Dynamics of incentives and value creation in (de-)centralised incentive systems

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Abstract: When young and small organisations grow into medium-sized organisations they often implement monetary incentive systems with unclear consequences. Whilst implemented to increase employee (innovative) output and value creation, they have ambiguous effects and may even reduce value creation. Due to the different effects of monetary incentives, this paper distinguishes reciprocal and opportunistic employees' different reactions to incentives. It analyses the effects of decentralised incentive systems – and thus of incentive systems targeted better at opportunistic vs. reciprocal employees – on value creation. Here, it proposes a causal feedback structure explaining opportunistic and reciprocal employees' different reactions and it investigates by simulation how incentives and value creation interact over time. The analysis reveals that behaviour is not pre-determined by employee disposition. It shows how dynamics evolve dependent on the interrelationships of employee dispositions and the organisational context. As such, it exemplifies the usefulness of studying dynamics of incentive systems and employee behaviour.

Keywords: monetary incentives; incentive system; pay for performance; centralisation; decentralisation; innovation; value creation; organisational dynamics; system dynamics modelling.

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1 Introduction

In early phases after foundation, organisational hierarchy levels and the distance between decision-maker(s) and employees are low as organisations are usually still small. When these organisations grow to medium-sized companies, however, the distance between organisational members increases. At this stage, organisational leaders have become less knowledgeable about their employees' characteristics and preferences and they start using incentive systems in order to manage employees and to increase their innovative behaviour and value creation. Often, centralised decision-makers in an organisation that has grown to medium size can only treat their organisation's or department's employees as a homogeneous group, because they are unable to know about all employees' characteristics and preferences. However, this may be disadvantageous as research on incentive systems has shown.

Research on incentive systems addresses the effects of incentives on employee motivation (conceptual: Amabile, 1993; Bridoux et al., 2011; empirical: Balliet et al., 2011; Fang and Gerhart, 2011). Findings suggest that monetary incentives may both increase employee performance and value creation (Falk, 2002; Fehr et al., 1993; Gächter and Falk, 2002) as well as decrease motivation and performance because individuals loose self-determination and shift the locus of control to the external (Frey and Jegen, 2001; Ryan and Deci, 2000a). Thus, findings are contradictory. In these studies, researchers often regard employees as a homogeneous group, while other streams of research portray clear differences within groups of employees (Bogaert et al., 2008; Fehr and Fischbacher, 2004). For the study of employee motivation, employee motives to cooperate are particularly important. Considering the heterogeneity of employee motives, research in the behavioural economics tradition distinguishes self-regarding or opportunistic employees from other-regarding or reciprocal employees, called proselfs and prosocials in the psychology literature (Bogaert et al., 2008; Bridoux et al., 2011; Kelley and Thibaut, 1978). These empirically grounded categorisations constitute ends of a continuum of a motive to contribute to a common good vs. oneself. Between 60% and 70% of people have shown to expect and enforce reciprocation (Fehr and Fischbacher, 2004). Research on social value orientation suggests that opportunistic people are driven by external incentives whereas for reciprocal people relationship- and value-oriented behaviour is more important (Bogaert et al., 2008). These people thus react differently to the same incentives.

However, centralised decision-makers in a medium-sized organisation are no longer able to know the degree of reciprocity among sub groups of employees and cannot target incentive systems to them. They may assume opportunistic people in sales and reciprocal people in research or human resources. Whether and to what extent this is true and whether inter-organisational differences exist remains unclear. Knowledge on the outcomes of centralised vs. targeted decentralised decisions is required here since opposed reactions of opportunistic and reciprocal people have been reported (e.g., Bogaert et al., 2012). Additionally, studies report ambiguous effects of decentralisation on motivation and output (Sherman and Smith, 1984; Zoghi et al., 2010 vs. De Paola and Scoppa, 2010; Walsh, 1993) and they do not account for different reactions of reciprocal vs. opportunistic employees. Additionally, these studies do not provide causal explanations (Zoghi et al., 2010).

Based on these contradictory findings, the purpose of this paper is to explain the effects of decentralised decision-making regarding incentive systems and value creation in organisations. This analysis offers an organisational and behavioural perspective concentrating on monetary incentives and their different effects on reciprocal and opportunistic employees. It thus distinguishes between groups of employees who are either more reciprocal, i.e., who reciprocate and pay back, or are more opportunistic, i.e., rational and selfish. This paper focuses on the inner-organisational perspective and helps make sense of existing contradictory findings in particular from behavioural economics and psychology. It addresses motivation effects (e.g., Balliet et al., 2011) at the exclusion of sorting and other effects (e.g., Bandiera et al., 2013; Guertzgen, 2009; Lazear, 1986, 2000) as it aims at a deeper understanding of the dynamics between incentives and motivation. This paper responds to Balliet et al.'s (2011, p.608) call for research on people's reaction to incentives over time. They argue that it remains unclear how group norms affect the evolution of repeated games. This paper not only investigates repeated snapshots, but provides a continuous perspective of incentive dynamics. Taking a causal perspective, it explains emerging dynamics via the interplay of feedback mechanisms with reference to a generic structural archetype called 'fixes that fail' [Senge, (1994), pp.388–389]. This analogy provides useful because the archetype reveals the structure of ineffective actions to researchers and organisations. It captures goal-seeking and reinforcing feedback of how decentralisation helps an organisation not to get stuck with an ineffective incentive system, but to incite its people to be innovative and create value for the organisation.

In the following section, the literature on incentive systems, decentralisation, and reciprocity will be reviewed as it relates to decision-making in organisations. Afterwards, the system dynamics method will be explained and a system dynamics model will be presented which will then be analysed and used to understand the dynamics of incentive systems and value creation in organisations. It explains, by combining causal structure and dynamic behaviour, how incentive systems affect employee innovative behaviour and how decentralisation helps target an incentive system to employees.

2 Research on incentives, reciprocity, and decentralisation

Research in the areas behavioural economics and psychology investigates the *effect of incentives on the effort and performance* of employees or people in general. Research on the *effect of decentralisation on employee performance* is rather established in management, labour economics, and public administration. The findings relevant for our analysis from these two streams of literature will be portrayed.

2.1 Incentive and reciprocity research

In behavioural economics and psychology, studies on incentives are often conducted in an experimental setting. While rational explanations for a positive effect of incentives on productivity exist (e.g., Eisenhardt, 1989), reality portrays more complex relationships. Empirical research found that monetary incentives which people receive increase their work effort (Balliet et al., 2011; Fehr et al., 1993; Heyman and Ariely, 2004). However, it has also become clear that people's effort correlates with the amount of fix wages that

have been paid even before people needed to put in any effort (Falk, 2002; Fehr et al., 1993; Gächter and Falk, 2002). Forsythe et al. (1994) also found that people's perception of fairness greatly affects how they behave. This means they reciprocate the behaviour or the intention they see in the other party (Gouldner, 1960). They even anticipate reciprocation: e.g., in experiments employers offer higher wages in anticipation of resulting high employee effort (Fehr et al., 1993). Hence, employers expect that employees behave reciprocally and employees reciprocate indeed. Additionally, a long term relationship supports reciprocation due to building trust between the involved parties [Gächter and Falk, 2002; for trust also see Malhotra (2004) and Williamson (1993)].

However, monetary incentives do not always have the desired effects (Prendergast, 1999). Contradictory to the fact that employees reciprocate wages by effort, researchers argued (Amabile, 1993; Ryan and Deci, 2000a) and showed (Falk, 2002; Frey and Jegen, 2001; Frey and Osterloh, 2001; Weibel et al., 2010) that monetary incentives crowd out intrinsic motivation of employees. The decrease in motivation and performance has been explained by individuals' loss of self-determination and shift of control to the external due to losses of competence, autonomy and relatedness [Ryan and Deci, 2000b; for meta-analytic evidence see Deci et al. (1999)]. Monetary incentives, i.e., extrinsic motivators, reduce effort because they negatively affect intrinsic motivation (Weibel et al., 2010). Here, people avoid being instrumentalised by incentives and therefore reject incentive systems that build on high monetary extrinsic rewards. At the same time, Fang and Gerhard (2011) do not find negative effects of pay for performance on intrinsic motivation, and results for the quality and quantity of results differ (Jenkins et al., 1998). Thus, the relationship between incentives and employee output is complex and research methods should capture this complexity.

2.2 Effects of decentralisation

Studies focusing on incentive systems, performance, and reciprocity have not yet considered the effects of decentralisation. Decentralisation includes a more organic form of control, more local decision-making, but also employees' ability to choose appropriate incentives through flexible benefit plans (Barringer and Milkovich, 1998), representing a form of strong decentralisation. More often, researchers analyse how decentralised incentive systems affect coordination and performance of networks between organisations instead of focusing on the inner organisational level, e.g., it has been shown that decentralised setting of union wages positively affects innovation (Haucap and Wey, 2004). In the area of horizontal and vertical collaboration among supply chain members, however, decentralisation has negative effects. When members of a supply chain set individual incentives, the entire supply chain may be less efficient as it is less aligned along overall incentives and goals (Lee and Whang, 1999). Additionally, decentralised collaborations are less beneficial than centralised ones when the partners are different (Oswald, 2010).

At the inner-organisational level, the alignment problem exists as well. Researchers argue that decentralised decision-making and delegation – i.e., a form of decentralisation – have negative consequences due to information asymmetries between the principal and its agents (De Paola and Scoppa, 2010) as well as due to bargaining costs (Walsh, 1993). Quite contrary, a study by Sherman and Smith (1984) suggests and one by Zoghi et al.

(2010) finds a positive relationship between decentralisation and innovation. As found through a meta-analysis, incentives are more effective when managed decentrally by close peers rather than far authorities (Balliet et al., 2011). These findings indicate that a reliable relationship between decentralisation and value creation has not been found.

Hence, existing research rather addresses the effects of employees' decentralised decision-making on organisational innovative behaviour and outcomes. It does not focus on the fit or appropriateness of a (de)centralised incentive system to employee reciprocity. Reverting to findings in the areas of organisational psychology and behavioural economics, Bridoux et al. (2011) argue how a misfit between incentive systems and employee characteristics can diminish value creation. This also indicates that a corporate environment which supports or contradicts inherent employee characteristics may influence employee behaviour positively as well as negatively. As these findings are still in a conceptual stage and as studies often analyse by experiments how to incite cooperative behaviour, they produce sequential snapshots of human behaviour. Additionally, in empirical studies on the relationship between decentralisation and incentives "the direction of causality, if any, is unclear" [Zoghi et al., (2010), p.638]. In the following section, this paper therefore explains by a feedback perspective the causal relationships between employee behaviour and incentives in centralised and decentralised organisations. Through simulation, it is able to continuously show how an organisation's motivational system and employee behaviour evolve over time.

3 A system dynamics model of monetary incentives, decentralisation and value creation

3.1 System dynamics modelling

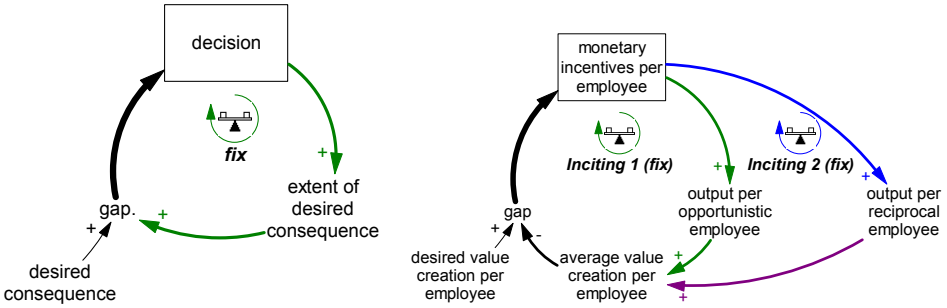
This paper uses system dynamics to model the relationship between the organisation and its employees' behaviour. System dynamics is a method that uses computer simulation to understand complex phenomena that involve accumulations, delays, nonlinear effects and feedback relationships (Forrester, 1961, 1994; Richardson, 1991). This makes it an especially useful method for analysing multicollinear settings, mediation, and circular causality. System dynamics uses formal modelling for a rigorous understanding of system structure and behaviour to aid decision-making (Milling, 1984). It is a structural theory of social systems (Größler et al., 2008; Lane, 1999; Milling, 1984) and thus, a systems method. It has been used for various applications starting from the Club of Rome's limits to growth issue (Forrester, 1971) to project management (Black and Repenning, 2001) and subsequent litigation as well as managerial decision-making (Rahmandad, 2012; Zimmermann, 2011). Investigating the effects of incentives has a long tradition in system dynamics. Because of the method's usefulness for understanding delays and counterintuitive effects, in particular different effects for following long-term goals vs. short-time incentives have been evaluated. For example, Black and Repenning (2001) investigated adequate vs. under-allocation of resources in companies, and Rahmandad (2012) examined the preference for investing in short-term operational capabilities vs. long-term growth opportunities. This paper presents a model of the allocation of resources to monetary incentives and effects of decentralisation on this allocation.

3.2 A model of monetary incentives, decentralisation, and value creation

The system dynamics model described in this chapter relates to incentives, value creation and decentralisation. First, it captures the effects of incentives on employees (e.g., Falk, 2002; Fehr et al., 1993; Gächter and Falk, 2002). Here, it makes use of a model focused only on incentives and output (Zimmermann 2014). Second, it closes the feedback view by including the organisation's reaction on its employees' behaviour. Third and most importantly, it encompasses the effects of decentralisation on how the relationship between output and incentives operates.

There are four feedback loops that are most influential for the model's behaviour, of whom the first two (right part of Figure 1) will be presented now and the third and fourth one several paragraphs later. The two feedback loops shown in the right part of Figure 1 describe goal seeking mechanisms by which the organisation adapts its incentive system as long as the goal *desired value creation* has not been achieved. When it perceives a gap, it increases *monetary incentives per employee*, which increase *output per opportunistic* and *reciprocal employee* as well as *average value creation per employee*, closing the *gap*. The picture of a scale in the middle of the loops indicates their balancing or goal-seeking character. The left part of Figure 1 presents this mechanism in a conceptual manner, whereas the right part of Figure 1 describes it in more detail related to the topic of incentives, value creation, and decentralisation.

Figure 1 Fix (see online version for colours)



Notes: Positive arrow polarity indicates a causal relationship of the same direction, i.e., if X increases (decreases), Y will increase (decrease). Negative arrow polarity indicates an inverse causal relationship, i.e., if X increases (decreases), Y will decrease (increase). A box around a variable indicates an accumulation, mathematically an integral of decisions that feed into this accumulation. A balancing feedback mechanism, indicated by a scale in the centre of the loop, explains goal seeking behaviour and the tendency towards equilibrium. A reinforcing mechanism, indicated by a rolling ball, explains amplifications.

When organisational decision-makers perceive a problem, e.g., a gap between *average* and *desired value creation per employee*, they try to fix it, here with higher monetary incentives [Clark and Wilson, (1961), p.129). Of course, this is based on the assumption that the average value creation per employee can be known. *Monetary incentives per employee* increase with delay – like a stock that takes time to fill – such that each month some proportion of the gap is closed. The delay is considered to be six month, representing a possible bi-annual revision of the incentive system. Following the literature, the model disaggregates and distinguishes between opportunistic and reciprocal

employees who react to incentives (e.g., Falk, 2002; Fehr et al., 1993; Gächter and Falk, 2002; Peterson and Luthans, 2006 vs. Frey and Jegen, 2001; Ryan and Deci, 2000a; see also Bridoux et al., 2011). Opportunistic employees increase their output with rising monetary incentives. This is captured by a linearly increasing *effect of incentives on the output of opportunistic employees* (Bridoux et al., 2011), representing employees' monetary interest, and by a less steep increase for higher incentives up to a maximum where opportunistic employees cannot increase their output any more. Line A in Figure 2 shows this relationship. It indicates how *monetary incentives per employee* affect the *output per opportunistic employee*, shown in Figure 1. Reciprocal employees also increase their output with rising fix incentives (see line B of Figure 2, *effect of fix incentives on output of reciprocal employees*) as they reciprocate their employer's appraisal through higher effort (Fehr et al., 1993; Heyman and Ariely, 2004). Up to a threshold where the nature of the incentive system becomes too monetary, their reciprocal nature as team players even makes them more productive than opportunistic employees. Economic studies [Bandiera et al., 2013; Lazear, 2000; for an overview see Gerhart et al. (2009)] investigating these settings empirically support these findings, but also hint to sorting effects which this analysis excludes so as to be able to understand dynamics of motivation. Overall, higher (innovative) effort increases the organisation's value creation and thus closes the gap between the desired and actual value. The organisation's decision on monetary incentives thus works like a *fix* to the problem of insufficient output and value creation.

However, concerning reciprocal employees this only represents one of two important mechanisms. Additionally, a reinforcing mechanism is active, shown in Figure 3, which renders monetary incentives a *fix that fails* with reciprocal employees. While their effort and output increases with fix incentives, high monetary rewards decrease their effort as they destroy their intrinsic motivation (Ryan and Deci, 2000a). Reciprocal people regard an incentive system highly focused on variable pay as an affront against their motivation. Empirical research supports that effort decreases when monetary incentives rise above a threshold (Falk, 2002; Frey and Jegen, 2001; Frey and Osterloh, 2001). In the model this threshold is set to 5,000 Euros, representing possible costs of the employee to the employer. Monetary incentives below this value represent fix incentives that increase reciprocal employees' output, whereas incentives above this value represent variable incentives that decrease their output. Line C in Figure 2 shows the latter relationship by the *effect of variable incentives on output of reciprocal employees*. The inverse gradients of lines A and B vs. line C in Figure 2 explain why the feedback loops *Inciting 1 and 2* in Figure 3 are balancing while *Inciting 3* is a reinforcing feedback loop. Once above the threshold, reciprocal employees do not feel valued any more, their performance decreases because of this misfit, but the organisation continues to react to this performance shortfall by increasing incentives. The three effects represented by the three lines in Figure 2 distinguish employees who desire high monetary incentives from those whose motivation is crowded out by a too monetary focus. The model structure that combines balancing with reinforcing effects corresponds to the fixes that fail archetype that explains structurally how people bet on the wrong horse [Senge, (1994), pp.388–389]. It elucidates how people, attempting to close a gap in what they consider a balancing structure, actually worsen the gap because they fail to acknowledge the underlying reinforcing nature of that structure.

Figure 2 Effects of incentives on output (see online version for colours)

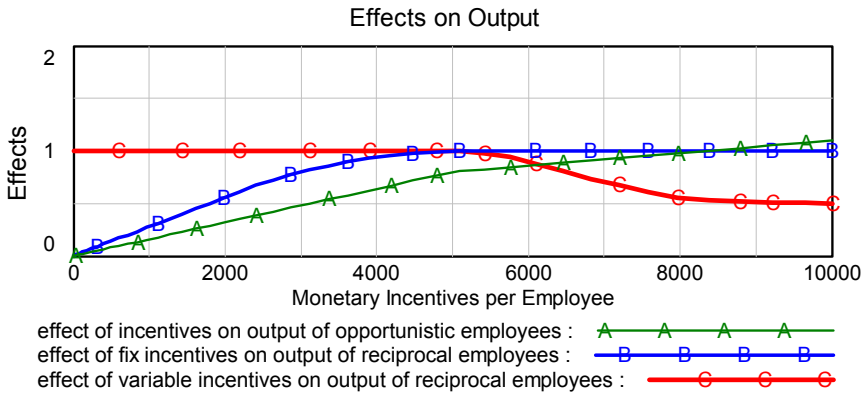
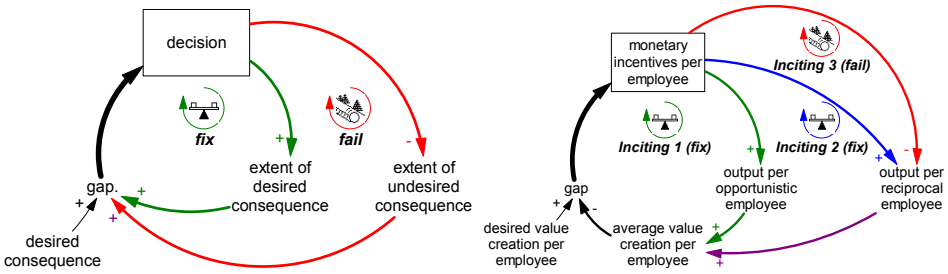
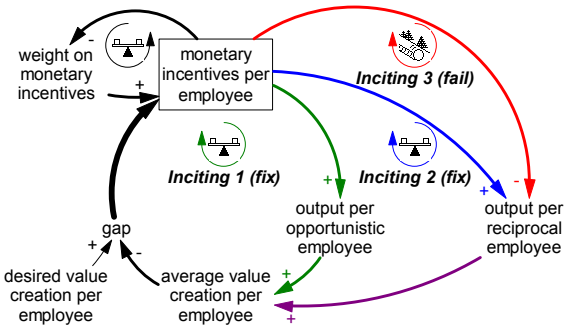


Figure 3 Fix that fails (see online version for colours)



Decentralisation has been modelled to represent organisational decision-makers' knowledge of their employees' preferences and how this knowledge allows them to target the incentive system to their employees' either more opportunistic or reciprocal characteristics. While these decision-makers cannot affect how an employee reacts to a given incentive system, they shape how the organisation reacts to a value creation gap and designs the incentive system. I.e., decentralisation targets the link between the *gap* and the *monetary incentives per employee*, indicated by the thicker line in Figure 4 which is affected by a further feedback loop indicating the changing *weight on monetary incentives* that decision-makers attribute. This weight depends on the current state of the incentive system, on employee preferences (i.e., the fraction of reciprocal employees), and on decision-makers' knowledge of this composition indicating how closely individual decisions are targeted to employees (degree of decentralisation). This allows adapting the sub-groups' motivational system to employee preferences.

Figure 4 Decentralisation (see online version for colours)



This model has been tested primarily for its internal consistency. It shows reasonable behaviour in all of these tests, e.g., concerning its dimensions, boundary, and extreme conditions (e.g., Forrester and Senge, 1980).

4 Results: dynamic effects of decentralisation

Simulation analyses of the model portray equilibrium conditions first (Figure 5) before turning to sensitivity results (Figure 6). As Figure 5 shows, there is an equilibrium point whenever the organisation is torn between increasing and decreasing incentives, when it is e.g., fully decentralised and aware of its distribution of reciprocal and opportunistic employees. In equilibrium, neither do employees change their work effort nor does the organisation adapt its incentive system. The sensitivity analyses portray conditions apart from equilibrium. They reveal that particularly for organisations having very reciprocal sub-groups, it is important to adapt these groups' motivational systems to employee preferences. Figure 6 demonstrates this by comparing value creation for reciprocal (left graphs) and opportunistic (right graphs) employees in their reaction to high (upper graphs) and low (bottom graphs) initial incentives. Importantly, the graphs do not represent constant monetary incentives, but show how value creation evolves over time, dependent on changing incentives. Figure 6 demonstrates how *average value creation per employee* evolves from month 0 to 120 dependent on *degrees of decentralisation* of 0 to 1 in the organisation.

The left two graphs of Figure 6 reveal that in an organisation with (70%) reciprocal employees a higher degree of decentralisation leads to higher value creation despite or because of lower variable incentives. Independent of whether the organisation starts out at low or high monetary incentives, over time, decentralised decision-makers adapt the system to employee preferences and thus achieve high value creation. A centralised decision-maker cannot equally adapt to employees' preferences. Value creation in a centralised organisation reaches a lower level due to an incentive system focused too much on variable pay that becomes increasingly inappropriate for the majority of employees.

Figure 5 Base run (see online version for colours)

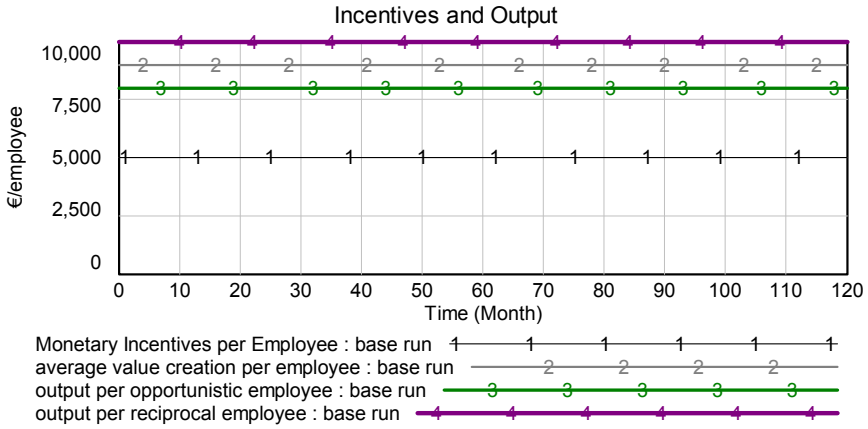


Figure 6 Model behaviour

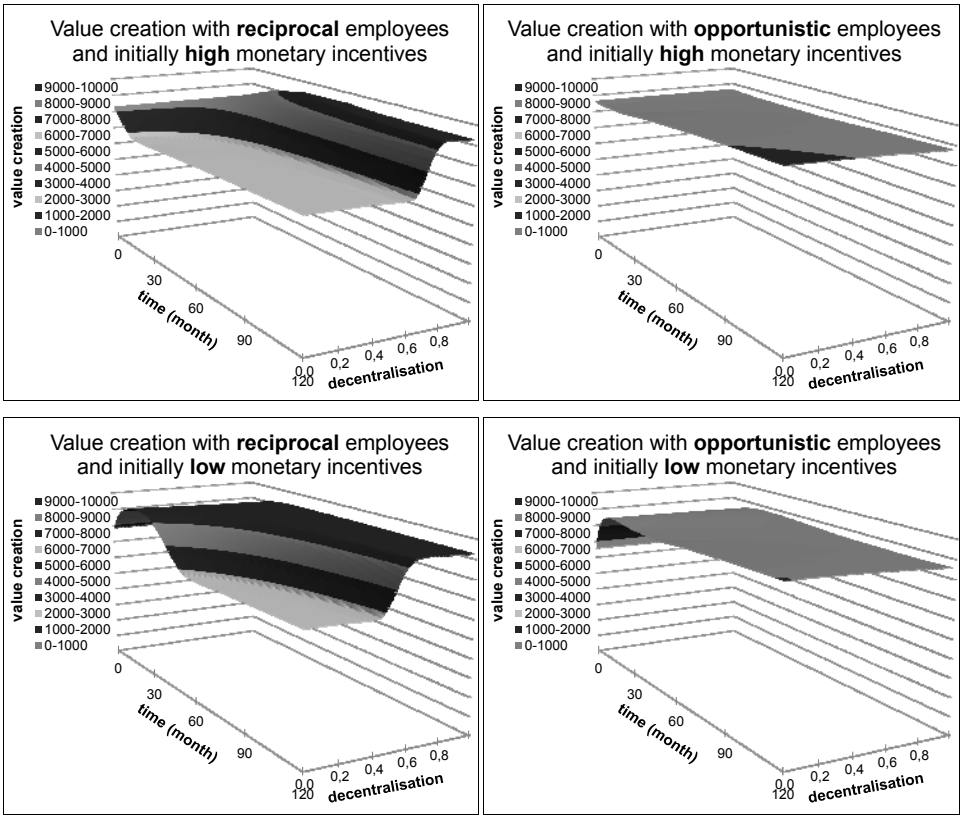
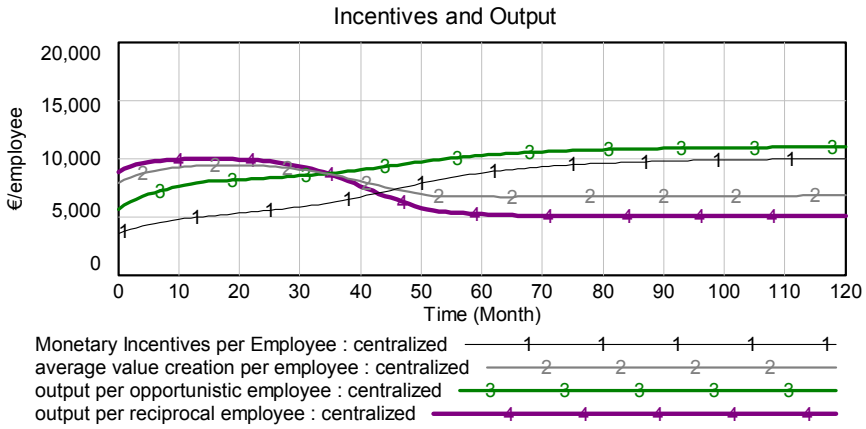


Figure 7 exemplifies the possible misfit for an organisation with a centralised decision-maker and rather reciprocal employees. If *monetary incentives* (line 1) start out low, *average value creation* (line 2) is below the desired value of 10,000 Euros. The organisation responds by increasing incentives (line 1). This raises the *output per*

reciprocal employee (line 4) to the desired level. However, the organisation continues to increase incentives as the *output per opportunistic employee* (line 3) and thus average value creation are still below 10,000 Euros. While the minority of opportunistic employees become increasingly satisfied and work better, the reciprocal employees' motivation is crowded out and their output diminishes (line 4).

Figure 7 Incentives and output (see online version for colours)



When employees are rather opportunistic (i.e. 30% reciprocal employees), decentralised decision-makers recognise their preferences and create a highly monetary incentive system that fits their preferences. Centralised decision-makers are also assumed to incite performance by high monetary incentives. In both cases, value creation is rather high, as shown in the two right graphs of Figure 6. Thus, when the organisation's response corresponds to employee preferences – by chance or knowledge – value creation is adequate. Overall, in a decentralised organisation there is better knowledge of how the sub-groups' motivational systems can be adapted to the situation. Dependent on the employees' characteristics, a centralised system, however, may freeze in a situation inefficient for the organisation and undesired by the employees.

5 Discussion and conclusions

5.1 Dynamic understanding of interactions

This paper explains the effects of decentralised decision-making regarding incentive systems and value creation in organisations. It combines research on incentives and rewards with that on reciprocity. Usually, researchers distinguish extrinsic and intrinsic motivation with respect to incentive systems, and it is established knowledge that extrinsic rewards may crowd out intrinsic motivation (Amabile, 1993; Falk, 2002; Frey and Jegen, 2001; Ryan and Deci, 2000a; Weibel et al., 2010). By including recent research on reciprocity and value creation (Bridoux et al., 2011), this work is able not only to distinguish different effects of monetary incentives per se, but captures and explains how reciprocal vs. opportunistic employees react differently to these incentives. It does so by combination of a causal structure and resulting dynamics. The causal

structure portrays a causal model of employees' reactions to incentive systems and enriches this perspective by including the organisational response to employee behaviour as well. This creates a feedback perspective that allows simulating the dynamic interaction of these two parties over time.

Drawing on the 'fixes that fail' archetype (Senge, 1994), this analysis shows why monetary incentives may have counterintuitive results among employees. It explains how decision-makers try improving a system while neglecting detrimental side-effects of their improvements. As the distance between the upper decision-making body and regular employees increases in a growing organisation, decision-makers often react by implementing incentive systems. This is based on the assumption of a goal seeking feedback structure, i.e., on the assumption that incentives increase employees' innovative performance and in particular that using incentives brings the organisation closer to its desired value creation. By correspondence to the fixes that fail archetype it could be shown that this is correct for opportunistic employees, but only partially correct for reciprocal employees. As findings in particular from experimental economics (Fehr et al., 1993) and psychology (Heyman and Ariely, 2004) indicate, reciprocal employees react positively on fixed incentives, creating the desired *goal seeking mechanism*, but they react negatively on 'too' monetary incentives (Falk, 2002; Frey and Jegen, 2001; Frey and Osterloh, 2001), creating a *reinforcing mechanism* by which incentives are driven upwards but value creation downwards. This structure explains why in some cases incentives work and why they do not achieve the desired results in other situations. The fraction of reciprocal employees determines which of the balancing and reinforcing feedback loops are particularly important. Knowledge of this structures helps making better decisions and decentralisation means better knowledge of this causal structure. This is why there is a much better fit between employee disposition and the incentive system in organisations that have reciprocal employees and are decentralised at the same time. Due to these organisations' knowledge of how incentives fall flat with certain groups of employees, decentralised decision-makers are less likely to trap into fixes that fail.

By combining causal structure with dynamic behaviour, this analysis reveals not only *that* but *how* incentive systems and employee behaviour converge or diverge over time. It helps distinguish patterns of behaviour and different equilibria that are reached by different strategies (i.e., combinations of employee reciprocity and organisational decentralisation). Linking behaviour back to a causal structure, i.e., back to goal-seeking and reinforcing mechanisms in the fixes that fail archetype as done above explains the different patterns of behaviour seen.

Sensitivity analyses that vary the organisation's degree of decentralisation show how employee reactions differ depending on organisational decisions. This reveals how the dynamics in these cases not are only depend on a fixed employee disposition, but differ in the course of time. Revealing this was only possible because of the two-sided causal structure that includes the employees' reaction to incentive systems and the organisation's modification of its incentive system. Other studies often have a psychological foundation and focus on employee characteristics, or they have an economic foundation with a focus on game theory and experiments. They are thus able to show employees favourable or unfavourable reaction to an incentive system and their decision whether to cooperate. However, this analysis adds a dynamic perspective, showing how the behaviour of an entire group of employees can evolve over time, instead on focusing on an employee's disposition or one-time decision. Overall, it can be

concluded that the evolving behaviour is determined dynamically by the employees' general disposition and by derived situational factors of the evolution of system preferences fit, giving room for managing employee behaviour in an organisation.

For managerial decision-makers, this analysis provides better understanding of the fit between managerial decisions and employee behaviour and thus of the consequences of their decisions. It creates a basis for setting incentives for innovative behaviour differently not only across departments as they may exist in larger organisations, e.g., by inciting sales people differently from people in research and development. Instead, it reveals that it may be useful to have even work groups or smaller groups in general, as they also exist in young or smaller organisations, decide on the incentive system they want to follow. By linkage to the underlying causal structure, it gives rise into the counterintuitive effects of the implementation or monetisation of incentive systems. In this way, this analysis aids recognising how different groups of employees can be targeted to achieve high value creation in each of the groups.

5.2 Contributions, limitations and future research

While there is a tendency to put in place monetary incentive systems in an organisation that grows from a young and small to a middle sized organisation, this does not hold true for every organisation. There exist exemptions that may focus on, e.g., fix pay only. In these organisations, results would inverse: While decentralisation would be particularly valuable when the majority of employees are rather opportunistic, it would still hold that decentralisation helps recognise employee preferences and helps adapt the incentive systems.

This inquiry builds on the fact that decentralised decision-makers have a better understanding of their instructed persons than a centralised organisational entity can have. Benefits that arise from this better understanding are limited by the side effects of decentralised incentive systems. E.g., Weibel et al. (2010) argue based on a meta-analytic study of the public sector that pay for performance produces hidden costs, which this analysis does not account for in great detail. While the system dynamics model captures the idea that organisational decision-makers are less willing to increase monetary incentives if these are high, future research should capture hidden costs to provide a more nuanced understanding.

In general, not all (interacting) phenomena are captured here. This study addresses motivation effects (e.g., Balliet et al., 2011) at the exclusion of differences between positive and negative reciprocity (Pereira et al., 2006) as well as at the exclusion of sorting effects (e.g., Bandiera et al., 2013; Guertzgen, 2009; Lazear, 1986, 2000) as it aims at a deeper understanding of the dynamics between incentives and motivation. An analysis of the development of interactions over time cannot portray the interaction of all variables as this is incomparably more complex. Dynamics first need to be understood ceteris paribus before in future research they can be integrated with effects from literatures on sorting (Bandiera et al., 2013; Guertzgen, 2009; Lazear, 1986, 2000), trust (Bogaert et al., 2008; Malhotra, 2004), or peer sanctioning (Bridoux et al., 2011).

Additionally, the feedback mechanisms provide a basis for investigating implementation of incentive systems, including implementation delays and costs in a more nuanced manner. The model captures costs indirectly by the organisation's diminishing willingness to increase incentives when incentives rise. Future research may

also capture delays between real and perceived value creation, different delays for increasing vs. decreasing incentives, and in particular it may investigate the effect of decentralisation on the length of these delays.

The simulation analysis conducted here at the organisational and group level, in combination with existing studies (Deci et al., 1999; Gerhart et al., 2009; Lazear, 2000), provides a sound basis for empirical investigation. This might include the observed fit between employee disposition and incentive system dependent on specific forms of monetary and non-monetary reward systems. It might also embrace the analysis of incentive systems considering organisational size and age (Shaw et al., 2002) as well as dynamics as young organisations mature and grow. Based on the dynamics presented here for sub-groups of employees, relevant within-group differences concerning performance could also be investigated at the individual level. In its current state, this paper already offers a dynamic understanding of the relationship between incentives, employee innovative performance and decentralisation, which is needed when organisations grow and incentive systems are implemented. The resulting knowledge on decentralised motivational systems can be used not only to incite output in general, but also to put in place adequate motivational systems for the generation of new ideas, innovative firm behaviour (Zoghi et al., 2010) and organisational change.

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Appendix

average value creation per employee = output per reciprocal employee * FRACTION OF RECIPROCAL EMPLOYEES + output per opportunistic employee * (1 – FRACTION OF RECIPROCAL EMPLOYEES)
Units: €/employee
Sum of group outputs. Here the model is based on the assumption that the average output per employee is known.

change in incentives = gap in value creation * weight on monetary incentives * effect of margin on incentives / TIME TO CHANGE INCENTIVES
Units: €/employee/Month
Decisions made concerning the incentive system.

DEGREE OF DECENTRALISATION = 1
Units: Dmnl
Extent to which decisions on the incentive system are made decentrally instead of centrally.

DESIRED AVERAGE VALUE CREATION PER EMPLOYEE = 10000
Units: €/employee
The organisation's performance goal.

effect of fix incentives on output of reciprocal employees = WITH LOOKUP (relative incentives, ([(0, 0)–(2, 1)], (0, 0), (0.5, 0.7), (0.6, 0.8), (0.7, 0.88), (0.8, 0.94), (0.9, 0.98), (1, 1), (2, 1)))
Units: Dmnl
Effect capturing how reciprocal employees increase their output with decreasing intensity up to a threshold as a response to rising fix monetary incentives.

effect of incentives on output of opportunistic employees = WITH LOOKUP (relative incentives, ([(0, 0) – (2, 2)], (0, 0), (1, 0.8), (2, 1.1)))
Units: Dmnl
Opportunistic employees increase their output almost linearly with rising monetary incentives. This is captured be a linear increase (Bridoux et al., 2011), representing their monetary interest, and by a less steep increase for higher incentives up to a maximum where opportunistic employees cannot increase their output any more.

effect of variable incentives on output of reciprocal employees = WITH LOOKUP (relative incentives, ([(0, 0.4) – (2, 1)], (0, 1), (1, 1), (1.1, 0.98), (1.2, 0.9), (1.4, 0.7), (1.6, 0.55), (1.8, 0.51), (2, 0.5)))
Units: Dmnl

Effect showing how displaced reciprocal employees feel in a strongly monetary incentive system. Reciprocal employees often regard the implicit message that work needs to be incited as an affront to their willingness to perform so that their intrinsic motivation is crowded out (Frey and Jegen, 2001; Frey and Osterloh, 2001).

effect of margin on incentives = (DESIRED AVERAGE VALUE CREATION PER EMPLOYEE – Monetary Incentives per Employee) / DESIRED AVERAGE VALUE CREATION PER EMPLOYEE
Units: Dmnl
This effects slows down inciting when incentives approach desired output, i.e. when the margin between incentives and output declines.

FINAL TIME = 120
Units: Month
The final time for the simulation.

FRACTION OF RECIPROCAL EMPLOYEES = 0.5
Units: Dmnl
Fraction of employees who reciprocate rather than being self-regarding.

gap in value creation = DESIRED AVERAGE VALUE CREATION PER EMPLOYEE - average value creation per employee
Units: Dmnl
Gap between output and performance goal.

INI MONETARY INCENTIVES = 5000
Units: €/employee
Amount of incentives offered at start of simulation.

INITIAL TIME = 0
Units: Month
The initial time for the simulation.

Monetary Incentives per Employee = INTEG (change in incentives, INI MONETARY INCENTIVES)
Units: €/employee
Amount of incentives offered per employee. It may include fix and variable pay offerings.

NORMAL INCENTIVES PER EMPLOYEE = 5000
Units: €/employee
Height of incentives that is considered normal by the employees. It may differ depending on the organisation, region, industry, ...

NORMAL OUTPUT = 10000
Units: €/employee
Output that employees can generate.

output per opportunistic employee = NORMAL OUTPUT * effect of incentives on output of opportunistic employees
Units: €/employee
Output generated per opportunistic employee. This value of this variable is unknown to the organisation.

output per reciprocal employee = NORMAL OUTPUT * effect of fix incentives on output of reciprocal employees * effect of variable incentives on output of reciprocal employees
Units: €/employee
Output generated per reciprocal employee. This value of this variable is unknown to the organisation.

perceived fairness of incentives = WITH LOOKUP (relative incentives, ([(0, 0) – (2, 1)], (0, 0), (0.5, 0.05), (0.7, 0.12), (0.8, 0.2), (0.9, 0.4), (0.95, 0.6), (1, 1), (2, 1)))
Units: Dmnl
Extent to which employees regard incentives as monetary fair. This variable indicates how far the payment is below the threshold when employees start considering the payment as fair.

relative incentives = Monetary Incentives per Employee / NORMAL INCENTIVES PER EMPLOYEE
Units: Dmnl
Height of incentives in comparison to what is considered normal e.g. in a particular organisation, region, industry, ...

SAVEPER = 1
Units: Month [0, ?]
The frequency with which output is stored.

TIME STEP = 0.125
Units: Month [0,?]
The time step for the simulation.

TIME TO CHANGE INCENTIVES = 6
Units: Month
Adaptation time including decision and implementation.

weight on monetary incentives = 1 – 2 * DEGREE OF DECENTRALISATION * FRACTION OF RECIPROCAL EMPLOYEES * perceived fairness of incentives
Units: Dmnl
The decision makers' inclination to react by increasing incentives. This variable can have values in the interval [–1, 1] and determines whether and how strongly decision makers react to a gap by increasing or decreasing monetary incentives, also depending on the degree of decentralisation and the fraction of reciprocal employees. Depending on degrees of reciprocity and decentralisation, there are instances when the system remains in equilibrium because the tendencies to increase and decrease incentives have equal size.