

# Incentive Life-cycles: Learning and the Division of Value in Firms

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**Tomasz Obloj<sup>1</sup> and Metin Sengul<sup>2</sup>**

## **Abstract**

In this paper, we study the individual and organizational learning mechanisms leading to the evolution of the division of value between economic actors under a given contractual arrangement. Focusing on the division of value between a firm and its employees, we theorize that following a change in the organizational incentive structure, employees learn, over time and with experience, how to be more productive under the implied objectives of the incentive regime, as well as how to game or exploit it. Results, based on outlet-level data from a Polish commercial bank over a 13-month period, show that the bank outlets' value creation (sales revenue from primary loans) and value appropriation (the sum of outlet employees' monthly bonus) both increased, at a decreasing rate, over time as outlet employees gained experience under the new incentive regime. In parallel, the bank's share (the percentage of value created by outlets retained by the bank) increased at first, then, after reaching a plateau, decreased continuously, indicating that the ability of the incentive regime to induce the intended results evolved, giving rise to an incentive life-cycle. In exploring the underlying micromechanisms, we found strong quantitative and qualitative evidence for the presence and relative paces of productive and adverse learning in bank outlets, as well as for the role of prior experience. This is the first empirical study to show that individual and organizational learning processes can influence the evolution of the division of value between economic actors.

**Keywords:** Incentives, learning, adverse learning, division of value, incentive life-cycles

A key issue in economic exchange is the division of value between actors. Each rational economic actor seeks to appropriate a higher share of the value created in the exchange: employees seek higher wages from their employers, suppliers seek higher prices, and alliance partners higher dividends. The

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<sup>1</sup> HEC Paris

<sup>2</sup> Boston College

amount of value that each actor can appropriate depends on the relative bargaining power of the actors involved (Pfeffer, 1981; Coff, 1999; Dencker, 2009) and in principle is bounded by their individual value added (Brandenburger and Stuart, 1996; Chatain and Zemsky, 2007). In ongoing, long-term relationships (e.g., employment, strategic alliances), the division of value is ultimately determined by contractual arrangements (Williamson, 2005). These contractual arrangements secure the continuity of the relationship and joint value creation. Within organizations, the corresponding arrangement is the structure of organizational incentives. As organizational incentives are concerned both with incentivizing intended actions (value creation) and specifying the conditions of value appropriation by employees (Schelling, 1956), they can be seen as an explicit contract specifying the division of value between a firm and its employees (Holmstrom and Roberts, 1998).

One common characteristic of existing work on the division of value between economic actors, including the theory of incentives, is the focus on the equilibrium division of value resulting from the bargaining process: although the division of value can change from one contractual arrangement to another, it remains static, holding the contractual arrangement constant (see, e.g., Laffont and Tirole, 1988; Holmstrom and Roberts, 1998). Focusing on the intrafirm phenomena, and following Baker (2002), by division of value within a firm, we refer to the split of the value created by employees between the firm and its employees. A multitude of factors, such as innovation or shifts in market supply and demand, can and do lead to a shift in the relative bargaining power of actors and subsequent renegotiations. These in turn result in a new contract or a new incentive regime that specifies a different division of value (Williamson, 1985; Baker, Gibbs, and Holmstrom, 1994; Dencker, 2009). Yet, as long as a contract is not changed, the actual division of value between actors is assumed to be fully determined by the terms of the current contract (Gibbons, 2010). Accordingly, an extensive body of work has focused on optimal contract design, examining the determinants, structure, and the consequences of different contract properties and designs (e.g., Williamson, 1985; Hart, 1995; Zenger and Marshall, 2000; Gibbons, 2005).

But organizations and individuals are not passive vis-à-vis their environment (Miner and Mezas, 1996; Argote et al., 2000; Benkard, 2000) and can learn how to better respond to a given incentive regime over time (Meyer and Gupta, 1994; Kaplan and Henderson, 2005; Argyres, Bercovitz, and Mayer, 2007). Once we acknowledge that employees and organizations can and do learn how to respond to a specific incentive regime over time and with experience, we cannot disregard the possibility that the effectiveness of that incentive regime as an organizational design instrument is likely to evolve, even without any external changes in the environment. This in turn has important consequences for our understanding of the antecedents as well as the consequences of contractual arrangements. Addressing this gap, and drawing on the value-based conceptualization of the firm, organizational learning literature and the theory of incentives, in this paper, we explore why and how the division of value between a firm and its employees evolves under a given incentive regime.

Under a given incentive regime, employees' ability to retain the value that they create changes over time as they learn how to be more productive under

the implied objectives of the incentive regime, as well as how to “game” or exploit it. Consequently, two concurrent learning mechanisms arise in response to a change in organizational incentives: productive learning and adverse learning. Productive learning is the process by which employees learn over time and with experience how to better and more efficiently conduct tasks induced by incentive instruments, positively contributing to organizational performance (e.g., mastering the multitasking involved in their jobs). Similarly, an organization learns over time and with experience how to best use and calibrate a given incentive regime to induce productive effort from its employees. As a result of productive learning, the effectiveness and productive use of incentives increases over time, leading to greater value creation (Adler and Clark, 1991; Ichniowski, Shaw, and Prennushi, 1997). Adverse learning, in contrast, is the process by which employees learn over time how to exploit a given incentive design for their private benefit at the expense of the organization, such as a salesman promoting high-price products at the expense of high-margin products to increase his or her total bonus based on sales volume. As a result of adverse learning, more effort is diverted over time from organizational value creation toward individual value appropriation, allowing employees to appropriate a larger proportion of the value that they create (Kerr, 1975; Chevalier and Ellison, 1997; Kreps, 1997; Frank and Obloj, 2009).

We argue that the presence and relative magnitude of productive and adverse learning, along with a fixed cost of changing the incentive regime, is likely to give rise to incentive life-cycles. Under a given incentive regime over time, the organization’s share of the total value created will follow an evolutionary trajectory. The introduction of a new incentive regime will trigger productive and adverse responses that are specific to a given set of incentives (Kreps, 1997; Lazear, 2000; Lazear and Shaw, 2007). This is because the incentive regime change alters the link between actions and outcomes, and employees need to relearn which choices of activities will be optimal for them (Kaplan and Henderson, 2005). Yet, as the relative attractiveness of productive and adverse responses to employees changes over time, the evolution of these two mechanisms will follow different trajectories: productive learning is likely to be more pronounced than adverse learning early on in the incentive life-cycle, but over time, their relative prominence should be reversed, and adverse learning should dominate productive learning. As a result, adverse responses will outweigh productive responses, and a greater proportion of the value created will be forfeited due to agency costs. Therefore, the ability of incentives to induce the intended results (typically, productive effort) should follow a concave, inverted-U shaped evolutionary trajectory, such that incentive regimes will have a life-cycle. Just as regime changes at the macro level, such as revolution and political system change, alter the division of value within societies (Olson, 1982), changes in incentive regimes alter the division of value in firms. To test our main predictions, as well as to explore the micro-mechanisms—how exactly productive and adverse learning takes place—and potential variations in the relative bargaining power over time, we studied data from all outlets of a Polish commercial bank covering the entire 13-month lifetime of an incentive regime, from its introduction until its replacement with another one.

## ORGANIZATIONAL INCENTIVES AND THE DIVISION OF VALUE IN FIRMS

The objective of every incentive regime is to create a link between employees' private benefits (e.g., compensation) and organizational objectives (Prendergast, 1999; Ethiraj and Levinthal, 2009). This link is said to be functional, in that incentives are aligned when they lead employees to make choices as to which activities to undertake and how much effort to allocate to them, choices that aim to maximize the total value for the organization as they seek to optimize their own private benefits (Baker, 2002). Consequently, incentives are aligned when the marginal effects of employees' actions toward value creation and their measured performance are correlated (Heckman, Heinrich, and Smith, 1997). A corollary to this observation is that, within organizations, the higher the incentive alignment, the more tightly coupled employees' value creation and value appropriation will be.

Here, following Baker (2002), we define the value created by employees as their contribution to the objective function of the firm and the value appropriated by employees as the amount of the created value that is retained by them. We assume, in accordance with the theory of incentives, that an employment relationship has two parties, employees, who do tasks or duties that they are incentivized to do, and a firm, which represents all other stakeholders who are not directly involved with doing the work, such as shareholders, and that the division of value between them is a zero-sum game, as value appropriated by the employees is a subset of value that they create. Thus our conceptualization of the division of value within firms parallels the notion of the division of value across firms or between firms and customers (Brandenburger and Stuart, 1996; Chatain and Zemsky, 2007). At the same time, our conceptualization is tailored toward the analysis of employment relationships, and it is broader, in that value creation could include net sales (i.e., a measure consistent with Brandenburger and Stuart's definition) as well as, for example, the number of acquired customers.

As the design of organizational incentives specifies how much and under what conditions employees will be compensated, it also determines how much of the created value will be retained by the employees. Thus the structure of organizational incentives can be seen as an explicit contract specifying the division of value between a firm and its employees (Holmstrom and Roberts, 1998). How organizational incentives are ultimately structured is largely a function of the relative bargaining power of employees vis-à-vis the firm (Pfeffer, 1981; Lambert, Larcker, and Weigelt, 1993; Sørensen, 1994; Coff, 1999). Relative bargaining positions are influenced by a multitude of factors, such as the ability to act in a unified manner, switching and replacement costs, labor market conditions, and access to information (Coff, 1999; Akerlof and Shiller, 2010). Employers seek to devise an incentive regime that will be more favorable to them, for example, in terms of lower wages, taking into account the optimal level of effort allocation by employees (Dencker, 2009). Similarly, employees (e.g., through collective bargaining) seek to devise an incentive regime that will be more favorable to them in terms of such benefits as higher wages, bonuses, and job security.

Consequently, existing work on the division of value between economic actors, including the theory of incentives, assumes that while the division of value within a firm can change from one incentive regime to another, for

example, as a result of changes in relative bargaining power, it remains static throughout the regime's lifetime (e.g., Laffont and Tirole, 1988; Holmstrom and Roberts, 1998; Baker, 2002). The "learning models" in labor economics, for example, show that better incentive alignment can only be reached by redesigning the incentive regime after finding out what individuals' type or ability is (Laffont and Tirole, 1988; Baker, Gibbs, and Holmstrom, 1994; Felli and Harris, 1996; Gibbons and Waldman, 1999). Multitasking models based on agency theory deal directly with the issue of moral hazard (i.e., employees can take self-serving decisions when their actions are not perfectly observable by their employer) but still assume a constant division of value for a given level of value created (Holmstrom and Milgrom, 1991; Holmstrom and Roberts, 1998; Prendergast, 1999; Gibbons, 2005). Similarly, in both organizational theory and strategic management, the relative division of value is assumed to be heterogeneous across individuals and/or organizational units, but, again, to be invariant within a given incentive regime over time (Azoulay and Shane, 2001; Vroom and Gimeno, 2007).

Nevertheless, the relative division of value between a firm and its employees can evolve under an incentive regime. Although incentives such as pay for performance may remove ex-post bargaining by specifying ex ante the rules governing the division of value (Holmstrom and Roberts, 1998), contracts are invariably incomplete, and every new incentive regime, by definition, introduces changes in the link between choices and actions and outcomes, both for the firm and its employees. Consequently, employees and organizations need to learn which choices about activities, attention, and effort will be optimal for them under a new incentive regime. With experience, as well as by assimilating knowledge and information from other units of their organization or from other organizations (Argote et al., 2000), both organizations and individuals gradually adapt to their environment (Argyris and Schön, 1978) and become more efficient at what they do (Adler, 1990). Such responses to changes in organizational incentives are likely to affect the trajectory of both the absolute levels of value creation and appropriation by employees and, consequently, the relative division of value between employees and the organization.

### **Evolution of Value Creation and Appropriation by Employees under a New Incentive Regime**

A key factor that affects the evolution of value creation and appropriation under a given incentive regime is productive learning, the process by which employees learn how to better and more efficiently conduct tasks induced by the incentive regime, positively contributing to organizational performance. Given that the marginal effects of employees' actions toward value creation and their measured performance tend to be correlated (Heckman, Heinrich, and Smith, 1997; Baker, 2002), productive learning contributes positively to both value creation and value appropriation by the employees. Incentive regime changes trigger productive learning because, to the extent that incentives influence the quantity and quality of effort allocation (Wiseman and Gomez-Mejia, 1998; Lazear, 2000; Lazear and Shaw, 2007), a change in the incentive regime is likely to disrupt value creation. This is mainly because "old intuitions as to what constitutes good effort are unlikely to be correct" under changed circumstances, and both "what constitutes good effort" and "appropriate measures of this

effort" have to be relearned (Kaplan and Henderson, 2005: 517). In retail banking, our empirical context, for example, a shift by the bank from incentives focusing on sales to existing clients to acquisition of new clients is likely to prompt productive learning of such actions as customer acquisition techniques or loan customization. Employees thus need to discover how, and how much, they need to direct their effort to chosen actions and objectives to optimize their individual benefits under the new incentive regime. As the organization and the employees learn how best to respond to the incentives, incentive alignment and, consequently, organizational and individual outcomes will improve.

A separate and influential factor that affects the evolution of value creation and appropriation after a change in the incentive regime is adverse learning, the process by which employees learn how to exploit a given incentive design for private benefit at the expense of the organization, thereby adversely contributing to organizational performance. A growing literature on incentive gaming shows how agents can divert their efforts to maximize their private benefits at the expense of organizational goals (Roy, 1952; Oyer, 1998; Larkin, 2007; Pierce, 2012). Effort diversion is an unwanted yet largely inevitable consequence of incentives (Prendergast, 1999; Harris and Bromiley, 2007). Employees may become more proficient over time at hiding their true effort. They can also learn how to best time and direct their effort to maximize their private benefits. At the extreme, they can even game the system either by artificially increasing their value creation—secretaries at Lincoln Electric, when compensated according to the number of typewriter strokes, took their lunch breaks in the office, continuously and randomly hitting the keyboard with one hand while they were having their lunch (Baker, 2002)—or by taking actions that may damage the firm in the long term—Sears auto-repair shops' mechanics misled car owners to authorize unnecessary repairs in order to boost their payouts (Patterson, 1992). In retail banking, such adverse behavior might consist of learning how to push and pull loans across monthly incentive cycles, how to trade loans with proximate outlets, or how to strategically offer excess discounts to some customers. Like productive learning, the ability of employees to game incentives, and therefore to create agency costs, is specific to the incentive regime. Depending on the structure and content of incentives, employees may have to game different objective functions—different tasks—as well as face different constraints. This suggests that following a change in incentives, just like employees would have to re-learn what constitutes productive effort, they would learn how to game the new incentive structure for private benefit.

Changes in these processes, however, are unlikely to happen instantaneously. The effort or quality of effort exerted by employees in response to organizational incentives changes with time and experience. Importantly, the marginal effect of productive and adverse learning on value creation and appropriation diminishes over time. Simply put, productive and adverse learning curves are concave, in line with the broad literature on learning curves and life-cycles (e.g., Miner and Mezas, 1996; Erev and Roth, 1998; Sutton and Barto, 1998; Benkard, 2000; Miller and Shamsie, 2001). This is because employees individually converge to a given set of effort allocations to optimize their private benefits (e.g., compensation), and each period, they learn a proportion of what is left to learn (e.g., Adler and Clark, 1991; Benkard, 2000). It is also possible that learning rates might diminish over time, accelerating the diminishing

marginal returns to learning (Epple, Argote, and Davedas, 1991; Reagans, Argote, and Brooks, 2005). Accordingly, under a new incentive regime, employees' value creation and, separately, value appropriation increase at a decreasing rate over time.

### Evolution of the Division of Value under a New Incentive Regime

While the presence of productive and adverse learning provides an explanation for how value creation and, separately, value appropriation evolve under a new incentive regime, our study aims to explain the evolution of the relative division of value between a firm and its employees. When the change in employees' value appropriation is proportional to the change in their value creation, for example, the relative division of the value between the firm and its employees will be unchanged, despite an increase in value appropriation by employees. But if employees divert more of the value they create over time, the organization's value appropriation, in relative terms, will decrease. Thus what incentive regime change and the ensuing learning processes imply for the relative division of value between a firm and its employees depends on the evolution of the firm's and its employees' ability to appropriate value relative to each other.

The firm's ability to appropriate value, in relative terms, will likely increase over time following an incentive regime change. This is not just because incentive regimes are purposefully designed by the organization, but mainly because organizations learn, with time and experience, how to make the new incentive regime more functional (Argyris and Schön, 1978; March, 1991). The uncertainty with respect to performance effects of certain design elements (e.g., how compensation for a certain activity will affect effort allocation by employees on other, related activities) resolves over time, like uncertainty surrounding any organizational change. The corresponding adjustments increase an incentive regime's ability to induce the intended organizational results. The process of calibration and adjustment clearly helps overall value creation and enhances the firm's ability to retain more of the value created by employees by amending the design of the incentive system and by improving managerial support and control systems. It is well established that, though minor adjustments and improvements are possible throughout the lifetime of any system, most changes and improvements to newly designed systems are mainly adopted shortly after the change implementation (Halliday, Powell, and Granfors, 1993; Baum and Singh, 1996).

Employees' ability to retain more of the value created will likely increase over time as well. This is mainly because the temporal prominence of productive and adverse actions is driven by employees' expectations about their relative costs and rewards (Holmstrom and Milgrom, 1991; Baker, 2002), and relative costs and rewards change for employees with experience. Employees will direct more of their effort along the productive or adverse dimension if and only if the expected net marginal increase in their value appropriation from productive actions exceeds that from adverse actions, or vice versa. This behavior is consistent with the "rational cheater" model of the employment relationship in labor economics (Nagin et al., 2002). With experience, employees can learn how to perform each of these tasks more efficiently. Thus the overarching learning process pertains to the role of actions and effort in outcomes (Sutton and Barto, 1998; Miller and Shamsie, 2001), with agents' learning stemming

from a general learning process wherein employees learn how to respond to a given system of incentives. Early in the life-cycle of the incentive regime, the marginal reward, adjusted for cost, for advancing along the productive learning curve is likely to be higher than that for adverse learning. Subsequently, later in the life-cycle, the cost-adjusted marginal reward for adverse responses becomes higher relative to productive responses. As a result, employees accumulate more experience along the productive dimension in the early stages after an incentive regime change and later put more emphasis on learning along the "gaming" dimension.

There are several reasons why this is the case. First, adverse learning is hampered by institutional barriers such as control systems put in place to prevent unwanted behavior (Ouchi, 1977), and the strength of these barriers is likely to be highest right after a change in the incentive regime (see Dencker, 2009). Monitoring intensity and breadth are likely to increase the costs of adverse behavior (Nagin et al., 2002). The risk of punishment (e.g., firing) should also be factored into the cost of alternatives. Clearly, these factors do not affect the returns to productive learning, as such behavior is consistent with the organization's objectives. Thus these considerations pertain only to adverse actions and therefore increase the overall cost of adverse learning compared with productive learning. Gaining knowledge of how to circumvent these is costly and requires time. For example, some observers have argued that the recent \$2 billion loss by a single trader at UBS that followed subverting the bank's control systems was only possible due to his long-accumulated experience and complex stealth strategy (BBC, 2011).

Second, the attractiveness of productive learning will be enhanced by institutional support put in place precisely to increase value creation and reduce uncertainty around productive actions. Organizations will support and help their employees in learning along this dimension, for example, through formal training or instructions (Youndt et al., 1996). Organization-wide activities that are aligned with the new incentive regime, such as customer-acquisition training programs, are also likely to decrease the cost of productive learning. Institutional support is particularly pronounced following organizational changes, such as a change in the incentive regime, because this is when the organization's intervention is most needed (Amburgey, Kelly, and Barnett, 1993). Taken together, the presence of institutional barriers and, separately, institutional support mechanisms highlight that formal organization tends to propagate productive learning and suppress adverse learning by employees, especially in the early stages of an incentive life-cycle.

Third, informal organization—the interlocking social structure that governs how people work together—facilitates both productive and adverse learning, but its facilitating effect on adverse learning lags its effect on productive learning. The relative attractiveness of both productive and adverse learning will be increased to the extent that employees can learn from each other, as such learning can substantially reduce the cost of trial and error. Following an incentive regime change, learning across employees is more likely to support productive learning early on because institutionally supported knowledge, facilitating productive learning, is likely to be exchanged through the informal network prior to the exchange of non-legitimate practices (Galinsky and Kray, 2004).



Finally, it is relatively harder to take advantage of experience gained from prior incentive regimes along the adverse dimension than on the productive dimension. The knowledge the employees bring to the task at the start from previous experience with related tasks influences what is useful and easy to learn (Lei, Hitt, and Bettis, 1996; Sutton and Barto, 1998; Gilboa and Schmeidler, 2001). Understanding the current context is important for the learning process (Bateson, 1972), and when the new context is more distinct and complex, learning and action are more likely to be decoupled (Glynn, Lant, and Milliken, 1994). Although certain transfers of knowledge across different incentive regimes will be evident for both productive and adverse learning, it will be faster, easier, and less costly to apply knowledge from prior incentive regimes for productive learning than for adverse learning. After an incentive regime change, employees need to learn both the new incentive regime *and* the associated control mechanisms in order to successfully game the system.

Taken together, the above arguments imply that there is a concave, inverted-U shaped relationship between the value appropriated by the firm as a percentage of the value created by employees and their experience under a new incentive regime. Formal organization, including organizational control systems and institutional support, promotes productive learning and suppresses adverse learning, and informal organization, including interactions with other employees, and prior experience aid both productive and adverse learning. Importantly, whereas changes in formal organization are likely to promptly follow an incentive regime change (e.g., Halliday, Powell, and Granfors, 1993; Dencker, 2009), changes in informal organization are gradual and follow the changes in formal organization with a significant lag (Nickerson and Zenger, 2002). As a result, organizational adjustment and productive learning are likely to be more pronounced than adverse learning early in the period after an incentive regime change, and the relative prominence of adverse learning increases later in the lifetime of the incentive regime. Therefore the value appropriated by a firm as a percentage of the value created by its employees is likely to first increase, reach a plateau, and then decrease over time. An incentive regime's ability to align employees' actions with organizational objectives thus has a life-cycle similar to that of products or organizational processes. Therefore we hypothesize:

**Hypothesis 1:** There is an inverted-U shaped relationship between value appropriated by an organization as a percentage of the value created by its employees and time and experience under a new organizational incentive regime.

## METHODS

We tested the proposed theory using a confidential dataset that contains detailed information on all outlets of a private retail bank operating in Poland over the entire life span of an incentive regime of the bank, a 13-month period. This dataset is exceptional and particularly well suited to testing our hypothesis for three main reasons. First and foremost, the data are longitudinal and fine-grained at the outlet level, enabling us to measure the changes in value creation and value appropriation within a firm. This is invaluable for our line of inquiry, because unlike existing empirical work on incentives that captures heterogeneity across firms and/or across different incentive regimes, we were

able to examine the changes within a given firm and under a given incentive regime over time. Second, the setting allowed us to focus on learning specific to the incentive regime (e.g., learning how to better match the objectives implied by the new incentive regime), because the bank changed the incentive system but did not introduce any new products with or during the new regime. Had the bank changed its product mix or the nature of its existing products, learning specific to the incentive regime would have been confounded with task-specific learning, such as learning how to be more efficient at selling loans. Third, the financial services industry constitutes an ideal setting in which to study the influence of incentives, as it is characterized by high-powered incentives (e.g., Hubbard and Palia, 1995; Chevalier and Ellison, 1997), which are not only likely to induce productive efforts from agents but are also likely to prompt them to try to exploit the incentive regime (Acemoglu, Kremer, and Mian, 2008). Echoing this pattern, in the bank that we studied, outlet employees received, on average, over 40 percent of their total compensation in the form of variable pay.

The bank is among the twenty largest financial institutions in Poland. As a private retail bank, it sells simple banking products such as deposit accounts and small personal loans to mass-market customers. The bank operates through a network of standardized outlets located in large- to mid-size towns and has a typical multi-unit structure. At the beginning of our observation period, in September of year 1, it had 176 outlets.<sup>1</sup> This number grew to 250 by the end of observation period, October of year 2. There were no outlet closures during the observation period. A typical outlet employed four to five salespeople, including the outlet manager.

We obtained privileged and confidential access to detailed intrafirm archival data spanning the entire 13 months of operations under an incentive regime, from its initiation in September of year 1 until the introduction of another incentive regime in October of year 2. For each outlet, the dataset contains daily loan sales data, as well as monthly data on sales targets, turnover, operating costs, and sales of other products, such as credit cards. All sales data were transformed linearly before they were given to us to assure confidentiality. Given that the data are available for the full duration of the incentive regime for all outlets of the bank, the dataset captures all longitudinal and cross-sectional variations without suffering from any sample selection bias or censoring. The final dataset contains 2,761 outlet-month observations.

We supplemented these intrafirm data with industry and region-level data from two publicly available sources. The *Situation on the Credit Market* questionnaire, published by the National Bank of Poland, surveys heads of credit committees of banks every quarter and provides aggregate information on changes in demand for personal loans. The *Regional Macroeconomic Data*, published by the Polish Statistical Institute (GUS), contains quarterly information on important macroeconomic indices, such as unemployment rate and population, at the regional level. To incorporate these data with the intrafirm dataset, we manually matched each outlet to one of the 16 administrative regions using bank outlets' addresses.

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<sup>1</sup> Due to a confidentiality agreement with the bank, we cannot reveal our exact observation period, although we can disclose that the 13-month observation period fell between 2000 and 2009.

Complementary qualitative evidence came from 21 interviews conducted by one of the authors in October and November of year 2, right after the bank replaced the focal incentive regime with a new one. Four of these interviews were with the top management of the bank, namely, the chief executive officer, and the directors of Sales, Human Resources, and Accounting. The remaining 17 interviews were with outlet managers. The semi-structured interviews, which lasted from 30 to 95 minutes, were all conducted in Polish, fully transcribed, and translated into English.

### The Structure of the Studied Incentive Regime of the Bank

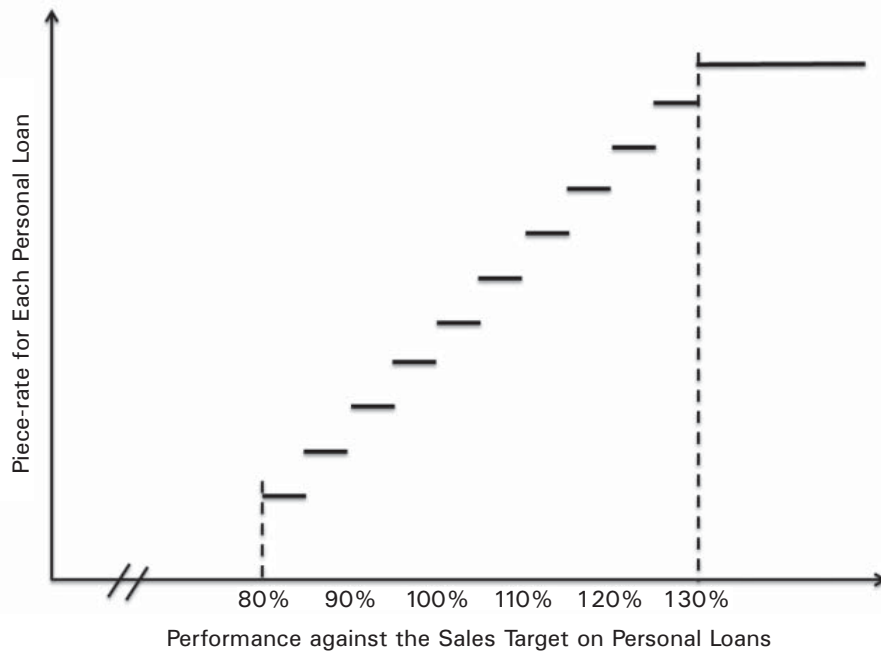
The bank that we studied sells a number of simple banking products, such as personal loans, deposit accounts, and credit cards. There are two types of personal loans that the bank offers: primary loans, loans sold to first-time customers with the bank, and secondary loans, loans sold to returning customers, typically with a positive history of repayment of their prior primary loans. According to the bank's organizational mission statement and the interviewed bank managers, the core product at the bank is, and has been, personal loans. The sales director most clearly underlined the prominence of personal loans during an interview: "What we sell are personal loans. Personal loans are where we make money. If we sell anything else, it is so that we can sell more personal loans." Personal loans corresponded to 90–92 percent of pre-tax profits during our observation period, while primary loans corresponded to 50–60 percent of total sales and 70–80 percent of pre-tax profits from personal loans.

Under the studied incentive regime, outlet employees were compensated based on their performance against a sales target. This target was based solely on primary loan sales and was centrally assigned monthly to each outlet by the bank's headquarters.<sup>2</sup> Outlet managers and employees received a "piece-rate" bonus for each primary loan sold once the outlet's sales exceeded 80 percent of the sales target. The bonus rate, graphed in figure 1, increased in a stepwise fashion (by increments of 5 percent) up to 130 percent of the sales target, after which it stayed constant. Outlet managers and employees were also given a piece-rate bonus for secondary loans (much lower, roughly 10 percent of the piece-rate bonus for primary loans), if and only if the outlet reached the sales target for primary loans. Outlet employees' piece-rates were higher (roughly double) compared with the outlet manager's but outlet employees shared their total bonus equally among themselves.<sup>3</sup>

Both the structure and the duration of the studied incentive regime are representative of other incentive regimes in the banking industry and prior and subsequent incentive regimes at the bank. Incentive designs that feature sales

<sup>2</sup> Though the connection between past performance and sales target for the next month was clear, outlet managers did not know exactly how sales targets for primary loans were set by headquarters. We found that lagged sales of primary loans, lagged sales targets for primary loans, and month dummies explained over 86 percent of the variation in sales targets for primary loans.

<sup>3</sup> Hence, conditional on meeting the sales target, an outlet manager received approximately a total compensation of  $w_m + b \times L_P + 0.1 \times b \times L_S$  and each outlet employee  $w_e + (1/N_E) (2 \times b \times L_P + 0.1 \times 2 \times b \times L_S)$ , where  $w_m$  and  $w_e$  refer to the base wage of the manager and employee, respectively,  $b$  refers to a piece rate based on the total sales volume on primary loans benchmarked against the sales target,  $L_P$  refers to the number of primary loans sold,  $L_S$  refers to the number of secondary loans sold, and  $N_E$  to number of outlet employees (excluding the manager).

**Figure 1. The structure of the studied incentive regime.**

quotas with discrete bonus echelons are the most widespread structures of sales compensation (Oyer, 2000). Even today, they are the most typical incentive plans in large U.S. firms (Murphy and Jensen, 2011). The duration of incentive plan that we studied is highly consistent with the lifetime of incentive regimes in other organizations as well. There is considerable evidence that organizations frequently (on average, every one to two years) change their incentive systems (e.g., Zoltners, Sinha, and Zoltners, 2001; WorldatWork, 2008; Watson Wyatt, 2009).

The incentive plan that we studied was preceded and followed by incentive plans that had roughly the same duration (14 and 11 months, respectively) and were similar to the focal incentive plan in essence (i.e., a variant of pay for performance, featuring sales quotas with discrete bonus echelons) but differed in the details of their structure.<sup>4</sup> A common feature of these incentive plans and accompanying organizational design elements was that, to a large extent, they eliminated potential competition and free riding within outlets. Competition within outlets, such as trying to pre-empt sales by other outlet employees, was

<sup>4</sup> The incentive plan (P-1) that preceded the plan that we studied (P) featured one sales target for the sum of all primary and secondary loans. Bonuses were based on thresholds (albeit different ones) as in the focal plan P, but contrary to plan P they were not based on a piece rate but on a percentage of the base compensation. The incentive plan (P + 1) that followed the plan that we studied (P) differed from the focal plan P in three aspects: (1) bonuses were based on total sales, including primary loans, secondary loans, and other products (e.g., credit cards, investment funds, etc.); (2) bonuses were calculated as a combination of a piece rate and a proportion of the base salary; and (3) there were periodic tournaments for prizes. These changes are fully consistent with Watson Wyatt's (2009) survey data, which indicated that most frequently observed modifications to incentive regimes across firms were changes in performance measures, performance measurement weightings, and incentive formulas.

clearly not a concern in this setting because an employee ultimately received the same bonus irrespective of the portion of loans that he or she sold individually. At the same time, given that incentives were based on team performance, each team member individually might have been better off by shirking and free-riding on others' effort. Yet the small size of outlets (on average, three to four employees) alleviated free-riding because outlet managers could effectively exert control over employees and curb free-riding. The potential free-rider problem was further diminished by the fact that the outlet manager was entitled by employment contracts given to outlet employees to lower the bonus of a given employee as he or she judged appropriate, in such cases as unethical behavior or actions detrimental to the objectives of the bank.

### Dependent Variable

To measure how the value created by an outlet is split between the firm and outlet employees, we first calculated the ratio of value appropriated by employees of an outlet to the value that the outlet created in a given month. This ratio captures the *ineffectiveness* of the incentive regime from the perspective of the bank because it increases when employees reduce their effort (value creation) without reducing their pay (value appropriation) or when employees increase their pay without increasing their effort. Hence, in line with Baker (2002) and Gibbons (2010), we assumed that the more the value created is diverted by employees, the less effective an incentive regime becomes. In our analysis, to convert our measure to a measure of *bank's share*, we subtracted the ratio of value appropriated by outlet employees to the value that the outlet created from one.

We measured *value appropriated by employees* at the outlet level by the sum of the outlet employees' monthly bonus from the sale of primary loans (i.e., personal loans sold to first-time customers) by matching actual sales figures with the structure of the studied incentive regime.<sup>5</sup> As employee pay is retained individually by employees and is contingent on their work and, frequently, on their effort, it is a straightforward and widely used measure of value appropriation by employees (e.g., Lazear, 2000). In parallel, we measured *value created by employees* of an outlet by the outlet's sales performance in primary loans, calculated as the difference between the outlet's total revenues from primary loans and the corresponding (imputed) costs of capital. While we know the exact volume of loans sold by each outlet and the interest rate at which loans were sold, the marginal cost of capital was not directly reported in the dataset we obtained from the bank. Therefore in order to assess outlet-month level profits from sales of primary loans, we calculated profitability by using

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<sup>5</sup> We only used bonuses, the variable component of pay, because due to the *Polish Personal Information Protection Act*, we could not obtain data on the magnitude of the fixed wage. This data limitation does not affect our results either quantitatively or qualitatively. The fixed component of compensation only serves the purpose of covering the opportunity cost for an employee, i.e., satisfying the participation constraint. As has been established in prior work in labor economics, a fixed wage does not affect productivity unless it is an "efficiency wage," a fixed wage that is significantly above outside labor market options (e.g., Yellen, 1984). This was clearly not the case in our setting, as the incentive regime we studied was a variant of pay-for-performance incentive plans. Furthermore, fixed wages at the bank were time-invariant because there were no changes in wages at the bank level during our period of observation.

available data. We assumed that the bank's marginal cost of loans is equal to the interest rate offered on its savings deposit accounts. Because our data on loan interest rates were disguised and rescaled by the bank, we needed the savings interest rate data on the same scale. These data were obtained through the following procedure: the bank provided data on the timing of television advertisements for its primary loans, from which we were able to trace the advertised interest rate. We took the rate offered during the first promotion in our sample period (which was in the first of the 13 months of our study) as our baseline loan interest rate, and we matched this to the interest rate offered on a deposit account during the same period. We then computed the savings interest rate scaled to our data as the product of (a) the ratio of the deposit to the loan interest rate and (b) the most frequent loan interest rate value in our data in the first month. Because the central bank's base interest rate rose during our sample period, we assumed that the bank's marginal cost did not remain constant. Therefore we allowed for the marginal cost to change in proportion to changes in the central bank's base interest rate.

In our dataset, outlet manager and employees, on average, appropriated 16 percent of their outlet's revenue, net of the cost of capital, as bonuses. On average, however, only 64 percent of the outlets were able to surpass the threshold, which was equal to 80 percent of the sales target, and obtain a bonus in a given month. Those outlets that were able to obtain a bonus appropriated 26 percent of the outlet revenue (net of the cost of capital) on average, up to a maximum of over 50 percent in extreme cases.

### Independent Variable

We hypothesized that, following a change in the incentive regime, employees would (re)learn what constitutes a good effort, both in terms of deciding which activities to execute and allocating effort to each of the selected activities, as well as how to game the system to their own advantage. We assumed that learning takes place over time and with experience. Accordingly, we measured experience under the new incentive regime by each outlet's cumulative sales of primary loans since its introduction. Cumulative sales are a good and established proxy for learning because they reflect both experience and exposure over time as well as learning by doing (see Adler and Clark, 1991, for a discussion of proxies for experience). In essence, this measure is identical to those used in prior work on organizational learning (e.g., Reagans, Argote, and Brooks, 2005; Wiersma, 2007) and experience curves (e.g., Adler and Clark, 1991; Benkard, 2000).

### Control Variables

We treated as control variables and included in our regressions several conventional factors that may explain heterogeneity in outlets' value creation and value appropriation.

**Outlet-level controls.** We controlled for *outlet turnover*, which we measured as the total number of employees who left (voluntary turnover) or were fired (involuntary turnover) as a percentage of the number of employees in the outlet in the previous month. Although the size of outlets remained more or

less stable during the observation period, the total turnover rate over the 13-month observation period was, on average, over 30 percent. It is important to control for the turnover rate because the changing mix of an outlet's workforce may affect the productivity of the outlet. On the one hand, to the extent that turnover is contingent on individual performance, higher turnover may imply the elimination of the least efficient employees, leading to higher productivity per employee (Abelson and Baysinger, 1984). On the other hand, changes in the workforce cause a loss of outlet-, location-, and customer-specific knowledge, thereby decreasing the outlet's ability to create value (Abelson and Baysinger, 1984; Argote, McEvily, and Reagans, 2003; Holtom et al., 2008).

A second, related control is *outlet manager change*, which takes the value of 1 if the outlet has a new manager, and 0 otherwise. Manager change is expected to have a negative influence on an outlet's value creation because the internal dynamics of the outlet will be reset. Outlet managers' tasks include not only selling the banking products directly themselves but also assuring—via monitoring, training, controlling, and when necessary enforcing—that employees work effectively toward achieving that objective. This is especially pertinent in this setting because outlets are small and all employees are co-located. In such small organizations, it is essential that managers establish control through direct supervision (Snell, 1992).

A third and final outlet-level control is *outlet costs*, which we measured as total centralized costs to the outlet that the outlet cannot directly control, such as the costs incurred due to a bankwide promotion and advertising campaigns. It is important to control for costs in estimating value creation and value appropriation because effort allocation and marginal returns to effort can be expected to be a function of costs (see Miller and Shamsie, 2001). Acquisition of resources and/or investments may increase the value creation of an outlet without affecting the effort allocated by the outlet's employees. For example, outlets in prime locations can be expected both to be more costly (e.g., pay higher rents) and to have access to a higher concentration of potential customers, potentially leading to higher sales.

**Region-level controls.** A principal source of heterogeneity in outlets' value creation and appropriation derives from the demand characteristics of the region in which they operate. Accordingly, drawing on the quarterly data from the Polish Statistical Institute, we included three region-level control variables. Our first control is a proxy for market size, *regional population*, which we measured as log of the number of inhabitants in thousands. Larger market size implies a larger pool of potential customers, increasing the likelihood that the outlet will be able to achieve higher sales (i.e., create more value). A second region-level control is *regional household income*, which we measured as the log of average household income in thousands of zlotys. Banks grant loans to potential borrowers based in part on their ability to repay their debt. Given that the probability of repayment increases with income level, the loan supply will be greater in regions with high income than low income. A third control is *regional inflation*, which we calculated as the percentage change in the average price of a representative basket of goods from the previous quarter. This is a potentially important control because local inflation is likely to reflect local business conditions, such as competition, and local demand for loans (Benabou,

**Table 1. Means, Standard Deviations, Bivariate Zero-order Correlations (Lower Triangle), and Bivariate within Correlations (Upper Triangle) (N = 2,503)\***

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Value created	2.26	1.11		.73	-.27	.39	.04	-.01	.30	-.08	-.07	.19
2. Value appropriated	.37	.36	.76		-.68	.18	.01	-.02	.19	-.05	-.06	.03
3. Bank's share	.84	.11	-.14	-.59		.10	.02	.03	-.02	-.06	.09	.13
4. Cumulative sales	22.74	17.53	.63	.39	.11		.05	-.02	.29	-.29	.10	.25
5. Outlet turnover (%)	.03	.17	-.01	-.02	.03	.02		.01	.03	-.01	-.02	.06
6. Outlet manager change	.02	.13	.01	-.02	.05	.00	.02		-.01	-.05	.01	.03
7. Outlet costs	.32	.11	.51	.38	.00	.40	-.03	.03		-.10	-.04	-.02
8. Regional population (log)	14.83	.49	.11	.07	.01	.05	.01	-.01	.18		-.11	-.01
9. Regional average income (log)	2.56	.35	.08	-.02	.09	.05	.01	-.02	.16	.72		-.32
10. Regional inflation (%)	.32	.37	.12	.02	.11	.19	.06	.02	.06	.00	-.05	

\* All correlations with an absolute value larger than 0.04 are significant at  $p < .05$ .

1988). Table 1 reports the sample statistics, bivariate zero-order and within correlations.

### Estimation

In choosing our estimation method, we took into consideration the cross-section and time-series nature of our data. If panel data exhibit neither outlet-specific nor time-specific heterogeneity, then the simple OLS estimation would be sufficient, and preferred. To check for individual and time effects, we ran a two-sided Breusch-Pagan Lagrange multiplier test (see Baltagi, 2001: 58–59, for a detailed explanation). All tests rejected both the null of zero outlet effects and the null for zero time (month) effects. Having found outlet and month-specific effects in our data, we then performed Hausman's specification test, which is based on the difference between the within (fixed effects) and GLS (random effects) estimators. The results indicated that using the current specification, outlet and month-level effects cannot be adequately modeled by a random-effects model ( $p < .05$  in all models). We hence focus on and report regressions with outlet and month fixed effects. Outlet fixed effects capture all time-invariant and outlet-specific factors such as outlet location (e.g., city center vs. suburban), type (e.g., stand-alone vs. kiosk), and/or visual appeal to customers. Month fixed effects capture all month-specific and outlet-invariant factors such as cyclicity (e.g., Christmas period) and/or demand shocks.

In addition to the potential problem of heteroskedasticity, a separate concern relates to potential serial correlation. In regression analysis of time-series data, serial correlation of the error terms violates the OLS assumption that the error terms are uncorrelated. Though serial correlation does not bias or affect the consistency of the coefficient estimates, the standard errors tend to be underestimated (and the t-scores overestimated) when the serial correlation of the error terms is positive (Baltagi, 2001). To validate, we checked for serial correlation in our data using the procedure proposed by Wooldridge (2002: 275), which is based on a pooled OLS regression of fixed-effects residuals on their lagged values. The test (weakly) rejected the null of zero serial correlation ( $p < .10$  in all models). The need for adjustment in the serial correlation is also



echoed by calculated Baltagi-Wu LBI (locally best invariant) statistics, which are the equivalent of the Durbin-Watson statistic for unbalanced panels (Baltagi and Wu, 1999; Baltagi, 2001). This test also (weakly) implied the presence of serial correlation with test statistics between 1.85 and 2.1 in all models (wherein values significantly below 2 imply considerable serial correlation). Hence it is necessary to establish the robustness of the results to serial correlation. Accordingly, we estimated our regression models using the Baltagi-Wu fixed effects autoregressive estimator (Baltagi and Wu, 1999), using the following specification:

$$Y_{i,t} = \alpha + \beta X_{i,t} + u_i + \lambda_t + \varepsilon_{i,t}$$

$$\varepsilon_{i,t} = \rho \varepsilon_{i,t-1} + Z_{i,t}$$

where  $i$  refers to outlet,  $t$  to month,  $Y$  to the dependent variable,  $X$  to the vector of independent and control variables,  $u$  to outlet fixed effects,  $\lambda$  to month fixed effects, and  $\varepsilon$  and  $z$  to error terms. In this method, the autocorrelation parameter  $\rho$  is estimated on demeaned data, and the estimated  $\rho$  is used to execute a Prais-Winsten transformation on each panel. After further adjusting the data, by removing the within-panel means and adding the overall mean, a pooled OLS regression is run resulting in within estimates of coefficients of  $\alpha$  and  $\beta$  corrected for serial correlation in the data.<sup>6</sup> This methodology, as expected, yielded relatively more conservative estimates (as reflected in reduction in the level of significance of some control variables). Thus, while the results were qualitatively identical to those obtained in standard two-way error components regression with fixed effects (with or without clustering the standard errors by outlet), we report regression models with the Baltagi-Wu fixed effects autoregressive estimator for all models.

## RESULTS

We hypothesized an inverted-U shaped relationship between value appropriated by an organization as a percentage of the value created by its employees and time and experience under a new organizational incentive regime. The regression results, reported in table 2, strongly support this hypothesis: the coefficient of cumulative sales is positive and significant and that of cumulative sales squared is negative and significant, as expected. Importantly, we observe an inflection point (i.e., a point at which the net effect of cumulative sales on the dependent variable turns from positive to negative) within the range of our data. Hence there is an inverted-U shaped relationship between cumulative sales (our measure of experience under a new incentive regime) and the bank's share of the total value created by outlets (our measure of the division of value between the bank and outlet employees). As graphed in figure 2a, after an outlet gains sufficient experience under an incentive regime, the marginal effect of

<sup>6</sup> Using robust clustered standard errors is recommended as an alternative method for serial correlation correction in fixed-effects panel data analysis, when no restriction can be placed on standard errors and when the time series is longer than three time periods (Stock and Watson, 2008). The results remain qualitatively unchanged when we followed this methodology. To further establish the robustness of the results, we reran all regressions including lagged dependent variables in our models. In these regressions, too, the results remained qualitatively unchanged.

**Table 2. Baltagi-Wu Fixed-effects Autoregressive Regressions Explaining Bank's Share of Value Created (N = 2,503)\***

Variable	1	2
Outlet turnover (%)	-.171 (1.015)	-.292 (1.592)
Outlet manager change	1.454** (.617)	1.461** (.599)
Outlet costs	-.053*** (.000)	-.052*** (.000)
Regional population (log)	12.218 (14.210)	7.239 (9.118)
Regional household income (log)	3.872 (3.845)	2.785 (3.312)
Regional inflation (%)	-.273 (1.450)	-.219 (1.614)
Cumulative sales		.831*** (.161)
Cumulative sales squared		-.019*** (.000)
R-squared	.33	.37
F-stat.	28.23***	32.44***
Baltagi-Wu LBI	1.97	2.04

\*  $p < .10$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$ .

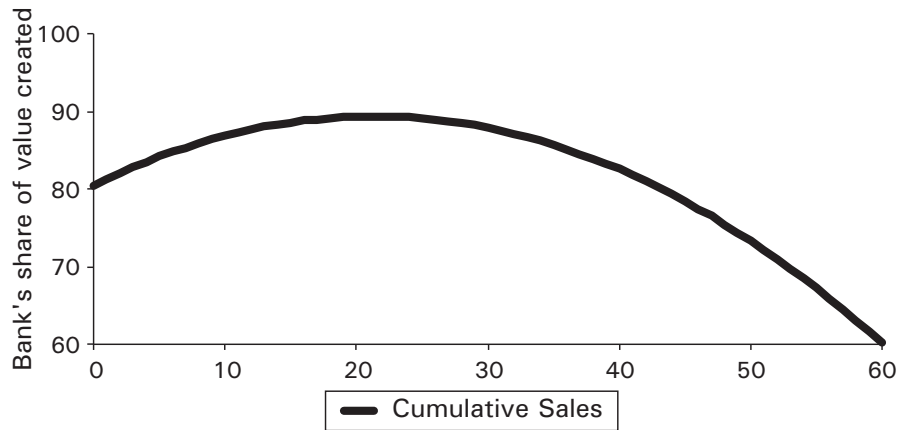
\* Standard errors are in parentheses. Constant, outlet fixed effects, and month fixed effects are included in all models.

an increase in outlet experience on the bank's ability to appropriate value is negative.

To assess the substantive significance of the results, we calculated the marginal effects on the bank's share of the total value created by outlets over time for average levels of cumulative sales for each month, focusing on table 2, model 2.<sup>7</sup> For an outlet with mean cumulative experience, the inflection point (i.e., maximum level of the bank's share of the value created) is reached around the 7th month of our observation period, around the middle of the lifetime of the studied incentive regime (the inflection point was identical for an outlet with median cumulative experience). Figure 2b graphs this effect. In month 7, employees appropriated, on average, 9 percent less of the value that they created than in the first month of the incentive regime. In the last month of the incentive regime, month 13, employees appropriated 12.5 percent more of the value that they created than in month 7. These results offer the first empirical evidence of an evolution in the division of value under an incentive regime.

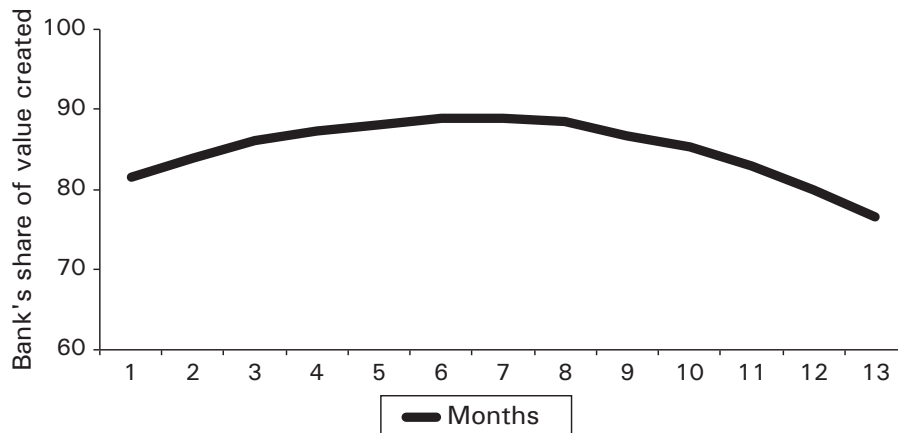
<sup>7</sup> Because the data the bank supplied were "transformed" sales values, for the substantive significance of the results, we report only the values corresponding to evolution over time, as we could not calculate the actual monetary effect of cumulative sales on our dependent variables. Given that this transformation is made by multiplying all values with the same constant (unknown to us), however, there is no bias in the results (i.e., the transformation does not affect the sign and significance of coefficients). Based on these transformed values, an average outlet's cumulative sales level was 19.5 in month 7 and 41.9 in month 13, the end of our observation period.

**Figure 2a. Evolution of the bank’s share of the value created by employees by cumulative outlet sales.\***



\* Bank’s share was calculated for mean volume of cumulative sales across all outlets based on regression results from table 2.

**Figure 2b. Evolution of the bank’s share of the value created by employees over time.\***



\* Bank’s share was calculated for mean volume of cumulative sales across all outlets based on regression results from table 2. For each month, the curve is calculated for mean volume of cumulative sales across all outlets.

The observation that the share of total value created that is appropriated by the bank increases but goes down from the seventh month onward indicates, according to our theory, that adverse responses to incentives prevailed over productive responses over time. Empirically, these micromechanisms have two testable implications: (1) the evolution of employees’ (absolute level of) value appropriation was driven by both productive and adverse learning, and (2) the productive learning curve is steeper than the adverse learning curve early on, but it also gets flatter much earlier as adverse learning continues to rise. Accordingly, we present the regression results pertaining to the evolution of absolute levels of value creation (models 1 and 2) and value appropriation (models 3 and 4) by outlets in table 3. In line with our baseline predictions, both value creation and, separately, value appropriation by outlet employees

**Table 3. Baltagi-Wu Fixed-effects Autoregressive Regressions Explaining Value Created and Value Appropriated by Outlets (N = 2503)\***

Variable	Value Created		Value Appropriated	
	1	2	3	4
Outlet turnover (%)	.002 (.089)	.029 (.090)	-.038 (.431)	.019 (.425)
Outlet manager change	-.061** (.031)	-.037** (.020)	-.289** (.133)	-.217** (.104)
Outlet costs	.003*** (.000)	.002*** (.000)	.017*** (.000)	.016*** (.000)
Regional population (log)	19.598* (10.243)	13.514 (17.877)	-26.341 (82.749)	-51.219 (83.538)
Regional household income (log)	.147*** (.039)	.117*** (.038)	.563 (.401)	.388 (.264)
Regional inflation (%)	-.199** (.094)	-.359*** (.093)	-.702* (.391)	-.894** (.429)
Cumulative sales		.191*** (.008)		.149*** (.046)
Cumulative sales squared		-.001*** (.000)		-.001*** (.000)
R-squared	.71	.75	.47	.49
F-stat.	65.03***	71.08***	32.53***	35.22***
Baltagi-Wu LBI	1.97	1.94	2.01	1.98

\* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

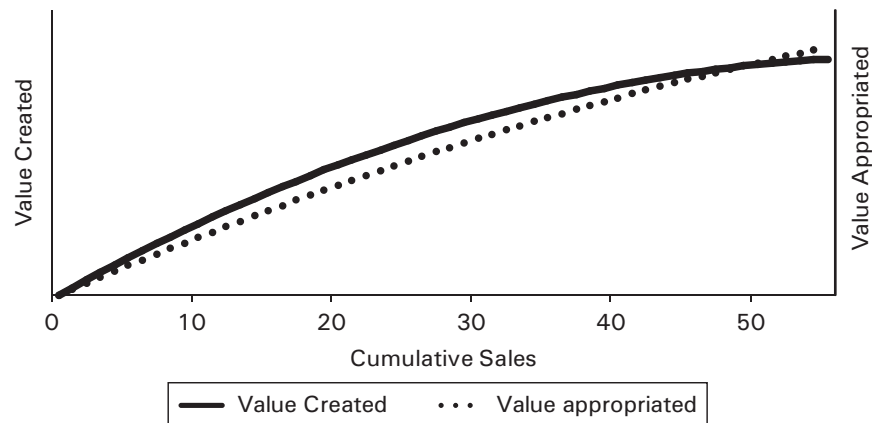
\* Standard errors are in parentheses. Constant, outlet fixed effects, and month fixed effects are included in all models. Value appropriated multiplied by 10 for comparison of coefficients.

increase, at a decreasing rate, with cumulative experience under the new organizational incentive regime, but we do not observe inflection points within the range of our data. To tease out the relative influence of value creation and incentive gaming on employees' value appropriation, in supplementary regressions, we first regressed value creation on value appropriated by employees. As expected, the coefficient of value creation was positive and highly significant. We then regressed all controls and independent variables on the residuals from the first regression. The residuals should, in principal, capture all changes on the value appropriation net of value creation. In both of these two regressions, too, the coefficient of cumulative sales was positive and significant and the coefficient of cumulative significance squared was negative and significant.<sup>8</sup> Therefore these empirical exercises imply that the changes in value appropriation by employees are driven not only by productive learning and concomitant value creation but also by other factors, including adverse learning.

We then evaluated the relative evolutionary trajectories of productive and adverse learning. As noted above, absolute levels of value creation and value appropriation by employees both increase, at a decreasing rate, with cumulative experience, without inflection points within the range of our data.

<sup>8</sup> Separately, as a further check, we included value creation as a control in models 3 and 4 of table 3. Though value creation was highly significant and positive as expected, still the coefficient of cumulative sales was positive and significant, and the coefficient of cumulative significance squared was negative and significant.

**Figure 3. Evolution of value created and value appropriated by employees by cumulative outlet sales.\***



\* Plot based on regression results from table 3.

Consequently, the net effect of cumulative experience continuously increased yet became flatter over time. When we plot the trajectories, shown in figure 3, as predicted and in line with the regression results, value created increases more steeply than the value appropriated by employees early in the incentive life-cycle. This trend is reversed in the later stages of the life-cycle.

Lastly, some brief observations are in order regarding our control variables. Outlet manager change had a significant and negative effect on value creation and value appropriation by employees and a significant and positive effect on the bank's share. The replacement of outlet managers disrupts both value creation and effort diversion by outlets. Outlet costs were also significant and signed as expected. High value-added activities have high costs, and marginal returns on effort are a function of these costs. Among region-level controls, regional inflation had a negative and significant effect on value creation and value appropriation by employees, and regional household income had a positive and significant effect on value creation. This highlights the importance of local (supply and demand-side) conditions in value creation and value appropriation in the banking industry. None of the region-level controls had a significant effect on the bank's share, indicating that local conditions affect absolute levels of value creation and value appropriation by employees but not how the created value will be shared between the bank and outlet employees.

### Robustness Checks

We conducted a set of supplementary empirical analyses using the available data to explore the robustness of the main results to a number of potential concerns: measurement of the dependent variable, measurement of the independent variable, non-linearity of the structure of the incentive plan, and changes in the external environment during our observation period. Table 4 summarizes the results.

A first concern is related to the exclusive focus on primary loans in the measurement of value creation and value appropriation, and hence the bank's share, our dependent variable.<sup>9</sup> We measured value creation by employees of

**Table 4. Summary of Robustness Checks**

Measurement of the dependent variable is based on the sales performance in primary loans	<p>The results are robust to the following:</p> <ul style="list-style-type: none"> <li>• The measurement of value creation and appropriation on primary <i>and</i> secondary loans.</li> <li>• The measurement of value creation and appropriation on revenues (instead of profits) from sales of primary and secondary loans.</li> <li>• Inclusion of the sale of other financial products (deposits accounts, credit cards, and investment funds) as control variables.</li> </ul>
Measurement of the independent variable is based on outlet's cumulative sales	The results are robust to using a time clock (i.e., a simple monthly count) as a proxy for experience under the studied incentive regime.
The structure of the incentive plan is non-linear, with discrete bonus echelons	<p>The results are robust to adding outlets' monthly sales performance against their sales target as a control, across its three different specifications:</p> <ul style="list-style-type: none"> <li>• Binary variable equal to 1 if an outlet passed the 80% threshold.</li> <li>• Continuous variable measuring the exact percentage of sales target met.</li> <li>• Continuous variable measuring the exact percentage of sales target met but takes the value of 0 if the outlet did not pass the 80% threshold and hence did not obtain a bonus.</li> </ul>
Exogenous macro-level factors can influence both the level and the evolution of value creation and appropriation within the bank	<ul style="list-style-type: none"> <li>• The incentive plan that we studied did not fall into a time period that was unique (as per macroeconomic indicators) for Poland and/or the Polish banking industry.</li> <li>• The overall perceived demand for loans in Poland was quite steady during our observation period.</li> </ul>

an outlet using the sales performance from the sale of primary loans, and value appropriation of employees using the sum of their bonuses from the sale of primary loans. These are exceptionally direct measures of value creation and value appropriation by employees, in one-to-one correspondence with our theory development and value-based conceptualization of the firm.<sup>10</sup> Still, one might be concerned that secondary loans and other financial products (namely, deposit accounts, credit cards, and investment funds), in addition to primary loans, form an integral part of value creation for bank outlets; hence not accounting for their influence undermines the multitasking nature of outlet employees' work. Accordingly, to check the robustness of the results, we ran three additional sets of regressions. First, we recalculated an outlet's value creation as the total revenues (net of the cost of capital) from the sale of primary and secondary loans, value appropriation as outlet employees' total variable pay from the sale of both primary and secondary loans, and the bank's share accordingly. Second, we recalculated an outlet's value creation as sales volume of loans sold (instead of loan sale revenues net of the cost of capital). Third, we included monthly outlet

<sup>9</sup> Note that bank's share is a ratio bounded between 0 and 1. Importantly, given that outlets cannot obtain any bonus when they do not meet their sales target, there are limit observations in our data. For dependent variables that are bounded and have limit observations, Tobit is the suggested estimation method. Accordingly, to validate the robustness of the results, we reestimated the model using (unconditional) Tobit with fixed effects for outlets and months. The results were qualitatively identical.

<sup>10</sup> Furthermore, though outlets could sell secondary loans and other financial products, the structure of the focal incentive regime as well as our interviews confirm that the sale of primary loans is the main objective of outlets and the main driver of employees' effort allocation. The regime provides no incentive for products other than personal (primary and secondary) loans. Also, the significance of secondary loans (loans sold to returning customers) for employees' compensation is relatively very low (with a piece-rate bonus of roughly 10 percent of the piece-rate bonus for primary loans) and is contingent on meeting the sales target for primary loans.

sales of all other banking products as control variables—number of deposit accounts opened, number of new credit cards issued, and total monetary value of investment funds sold. The results were qualitatively unchanged in any of these regressions, further increasing our confidence in the reported results and the measurement of our dependent variables.<sup>11</sup>

A separate concern pertains to the measurement of the independent variable. We measured experience under the new incentive regime by each outlet's cumulative sales of primary loans since its introduction. Cumulative sales are a good and established proxy for learning because they reflect both experience and exposure over time as well as learning by doing. Still, the results are qualitatively unchanged if we use the other widely used measure of learning and experience (e.g., Miller and Shamsie, 2001), namely, a time clock, measured by a simple monthly count, which takes the value of 1 for the month in which the new incentive regime was introduced, and linearly increases up to 13 in the last month before another incentive regime was introduced. Furthermore, when we included simultaneously both a time clock and cumulative sales in our models, cumulative sales outperformed time as a measure of experience. As in Adler (1990), the cumulative sales variable keeps its sign and significance, whereas the time clock variable becomes insignificant. This implies that cumulative sales capture the variance in the time clock and is a better all-around measure of experience in our setting.

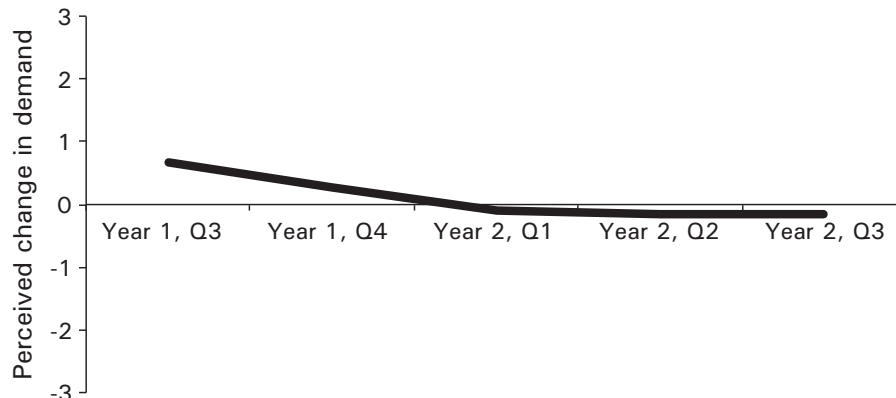
A third concern relates to the non-linear nature of the focal incentive regime. In the incentive regime we studied, the bonuses increased in 5-percent increments, starting from 80 percent of the sales target up to 130 percent. Any outlet that did not meet the sales target on a primary loan in a given month did not obtain any bonus that month. Thus linear changes in value creation could result in non-linear changes in value appropriation. To account for this property of the incentive plan in our estimation, we reran all models by adding outlets' current month performance against the sales target as a control variable in the regressions. We examined three alternative specifications: a binary variable equal to 1 if an outlet passed the 80-percent threshold, a continuous variable measuring the exact percentage of sales target met on the last day of the current month, and a third measure that recodes the second measure transformed to 0 if the outlet did not pass the 80-percent threshold and hence did not obtain a bonus. Though this variable was naturally highly significant in all models across all three specifications, the results were qualitatively unchanged.<sup>12</sup> Given the

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<sup>11</sup> Though the results were qualitatively unchanged across all three specifications, understandably they were more statistically significant when we used volume of sales (instead of net sales revenues) due to noise reduction. Whereas sales volume is a theoretically less appropriate measure of value creation, because it does not directly take into account costs or margins, it has one advantage in our dataset: the data on sales volume is less noisy than sales performance, because the latter is imputed, whereas the former is based on raw values.

<sup>12</sup> We also examined the robustness of the results to the conditional nature of the setting: outlet employees get a bonus if and only if their outlet reaches its sales target. Accordingly, we first ran a logit on reaching the sales target (coded as 1 if the outlet reaches its sales target, 0 otherwise). And, in the second stage, we reran our main model on the subsample of outlets that reached their sales target, including the inverse-Mill's ratio, lambda, calculated from the first stage as a right-hand-side variable. In both regressions, whereas lambda was insignificant, the coefficient of cumulative sales was positive and significant, and the coefficient of cumulative sales squared was negative and significant as before ( $p < .05$ ).

**Figure 4. Perceived change in demand for personal loans in Poland, compared with the previous quarter during the observation period.\***



\* Source: *Situation on the Credit Market* questionnaire, National Bank of Poland.

potential endogeneity between sales targets and our dependent variables, and that the main results are insensitive to the inclusion or exclusion of this variable, we report the results without including this measure as a control.

Yet another concern is the extent to which our analyses capture learning within the bank as opposed to exogenous macro-level trends. If our analyses mainly capture the trend of overall market demand, as opposed to intrafirm phenomena, the results would be misleading. Exogenous, macro-level factors can affect both the level and the evolution of value creation and value appropriation within firms. Yet the macro-level data reveal that this is not the case. The incentive plan that we studied did not fall into a time period that was unique for Poland and/or the Polish banking industry. Our observation period ends well before the beginning of the financial crisis that shook Europe and the rest of world. Macroeconomic data (unemployment, GDP per capita, and inflation) that we gathered from the Polish Statistical Institute (GUS) did not indicate anything unique about our observation period. There was no indication of a recession or a boom, nor did an election take place. Importantly, while we observed increasing value creation at the bank's outlets, the overall perceived demand for loans in Poland was in fact quite steady during our observation period, as shown in figure 4 (data from the *Situation on the Credit Market* questionnaire published by the National Bank of Poland). If anything, there was a downward trend.

## LEARNING MECHANISMS AND THE DIVISION OF VALUE

A baseline prediction in this paper is that learning specific to the incentive regime will take place in organizations following a change in incentive regime. Interviews with bank employees confirmed this prediction. For example, one outlet manager said "What happened [after the change] is that everyone was uncertain about how the new system will work . . . I felt as if I was starting a new job . . . I had to re-learn what and how to sell . . . I also had to figure out how to max out my bonus all over again."

Based on this baseline prediction, we introduced the concept of incentive life-cycles. The above regression results give credence to the proposed theory.



Scrupulous inclusion of control variables is meant to rule out alternative explanations, including outlet-specific characteristics, monthly shocks, or regional and economic factors, but our confidence in the observed general patterns would be higher if we could approach the learning mechanisms more directly. Thus we focus on these mechanisms below.

### Productive Learning under the Focal Incentive Regime

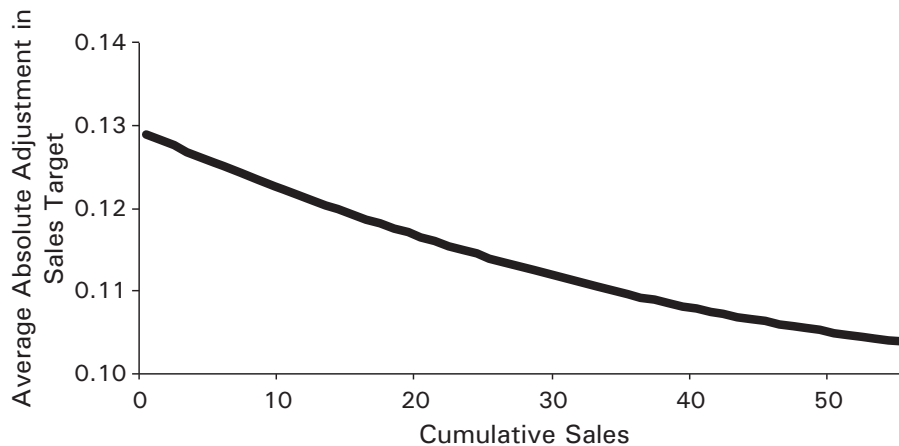
One instance of productive learning in the current context is the evolution of sales targets set by the bank and each outlet's ability to match those targets. Sales targets are central to effort allocation under the new incentive regime because employees' bonuses will depend on meeting the sales targets on primary loans that the bank sets every month for each outlet. Correctly setting these targets is important for the bank because, as highlighted by goal-setting theory, organizational outcomes tend to be enhanced when goals are challenging yet specific and attainable (Locke and Latham, 1990). If the target is set too high, outlet employees will not expect to benefit from a bonus and will not be tempted to increase their efforts. If the target is set too low, outlet employees would expect to benefit easily from bonuses and, again, not increase the level of their effort, yet would appropriate a large share of the value created. Hence, the incentive regime does not produce the desired behavior if sales targets are not set correctly. As the director of the sales department noted, "Both overshooting and undershooting are bad for business. One gets us to pay little for almost nothing, the other makes us pay too much. We work hard with our analysts to get better and better at predicting what outlets can actually sell given the economic situation."

Thus if productive learning specific to the incentive regime takes place in the current setting, one would expect that the bank would get more accurate at setting sales targets, and outlets would get better at meeting them. This is what exactly happened, according to our interviews. One outlet manager said, "Early after the introduction of the incentive regime [sales targets] used to be off by a lot. Fortunately, from time to time [the Sales Department was] underestimating our capacity, but, of course, [occasionally] they were also way above what we could sell. Now [sales targets] are actually quite accurate. One has to work hard but it's manageable."

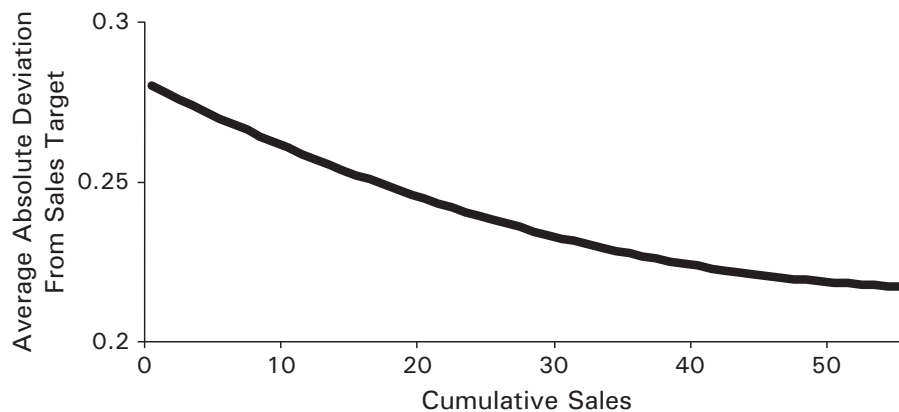
To further validate this, we regressed monthly sales-target changes (measured as the average absolute adjustment in the sales target) and, separately, deviations from sales targets (measured as the average absolute deviation of outlet sales from the sales target in a given month) on experience and control variables included in the main regressions. As expected, the bank got better at setting sales targets, and fewer adjustments were needed over time, as graphed in figure 5a. Also as expected, outlets' sales were, on average, closer to the sales target over time, as shown in figure 5b.<sup>13</sup> Thus the results are

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<sup>13</sup> The regression on performance against the sales target also checks the role of reference points (see Greve, 1998) in our setting. When, and if, the ability of incentives to drive value creation depends on their perceived prominence relative to a reference point rather than on their absolute value, models based on absolute values are underspecified. In our setting, sales targets represent performance reference points as they reflect aspirations, ability assessment, and demand forecasting of headquarters with respect to outlets. When performance against the sales target is used as a measure of value creation, none of the results changed.

**Figure 5a. Evolution of the average absolute adjustment to sales targets by the bank.\***

\* Fitted regression lines. The control variables and specification are the same as in tables 1 and 2. Outlet and month fixed effects are included. Experience is measured with cumulative sales and its square. Experience is negative and significant in the regression at  $p < .01$ . Experience squared is positive and significant in the regressions at  $p < .10$ ;  $N = 2503$ .

**Figure 5b. Evolution of the average absolute deviation of outlet sales from sales targets.\***

\* Fitted regression lines. The control variables and specification are the same as in tables 1 and 2. Outlet and month fixed effects are included. Experience is measured with cumulative sales and its square. Experience is negative and significant in the regression at  $p < .01$ . Experience squared is positive and significant in the regressions at  $p < .10$ ;  $N = 2503$ .

congruent with our expectations and interviews: incentive regime changes trigger productive learning specific to the incentive regime, both by the firm and its employees. These results also lend support to the view that value creation within firms can be seen as composite rents.<sup>14</sup>

<sup>14</sup> Value creation is akin to the notion of composite rents, rents that result from complementarity between employees and the firm in which their union produces more value than the sum of their individual inputs (Sørensen, 1994; Dencker, 2009), and value appropriated by employees is akin to the notion of simple rents that are accrued by employees, rents that result from employees' deployment of their scarce human capital (Sørensen, 1994; Lippman and Rumelt, 2003).

### Adverse Learning under the Focal Incentive Regime

As employees learn how to divert to themselves more of the value that they create, adverse responses outweigh productive responses, and a marginal increase in employees' value appropriation outweighs a marginal increase in their value creation. Consequently, as we hypothesized and showed empirically, an organization's share of the total value created by employees reaches a peak and goes down thereafter.

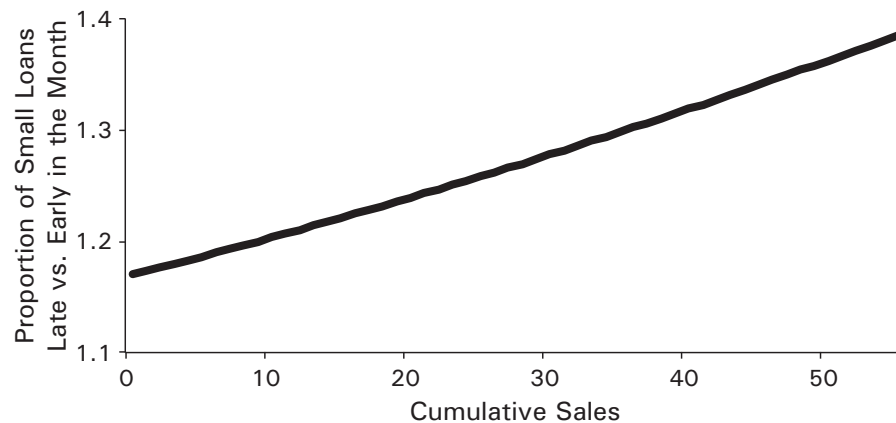
One mechanism through which outlet employees can game the incentive system and therefore shift the division of value in their favor is through delaying or "chopping" large loan requests. The structure of the incentive regime implies that it is more beneficial for employees to sell large loans early in the month and small loans late in the month. Outlet employees start getting a piece-rate bonus for each loan they sell only after their outlet's sale volume exceeds 80 percent of the sales target. Outlets would prefer to sell large loans early in the month to increase the probability that they will reach the threshold and obtain a bonus for that month. Once they reach the threshold, however, outlets would then prefer to delay large loans to the next month in order to increase their likelihood of reaching the threshold in that month. Furthermore, large loans after reaching the threshold could significantly increase the total sales volume of the outlet, consequently increasing the sales target for the following month and thereby making it harder to obtain bonus in the subsequent month(s). Thus when they have an opportunity to sell a large loan to a customer, after reaching the threshold, employees have an incentive to delay the large loan, or a part of it by "chopping" it into two, to the subsequent month. Indeed, one outlet manager noted that "the best thing that could happen to you is one big customer very early in the month. Such a customer can make up to 25 percent of the [sales target] in my outlet. You don't have to worry that there'd be no bonus. At the same time, such a customer is a nightmare if he shows up on the 30th [day of the month]."

Neither delaying nor chopping is beneficial for the bank. Delaying is risky because there is no guarantee that the customer seeking a loan will still need the loan *and* will come back to an outlet of the bank (rather than to another bank) the next month. The same applies to the "chopped" loans. Furthermore, chopping incurs additional transaction costs as each loan-giving procedure involves fixed per-contract fees. Either way, to convince the customer to come back, the outlet might need to give a deeper discount than it normally would to the initial request. Even if we assume there are no transaction costs, intertemporal demand uncertainty, or unnecessary discounting, delaying or chopping are still detrimental to the bank as they increase the bonuses of outlet employees without increasing their value creation.

Although we cannot observe in our data whether outlets actually delay a large loan application from one month to another, we can examine the distribution of loan sizes within a given month and how it evolves over the observation period.<sup>15</sup> The data pattern revealed that outlets sell more small loans late in the

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<sup>15</sup> In the dataset we obtained from the bank, loan sizes are coded into a rank-ordered categorical variable, which takes the value of 1 for the smallest loans and 5 for the largest loans. Using this variable, we first created a dummy variable which takes the value of 1 if the loan is small (i.e., categorical loan-size variable is 1 or 2) and 0 otherwise. The results are not sensitive to an alternative specification, in which small loans are assumed to correspond to values 1, 2, or 3 of the categorical loan-size variable. Then we calculated the number of small loans as a percentage of the total number of loans sold by a given outlet in the first half the month and, separately, in the second half of the month.

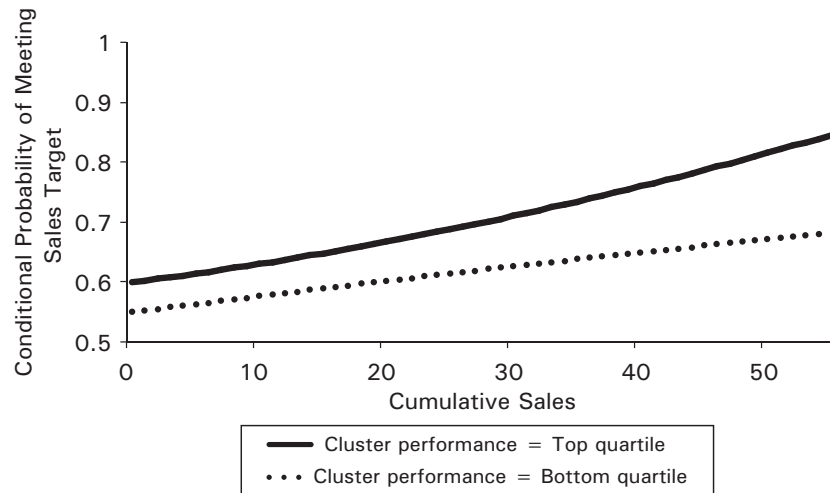
**Figure 6a. Proportion of small loans sold late in the month compared with early in the month.\***

\* Fitted regression line. The control variables and specification are the same as in tables 2 and 3. Outlet and month fixed effects are included. Experience is measured with cumulative sales and its square. Experience is positive and significant in the regression at  $p < .01$ . Experience squared is positive and significant in the regression at  $p < .05$ ;  $N = 2503$ .

month than they do early in the month, as expected. On average, small loans represent 40 percent of the total loans sold by an outlet in the first half of the month and 44 percent in the second half of the month. The ratio of the small loan share late in a month to early in the same month, on average, was 1.10 (44% / 40%), but it steadily increased from 1.05 from the first month under the new incentive regime to 1.16 in the last month of the 13-month observation period. To further validate this finding, we regressed the ratio on the full set of control and independent variables included in the main regressions. The results, graphed in figure 6a, showed a statistically significant linear increase in an outlet's emphasis on small loans later in the month over time. Although some demand characteristics might explain why large loans are more likely earlier in the month than later in the month, there is no reason to expect that the emphasis on small loans late in the month (relative to early in the month) would increase during the lifetime of the incentive regime, except for outlet employees' adverse learning in the form of delaying or chopping loans. Therefore these results give credence to the qualitative evidence that emerged from our interviews that outlets can and do game the incentive regime by delaying or chopping loans. Importantly for our theoretical framework, gaming becomes more pronounced over time as outlets get better at sizing and timing loan requests for their own benefit.

Another incentive gaming tactic is trading customers across outlets. When an outlet reaches its sales target, and hence obtains the right to a bonus for a given month, it may direct a loan request to another outlet that has not yet achieved its sales target. Though in principle outlets can trade customers with any other outlet of the bank (and even with outlets of other banks), trading is more likely between sister outlets that are in close geographical proximity. Not only is it easier to direct the applicant to a nearby outlet, but it is also easier to coordinate with those in close proximity. This tendency was confirmed by one outlet manager we interviewed: "A friend is running another outlet in the

**Figure 6b. Conditional probability of meeting the sales target as a function of cluster performance and cumulative sales.\***



\* Fitted fixed effects logistic regression line. The control variables are the same as in tables 2 and 3. Outlet and month fixed effects are included. Experience is measured with cumulative sales variable and its square. Interaction of cumulative experience squared and cluster performance is positive and significant at  $p < .05$ ;  $N = 1443$ .

vicinity. We have worked out a deal recently. If I'm over my target and a big client walks in, I'll drive him to my friend's."

The main expectation in this form of intrafirm-interunit collusion is reciprocity: if the focal outlet cannot meet the sales target in the future, it can rely on its sister outlet to channel some loan requests in return to help it reach the target. Although this practice will not increase value creation—and may even decrease value creation, as there is always a non-zero probability that customers will not buy the loan from the outlet that they were rerouted to—it clearly diverts value from the bank to the outlets because, for the same level of value creation, more outlets will obtain a bonus. Thus the alignment between outlet employees' value creation and their value appropriation will be weaker.

To validate the prevalence of this gaming tactic, we would ideally track which outlet an applicant first visited and by which outlet the loan was granted. Given the unavailability of corresponding data, however, we examined clusters of geographically proximate outlets.<sup>16</sup> Specifically, we estimated the probability that an outlet would meet its sales target as a function of the performance of other outlets in the same cluster (which we proxy by the ratio of all outlets in the cluster that meet their sales target), along with the full set of independent and control variables included in the main regressions. Controlling for shared demand characteristics (and shocks), cluster performance will be associated with a given outlet's performance if, and only if, there is cluster-specific productive and/or adverse learning. The results, graphed in figure 6b, show that the probability of an outlet meeting its sales target increases according to the performance of outlets in its vicinity. Importantly, the impact of cluster

<sup>16</sup> We assume that outlets can trade customers with other outlets within 10km. By this logic, and leaving out geographically isolated outlets, we obtained a subsample of 140 outlets located in 36 geographical clusters.

performance on the focal outlet's performance increased over time and was significantly more pronounced when the overall cluster performance was higher (and hence cluster members were more able to trade customers). Though these indirect results should be considered as indicative, they, along with the qualitative evidence, suggest that outlets can and do game the incentive regime by trading customers and that they resort to this tactic more frequently over time.

Finally, it is also possible that adverse learning leads not only to the transfer of value from the bank to outlet employees but also to the destruction of value. As the recent financial crisis reminds us, in the context of the banking industry in general, and the sale of personal loans in particular, such destruction of value could occur if outlets disregard the creditworthiness of customers and extend loans even to high-risk customers to increase their monthly sales volume and subsequent bonus. When and if this is the case, the sale of such loans will destroy value in the long run, even though they would appear to create value in the short run, because the default rate will likely increase. Unfortunately, we are not able to fully account for such a possibility because we do not have data on the over-time performance of individual loans and whether an individual loan defaults or not.<sup>17</sup> Still, pending further research, several characteristics of our research setting indicate that potential value destruction was not highly salient. Unlike mortgage loans, the personal loans that we studied are of relatively short maturity, with a pay-back period rarely exceeding 10 months. They are therefore significantly less likely to give rise to the problem of moral hazard. Furthermore, outlets have little discretion, whereas the bank's headquarters exercises an instantaneous and high level of control over granting loans to "risky" customers. The bank operates via an automated system, in which the creditworthiness of each customer is automatically assessed, and all loans categorized as risky are directly sent for approval to the bank's risk department. Therefore outlets have relatively little discretion over the risk of their portfolio of loans. Reflecting these observations, the mean "good" loan rate is over 92 percent, with a standard deviation of just 7 percent across outlets and of less than 3 percent within outlets and across time.

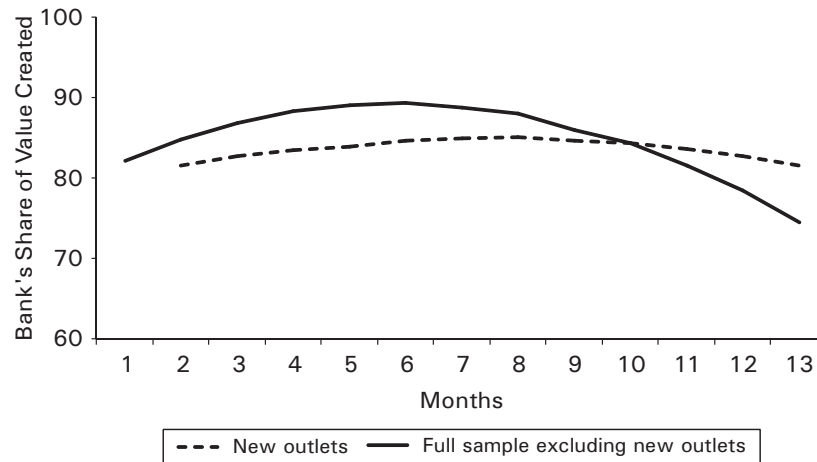
### **Prior Experience and Productive and Adverse Learning under the Focal Incentive Regime**

The absolute and relative pace of productive and adverse learning under a new incentive regime, as we mentioned earlier, could also be influenced by the extent to which the new regime introduces a new context, compared with the preceding regimes. In general, when the new context is more distant, learning and action are more likely to be decoupled. The expertise that employees bring to the task draws on their prior experience with related tasks and affects how they learn. In particular, when the new incentive regime is highly similar to a prior incentive regime, employees can directly draw on their prior experience, both productive and adverse.

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<sup>17</sup> This data limitation noted, the possibility of value-destroying activities does not bias our results. Value-destroying activities are a subclass of adverse learning and are likely to be reflected on the left-hand side, rather than the right-hand side of our regressions. Simply put, the fact that we do not directly account for value-destroying activities does not introduce an omitted variable bias in our regressions.

**Figure 7. Evolution of the bank's share of the value created by employees over time by outlet longevity.\***



\* Bank's share was calculated for mean volume of cumulative sales across all outlets for each subsample based on the model specification from table 2. For each month, the curve is calculated for mean volume of cumulative sales across all outlets. New outlets are defined as outlets that were created in month 2 or later of the observation period.

To validate this idea, we assessed the aggregate effect of prior experience on the incentive life-cycle trajectory using available data. As we mentioned earlier, a small subsample of our outlets joined the panel during the duration of the studied incentive regime. We do not have information on whether employees of these outlets were transferred from already existing outlets or were drawn from the external labor market. As a result, we simply assume that, on average, these outlets will have less prior industry and bank-specific experience than more established outlets.<sup>18</sup> If and when this is the case, new outlets should be expected to learn productively and adversely at a slower rate than established outlets that can more easily draw on their prior experience, and this is what we found. We reran the regressions reported in table 2, splitting our sample into two subsamples: 74 outlets that were opened during our observation period and the remaining outlets that were already open at the beginning of our observation period. Though we still observed a statistically significant presence of incentive life-cycles in both subsamples, as shown in figure 7, the life-cycle curve for new outlets is much flatter, indicating that they learn at a significantly slower rate how to be more productive as well as how to game incentives. These results give credence to the importance of prior experience in learning processes. Table 5 summarizes the empirical findings on learning mechanisms.

<sup>18</sup> This assumption is further validated by the following thought experiment: if new outlets were mostly staffed through the internal labor market, then we would see high turnover in the outlets neighboring the newly opened one. We did not find evidence of such an empirical pattern.

**Table 5. Summary of Empirical Findings Pertaining to Learning Mechanisms**


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<i>Productive learning</i>	
Adjustments to sales targets	Over time and with experience, the bank got better at setting sales targets and fewer adjustments were needed.
Ability to meet sales targets	Over time and with experience, outlets got better at meeting their sales target and the deviation of their sales from the sales target got narrower.
<i>Adverse learning</i>	
Loan "chopping"	Carrying loans to the subsequent month either by delaying or chopping loans, once the sales target is met, optimizes bonuses. Outlets sold proportionally more small loans late in the month over time and with experience, indicating increasing loan chopping.
Loan "trading"	Trading loans across outlets to meet their sales target and reciprocation over time optimizes bonuses. The probability of an outlet meeting its sales target increased with the performance of outlets in its vicinity and this link got stronger over time and with experience, indicating loan trading.
"Bad" loans	Extending loans to high-risk customers optimizes bonuses in the short run but due to high default rates such 'bad' loans destroy value in the long run. Relatively short maturity of loans and obligatory headquarter approval make bad loans unlikely, with 'good' loan rates consistently over 92 percent.
<i>Prior experience</i>	
New vs. old outlets	Prior experience helps outlets to learn faster both productive and adverse responses to a new incentive regime. Learning curves for established outlets were much steeper than learning curves for joining outlets.

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### Temporal Changes in Relative Bargaining Power under the Focal Incentive Regime

In the preceding analysis, we treated the structure of an incentive design as an outcome of bargaining processes between a firm and its employees. Therefore we have so far implicitly assumed that the relative bargaining power of employees vis-à-vis the firm does not change under a given incentive regime. Incentive regimes such as pay for performance specify ex ante the rules governing the division of value and hence may remove ex-post bargaining (Holmstrom and Roberts, 1998). Yet, to the extent that ex-post bargaining is possible, changes in relative bargaining power can lead to changes in the division of value even under a given incentive regime. In fact, there is some evidence that bargaining power can shift, even holding incentive design constant (Dencker, 2009). Thus temporal variations in the relative bargaining power of a firm and its employees potentially offer a complementary mechanism to the one offered in this study for shifts in the division of value under a given incentive regime.

Temporal variations in relative bargaining power in an employment relationship may come mainly from changes in two factors: the firm's ability to monitor its employees and the firm's dependence on its employees (Dencker, 2009). A firm's ability to monitor its employees has a strong influence on the division of value, because increased monitoring is likely to result not only in more effort (Fama, 1980) but also in less adverse behavior (Nagin et al., 2002). Though the intensity of monitoring is likely to be positively correlated with a firm's share in the total value created, beyond a certain point, as monitoring costs become excessive, it is also likely to be negatively correlated with the absolute level of value created (Tosi and Gomez-Mejia, 1994). In terms of temporal variation in



monitoring intensity, Dencker (2009) argued that the monitoring rate and the firm's resulting bargaining power is likely to be highest early after a change in incentive regimes. Consequently, such a pattern would result in an increase of the slope of the incentive life-cycle trajectory in its early stages. In general, increased monitoring will decrease the share of the value appropriated by employees.

A second factor affecting the relative bargaining power of economic actors is the dependence of one side of the transaction on the other side. Bidwell and Fernandez-Mateo (2010), for example, showed in the context of the staffing sector, that as the dependence of sellers on brokers increases, brokers are able to capture an increasing percentage of the margins. Within firms, changes in labor market conditions are likely to affect the relative division of value (Lambert, Larcker, and Weigelt, 1993; Sørensen, 1994). Changes in relative bargaining power stemming from external labor market opportunities and the probability of layoffs are also likely to affect the type and intensity of incentives used by firms (Dencker, 2009). In terms of temporal variation, changes in the incentive regimes are commonly linked to organizational restructuring, when the threat of termination is also likely to be highest. Similar to the problem of monitoring intensity, such a pattern would result in increasing the slope of the incentive life-cycle trajectory. In general, as the bargaining power of the firm over its employees increases, the increased threat of termination of employment will decrease the share of the value appropriated by employees.

Our setting was characterized by the greater bargaining power of the bank relative to employees. Intense monitoring of outlets was a salient characteristic of the working relationship in the bank. In a survey that we conducted among outlet managers three months after the end of our observation period, 89 percent mentioned that their outlet was monitored daily and another 8 percent weekly. When questioned as to what extent they felt they were being monitored, 91 percent indicated high or very high monitoring, and none indicated low or very low monitoring. Furthermore, employees were dependent on the bank for their work rather than the other way around. With a high unemployment rate in Poland at the time, the labor market was particularly tight for the bank's employees. Only 3 percent of our survey respondents reported that it would be easy or very easy for them to find a similar job. Moreover, the average base wage at the bank we studied was low, and contingent pay in the form of bonuses was highly salient, at 40 percent of the employee's total income on average, indicating high bargaining power on part of the bank (Dencker, 2009). Still, only 2 percent of the respondents reported that they were looking for a new job, and 79 percent said that it was very likely that they would be working at the bank in a year from the time of the survey.

We also considered possible temporal changes in relative bargaining power. To the best of our knowledge, and according to the available data, there was no temporal variation in the bargaining power of the bank and its employees relative to each other during the incentive regime that we studied. Our in-situ observations and our interviews did not point to any changes in monitoring practices or in labor market dependence under the incentive system. Macroeconomic data (unemployment, GDP per capita, and inflation) from the Polish Statistical Institute (GUS) did not indicate any drastic changes in the external labor market or macroeconomic conditions in Poland. Unfortunately, given data limitations, we cannot directly examine the evolution of the relative

bargaining power under the studied incentive regime. To the extent that there were temporal variations in relative bargaining power, we would have expected to see, for example, an increase in the bank's share of the total value created in response to an increase in monitoring frequency (e.g., from monthly to weekly) or intensity (e.g., from low to high).

Still, in an attempt to unpack the role of temporal variations in relative bargaining power on the evolution of the division of value with the data we had, we tried to infer any such variation from potential outcomes of the bargaining process. Given that there was no change in wages, we focused on potential bargaining over sales targets because it was the only remaining choice parameter that could have systematically affected the bonuses of employees. In the bank we studied, the process of setting sales targets was highly centralized—outlet employees have virtually no say in this matter—and there was no bargaining over sales targets. In the survey we conducted, 85 percent of outlet managers either disagreed or strongly disagreed with the following statement: "The bank informs me about how the sales plan for my unit is constructed." Even more strikingly, 97 percent of the managers responded negatively to the statement, "My sales target depends on my suggestions." These results also concur with our interviews with the outlet managers, who consistently stated that they had no influence on sales targets. One of the managers described the process of setting sales targets as follows: "On the last day of a month I receive a sales target for the next month from headquarters. Period. There is no discussion about how large it is." Another manager mentioned her experience with trying to bargain down the sales targets: "The sales target for next month arrives in an email. Even if I wanted to contest it, I'd have to go all the way up to the sales director. I tried a couple of times but it didn't work at all." These interviews indicate that not only was the algorithm for setting the sales target a closely guarded secret but there was no bargaining involved in this process.

## DISCUSSION AND CONCLUSIONS

In this paper, we theorized about how the division of value in firms evolves under a given incentive regime. We argued that of the total value created, the share appropriated by the organization follows an evolutionary trajectory over time, giving rise to incentive life-cycles. The results of our analysis give credence to the theory. Subsequent to the introduction of a new incentive regime, the bank's share of the total value created increased at a decreasing rate, and, after an inflection point, decreased over time and with experience. The results and supplementary analysis imply that, as we hypothesized, organizational incentives trigger two distinct learning mechanisms, namely, productive and adverse learning, and that the relative prominence of these learning mechanisms changes over the lifetime of an incentive regime.

Consistent with the productive learning mechanism, we found that, over time and with experience, the bank got better at setting sales targets and fewer adjustments were needed, and outlets got better at meeting their sales targets and the deviation of their sales from the sales targets decreased. Consistent with the adverse learning mechanism, over time and with experience, outlets sold proportionally more small loans late in the month, indicating increasing loan "chopping," and the probability of an outlet meeting its sales

target increased with the performance of outlets in its vicinity, indicating loan "trading." Neither of these two practices benefited the bank but potentially resulted in higher bonuses for outlet employees. We also found that prior experience helped outlets to learn faster both productive and adverse responses to a new incentive regime.

To be sure, the life-cycle pattern that we depict and document represents a general, and not a universal, trajectory. We assumed in our theory, echoing the theory of incentives (Gibbons, 2005), that incentives of employees and the firm are imperfectly aligned. This mirrors a common assumption in the contracting literature that effort is imperfectly observable and the contract for total value creation is not perfectly enforceable. Overall, this is a realistic assumption, as incentives are imperfectly aligned in almost all cases including asymmetric information and separation of ownership and control (e.g., Williamson, 2005). We acknowledge that for sufficiently low initial differences in relative cost and uncertainty between productive and adverse behaviors, or for sufficiently high attractiveness of gaming and lack of monitoring, incentive life-cycles might follow a different trajectory than the one we hypothesized.

We also assumed that the relative bargaining power of employees vis-à-vis the firm does not change under a given incentive regime. Incentive regimes such as pay for performance specify ex ante the rules governing the division of value and hence may remove ex-post bargaining (Holmstrom and Roberts, 1998). Yet, to the extent that ex-post bargaining is possible, changes in relative bargaining power can lead to changes in the division of value even under a given incentive regime. Although in our context, characterized by a stable high monitoring rate and tight labor market, this was not the case, we acknowledge that in other contexts or organizations, bargaining over dynamic threshold levels could affect the life-cycle trajectory.

### Contributions and Future Research

The presence of incentive life-cycles has profound implications for the dynamics of value creation and value appropriation in organizations. It implies that these two constructs co-evolve along the life-cycle trajectory of organizational incentives. We complement existing literature on the value-based conceptualization of the firm (e.g., Brandenburger and Stuart, 1996) and the theory of incentives (e.g., Holmstrom and Milgrom, 1991) by showing how and why the division of value can evolve under a given contractual arrangement. In particular, we focus on learning in response to organizational incentives, an important out-of-equilibrium process that accounts for the evolution of division of value. We therefore move away from the dominant focus on the pure efficiency of contractual relations and explicitly analyze the micro foundations of the determinants of value creation and value appropriation in firms.

Additionally, our study contributes to the extant literature on individual and organizational learning by establishing a link between learning mechanisms and organizational incentives. Learning has been shown to influence a multitude of organizational outcomes, including productivity (Benkard, 2000), innovation (Katila and Chen, 2008), improvisation (Weick, 1993), organizational errors (Haunschild and Sullivan, 2002), acquisition patterns (Baum, Li, and Usher, 2000), decoupling of policies and practice (Westphal and Zajac, 2001), performance reliability (Sørensen, 2002), and even organizational survival (Henderson

and Stern, 2004). We show that changes to organizational incentives trigger incentive-regime-specific learning mechanisms that can be distinctly categorized as either productive (increasing value creation) or adverse (increasing value diversion by employees) from the point of view of the firm, and that the evolution of productive and adverse learning influences the division of value in organizations. To our knowledge, this is the first paper that demonstrates the influence of both productive and adverse learning on organizational outcomes.

Our findings also help explain and predict changes in organizational incentives. There is considerable anecdotal evidence that organizations frequently (on average, every two years or more frequently) change their incentive systems (e.g., Zoltners, Sinha, and Zoltners, 2001; WorldatWork, 2008; Watson Wyatt, 2009). Importantly, 82 percent of the respondents to the WorldatWork (2008) survey indicated that incentive alignment was a major driver of incentive system change in their organizations. Such a high frequency of incentive regime change is rather unexpected (at least theoretically), given the fixed costs of regime change, including coordination costs, implementation costs, communication costs, or costs due to uncertainty surrounding the change (Kaplan and Henderson, 2005), and given that organizational changes are associated not only with positive organizational consequences—such as overcoming inertia, but also with negative organizational consequences—disrupting organizational processes and thereby putting organizations at risk (Amburgey, Kelly, and Barnett, 1993).

One existing explanation, based on a contingency view, is that organizations continuously design incentive plans that better fit their current objectives and environmental conditions: as organizational objectives and external forces evolve over time, incentive regimes must be changed as well (Meyer and Gupta, 1994; Ethiraj and Levinthal, 2009). In this paper, we combine this reasoning with an alternative explanation laid out by Nickerson and Zenger (2002): organizational change can arise endogenously. They argued that organizations can capture efficiency by modulating between and among discreet organizational designs. In our framework, changes to incentives occur because any given structure can trigger learning mechanisms that decrease the effectiveness of the incentive regime over time. The ability of an incentive regime to induce intended consequences decreases over time because employees get better at gaming the regime. Hence, organizations change their incentive regimes to reset the adverse learning clock as they learn about the magnitude and costs of such adverse actions. Though we cannot rule out with certainty that improving the efficiency of the incentive design was a motive for the change, our results and interviews give credence to this alternative explanation. The bank's sales director, who was the bank executive responsible for the design of the incentive plans, was very explicit about the role of adverse learning in changes in incentive plans. He noted during one of the interviews that "[Outlet managers and employees] all try to game the system. Fortunately it takes them time to figure out how to do it. In fact, as soon as I realize that they have figured out how to game, I start to think about the new structure of incentives."

Finally, our paper's contribution extends to the literature on the consequences of opportunistic behavior. Fear of opportunistic behavior (and its mitigation) has important consequences for contract design and may reduce value creation in an economic exchange (Williamson, 1985; McAfee and Schwartz,

1994). Though opportunism has long been acknowledged as a key determinant of the design, duration, and cost of contracts in institutional economics, few studies have directly examined how opportunistic behavior actually affects the division of value between economic actors. We contribute to this literature by analyzing how incentive gaming, an instance of opportunistic behavior, may evolve over time, leading to shifts in the relative division of value among the contracting parties. We approach opportunistic behavior, in the form of incentive gaming, as a skill that can be learned, not as a behavioral trait, and examine how, holding the contract design constant, it can influence the division of value among contracting parties.

The co-evolution of value creation and value appropriation in organizations, as we documented, highlight the importance of taking into account history, actors' heterogeneity, and learning mechanisms when evaluating optimal organizational designs. As Siggelkow and Rivkin (2009) argued, coupled search processes may obscure the relationship between high-level organizational choices (such as design of incentives) and performance. Our results fully concur with this prediction. We hope that the findings presented here will spur future research on some of the unresolved issues in the literature, such as the lower-than-expected accordance of theoretical predictions with empirical patterns of organizational design, or moderators of organizational and individual learning processes, such as the heterogeneity of actors or elements of organizational design, in the study of how value between economic actors is divided.

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**Authors' Biographies**

**Tomasz Obloj** is an assistant professor in the Strategy and Business Policy Department at HEC Paris, 1 rue de la Libération, 78351 Jouy-en-Josas, France (e-mail: [obloj@hec.fr](mailto:obloj@hec.fr)). His research interests center around organizational design, incentives, value-based approach, and theories of learning. He received his Ph.D. in strategy from INSEAD.

**Metin Sengul** is an assistant professor at Boston College, Carroll School of Management, 140 Commonwealth Avenue, Chestnut Hill, MA 02467 (e-mail: [metin.sengul@bc.edu](mailto:metin.sengul@bc.edu)). His research examines those internal organizational choices that structure the organization, define the nature of power and influence, and impact the firm's competitive stance. He received his Ph.D. in strategy from INSEAD.