The Effect of Management Control Elements on Coordination

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Abstract

This study examines how control elements of a firm affect coordination among profit centers. The firm operates a network of 59 profit centers. It uses a transfer-pricing system designed to account for interdependencies between profit centers and to induce coordination. Further, profit center managers are incentivized with own-level residual income measures. The use of the latter measure would lead managers to make decisions benefiting their performance irrespective of whether these decisions negatively affect other profit centers. However, the firm implemented a third system that would potentially lead managers to benefit other profit centers. The firm established regional clusters of profit centers that meet at least once every quarter. The creation of these clusters creates proximity as profit centers perform complementary activities, making it more beneficial for them to coordinate. Our findings suggest that self-centered choices by profit centers are mitigated as proximity within a cluster increases. Additionally, we find evidence that proximity is positively associated with coordination and overall performance.

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1. INTRODUCTION

In this paper we examine whether and under what conditions profit centers (henceforth referred to as focal profit centers) impose negative externalities or create positive externalities affecting other profit centers in the firm. We argue that focal profit centers incentivized to increase their own profitability may take advantage of other profit centers in order to improve their own profitability. However, extant literature also predicts that individual profit centers are more likely to favor each other when they are in a high proximity condition. Both conditions are studied in a context where focal profit centers are likely to benefit from either imposing negative or positive spillovers on other profit centers of the same firm.

Our study is set in a transportation firm that operates a network of individual profit centers. The profit centers decide to a large extent over their own actions and often specialize in acquiring or executing activities. While each profit center conducts both activities of acquiring and executing business, each individual profit center can reap benefits from its specialization. While these benefits may accrue from making self-centered decisions, profit centers may also increase joint profitability through coordination of actions and decisions. We argue that it is more likely for focal profit centers to coordinate when they are geographically close while their activities complement each other.

The firm we study put a cost-based transfer pricing system in place that purportedly deals with all interdependencies between profit centers. In addition, the firm incentivizes its managers on residual income measured at the profit-center level. The latter would encourage these profit center managers to select activities that benefit their focal profit center most - irrespective of whether or not other profit centers would have been better off had the focal profit center coordinated activities with them. At the same time, the firm put a unique system in place that makes it expensive for individual profit centers to abstain from coordination. That is, each profit center is assigned to a regional group/cluster[2] by head office. Headquarters decided that these clusters have to meet at least once per quarter. We argue that these meetings foster information and/or knowledge exchange that, in turn, enhance the likelihood of coordination among profit centers. Specifically, we argue that a focal profit center in a regional group is less likely to make self-centered decisions as it potentially negatively impacts other profit centers in the same cluster.

Our findings are consistent with our conjectures. That is, the evidence suggests that profit centers who are in a position to do so make choices that will favor themselves while these choices will not necessarily

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[2] We use the terms group and cluster interchangeably throughout the paper. In each case we refer to a regional group composed of individual profit centers of the firm.

be beneficial to other profit centers. We find, for instance, that executing long-haul rather than short distance transportation activities are more profitable. Profit centers who acquire business are in a better position to choose whether to execute the more profitable activity themselves or to transfer these activities to other profit centers. We find that profit centers specializing in acquiring business are most likely to perform this activity themselves and shift the less profitable short distance transportation activities to other profit centers. Accordingly, types of transportation activities vary across profit centers.

On the other hand, we find that for profit centers featuring high proximity the more profitable long haul activities are more evenly distributed across profit centers. This suggest that specialized profit centers facing high proximity are more willing to adjudge the more profitable long haul transportation activities to other profit centers. We also find more specific indications for coordination between profit centers. That is, we find that profit centers operating in high proximity are more likely to deliver products timely. As business orders are usually carried out by two or more profit centers, timely delivery crucially depends on coordination between profit centers. Finally, proximity improves the overall financial performance (residual income) on a profit center level. These results indicate that profit centers within a cluster benefit from high proximity.

Our study contributes to the literature in several ways.

First, the study takes issue with how management controls may affect managerial decision making. The transfer pricing system put in place should promote coordination (e.g., Alles and Datar, 1998; Baldenius et al., 2004), but it is not clear whether the system can actually achieve this purpose at each point in time. For instance, Baldenius et al. (1999) demonstrate that a cost-based transfer price will likely incur distortions in intra-company transfers. Further, the profit center managers in our firm are solely evaluated and compensated on the level of residual income they achieve. It has been argued that such own-level performance measures may lead managers to resort to self-centered decisions (e.g., Abernethy et al., 2004; Bouwens and Van Lent, 2007). In addition to these systems, the firm puts an informal control element into work that may lead profit center managers to coordinate activities. With the creation of five regional clusters, the firm induces conditions that enhance knowledge and information transfer between individual profit centers, while increasing the cost of abstaining from coordination. Each profit center is member of one unique regional group. The benefits from knowledge transfer are enhanced to the extent that these profit centers differ from each other. In particular, variation in activities (specialization) among the profit centers making up a cluster makes it worthwhile

to exchange information, provided that profit centers share a common knowledge base (Boschma, 2005). It has been demonstrated in previous studies that the creation of such proximity promotes coordination (e.g. Tsai, 2002; Henderson and Cockburn, 1996). Hence, in case the transfer pricing system and the performance measures may not assure coordinated actions, the creation of proximity may enhance the case for coordination. We argue that with the creation of these clusters the firm brought about dynamism where profit centers who trade within a cluster communicate more intensively than profit centers trading with profit centers belonging to different clusters. This communication increases the costs for each profit center should they choose not to coordinate. Given the creation of (these regional) clusters, we can test whether and how these controls –transfer price, own level residual income, and clusters– in conjunction affect coordination. To our knowledge, no prior study has investigated how these control system elements *in conjunction* affect coordination.

Second and related to our first argument this study potentially contributes to relational-contracts theory (Baker, Gibbons and Murphy, 2002; Gibbons and Henderson, 2012 a and b). Baker et al. describe relation contracts as: "informal agreements and unwritten codes of conduct that powerfully affect the behaviors of individuals within firms." Gibbons and Henderson (2012a) elaborate on this idea where they argue that firms that look very similar on the surface are quite different in how its employees (managers) relate to each other. These differences are explained by the informal arrangements defining the relational contracts. They continue to argue that dissimilarities in these relations account for significant performance differences between these seemingly similar firms. While the dimension of relational contracts is difficult to measure, we believe that with the creation of their clusters the firm allows us to study the effect of differing relations. That is, all units are seemingly similar yet there is this difference between them in terms of whether two units of a firm are together in a cluster or not. Observing these differences in performance and identifying conditions where such differences are bound to emerge potentially helps us to improve our understanding of how these differing relations play out in firms.

Third, our study examines how specialization potentially plays out in choices profit centers make. The profit centers making up the firm differ in how and how much they specialize in acquiring and executing activities. Kretschmer and Puranam (2008) have shown theoretically that efficiency levels of interdependent profit centers are not just enhanced if profit centers are motivated to cooperate. Indeed what is required is that each profit center is enabled to further advance what they are specifically good at. Kretschmer and Puranam show that in order to pursue these efficiencies it is required for these profit centers to coordinate rather than to emphasize cooperation. That is, cooperation may actually impede the extent to which a profit center is able to accrue benefits from its own specialization. In our study we

observe a variety of specialization levels enabling us to examine how specialization plays out in terms of coordination and specialization. Specifically, the data allows us to empirically test whether and how specialization is related to coordination.

2. LITERATURE REVIEW

Activities performed by individual profit centers making up an organization may involve positive and negative externalities brought about by decisions individual profit centers make. Profit centers subject to such externalities possess an inherent incentive to coordinate their activities provided that both profit centers sufficiently benefit from coordination. In other words, to the extent that coordination creates a net benefit for one profit center that is not matched in the focal profit center, it is not clear whether the focal profit center will actually coordinate. It is the purpose of this study to shed light on that idea. Under what conditions do we observe that profit centers coordinate activities, and what are conditions that would lead profit centers to focus on self-centered decisions?

Building on the extant literature, we first argue that accounting systems are designed to promote coordination. We further argue that profit center managers may fail to coordinate activities when the accounting system fails to uncover profit centers imposing a cost on other profit centers by not coordinating. In that case we would expect to observe negative externalities to surface. We then argue that positive externalities are more likely to surface when organization profit centers are in high proximity and the accounting systems accounts for (positive and negative) spillovers between profit centers.

2.1. Accounting induced coordination

Firms may choose to centralize decision-making in order to ensure that coordination between profit centers is achieved. Such centralization comes at a cost because individual profit centers may possess information that is expensive to communicate, implying that communication would still not result in the desired level of coordination (e.g., Jensen and Meckling, 1992). Therefore, firms may choose to decentralize decision-making to individual profit centers. Under the condition that a focal profit center can affect the performance of other profit centers without being noticed, it may be tempted to impose costs another profit center in order to look good. Accounting systems offer firms at least two means to control the externalities these profit centers may impose on each other: multi-level performance

measures and transfer pricing systems. Firms may design their performance measures in a fashion that makes it attractive for individual profit centers to positively affect the performance of other profit centers, or firms may implement a transfer pricing system to impede negative spillovers between profit centers to occur. In the first case, focal profit centers are typically evaluated on a set of performance measures that convey own-level achievement and performance measures that summarize realizations of one or more profit centers featuring interdependencies (See for instance, Bouwens and van Lent 2007, Bouwens, Hofmann and van Lent, 2013). In the second case, when firms use a transfer pricing system to coordinate activities, they rely on their ability to impound potential externalities in the transfer pricing system (see for instance, Alles and Datar, 1998). In our study, the firm employs own-level residual income as the focal measure of performance while using a cost-based transfer pricing system to induce coordination among its interdependent profit centers. Below we argue that while the own level-measures would incentivize the profit center-manager to make self-centered decisions; the transfer-pricing system would mitigate but not necessarily prevent such decisions to be made.

2.2. Negative spillovers and control loss

Incentives. When the incentive system would make it beneficial for a focal profit center to disadvantage other profit centers - in order to make the focal profit center look good - standard economic literature would predict that managers will decide to do so. Starting with Jensen and Meckling (1976), this literature suggests that individual managers have little objection against benefiting themselves at the costs of other managers of the organization. Fried and Bebchuck (2004) make a case of executives taking advantage of their superior position at the cost of shareholders. In order to prevent such behaviors to surface within organizations, Lazear (1989) argues that firms may decide to compress intra-firm wages. Lazear shows that wage compression makes it detrimental for profit center managers to engage in uncooperative behavior. It follows from this paper that firms, who employ competitive workers and who have to intensively work in teams, operate best under flat wage rates. In this regard, Milgrom and Roberts (1990) argue that internal wage inequalities may motivate workers with preferences for wage increases to engage into rent-seeking behavior.

Hence, when managers benefit from uncooperative behavior, they may start to engage in this behavior. A focal profit center may advance its performance at the cost of other profit centers when it is rewarded to do so. This is likely to happen if the accounting system fails to reveal that the focal profit center took advantage of another profit center, i.e. the firm faces a potential control loss (e.g., Mookherjee and

Reichelstein, 1997). Using simulation procedures, Siggelkow and Rivkin (2005) show how incentivized profit center-level managers may start to "withhold information about departmental options, to control decision-making agendas, to veto firm wide alternatives, and to take unilateral action." Maas and van Rinsum (2013) find in an experimental setting that individuals are more likely to even resort to dishonest behavior vis-à-vis others if performance reports are concealed. Indeed such situations would make the case for performance independent compensation programs (Milgrom and Roberts, 1990).

Opportunity and incentives. Firms put transfer pricing systems and/or a performance measure in place to prevent their profit center managers from making self-centered decisions. A transfer-pricing system potentially prevents any particular profit center to take advantage of other profit centers when making management choices. The extent to which this is possible depends on how well the transfer pricing system is suited to pick up externalities between profit centers in each potential situation. However, given that demand and that the availability of resources may vary, it is hardly conceivable that the transfer-pricing system deals sufficiently with externalities at each point in time. This provides managers with the opportunity to make decisions benefitting them but not necessarily other profit centers at the same time. In cases where the performance measure is defined on the own level it is less likely for individual profit centers to consider the effect of their decisions on others (e.g. Bouwens and van Lent, 2007; Bouwens, Hofmann, van Lent, 2013). Indeed, the use of own-level performance measures provides managers with a motive to seek opportunities that benefit them most. We therefore expect that individual managers will select into activities that can enhance their own-level performance income. We summarize this idea in hypothesis 1.

Hypothesis 1: Profit centers vary in the activities they execute.

2.3. Positive spillovers and proximity

Individual decisions. In the economics literature it has been demonstrated that proximity enhances the case for positive externalities to occur. The underlying idea of the 'proximity argument' is that 'the closeness' of firm profit centers increases the likelihood that individual firm profit centers communicate with each other about and/or observe what progress they make in what areas of their business. Closeness can be related to physical distance, training background, opinions, values, and the like. In firms, *proximity* of individual firm profit centers offers an informal means of control where the relations between the profit centers would make it routine for profit centers in close proximity to check in on each

other's state of affairs. The economics literature would suggest that in a multi-agent setting, the case for surplus creation is enhanced when agents mutually observe each other's effort (Holmstrom and Milgrom, 1990; Varian, 1990). The reason is that in the presence of information, it becomes more expensive for managers to conceal information. This, in turn, enhances the case for information exchange to occur between managers (Milgrom and Roberts 1995).

Information exchange. The management literature has dug deeper into the organization's activities to examine whether proximity and positive spillovers co-occur such that information is exchanged and profit centers coordinate. Epple, Argote and Murphy (1996) find that when a truck assembly line changes from a one-shift operation to a two-shift operation, the second shift achieved a level of productivity the first shift had only reached two years after it had started. Tsai (2002) used a survey approach to examine what patterns of knowledge sharing occur within the organization. To that end he asked each respondent to indicate the profit centers from which they received technology or know-how. Based on network analysis Tsai (2002) finds that proximity is positively associated with the likelihood of knowledge sharing. The reason is that proximity makes it beneficial for managers to coordinate. These benefits increase because managers get to meet each other more often. In particular, these meetings make it expensive to the profit center manager to withhold information for his own benefit. At a next meeting he will meet the manager he 'harmed' by not coordinating. In addition, given that they meet, the next time around roles may be reversed. When it is less likely that profit centers meet, ignoring the interests of other profit centers is of a lesser concern. In that regard, Landier, Nair and Wulf (2009) demonstrate that firm profit centers located close to head office are more likely to be granted investment proposals and are less likely to face headquarter induced lay-offs than profit centers located at a larger distance from headquarters.

Variety in activities. The management literature has further examined how controls potentially enhance coordination and cooperation. For example, Pinto, Pinto and Prescott (1993) show that goals promoting cooperation are indeed important antecedents of cooperation. Tyler and Blader (2005) demonstrate that inculcating a culture in which cooperation is the norm is more strongly related to the incidence of cooperation/coordination than in a situation where the firm resides to setting explicit goals to promote cooperation. Similarly, it is argued in the literature of economic geography that the creation of informal controls via regional clusters enhances the case for communication (i.e. of knowledge and information exchange) between profit centers. However, it is also argued that geographical proximity on its own does not provide a sufficient condition for information exchange and coordination to occur (Boschma, 2005). That is, the need for coordination is conditioned on that individual profit centers benefit from

such coordination. The potential benefits of coordinating activities will increase if profit centers can help each other to step up their levels of activity. Such a condition would exist if profit centers differ to such the extent that some variety exists in the types of activities they perform. Henderson and Cockburn (1996) examine a situation where profit centers are closely situated but vary in the activities they perform. Henderson and Cockburn (1996) observe a greater incidence of knowledge transfers between different research programs that occur within the same firm when the number of individual research programs increase. They also document how even different research programs may complement each other and that these complementarities bring about economies of scope, that in turn, make it more efficient to again step up the level of research activities (Milgrom and Roberts, 1995).

To summarize, firm profit centers that operate in high proximity are likely to benefit from information exchange and to coordinate activities accordingly. The case for coordination is further enhanced if there is increased variation in the activities performed by the profit centers of a cluster. For this reason we conceive the notion of proximity in terms of the combination of closeness and variety in activities. Based on the findings in the economics and management literature, we expect positive spillovers to be associated with the proximity of firm profit centers that together render a service or manufacture a product. We summarize our expectations in the following hypothesis.

Hypotheses 2: Proximity and coordination have a positive association.

3. METHODOLOGY

3.1. Research Setting

Our research site is the national site of a multinational logistics company headquartered in Germany, whose core competencies are the transportation of durable and perishable commodities. The company comprises of 59 profit centers that each provide transportation services of either durable commodities (34 profit centers) or perishable commodities (25 profit centers). Profit centers are run by a manager who reports directly to headquarters and is responsible for all decisions made at the profit center. Sometimes, a manager is responsible for two profit centers which are located in the same location but provide different services. Yet, decisions are made separately per profit center as the provided services are distinct in terms of product handling (perishable commodities impose specific handling and storage requirements, such as chilling). Hence each profit center relies on its own terminal and trucks.

Business Order Processing. Clients typically call for bids and a profit center manager quotes a price for the desired transportation order. Profit center managers are provided with full decision rights on determining the final offer and in providing discounts[3]. Headquarters are only involved in long-term transportation contracts that affect three or more profit centers or involve long-term storage and generate considerable annual revenue.

After the client and profit center manager agree upon a price, the profit center manager who acquired the order has to decide who will execute (which activities of) the business order. Accordingly, being an acquiring profit center comes along with more decision rights. In particular, the acquiring profit centers can decide whether they fully or partly execute the order or whether they (partly) transfer the execution to another profit center within the network or to an outside subcontractor. As most of the orders involve other profit centers' terminals, we focus on order executions within the network for illustrative purposes.

Business Order Execution. The execution of a transportation activity typically involves three activities: up- and unloading trucks at the terminals ("terminal handling"), long haul transportation (terminal–to–terminal or client–to–client for very large orders) and short distance transportation (collection from and delivery to clients). Terminal handling cannot be transferred between profit centers as it occurs at the profit center's own terminal and is always executed by its own employees. The transportation activities (long haul and short distance) themselves can be transferred to any other profit center within the network. Hence, the only capacity constraint arises in the terminal, where commodities are shortly stored between unloading and uploading the trucks. Typically, the execution of an order involves more than one profit center requiring high levels of coordination.

[Insert Figure 1 here]

To enable the firm to quote at competitive prices, it is important for the firm to pursue continuous move. Continuous move exists when truck capacity is used and paid for on a continuous basis. First, the firm relies on a sophisticated information system for determining optimal delivery routes. Further, individual profit centers must consider the reduction or elimination of dwell time and deadhead movements. A deadhead movement pertains to an empty truck repositioning itself from a destination to its next origin

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[3] Even though sales prices are theoretically completely negotiable, the logistic market in Germany is highly competitive, leaving little latitude to negotiate about prices. A recent survey by the German Association Materials Management Purchasing and Logistics in 2012 revealed that 85.7% of the logistics companies perceive a tendency towards cutthroat competition in the logistic industry (Gburek and Wittenbrink, 2012).

for a pickup. It is certainly not always possible to achieve continuous move. Main lanes (or head haul lanes) connecting a site where products are mainly collected (e.g. a main port) with a site that mainly receives product (e.g., a main city) may often involve trucks to be loaded in only one direction. The focal (acquiring) profit center that originated the business must now either rely on the local profit center to acquire a back haul on the return trip or try itself to find a customer to prevent a deadhead movement to occur all the way back to its home base.

Residual income and incentives. Profit centers operate in a decentralized network where managers are provided with comprehensive decision rights. Accordingly, each profit center manager is responsible for acquiring and executing business orders and often chooses to specialize in either one. Each profit center manager is held accountable for the residual income of his particular profit center(s), i.e. his bonus is solely based on residual income. As network delivery performance is rated by its clients and thus affects the whole network, the firm also attaches great importance to timely delivery. Hence, profit centers maximize profit conditional on timely delivery (where the target is a 98% rate of timely deliveries).

Profit centers managers have two ways to increase their bonus payments: by increasing revenue and by decreasing costs. To a (very) limited extent, external revenue can be influenced by negotiating profitable prices with clients. Internal revenue is based on the calculated transfer price and hence not negotiable. On the cost side, residual income can be improved by decreasing costs associated with terminal handling, long haul transportation and short distance transportation. Furthermore, it is very important to deliver on time as late deliveries can be associated with severe penalty payments (thus decreasing residual income). Whether a penalty will be imposed at all is, however, at the discretion of the affected profit center. Only in the case of reoccurring severe delays, headquarter gets involved, which may then even be associated with dismissals.

Business Order Execution and Self-centered decisions. As indicated before, acquiring profit centers can decide which activities of an order to execute and which to transfer. As such, specializing into acquiring comes with relatively more decisions rights. If the acquiring profit center executes (transfers) an order, the profit will be the difference between the negotiated price [p] and the associated executing costs [c] (associated transfer price [tp]) per activity, i.e. terminal handling, and long haul and short distance transportation (a_i, a_j, a_k, respectively). Likewise, if the execution of the business order is partially transferred, the profit to the acquiring profit center consists of the negotiated price minus execution costs and the internal transfer price it has to pay (e.g., profit = $p - c(a_i, a_j) - tp(a_k)$). As individual profit

centers are incentivized on own-level residual income, the acquiring profit center prefers to execute (transfer) activities where executing costs are lower (higher) than the transfer price (provided profit centers have sufficient capacity to execute the order). Given the use of these own-level performance measures, the acquiring profit center's manager will continue to do so even if it is at the cost of another profit center - unless the transfer pricing system is able to prevent such behavior.

Transfer Price. The firm uses a sophisticated transfer-pricing system that is updated on a yearly basis to deal with any costs that profit centers incur when executing business that was acquired by another profit center. The executing profit center typically accrues internal revenues for rendering its service which are one-to-one recorded as an internal cost for the profit center that acquired the business. The transfer-pricing system is comprehensive in that it not only charges for planned tasks, but can be flexibly adjusted also for additional (traceable) tasks that acquiring profit centers may impose on or abate from executing profit centers. In particular, the transfer price is based on a standard price (determined by headquarters) adjusted for the size of the freight, its weight, the routing schedule, regional cost levels, etc. Likewise, the transfer price considers whether profit centers succeed in avoiding deadhead movements by either reducing internal costs or increasing internal revenue to the benefit of the profit center responsible for continuous move. Thereby, the transfer pricing system induces coordination between profit centers.

In the words of firm's management, the transfer pricing system leaves no questions on the table on who is to be compensated and what needs to be compensated. It is a shared belief among the firm's management that the transfer pricing system motivates profit center managers to coordinate. Accordingly, if the transfer pricing system is capable of adequately capturing all interdependencies between profit centers, it should prevent any profit center from engaging in self-centered decision making at the cost of other profit centers.

Coordination and regional clusters. Coordination within the network is considered a next key factor by the firm. Next to the two formal control systems in place (i.e. own-level performance measures and the transfer pricing system) the firm thus implemented an informal control system via the introduction of regional clusters to enhance coordination between profit centers. In particular, more than a decade ago, the company implemented five regional clusters to decrease the costs of communication, i.e. to further enhance coordination through knowledge and information exchange. Overall, these five groups consist each of four to eleven profit center managers. These regional groups meet on a regular basis every two

to three months to discuss businesses, upcoming orders, and the like. Accordingly, each cluster features high geographical closeness. The clusters do, however, differ in their extent of variation in specialization between the profit centers making up the cluster. As the firm set up *regional* clusters, the degree of variety in specialization within the different clusters varies naturally. That is, in terms of specialization choices, profit centers were randomly assigned to clusters. As the variety in activities increases, coordination potential as well as costs from abstaining from coordination increase, thereby increasing the likelihood of coordination.

To conclude, the network is run by separate profit centers that can enhance its competitive position through specialization and coordination. The transfer pricing system is designed to decrease the likelihood that individual profit centers can benefit from shifting activities to other profit centers at the cost of these other profit centers. It is possible, however, to improve performance through coordination. For instance, profit centers can enhance timeliness in deliveries through concerted planning. That in itself gives, together with the transfer price, an incentive to coordinate activities. Further, proximity should mitigate self-centered behavior and further enhance coordination.

3.2. Focus of the analysis and sample

3.2.1. Focus of the analysis

Given the control elements in place, we are essentially interested in two questions: 1) Would profit center managers impose negative externalities on each other if they can? 2) When would profit centers coordinate more?

Identification strategy for self-centered decisions (H1)

Recall all profit centers acquire and execute business. To the extent that activities are equally profitable, profit centers will be indifferent as to what activity they execute. However, this position will change if there are differences between activities. To the extent that one activity is more profitable, profit centers will (1) try to acquire more orders involving a higher extent of that activity, and (2) will prefer to execute that activity over other activities. They do so as each profit center is incentivized on own-level residual income. Executing more of the most profitable activity simply increases profitability to the highest extent.

The fact that profit centers will try to acquire more of an activity will still have no effect on the distribution of the activities over the profit centers provided that the transfer price will take care of all externalities involved. However, to the extent that the transfer price does not always capture all externalities, individual profit centers will care about who executes the more profitable activity. We predict that when the transfer price is higher than the costs to execute that activity, profit centers will prefer to execute that activity. On the other hand, when the transfer price is lower than the internal costs, the profit center will prefer to transfer that activity to another profit center.

The test we perform comprises of two stages. We first test which activity is more profitable. In the second stage we test whether the more profitable activity is indeed performed at a higher frequency by the profit centers that de facto can decide on who executes that activity. The latter are profit centers that acquire more business than they execute themselves. Hence, we test whether acquiring profit centers keep the activities that are more profitable at the profit center-level to themselves, while transferring the less profitable activities to other profit centers.

Identification strategy for coordination (H2)

Based on theory we expect that profit centers featuring high proximity face higher costs when they abstain from coordination. These costs are higher for profit centers making up a cluster because they meet regularly and are more likely to know what decisions managers of the same cluster made than decisions made by managers belonging to other clusters. Not coordinating may come down to withholding profit opportunities for other profit centers. Accordingly, profit centers that feature high proximity are more willing to share profitable activities such that profitable activities are more evenly distributed among profit centers. We perform two tests to establish whether or not proximity is associated with coordination. We first examine whether the distribution of activities is associated with proximity. We then present a second line of tests to examine whether profit centers are timelier in their deliveries when proximity is high. We construe such a finding as evidence of coordination.

3.2.2. Sample

Our sample covers quarterly data for six fiscal years (2006 to 2011). The actual number of profit center-quarter observations is lower due to the absence of information on timely delivery or openings of new profit centers. Our data base comprises 59 profit centers and 1,204 PC-quarter observations.

In particular, we rely on the following data received from the firm's accounting system for our analysis: actual external revenue, actual costs (of long haul transportation, short distance transportation, and terminal handling), actual internal business transfers (internal revenue and internal costs based on the transfer pricing system) and actual residual income; deviations from standard costs, information on the commodities transported (number and weight of commodities), the extent of timely delivery, and information on the size of the profit centers (sqm utilization of the terminal, number of full-time employees) for each profit center.

3.3. Variable Measurement

3.3.1. Main Variables

Specialization: acquiring and executing profit centers

As profit center managers are responsible for both acquiring and executing business orders, a profit center may choose to specialize either in acquiring businesses or in executing orders. We define specialization as the extent to which a profit center focuses on one task, i.e. the extent to which a profit center acquires more business orders than it executes and vice versa. Accordingly, an 'acquiring profit center' acquires more business than it executes and hence transfers (a part of) the execution of those orders to other profit centers. Likewise, an 'executing profit center' executes more orders than it acquires and hence relies on other profit centers to obtain business orders.

To measure specialization (referred to as *specialization*) we rely on the transfer-pricing system, which reflects the amount of business conducted for other profit centers (internal revenue) and the amount of business transferred to other profit centers (internal cost). Our measure of specialization is based on an adapted version of the Herfindahl-Hirschmann Index[4] proposed by Staats and Gino (2012), and Narayanan et al. (2009). The measure gauges the relative dominance of specialization versus variety in activities. Variety occurs when profit centers perform equal levels of activities in acquiring and executing business. A profit center is considered to specialize in the extent that the number of acquiring activities deviates from its executing activities (i.e. it performs relatively more of the respective activity in which it specializes). Our measure of specialization is represented by the following equation: $(\frac{business\ transferred - business\ received}{FTE})^2$.

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[4] A Herfindahl-Hirschmann Index is calculated by identifying the percentage of a profit center's total daily experience in a certain task, then squaring that value and summing the components (Staats and Gino, 2012).

As the measure does not differentiate between the different types of specialization (but measures the extent of being specialized), we additionally include a dummy variable (*ACQUIRE_D*) indicating whether a profit center is an acquiring profit center (it equals one for profit centers that specialize in acquiring and is zero for profit centers specialized in executing) and let this dummy interact with our measure of specialization. This way, we capture potential differences between acquiring and executing profit centers (which is especially important for testing whether different types of specialization accrue (different) externalities on other profit centers)[5].

Proximity

Recall that prior research has shown that geographical closeness increases information and knowledge exchange between regional cluster members. The extent to which individual profit centers belonging to one cluster reap benefits from this increased information exchange depends, however, on the variety in activities performed by cluster members.

Our measures 'proximity' essentially captures this idea. In particular, our measure captures the extent to which profit centers belonging to a cluster vary in their degree of specialization. The underlying idea is that specialization creates the potential of complementarities to arise (Milgrom and Roberts, 1995); if the difference growths, profit centers in the region may reap larger benefits from coordination.

To assure that our measure of proximity picks up different types and levels of specialization (i.e. acquiring vs. executing) we measure *proximity* as the variation in *un*-squared specialization within each cluster (i.e., std. dev. of ($\frac{business\ transferred - business\ received}{FTE}$)).[6] In addition, we examine whether specialized profit centers reap other benefits from proximity than rather unspecialized profit centers by including an interaction between the extent of variation in specialization within a cluster (*proximity*) and the extent of specialization (*specialization*).

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[5] As a validity check we also examined how our variable relates to external revenue. Based on a fixed effects panel regression, we find a positive relation between both specializing in acquiring per se (i.e. the Dummy) and the extent to which a profit center specializes in acquiring (i.e. the interaction), thus supporting the validity of our measure.

[6] A squared measure would here be inappropriate as a profit center highly specialized in executing (which is associated with a negative value of the un-squared specialization measure) and a profit center highly specialized in acquiring business (which is associated with a positive value of the un-squared specialization measure) would show no variance had the square been taken. Hence differences in the type of specialization (acquiring vs. executing) would not bear out if we would rely on the squared measure of specialization.

3.3.2. Dependent Variables

Operational choices and financial performance measures

We received all financial measures associated with acquiring and executing orders on a quarterly basis from the firm's accounting system. External revenues (referred to as *ER_fte*) is the revenue generated through client orders; variable terminal handling costs (referred to as *TH_fte*) occur at the terminal where trucks are un- and uploaded and commodities are shortly stored; and long haul and short distance costs refer to the variable costs associated with long haul and short distance transports, respectively (referred to as *LH_fte* and *SD_fte*). The performance measure, residual income, was further supplied by the firm (referred to as *RI_fte*). Each financial measure is scaled by FTE in order to control for size effects. Also, all financial variables have been adjusted for inflation. Based on the measures, we can gauge how specialization and proximity relate to selecting into certain activities and the overall performance on a profit center level.

Coordination and timeliness in deliveries

From the firm's perspective, timeliness in deliveries is the ultimate measure of coordination. Only if profit centers coordinate well, they are able to deliver on time. *Timeliness* is captured by a percentage measure indicating the percentage of on time deliveries within a quarter (provided by the firm).

3.3.3. Control variables

As control variables, we include cost efficiency, characteristics of the freight transported, the utilization of the terminal, and a season dummy. Also, timeliness in deliveries is included as a control variable in all regression except the regression on timeliness itself.

We measure c*ost efficiency* as the percentage deviation of actual costs from standard costs. *Freight characteristics* represent the weight and number of commodities handled per FTE. As these two measures correlate highly (>60%) we aggregated them via a factor analysis. Both variables loaded highly on the resulting factor (factor loadings are both > 0.89) (referred to as *goods transported*). *Terminal utilization* is provided via the sqm used in the profit center's terminal per quarter (referred to as *sqm*). These variables were all provided by the firm. Lastly, our season dummy *'Winter'* controls for the fact that winter month are typically associated with higher transportations costs.

3.4. Model Estimation

To investigate our research questions we implemented a fixed effects panel data regressions at the profit center level. Profit centers provide transportation service for either durable or perishable commodities, but never for both (as perishable commodities impose different product handling requirements). Sometimes, however, one manager is responsible for two profit centers at the same location. We control for this fact by clustering standard errors per profit center manager. Further, we run a fixed-effects panel regression to control for underlying time-invariant factors that might influence the performance of the profit centers (such as: individual PC manager's experience/knowledge, regional differences, type of service provided, etc.) and standardize our continuous variables.

Concluding, we run the following regression, where the dependent variable ($\widehat{Y_{i,t}}$) represents operational choices, coordination measures and performance at the profit center level, which have been discussed above:

$$\widehat{Y_{i,\iota}} \ = \ b_i + b_1 * specialization_{i,t} + b_2 * ACQUIRE\_D_{i,t} + \ b_3 * specialization_{i,t} * ACQUIRE\_D_{i,t}$$
$$+ \ b_4 * proximity_{i,t} + \ b_5 * proximity_{i,t} * specialization_{i,t} + \ controls_{i,t} + \varepsilon$$

In our regressions, the coefficients b_1, b_2, and b_3 pertain to the effect of specialization at average levels of proximity. The *specialization* variable picks up the extent to which specialization is related to the main dependent variables. As this variable [*specialization*] does not differentiate between the different types of specialization (i.e. acquiring vs. executing) we further include a dummy variable [*ACQUIRE_D*] identifying profit centers that specialize in acquiring orders. We let these two variables interact to capture potential slope differences for acquiring vis-à-vis executing profit centers [interaction: *ACQUIRE_D* specialization*]. Assuming an average level of proximity, we below sketch how these regressions will work out mathematically.

$$\hat{Y}_{executing} = b_1 * specialization_{i,t} \qquad\qquad (1)$$

$$\hat{Y}_{acquiring} = b_2 + (b_1 + b_3) * specialization_{i,t} \qquad\qquad (2)$$

In equation (1), b_1 captures the relation between specializing in executing business and the DV (say residual income). Equation (2) represents the association between specializing in acquiring business and the DV. In particular, b_2 refers to the association of the dummy variable identifying a profit center as an acquirer with the DV, reflecting the difference in the intercept between acquiring and executing profit

centers. Similarly, b_3 represents the *extent* to which the relation of being an acquiring profit center differs from the relation of being an executing profit center with the dependent variable. Accordingly, b_1+b_3 reflect the slope coefficient for acquiring profit centers and b_1 for executing profit centers.

At this point we want to emphasize that our dummy (acquirer or not) as well as the interaction of specialization with our dummy essentially capture the same underlying variable. In the regression we run loadings on specialization point to the extent to which specialization plays out in relation to the DV. The dummy and the interaction point to whether this relationship differs for acquiring vs. executing profit centers. We discern between these two aspects because we are interested in teasing out the extent to which acquiring profit centers *per se* differ from executing profit centers (dummy, i.e. b_2) and *to what extent* they differ (interaction, i.e. b_3) in their relation with the DV.

The coefficients b_4 and b_5 capture the effect of proximity (the extent to which profit centers that belong to a cluster differ in their activities) on the DV and its effect on the relation between specialization and the DV. In particular, we are interested whether the increased potential for coordination (achieved through variety in activities, referred to as '*proximity*'), represented by b_4, affects operational choices/coordination and profit center performance. We further intend to disentangle whether highly specialized profit centers are impacted differently by proximity than rather unspecialized profit centers by including an interaction (*proximity * specialization*), reflected by b_5.

Our control variables include cost efficiency, timeliness in deliveries, sqm utilization of the terminal, freight characteristics, and a seasonal dummy indicator.

4. RESULTS

4.1. Descriptive Statistics

4.1.1. Main Variables

Specialization: acquiring and executing profit centers

Of the 59 profit centers in our analysis, 27 profit centers generally specialize in acquiring business and 32 profit centers generally specialize in executing business. Comparing specialization choices per service provided, transportation services for durable commodities specialize in 19 cases in acquiring business and in 15 cases in executing business. Transportation services for perishable commodities specialize in 8

cases in acquiring business and in 17 cases in executing business (see Table 1, Panel A). Potential performance differences due to the different transportation services provided are controlled for by including fixed effects in our regressions.

[Insert Table 1, Panel A here]

Table 1 Panel B shows the persistence of specialization over time. Based on our dummy variable (*ACQUIRE_D*) indicating whether a profit center specializes in acquiring (=1) or executing (=0) business orders, we can determine transition probabilities over time, i.e. the probability that a profit center changes its specialization over time. For our sample, the specialization focus is very time persistent: the probability of retaining a specialization choice over time is ~94%.

[Insert Table 1, Panel B here]

Table 1, Panel C provides descriptive statistics on specialization and proximity. As our measures of these variables are based on financial numbers, it is necessary to consider that we linearly transformed all financial numbers in order to retain the firm's anonymity. It is very important to the firm to ensure that its identity is not identifiable by competitors.

We first present the (non)financial numbers used to calculate our measure of specialization and then the measures themselves. The internal transfer prices (internal costs and internal revenue) show a mean (median) of EUR 337,439.55 (271,818.63) associated with internal costs and a mean (median) of EUR 337,268.28 (280,216.41) associated with internal revenue. The numbers do not add up perfectly as the execution of some orders involved profit centers outside of Germany. The difference between internal revenue and internal costs is, however, very small (<0.001% of the associated amount). Finally, all financials are scaled by the number of full-time employees per service line, which have a mean (median) of 124.62 (114.64) to control for size differences.

Our measure of specialization includes one outlier whose magnitude is more than 3 times as large compared to the magnitude of the next observation. As it shows to influence our results, we winsorize the outlier. Yet, our qualitative results would not change if we kept the outlier in our analysis.

Given the transformation of all financial numbers, our *un-squared* measure of specialization does not indicate the *exact* EUR amount per FTE by which a focal profit center transfers more (less) business to other profit centers than it receives. Nevertheless, our descriptive statistics provide an indication on the distribution of specialization across profit centers. In particular, we find a mean (median) specialization of EUR -521.86 (-120.57) per FTE and a spread in specialization (un-squared) ranging from –EUR -

12,297.06 to EUR 3,382.30. This suggests that profit centers tend to specialize in executing business *on average* and that our measure is a little skewed to the left. This is, however, not problematic as the underlying observations used to calculate our measure of specialization do not share this skew and the skew in our measures further supports that we capture specialization: "If [profit centers] are specialized in a given activity, one would expect the estimated distribution to be concentrated at (or near) a particular level of activity [...] and skewed [...] if this activity represents an important share [...] (Curi, Guarda, and Zelenyuk, October 2011, pg.21). Additionally, the spread in specialization indicates a large variation in the extent of specialization across profit centers.

Proximity

Concerning variety in specialization between profit centers making up a cluster, we find a mean (median) variation of 1,635.71 (1,469.75). Again, these numbers do not represent the "actual" variation level as all financial numbers have been linearly transformed to ensure the firm's anonymity. Yet, as all numbers have been equally transformed, these numbers show how great the variation of specialization between regional clusters is: Having a minimum value of 509.36, our maximum value of 3,752.91 is more than seven times larger than the minimum value.

[Insert Table 1, Panel C here]

4.1.2. Profit Center Performance

Table 1, Panel D provides an overview on profit center performance per provided transportation service (i.e. durable vs. perishable commodities). We distinguish between the two different services as transporting/storing perishable commodities impose different requirements (i.e. chilling) as compared to durable commodities. In our multivariate panel data regression we control for this fact via including fixed effects.

For timely delivery, there is no difference between the two different service lines: both show a mean (median) value of 0.99 (0.99), indicating that all profit centers on average deliver on time.

Concerning financial performance, mean residual income per FTE is more than twice as high for profit centers transporting durable commodities (616.71) as compared to perishable commodities (286.55). This performance difference seems to be mainly attributable to the higher costs: Both service lines generate on average a similar amount of external revenue: 9,774.49 for profit centers transporting

durable commodities and 10,845.96 for profit centers transporting perishable commodities. Yet, costs are considerably higher for handling perishable commodities. In particular, terminal-handling costs per FTE, are on average almost 1.5 times higher for profit centers transporting perishable commodities (1,226.71) as compared to durable commodities (870.96).

[Insert Table 1, Panel D here]

4.1.3. Pearson Correlation

We present the correlation matrix of our main variables in Table 1, Panel E. First, we observe a positive relation between the extent of specialization and proximity (COEFF.=0.26; SIGN:<1%), which is consistent with the idea that within clusters, profit centers try to engage in different/complementary activities. External revenue per FTE is positively correlated with our acquiring dummy (COEFF.=0.14; SIGN:<1%), suggesting that we capture the profit center's attempt to specialize in acquiring business. Furthermore, we find a positive correlation between the extent of specialization and costs per FTE at all three variable cost dimensions (Long Haul: COEFF.=0.12, SIGN:<1%; Short Distance: COEFF.=0.51, SIGN:<1%; Terminal Handling: COEFF.=0.58, SIGN:<1%), while our acquiring dummy is negatively correlated with short distance costs per FTE (COEFF.=-0.51; SIGN:<1%), and terminal handling costs per FTE (COEFF.=-0.31; SIGN:<1%). This could suggest that specialization relates to the type of activities that profit centers concentrate on. Residual income per FTE is negatively correlated with the extent of specialization (COEFF.=-0.07; SIGN:<5%),   and positively correlated with the acquiring dummy (COEFF.=0.14; SIGN:<1%), and proximity (COEFF.=0.11; SIGN:<1%). Further, we find a positive correlation between the extent of timeliness in delivery and proximity (COEFF.=0.08; SIGN:<1%) , which is consistent with our idea of coordination.

It is important, however, to keep in mind that these relations are based on univariate and cross-sectional correlations. Since we are analyzing a panel data set we have to be cautious in drawing conclusions from these correlations.

[Insert Table 1, Panel E here]

4.3. Main results

Recall that our test of Hypothesis 1 comprises of two stages. First, we establish whether some transportation activities are relatively more profitable than others. To that end we estimate how these

activities are related to residual income [Table 2]. If we find that certain activities are more profitable, profit centers will prefer to execute the more profitable activity, unless this is completely accounted for by the transfer pricing system.

We then continue to test Hypotheses 1 by examining whether specialization is related to the extent to which profit centers select into activities that are allegedly more profitable [Table 3]. If the transfer pricing system is able to always fully take into account any externality between profit centers, we should not find any relations. This analysis helps us to establish whether (acquiring) profit centers are able to select into more profitable transportation activities. If this is the case, it would result in a skewness in the distribution of transportation activities across profit centers (H 1).

We then continue to test Hypotheses 2 by examining the association between proximity and coordination, i.e. whether profit centers that belong to a cluster with a high variety in activities across profit centers are associated with increased coordination. We capture coordination in two different ways: First, coordination should increase a profit center's willingness to share profitable activities, resulting in a more equal distribution of these activities across profit centers. Second, coordination should improve timeliness in deliveries. Accordingly, we test whether proximity is related to the distribution of activities [Table 3] and timeliness in deliveries [Table 4].

Lastly, we test whether specialization and proximity are overall beneficial to individual profit centers by examining the relation between specialization, proximity and residual income [Table 5].

4.3.1. Profit impact of transportation activities

We first examine which of the activities a profit center would want to increase in order to maximize next period's profit. Our approach is to assess how changes in activity levels over one period (quarter) affect residual income. We focus on the three main cost factors (long haul transportation, short distance transportation and terminal handling), while controlling for timeliness in deliveries (*timeliness*), terminal utilization (*sqm*), freight characteristics (*goods transported*), seasonality (*Winter*), prior performance (*prior year's RI*). We reproduce our results in Table 2.

[Insert table 2 here: Contribution to residual income]

It appears that profit centers fare better if they can step up the levels of long haul transportation (COEFF.= 0.169; SIGN.<1%) and if they are able to downplay the levels of terminal handling (COEFF.= -

0.610; SIGN.<1%) they are required to perform. Short distance does not load on residual income.   In the second column, we run the same regression to include whether profit centers accrue changes in cost efficiencies. Compared to the results documented in column (1), our results are hardly affected. We therefore conclude that stepping up activity levels in long haul transportation (terminal handling) is profitable (costly). As profit centers are not able to deselect from terminal handling (which is mostly related to the size of the terminal; terminal handling has to be carried out by the respective employees of the profit center), we conclude that profit centers try to increase the amount of long haul activities performed.

4.3.2. Selecting activities with a higher profit potential

Given these results, profit centers should *prefer* to execute long haul transportation over short distance transportation (because of capacity constraints in the terminal increasing the amount of long haul distance is associated with a decrease in short distance activities). If the transfer pricing system is able to account for all interdependencies between profit centers, we should, however, not find any relations; i.e. profit centers would be indifferent as to which activity they execute and activities would be equally distributed across profit centers. If the transfer pricing system is *not* able to account for all externalities between profit centers at each point in time, we expect that profit centers select into long haul activities if they are able to (and correspondingly deselect from short distance activities).

To test Hypotheses 1, we hence investigate whether profit centers select into long haul activities to improve their performance. As acquiring profit centers are in a better position to actively select the more profitable activities, they will be the one we expect to select into long haul transportation activities, while executing profit centers have less leverage in activity selection. Accordingly, we expect acquiring profit centers to select into executing long haul activities, while transferring short distance activities to executing profit centers. To what extent acquiring profit centers succeed in (de)selecting more (less) profitable activities depends essentially on two aspects: whether they are an acquiring profit center at all and the extent to which they are specialized in acquiring (enhancing their choice potential). We reproduce our results in Table 3.

[Insert table 3 here: Activity Selection]

Specialization. The results on our specialization measure support Hypothesis 1. That is, we find that specialized profit centers vary in the activities they perform. First, as all profit centers seek to perform

long-haul activities, we find that the extent of specialization is positively associated with executing long haul transportation activities (column 1; Specialization: COEFF.=0.107, SIGN.<10%). However, acquiring profit centers are in a better position to select into long haul activities and indeed we find that being an acquiring profit center is positively associated with performing more long-haul transportation activities (column 1; ACQUIRE_D: COEFF.= 0.110; SIGN.<5%). Further, the more profit centers specialize into acquiring, the more they *de*select from short distance activities and hence transfer these activities to other profit centers (column 2; interaction term: ACQUIRE_D*specialization: COEFF.= -0.149; SIGN.<5%; the equation including main effects would be for acquiring profit centers: -0.0569 - 0.0988*specialization). These results suggest that acquiring profit centers select the more profitable activities and shift the relatively less profitable activities to other profit centers. Lastly, as expected, we find no relation between specialization and terminal handling activities (column 3). The reason is that terminal handling cannot be transferred to other profit centers but has to be carried out by each profit center itself.

We conclude that acquiring profit perform relatively more (less) long haul (short distance) activities as compared to executing profit centers (supporting Hypothesis 1). Accordingly, acquiring units select into the activities that feature a higher profit potential. This finding is also supported by anecdotal evidence, as profit center managers complained to the firm's management that it is easier for acquiring profit centers to improve their financial performance by selecting into the more profitable long haul activities.

Proximity. The results in Table 3 also support Hypothesis 2. That is, we observe that proximity is indirectly related to the amount of long-haul transportation activities performed by a profit center. In particular, the results suggest that the more profitable long haul activities are more evenly distributed among profit centers if proximity, i.e. the extend of variety in activities within a cluster, is high (column 1; interaction term proximity*specialization: COEFF.= -0.0526; SIGN.<5%). This is consistent with the idea that profit center managers are less likely to resort to attempts to select into activities that are more profitable to them when they are part of a cluster with high variety in activities. Not coordinating may come down to withholding profit opportunities for other profit centers. As profit center managers meet regularly, abstaining from coordination becomes costly as these managers meet again in the future. Accordingly, high proximity increases a profit centers willingness to share profitable activities, yielding a more even distribution of long haul activities across profit centers.

Concluding, we find support for our Hypothesis 1 and Hypotheses 2. That is, the evidence suggests that profit centers perform different activities, i.e. acquiring profit centers select into the more profitable long-haul activities (H1). Profit centers in high proximity seem to coordinate more by sharing the more profitable activities among each other (H2). [7]

4.3.3. Timeliness

To further substantiate our findings on the relation between proximity and coordination (Hypothesis 2), we investigate how timeliness in deliveries relates to specialization and proximity (i.e. the extent to which profit centers belonging to one cluster vary in their activities). Timeliness in deliveries is a very important target to the firm and the firm's management made clear to us that profit centers need to execute orders efficiently and coordinate well to achieve timely deliveries. Hence, we expect that proximity is positively associated with timeliness in deliveries, while controlling for efficiency in order execution. We reproduce our results in Table 4.

[Insert table 4 here: Timeliness]

Specialization. Specialized profit centers do not seem to perform better on the timeliness dimension as we do not find any relation there. Keep in mind, however, that the variation in timely delivery is very small, which might explain why there is no significant performance difference between specialized and unspecialized profit centers with regard to timely delivery.

Proximity. We do, however, find a relation between proximity and timeliness in deliveries, further supporting Hypothesis 2. In particular, we find that proximity is positively related to timeliness in deliveries (column 1; proximity: COEFF.= 0.0872; SIGN.<10%). We make sure that our findings are not driven by potential outliers by winsorizing all observations with a delivery rate below 96% (i.e. the percentage points of late deliveries match the percentage points of timely deliveries). Our results are not affected. We further run a fixed effects logistic regression (classified as on time delivery if delivery rate ≥

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[7] Please note that we control for cost efficiencies in each regression. Thereby, we ensure that our relations are not driven by cost efficiencies, but actually capture activity selection. However, excluding cost efficiency measures from these regressions still yield the same results.

0.98, and as late if delivery rate <0.98) as a robustness check, which also yields the same qualitative results.

Concluding, profit centers seem to benefit from belonging to a cluster with higher variations in activities, as suggested by theory. Indeed such variety in activities would potentially increase coordination and the flexibility of the profit centers to an extent that would allow for a higher timeliness record.

4.3.4. Financial performance

Lastly, we are interested in how profit centers perform on the overall firm target of profit maximization by examining how specialization and proximity play out. First, we are interested whether it pays off to specialize as a profit center. Further, we are interested whether the documented positive association between proximity and coordination carries over to a better profit centers performance. Accordingly, we investigate how specialization and proximity are related to residual income. We reproduce our results in Table 5.

[Insert table 5 here: Financial performance]

Specialization. Our results suggest that specialized profit centers are in the end more profitable (Specialization: COEFF.= 0.142; SIGN.<5%), i.e. it is beneficial for a profit center to specialize. Interestingly, acquiring profit centers do not perform better than executing profit centers, suggesting that acquiring profit centers are not able to outperform executing profit centers despite their decision rights with regard to activity selection.

 Proximity. The results on our proximity measure reveal that profit centers experiencing high proximity are associated with an increased performance concerning residual income. In other words, we find evidence that more variety in activities within a cluster is beneficial to the profit center's financial performance (proximity: COEFF.= 0.0982; SIGN.<1%). Overall, this suggests that profit centers benefit unequivocally from proximity, i.e. variety in specialization.

4.3.5. Robustness checks

The above discussed results are based on the winsorized measure of specialization (where we winsorized one extreme outlier, as discussed in section 4.1). However, including the outlier in our regression does also support our presented results. Similarly, not including cost efficiency measures in our regressions does not impact our findings. We control for potential time effects by including year-fixed effects in our regressions. Our results do not change if we discard these either. As a robustness check, we further include time itself into our regressions [untabulated]. Our results are still consistent with our original findings.

To ensure that increased communication between group members is the prerequisite of the observed impact of proximity (i.e. the extent to which profit centers within a cluster vary in terms of specialization), we create random groups and re-run our analysis [untabulated]. If groups are randomly created, the observed effects of proximity vanish. This further supports that the interaction between group members impacts decision making, where the benefit of communication increases with the extent of heterogeneity in specialization between group members.

5. DISCUSSION AND CONCLUSION

In this paper we examine the working of a control system that comprises of three elements: profit center-level residual income, transfer pricing and regional clusters. Business occurs between clusters and within clusters.

Profit center managers in our sample are incentivized and evaluated on the residual income of their specific profit center. These incentives would encourage them to make self-centered decision so as to increase their residual income, while the effect on other profit centers is less of consideration. However, the transfer pricing system the firm uses is designed to encourage coordination between profit centers while impeding profit centers from making decisions that impose negative spillovers on other profit centers. We argue that it will be difficult for the transfer pricing system to always fully account for all externalities and therefore predict that profit centers will make self-centered decisions if they are able to given the incentive system in place.

Specialization in acquiring business

In order to test whether they will do so, we discern profit centers that are in a better position to favor themselves. We argue that profit centers that specialize in acquiring business are in a better position to take advantage of other profit centers than profit centers that primarily execute business. The reason is that these profit centers can choose which business they transfer to other profit centers and which business they rather execute themselves. We test whether focal profit centers select into activities and find evidence that is consistent with that idea. Hence, we conclude from this finding that profit center managers find it hard to abstain from making self-centered decisions. This finding should not be surprising given the incentives in place. That is, given the own-level residual income measure, profit center managers are incentivized to do so and are simultaneously given the opportunity (as it is impossible for the transfer price to always fully account for all externalities at each point in time). Even if these managers would know that they disadvantage their colleagues they can rationalize their behavior using excuses like: "no one is hurt" or "The effect on others is immaterial." Simons (2005, p. 111) refers to this situation where opportunity, performance pressure, and rationalization opportunities exist as the dangerous triangle.

Proximity

We believe that the firm fitted a unique control to mitigate self-centered behaviors and foster coordination among profit centers. The firm created more than a decade ago regional clusters comprising of profit centers, which headquarters expect to meet on a regular basis. We predict that these meetings would make profit centers reluctant to take advantage of each other. Our reasoning is that these regular meetings would increase the costs of being dishonest to those colleagues. Indeed the mere fact that the firm tells these managers that they are connected does in itself increase the likelihood that they take decisions in the interest of whom they are connected to (Babcock, Loewestein and Issacharoff, 1995). This is even more so the case when business-related information is exchanged during formal meetings. The availability of information makes it more difficult to take advantage of other profit centers per se and it increases the social costs of putting colleagues that one knows at a disadvantage. Lundquist et al. (2009) find that it is far less likely for people to lie once they have communicated with each other. Not coordinating can be considered as a subtle form of lying. Our results are consistent with this idea. That is, we observe mitigated self-centered behavior and increased levels of coordination for profit centers that are part of a cluster with high proximity; where profit centers within a cluster vary in their extent of specialization (i.e. are complementary). This variation in specialization between profit

centers comprising a cluster increases the potential benefit they can accrue from coordination. In particular, we find that under high proximity, specialized profit centers are more likely to share the more profitable activities with other profit centers. Other indications of better coordination are that profit centers in a high proximity cluster are more likely to deliver their freight timely and realize higher levels of residual income.

Taken together the results are consistent with the idea that profit centers are more likely to benefit from high proximity (i.e. variation in specialization) within their cluster. Indeed, as theory suggests, physical closeness and regular meetings enhance the case for information and knowledge exchange, while variation in specialization (proximity) increases the potential benefits that profit centers can accrue from coordination. Building on the idea of relational-contracts theory (Henderson and Gibbons, 2012a) we find some evidence to suggest that seemingly similar units are essentially different in how relational contracts have been built in the firm. Our evidence suggests that the formation of clusters leads units to coordinate more. We also demonstrate that increased coordination affects the results of the units making up the firm. This evidence provides some potential insight into why seemingly similar units do achieve different performance levels. We conclude that the evidence we present leads to the conclusion that proximity enhances coordination, impacting profit center performance.

Our results would lead us to the observation that if coordination unequivocally benefits the firm, firms are better off to design controls in a fashion that enhances the likelihood of coordination. It would seem that formal controls (in our case the transfer pricing system) can be used to only a limited extend. It appears to be that case that – controlling for transfer pricing accurateness – the creation of proximity makes it more likely that coordination occurs. The firm's choice to create proximity by promoting regional profit centers to regularly meet seems to entail levels of coordination that cannot be achieved with the implemented formal control systems alone. We find that the proximity created with the formation of these profit center clusters positively affect the incidence of coordination, when group members show complementarities in specialization. On the other side, we also find that the use of profit center-level residual income measure entices focal profit centers to make self-centered decisions and to give less priority to coordination. Accordingly, our results suggest that the informal control system implemented through the regional clusters (proximity) complements the formal control systems in place by counterbalancing mechanism that decrease coordination between profit centers.

Caveats

As with most empirical work, our study has some caveats that may affect the implications of our results.

In the first place our research setting is limited to one firm. While this approach enhances the comparability between the profit centers, the generalizability of our results may suffer from this design. We take care, however, to base our tests on previous literature. Secondly, we are not able to directly measure business transfers between profit centers, meaning that we do not have information on individual transactions and the exact determination of the transfer price. The availability of information at the transaction-level and more detailed transfer-price information would have generated more detailed insights into how specialization and proximity affect operational decisions and coordination behavior of profit centers. While this caveat does not impair our results, and our results are consistent with what theory would predict, it would be interesting for future research to focus on one-to-one relations within a network.

Similarly, we do not have further information on the composition of the clusters. In particular, we don't have the exact geographical distance (in km) between members, or how long individual members have known each other (years). We do know that the groups have been created more than a decade ago and are set up based on regions, but the firm would not provide us with further information for competitive reasons. While we control for the aspects via a fixed-effects analysis, it would be desirable to disentangle these different effects and their relation to coordination.

Lastly, and related to the first caveat, the findings we present may evoke that the firm is operating off-equilibrium. We hesitate to assert that we make no such an assumption. That is, we assume that the firm operates in equilibrium in the choices it made, to design its operations in a fashion that is optimal from the firms (network) point of view. Having said that, it may still be the case that the firm's control system design is suboptimal. However, based the fact that the firm has been growing steadily over decades and was even growing during the recent economic crisis, there is little indication that that is actually the case.

Notwithstanding these caveats, we believe that the study offers the potential to learn how controls affect managerial decision making and how firms may enhance coordination through complementarities among the activities executed at different locations of the firm.

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Appendix A

Variable	Description
Main Variables	
Specialization	((Internal Costs-Internal Rev)/FTE)^2 Capturing the extent of specialization based on an adapted version of the Herfindahl–Hirschman Index
ACQUIRE_D	Dummy variable indicating whether an unit specializes in acquiring (1) or executing (0)
specialization* ACQUIRE_D	Interaction between Dummy and the extent of specialization capturing slope differences between executing and acquiring units
Proximity	Variation in specialization within a cluster per quarter
Performance and Coordination Measures	
ER_fte	External Revenue per FTE
IR_fte	Internal Revenue per FTE (based on transfer price)
IC_fte	Internal Costs per FTE (based on transfer price)
LH_fte	Long Haul Costs per FTE
SD_fte	Short Distance Costs per FTE
TH_fte	Terminal Handling Costs per FTE
RI_fte	Residual Income per FTE
D.var	Difference in variable value "var" between t and t-1
timeliness	rate of timely delivery (%)
Control Variables	
LH_var_STD	LH cost deviation from standard costs as a % of LH standard costs
SD_var_STD	SD cost deviation from standard costs as a % of SD standard costs
TH_var_STD	TH cost deviation from standard costs as a % of TH standard costs
sqm	sqm utilization of the terminal
goods transported	characteristics of goods transport; factor of shipments and tonnage (chargeable weight) per FTE
Dummy W	Dummy variable capturing whether it is winter (1) or summer (0)

Figure 1 – Order processing
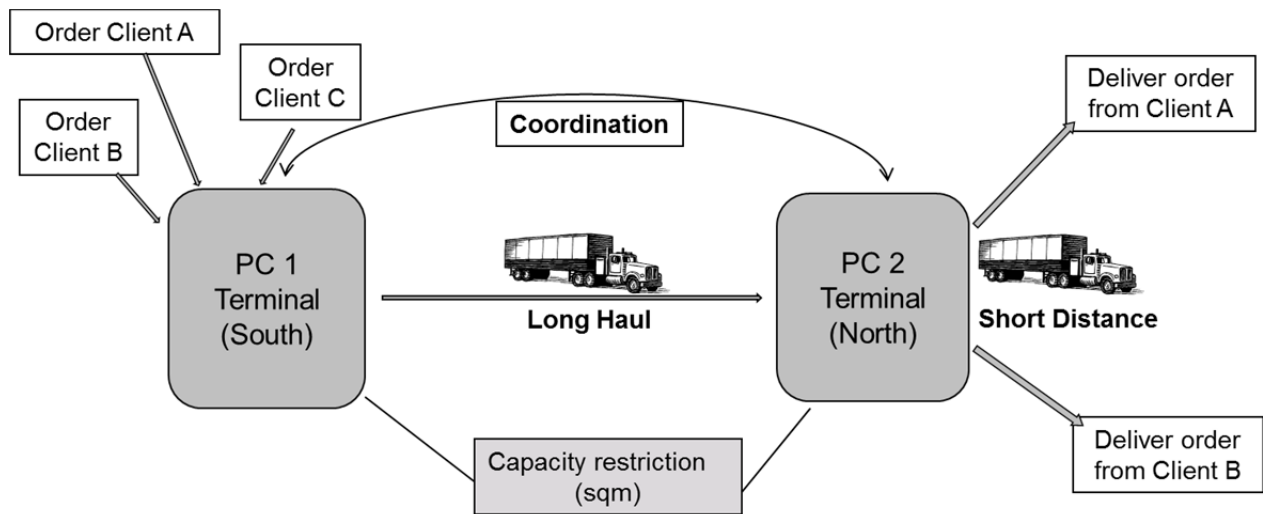
Table 1: Descriptive Statistics

Panel A - Number of Acquiring and Executing Profit Centers per Service Line

	Service Lines	
	Transportation of durable commodities	Transportation of perishable commodities
Specialize in Acquiring	19	8
Specialize in Executing	15	17
Total	34	25

Panel B - Transition Probabilities for Specialization (Acquiring = 1, Executing = 0)

ACQUIRE_D	ACQUIRE_D		
	0	1	Total
0	93.77	6.23	100.00
1	5.93	94.07	100.00

Panel C – Descriptive Statistics on Specialization and Group Heterogeneity

	mean	sd	min	25%	50%	75%	max
Internal Costs	337,439.55	221,539.88	4,635.00	15,5204.48	271,818.63	529,467.03	915,158.88
Internal Rev.	337,268.28	212,169.50	43,605.46	181,137.03	280,216.41	450,903.23	107,5435.88
FTE	124.62	80.82	3.76	55.93	114.64	183.96	416.74
Unsquared specialization	-521.86	1,766.86	-12,297.06	-1,286.95	-120.57	558.89	3,382.30
Proximity	1,635.71	724.02	509.36	1,143.56	1,469.75	2,043.15	3,752.91

Panel D – Descriptive Statistics on Profit Center Performance per Service Line

Durable Commodities

	mean	sd	min	25%	50%	75%	max
Timeliness	0.99	0.01	0.91	0.99	0.99	1.00	1.00
External Rev. /FTE	9,774.49	2,449.65	2,492.22	8,386.78	9,681.67	11,081.89	19,542.97
Long haul/FTE	4,523.18	1,665.08	869.98	3,536.59	4,207.86	5,200.16	14,064.03
Short Distance/FTE	2,204.51	752.27	599.70	1,702.43	2,186.29	2,591.92	5,101.41
Terminal Handling/FTE	870.96	242.55	346.26	718.34	874.27	1,007.71	1,907.07
Residual Income/FTE	616.71	523.34	-2,522.78	335.18	639.91	959.50	2,094.61

Perishable Commodities

	mean	sd	min	25%	50%	75%	max
Timeliness	0.99	0.01	0.93	0.99	0.99	1.00	1.00
External Rev. /FTE	10,845.96	5,762.84	124.63	7,872.91	9,810.19	12,255.78	57,632.02
Long haul/FTE	5,139.85	4,617.79	674.13	3,296.99	4,224.01	5,226.74	47,900.39
Short Distance/FTE	3,081.25	1,633.11	762.56	2,058.47	2,707.21	3,990.60	17,147.74
Terminal Handling/FTE	1,226.71	602.59	379.56	903.29	1,068.08	1,401.51	6,324.95
Residual Income/FTE	286.55	972.77	-3,713.14	-243.47	268.10	752.76	5,328.84

Panel E – Pearson correlation matrix

	1	2	3	4	5	6	7	8
1 Specialization	1.00							
2 AQUIRE_D	-0.09***	1.00						
	(0.00)							
3 Proximity	0.26***	-0.11***	1.00					
	(0.00)	(0.00)						
4 Timeliness	-0.03	0.03	0.08***	1.00				
	(0.30)	(0.23)	(0.01)					
5 Residual Income/FTE	-0.07**	0.14***	0.11***	0.18***	1.00			
	(0.02)	(0.00)	(0.00)	(0.00)				
6 Ext. Rev. /FTE	0.00	0.14***	0.05*	0.09***	0.15***	1.00		
	(0.90)	(0.00)	(0.07)	(0.00)	(0.00)			
7 Long Haul Costs/FTE	0.12***	-0.04	0.11***	0.08***	0.00	0.89***	1.00	
	(0.00)	(0.16)	(0.00)	(0.00)	(0.95)	(0.00)		
8 Short Dist. Costs/FTE	0.51***	-0.51***	0.18***	-0.11***	-0.20***	0.29***	0.32***	1.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
9 Terminal Handl. Costs/FTE	0.58***	-0.31***	0.14***	-0.06**	-0.33***	0.26***	0.25***	0.80***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)

Table 2: Contribution to residual income

Table 2 reports regression estimates from a fixed-effects panel data regression on the following models: Model 1 investigates how changes in activity levels (long haul / short distance / terminal handling) over one period (quarter) affect residual income (RI) per FTE. Thereby, we examine which activities feature a higher profit potential. In model 2 we add changes in cost efficiency to ensure that any relation to residual income is not driven by changes in cost efficiency. Our qualitative results are not impacted. Similarly, excluding prior year's residual income per FTE does not impact our results.

VARIABLES	(1) RI/FTE	(2) RI/FTE
Change in long haul (LH) costs per FTE	0.169***	0.150**
(D.LH_fte)	(0.0583)	(0.0657)
	0.00625	0.0280
Change in cost efficiency on LH costs		0.182**
(D.LH_var_LH)		(0.0732)
		0.0172
Change in short distance (SD) costs per FTE	0.422	0.446
(D.SD_fte)	(0.290)	(0.385)
	0.154	0.254
Change in cost efficiency on SD costs		0.117**
(D.SD_var_SD)		(0.0460)
		0.0153
Change in terminal handling (TH) costs per FTE	-0.610***	-0.608**
(D.TH_fte)	(0.164)	(0.296)
	0.000646	0.0468
Change in cost efficiency on TH costs		0.00197
(D.TH_var_TH)		(0.121)
		0.987
Prior year's RI/FTE	0.140***	0.136***
	(0.0496)	(0.0494)
	0.00753	0.00910
Timeliness	0.0680***	0.0593***
	(0.0221)	(0.0216)
	0.00385	0.00903
sqm	-0.0811	-0.0945
	(0.0700)	(0.0714)
	0.254	0.193
Goods transported	0.140	0.121
	(0.277)	(0.276)
	0.616	0.664
Winter_D	-0.0230	-0.00875
	(0.0252)	(0.0263)
	0.366	0.741
Constant	0.134**	0.113**
	(0.0516)	(0.0526)
	0.0133	0.0386
PC and Year fixed effects	YES	YES
Observations	1,061	1,061
Number of profit centers	59	59
Adjusted R-squared	0.145	0.169

Variable definitions are provided in Appendix A. Standard errors (in parentheses) are adjusted for clustering observations per PC manager. Associated (two-tailed) p-values are reported below, with *** p<0.01, ** p<0.05, *p<0.1.

Table 3 – Activity Selection

Table 3 reports regression estimates from a fixed-effects panel regression on the analysis of whether profit centers select into different activities, i.e. long haul transportation (column 1), short distance transportation (column 2), and terminal handling (column 3) and how this is affected by proximity.

VARIABLES	(1) Long-haul costs/FTE	(2) Short dist. Costs/FTE	(3) Terminal Handl. Costs/FTE
Specialization	0.107*	0.0502	-0.0101
	(0.0620)	(0.0568)	(0.0346)
	0.0934	0.382	0.771
ACQUIRE_D	0.110**	-0.0569	-0.0617
	(0.0540)	(0.0508)	(0.0474)
	0.0492	0.269	0.200
ACQUIRE_D*Specialization	-0.112	-0.149**	-0.0193
	(0.109)	(0.0582)	(0.0309)
	0.311	0.0143	0.536
Proximity	0.00879	-0.00297	-0.0187
	(0.0162)	(0.0246)	(0.0160)
	0.591	0.905	0.250
Proximity*Specialization	-0.0526**	-0.000723	0.0144
	(0.0257)	(0.0184)	(0.0128)
	0.0474	0.969	0.269
Cost efficiency in LH costs	0.0465		
	(0.0536)		
	0.391		
Cost efficiency in SD costs		-0.126***	
		(0.0334)	
		0.000536	
Cost efficiency in TH costs			-0.383***
			(0.0360)
			0
Timeliness	0.00657	-0.0238**	-0.0219***
	(0.00847)	(0.00969)	(0.00639)
	0.442	0.0188	0.00144
sqm	0.0334	-0.0207	0.0222
	(0.0280)	(0.0210)	(0.0283)
	0.240	0.332	0.438
Goods transported	0.627***	0.765***	0.829***
	(0.148)	(0.127)	(0.0606)
	0.000138	4.87e-07	0
Winter_D	0.0196	0.0113	0.00704
	(0.0149)	(0.0118)	(0.0124)
	0.195	0.341	0.573
Constant	-0.0545	0.0862	0.0989**
	(0.0328)	(0.0703)	(0.0474)
	0.104	0.227	0.0434
PC and Year fixed effects	YES	YES	YES
Observations	1,204	1,204	1,204
Number of profit centers	59	59	59
Adjusted R-squared	0.631	0.778	0.710

We winsorize the highest observations on our measure of specialization as it represents an outlier. Variable definitions are provided in Appendix A. Standard errors (in parentheses) are adjusted for clustering observations per PC manager. Associated (two-tailed) p-values are reported below, with *** p<0.01, ** p<0.05, *p<0.1.

Table 4 – Timeliness

Table 4 represents regression estimates from a fixed effects panel regression on the relation between specialization, proximity and timeliness in deliveries (i.e. coordination). Timeliness is measured as a percentage indicating the extent of timely deliveries per quarter (target delivery rate = 0.98). Winsorizing potential outliers (timeliness <0.96) and running a fixed effects logit regression on timeliness (classified as on time (late) delivery if delivery rate ≥ (<) 0.98) yield the same qualitative results (untabulated).

VARIABLES	Timeliness
Specialization	-0.0540
	(0.0527)
	0.312
ACQUIRE_D	0.130
	(0.178)
	0.469
ACQUIRE_D*Specialization	-0.196
	(0.176)
	0.270
Proximity	0.0872*
	(0.0451)
	0.0605
Proximity*Specialization	0.00729
	(0.0191)
	0.705
Cost efficiency in LH costs	0.109
	(0.0651)
	0.102
Cost efficiency in SD costs	0.0676
	(0.0720)
	0.354
Cost efficiency in TH costs	0.157**
	(0.0638)
	0.0183
sqm	-0.0408
	(0.117)
	0.730
Goods transported	0.0136
	(0.0651)
	0.835
Winter_D	0.119*
	(0.0633)
	0.0668
Constant	-0.0715
	(0.103)
	0.491
PC and Year fixed effects	YES
Observations	1,204
Number of profit centers	59
Adjusted R-squared	0.140

We winsorize the highest observations on our measure of specialization as it represents an outlier. Variable definitions are provided in Appendix A. Standard errors (in parentheses) are adjusted for clustering observations per PC manager. Associated (two-tailed) p-values are reported below, with *** p<0.01, ** p<0.05, *p<0.1

Table 5 – Financial Performance

Table 5 represents regression estimates from a fixed effects panel regression on the relation between specialization, proximity and residual income.

VARIABLES	RI/FTE
Specialization	0.142**
	(0.0667)
	0.0394
ACQUIRE_D	-0.0672
	(0.0780)
	0.394
ACQUIRE_D*Specialization	0.212
	(0.162)
	0.197
Proximity	0.0982***
	(0.0347)
	0.00729
Proximity*Specialization	-0.0372
	(0.0236)
	0.123
Cost efficiency in LH costs	0.344***
	(0.0617)
	2.05e-06
Cost efficiency in SD costs	0.0422
	(0.0666)
	0.530
Cost efficiency in TH costs	0.387***
	(0.0997)
	0.000393
Prior year's RI/FTE	0.100**
	(0.0390)
	0.0143
timeliness	0.0596**
	(0.0236)
	0.0156
sqm	0.0653
	(0.0800)
	0.419
Goods transported	-0.0518
	(0.240)
	0.830
Winter_D	0.0284
	(0.0278)
	0.313
Constant	-0.204*
	(0.114)
	0.0809
PC and Year fixed effects	YES
Observations	1,065
Number of profit centers	59
Adjusted R-squared	0.319

We winsorize the highest observations on our measure of specialization as it represents an outlier. Variable definitions are provided in Appendix A. Standard errors (in parentheses) are adjusted for clustering observations per PC manager. Associated (two-tailed) p-values are reported below, with *** p<0.01, ** p<0.05, *p<0.1.