Incentive Life-Cycles:
Learning and the Division of Value within Firms

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This paper explores why and how the division of value within firms – between a firm and its employees – evolves under a given incentive regime. We argue that two distinct learning processes arise in response to incentive regimes: productive learning (i.e. increases in effort deepening) and adverse learning (i.e. increases in effort diversion). As the evolution of these two learning mechanisms follows different clocks, organization’s share of the value created follows an inverted-U shaped, evolutionary trajectory under a given incentive regime. In other words, the ability of an incentive regime to induce the intended results evolves, leading to the presence of incentive life-cycles. Regression results, based on outlet-level data from all outlets of a commercial bank covering full lifetime of an incentive regime, and supplementary analyses are strongly congruent with our predictions. This study, a first to explore empirically the evolution of the division of value within firms, suggests that internal learning process can influence effectiveness of organizational incentives and lead to the evolution of the division of value between economic actors.
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 higher prices, and alliance partners higher dividends. The amount of value that each actor can appropriate is bounded by their individual value added (Adner and Zemsky, 2006; Brandenburger and Stuart, 1996; Lippman and Rumelt, 2003). Given these bounds, how the value will eventually be split is determined by haggling and bargaining (Lippman and Rumelt, 2003; Marshall, 1920; Sorensen, 1994), outcome of which reflects the relative bargaining power of the actors involved (Abowd, 1989; Blau, 1964; Coff, 1999; Dencker, 2009; McDonald and Solow, 1981; Pfeffer, 1981). In ongoing, long-run relationships (e.g., employment, strategic alliances) the division of value is ultimately determined by contractual arrangements that emerge as a result of such bargaining processes (Williamson, 2005) as contracts secure the continuity of the relationship and joint value creation. In contrast, in spot market exchange, the division of value between actors can be fully determined by the supply and demand forces. The competitive context is particularly influential in shaping the actual division of value between economic actors (Chatain and Zemsky, Forthcoming).

One characteristic of the existing work is the focus on the equilibrium division of value resulting from the bargaining processes. This focus has an important implication for ongoing, long-run relationships: the division of value remains static under the contractual arrangement (e.g. Brandenburger and Stuart, 1996; Coff, 1999; Holmstrom and Roberts, 1998). A multitude of factors (such as innovation or shifts in market supply and demand) can and do lead to a shift in bargaining power and renegotiation, and, consequently, to a new contract that specifies a different division of value (Baker, Gibbs, and Holmstrom, 1994; Dencker, 2009; Lippman and
Yet the division of value is likely to evolve under a given contractual arrangement. After all, contracts are invariably incomplete. In particular, as organizational learning literature has long highlighted, organizations and individuals do not passively and statically respond to their environment (Argote, 1993; Argote, Ingram, Levine, and Moreland, 2000; Benkard, 2000; Miner and Mezias, 1996). Actors can learn how to better respond to a given contract over time (Meyer and Gupta, 1994; Kaplan and Henderson, 2005). If and when this is the case, the division of value between actors in an ongoing relationship might change over time in ways that are not ex-ante specified by the contract currently governing the relationship. Drawing on the value-based conceptualization of the firm, organizational learning literature, and the economic theory of incentives, this is the gap we address in this paper.

We develop a theory of why and how the division of value within firms–between a firm and its employees–evolves under a given incentive regime. The structure of organizational incentives can be seen as an explicit contract specifying the division of value between a firm and its employees as it defines how much and under which conditions employees will be compensated (Holmstrom and Roberts, 1998). It is concerned both with incentivizing intended actions (value creation) and the division of value between the actors involved (Schelling, 1956).
Our arguments are built on the central premise that under a given incentive regime, employees’ ability to retain the value that they create changes over time as a result of their incentive regime specific learning –learning how to be more productive under the implied objectives of the incentive regime, as well as how to game (i.e. exploit) it.

Productive learning occurs because employees learn over time and with experience how to better and more efficiently conduct tasks induced by incentive instruments. Similarly, the organization learns over time how to best use a given incentive contract to induce productive effort. As a result of productive learning, effort deepening and productive use of incentives increases over time, leading to greater value creation (i.e., employees’ contribution to the organization) (Adler and Clark, 1991; Ichniowski, Shaw, and Prennushi, 1997; Paarsch and Shearer, 1999). Adverse learning occurs because employees learn over time and with experience how to exploit a given incentive design to their private benefit. As a result of adverse learning, effort diversion increases over time, allowing employees to appropriate a larger proportion of the value that they create (Chevalier and Ellison, 1997; Frank and Obloj, 2009; Kerr, 1975; Kreps, 1997).

The presence and relative magnitude of the two mechanisms (i.e., productive and adverse learning), along with a fixed cost of changing the incentive regime, suggests that the organization’s share of the total value created follows an evolutionary trajectory for two main reasons. First, effort deepening and effort diverting responses are specific to incentive regimes (Kreps, 1997; Lazear, 2000; Lazear and Shaw, 2007) and need to be relearned when the

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1 We assume that effort is imperfectly observable and the contract for the total value creation is not perfectly enforceable. Hence, we exclude cases wherein incentives are perfectly aligned and/or cannot be gamed (consider, for example, an entrepreneur running alone her own business). While the assumption of imperfect incentive alignment may seem restrictive, it underlies the majority of work within the economic theory of incentives (Gibbons, 2005). In reality, incentives are imperfectly aligned in almost all cases including asymmetric information and separation of ownership and control (see, for example, Small, Smith, and Yildirim, 2007; Williamson, 2005).
incentive regime changes (Kaplan and Henderson, 2005). Second, the evolution of these two mechanisms follows different clocks. Productive learning (i.e. increases in effort deepening) is more pronounced than adverse learning (i.e. increases in effort diversion) early on, but over time their relative prominence is reversed and adverse learning dominates productive learning. Hence, the ability of incentives to induce the intended results (typically, productive effort) follows a concave, inverted-U shaped evolutionary trajectory. In other words, incentive regimes have a life-cycle.

To test our predictions, we studied data from all outlets of a commercial bank covering a full lifetime of an incentive regime from its introduction until its replacement with another one. The results are strongly congruent with our predictions. Under the new incentive regime, bank outlets’ value creation and value appropriation increased, at a decreasing rate, over time. At the same time, bank’s share (which we measure as the proportion of the total value appropriated by the bank) evolved over time – increasing at first and, after reaching a plateau, decreasing continuously. This was because increases in value creation were rapid in the beginning but were outpaced later on by increases in outlet employee’s value appropriation. Hence, over time, adverse learning outweighed productive learning and a greater proportion of the organizational profits was forfeited due to agency costs. Supplementary analyses and interviews further support the hypothesized evolution of productive and adverse learning mechanisms under the studied incentive regime. These results offer the first empirical evidence on the evolution of the division of value during the lifetime of an incentive regime.

In terms of theory, this paper offers three main contributions. First, we complement existing literature on the determinants of the division of value between economic actors (Brandenburger and Stuart, 1996; Buchanan, 2001; Holmstrom and Milgrom, 1991; Porter,
1980) by showing how and why the division of value can evolve under a given contractual arrangement. In particular, we explicitly bring in learning by agents (how to respond to organizational incentives), an important out-of-equilibrium process, to value-based conceptualization of the firm. Second, we contribute to the literature on individual and organizational learning (Argote, 1996; March, 1991; Simon, 1991; Schilling et al., 2003) by showing that incentive regime changes can trigger both productive and adverse learning mechanisms within organizations. To our knowledge, this is the first paper that demonstrates the influence of both productive and adverse learning on organizational outcomes. Further, increasing diversion of value from the organization in later stages of an incentive life-cycle implies that, as organizational change can trigger productive and adverse learning in organizations, productive and adverse learning can also trigger organizational change (e.g. replacement of one incentive regime with another). Third and finally, we demonstrate how opportunistic behavior by agents affects their value appropriation. While opportunistic behavior (and its mitigation) has long been recognized as a key determinant of the design, duration, and cost of contracts in institutional economics (Williamson, 1985; 1993), few studies have directly examined how opportunistic behavior actually affects the division of value between economic actors. In this paper, we approach opportunistic behavior (in the form of incentive gaming) as a skill that can be learned (and not as a behavioral trait) and examine how, holding the contract design constant, it can influence the division of value among contracting parties.

ORGANIZATIONAL INCENTIVES AND THE DIVISION OF VALUE WITHIN FIRMS

The objective of every incentive regime is to create a link between employees’ private benefits (e.g. compensation) and organizational objectives (Ethiraj and Levinthal, 2009; Prendergast,
This link is said to be functional, that is incentives are aligned, when incentives lead employees to choices (as to which activities and how much they allocate their effort) that are aimed at maximizing the total value of the organization as they try to optimize their own private benefits, and, consequently, when the marginal effects of employees’ actions towards value creation and their measured performance are correlated (Baker, 2002; 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.2

As the structure of organizational incentives specifies how much and under which 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). Given that there is no market solution that could create an equilibrium division of the value within firms (Marshall, 1920), “division of the mutual advantage between [employees] and the firm can be obtained only by ‘haggling and bargaining’” (Sorensen, 1994: 509). Employers seek to devise an incentive regime that is more favorable to them in terms of, for example, lower wages, taking into account the optimal level of effort

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2 In this paper, focusing on intra-firm dynamics, and in line with Marshall (1920) and Dencker (2009), we define value created by employees as their contribution to the objective function of the firm and value appropriated by employees as the amount of the created value that is retained by them. Therefore, the division of value between a firm and its employees can be seen as a zero-sum game as value appropriated by the employees is a subset of value that they create. This conceptualization is very similar to the division of value across firms, and between firms and customers in studies using cooperative game theory (Brandenburger and Stuart, 1996; Chatain and Zemsky, 2007; Lippman and Rumelt, 2003). Yet, whereas existing conceptualizations are particularly well suited to the analysis of value distribution between firms across a value chain, our conceptualization is tailored towards the analysis of value distribution within a firm. Also note that this definition is broader as value creation could include profit (i.e., a measure consistent with Brandenburger and Stuart’s definition) as well as, for example, number of acquired customers. This is mainly because our definition depends on the specific objective of the firm. In this sense, our definition of value creation is closely related to the Marshallian concept of “composite rents” – rents that result from complementarity between employees and the firm where their union produces more value than the sum of their individual inputs (cf. Dencker, 2009).
allocation by employees (Dencker, 2009). Similarly, employees (e.g. through collective bargaining) seek to devise an incentive regime that is more favorable to them in terms of, for example, higher wage, bonus, or job security. How organizational incentives are ultimately structured is largely a function of the relative bargaining power of employees vis-à-vis the firm (Blau, 1964; Coff, 1999; Lambert, Larcker, and Weigelt, 1993; Pfeffer, 1981). Relative bargaining positions are influenced by a multitude of factors, such as ability to act in a unified manner, switching and replacement costs, labor market conditions, and access to information (Akerlof and Shiller, 2010; Coff, 1999; Marburger, 1994).

One common characteristic of existing work on the division of value between economic actors, including the theory of incentives, is that, while the division of value within a firm can change from one incentive regime to another, it remains static throughout the lifetime of a given incentive regime (e.g. Brandenburger and Stuart, 1996; Buchanan, 2001; Coff, 1999; Porter, 1980). Thus, existing work largely abstracts away from a possibility that the division of value can evolve under a given incentive regime. The ‘learning models’ in labor economics, for example, show that a better incentive alignment can only be reached by redesigning the incentive regime after finding out what individuals’ type (or ability) is (Baker, Gibbs, and Holmstrom, 1994; Farber and Gibbons, 1996; Felli and Harris, 1996; Gibbons and Waldman, 1999; Laffont and Tirole, 1988). Similarly, multi-tasking models based on agency theory directly deal with the issue of moral hazard (i.e., effort is not easily measurable) but still assume a constant division of value for a given level of value created (Gibbons, 2005; Holmstrom and Milgrom, 1991; Holmstrom and Roberts, 1998; Prendergast, 1999). In organizational theory and strategic management too, the relative division of value is assumed to vary from one regime to another.
and invariant within a given incentive regime over time (but heterogeneous across individuals and/or organizational units) (Azoulay and Shane, 2001; Vroom and Gimeno, 2007).

Nevertheless, while incentives such as pay-for-performance may remove the ex-post bargaining by ex-ante specifying the rules governing the division of value, contracts are invariably incomplete and employees and organizations may learn how to respond to a given incentive regime over time. In fact, the extensive literature in organizational learning posits that organizations and individuals do not passively and statically respond to their environment (Argote, 1993; Argote, Ingram, Levine, and Moreland, 2000; Benkard, 2000; Miner and Mezias, 1996). Over time and with experience, they get better and more efficient at what they do (Adler, 1990; Wright, 1936). They gradually adapt to their environment (Argyris and Schön, 1978), assimilating knowledge and information from other units of their organization or from other organizations (Argote, Ingram, Levine, and Moreland, 2000). Importantly, organizational changes, like a change in incentive design, interrupt organizational and individual learning mechanisms. Changes can reset the learning clock of efficient effort allocation and put organizations at hazard (Amburgey, Kelly, and Barnett, 1993). Yet, changes can also enable learning by disrupting the status-quo and organizational inertia (Kaplan and Henderson, 2005). Such learning mechanisms arising in response to changes in organizational incentives are likely to affect the trajectory of both the absolute level of value appropriation by employees and, consequently, the relative division of value between employees and the organization.

**Evolution of value appropriation by employees under a new incentive regime**

A key factor that affects the evolution of value appropriation under a given incentive regime is productive learning. Given that (marginal effects of) employees’ actions towards value creation
and their measured performance tend to be correlated (Baker, 2002; Heckman, Heinrich, and Smith, 1997), productive learning contributes positively to both value created and value appropriated by the employees. Incentive regime changes trigger productive learning processes because, to the extent that incentives influence quantity and quality of effort allocation (Lazear, 2000; Lazear and Shaw, 2007; Wiseman and Gomez-Mejia, 1998), 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). Put differently, an incentive regime change resets the link between individual benefits and value creation and renders the effectiveness of effort allocation decisions uncertain for the employees. Therefore, a change in organizational incentives triggers effort deepening learning processes. Given that value creation depends on the objective of the firm and that most, if not all, tasks entail multiple activities, such deepening can happen through two main channels: by directing effort to chosen actions and objectives, and by ensuring an efficient level of effort allocation.

These processes, however, are unlikely to happen instantaneously. The effort (or quality of effort) exerted by employees as a response to organizational incentive instruments changes with time and experience. New incentive structures require experience and common interpretation, just as new tasks require new knowledge and skills. As the organization and employees learn how best to respond to the incentives (by choosing among different actions, by adjusting their effort level, and/or by setting the right objectives), incentive alignment and, consequently, organizational and individual performance will increase (Argote, 1996; Argote and Greve, 2007; Wright, 1936). Accordingly, under a new incentive regime, employees’ value
appropriation increases over time along with the value that they create. Yet, the extent of such productive learning and subsequent increases in value creation naturally diminishes over time. This is because employees have capacity constraints for learning, and because they (individually) converge to a given set of effort allocation in order to optimize their private benefits (e.g. compensation). More technically, as broadly documented in the literature, the learning curve is concave (see, for example, Argote, 1996; Benkard, 2000; Miller and Shamsie, 2001; Miner and Mezias, 1996).

A separate and influential factor that affects the evolution of value appropriation after a change in the incentive regime is adverse learning. A growing literature on incentive gaming shows how agents can divert their effort to maximize their private benefits at the expense of organizational goals (Anton and Yao, 2007; Asch, 1990; Chevalier and Ellison, 1997; Larkin, 2007; Oyer, 1998). Effort diversion is an unwanted yet largely inevitable consequence of incentives (Harris and Bromiley, 2007; Prendergast, 1999). Employees, for example, may over time become more proficient at hiding their true effort. They can also learn how to best time and direct their effort in order to maximize their private benefits. Such adverse learning leads to decreasing incentive alignment and therefore increases value appropriated by employees without enhancing the value created. Hence, the relative magnitude of value appropriated by employees, keeping the effort constant, depends on employees’ ability to exploit the system.

It is important to note that the ability of employees to game incentives, and therefore to create agency costs, is incentive regime specific. 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 the change in incentives, employees would have to re-learn how to game the incentive structure for private benefits. Taken together,
evolution of value creation and, separately, of adverse learning, lead to a curvilinear increase in
d value appropriated by employees under a new incentive regime.

Hypothesis 1. Under a new organizational incentive regime, value appropriated by
employees increases (at a decreasing rate) over time and with experience.

Evolution of the division of value under a new incentive regime

While the above arguments explain how value appropriated by employees will evolve under a
new incentive regime, it is imperative to also understand what incentive regime change and
learning processes imply for 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, 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 (This is similar to adding a costly feature to a product that will increase customer
willingness to pay. A disproportional increase in costs could result in lower net value creation
and value appropriation). We argue that there exists a concave, inverted-U shaped relationship
between value appropriated by the firm as a percentage of the value created by employees and
experience under a new incentive regime: organization’s share first increases, reaches a plateau,
and decreases over time and with experience. In other words, an incentive regime’s ability to
align employees’ actions with organizational objectives has a life-cycle similar to that of
products or organizational processes. This is mainly because value creation and value
appropriation have separate clocks. Learning is expected to be faster in early stages of the
incentive life-cycle along the productive (i.e. effort deepening) dimension, and later to be
outpaced by learning along the “gaming” (i.e. effort diversion) dimension. There are several reasons why this is the case.

First of all, there is institutional support for productive learning, whereas such support does not exist for adverse learning. While effort allocation cannot be perfectly specified (and is thus not enforceable), in most cases employees and the firm know the intent of the incentives regime, which is, crudely, to maximize effort allocation on productive activities. Therefore, organizations will support and help their employees in learning along this dimension (through, for example, formal training, instructions, etc.; Youndt, Snell, Dean Jr, and Lepak, 1996). In fact, organizational support will evolve as well because organizations learn, with experience, how to make the new incentive regime more functional (Argyris, 1977; March, 1991). Organization-wide activities that are aligned with the new incentive system, such as targeted marketing, are also likely to increase returns to productive effort and increase organization’s share of the total value created. As a result, it will be easier (i.e., require less effort) to advance along productive activities.

Second, and related, not only there is no institutional support for adverse learning, but also there are institutional barriers (e.g., monitoring and control mechanisms) to prevent incentive gaming. Organizations might even alter the existing control mechanisms or introduce new ones with new incentive regimes. Employees will put more emphasis on incentive gaming than on productive activities, only if gaming is personally more beneficial and less costly. Put differently, if the marginal returns to effort are greater for effort deepening than effort diverting activities, employees will choose the former. Therefore, employees are more likely to exploit the system when the extent and effectiveness of monitoring and control systems is low (Nagin, Rebitzer, Sanders, and Taylor, 2002).
Third, following an incentive regime change, interactions with other employees are more likely to foster productive learning than adverse learning. When new incentive instruments are first introduced, employees will have idiosyncratic beliefs about how to optimize their private benefits. However, as they regularly interact with their contacts within the firm, they will learn from each other how different employees navigate under the new incentive regime. Employees will share information with each other and “compare the performance of their own belief sets to those of their contacts [within the organization]” (Fang, Lee, and Schilling, 2010: 630). These interactions will be particularly influential for productive learning (compared to adverse learning), given that information pertaining to how to be more productive is more likely to be shared than the information pertaining to how to best exploit the system for private benefits (Galinsky and Kray, 2004).

Finally, the complexity of incentive gaming, relative to productive learning, makes it harder to take advantage of experience from prior incentive regimes in the current context (Lei, Hitt, and Bettis, 1996; Levinthal and March, 1993). Employees need to learn both the new incentive regime and the associated control mechanisms in order to be able to successfully game the system. 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). While certain transfers of knowledge across different incentive regimes will be marked for both productive and adverse learning, it will be easier and faster to apply knowledge from prior incentive regimes for productive learning than for adverse learning. Therefore:

Hypothesis 2. 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 test 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. This dataset is exceptional and particularly well-suited to test our hypotheses for three main reasons. First and foremost, the data is 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 in separating from the existing empirical work on incentives that captures heterogeneity across firms and/or across different regimes, we are able to examine the changes in a given firm and under a given incentive regime over time.

Second, the setting allows us to focus on incentive regime specific learning (i.e. 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 by the new regime (nor during the period studied). It is important because if the bank had changed its product mix or the nature of its existing products, incentive regime specific learning would have been confounded with task specific learning (e.g. learning how to be more efficient at selling loans). This is not the case in the current setting. Third, the financial services industry constitutes an ideal setting to study the influence of incentives, as it is an industry characterized by high-powered incentives. High-powered incentives are not only likely to induce productive effort from agents, but also likely to encourage them to try to exploit the incentive regime (Acemoglu, Kremer, and Mian, 2008). It is well documented that the importance of incentives for organizational performance and behavior in the financial services industry is paramount (see, for example, Chevalier and Ellison, 1997; Hubbard and Palia, 1995).
The bank that we study is among the twenty largest financial institutions in Poland. The bank 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. It has therefore a typical multi-unit structure. In the beginning of our observation period, in September of Year 1, the bank had 176 outlets. (Unfortunately, due to our confidentiality agreement with the bank, we cannot reveal our exact observation period. We shall, however, note that the 13-month observation period falls within the 2000-2009 interval.) This number grew to 250 by the end of observation period, October of Year 2. A typical outlet employs three to four sales people including the outlet manager.

We obtained privileged and confidential access to detailed intra-firm archival data from the bank, spanning the entire 13 months of operations under a given incentive regime (see Appendix A for details), 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 personal loan sales data, as well as monthly data on sales targets, sales of other products (e.g. credit cards), turnover, and operating costs (All sales data were transformed linearly before they were given to us to assure confidentiality). Given that the data is available for the full duration of the incentive regime for all outlets of the bank, the dataset captures all longitudinal and cross-sectional variation without suffering from any sample selection bias or censoring. The final dataset contains 2,761 outlet-month observations.

We supplement these intra-firm data with industry and region-level data from three publicly available sources. The Quarterly Financial Services Industry Report, published by the National Bank of Poland, contains quarterly information on the Polish retail banking industry including profitability, revenues, number of registered retail banks, and changes in demand for
personal loans. The *Situation on the Credit Market* questionnaire, also published by the National Bank of Poland, surveys heads of credit committees of banks every quarter and provide aggregate information on changes in demand for personal loans. Finally, *Regional Macroeconomic Data*, published by Polish Statistical Institute (GUS), contains quarterly information on important macroeconomic indices (such as, unemployment rate, population, etc.) at the regional level. In order to be able to incorporate these data with the intra-firm dataset, we manually matched each outlet to one of the 16 administrative regions using bank outlet addresses.

**Dependent variables**

*Value appropriated by employees.* We measure 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 with the bank). We calculate bonuses by matching actual sales figures with the structure of the studied incentive regime (see Appendix A for details). Employee pay is a straightforward and widely used measure of value appropriation by employees (see, for example, Lazear, 2000), as it is retained individually by employees and is contingent on their work (and, frequently, on their performance). On average, outlet employees received over 40% of their compensation in form of variable pay.3 Thus, as also confirmed by our interviews, the incentive regime we studied resulted in relatively high-powered incentives.

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3 We use 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 affects our results neither quantitatively nor 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 it is well-established in prior work, 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. Akerlof and Yellen, 1986; Shapiro and Stiglitz, 1984; 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. Separately, and importantly, fixed wages at the bank were time-invariant (that is, there were no changes in wages at the bank level) during our period of observation.
Division of value between the firm and its employees. 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 (measured as described above) to value that the outlet created in a given month. We measure value created by an outlet by its total profit from the sale of primary loans, calculated as the difference between outlet’s total revenues from primary loans and corresponding (imputed) costs (We describe the procedure used to calculate marginal cost of loans in detail in Appendix B).\footnote{Profitability is not only the most commonly used measure of value creation (Newbert, 2007), but also it is an ideal measure of value creation in this setting because it is consistent both with our theory development and with the economic definition of value creation. Still, one alternative is to use the volume of sales. While sales, as opposed to profits, do not take into account costs or margins, the same also holds for the studied incentive regime. Further, the data on sales volume is less noisy than profits, because the latter is imputed whereas the former is based on raw values. To check, we rerun all regressions using volume of loans sold as our measure of value creation. While the results were understandably more statistically significant (due to noise reduction), they were qualitatively unchanged.} This ratio captures ineffectiveness of the incentive regime from the perspective of the bank since 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 (2009), we assume that the more of the value created is diverted by employees, the less effective an incentive regime becomes. Outlet manager and employees, on average, appropriated 16% of the outlet-generated profits as bonus. However, on average, only 64% of the outlets were able to surpass the threshold (which was equal to 80% of the sales target –see the details of the incentive regime described in Appendix A) and obtain a bonus in a given month. Those outlets that were able to obtain a bonus appropriated 26% of the profits on average, reaching up to a maximum of over 50% in extreme cases. In our analysis, in order to convert our measure to a measure of bank’s share, we subtract the ratio (of value appropriated by outlet employees to value that the outlet created) from one.
**Independent variable**

We hypothesized that, following a change in the incentive regime, employees will (re)learn what constitutes 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 follow the literature and assume that learning takes place over time and with experience: individuals get better and more efficient in what they do (Adler, 1990; Wright, 1936), adapt to their environment (Argyris and Schön, 1978), and/or assimilate knowledge and information from other units or other organizations (Argote, Ingram, Levine, and Moreland, 2000). Accordingly, we measure experience under the new incentive regime by each outlet’s cumulative sales of primary loans since the introduction of the incentive regime. Cumulative sales is a good and established proxy for learning because it reflects both over-time experience and exposure as well as learning-by-doing (see Adler and Clark, 1991 for a discussion on the choice of proxies for experience). Note that this measure is in essence identical to those used in prior work on organizational learning (e.g. Argote, 1993; 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, some of which we touched on above, that can explain heterogeneity in outlets’ value creation and value appropriation.

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5 The results are qualitatively unchanged if we use the other widely used (e.g. Aguiar and Hurst, 2007; Miller and Shamsie, 2001) measure of learning and experience, namely, 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 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 the cumulative sales capture the variance in time clock and is a better all-around measure of experience in our setting.
Outlet level controls. We control for outlet turnover, which we measure as the total number of employees who left (i.e., voluntary turnover) or were fired (i.e., involuntary turnover) as a percentage of the number of employees of the outlet in the previous month. While 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%. It is important to control for the turnover rate because the changing mix of an outlet’s workforce might affect the productivity of the outlet. On one hand, to the extent turnover is contingent on individual performance, higher turnover might imply elimination of the least efficient employees, leading to a higher per employee productivity (Abelson and Baysinger, 1984; Bartelsman and Doms, 2000). On the other hand, changes in the workforce cause a loss of outlet, location, and customer-specific knowledge thereby debilitating the outlet’s ability to create value (Abelson and Baysinger, 1984; Holtom, Mitchell, Lee, and Eberly, 2008).

A second, and related, control is outlet manager change, which takes the value of 1 if the outlet has a new manager, 0 otherwise. Manager change is expected to have a negative influence on outlet’s value creation because with a new manager internal dynamics of the outlet is 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 their employees work effectively towards achieving that objective. This is especially pertinent in this setting because outlets are small (having, on average, 3 employees, with a maximum of 7) and all employees are co-located. It is fundamental in the strategic control literature that in such small organizations managers establish control through direct supervision (Child, 1973; Ouchi, 1977).

A third and final outlet level control is outlet costs, which we measure as total centralized costs to the outlet –costs that it cannot directly control (e.g. costs acquired due to bank-wide
promotion and advertisement campaigns). It is important to control for costs as we estimate 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 allocation by the outlet’s employees. For example, outlets with prime location 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 an outlet’s value creation and appropriation derives from certain 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, which we measure as regional population (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 reach higher sales figures (i.e., create more value). A second region-level control is regional household income, which we measure as the log of average household income in thousands of zlotys. Banks grant loans to potential borrowers based, in part, on their ability repay their debt. Given that probability of repayment increases with the income level, the supply of loans are higher in regions with high income compared to low income regions. A third control we included is regional inflation, which is calculated as the percentage change in the average price of a representative basket of goods from previous quarter. This is a potentially important control as interest rates (i.e. the cost of loans to borrowers) are linked to the inflation rate. As a result, increasing inflation is expected to drive up the interest rates, which, in turn, will drive down the overall demand for personal loans (Fama, 1975).
We report the sample statistics, bivariate zero-order and within correlations in Table 1. Although there are no critically collinear variables in the final dataset, we reran regressions by dropping moderately correlated variables (e.g. regional average income), one-by-one and in combinations. Regression results were qualitatively insensitive to inclusion/exclusion of these variables. To further alleviate multicollinearity concerns, we also calculated variance inflation factors (VIFs) on outlet-demeaned data. All calculated VIFs were much lower than the critical value of ten, indicating no serious multicollinearity. Therefore we are confident that potential multicollinearity is not driving the results.

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Insert Table 1 about here
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**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 of these tests indicated that, using the current specification, outlet and month-level effects cannot be adequately modeled by a random-effects model (p<0.05 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’s 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 cyclicality (e.g., Christmas) and/or demand shocks.

In addition to the potential problem of heteroskedasticity, a separate concern is related 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. While 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 correlations of the errors are positive (Baltagi, 2001). To validate, we checked for serial correlation in our data using the procedure proposed by Woolridge (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<0.10 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 models’ 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 vector of dependent variables, $X$ 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. 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**

Table 2 (Models 1 and 2) presents the main regression results for value appropriation by outlets. The results offer strong support for Hypothesis 1. Controlling for a multitude of outlet and region-level factors, value appropriation by outlet employees increases, at a decreasing rate, with cumulative experience under the new organizational incentive regime. Coefficient of cumulative sales is positive and significant, and coefficient of cumulative sales squared is negative and significant, as hypothesized. Consequently, the net effect of cumulative experience continuously increased yet became flatter over time. It is also important to note that, in terms of the magnitude of coefficients, we do not observe inflection points (i.e., points at which the net effect of cumulative sales on the dependent variable turn from positive to negative) within the range of our data. Therefore, the results are strongly congruent with our prediction that, under a new

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6 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 time-series is longer than three time periods (Stock and Watson, 2008). The results remain qualitatively unchanged when we follow 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 remain qualitatively unchanged.
organizational incentive regime, value appropriation by outlets increase, at a decreasing rate, over time and with experience.

For comparison, we also report in Table 2 (Models 3 and 4) results of the regressions for value created by employees. As expected, value created by outlet employees also increases, at a decreasing rate, with cumulative experience under the new organizational incentive regime.7

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Insert Table 2 and Table 3 about here
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In Table 3 we present regression results for bank’s share of total value created by outlets, our measure of division of value between the bank and outlet employees. As in Table 2, coefficient of cumulative sales is positive and significant, and coefficient of cumulative sales squared is negative and significant. For an outlet with mean cumulative experience the inflection point (i.e., maximum value, in relative terms, retained by the organization) is reached around the seventh month of our observation period (the inflection point was identical for an outlet with median cumulative experience). Note that the inflection point thus occurs around the middle of the life-time of the studied incentive regime. Hence, the share of total value created that is appropriated by the organization goes down from the seventh month forward, implying that effort diverting responses to incentives prevailed over effort deepening responses over time (see Figure 1). This pattern is also clearly visible when we look at the evolution of value creation by

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7 In order to tease out the relative influence of value creation and incentive gaming on employees’ value appropriation, we conducted a set of supplementary analysis. 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 regressions. 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. Separately, as a further check, we included value creation as a control in models 1 and 2 of Table 2. While 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. 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.
outlets relative to their value appropriation (see Figure 2, which is based on regression results from Models 2 and 4, Table 2). As predicted, 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. Taken together, the results strongly support Hypothesis 2: there is an inverted-U shaped relationship between cumulative sales and organization’s share of the value created by outlets.\(^8\) These results offer the first empirical evidence on the evolution of the division of value under an incentive regime.

\[\text{Insert Figure 1 and Figure 2 about here}\]

To appreciate the actual effect of experience on the evolution the division of value, consider the economic significance of the estimated effects. Focusing on Table 3, Model 2, we calculated the marginal effects on bank’s share of the total value created by outlets over time for average levels of cumulative sales for each month. In Month 7, employees appropriated around 9% less of the value that they created compared to Month 1, the first month of the incentive regime. And then, in Month 13, the last month of the incentive regime, employees appropriated 12.5% more value that they created compared to Month 7. Therefore, from Month 7 onwards, the marginal effect of cumulative sales on bank’s share of the total value created by outlets was negative.

Lastly, brief observations are in order regarding our control variables. Outlet manager change had a significant and negative effect on value appropriation by employees and a

\(^8\) Note that the dependent variable for this set of regressions, namely, organization’s share, is a ratio bounded between 0 and 1. Importantly, given that outlets cannot obtain any bonus when they cannot 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 re-estimated the model using Tobit with fixed effects for outlets and months. The results were qualitatively identical.
significant and positive effect on bank’s share, as expected. The replacement of outlet managers disrupts both value creation and effort diversion by outlet employees. Outlet costs were also significant and signed as expected. High value-added activities have high costs, and hence marginal returns to effort are a function of costs. Among region-level controls, regional inflation had a negative and significant effect as predicted. This highlights the importance of demand-side factors (in this case, the cost of loans to borrowers) in value creation and value appropriation in the banking industry.

**Learning mechanisms driving the evolution of the division of value**

A baseline prediction in this paper is that incentive regime specific learning will take place within organizations following an incentive regime change because employees need to (re)learn how their activities (regarding to which activities and how much to allocate their effort) are linked to their own private benefits (i.e. compensation). Our interviews with the bank employees were in line with this prediction. For example, one outlet manager mentioned that:

> 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 incentive life-cycles. We argued that both productive (i.e. effort deepening) and adverse (i.e. effort diverting) learning mechanisms take place. As evolution of these two mechanisms follow different trajectories over time, ability of organizational incentives to induce the intended results has a life-cycle. Net benefit of the incentive regime for the firm does have a peak, after which marginal increases in employees’ value diversion tend to be greater than marginal increases in their value creation. The above regression results gave credence to the proposed theory. Scrupulous inclusion of control
variables meant to rule out alternative explanations, including outlet specific characteristics, monthly shocks, or regional/economical factors. Still, our confidence in the observed patterns will be higher if we could more directly approach the learning mechanisms. This is what we turn to in this section.

*Productive learning and effort deepening.* One instance of productive learning in the current context is the evolution of sales targets set by the bank and outlet’s ability to match those sales targets. Sales targets are central for effort allocation in the new incentive regime because employees’ bonuses were tied to meeting a sales target on primary loans set by the bank every month for each outlet (see Appendix A for details). If the target was set too high, outlet employees would not expect to benefit from bonuses and therefore would not be tempted to increase the level of their effort. If the target was set too low, outlet employees would expect to benefit from bonuses easily and therefore, again, would not be tempted to increase the level of their effort and would appropriate a large share of the value created. Hence, the incentive regime would not produce the intended behavior if the sales targets are not set correctly. As the director of 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 incentive regime specific productive learning takes place in the current setting, one would expect to observe that the bank would get better in setting sales targets (i.e. less likely to under- or over-shoot) and outlets would get more accurate at meeting the target (i.e. less likely to deviate from the sales target set for the month). This is what exactly happened, according to our interviews. One outlet manager mentioned that:
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, we regressed monthly sales target changes (measured as average absolute adjustment in sales target) and, separately, deviations from sales targets (measured as average absolute deviation of outlet sales from sales target in a given month) on experience and control variables included in the main regressions. As expected, the bank got better in setting sales targets and fewer adjustments needed over time (see Figure 3a). Also as expected, outlets’ sales were on average closer to the sales target over time (see Figure 3b).9 Thus, the results are congruent with our expectations and interviews. Incentive regime changes trigger incentive regime specific productive learning –both by the firm and its employees. Note that these results also lend support to the view that value creation within firms can be seen as composite rents.

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Insert Figures 3a and 3b about here
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Adverse learning and effort diversion. Productive learning is typically accompanied by adverse learning in organizations. Value appropriated by employees increases over time and with experience under a given incentive regime, not only because value creation increases but also because employees learn how to game (i.e. exploit) the new incentive regime. As employees learn how to divert more of the value that they create, adverse learning outpaces productive learning and marginal increase in employee’s value appropriation outpaces marginal

9 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 the headquarters with respect to outlets. When performance against the sales target used as a measure of value creation none of the results changed (but resulted in reduced model fit).
increase in their value creation. Consequently, as we hypothesized and showed empirically, organization’s share of the total value created by employees reaches a peak and goes down afterwards.

One mechanism through which outlets 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 to employees to sell large loans early in the month and small loans late in the 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].*

Note that neither delaying nor chopping is beneficial for the firm. Delaying is risky because there is no guarantee that the customer asking for the loan will still need the loan and will come back to an outlet of the bank (and will not go to another bank) the next month. The same applies to the ‘chopped’ loan as it artificially boosts the bonus of outlet employees. What is more, chopping incurs additional transaction costs as each loan-giving procedure involves fixed, per contract fees. Either way, in order to convince the customer to come back, the outlet might need to give deeper discount than it normally would to the initial request. Even if we assume there are no transaction costs, inter-temporal demand uncertainty, and unnecessary

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10 This is because outlet employees start getting a piece rate bonus for each loan they sell only after their outlet’s sale volume exceeds 80% 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 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 sale volume of the outlet, consequently increasing the sales target for the following month and thereby making 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, they have an incentive to delay the large loan (or a part of it by “chopping” it into two) to the subsequent month.
discounting, delaying or chopping are still detrimental to the bank as they will increase the bonuses obtained by outlet employees without increasing their value creation.

While we cannot observe in our data whether or not outlets actually delay a large loan application from one month to another, we can examine distribution of loan sizes within a given month and how it evolves over the observation period. The data pattern revealed that outlets sell more small loans late in the month than they do early in the month, as expected. On average, small loans represent 40% of the total number of loans sold by an outlet in the first half of the month and 44% in the second half of the month. The ratio of small loan share late in a month to early in the same month, on average, was 1.10 (44% / 40%), but 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, we regressed the ratio on the full set of control and independent variables included in main regression. The results showed a statistically significant linear increase in outlet’s emphasis on small loans later in the month over time (see Figure 4a). While 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 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 adverse learning in form of delaying or chopping loans by outlet employees. Therefore, these results give credence to the qualitative evidence emerged from our interviews that outlets can and do game the incentive regime by delaying or chopping loans. Importantly, for our

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11 In the dataset we obtained from the bank loan sizes are coded into a ranked ordered categorical variable, which takes the value of 1 for the smallest loans and the value of 5 for 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, where small loans 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 total number of loans sold by a given outlet in the first half the month and, separately, in the second half of the month.
theoretical framework, gaming has become more pronounced over time as outlets get better in sizing and timing the loan requests to their private benefits.

Another incentive gaming tactic is trading customers across outlets. When an outlet reaches its sales target (and hence obtain the right to get bonus) for a given month, it might direct a loan request to another outlet which has not yet made its sales target. While, in principle, outlets can trade customer with any other outlet of the bank (in fact, even with outlets of other banks), trading is more likely between sister outlets that are in close geographical proximity. Not only it is easier to direct the applicant to a nearby outlet, but also it is easier to coordinate with those in close proximity. This tendency is echoed by an outlet manager we interviewed:

* A friend is running another outlet in the 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 can not meet the sales target in the future, it can rely on its sister outlet to provide some loans in return to help it match the sales target. While this practice will not increase value creation (it might even decrease value creation as there is always a non-zero probability that the customer will not buy by the loan from the directed outlet and, hence, the focal bank), it will certainly divert value from the bank to outlets as at the same level of effort more outlets will obtain bonus. Thus, the alignment between bonus and effort 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 is granted. Given unavailability of
corresponding data, we examined clusters of geographically proximate outlets. Specifically, we estimated the probability that an outlet will meet its sales target as a function of performance of other outlets in the same cluster (which we proxy by the ratio of all outlets in the cluster that have meet the 100% 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 showed that the probability that outlet will meet its sales target increases by the performance of outlets in its vicinity (see Figure 4b). Importantly, the impact of cluster performance on the focal outlet’s performance is increased over time and was significantly more pronounced when the overall cluster performance was higher (and hence when cluster members were more able to trade customers). While 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 more frequently resort to this tactic over time as they better understand the functioning of the new incentive system.

Robustness checks and supplementary analysis

To explore the robustness of our main results and address certain potential concerns and alternative explanations, we conducted a supplementary empirical analysis exploiting available data.

A first concern is related to the measurement of value creation and value appropriation. We measured value creation using the profits from the sale of primary loan, and value

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12 We assume that outlets can trade customers with other outlets within 10 km. By this logic, and leaving out geographically isolated outlets, we obtained a sub-sample to 140 outlets located in 36 geographical clusters.
appropriation of employees using the sum of their bonuses from the sale of primary loans. One might be concerned that other financial products, in particular secondary loans (loans sold to returning customers), are an integral part of value creation for bank outlets and not accounting for their influence undermines the multi-tasking nature of value creation. However, the structure of the incentive regime that we studied, as well as our interviews, spotlights the sale of primary loans as the main objective of outlets and the main driver of employees’ effort allocation. The regime does not provide any incentive for products other than personal (primary and secondary) loans. Also, the significance of secondary loans is relatively very low (with a piece-rate bonus of roughly 10% of the piece-rate bonus for primary loans) and contingent on meeting the sales target for primary loans. We nevertheless checked the robustness of the results to this alternative, and more inclusive measurement, of value creation. Accordingly, we recalculated outlet’s value creation as the total profits of primary and secondary loans, value appropriation as outlet employees’ total variable pay from the sale of both primary and secondary loans, and accordingly the bank’s share. While this operationalization naturally increased the magnitude of value creation and value appropriation, the results were qualitatively unchanged in all models.

A second concern is related to the non-linear nature of the incentive regime we studied. Recall that the bonuses increased in 5% increments starting from 80% of the sales target up to 130% and any outlet that did not meet the sales target on primary loan in a given month did not obtain any bonus in that month (see Appendix A for details). Thus, linear changes in value created could result in non-linear changes in value appropriated. To account for this explanation, 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% threshold, a continuous variable measuring the
exact percentage of sales target met on the last day of current month, and a third measure which recodes the second measure transformed to 0 if the outlet did not meet the sales target and hence did not obtain any bonus. While this variable was naturally highly significant in all models (across all three specifications), the results were qualitatively unchanged. Given potential endogeneity between sales targets and our dependent variables, and given that the main results are insensitive to inclusion/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 and not some exogenous, macro-level trends. If our analyses mainly capture the trend of overall market demand, as opposed to intra-firm phenomena, the results would be misleading. Yet, the market level data (from the Situation on the Credit Market questionnaire, the National Bank of Poland) reveal that this is not the case. While we observe increasing value creation at the outlets of the bank, the overall perceived demand for loans in Poland was in fact quite steady during our observation period (see Figure 5). If anything, there was a downward trend.

DISCUSSION AND CONCLUSIONS

In this paper we put forward a theory of how the division of value within firms evolves under a given incentive regime. We argued that of the total value created, the share that is appropriated by the organization follows an evolutionary trajectory over time - giving rise to incentive life-

13 We also examined the robustness of the results to the conditional nature 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 sub-sample 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, coefficient of cumulative sales is positive and significant, and coefficient of cumulative sales squared is negative and significant as before (p<0.05).
cycles. In our framework, changes in the division of value are treated as endogenous to learning processes that arise in response to incentives within organizations. 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 relative prominence of these learning mechanisms changes over the life-time of an incentive regime.

The presence of incentive life-cycles has profound implications for the dynamics of value creation and value appropriation within organizations. It implies that these two constructs co-evolve along the life-cycle trajectory of incentives. This assertion lies in contrast with agency models which usually only assume that repetitive agency relationship leads to increasing performance as a function of time (Holmstrom, 1979; Levinthal, 1988). To our knowledge, this is the first study to hypothesize that the division of value between actors, while dependent on the incentive design, is endogenous to learning processes unfolding over time and with experience, and provide empirical support for the co-evolution of value creation and value appropriation within organizations. While in our empirical analysis we examined a variant of pay-for-performance incentives, the theory proposed in this paper aims to be general enough to encompass the trajectories of the division of value induced by various types of incentive instruments (such as tournaments, efficiency wages, job restrictions, or property rights induced incentives), and therefore go beyond the empirical context of this study.

Additionally, our study contributes to the extant literature on organizational and individual learning by establishing a link between learning mechanisms and organizational
incentives. Learning is shown to influence a multitude of organizational outcomes including productivity (Benkard, 2000), innovation (Greve, 2003; Katila and Chen, 2008), improvisation (Miner, Bassoff, and Moorman, 2001; 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 mean and reliability (Sorensen, 2002), and even organizational survival (Henderson and Stern, 2004; Ingram and Baum, 1997). In this paper, we show that incentive regime changes can trigger both productive and adverse learning within organizations and their evolution influence division of value within organizations.

The results also help explain changes in organizational incentives. There is considerable anecdotal evidence showing that organizations frequently (on average, every two years or more frequently) change their incentive systems (e.g., WorldatWork, 2005; Wyatt, 2009; Zoltners, Sinha, and Zoltners, 2001). Importantly, 74% of the respondents to the WorldatWork (2005) survey indicated that incentive alignment was a major driver of incentive system change in their organizations. Such high frequency of incentive regime change is rather (at least, theoretically) unexpected given fixed costs of regime change (e.g. coordination costs, communication costs, or costs due to uncertainty surrounding incentive change; Kaplan and Henderson, 2005) and given that organizational changes are associated not only with positive organizational consequences (e.g. resetting the inertia) but also with negative organizational consequences (e.g. disrupting the organizational processes and putting organizations at risk) (Amburgey, Kelly, and Barnett, 1993; Barnett and Carroll, 1995). One existing explanation is that organizations continuously design incentive plans that better fit their current objectives (Laffont and Tirole, 1988). As organizational objectives evolve over time, incentive regimes must be changed as well (Ethiraj and Levinthal, 2009; Meyer and Gupta, 1994). In this paper, we join this reasoning with an
alternative explanation. The ability of an incentive regime to induce intended consequences decreases over time, especially because the employees get better and better at gaming the regime. Hence, organizations change their incentive regimes to reset the adverse learning clock. Our results, and interviews, give credence to this alternative explanation.

Our study has important implications for the research design of theoretical and empirical inquiry into the link between organizational incentives and outcomes. In a recent article, Siggelkow and Rivkin (2009) argued that 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 assertion. The theory and results put forward in this paper indicate that looking at a cross-section of firms and incentive designs might lead to biased results. This is because at any given point in time, firms will be at different stages of their incentive life-cycles. It is therefore important to take into account the history and learning mechanisms when evaluating optimal incentive design. Thus, the findings presented here may help shed light on some of the unresolved issues in the agency theory literature concerning lower than expected accordance of observed contracts with theoretical predictions (Lafontaine and Slade, 1997; see also Prendergast, 2002 for a discussion on non-accordance of theoretical literature and empirical findings on incentive design).

Our paper’s contributions extend to the literature on the consequences of opportunistic behavior as well. It has long been recognized that fear of opportunistic behavior has important consequences for the contract design and may result in a reduced total value created in an economic exchange (Hart and Tirole, 1988; McAfee and Schwartz, 1994; Williamson, 1985). 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
contracting parties. We approached opportunistic behavior (in the form of incentive gaming) as a skill that can be learned (and not as a behavioral trait) and examined how, holding the contract design constant, it can influence the division of value among contracting parties.

Finally, our theory speaks to the literature investigating the consequences of bounded rationality for contract design and effectiveness. Understanding bounded rationality is central in the study of individual and organizational behavior (Cohen and Levinthal, 1990; Cyert and March, 1963; Simon, 1957). However, the theory of incentives has predominantly relied on the rational actor paradigm, arguing that it provides sufficient explanatory power. At the same time, several authors have argued that this might not be the case. Azoulay and Shane (2001) argued that heterogeneity in entrepreneurs’ capability to design contracts leads to heterogeneity in economic efficiency of these contracts. Argyres and Mayer (2007) developed a dual alignment model to account for firm-level contracting capability. Jacobides and Croson (2001) argued that monitoring and information asymmetry significantly influence the value of agency relationships. Given that learning (both productive and adverse) within organizations is greatly influenced by information processing constraints and bounded rationality, our study contributes to this strand of research by emphasizing the role that learning plays in the division of value among economic actors.
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FIGURE 1
Impact of mean cumulative sales on the bank’s share of value created

![Graph showing the impact of mean cumulative sales on the bank’s share of value created.]

*a* Bank’s share is calculated for mean volume of cumulative sales across all outlets based on regression results from Table 3.

FIGURE 2
Evolution of value created and value appropriated by employees over time

![Graph showing the evolution of value created and value appropriated by employees over time.]

*a* Value created and value appropriated by employees are calculated for mean volume of cumulative sales across all outlets based on regression results from Table 2.

*b* Value appropriated is rescaled for clarity of the visual presentation.
Evolution of the average absolute adjustment of sales targets

Evolution of the average absolute deviation from sales targets

Fitted regression lines. The control variables and specification are the same as in Table 1 and 2. Outlet and month fixed effects are included. Experience is measured with a time clock variable and its square. Experience is negative and significant in the regression at p<0.01 level. Experience squared is positive and significant in the regressions at p<0.1 level. N=2503.
FIGURE 4a

Proportion of small loans sold late in the month compared to early in the month

![Graph showing proportion of small loans sold late vs. early in the month.](image)

* Fitted regression line. The control variables and specification are the same as in Table 1 and 2. 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<0.01 level. Experience squared is positive and significant in the regression at p<0.05 level. N=2503.

FIGURE 4b

Conditional probability of meeting the sales target as a function of cluster performance and experience

![Graph showing conditional probability of meeting sales target.](image)

* Fitted fixed effects logistic regression line. The control variables are the same as in Table 1 and 2. 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<0.05 level. N=1443.
FIGURE 5

Perceived change in demand for personal loans in Poland, compared to the previous quarter during the observation period

Source: Situation on the Credit Market questionnaire, National Bank of Poland.
TABLE 1
Means, standard deviations, bivariate zero-order correlations (lower triangle), and bivariate within correlations (upper triangle)

| Variable                        | Mean | S.D. | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
|---------------------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. Value created                | 2.26 | 1.11 | 0.73| -0.27| 0.39| 0.04| -0.01| 0.30| -0.08| -0.07| 0.19 |
| 2. Value appropriated           | 0.37 | 0.36 | 0.76| -0.68| 0.18| 0.01| -0.02| 0.19| -0.05| -0.06| 0.03 |
| 3. Bank’s share (x100)          | 84.01| 11.22| -0.14| -0.59| 0.10| 0.02| 0.03 | -0.02| -0.06| 0.09 | 0.13 |
| 4. Cumulative sales             | 22.74| 17.53| 0.63| 0.39 | 0.11| 0.05| -0.02| 0.29| -0.29| 0.10 | 0.25 |
| 5. Outlet turnover (%)          | 0.03 | 0.17 | -0.01| -0.02| 0.03| 0.02| 0.01 | 0.03| -0.01| -0.02| 0.06 |
| 6. Outlet manager change       | 0.02 | 0.13 | 0.01 | -0.02| 0.05| 0.00| 0.02 | -0.01| -0.05| 0.01 | 0.03 |
| 7. Outlet costs                | 0.32 | 0.11 | 0.51 | 0.38 | 0.00| 0.40| -0.03| 0.03| -0.10| -0.04| -0.02|
| 8. Regional population (log)   | 14.83| 0.49 | 0.11 | 0.07 | 0.01| 0.05| 0.01 | -0.01| 0.18 | -0.11| -0.01|
| 9. Regional average income (log)| 2.56 | 0.35 | 0.08 | -0.02| 0.09| 0.05| 0.01 | -0.02| 0.16 | 0.72 | -0.32|
| 10. Regional inflation (%)     | 0.32 | 0.37 | 0.12 | 0.02 | 0.11| 0.19| 0.06 | 0.02| 0.06 | 0.00 | -0.05|

N=2,503.
All correlations with an absolute value larger than 0.04 are significant at p<0.05.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Value Appropriated</th>
<th>Value Created</th>
</tr>
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<tbody>
<tr>
<td>Outlet turnover (%)</td>
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<td>0.019</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(0.42)</td>
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<td>Outlet manager change</td>
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<td>-0.217**</td>
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<td></td>
<td>(0.13)</td>
<td>(0.10)</td>
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<tr>
<td>Outlet costs</td>
<td>0.017***</td>
<td>0.016***</td>
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<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
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<tr>
<td>Regional population (log)</td>
<td>-26.341</td>
<td>-51.22</td>
</tr>
<tr>
<td></td>
<td>(82.75)</td>
<td>(83.54)</td>
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<tr>
<td>Regional household income (log)</td>
<td>0.563</td>
<td>0.388</td>
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<td></td>
<td>(0.40)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>Regional inflation (%)</td>
<td>-0.702*</td>
<td>-0.894**</td>
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<tr>
<td></td>
<td>(0.39)</td>
<td>(0.43)</td>
</tr>
<tr>
<td>Outlet fixed effects</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Month fixed effects</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Cumulative sales</td>
<td>0.149***</td>
<td>0.191***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.008)</td>
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<tr>
<td>Cumulative sales squared</td>
<td>-0.001***</td>
<td>-0.001***</td>
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<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>R-squared</td>
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<td>0.49</td>
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<tr>
<td>F-stat</td>
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<td>35.22***</td>
</tr>
<tr>
<td>Baltagi-Wu LBI</td>
<td>2.01</td>
<td>1.98</td>
</tr>
</tbody>
</table>

*p<0.1, **p<0.05, ***p<0.01.

Two-sided significance levels are reported for all variables.

N=2,503.

Constant included, but not reported.

Standard errors in parentheses.

* Value appropriated multiplied by 10 for comparison of coefficients.
### TABLE 3

Baltagi-Wu fixed effects autoregressive regressions explaining bank’s share of value created

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outlet turnover (%)</td>
<td>-0.17</td>
<td>-0.29</td>
</tr>
<tr>
<td></td>
<td>(1.01)</td>
<td>(1.59)</td>
</tr>
<tr>
<td>Outlet manager change</td>
<td>1.45 **</td>
<td>1.46**</td>
</tr>
<tr>
<td></td>
<td>(0.61)</td>
<td>(0.59)</td>
</tr>
<tr>
<td>Outlet costs</td>
<td>-0.05 ***</td>
<td>-0.05***</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Regional population (log)</td>
<td>12.21</td>
<td>7.23</td>
</tr>
<tr>
<td></td>
<td>(14.21)</td>
<td>(9.11)</td>
</tr>
<tr>
<td>Regional household income (log)</td>
<td>3.87</td>
<td>2.78</td>
</tr>
<tr>
<td></td>
<td>(3.84)</td>
<td>(3.31)</td>
</tr>
<tr>
<td>Regional inflation (%)</td>
<td>-0.27</td>
<td>-0.21</td>
</tr>
<tr>
<td></td>
<td>(1.45)</td>
<td>(1.61)</td>
</tr>
<tr>
<td>Outlet fixed effects</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Month fixed effects</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Cumulative sales</td>
<td></td>
<td>0.831***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.16)</td>
</tr>
<tr>
<td>Cumulative sales squared</td>
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<td>-0.019***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.33</td>
<td>0.37</td>
</tr>
<tr>
<td>F-stat</td>
<td>28.23***</td>
<td>32.44***</td>
</tr>
<tr>
<td>Baltagi-Wu LBI</td>
<td>1.97</td>
<td>2.04</td>
</tr>
</tbody>
</table>

*p <0.1, **p <0.05, ***p <0.01.
Two-sided significance levels are reported for all variables.
N=2,503.
Constant included, but not reported.
Standard errors in parentheses.
Appendix A

The structure of the studied incentive regime of the bank

As a private retail bank, the bank 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 loan). According to its 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% of pre-tax profits during our observation period, while primary loans corresponded to 50-60% of total sales and 70-80% of pre-tax profits from personal loans.

Under the studied incentive regime, a sales target for primary loans was centrally assigned monthly to each outlet by the bank’s headquarters. Outlet managers 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 was increasing in a stepwise fashion (by increments of 5 percent) up until 130 percent of the sales target, after which it stayed constant. Outlet managers were also given a piece-rate bonus for secondary loans (much lower, roughly 10% of the piece-rate bonus for primary loans), if and only if the outlet reached the sales target for primary loans. Outlet employees operated under the same incentive regime as outlet managers: they got a bonus if and only if the outlet reached its sales target on primary loan sales. Once the outlet reached its sales target, their bonuses increased step-wise as described above. Outlet employees’ piece-rate bonus on each individual loan was higher (roughly twice as much) compared to outlet managers, but they were compensated solely on the sales they executed individually whereas outlet managers were compensated over the total volume of sales by the outlet.

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14 While a connection between the past performance and sales target for the next month was clear, how exactly sales targets for primary loans are set by the headquarters were not known to outlet managers. We found that lagged sales of primary loans, lagged sales target for primary loans, and month dummies explained over 86% of the variation in sales target for primary loans.
Appendix B

Procedure for imputing the marginal cost 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 available data and making a number of assumptions. 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 are disguised and rescaled by the bank, we needed the savings interest rate data on the same scale. This data was 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 we 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.