

Servitization and the effect of training on service delivery system performance

Abstract

Manufacturers moving into services must design a service delivery system that can effectively and efficiently support their product-service offering. Commonly, such manufacturers outsource customer service and support to independent service suppliers, while maintaining the ownership and control of certain service units. Despite the increasing number of studies in service triads investigating ways that may improve service performance and customer satisfaction, the dynamics of mixed-ownership service delivery systems have remained understudied. By deploying the Motivation-Opportunity-Ability (MOA) framework and synthesizing insights from the literature on franchising and the transfer of training, we hypothesize that manufacturer-led formal training increases the service performance of the entire network, but that outsourced service units choose more suitable training courses and derive comparatively higher performance benefits than company-owned ones. We test our hypotheses within the UK service network of a major commercial vehicles manufacturer, using several panel data regression models and objective measures of training and performance. This study primarily contributes to the literature on servitization and service triads by showing the performance-enhancing capacity of manufacturer-led training. The results have practical implications for the development and implementation of the service operations strategy of servitized manufacturers that support customers through mixed-ownership service networks.

Keywords: Servitization, service delivery system, service triads, employee training, panel data

1. Introduction

‘Traditional’ manufacturers are increasingly adopting business models that entail the integration of products and services, a trend that is commonly referred to as *servitization* of manufacturing (see Vandermerwe and Rada 1988). Integrated Product-Service (PS) offerings can vary in sophistication, from an ‘add-on’ service aimed at ensuring a product’s proper functioning (e.g. maintenance contract), to a result- or use-oriented offering aimed at increasing the effectiveness and efficiency of the customer’s processes (e.g. availability-based contract – see Oliva and Kallenberg 2003). This makes at least a third of manufacturers worldwide involved in some sort of service operations (Neely 2008), classifying them as *servitized*. The increasing prevalence of servitization, and the multifaceted strategic, technological and organizational challenges that it poses, have spurred plenty of research in the Operations Management (OM) field (see Baines et al. 2017 for a synthesis).

The rationale for this study originates from the observation that, despite the many references in the literature to the need for a fundamental cultural and attitudinal change of manufacturers’ employees when moving into services (Miller et al. 2002, Oliva and Kallenberg 2003), aspects relating to employee behaviors, policies and practices have largely remained unexamined (Baines et al. 2013, Johnstone et al. 2014). Following Boudreau et al.’s (2003) call for closer integration of insights from OM and Human Resource Management (HRM), this work is positioned on the interface of the two fields, examining the role of an HR practice (training) in the effective enactment of operations strategy for servitization.

Successful PS provision and, ultimately, customer satisfaction, depend on an effective service delivery system (Cook et al. 1999), or simply, service network, which consists of the various entities and their facilities that deliver the services to the manufacturer’s customer-base. In certain industrial contexts, manufacturers follow a mixed-ownership (or mixed-mode) strategy, whereby they own a fraction of the network, but simultaneously rely on third-parties to deliver customer service (Li et al. 2016, Windahl et al. 2004). Mixed-mode service networks are common, and arguably inevitable, in environments where nationwide or global presence is necessary. Since customer service is outsourced to independent service suppliers, the latter come into direct contact with the manufacturer’s customers. The three entities (manufacturer, customer and service supplier) form a structural arrangement that is often referred to as a *service triad* (Li and Choi 2009). In a service triad, the supplier’s conduct and

performance are determinative for customer satisfaction, and consequently, for the well-being of the manufacturer-customer relationship (Tate and van der Valk 2008, van der Valk and van Iwaarden 2011). As such, manufacturers need to ensure that first, they partner with the right service suppliers, and second, that the latter deliver the services at contractually agreed performance levels. This is easier said than done; manufacturers such as Dell and AT&T had to revoke their service outsourcing decisions and return customer support functions in-house, after a sharp decline in business customer satisfaction with the quality of service delivered by their partners (Li and Choi 2009).

Front-end service processes involve high levels of customer interaction, thus, customer-facing employees must possess the technical, relationship-management, communication and negotiation skills (Foote et al. 2001, Johnstone et al. 2014) required to deal with the increasing sophistication of the offerings, and to support the variable needs of the customer (Kreye 2017). In a mixed-mode network, the manufacturer is in control of the recruitment, selection, training and development of employees of the service units that it owns (referred to here as ‘company-owned’), so it can introduce programs and policies aimed at improving their customer-facing capabilities (Baines et al. 2013). This is unlikely to be the case though for the units of the service partners; the latter, being independent entities, are free to adopt practices they deem suitable, which, however, may not be aligned with the manufacturer’s service operations strategy. The manufacturer can encourage the adoption of practices that could potentially improve the capabilities of the partners’ units, such as behavior-based reward systems and teamworking (Johnstone et al. 2014), but cannot formally impose them. In such situations, offering them the opportunity to undertake technical or management skills training to better support the PS offering, is emerging as a promising practice (Forkmann et al. 2017, Raja and Frandsen 2017).

The role of training in servitization and service triads has not been systematically investigated, and we suggest that *manufacturer-led* training in particular, can mitigate the risk of poor service quality and performance of the partners. In a service triad, training of the employees of a party (the service partner), by another entity (the manufacturer), to support the latter’s offering toward a third actor (the manufacturer’s customer) on behalf of the manufacturer, effectively comprises ‘outside’ training. This means that the finding of systematic reviews from the HRM field that training can increase various aspects of firm-level operational performance, is not directly and necessarily applicable (see Combs et

al. 2006, de Menezes et al. 2010, Jiang et al. 2012, Tharenou et al. 2007). But despite our primary interest being in the performance-enhancing potential of manufacturer-led training for the outsourced service units, training is also expected to improve the performance of the manufacturer's company-owned units. Indeed, the HRM literature on the effectiveness of training points in this direction. Overall, the first objective of this work is to quantify the relationship between manufacturer-led training and the service performance of the entire mixed-mode service network.

Our second objective stems from the fact that there are two consequential differences between company-owned and outsourced service units. Drawing from the well-established Motivation–Opportunity–Ability (MOA) model and the two distinct research streams of franchising and the transfer of training, we argue that these differences can be captured by the components of Motivation and Opportunity, which can enhance or inhibit the effect of Ability. Comparatively speaking, independent units are freer to choose the courses that best fit their local needs, which implies that they also get the chance to apply their learned skills more regularly. In addition, they are relatively more motivated to make training pay dividends, since it is an investment in money and time that could have been spent elsewhere. As such, we aim to identify whether the effect of manufacturer-led training on service performance differs between outsourced and company-owned service units. In the context of franchising, where the intricacies of mixed-ownership networks have started to be studied, research suggests that franchisees may exploit their relatively larger degree of autonomy and choose HR practices that ‘best fit’ their local environment (Croonen et al. 2016a). They have also been found to reap larger performance benefits compared to company-owned units, even though they adopt HR practices at a lower intensity (Brand and Croonen 2010). These (still nascent) ideas have not been examined in the context of servitization, but are relevant since service outsourcing is often manifested in the form of franchising (Parmigiani and Holloway 2011, Zhang et al. 2015). A comparison between outsourced and company-owned service units can provide theoretical insight on the differential effect of training on service performance, and practical insight to improve the effectiveness of mixed-mode service networks of firms meshing manufacturing and service ‘paradigms’ (Johnstone et al. 2014).

To address the two objectives, our research takes place in the context of a UK network of a servitized European commercial vehicles manufacturer, consisting of both company-owned and

independent service units. The services rendered (e.g. planned maintenance, breakdown attendance, spare parts fitting) are common across units, while the performance of all units is consistently evaluated every quarter across four main Key Performance Indicators (KPIs) that were set by the manufacturer after consultation with its major customers. In addition, the manufacturer offers various training courses that are available to both company-owned and independent units. Methodologically speaking, we follow the same units over 19 consecutive quarters and employ appropriate panel data regression models that intend to address endogeneity issues that are common in the HRM literature (see Tharenou et al. 2007, Wall and Wood 2005), allowing us to obtain reliable estimates of the effect of training on performance. Specifically, apart from controlling for observed confounding variables, we also control for unobserved unit-specific factors by using an approach that emulates a standard Fixed-Effects model, while also accounting for the possibility of reverse causality by controlling for past performance.

The analysis suggests that increased manufacturer-led formal training improves the performance of both company-owned and independent service units, but the effect is stronger for the latter. The differential effect is robust across various model specifications and estimation strategies, irrespective of the training and performance measures used. We attribute this differential effect to the higher degree of: opportunity to choose training courses, opportunity to apply the trained skills, and motivation to reap the rewards of training of independent service units.

2. Research background

This section positions this study theoretically against the burgeoning research in servitization and service triads, while also making the case for investigating the performance-enhancing potential of manufacturer-led training. It then introduces the reader to the empirical context and some qualitative information that provides additional grounds for the development of the hypotheses.

2.1 Structural considerations for the design of an effective service network

For a servitized manufacturer, service system design will include *structural* decisions such as the number, size and ownership of the service facilities, and the degree of outsourcing (Baines et al. 2009, Roth and Menor 2003). The manufacturer can: a) choose to deliver the services itself, b) assign

service delivery to a retailer, or c) allow a specialized third-party to deliver the services (Li et al. 2016). However, that does not preclude a mixed-mode design, whereby multiple entities of different ownership provide services to a common customer-base. As such, manufacturers have been observed to outsource part of their front-end service processes to independent, specialist service partners or franchisees, while also maintaining elements of service provision in-house (Baines et al. 2009; Raja and Frandsen 2017). In the franchising literature, mixed-mode networks are known as *plural systems* (or plural forms of governance – e.g. Bradach 1997). Examples of servitized manufacturers using mixed-mode networks include Volvo Trucks, Husqvarna and ITT Water & Wastewater (Kowalkowski et al. 2011), while they are also ubiquitous in pure service industries (Kellner 2017, Parmigiani and Holloway 2011).

Front-end service processes involve high levels of direct customer contact (Balakrishnan et al. 2008, Chase 1981). For front-end service components that the manufacturer delivers itself through its own service units (*i.e.*, insourcing), it can maintain the control of customer contact and the responsibility for coordinating overall network performance (Perdikaki et al. 2015). However, when the manufacturer outsources customer service to another entity, by definition, the latter comes in direct contact with the manufacturer's customers, resulting in the formation of service triads (Wynstra et al. 2015). In a service triad, because the manufacturer loses control of some customer touchpoints, the performance of the service supplier can affect customer satisfaction and the manufacturer's relationships with customers (Perdikaki et al. 2015). Moreover, the introduction into the network of independent organizations and their multiple units makes it more difficult to achieve coordination and harmonization across units (Rudberg and Olhager 2003, Sorenson and Sørensen 2001). It also introduces the risk of free-riding, whereby independent service units may cut inputs to boost their own profits whilst damaging service quality and the reputation of the focal manufacturer (Lafontaine 1992, Michael 2000).

2.2 Infrastructural considerations and the role of employee training

A servitized manufacturer also needs to determine the *infrastructural* elements of its service network. These relate to programs, policies and the behaviors of employees (Baines et al. 2009, Roth and Menor 2003). Thus, appropriate HR practices need to be adopted to improve the service orientation of the customer-facing employees, and ensure superior operational performance (Johnstone et al. 2014).

In mixed-mode service networks (the context of this work), the manufacturer's top management can resort to hierarchical authority and fiat to ensure compliance of the company-owned units with a codified set of corporate practices (Winter et al. 2012). These will include the recruitment of people with the right skillsets (Baines et al. 2013, Spohrer and Maglio 2008) and extensive personnel training. On the other hand, when it comes to its customer-facing service partners, the manufacturer cannot legally prescribe or mandate employment practices (Brand and Croonen 2010), since these companies are independent, autonomous agents with decision rights over their assets, including HR (Mumdžiev and Windsperger 2011, Yin and Zajac 2004). Hence, irrespective of whether it is one large outsourcing partner, or multiple small units (e.g. franchisees) responsible for service delivery, the manufacturer must rely on contracting, relational, and technical capabilities to manage them (Parmigiani and Holloway 2011). Thus, scholars have started examining how incentive mechanisms, behavior- or performance-based contracts, and relational norms, can ensure that these suppliers create value for customers (Broekhuis and Scholten 2018, Karatzas et al. 2017, Tate and van der Valk 2008, Wuyts et al. 2015).

Against this background, institutionalized manufacturer-led training is an overlooked mechanism, which, we claim, has the potential to increase the ability of employees of independent (but also, company-owned) service units to support the servitized manufacturer's PS offering. Only a few empirical works have tangentially (and qualitatively) examined the role of training in servitization (Section A of online Appendix), suggesting that ongoing and tailored training of the manufacturer's customer-facing staff (e.g. engineers, sales and service people) is a necessity (Johnstone et al. 2014, Ulaga and Loveland 2014). Moreover, some works indicate that third-parties (e.g. distributors) responsible for service delivery to customers, can also benefit from manufacturer-led training (Forkmann et al. 2017, Paiola et al. 2012); in fact, in Raja and Frandsen (2017), the service partners were even found to actively request more extensive training to be able to deliver quality service.

Hence, despite the indications that, within mixed-mode service networks, manufacturer-led formal training is potentially performance-enhancing, the lack of focused, nuanced and systematic investigation constitutes a gap in the extant knowledge-base. For instance, it is unclear whether training has lasting performance benefits for the entire network, whether employees of company-owned and independent service units respond to training in the same manner, and whether there are types of training

that are relatively more efficacious. Such questions are managerially relevant, since a manufacturer should aim to improve the effectiveness of its entire service network through targeted policy interventions. Additionally, examining and comparing the potential of training for both types of service units can develop theoretical insights at the interface of OM and HRM (Boudreau et al. 2003).

2.3 Empirical background and anecdotal evidence

We study the UK service network of a major European commercial vehicles manufacturer which is considered by practitioners to be a successful example of servitization in the industry; at the end of the data collection, 60% of the company's revenues came from services. Instead of simply selling trucks and buses, the manufacturer provides its vehicles under fixed-price, fixed-term contractual arrangements, which means that customers pay for the 'use' of the equipment rather than its ownership. The services, varying from simple, scheduled maintenance, to on-demand, advanced telematics, are included in the customer contract, and are delivered by a service network comprising 48 independent, outsourced service units, and 18 company-owned ones. Thus, the manufacturer has adopted a mixed-mode service system design, with the independent units maintaining the legal status of franchisees, a common arrangement in industries where geographical coverage is crucial. Unlike archetypical franchising though, whereby the franchisee provides the entire value proposition to the customer (*i.e.* including the vehicle) and can adjust labor hourly rates (Zhang et al. 2015), in this study context, the PS offering (including vehicle specification, types of add-on services, service levels) as well as labor hourly rates are contractually agreed between the manufacturer and the customer. Independent service units focus solely on service delivery. This means that within the entire mixed-mode service network, when a company-owned service unit encounters a customer, interaction remains dyadic; but when an independent unit interacts with a customer, the former acts as an outsourcing partner, and thus a front-end service outsourcing triad is formed (see Perdikaki et al. 2015, Zhang et al. 2015).

Early contact with the manufacturer (hereafter: TruckBus) through unstructured interviews, revealed various issues relevant to the delivery of services, the performance of service units, and the formal training offered by TruckBus. TruckBus measures unit-level service performance in an objective and consistent manner. Be they company-owned or independent, service units are treated equally:

“From our point of view a unit is a unit, be it owned by us or independent it does not matter to us; the systems, procedures, policies and standards are the same” (TruckBus regional manager). However, in TruckBus’s own admission, units of outsourcing partners are more motivated: *“I think they are more incentivized; the fact that the guy who owns the dealership and the profit or loss comes out of his own pocket... They tend to be much better run and more reactive to problems”* (TruckBus senior executive).

When it comes to training, TruckBus organizes centralized, formal training for employees of company-owned and outsourced units. The latter are eligible to undertake the full spectrum of courses, but a crucial difference between them and company-owned units is that they must incur the costs of that training. This means that TruckBus cannot compel independent unit managers to send their employees for training. But, as is the case with other operational decisions (e.g. opening hours, staffing), they can certainly suggest it *“...if we went to them and said: ‘Right, okay, the level of vehicles has gone up, we suggest that you should do this and this to cope’ in the main they would do it”* (TruckBus regional manager). This means that outsourced units “cherry-pick” training courses: *“They will look at those available and might go ‘Oh we don’t see any of them [TruckBus vehicle models], we won’t bother with that one’”* (TruckBus regional manager). On the other hand, company-owned units have little room for choice, and there are training regimes that every unit has to follow in order to be ready to deal with any contingency. On the whole, it seems that the service partners see the benefits of training: *“... you would not be able to do the job without it, and that is what makes it worthwhile”* (Unit general manager). There is a strong preference for courses of a technical nature, that are focused on servicing vehicles (e.g. electrics, telematics, brakes and suspensions, exhausts), while certain administrative courses are regarded as *“rubbish”* and a *“waste of time”*.

In summary, outsourced service units would appear relatively more motivated than company-owned ones, and selective in terms of training; they invest in the development of skills that they perceive to directly affect their service performance. In the following section, we provide theoretical backing to these assertions, before formally testing them in the context of the manufacturer’s entire network.

3. Hypotheses development

Toward developing our hypotheses, we adopt the Motivation-Opportunity-Ability (MOA) model (see Boxall and Purcell 2008, Jiang et al. 2012) as an overarching organizing framework. Within it, we integrate key theoretical insights from the franchising literature, as well as findings from the literature on *training transfer*, and in particular the conditions and factors that enable the translation of training into on-the-job performance improvements. Since Boudreau et al. (2003) demonstrated how MOA can inform OM research, the model has been adopted by OM scholars in various related areas of study, including knowledge sharing (Siemens et al. 2008), servitization (Johnstone et al. 2014) and service triads (Wuyts et al. 2015). In short, MOA postulates that employee performance is a multiplicative function of his/her *motivation* (*i.e.* willingness to act and level of exerted effort), *opportunity* (*i.e.* situational and operational enablers and constraints) and *ability* (*i.e.* knowledge, skills and attitudes required for the job). These three elements interact with one another and can thus enhance or inhibit the effect of each other on an employee's behavior and actions (Blumberg and Pringle 1982). Moreover, despite MOA being a theory explaining behavior at the individual level, it has been 'vertically borrowed' (Whetten et al. 2009) and shown to have explanatory power at the organizational level of analysis (e.g. Kim et al. 2015, Raja and Frandsen 2017). Our work adds to this set of studies.

3.1 Training and its effect on service performance

Training is an *ability*-enhancing practice. It comprises the systematic acquisition and development of firm-specific Knowledge, Skills, and Abilities (KSAs) required by employees to adequately perform a task or job (Goldstein 1980). If the learning resulting from a training experience of an employee is applied in the job context and maintained over a period of time (*i.e.*, it *transfers* – Baldwin and Ford 1988), his/her work performance will increase (Blume et al. 2010). This improvement in individual performance, and the aggregate increase in the quality of the human capital of the organization, will benefit organization-level outcomes such as productivity, and operational and service system performance (e.g. Combs et al. 2006, Conti 2005, de Menezes et al. 2010, Tharenou et al. 2007).

Since there is ample empirical support for the link between employee training and firm-level performance across various contexts, one novelty of this work is that it tests for this relationship in an environment where it has not been systematically examined (Johnstone et al. 2014). As discussed,

servitization gives rise to structural arrangements that present the manufacturer with the reality that customer satisfaction is (partly) contingent upon the service delivery performance of independent third-parties. Following previous servitization and service triads research, in this work service delivery performance (or simply, service performance) refers to the performance of the service units that is *seen or felt by the customers*. It is thus conceptualized to include operational aspects such as service time, waiting time, and responsiveness (Mackelprang et al. 2012). We thus submit our underlying contention for a positive association between manufacturer-led training and service performance in a mixed-mode service network as a base-line hypothesis. A contextualized intuition follows.

As the products, services, and the service encounter become more complex, formal training of customer-facing employees may enable them to deal successfully with the inherent uncertainty and variability (Forkmann et al. 2017, Kreye 2017, Skaggs and Youndt 2004). Irrespective of whether they work for company-owned or independent service units, training will foster a deeper understanding of product features, service contracts, pricing, information systems and work processes that are specific to the manufacturer (Batt 2002). The development of firm-specific human capital will increase the service orientation of the service unit as a whole (Paiola et al. 2012), *i.e.* its “*propensity for delivering service excellence*” (Oliveira and Roth 2012, p.174) by enabling customer-facing employees to interact effectively with the manufacturer’s customers (Batt 2002). This development of unique KSAs will enhance the *ability* of employees to support the offering (Raja and Frandsen 2017), eventually improving the service performance of the entire network (Mackelprang et al. 2012). Hence:

Hypothesis 1: In a mixed-mode service network, formal training led by the focal manufacturer will increase the service performance of both independent and company-owned service units.

In line with standard MOA theory, we claim that the effect of enhanced ability (through training) on performance will depend on the levels of motivation and opportunity. In the remainder of this section we suggest that, on average, independent units will differ from company-owned ones in terms of those two factors. In our argumentation, we draw from the franchising literature on plural forms, where the differences between company-owned and independent (franchised) units have been

investigated. In particular, this stream of research stresses the balance (and tension) between the strategic imperatives of standardization (of company-owned units) and local adaptation (of franchisees), and the fact that owner-managers of franchisees bear the residual risk of their operations and are driven by incentives to maximize their unit's profits, in contrast to employee-managers of company-owned units (e.g. Kaufmann and Eroglu 1998, Lafontaine 1992, Shane 1998, Yin and Zajac 2004). In MOA parlance, the first idea relates to the component of opportunity, and the second to motivation. In a nutshell, because of differences in the two (unobserved) factors between the two groups of service units, we expect a manifest difference in the effectiveness of training for them, *i.e.* that ownership status will moderate the effect of training on service performance.

3.2 The differential choice of training by independent and company-owned service units

Opportunity refers to the states of nature and actions of others that enhance or inhibit employee performance (Blumberg and Pringle 1982). We argue that in this study context, it will refer to the opportunity to *choose* which skills to train in, and the opportunity to *apply* those skills. Opportunity to choose reflects the degree of operational autonomy that the units have when it comes to choosing HR practices and policies, including training (Brand and Croonen 2010, Croonen et al. 2016a, Yin and Zajac 2004). Unlike company-owned units, outsourced units are independent organizations and the residual profit claimants from the services they provide, hence, the manufacturer has relatively limited influence on the type and extent of employee training (Mumdzhev and Windsperger 2011). This will have implications for the composition of the training regimes of the two groups of service units.

Both groups of units can be considered to face a dynamic profit maximization problem subject to a potentially non-binding budget allocation constraint, but with a key difference that is crucial for the optimal allocation of resources. Outsourced units can choose not to spend their whole budget in a given period, so as to be able to spend it in the future, when, for example, more relevant training courses are given by the manufacturer. Assuming that profits increase monotonically with service performance, outsourced units will aim at maximizing the latter by optimizing the allocation of their budget to different activities, including manufacturer-led training. Since they are relatively 'free' from demands and constraints imposed by the manufacturer relating to their HR practices (Yin and Zajac 2004),

owner-managers can invest in training courses for their employees that are deemed appropriate, to the desired extent and at the preferred time. This operational autonomy allows them to adapt their choice of training courses to best fit their strategy and idiosyncratic local needs (Croonen et al. 2016a, Grünhagen et al. 2014, Kaufmann and Eroglu 1998). This entrepreneurial spirit contrasts with company-owned service units, which are run by managers who are themselves company employees. Employee-managers may be able to exercise some level of local control over day-to-day decisions, but their overall operational flexibility and decision rights are restricted by the firm's centrally developed policies (Yin and Zajac 2004), which include training programs. Because they effectively *are* the manufacturer, employees of the company-owned units must be capable of dealing with every possible customer problem. They must be fully trained to efficiently service the vehicles, utilize the necessary inter-organizational IT systems, and promote the manufacturer's offering to attract more customers. For this reason, the manufacturer is likely to apply a uniform template, in the form of 'best practices' (including what training is to be undertaken and when), which will be insensitive to the idiosyncratic local needs of individual company-owned units (Croonen et al. 2016a). Furthermore, employee-managers will be inclined to stick closely to that template, out of risk-aversion or fear of sanctions in case their decisions conflict with the standardized operating routines of the firm (Bradach 1997, Michael 2000).

All these suggest that company-owned units have less local control over the resources spent for training in each period, in the sense that the type and timing of training are determined in a centralized, bureaucratic manner. Standard optimization theory would predict that their final allocation of resources to training will usually be suboptimal relative to outsourced units (Kamien and Schwartz 2012, Simon and Blume 2010); they will take relatively more manufacturer-led training courses than outsourced units, but in proportional terms, more resources will be allocated to training skills that are less strongly linked to service performance. We thus posit that:

Hypothesis 2a: On average, the composition of the training regimes of outsourced and company-owned units will be qualitatively different. Specifically, the regimes of outsourced units will be skewed towards types of training that are more strongly associated with service performance.

3.3 The differential effect of training for independent and company-owned service units

Besides choosing differently, employees of independent units will have more opportunities to apply their learnings and will also be more motivated to do so. The concept of *transfer of training* becomes central for theoretically motivating this contention. Transfer of training is conceived as the effectiveness of the trainee in applying the acquired knowledge or trained skill (Blume et al. 2010).

Research in this area has identified a multitude of factors that explain training effectiveness in various contexts (Blume et al. 2010). One of the core, high-level factors is the transfer climate (or work environment), *i.e.* the situations and consequences that either inhibit or enable the application of what has been learnt (Burke and Hutchins 2007, Rouiller and Goldstein 1993), which plays an important role in whether the newly acquired skills will translate into performance improvements. One important aspect of the transfer climate is the opportunity, or need, to *apply* what has been trained. Research has consistently found that if employees do not have the opportunity to use their learning in their work setting, performance improvements will be limited (Burke and Hutchins 2007, Ford et al. 1992, Lim and Morris 2006). In our context, if, compared to company-owned, independent service units choose their training courses more strategically and based on their idiosyncratic local needs, those trained skills should be the ones that will be needed more frequently in the field. This implies that employees will have the opportunity to apply what they learn more regularly, so the effectiveness of training will be further enhanced, when compared to the employees of company-owned units.

Ownership type also implies differences in the *motivation* between the employees of the two groups of service units to derive benefits from training. At the management level, because owner-managers have their own investment at risk, it is generally accepted that they will be more motivated than employee-managers of company-owned units to do whatever it takes to make their units successful (Shane 1998). For the former, training is relatively costlier, since it is an investment of scarce resources they could have dedicated elsewhere. Costs such as the price of the course, traveling expenses, and foregone revenues or overtime pay due to staff shortages, have higher weight for outsourced units, since the latter lack the financial backing of a large corporation (the manufacturer), in stark contrast to company-owned (Brand and Croonen 2010). The strong ownership incentives of owner-managers of outsourced units will make them want to see the benefits of their investment (Yin and Zajac 2004). As

such, they will encourage and motivate all employees, from administrators to technicians, to put more effort into developing the required skills and to act on their enhanced knowledge (Kidwell and Nygaard 2011, Sorenson and Sørensen, 2001). It is likely then that trainees from outsourced units will exhibit high levels of *pre-training motivation* and *motivation to learn*, both significant predictors of training transfer (Facteau et al. 1995). Given also our earlier suggestion that owner-managers allocate resources to courses in skills that best fit their local needs, trainees are more likely to perceive that what they learn is relevant to their goal of improving their on-the-job performance (Yamnill and McLean 2001). The higher the trainee's *motivation to transfer*, *i.e.* the desire to use the skills and knowledge acquired through training (Noe and Schmitt 1986), the higher their effectiveness in applying those skills and knowledge (see meta-analysis by Blume et al. 2010). As such, the desirability of the positive outcome of training (*i.e.*, service performance) for outsourced service units will be comparatively higher.

Moreover, independent service units are more likely to acknowledge the instrumental value of superior unit-level service performance, in the sense that they will see its close connection to further positive outcomes. For example, good reputation within the service network, customer satisfaction, a harmonious relationship with the manufacturer and, ultimately, high profit margins, are all likely outcomes of superior day-to-day service performance in a service triad (Li and Choi 2009). Thus, on average, outsourced units will be relatively more motivated to make training increase their day-to-day operational performance, as a means to achieve more distant outcomes.

Hence, outsourced service units are expected to gain more benefit out of their training, *ceteris paribus*, due to higher motivation. We expect this to be the case at the aggregate level, as well as for the different types of training courses. Overall:

Hypothesis 3: The positive effect of manufacturer-led formal training on unit-level service performance will be higher for outsourced service units than for company-owned ones.

4. Methodology

4.1 Data and descriptive statistics

Objective data on service performance and training have been obtained for every service unit in the mixed-mode network of TruckBus, from the 1st quarter of 2007 and for 19 consecutive quarters, alongside information on several other covariates. We note that the use of objective data for both training and performance is considered an advantage over much of the existing literature on the HR practices/performance relationship, which has largely relied upon self-reports of single company executives (see Guest 2011, Van Iddekinge et al. 2009 for discussions). Indeed, a meta-analysis on the effect of training specifically, found that studies employing perceptual measures inflate its relationship with outcomes (Tharenou et al. 2007).

4.1.1 Outcome Variable

The outcome variable is the service performance of each unit. TruckBus has been consistently measuring the performance of outsourced and company-owned units across four context-specific KPIs. They are briefly described in Table 1.

[TABLE 1 ABOUT HERE]

For each KPI, TruckBus sets targets that are common across all units and are known to them in advance. These targets determine which units ‘pass’ and which ‘fail’ a KPI. As shown in Table 1, the four KPIs can be linked to measures of service excellence, such as quality, waiting time, proactiveness and responsiveness. On aggregate, they indicate how good each unit is at keeping vehicles on the road, which is what matters for the customers of TruckBus. Based on this information, an index is constructed that takes values from 0 to 4, depending on how many KPIs the unit achieved in a quarter. This approach treats each KPI as equally important for TruckBus and its customer-base. Hence, it is not which KPIs have been achieved that matters, but only how many of them. Consequently, our performance measure can be treated as an ordinal variable, a characteristic that is incorporated in the estimation strategy. Nevertheless, a series of sensitivity checks is performed, which shows that the results are robust to alternative operationalizations of service performance. Table 2 presents the distribution of the chosen performance outcome by ownership status. Overall, about 41% of the time, service units achieve a score of 4, while only about 11% of the time they achieve a score of 0 or 1. On average, company-owned units perform slightly better. This small difference, as well as an upward trend for both groups, are also

illustrated in Figure 1, which presents the mean performance score by ownership status for each period.

[TABLE 2 ABOUT HERE]

[FIGURE 1 ABOUT HERE]

4.2.2 Main explanatory variables

Training: The explanatory variable of interest is manufacturer-led training undertaken by the service unit to support the manufacturer’s offering. As such, it includes courses on diagnosing, maintaining and repairing hardware and software on TruckBus vehicles, on using the several inter-organizational, TruckBus-specific information systems, and on promoting the offering (e.g. marketing and sales). We measure overall training in three ways. The first measure is the total number of courses attended by the service unit’s employees during the quarter (*i.e.* training *flow*). This can be perceived as the number of skills added to the skill *stock* of the unit every quarter. Figure 2 presents the mean number of courses per period undertaken by the two groups. As expected, company-owned units have received more training. The spikes in the series correspond to the introduction of new equipment, software or servicing routines and procedures. The differences in the extent of training are also illustrated in Table 3. About 25% of the time, outsourced units receive no training, in contrast to only around 8% for company-owned.

[FIGURE 2 ABOUT HERE]

[TABLE 3 ABOUT HERE]

With the second measure, we attempt to account for the accumulation of skills within the service unit, but with a reasonable rate of human capital depreciation (Conti 2005), or for the possibility that some skills are used rarely so workers may lose proficiency in them (Goldstein 2002). Thus, for service unit i at time $t > 1$:

$$Stock_{it} = Flow_{it} + (1 - D)Stock_{it-1} , \quad (1)$$

where D is the depreciation rate with $0 < D < 1$. Since some courses are longer in terms of days, our third measure is the sum of days spent on training by the unit’s employees in each period.

The quadratic term of the training measures is also included in the models to allow for the possibility that the positive effect of training on performance decreases with the extent of training. This

is because training is associated with some opportunity costs, so the more training undertaken by employees, the less time and resources are spent in servicing vehicles, which in turn may negatively influence performance.

Our training data allow us to introduce two critical distinctions to operationalize and test Hypothesis 2a. First, we distinguish between technical skills training (e.g. repairing an engine, fitting vehicle parts), versus administrative and management skills (e.g. Microsoft office, sales and leadership courses, back-office administrative tasks). We expect that technical training will be relatively more effective. This is because such training will focus exclusively on *closed* skills, *i.e.* skills which are to be reproduced identically in the work environment as learnt within the training environment (Baldwin et al. 2009). For example, learning how to repair the brakes of a truck during a course will be identical to repairing them in the field. Given the operational nature of service performance in this context (which indicates how good a service unit is at keeping the vehicles on the road), one would expect that skills for front-end services would be more efficacious than skills for auxiliary activities. If, all else held equal, courses focused on technical skills are more effective than those focused on administrative or management skills, *and* independent service units choose relatively more of the former compared to company-owned ones, we will have found support for H2a.

We also distinguish between ‘first-time’ and ‘repeated’ training. The former refers to courses taken for the first time by any employee of a service unit, hence they represent newly acquired skills both for the individual employee and for the unit. Conversely, the latter refers to repetitions of previously undertaken courses. These repetitions could be taken for three reasons. First, for newly appointed employees to become accustomed to the manufacturer’s PS offering; second, to update or refresh the knowledge of existing employees; and third, to equip additional employees with certain skills in response to an increase in workload or a change in local customer needs and preferences. As such, undertaking ‘repeated’ training is more likely to reflect entrepreneurial thinking by the managers, in response to the idiosyncratic needs of their service units. Repeated training should also exclusively relate to skills that are used regularly in the field (as opposed to possibly one-off, scarcely needed skills). The very fact that such courses are taken repeatedly suggests that possessing those skills in abundance at the unit level is essential. If, all else held equal, repeated training is more effective than new skills

training, *and* independent service units choose relatively more of the former compared to company-owned units, then we will have found additional support for H2a.

Ownership: A dummy variable which is equal to 1 for outsourced and 0 for company-owned units, mainly used to create interaction terms with the training measures. Our base-line models include these interaction terms, allowing us to investigate whether the effect of training depends on the ownership status of the unit (testing H2b). We also use the squared terms of these interactions, to allow for differences in the quadratic effect of training between outsourced and company-owned units.

4.2.3 Covariates

We consider additional variables that may be associated with both performance and training, as failing to control for these will result in unde/over-estimating the effect of training on performance. All variables' summary statistics are presented in Table 4.

[TABLE 4 ABOUT HERE]

Size: Larger service units may perform better due to economies of scale and scope, higher market power aspirations and higher financial resources. At the same time, they may have more funds available to invest in training. Indicators, such as the number of employees or the unit's turnover, would have been appropriate; however, it was impossible to attain their time series for most service units. Thus, we use two proxies that were readily available. The first is the total number of employees per unit who undertook training during the entire timeframe. This reflects the fact that larger service units tend to send more employees to be trained. The second is the scale of the TruckBus-related workload for each service unit, measured by the time series of the number of 'service incidents' reported to TruckBus every quarter. An alternative measure of workload is the number of hours that the unit spent on servicing TruckBus vehicles. Although this is very insignificant in our base-line models of service performance (hence, not included), its lagged values and their quadratic terms are strong predictors of the extent of training, which is exploited in one of our robustness checks.

Bonus in previous period: If a unit achieves a certain number of KPIs, a monetary bonus is awarded proportionally to the number of KPIs achieved and the number of hours the unit spent working on customer vehicles that are under contract. With extra money at its disposal due to receiving the

performance-related bonus in period $t - 1$, a service unit may be more likely to invest in other potentially performance-enhancing assets (e.g. new equipment) or training in period t . Thus, we use a dummy variable indicating whether the unit received the bonus in the previous quarter.

Location: All units are in the UK, but some are located in relatively denser and busier areas (e.g. metropolitan areas, major ports). Such units may face higher competition by local rivals, thus strive harder for excellent performance compared to others within TruckBus's network. Higher local competition may also lead them to invest more in training, so they can 'sell' their expertise to (potential) customers. For these reasons, the models include the logarithm of population density of the UK county in which the service unit is located. To capture further potential effects of location, we also include the distance (in miles) from the manufacturer's headquarters, a dummy variable capturing whether the unit is located in an urban versus a rural area, regional dummies, and the percentage of jobless households in the respective unitary authority. However, the last three variables were found to be highly statistically insignificant in all models and were duly dropped.

Time: The linear and quadratic terms of a time index were included in the models to control for the observed positive trend in both performance and training. A potential mechanism that generates the positive trend in performance is 'learning-by-doing' (Darr et al. 1995).

Switch: Because at some point during the observed 19 periods, five units switched from outsourced to company-owned and four switched the other way, a dummy variable named *switch*, that takes the value of 1 for those which switched ownership, was also included.

4.3 Study Design and Estimation Framework

In a cross-sectional study, an observed positive relationship between training and performance could mean that either training increases performance, or that high performing units do more training due to those unobserved reasons (Wooldridge 2010). However, the longitudinal design employed here enables us to control for these unobserved unit-specific characteristics that affect both training and performance, such as managerial style and value of personal development (e.g. Birdi et al. 2008).

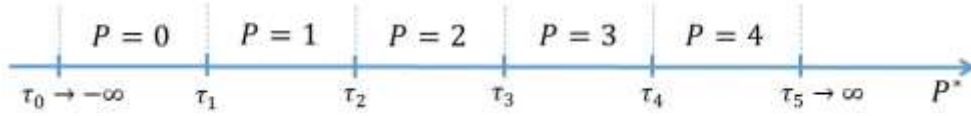
In addition, the panel data structure allows us to correct for biases generated from a potentially reverse effect of service performance on the extent of training the units undertake in the next period, by

including the lagged dependent variable as an explanatory variable (Baltagi 2013). This dynamic framework also allows us to estimate what is known as *true state dependence* (Heckman and Borjas 1980); the ‘true’ effect of past performance on the current one, which is often identified in longitudinal studies examining the effect of HR practices on performance (e.g. Van Iddekinge et al. 2009, Yin and Zajac 2004). The remainder of this section provides a detailed description of our estimation framework.

Suppose that, for unit i and time period t , service performance is given by the continuous latent measure P_{it}^* , which is linearly related to lagged performance, P_{it-1}^* , a $K \times 1$ vector of explanatory variables \mathbf{x}_{it} that consists of a training measure and covariates, unobserved time effects η_t , unobserved time invariant unit-specific heterogeneity u_i and an idiosyncratic error ϵ_{it} which is assumed to be exogenous and standard normally distributed. That is:

$$P_{it}^* = \alpha P_{it-1}^* + \boldsymbol{\beta} \mathbf{x}_{it} + \eta_t + u_i + \epsilon_{it}, \quad (2)$$

where α and $\boldsymbol{\beta}$ (a $1 \times K$ vector) are unknown parameters to be estimated. Instead of P_{it}^* , TruckBus observes the total number of KPIs achieved, according to the following threshold mechanism:



where $\tau_0, \tau_1, \dots, \tau_5$ are the threshold parameters, also to be estimated. Thus, TruckBus observes the ordinal indicator $P_{it} = j$, if $\tau_j < P_{it}^* \leq \tau_{j+1}$, with $j = 0, 1, \dots, 4$. Then:

$$\begin{aligned} \Pr(P_{it} = j) &= \Pr(\tau_j < P_{it}^* \leq \tau_{j+1}) = \Pr(\tau_j < \alpha P_{it-1}^* + \boldsymbol{\beta} \mathbf{x}_{it} + \eta_t + u_i + \epsilon_{it} \leq \tau_{j+1}) \\ &= \Pr(\tau_j - \alpha P_{it-1}^* - \boldsymbol{\beta} \mathbf{x}_{it} - \eta_t - u_i < \epsilon_{it} \leq \tau_{j+1} - \alpha P_{it-1}^* - \boldsymbol{\beta} \mathbf{x}_{it} - \eta_t - u_i). \end{aligned}$$

Since ϵ_{it} is standard normally distributed, it follows that:

$$\Pr(P_{it} = j) = \Phi(\tau_{j+1} - \alpha P_{it-1}^* - \boldsymbol{\beta} \mathbf{x}_{it} - \eta_t - u_i) - \Phi(\tau_j - \alpha P_{it-1}^* - \boldsymbol{\beta} \mathbf{x}_{it} - \eta_t - u_i), \quad (3)$$

where $\Phi(\cdot)$, is the cumulative standard normal distribution.

Note that since P_{it-1}^* is unobserved, it is replaced by a 4×1 vector of the observed performance dummies at period $t - 1$, $\mathbf{P}_{it-1} = [P_{1,it-1}, \dots, P_{4,it-1}]$, where the dummy for performance score equal to 0 is the base group. The unobserved time effects can be captured by introducing time dummies, but our results indicate that a linear trend, t , and a quadratic trend, t^2 , fit the data equally well. Importantly, we must deal with u_i , which is correlated with P_{it-1}^* and probably with training and the other covariates.

Also, this dynamic framework gives rise to the so-called ‘initial conditions’ problem (Heckman 1981). We deal with both issues by combining Mundlak’s (1978) and Wooldridge’s (2005) approaches, setting:

$$u_i = \delta_1 \bar{\mathbf{x}}_i + \delta_2 \mathbf{P}_{i1} + v_i, \quad (4)$$

where $\bar{\mathbf{x}}_i$ is a vector of the unit-specific means of all explanatory variables, \mathbf{P}_{i1} is the vector of performance dummies at the initial period $t = 1$ (capturing the ‘initial conditions’), and v_i is assumed to be independent of all explanatory variables and normally distributed with mean 0 and variance σ_v^2 (see also Contoyannis et al. 2004). As a result, equation (2) changes to, $P_{it}^* = \alpha \mathbf{P}_{it-1} + \beta \mathbf{x}_{it} + \gamma_1 t + \gamma_2 t^2 + \delta_1 \bar{\mathbf{x}}_i + \delta_2 \mathbf{P}_{i1} + v_i + \epsilon_{it}$, and equation (3) becomes:

$$\begin{aligned} \Pr(P_{it} = j) = & \Phi(\tau_{j+1} - \alpha \mathbf{P}_{it-1} - \beta \mathbf{x}_{it} - \gamma_1 t - \gamma_2 t^2 - \delta_1 \bar{\mathbf{x}}_i - \delta_2 \mathbf{P}_{i1} - v_i) \\ & - \Phi(\tau_j - \alpha \mathbf{P}_{it-1} - \beta \mathbf{x}_{it} - \gamma_1 t - \gamma_2 t^2 - \delta_1 \bar{\mathbf{x}}_i - \delta_2 \mathbf{P}_{i1} - v_i). \end{aligned} \quad (5)$$

This is an Ordinal Probit model, where the linear index in $\Phi(\cdot)$ has a Random Effects structure. The parameters of this model can be estimated by a conditional Maximum Likelihood Estimator. We estimate standard errors (SEs) robust to arbitrary intra-unit serial correlation in ϵ_{it} , aka clustered SEs (Wooldridge 2010). As this model also allows for correlation between u_i and the explanatory variables through equation 4, we refer to it as the Correlated Random Effects Ordinal Probit model, or CRE-OP.

In this model, the estimated values of α can be interpreted as estimates of the *true state dependence* and β represents the partial effects of the explanatory variables on performance, as this model already controls for unit-specific unobserved heterogeneity and ‘initial conditions’ through the inclusion of $\bar{\mathbf{x}}_i$ and \mathbf{P}_{i1} respectively. The estimated δ s provide some indication of the relationship between explanatory variables and unit-specific heterogeneity, u_i .

Note that although in a linear panel data framework the Correlated Random Effects model is identical to the standard Fixed Effects model, in our non-linear setting, a standard Ordinal Probit Fixed Effects model is not available. However, the CRE-OP provides a close approximation to it. We believe that, together with the dynamic specification, our CRE-OP model allows us to eliminate most of the potential bias due to omitted variables, and due to the reverse effect of performance on training.

5. Analysis and Results

5.1 Determinants of training

To obtain an estimate of the causal effect of training on performance, one needs to control for all variables that are correlated with both the outcome and the explanatory variable of interest. We thus run a series of regressions using training *flow* as the dependent variable to determine which variables influence it, and therefore, which variables need to be ‘controlled for’ in our main regression models.

The results presented in Section B of the online Appendix, indicate that high performing units in period t tend to take more training in period $t + 1$. This justifies the inclusion of the lagged performance score as a covariate in the models explaining service performance, since it is possible that lagged performance also impacts on current performance due to state dependence (see Section 4.3). In addition, as expected, company-owned service units take significantly more training courses, *ceteris paribus*. One can also see that most explanatory variables discussed in Section 4.2 affect the number of courses undertaken by a service unit, meaning that omitting them from the right-hand side of the performance regressions would compromise the reliability of the estimated coefficients of training, since the latter would be capturing part of those variables’ effect on service performance.

5.2 The effect of training on service performance of company-owned and outsourced units

Table 5 contains our base-line results, where the 5-level index of service performance is the dependent variable in all four model specifications. For ease of interpretation, instead of reporting the coefficients of the interaction terms, we report the training coefficients for company-owned and outsourced units separately, having also conducted Wald tests for the joint significance of the terms. Due to space limitations, only the coefficients of the most important variables are reported. Of the omitted results the following are worth noting. There is only a moderate size effect: busier units (in terms of service incidents) perform better, but the employee number proxy is insignificant. The coefficients of the two location variables are positive but insignificant (with p -values of around 0.2). Companies that received the bonus in the previous period are more likely to perform well, but the variable loses its significance if past performance is controlled for (since lagged bonus is proportional to lagged performance, lagged performance captures much of its effect). Using a Wald test of the joint null hypothesis, $\delta_1 = 0, \delta_2 = 0$, we find that the means of the time-varying regressors (and initial

conditions in the dynamic model) are jointly significant, providing evidence that unit-specific heterogeneity is important, and is also correlated with some of the explanatory variables.

[TABLE 5 ABOUT HERE]

Model (1) captures the contemporaneous effect of the number of courses on performance without controlling for lagged performance and is only presented for comparative purposes. Model (2) presents the non-dynamic CRE-OP specification with training ‘stock’ and its quadratic term as the explanatory variables of interest. Here the quarter-by-quarter depreciation rate D is set to 20%, but the results are not sensitive to other realistic values of D between 10% and 50%. For outsourced units, the signs and statistical significance of the linear and quadratic terms indicate that service performance significantly increases with the accumulation of skills, but at a decreasing rate. For company-owned units there seems to be a weak linear effect (p -value=0.062).

Model (3) is the dynamic specification of Model (1). It thus maintains number of courses as the training measure and adds lagged performance as a dummy variable for each performance level with 0 being the base category. Again, for company-owned units, there is mild evidence of a training effect, since the linear and quadratic terms are jointly significant at the 5% level (Wald statistic of 8.23, p -value=0.016). The effect is much larger and more significant for outsourced units (Wald statistic of 14.35, p -value=0.001), and there is again evidence of an inverted U-shaped relationship. The turning point is at about 14 courses (but only around 1% of outsourced units have exceeded that number in a given period). Model (4) uses the aggregate number of training days per quarter, instead of the number of courses. Like Model (3), it suggests that training strongly affects the performance of outsourced service units in a non-linear way, while the effect is weaker (and linear) for company-owned.

Past performance has a strong impact on present performance. The strongly significant and positive coefficients of the dummies indicating the achievement of 3 and 4 KPIs in period $t - 1$, suggest that highly performing units are more likely to perform well again in period t . This can be interpreted as true state dependence; because service performance is immediately known by service units at the end of each quarter, it is a kind of visible feedback for their work. The still vivid ‘experience’ of superior performance in the current period, can boost employee morale and pride in one’s work, and shape employee behaviors that lead to similarly high levels of performance in the next period. This positive

experience may act as extra motivation for employees to try hard again toward excellent performance. Finally, the time trend and its quadratic are strongly significant, and their respective positive and negative signs indicate that performance increases due to ‘learning-by-doing’ but at a decreasing rate.

An intuitive way to interpret the coefficients is by estimating and plotting the probabilities for any outcome j , allowing the explanatory variable of interest (training) to vary. To do this, we first plug in the estimated coefficients in the model, set v_i to its mean value of 0 for each unit, and each variable (apart from training) to its actual value in the sample. This gives an estimated probability for outcome j , for each unit and value of training. We then take the mean of these probabilities allowing training to vary. In Figure 3, we present the predicted probabilities for outcome 4 only, the highest (and most frequent) level of performance, for Models (2), (3) and (4). All graphs indicate that with very little training, company-owned units are more likely to achieve a score of 4. As training increases, the probability of outsourced units to achieve all KPIs increases faster, quickly surpassing that of company-owned ones. Figure 3b shows that, at around 14 courses per quarter, the probability of the highest level of performance for outsourced units has started to decrease but is still higher than for company-owned.

Overall, this analysis provides support to Hypotheses 1 and 2b. However, by using the whole sample and including interaction terms between the training measures and ownership, we have assumed that the effects of all explanatory variables (apart from training) on performance are the same for both company-owned and outsourced units. Thus, as a robustness check, we split the sample into two groups, allowing for the possibility that company-owned and outsourced units are qualitatively different. The results, presented in the online Appendix (Section C), are in total agreement with the base-line results.

[FIGURE 3 ABOUT HERE]

5.3 Unit ownership and choice of training

We have hypothesized that outsourced units are less constrained to choose courses, hence their training regimes will be qualitatively different, and skewed towards skills that have a relatively stronger impact on performance. To provide evidence on this, as a first step, we examine whether the proportions of technical (relative to non-technical) and of ‘first-time’ (relative to ‘repeated’) training courses differ between the two groups. We estimate separate Pooled OLS and Fixed Effects regression models with

the two proportions as outcome variables (Table 6). Controlling for the other explanatory variables (and unit-specific heterogeneity), the ownership dummy is significant in the technical skills regressions (Models 1a-c), but not in the ‘first-time’ skills regressions. This shows that, holding everything else constant, outsourced units take significantly more technical courses, in proportion, compared to company-owned ones, while the two groups do not differ in terms of ‘first-time’ versus ‘repeated’ training (even though outsourced units indeed choose proportionately more of the latter – Model 2c). In turn, the second step is to examine the differential effect of these types of training, for the two groups.

[TABLE 6 ABOUT HERE]

Table 7 presents the results of the dynamic CRE-OP specification after splitting the sample in company-owned versus outsourced and distinguishing between the different types of courses. The first set of models (Model 1) shows that non-technical training does not have a statistically significant impact on the performance of either group (even though the coefficient is larger in magnitude for outsourced). On the other hand, technical training has a strong and significant inverted U-shaped effect on the service performance of outsourced units, but a weaker and linear effect on the performance of company-owned. Model 2 suggests that ‘first-time’ courses have hardly any effect on the performance of company-owned units, in contrast to outsourced ones who seem to reap benefits from them. The effect of ‘repeated’ courses is positive and comparably large for both groups (and linear in nature).

[TABLE 7 ABOUT HERE]

There are two key observations from these results. First, outsourced units seemingly choose to spend a larger part of their training budget on technical courses relative to company-owned, as they recognize the strong and direct connection between being technically competent and achieving higher performance. Because their choice is unconstrained by the manufacturer, they can spend their resources in improving necessary and relevant technical abilities. For non-technical skills (which are found to be less impactful) they may resort to internal employee knowledge-sharing, or informal training (e.g. over the phone with the TruckBus service department). This provides support for H2a.

Second, the two groups of service units do not differ significantly with respect to the choice of first-time versus repeated skills training, even though outsourced units choose proportionately more of the latter. However, the result reveals another aspect of the outsourced units’ strategic and

entrepreneurial thinking; they seem to understand the need to possess a wide variety of skills to keep up-to-date with new developments and be able to cope with the increased product sophistication and variability in the service encounter. Hence, in terms of skill variety they remain on a par with company-owned units. The difference is that they make these skills pay dividends, in contrast to company-owned, whose 'first-time' courses are likely to be on one-off, unnecessary skills due to bureaucratic requirements. Therefore, even though the results do not lend further support for Hypothesis 2a, they provide an additional discussion point that is in line with our thesis. Namely, that independent units choose their training more strategically and reap more benefits from it. Finally, all four types of courses are more effective for outsourced service units, providing further support for H3.

5.4 Robustness checks and further analysis

To check whether our results are sensitive to alternative methodological choices and model specifications, we conducted a series of further robustness checks. They are detailed in Sections C-F of the online Appendix. Briefly, we repeat the base-line analysis but by using time dummies instead of a time trend to control for the effect of any possible period-specific events. We also experiment with different operationalizations of the performance outcome. In addition, we use two alternative approaches to deal with the endogeneity problem; a Two-Stage Least Squares (2SLS) approach and a dynamic linear panel data framework, treating the performance index as a continuous variable. In Section E, we use a matching estimator to match company-owned units with their most similar (in terms of training profiles) outsourced ones, and test for differences in performance. Section F is devoted to further probing of H2a specifically, by studying the changes in the choice of training of the nine service units that switched ownership status within the study timeframe. The results of all these checks are in line with those reported herein, adding credence to the main findings.

6. Discussion and conclusions

This work is positioned on the interface between OM and HRM. Following Boudreau et al. (2003), OM, and specifically the mixed-mode service delivery system of a servitized manufacturer, has

provided the context that explains or moderates the effect of training (a key HR practice). At the same time, behavioral insights stemming from the MOA framework and the literature on the transfer of training have been applied, in order to explain what could have potentially been treated as randomness or error variance under a purely OM lens, namely, the differences in the choice and effectiveness of training between company-owned and outsourced service units. As such, this work adds to the OM studies that have adopted MOA to illuminate phenomena such as knowledge exchange (e.g. Siemsen et al. 2008) and service outsourcing (Wuyts et al. 2015), by showing the model's usefulness in elucidating the performance-enhancing potential of training in a mixed-mode service delivery system. Specifically, we contribute theoretically by drawing explicit connections between: a) The Motivation and Opportunity components of the model, b) salient findings from the research stream on the transfer of training, and c) emerging insights from the literature on plural forms of governance. This integration could be adopted, and possibly advanced theoretically and empirically, by interested scholars. In the reminder of this section we discuss the implications of the substantive findings for theory and practice.

6.1 Discussion of the findings and managerial implications

The findings derived from the analysis of panel data from the UK network of a major commercial vehicles manufacturer, can be summarized as follows:

- a. Training provided by the focal manufacturer has a positive effect on the service performance of the entire mixed-mode service network;
- b. Independent service units choose their training courses more wisely;
- c. As a result, and because of their higher motivation, independent units derive higher performance benefits from all types of training, *i.e.* they leverage training better.

The positive association between training and the performance of company-owned units is hardly surprising, given the salient finding of the HRM literature that firms which provide training to their own employees will eventually see improvements in organization-level outcomes (Batt 2002, Mackelprang et al. 2012). On the other hand, the significant inverted U-shaped relationship between manufacturer-led (*i.e.*, 'outside') training and the performance of outsourced service units has novel implications for service outsourcing theory and practice. Given the increasing attractiveness of this

strategy for manufacturers (Wuyts et al. 2015), manufacturer-led training presents itself as a non-coercive mechanism that can improve the performance of independent service partners and ensure the effective provision of the PS offering. In such front-end service outsourcing triads (Zhang et al. 2015), effective service delivery by the partners means satisfied customers and a harmonious manufacturer-customer relationship (Karatzas et al. 2017, Li and Choi 2009; Perdikaki et al. 2015). The manufacturer can thus institutionalize training to safeguard against the risks stemming from the self-interest of the customer-facing partners, such as cost-cutting and under-delivering in quality and customer value (Zhang et al. 2015). Motivating training with an appropriate compensation scheme conditional on service performance (that can partially offset the costs incurred by the partners) has worked well for the commercial vehicles manufacturer under study. This finding could be generalizable to similar contexts, wherein a manufacturer of complex industrial equipment assigns customer service and support to multiple independent parties. Firms in industries like commercial aviation, automotive, railway and defense also share the need for a broad geographical presence to effectively service their customer-bases, which often happens through alliance partners (Baines et al. 2009, Kowalkowski et al. 2011).

Second, our work suggests that the manufacturer should not directly control the choice of service partners when it comes to which skills to train. The operational autonomy afforded to outsourced units gives them the freedom to develop skills that ‘best fit’ their idiosyncratic local needs at any given time (Yin and Zajac 2004). These skills, which tend to be of a technical nature, are required on the job regularly (so, employees have the opportunity to apply them relatively more often) and are more closely linked to on-the-job performance improvements. On the other hand, the training undertaken by company-owned units is less optimal, since a) they are required to follow a uniform, ‘best-practices’ training policy that aims toward standardization and high system-level performance, while not catering for the idiosyncratic local needs of service units, and b) employee-managers have no incentive to deviate from the set template. Consequently, management might be sending employees to training that some may find pointless, or without a clear, strategic view as to exactly which types of skills will add value at the unit-level. Those less effective courses, in this context, seem to be the ones in non-technical subjects. It is worth noting that the results from our matching approach (part E of the online Appendix) suggest that not only do outsourced units differentiate *between* more and less effective categories of

courses, but they also seem to choose more optimally *within* those categories. This is because, when matched based on the *number* of technical, non-technical, first-time and repeated courses, company-owned units significantly underperform compared to their peers. This means that in terms of the tension between standardization and local adaptation, a key theme in the literature on plural forms (Bradach 1997, Sorenson and Sørensen 2001), this work provides support for local adaptation. Namely, it suggests that training is an HR practice over which decision rights had better reside with the third-parties (Kaufmann and Eroglu 1998, Truss 2004). In tandem, because training is a costly investment with evident opportunity costs for them, their employees are relatively more motivated to learn and successfully apply their acquired skills. Ultimately, while dedicating comparatively fewer resources than company-owned units and achieving similarly consistent performance improvements, outsourced units have managed to leverage (all types of) training for human capital development more effectively.

Third, our study contributes to the franchising literature, answering calls for the conduct of micro-level empirical studies that can improve our understanding of how HR practices (and their effects on unit-level performance) vary between company-owned and franchised units (Castrogiovanni and Kidwell 2010, Kellner 2017). Since mixed-ownership franchise systems are ubiquitous, and the tripartite franchisor – franchisee – customer relationship constitutes a service triad (Zhang et al. 2015), we see no reason why our findings cannot be generalized to that context. As such, this study validates and extends recent findings on the positive role of operational autonomy in unit-level performance within plural systems (Croonen et al. 2016a, Grünhagen et al. 2014). However, it has done so after: a) providing a solid theoretical foundation for the differential choice and effect of training, b) testing the hypotheses in a constrained empirical setting that eliminates industry and cultural influences, and c) investigating and singling out alternative explanations of the observed effects (e.g. reverse causality, unobserved unit-level heterogeneity) using robust econometric techniques.

The findings have policy implications for servitized manufacturers facing the design of a mixed-mode service delivery system (Li et al. 2016). First, a centralized, ‘one size fits all’ approach to employee training of company-owned units that assumes homogeneity, may not be the optimal HR strategy. It may fail to recognize the context-specificity of the individual service unit (e.g. ‘typical’ customer, employee needs and preferences, skill shortages), leading to untargeted and less effective

training. Given the costs associated with running the courses, and the foregone revenues at the unit level, a more targeted approach may generate additional material benefits. For more appropriate choice of training, the manufacturer can empower the managers of its company-owned units to run their own, ‘local’ needs assessments and emulate the entrepreneurial spirit of their outsourced counterparts. Therefore, firstly, it can delegate training choice at the unit-level, based on simple guiding principles or a loose framework with which training choice should be aligned; and secondly, since employee-managers are prone to simply emulating ‘best practices’ and avoiding taking risks that would compromise their salary, it could link training to bonuses for unit- or employee-level performance improvements (Brand and Croonen 2010). More targeted training should make employees perceive the utility and value of the new knowledge and skills, as it is more likely to enhance relevant aspects of their work performance (Baldwin & Ford 1988, Burke and Hutchins 2007). Finally, to increase the chances of positive transfer, manufacturers can introduce additional interventions that increase the learner’s pre-training motivation and perceived self-efficacy, which are strong predictors of successful training transfer and, unlike cognitive ability, are malleable characteristics (Burke and Hutchins 2007).

For outsourced service units, the estimated non-linear (positive but decreasing) effect of training suggests that there are diminishing returns from it. In this study context, after 10 courses on average, every additional one seems to produce negligible gains. This suggests that simply encouraging third-parties to do ‘more training’ is not the answer; rather, it is the ‘right’ trained skills (and possible combinations thereof) that considerably improve performance toward the manufacturer’s customer-base. As such, manufacturers could even consider placing upper bounds in terms of how much training their partners can receive (which should depend on the context and the size of the service unit), to prevent over-excited or over-worried managers from spending excessive resources for only negligible gains. In front-end service outsourcing triads, high performance of the service partner is not just in its own interest, but also that of the manufacturer. This should also be the case then when it comes to the optimal allocation of resources for activities such as formal training.

6.2. Limitations and further research

Despite the robustness of the main findings, this study is not exempt from limitations. Firstly, although the focus on a single manufacturer, industry and country has helped us eliminate several sources of heterogeneity that can confound the examined relationships, it may limit the generalizability of the results. Another barrier to generalizability is the fact that in this study context, service outsourcing is effectively manifested through franchising, where independent service units are small- and medium-sized enterprises (SMEs) run by owner-managers. A question that arises is whether our findings hold in contexts where such units belong to large, specialized service firms, and are thus run by employee-managers of the latter. These employee-managers may lack the incentives and motivation of single-unit owner-managers, and there is ongoing research in the franchising literature investigating this issue and its implications for unit-level performance (Croonen et al. 2016b). Relatedly, unlike TruckBus, some manufacturers may try to dictate the terms of training even for outsourced service units (Truss 2004). Although theory and practice suggest that the latter is a relatively less common setting, these contextual features suggest that to firmly establish the positive effect of manufacturer-led training on service performance, and the differential efficacy of training for company-owned and outsourced units, one should try to replicate this work in other manufacturers' service networks.

Secondly, we recognize that there may still be some unit-specific time-varying elements whose role has not been fully captured here due to data unavailability. For example, changes in other HR practices (e.g. job involvement, career planning), may be associated with both service performance and the extent of manufacturer-led training undertaken by the unit. Even though these are less likely to vary with time over our (relatively short) timeframe compared to the choice and extent of training, capturing their time-variant variation might produce more reliable estimates of the 'true' effect of training. This could also aid the identification of complementarities between training and those unit-level practices.

Finally, although we have provided evidence that training increases the service performance of the supplier toward the manufacturer's customer-base, hence it is beneficial for both customers and the manufacturer, it is not entirely clear if it has a net benefit for the suppliers. This is because we do not consider the price of the courses, or the foregone output costs of training during working hours. An obvious research direction is a cost-benefit analysis to determine whether the revenues associated with superior service performance outweigh total costs.

References

- Baines, T., A. Ziaee Bigdeli, O.F. Bustanza, V.G. Shi, J. Baldwin, K. Ridgway. 2017. Servitization: revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*, 37 (2), 256–278.
- Baines, T., H. Lightfoot, P. Smart, S. Fletcher. 2013. Servitization of manufacture: Exploring the deployment and skills of people critical to the delivery of advanced services. *Journal of Manufacturing Technology Management*, 24 (4), 637–646.
- Baines, T., H. Lightfoot, J. Peppard, M. Johnson, A. Tiwari, E. Shehab, M. Swink. 2009. Towards an operations strategy for product-centric servitization. *International Journal of Operations & Production Management*, 29 (5), 494–519.
- Balakrishnan, K., U. Mohan, S. Seshadri. 2008. Outsourcing of front-end business processes: Quality, information, and customer contact. *Journal of Operations Management*, 26 (2), 288–302.
- Baldwin, T.T., J.K. Ford. 1988. Transfer of training: A review and directions for future research. *Personnel Psychology*, 41, 63–105.
- Baldwin, T.T., J.K. Ford, B.D. Blume. 2009. Transfer of training 1988-2008: An updated review and new agenda for future research. In G.P. Hodgkinson & J.K. Ford (Eds.), *International Review of Industrial and Organizational Psychology* (24, 41-70). Chichester, UK: Wiley.
- Baltagi, B. 2013. *Econometric analysis of panel data*. Chichester, UK: John Wiley & Sons.
- Batt, R. 2002. Managing customer services: Human resource practices, quit rates, and sales growth. *Academy of Management Journal*, 45 (3), 587–597.
- Birdi, K., C. Clegg, M. Patterson, A. Robinson, C. Stride, T. Wall, S. Wood. 2008. The impact of human resource and operational management practices on company productivity: a longitudinal study. *Personnel Psychology*, 61 (3), 467–501.
- Blumberg, M., C. Pringle. 1982. The missing opportunity in organizational research: Some implications for a theory of work performance. *Academy of Management Review*, 7 (4), 560–569.
- Blume, B.D., J.K. Ford, T.T. Baldwin, J.L. Huang. 2010. Transfer of training: A meta-analytic review. *Journal of Management*, 36 (4), 1065–1105.
- Boudreau, J., W. Hopp, J.O. McClain, L.J. Thomas. 2003. On the Interface Between Operations and Human Resources Management. *Manufacturing & Service Operations Management*, 5 (3), 179–202.
- Boxall, P., J. Purcell. 2008. *Strategy and human resource management*. Basingstoke, U.K.: Palgrave Macmillan.
- Bradach, J. 1997. Using the plural form in the management of restaurant chains. *Administrative Science Quarterly*, 42, 276–303.
- Brand, M.J., E.P.M Croonen. 2010. Franchised and Small, the Most Beautiful of All; HRM and Performance in Plural Systems. *Journal of Small Business Management*, 48 (4), 605–626.
- Broekhuis, M., K. Scholten. 2018. Purchasing in service triads: the influence of contracting on contract

- management. *International Journal of Operations & Production Management*, 38 (5), 1188–1204.
- Burke, L.A., H.M. Hutchins. 2007. Training transfer: An integrative literature review. *Human Resource Development Review*, 6 (3), 263–296.
- Castrogiovanni, G.J., R.E. Kidwell. 2010. Human Resource Management Practices Affecting Unit Managers in Franchise Networks. *Human Resource Management*, 49 (2), 225–239.
- Chase, R.B. 1981. The customer contact approach to services: theoretical bases and practical extensions. *Operations Research*, 21 (4), 698–705.
- Combs, C., Y. Liu, A. Hall, D. Ketchen. 2006. How much do high-performance work systems matter? A meta-analysis of their effects on organizational performance. *Personnel Psychology*, 59 (3), 501–528.
- Conti, G. 2005. Training, productivity and wages in Italy. *Labour Economics*, 12 (4), 557–576.
- Cook, D., C. Goh, C. Chung. 1999. Service typologies: A state of the art survey. *Production and Operations Management*, 8 (3), 318–338.
- Contoyannis, P., A. M. Jones, N. Rice. 2004. The dynamics of health in the British Household Panel Survey. *Journal of Applied Econometrics*, 19, 473–503.
- Croonen, E.P.M., M. Grünhagen, M.L. Wollan. 2016a. Best fit, best practice, or stuck in the middle? The impact of unit ownership on unit HR performance in franchise systems. *International Entrepreneurship and Management Journal*, 12 (3), 697–711.
- Croonen, E.P.M., M.J. Brand, E.K.R.E. Huizingh. 2016b. To be entrepreneurial, or not to be entrepreneurial? Explaining differences in franchisee entrepreneurial behavior within a franchise system. *International Entrepreneurship and Management Journal*, 12 (2), 531–553.
- Darr, E.D., L. Argote, D. Epple. 1995. The Acquisition, Transfer, and Depreciation of Knowledge in Service Organizations: Productivity in Franchises. *Management Science*, 41 (11), 1750–1762.
- De Menezes, L. M., S. Wood, G. Gelade. 2010. The integration of human resource and operation management practices and its link with performance: A longitudinal latent class study. *Journal of Operations Management*, 28 (6), 455–471.
- Facteau, J.D., G.H. Dobbins, J.E.A. Russell, R.T. Ladd, J.D. Kudisch. 1995. The influence of general perceptions of the training environment on pre-training motivation and perceived training transfer. *Journal of Management*, 21, 1–25.
- Foot N.W., J.R. Galbraith, Q. Hope, D. Miller. 2001. Making Solutions the Answer. *McKinsey Quarterly*, 3, 84–93.
- Ford, J.K., M.A. Quinones, D.J. Sego, J.S. Sorra. 1992. Factors affecting the opportunity to perform trained tasks on the job. *Personnel Psychology*, 45, 511–524.
- Forkmann, S., C. Ramos, S.C. Henneberg, P. Naudé. 2017. Understanding the service infusion process as a business model reconfiguration. *Industrial Marketing Management*, 60, 151–166.
- Goldstein, I. 1980. Training in work organizations. *Annual Review of Psychology*, 31, 229–272.
- Goldstein, I. 2002. Training in Organizations: Needs Assessment, Development, and Evaluation.

- Wadsworth, Belmont, CA.
- Grünhagen, M., M.L. Wollan, O. Dada, A. Watson. 2014. The moderating influence of HR operational autonomy on the entrepreneurial orientation–performance link in franchise systems. *International Entrepreneurship and Management Journal*, 10 (4), 827–844.
- Guest, D. E. 2011. Human resource management and performance: still searching for some answers. *Human Resource Management Journal*, 21 (1), 3–13.
- Heckman, J. 1981. The incidental parameters problem and the problem of initial conditions in estimating a time-discrete data stochastic process. In Manski, C., D. McFadden Eds. *Structural Analysis of Discrete Data with Econometric Applications*. MIT Press, Cambridge, MA.
- Heckman, J., G. Borjas. 1980. Does Unemployment Cause Future Unemployment? Definitions, Questions and Answers from a Continuous Time Model of Heterogeneity and State Dependence. *Economica*, 47 (187), 247–283.
- Jiang, K., D. Lepak, J. Hu, J. Baer. 2012. How Does Human Resource Management Influence Organizational Outcomes? A Meta-analytic Investigation of Mediating Mechanisms. *Academy of Management Journal*, 55 (6), 1264–1294.
- Johnstone, S., A. Wilkinson, A. Dainty. 2014. Reconceptualizing the service paradox in engineering companies: Is HR a missing link? *IEEE Transactions on Engineering Management*, 61 (2), 275–284.
- Kamien, M., N. Schwartz. 2012. *Dynamic optimization*. Mineola, New York: Dover Publications.
- Karatzas, A., M. Johnson, M. Bastl. 2017. Manufacturer-supplier relationships and service performance in service triads. *International Journal of Operations & Production Management*, 37 (7), 950–969.
- Kaufmann, P.J., S. Eroglu. 1998. Standardization and Adaptation in Business Format Franchising. *Journal of Business Venturing*, 14, 69–85.
- Kellner, A. 2017. Human resource management standardisation and adaptation in franchises. *Service Industries Journal*, 37 (9–10), 545–566.
- Kidwell, R.E., A. Nygaard. 2011. A Strategic Deviance Perspective on the Franchise Form of Organizing. *Entrepreneurship: Theory and Practice*, 35 (3), 467–482.
- Kim, H., D. Hur, T. Schoenherr. 2015. When Buyer-Driven Knowledge Transfer Activities Really Work: A Motivation–Opportunity–Ability Perspective. *Journal of Supply Chain Management*, 51 (3), 33–60.
- Kowalkowski, C., D. Kindström, L. Witell. 2011. Internalisation or externalisation? Examining organisational arrangements of industrial services. *Managing Service Quality: An International Journal*, 21 (4), 373–391.
- Kreye, M.E. 2017. Can you put too much on your plate? Uncertainty exposure in servitized triads. *International Journal of Operations and Production Management*, 37 (12), 1722–1740.
- Lafontaine, F. 1992. Agency theory and franchising: Some empirical results. *Rand Journal of Economics*, 23, 263–283.
- Li, M., T. Choi. 2009. Triads In Services Outsourcing: Bridge, Bridge Decay And Bridge Transfer.

- Journal of Supply Chain Management, 45 (3), 27–39.
- Li, X., Y. Li, X. Cai, J. Shan. 2016. Service Channel Choice for Supply Chain: Who is Better off by Undertaking the Service? *Production and Operations Management*, 25 (3), 516–534.
- Lim, D.H., M.L. Morris. 2006. Influence of trainee characteristics, instructional satisfaction, and organizational climate on perceived learning and training transfer. *Human Resource Development Quarterly*, 17 (1), 85–115.
- Mackelprang, A.W., J. Jayaram, K. Xu. 2012. The influence of types of training on service system performance in mass service and service shop operations. *International Journal of Production Economics*, 138 (1), 183–194.
- Michael, S.C. 2000. The effect of organizational form on quality: The case of franchising. *Journal of Economic Behavior and Organization*, 43, 295–318.
- Miller, D., Q. Hope, R. Eisenstat, N. Foote, J. Galbraith. 2002. The problem of solutions: Balancing clients and capabilities. *Business Horizons*, 45 (2), 3–12.
- Mumdzhev, N., J. Windsperger. 2011. The Structure of Decision Rights in Franchising Networks: A Property Rights Perspective. *Entrepreneurship: Theory and Practice*, 35 (3), 449–465.
- Mundlak, Y. 1978. On the Pooling of Time Series and Cross Section Data. *Econometrica*, 46 (1), 69–85.
- Neely, A. 2008. Exploring the Financial Consequences of the Servitization of Manufacturing. *Operations Management Research*, 1 (2), 103–118.
- Noe, R.A., N. Schmitt. 1986. The influence of trainee attitudes on training effectiveness: Test of a model. *Personnel Psychology*, 39, 497–523.
- Oliva, R., R. Kallenberg. 2003. Managing the transition from products to services. *International Journal of Service Industry Management*, 14 (2), 160–172.
- Oliveira, P., A.V. Roth. 2012. Service orientation: the derivation of underlying constructs and measures. *International Journal of Operations & Production Management*, 32 (2), 156–190.
- Paiola, M., H. Gebauer, B. Edvardsson. 2012. Service Business Development in Small- to Medium-Sized Equipment Manufacturers. *Journal of Business-to-Business Marketing*, 19 (1), 33–66.
- Parmigiani, A., S.S. Holloway. 2011. Actions speak louder than modes: antecedents and implications of parent implementation capabilities on business unit performance. *Strategic Management Journal*, 32 (5), 457–485.
- Perdikaki, O., D.X. Peng, G.R. Heim. 2015. Impact of Customer Traffic and Service Process Outsourcing Levels on e-Retailer Operational Performance. *Production and Operations Management*, 24 (11), 1794–1811.
- Raja, J.Z., T. Frandsen. 2017. Exploring servitization in China: Challenges of aligning motivation, opportunity and ability in coordinating an external service partner network. *International Journal of Operations & Production Management*, 37 (11), 1654–1682.
- Roth, A.V., L.J. Menor. 2003. Insights Into Service Operations Management: a Research Agenda.

- Production and Operations Management, 12 (2), 145–164.
- Rouiller, J.Z., I.L. Goldstein. 1993. The relationship between organizational transfer climate and positive transfer of training. *Human Resource Development Quarterly*, 4 (4), 377–390.
- Rudberg, M., J. Olhager. 2003. Manufacturing networks and supply chains: an operations strategy perspective. *Omega*, 31 (1), 29–39.
- Shane, S.A. 1998. Explaining the distribution of franchised and company-owned outlets in franchise systems. *Journal of Management*, 24, 717–739.
- Siemens, E., A.V. Roth, S. Balasubramanian. 2008. How motivation, opportunity, and ability drive knowledge sharing: The constraining-factor model. *Journal of Operations Management*, 26 (3), 426–445.
- Simon, C., L. Blume. 2010. *Mathematics for economists*. New York: W.W. Norton.
- Skaggs, B., M. Youndt. 2004. Strategic Positioning, Human Capital, And Performance in Service Organizations: a customer interaction approach. *Strategic Management Journal*, 25 (1), 89–99.
- Sorenson, O., J.B. Sørensen. 2001. Finding the right mix: franchising, organizational learning, and chain performance. *Strategic Management Journal*, 22 (6–7), 713–724.
- Spohrer, J., P.P. Maglio. 2008. The emergence of service science: Toward systematic service innovations to accelerate co-creation of value. *Production and Operations Management*, 17 (3), 238–246.
- Tate, W. L., W. van der Valk. 2008. Managing the performance of outsourced customer contact units. *Journal of Purchasing and Supply Management*, 14 (3), 160–169.
- Tharenou, P., A.M. Saks, C. Moore. 2007. A review and critique of research on training and organizational-level outcomes. *Human Resource Management Review*, 17 (3), 251–273.
- Truss, C. 2004. Who's in the driving seat? Managing human resources in a franchise firm. *Human Resource Management Journal*, 14 (4), 57–75.
- Ulag, W., J.M. Loveland. 2014. Transitioning from product to service-led growth in manufacturing firms: Emergent challenges in selecting and managing the industrial sales force. *Industrial Marketing Management*, 43 (1), 113–125.
- Van der Valk, W., J. van Iwaarden. 2011. Monitoring in service triads consisting of buyers, subcontractors and end customers. *Journal of Purchasing and Supply Management*, 17 (3), 198–206.
- Van Iddekinge, C., G. Ferris, P. Perrewé, A. Perryman, F. Blass, T. Heetderks. 2009. Effects of selection and training on unit-level performance over time: A latent growth modeling approach. *Journal of Applied Psychology*, 94 (4), 829–843.
- Vandermerwe, S., J. Rada. 1988. Servitization of business: Adding value by adding services, *European Management Journal*, 6 (4), 314–324.
- Wall, T., S. Wood. 2005. The romance of human resource management and business performance, and the case for big science. *Human Relations*, 58 (4), 429–462.
- Whetten, D.A., T. Felin, B.J. King. 2009. The practice of theory borrowing in organizational studies:

- current issues and future directions. *Journal of Management*, 35 (3), 537–63.
- Windahl, C., P. Andersson, C Berggren, C. Nehler. 2004. Manufacturing firms and integrated solutions: characteristics and implications. *European Journal of Innovation Management*, 7 (3), 218–228.
- Winter, S.G., G. Szulanski, D. Ringov, R.J. Jensen. 2012. Reproducing Knowledge: Inaccurate Replication and Failure in Franchise Organizations. *Organization Science*, 23 (3), 672–685.
- Wooldridge, J. 2005. Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity. *Journal of Applied Econometrics*, 20, 39–54.
- Wooldridge, J. 2010. *Econometric analysis of cross section and panel data*. MIT Press.
- Wuyts, S., A. Rindfleisch, A. Citrin. 2015. Outsourcing customer support: The role of provider customer focus. *Journal of Operations Management*, 35, 40–55.
- Wynstra, F., M. Spring, T. Schoenherr. 2015. Service triads: A research agenda for buyer-supplier-customer triads in business services. *Journal of Operations Management*, 35, 1–20.
- Yamhill, S., G.N. McLean. 2001. Theories Supporting Transfer of Training. *Human Resource Development Quarterly*, 12 (2), 195–208.
- Yin, X., E.J. Zajac. 2004. The strategy/governance structure fit relationship: theory and evidence in franchising arrangements. *Strategic Management Journal*, 25 (4), 365–383.
- Zhang, J.J., B. Lawrence, C.K. Anderson. 2015. An agency perspective on service triads: Linking operational and financial performance. *Journal of Operations Management*, 35, 56–66.

Tables and Figures

Table 1 – The four KPIs and their descriptions

1. Ministry of Transport (MOT) pass rate (<i>Quality</i>)	The % of vehicles passing the MOT test in the 1 st attempt. A vehicle's MOT history is linked to its 'Operator license' and affects the customer's Operator Compliance Risk Score (OCRS). The target was adjusted upwards 3 times during the study timeframe.
2. Breakdown attendance (<i>Waiting time</i>)	Relates to the time it takes a service unit to attend a broken-down vehicle under contract in its area of remit. 95% of breakdowns should be attended within 60 minutes.
3. Preventive maintenance inspection (<i>Proactiveness</i>)	Relates to the obligatory 6-weekly inspection that all commercial vehicles in the UK must pass. For each unit, 90% of the vehicles under its responsibility must complete the test in the week in which they are due (minimizing 'slippage' due to neglect).
4. Unscheduled repair or maintenance (<i>Responsiveness</i>)	Relates to unplanned vehicle 'downtime' and involves the use of a TruckBus-specific system. If the repair is anticipated to take longer than 12 hours, or if required parts cannot be delivered by the next working day, the unit must register the incident on the system in no more than 0.5 days, with no exception. TruckBus can then provide technical help or missing parts as an emergency to speed up vehicle turnaround.

Table 2 – Distribution of performance for company-owned and outsourced units (in %)

Performance	C-o.	Out.	Total
0	.91	2.23	1.86
1	5.47	10.08	8.80
2	18.84	16.18	16.92
3	31.91	31.65	31.73
4	42.86	39.86	40.69

Table 3 – Distribution of № of courses for company-owned and outsourced units (in %)

№ of Courses	C-o.	Out.	Total
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0	8.21	24.91	20.27
1	8.81	17.89	15.37
2	10.64	14.15	13.18
3	7.6	10.06	9.38
4	8.51	10.29	9.8
5	7.29	7.13	7.18
6	8.51	3.98	5.24
7	6.38	3.51	4.31
8	6.38	1.05	2.53
9	5.78	1.87	2.96
10+	21.88	5.15	9.80

Table 4 – Descriptive statistics by company-owned and outsourced units

Variables	Mean		Mean Differences	Std. Deviation		Min. – Max.	
	C-o.	Out.		C-o.	Out.	C-o.	Out.
Performance from 0 (lowest) to 4 (highest)	3.10	2.97	.135	.953	1.08	0 – 4	0 – 4
Nº of courses (<i>flow</i>)	6.66	2.95	3.71***	6.28	3.40	0 – 51	0 – 26
% of courses for technical skills	72.16	80.91	-8.74***	30.54	31.38	0 – 100	0 – 100
% of courses for ‘first-time’ skills	46.53	55.36	-8.83*	33.35	37.91	0 – 100	0 – 100
Cumulative Nº of courses (<i>stock</i>)	25.55	10.91	14.64***	19.95	10.01	0 – 81.09	0 – 81.8
Nº of training days	14.94	7.01	7.93***	12.91	8.15	0 – 81	0 – 68
Nº of incidents (proxy for size)	72.31	49.23	23.08***	65.22	60.25	0 – 304	0 – 313
Nº of employees trained (proxy for size)	23.84	15.05	8.78**	13.45	10	7 – 51	4 – 57
Bonus achieved (=1 if yes, =0 if no)	.687	.642	.045	-	-	0 – 1	0 – 1
County density (in ppl/km ²)	1,235.37	1,098.5	136.78	1,505.1	1,391.2	73.18 – 5,223	39 – 5,223
Distance (from headquarters in miles)	201	155.18	45.82	127.89	106.93	0 – 498	0 – 551
Nº of service hours sold to TruckBus	2,538.16	1,757.8	780.31**	1,403.7	1893.5	0 – 6,909.3	31.8 – 15,043.9

For the mean differences column, *** p<0.01, ** p<0.05, * p<0.1, based on clustered (by unit) standard errors

Table 5 – Base-line results: The effect of training on service performance

Variables	(1)	(2)	(3)	(4)
	Nº of courses (static)	Training stock (static)	Nº of courses (dynamic)	Nº of training days (dynamic)
C-o. training	.0333 (0.0267)	.0426* (0.0228)	.0272 (0.0280)	.0175 (0.0156)
C-o. training squared	-.00013 (0.00069)	-.00039 (0.00037)	-.00008 (0.00074)	-.00008 (0.00026)
Out. training	.0914*** (0.0234)	.0803*** (0.01602)	.0851*** (0.0240)	.0389*** (0.0091)
Out. training squared	-.00310** (0.00135)	-.00082*** (0.00018)	-.00301** (0.00140)	-.00050** (0.00023)
<i>Performance at t – 1 (base dummy is Performance=0)</i>				
Performance = 1			-.0336 (0.2269)	-.0410 (0.2315)
Performance = 2			.1075	.0972

			(0.1996)	(0.2051)
Performance = 3			.5908***	.5840***
			(0.2189)	(0.2226)
Performance = 4			.9777***	.9704***
			(0.2554)	(0.2587)
Time	.1676***	.0816**	.1304***	.1324***
	(0.0329)	(0.0331)	(0.0295)	(0.0294)
Time squared	-.00492***	-.00190	-.00374***	-.00389***
	(0.00147)	(0.00141)	(0.00130)	(0.00130)
Nº of observations	1,118	1,118	1,116	1,116
Nº of clusters	64	64	64	64
Log pseudolikelihood	-1,186.7	-1,179.5	-1,163.5	-1,161.7
Wald stat c-o.	11.88***	6.56**	8.23**	6.63**
Wald stat out.	17.64***	25.69***	14.35***	20.66***
Wald stat. (for $\delta_1 = 0, \delta_2 = 0$)	96.42***	82.42***	133.54***	137.18***

Robust (clustered by unit) standard errors to account for serial correlation in the idiosyncratic error term within units are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: All models include a constant, all explanatory variables, the unit-specific means of the time-varying variables and interaction terms between the training variables and the ownership dummy (=1 for outsourced units). The dynamic specifications also include performance in period 1 (initial period) as explanatory variables.

‘Wald stat c-o.’ and ‘Wald stat out.’ are the Wald stats for the null hypothesis that training, and training squared have no joint effect on performance for company-owned and outsourced companies respectively.

Table 6 – Proportion of technical training and proportion of ‘first-time’ training

Variables	(1)			(2)		
	Proportion of Technical training			Proportion of First-time training		
	(a) POLS	(b) POLS	(c) FE	(a) POLS	(b) POLS	(c) FE
Ownership dummy (=1 if outsourced)	.0877*** (0.0261)	.1117*** (0.0288)	.0775* (0.0427)	.0863* (0.0452)	-.0242 (0.0313)	-.0352 (0.0589)
Explanatory variables		✓	✓		✓	✓
Time dummies		✓	✓		✓	✓
Nº of observations	907	907	907	907	907	907
Nº of clusters	64	64	64	64	64	64
R squared	0.0169	0.3952	0.3754	0.0126	0.3744	0.3072

Robust (clustered by unit) standard errors to account for serial correlation in the idiosyncratic error term within units and heteroskedasticity are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: All models include a constant and all explanatory variables are included in the *Training* equations (see Table B in the Appendix).

Table 7 – Technical vs. non-technical training and first-time vs. repeated training

Variables	(1)		(2)	
	Technical vs. Admin		First-time vs. Repeated	
	C-o.	Out.	C-o.	Out.
Nº of Technical courses	.0380** (0.0175)	.0847*** (0.0277)		
Nº of Technical courses squared		-.0030* (0.0016)		
Nº of Non-technical courses	.0096 (0.0207)	.0340 (0.0270)		
Nº of First-time courses			.0441	.1263**

			(0.0591)	(0.0563)
№ of First-time courses squared			-.0063*	-.0196**
			(0.0038)	(0.0091)
№ of Repeated courses			.0415**	.0587***
			(0.0178)	(0.0210)
№ of observations	314	804	314	804
№ of clusters	20	53	20	53
Log pseudolikelihood	-320.29	-829.73	-319.41	-829.32
Wald stat for effect of technical training	4.71**	10.77***		
Wald stat for effect of admin training	0.21	1.58		
Wald stat for effect of first-time training			3.58	5.30*
Wald stat for effect of repeated training			5.46**	7.81***

Robust (clustered by unit) standard errors to account for serial correlation in the idiosyncratic error term within units are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: All models include a constant, all explanatory variables, including past performance and initial conditions, and the unit-specific means of the time-varying variables. '№ of Technical courses squared' is not included in Model (1) for company-owned, as it provides a very bad fit. The quadratic of '№ of Non-technical courses' is also excluded, as it is very insignificant for both c-o. and out. units.

Figure 1 – Average performance of company-owned versus outsourced units

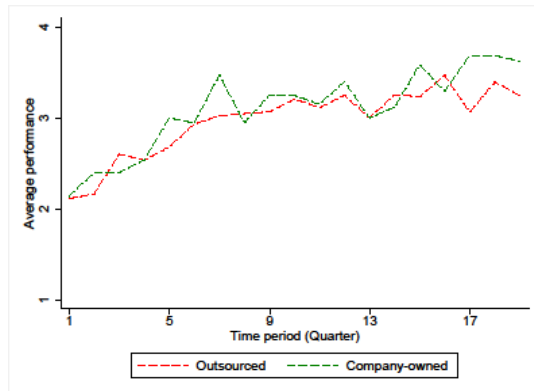


Figure 2 – Average training of company-owned versus outsourced units

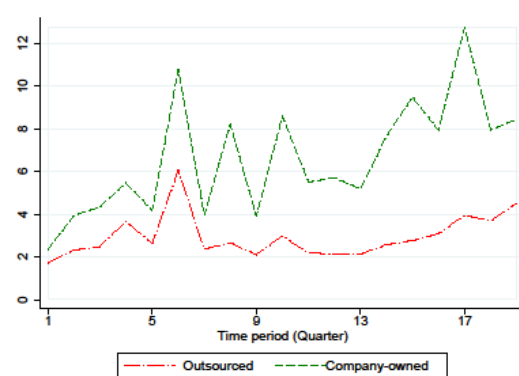


Figure 3 – Predicted probabilities of achieving a performance score of 4 for both groups by training

