	-0.001
		(0.00)	(0.97)	(0.10)	(0.69)
Gov		8.045*	8.282*	579.6	-12.80
		(0.06)	(0.08)	(0.84)	(0.19)
Quarter FE		Yes	Yes	Yes	Yes
Project Manager FE		No	Yes	Yes	Yes
Cluster SE		prj	prj	prj	prj
F-stat (b1+b3)=0		0.03	-	-	-
obs		22696	22696	28551	23313
R^2		0.06	0.11	0.06	0.08

Figure 1 Trend of Average Conversion Efficiency by Senior/Junior Managers

This figure depicts the trend of average cash conversion efficiency over each quarter. The x-axis is year-quarter from the first quarter of 2014 to the fourth quarter of 2015, and the y-axis is the cash conversion efficiency, the proxy of which is shown in the title of each chart respectively. The observations are divided into two groups, according to the median tenure of 10 years: the projects managed by senior managers (blue line), whose tenure is larger than 10 years, and those managed by junior managers (red line), whose tenure is less or equal to 10 years. Each dot represents the mean of cash conversion efficiency of the projects run by senior managers and junior managers in each year-quarter, respectively. The green line "Total" depicts mean cash conversion efficiency of all projects in each year-quarter. The specific performance measure policy takes place in the fourth quarter of 2014.

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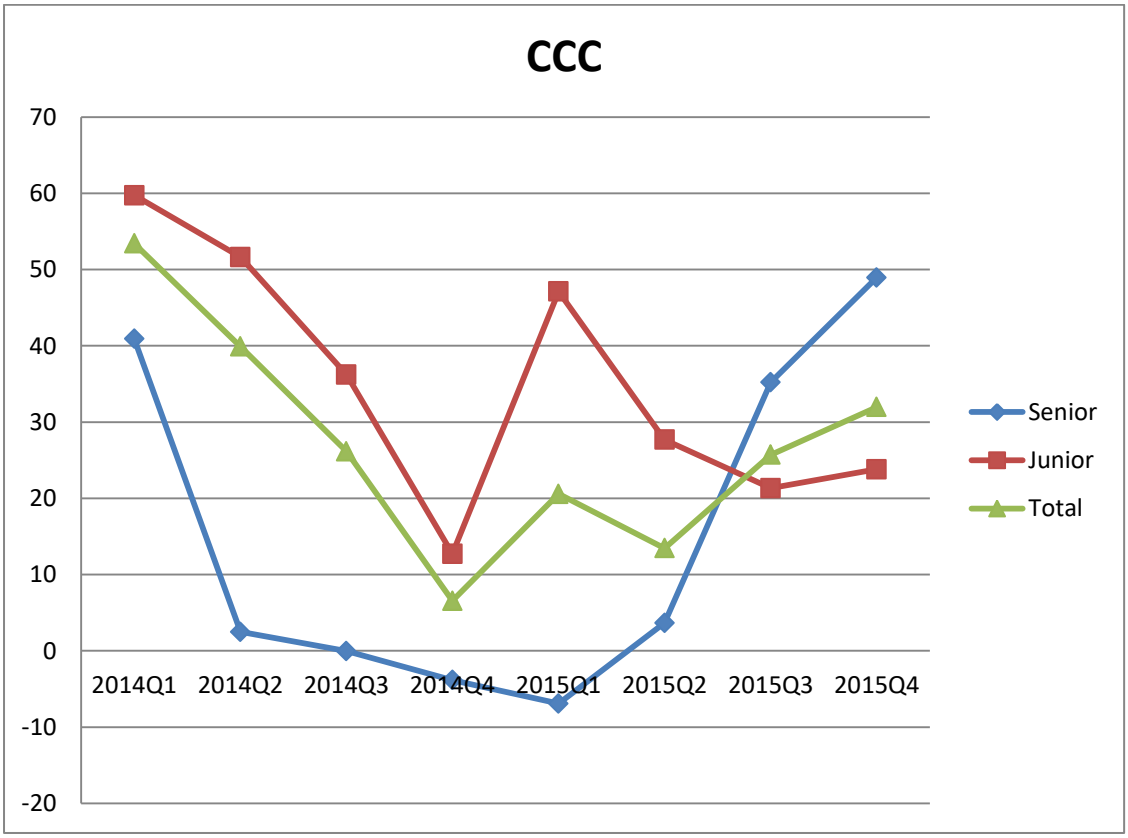
30.00
20.00
10.00
0.00
-10.00
-20.00
2014Q1
2014Q2
2014Q3
2014Q4
2015Q1
2015Q2
2015Q3
2015Q4
Seinor
Junior
Total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40
30
20
10
0
-10
-20
2014Q1
2014Q2
2014Q3
2014Q4
2015Q1
2015Q2
2015Q3
2015Q4
Senior
Junior
Total