Innovating into trouble:
When innovation leads to customer complaints

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Abstract:
This paper examines the unintended consequences of innovation. We show that innovative activity can have adverse outcomes in the form of increased customer complaints with the potential for reputational and financial damage. Complaints may arise directly from adverse reactions to innovative services or indirectly from service failures where firms over-prioritise innovation. Our empirical analysis focuses on legal services in England and Wales. Survey data on innovation by legal service providers is matched with complaints data from the Legal Ombudsman for England and Wales. This allows us to identify the links between innovation activity and subsequent customer complaints. Our analysis reveals that higher levels of innovation activity increase the probability and number of consumer complaints. We identify how firms can reduce the potential for consumer complaints by adopting collaborative innovation strategies. In addition, firms with international competitors are less likely to face complaints. Our results have strategic, regulatory and policy implications.

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1. Introduction

Definitions of innovation often stress its potential benefits in terms of 'creating new value for customers and financial returns for the firm'[1]. Here, we consider the potential for innovation to have unanticipated negative effects, causing an increase in customer complaints with negative financial and reputational consequences (Liao et al., 2015). Our analysis draws on the literatures on collaborative innovation and consumer complaining behaviour (CCB) which defines complaining behaviour as: 'an action taken by an individual which involves communicating something negative regarding a product or a service to either the firm manufacturing or marketing that product or service, or to some third-party organizational entity' (Jacoby and Jaccard 1981, p. 6). We compliment other studies which have looked at the role of consumer complaints in stimulating innovation (Christiansen et al., 2016), and how firms can benefit from customer complaint information as part of broader quality management or improvement activities (Leavengood et al., 2014). More broadly our research extends the literature on the unanticipated – and potentially negative – consequences of innovation (Ciborra et al., 1998), and identifies strategies which firms and policy makers can adopt to counter the 'dark side' of innovation (Coad et al. 2021).

Prior research on innovation and customer complaints is relatively limited and has focused primarily on individual complainants and their attitudes, cognition, and motivation (Heidenreich et al. 2016; Heidenreich and Kraemer 2015; Heidenreich and Handrich 2015; Talke and Heidenreich 2014). Less attention has been paid to how the strategies of innovating organisations, or the context in which innovation is taking place, may influence customer complaints (Arora and Chakraborty, 2021). This is perhaps surprising as the early discussion of loyalty, exit and voice by Hirschman (1970) references industrial structure and organisational strategies as potential influences on complainant behaviour. For example, engaging with consumers or suppliers during an innovation process may help firms to better match new products or services to customer needs and avoid customer complaints (Busse and Siebert, 2018; Mattsson and Helmersson, 2007; Schreier and Prugl, 2008; Pedersen, 2016).

[1] Advisory Committee on Measuring Innovation in the 21st Century Economy 2008, p. i.

Our empirical analysis focuses on legal services in England and Wales and is based on a 2015 survey of innovation by legal services providers matched with data on customer complaints between 2016 and 2018 provided by the Legal Ombudsman[2]. The legal services sector, which include the activities of solicitors, barristers, and other legal professionals such as patent attorneys, conveyancers and will writers, plays an important economic and social role (Rickman and Anderson, 2011). In economic terms, legal services play an 'enabling' role ensuring fair competition and enforcing property rights and contractual compliance (Legal Services Board, 2011). In social terms, legal services are important in addressing criminality, and ensuring the maintenance of domestic and human rights. Fundamentally, however, legal service provision shares many of the standard attributes of other professional services, e.g., their intangible nature, inseparability, and extensive inter-activity between client and provider.

We make three main contributions. First, we identify how innovation can lead to an increase in customer complaints (Heidenreich and Kraemer, 2015; Talke and Heidenreich, 2014). Innovation may lead directly to customer complaints where a new product or service fails to meet consumer expectations or match marketing messages. Indirect links between innovation and complaints may also arise, however, if the over-allocation of resources to innovation leads to service failure or a failure to deal effectively with emerging customer issues (Hortinha et al., 2011). Such unanticipated consequences of innovation have received relatively little attention in the existing literature, perhaps due to data limitations (Meijer and Thaens, 2021; Coad et al., 2021). Second, we explore how firms can reduce the potential for complaints by shaping their approach to innovation. We consider the potential value of engaging with customers during the innovation process (Busse and Siebert, 2018; Mattsson and Helmersson, 2007; Schreier and Prugl, 2008; Pedersen, 2016) and the potential value of team-working which has often been linked to higher quality and more successful innovation (e.g., Storey et al., 2016). Both strategies provide a link with the broader literature on services innovation, highlighting that strategies which are standardly associated with improving innovation outputs may also help in avoiding unanticipated and undesirable consumer responses (Song et al., 2011). Third, we examine the role of competition in moderating the innovation-complaints relationship, focusing particularly on whether firms which face more intensive international competition are more or less likely to experience complaints after innovating. The argument here is that more intensive

[2] The Legal Ombudsman is a statutory body in the UK which acts as investigator and arbitrator in situations where consumers have an unresolved complaint about some aspect of legal service provision (Huppertz and Mower, 2014; Kucsko-Stadlmayer, 2008).

international competition might increase the commercial risks of introducing low quality innovation, so raising innovation quality or conservatism, and reducing the probability of consumer complaints. This is particularly important in legal services where a lack of competition has often been associated with a lack of innovation and where, in the UK, a strategy of policy de-regulation has sought to encourage new market entry and stimulate innovation and service improvements (Parker et al., 2010; Roper et al., 2015). Our results suggest how legal services firms can de-risk innovation, reducing the likelihood of future complaints. In terms of policy, our results suggest that customer complaints from innovation can be minimised by ensuring that legal service reforms result in markets which are competitive and open to international entrants.

The argument proceeds as follows. In section 2 we conceptualise the link between innovation and customer complaints (Heidenreich and Kraemer, 2015; Talke and Heidenreich, 2014). Section 3 develops related hypotheses. Section 4 describes our innovation survey and complaints data, our measurement approach and estimation strategy. Section 5 presents our main empirical results, with implications discussed in Section 6.

2. Conceptual development

2.1 Service Innovation

Definitions of service innovation tend to be quite general, reflecting novelty and commercialisation rather than new technology (Carlborg et al., 2014; Barcet, 2010). This emphasises the diversity of service innovation activity that may, for example, focus on different elements of organisations' operations and/or their marketed services. Service innovation can generate added value both for consumers and for innovating firms, with behavioural models suggesting that levels of innovative activity will increase with the expected returns (Geroski, 1990). Innovating firms may be able to achieve first mover advantages, high rates of return and an advantageous understanding of consumer attitudes. Innovation has also been strongly linked to firms' ability to succeed in export markets, further increasing returns on investment (Love and Roper, 2015). For customers, innovation may create new product or service options or lead to unpriced or under-priced performance enhancements in existing products or services (Buiseret et al., 1995). Either may generate an increase in perceived value.

Professional services, such as legal services our focus here, are a sub-group of the wider services sector; mainly advisory in nature, focusing on problem solving, where skilled professionals provide the services (Marr et al., 1996). In such firms, the fundamental resource is knowledge and information as both an input and an output in the production process (Nachum, 1996). As in all other firms, professional service firms' ability to maximise their innovative potential is fundamental to long-term survival and growth (Baumol, 2002; Schumpeter, 1939), and their services significantly contribute to the value creation and competitiveness of their clients (OECD, 2006). Over recent years the service innovation landscape has undergone radical shifts, due in part to accelerating technological advances (Helkkula et al, 2018). Consequently, the body of scholarly research in this area, while relatively modest, is growing considerably (Bourke et al., 2020, Patrício et al., 2017).

Innovation in legal services, the focus of our empirical analysis, has often been argued to be limited by regulation and organisational cultures[3]. Innovation for legal services firms may involve providing services in new areas of legal practice or extending their offer to customers beyond purely legal services, e.g., by providing financial or other professional services. Other types of legal service innovations may relate to fixed or more transparent pricing of service activity or an ability for customers to get quotes more readily for legal work (Roper et al., 2015). For other firms, legal service innovation may involve advertising, the development of on-line marketing and services and changes in the way in which solicitors and other staff communicate with clients.

Legal service innovation, like other professional service activity, is characterised by bi-directional knowledge exchange with suppliers and customers often acting as co-producers and co-creators of value (Grönroos and Ravald, 2011). Through this dynamic disposition of resources (people, technology, organisations, and shared information) service providers and customers collaborate in various ways to create value (Hidalgo and D'Alvano, 2014). Thus, the networked, iterative, and open nature of service innovation emphasises the potential for customers to play a lead role in identifying market needs with positive implications for innovation quality (Jespersen, 2010). Recently, Watson et al. (2018) identified structures and

[3] See, for example, OECD discussion on disruptive innovation in legal services. Available at: https://one.oecd.org/document/DAF/COMP/WP2/M(2016)1/ANN2/FINAL/en/pdf (Accessed: 20 May 2021).

processes that help an organization "learn to learn" from its external stakeholders with respect to environmental innovation. Previous studies also reveal that partnering in innovation can help firms increase the market success of their innovation activity (Suh and Kim, 2012; Janeiro et al., 2013). For many collaborative innovators – particularly in services - engaging customers or potential customers in the development of their innovation is a key source of insight (Storey and Larbig, 2018; Love and Mansury, 2007), with some studies suggesting that experienced lead users (Schuhmacher and Kuester, 2012) and new customers (Lau et al., 2010) can provide particularly valuable information. Engaging with consumers as part of an innovation project may help firms better assess the potential market for any innovation, the acceptability of different forms of innovation and so reduce the risk of encountering innovation resistance (Astebro and Michela, 2005; Storey and Larbig, 2018).

Team-working during the innovation process may also enable more diverse knowledge to be focused on an innovation challenge (Ancona and Caldwell, 1992) and may enhance creativity and innovation quality (Shipton et al., 2005), particularly during the early stages of the innovation process (Love et al., 2011; Love and Roper, 2004). For example, the introduction of cross-functional development teams might be an important part of the development of both process and service innovations (Song et al., 1997). There is also evidence that senior management team composition influences innovation outcomes (Talke et al. 2010) while strong evidence exists that multifunctional teams can contribute positively to service firms' ideation activity (Love et al., 2011). This effect may be weaker, however, in legal services where firms have tended to foster a culture of individual practice (Kabene et al., 2006) and may discourage non-fee earning activities such as knowledge sharing (Terrett, 1998).

As well as factors internal to the firm such as team-working or customer engagement, service innovation may also be influenced by external factors such as the regulatory regime and the degree of competition firms face (Coad et al., 2016). Conceptual arguments conflict, however, suggesting that greater competition may either encourage (Arrow, 1962) or be a barrier to innovation (Schumpeter 1934). The empirical evidence also suggests a mixed picture: Aghion et al. (2005) find an inverted-U shape relationship between competition and innovation in UK manufacturing; Rafique Hashmi (2013) find a marginally negative relationship for the US; while Askenazy et al. (2013) find that competition only influences innovation in larger French firms. More recent studies also provide conflicting evidence. Mulkay (2019) finds a negative

relationship between competition and innovation in French firms, while Bento (2020) finds that among EU firms, stronger competition – itself related to barriers to entry and market openness - is associated with higher levels of innovation. Competition may also change the nature of firms' innovation activity towards more radical or incremental product or service changes or towards a focus on process rather than product change. Briest et al. (2020) suggest, for example, that while market uncertainty may favour incremental innovation, the incentives created by strong competition encourages more radical innovation.

2.2. From innovation to customer complaints

Innovation itself may also not always be valued by consumers due to satisfaction with the status quo (Castellion and Markham, 2013; Heidenreich et al., 2016). Customer resistance may relate to innovation generally or may arise due to the characteristics and evaluation of specific innovations (Heidenreich et al., 2016). This effect may be strongest where innovation is more radical, although this itself may depend on individual cognition. For example, the radicalness of an innovation may increase consumer resistance when an individual's cognition favours stability but may reduce resistance where individuals seek novelty (Baumgartner and Steenkamp, 1996). Where consumers' reactions to an innovation are negative, a range of consumer behaviours may result. Hirschman (1970) suggested three alternatives: exit, voice, and loyalty. Exit is an active response in which a negative consumption experience leads to consumers switching suppliers or reducing consumption. Voice is a similarly active outcome where a consumer actively engages with the service supplier to register their complaint and seek redress. Alternatively, where the negative experience is mild or where switching costs are particularly high, buyers may also show 'loyalty' despite poor or inadequate service.

Negative customer reactions are most likely where innovations are either of poor quality, fail to meet consumers' requirements or are introduced to market too early in their development. Many innovation projects 'fail' or are abandoned before reaching the market. In a recent review of the literature on innovation failure, Rhaiem and Amara (2021) estimate the proportion of innovative projects failing, wholly or in part, to be between 40 per cent and 90 per cent[4].

[4] Empirical investigations of learning from innovation failures are limited (Leoncini 2016), although several case studies examine situations where threats or risks were downplayed leading to catastrophic consequences, such as the 2003 Columbia Space Shuttle disaster (Roberto et al. 2006). This has led to authors such as Stilgoe et al. (2013) to suggest frameworks for understanding and supporting efforts aimed at 'responsible innovation'.

Innovation failure may occur for either technological or organisational reasons (Rhaiem and Amara, 2021), factors which may also influence the market success of innovations. The value of team-working and customer collaboration has already been considered but financial constraints during the innovation process may also slow down innovation projects or reduce their quality, increasing the risk of complaints (Mohnen et al., 2008). Approaches to creativity in organisations (Revilla and Rodriguez-Prado, 2018), leadership and management routines (Guimaraes et al., 2018), and organisational culture (Fellnhofer, 2017) have also been linked to innovation success and failure.

For innovating firms, both 'exit' and 'voice' effects have potentially negative consequences in terms of lost business and reputational damage. Other negative indirect effects may also arise if firms over-allocate resources to innovation leading to failures in service delivery. This reflects the tension in resource allocation between firms' operational, customer-facing and innovation activities (e.g., Von Stamm, 2003). As Hortinha et al. (2011, p. 37), comment: 'the trade-off between customer orientation and technology orientation is of the utmost importance … resources are limited, and firms must make choices in their allocation'. For instance, in an environment of constrained resources, a firm which allocates resources to innovation may need to withhold or reduce resources to other aspects of their business. Therefore, increased innovation may correlate with an increase in customer complaints around service delivery. However, these complaints may not be specifically about innovation activities within the firm, instead being due to inferior service delivery because of resource allocation decisions supporting innovation. Similar trade-offs are evident between the effort invested in exploration and exploitation (Li et al., 2018). Recent studies also suggest short-term trade-offs between the adoption of advanced management techniques and innovation (Bourke and Roper, 2016) and quality improvement management and innovation (Bourke and Roper, 2017). For some firms this may be managed using techniques such as a balanced scorecard which guides resource allocation between multiple objectives. The evidence suggests that this type of formal managerial routine can be effective in terms of boosting financial performance and innovation (Malagueno et al., 2018) and achieving both short-term and longer-term innovation objectives (Frezatti et al., 2014). This is in line with much of Bloom and Van Reenen's extensive work on management practices (Bloom and van Reenen, 2007; 2010). They report a positive association between structured management practices and important performance measures, such as productivity, profitability, and survival. The adoption and successful implementation of management practices differs across firms and countries (Bloom et al., 2012; Bloom and

van Reenen, 2007), with "lower management quality being at least in part to blame for the differences in aggregate productivity between Germany and the US" (Broszeit et al. 2016, p.2).

While customer complaints may represent an adverse outcome, Argyris and Schon (1978) argue that if a firm is a learning organisation, customer complaints can also provide valuable learning opportunities. Such learning, the integration of new and different information, knowledge, and resources, may then shape innovativeness (Akgün et al., 2006) and competitive advantage (Bapuji and Crossan, 2004; Bell Mengüç and Widing, 2010). Learning from complaining behaviour can foster both immediate and long-term performance, although complaining customers are more sensitive to the outcome of the resolution process than the way they are treated during the complaint handling process (Yilmaz et al. 2016).

3. Hypotheses

Our hypotheses focus on the probability that a firm will experience customer complaints as either a direct or indirect result of their innovation activity. Innovation may generate customer complaints directly where new innovations prove disappointing to customers. Indirect effects related to resource allocation may also arise where firms over-emphasise the development of new innovations with negative consequences for service quality (Hortinha et al., 2011). Both the direct and indirect (resource allocation) effect will work in the same direction. In line with previous studies (Bourke and Roper, 2016; 2017), we anticipate that introducing new innovations will initially be disruptive to firm performance, as firms dedicate resources to innovation rather than routine functions. Our first and central hypothesis therefore reflects the relationship between firms' innovation activity and the probability of experiencing customer complaints:

> ***Hypothesis 1: Innovation and Customer Complaints***
> *Firms undertaking innovation will have a higher subsequent probability of receiving customer complaints.*

Our second hypothesis focuses on the potential moderating effects of customer engagement on the link between innovation and customer complaints. A key aspect of customer orientation in service organisations is through integrating the customer into the production and innovation

process. It is not unusual for a service organisation's client to initiate and stimulate innovations, and customer participation is frequently reported as an essential condition for success (Preissl, 2000). The close interaction between service provider and customer participation comes in various forms, such as co-production, servuction and service relationships. Sundbo and Gallouj (2000) explain how, under some circumstances, the customer could become so closely involved with the innovation process as to be virtually an internal rather than an external resource. In our own study the value of such client relationships was evident in a series of twenty exploratory case studies with legal service providers.[5] Many participants explained that their clients or potential clients provided useful information which influenced changes and new ways of working. In some cases clients were directly involved in making suggestions or shaping the service they received. For example, in larger organisations and those offering integrated professional services, the demand for such integration was a critical driver in setting up such an approach. Direct client feedback was also described as important on an on-going basis. Organisations servicing corporate clients often described a partnership approach, with regular account review meetings or similar.

Innovation strategies which seek to reduce the probability of adverse customer reactions through consumer engagement have been described in industries as diverse as food (Busse and Siebert, 2018; Mattsson and Helmersson, 2007), extreme sports gear (Schreier and Prugl, 2008) and health services (Pedersen, 2016). In services, evidence on the value of consumer engagement in innovation is, however, 'inconclusive', depending strongly on firms' ability to absorb the insights provide by consumers and their flexibility in adapting service provision. (Storey and Larbig, 2018). Consumer engagement may also have fewer positive effects by setting up unrealistic expectations which may, subsequently, exacerbate active innovation resistance (Witell et al., 2017). On balance, however, the evidence suggests that:

Hypothesis 2: Customer informed innovation

Customer engagement in innovation will negatively moderate the effect of innovation on the probability of customer complaints.

Prior studies show that team-working during the innovation process can also contribute positively to successful innovation and, by inference, to reduced customer complaints. This is

[5] See Roper *et al*. (2015, 2016) for further detail of the twenty exploratory case studies.

the focus of our third hypothesis. Rivas and Wu (2019) suggest that team-working may make technological, commercial, and entrepreneurial contributions to innovation success. For example, team-working may enable a more exhaustive search for new opportunities or appropriate technologies contributing to the development of higher-quality innovations (Talke et al., 2011). Similarly, teams may create the capacity to undertake a more comprehensive analysis of existing and potential customer needs (Slater and Narver, 1999). Team-working may also help to develop more creative and entrepreneurial responses to market opportunities (Cabrales et al. 2008).

Aspects of innovation teams which have received significant research attention are: diversity in terms of gender (Gonzalez-Moreno et al., 2018), cultural background, and functional expertise (Edmondson and Harvey, 2018). Evidence on the effects of most aspects of team diversity on innovation success remains mixed (Edmondson and Harvey, 2018). Inconclusive results may reflect the very different corporate environments in which teams operate with implications for individuals' willingness to share knowledge (Cheung et al., 2016) and the variety in firms' innovation challenges and objectives (Cabrales et al., 2008). It has been suggested that in terms of the functional dimension of diversity there is stronger evidence from meta-analyses (Bell et al., 2011; van Dijk et al., 2012) of a positive link to innovation success (Edmondson and Harvey, 2018). In either case we anticipate that team-working might improve the quality of innovation and/or better align firms' innovation with customer needs reducing the potential for generating customer complaints. This suggests our third hypothesis:

Hypothesis 3: Team-working and innovation

Team-working during the innovation process will negatively moderate the effect of innovation on the probability of customer complaints.

Our final hypothesis relates to the impact of competition on the innovation-to-complaints relationship, a linkage which is of particular interest in the context of legal services, a strongly regulated sector in which market entry has historically been tightly restricted and levels of competition have often been viewed as too low. For example, a 2016 review by the UK Competitions and Market authority commented that 'competition in the legal services sector for individual consumers and small businesses is not working well … Innovation in the sector is limited' (C&MA, 2016, pp. 8-9). This led to calls for market de-regulation, increased transparency in the pricing of legal services and a further opening-up of legal service markets

to new entrants to stimulate competition and innovation. A key aspect of this increased market openness is whether regulatory and market structures mean that domestic markets are open to international competitors. Where this is the case, this may stimulate import competition in domestic markets, changing the incentives for innovation, and – potentially – the level and nature of innovation activity itself (Shu and Steinwender 2019)

Both conceptual and empirical analyses suggest, however, that increased import competition can have complex effects rather than according to a simple Schumpeterian proposition that more competition leads to more innovation. Aghion et al. (2005), for example, find evidence of an inverted-U shape relationship between levels of market competition and innovation, i.e., medium levels of competition maximise innovation. Where competition is low there may be a lack of competitive pressure with firms facing little incentive to innovate; where competition is particularly strong, post-innovation rents may be low and imitation risks substantial. More recent empirical studies suggest a similar inverted-U shape in services, and that in some situations de-regulation resulted in lower levels of innovative activity (Bos et al., 2013). Fewer studies have considered the impacts of competition – whether domestic or international - on innovation quality or customer complaints – although there is some evidence of a potentially negative relationship where regulation is relaxed (Sanyal and Ghosh, 2013). Where competition is weak, firms may be prepared to target higher returns by adopting more radical innovation strategies with a greater risk of customer complaints (Kolodinsky, 1995). Conversely, where competition is strong, firms may adapt their innovation behaviour to minimise the risk, and potentially negative financial and reputational consequences, of customer exit or voice (Liao et al., 2015). Both may also have consequences for customer complaints, with Hirschman (1970) suggesting that where competition is more intensive discontented consumers will simply move providers rather than complain. Empirical support for this proposition comes from the US telephone sector (Beard et al., 2015). On balance, we therefore anticipate that:

Hypothesis 4: Complaints and competition

More intensive competition associated with more open markets will negatively moderate the effect of innovation on customer complaints.

4. Data and methods

Our empirical analysis focuses on the legal services sector in England and Wales for which we have data on both innovation and customer complaints. Firm-level innovation data is taken from the 2015 Survey of Innovation in Legal Services (SILS) which is matched with administrative data on customer complaints provided by the Legal Ombudsman for England and Wales. The Survey of Innovation in Legal Services covered a structured sample of legal service providers whose primary business related to the provision of legal services.[6] This includes barristers' chambers, solicitors, and other legal service providers (OLSPs) including patent and copyright agents, notaries, bailiffs, arbitrators, examiners and referees etc. SILS provides a representative view of innovation across the whole of the legal services sector (including those activities regulated and unregulated under the Legal Services Act 2007) in England and Wales (Roper et al., 2015).[7] Sampling frames were provided by regulators (i.e., the Legal Services Board, Solicitors Regulation Authority) augmented with commercial databases for non-regulated sectors. Survey fieldwork was conducted by telephone between February and April 2015 and focused on firms' innovation activities during the previous three years. The survey was structured by employee size-band and responses are weighted to give representative results. Approximately, 1,500 legal services firms completed the survey, around 10 per cent of all legal service providers in England and Wales.[8] 329 of these firms are categorised as unregulated legal services firms and do not come under the remit of the Legal Ombudsman. As part of the survey, respondents were asked explicitly whether data from their business could be matched with other publicly available data. 1,102 (94.2 per cent of 1171 respondents under the remit of the Legal Ombudsman of England and Wales) agreed to this and their company name was included in the survey record which we received.

[6] The SILS survey covered Standard Industrial Classification (2007) 69.1 - 'Legal activities'. The definition of this is as follows: 'This division includes legal representation of one party's interest against another party, whether or not before courts or other judicial bodies by, or under supervision of, persons who are members of the bar, such as advice and representation in civil cases, advice and representation in criminal actions, advice and representation in connection with labour disputes. It also includes preparation of legal documents such as articles of incorporation, partnership agreements or similar documents in connection with company formation, patents and copyrights, preparation of deeds, wills, trusts, etc. as well as other activities of notaries public, civil law notaries, bailiffs, arbitrators, examiners and referees'.

[7] Legal regulation in England and Wales derives from the Legal Services Act 2007. Regulated activities include: patent and trade mark attorneys, notaries, legal executives, licensed conveyancers and cost lawyers. Un(regulated activities include: will writers, bailiffs, arbitrators, examiners and referees etc. Legal services in Scotland and Northern Ireland have separate regulatory frameworks.

[8] See Annex 4 of the Innovation in Legal Services report (Roper et al., 2016) for a more detailed description of the sampling frame, response rates and survey weights.

To investigate the link between innovation and customer complaints we focus on three indicators from the Survey of Innovation in Legal Services. First, a measure of service innovation, i.e., a binary measure of whether firms introduced new or improved services during the three years prior to the survey. Second, a binary measure of delivery innovation, i.e., whether the firm had introduced new or improved approaches to delivering its services over the previous three years. Third, we use a measure of the intensity of service innovation – the proportion of firms' sales derived from new or improved services. Higher innovation intensity is likely to create greater potential for customer complaints and may also make decisions about resource allocation between innovation and firms' other activities more difficult. As Hortinha et al. (2011) suggest, any consequent misallocation of resources may lead to service failure and, indirectly, more customer complaints.

We use three other main measures derived from the Survey of Innovation in Legal Services to reflect customer collaboration and team-working during the innovation process. In the SILS respondents were asked for a binary response to a question on team-working: 'Does your firm set up teams to develop new or improved services or ways of delivering them? In terms of collaboration with customers firms were asked: Which of the following external organisations have you used to help you develop your new or improved services or how you deliver them? 'Clients' was one of a range of potential partners specified in the survey. Firms were also asked 'which of the following best describes the nature of the competition you face?' with 'compete with firms internationally' one of the answer categories.

As our measure of customer complaints, we use data provided by the Legal Ombudsman for England and Wales. The Legal Ombudsman was established by the Legal Services Act 2007 and provides a dispute resolution service covering legal service providers and claims management companies. Where legal service users have a complaint about the service they have received or the provision of that service they are first required to seek resolution with their legal service provider. Where no satisfactory resolution is achieved the complaint may then be referred to the Legal Ombudsman for consideration (Legal Ombudsman 2015).

When a complaint is referred to the Legal Ombudsman, the company involved is publicly identified. After investigation, where the complaint is found to be valid, a remedy – often some form of financial compensation – is proposed. Here, we use data on complaints handled by the Ombudsman between 2016 and 2018 (2 years). Most complaints handled by the Ombudsman

relate to residential and planning issues, family law, personal injury, wills and probate and crime.[9] The reasons for more than half of all Ombudsman complaints include 'delay/failure to progress' (21.2 per cent), 'failure to advise' (18 per cent) and 'failure to follow instructions' (17.1 per cent). Other reasons for complaints include 'failure to keep informed' (9.8 per cent), 'excessive costs' (8.9 per cent), 'costs information deficient' (7. 4 per cent) and 'failure to reply' (6.9 per cent).[10] 6,573 and 6,127 complaints were resolved by the Ombudsman over the periods 2016-17 and 2017-18; with, for example, 67 per cent upheld in 2017-18 (Legal Ombudsman 2018).[11]

Data on complaints against individual legal service providers was provided by the Ombudsman and matched using company name with the SILS data. Of the 1,102 companies which agreed to data matching, 255 had received one or more complaints during the 2016-2018 period. Of these 255 firms, 116 had received more than one complaint, with one firm receiving 30 complaints. All remaining firms in the database had received no complaints in 2016-18. Considering the two years independently, 187 and 155 firms received one or more complaints during the 2016-17 and 2017-18 periods respectively. 89 firms received at least one complaint in each year. The total number of complaints received by our sample of firms was 289 in 2016-17 and 240 in 2017-18.

We use this complaints data to define two alternative indicators: the absolute number of complaints received by each firm and a binary indicator of whether any firm received one or more complaints. The absolute number of complaints provides an indication of the frequency with which complaints are received but may be related to the size of the legal services provider. The binary measure overcomes this issue at the potential loss of some explanatory power[12].

The first step in our estimation strategy aims to explore Hypothesis 1. Here, we estimate a series of baseline models relating the number of complaints or the probability of receiving complaints to firms' innovation activities. The two alternative complaint indicators form our

[9] See http://www.legalombudsman.org.uk/raising-standards/data-and-decisions/#complaints-data. Accessed: 4th January 2018.
[10] See https://www.legalombudsman.org.uk/wp-content/uploads/2014/09/what-were-complaints-about-2016-17.csv. Accessed: 14th January 2019.
[11] The total number of Ombudsman complaints were accessed from the Annual Reports from the Legal Ombudsman for England and Wales (Legal Ombudsman 2016, 2017, 2018)
[12] We also experimented with a third scaled dependent variable – the number of complaints per employee in each firm. This gave us identical results to those presented in terms of the link between innovation and complaints.

dependent variables C_{it+2}, with the innovation measure (I_{it}) as the key explanatory variable in our baseline models:

$$C_{it+2} = \beta_0 + \beta_1 I_{it} + \beta_2 C_{it} + \beta_3 Controls_{it} + \varepsilon_i \quad (1)$$

In the empirical analysis, innovative activity is measured in 2015 and complaints are measured in the following two years 2016-17 and 2017-18. Hypothesis 1 suggests positive and significant values of β_1 as higher levels of innovation activity leads to an increase in complaints.

The second step in our estimation approach is designed to investigate Hypotheses 2 - 4 and whether customer collaboration and team-working during the innovation process and having international competitors mitigate any innovation impacts on customer complaints. Note here that the structure of equation (1) restricts the coefficient on the RHS innovation term to be the same whether innovation is undertaken with or without customer collaboration, team-working or international competition. Hypotheses 2 - 4 suggest, however, that we would anticipate lower coefficients on the innovation term where innovation involves customer collaboration or team-working or firms face international competition. To allow us to test these propositions we estimate three further models. To test Hypothesis 2, we partition the innovation term (I_{it}) in equation (1) into two variables depending on whether firms undertook innovation with or without customer engagement. More specifically, let x_{it} take value 1 if a firm engages with customers during innovation activity and 0 otherwise. We then estimate:

$$C_{it+2} = \beta_0 + \beta_{11} I_{it} * x_{it} + \beta_{12} I_{it} * (1 - x_{it}) + \beta_2 C_{it} + \beta_3 Controls_{it} + \varepsilon_i \quad (2)$$

This parameterisation relaxes the restriction imposed by equation (1) on innovation with and without customer collaboration. Hypothesis 2, which suggests that customer collaboration will reduce the effect of innovation on complaints then implies that $\beta_{11}<\beta_{12}$. F tests are used to evaluate this inequality. We estimate analogous models to test Hypotheses 3 and 4 for the potential mitigation effects which arise due to team-working and competition effects.

We include in all models a series of firm-level control variables derived from the SILS which we anticipate may influence complaints. In terms of firm characteristics, we include size and age, whether the organisation is selling services internationally and whether the firm's main

competition is regional or national.[13] Another group of controls relates to the areas of law in which organisations are operating. To reflect the managerial characteristics of companies, we also include a variable relating to whether the legal services firm is fully owned by lawyers, or at least partially owned by those with experience of other sectors. Finally, we include a lagged dependent variable to capture whether the firm was subject to any Ombudsman complaints in the previous period (2015-16) (see Table 1 for sample descriptives).

Estimation methods are suggested by the nature of our two dependent variables. Where we measure customer complaints using the absolute number of complaints received, we use a Negative Binomial estimator.[14] Where customer complaints are measured using a binary complaints variable, Probit models are used. The results prove largely consistent across both approaches.

5. Empirical results

Our first hypothesis suggests that higher levels of innovation will lead to more customer complaints. This is tested in our baseline models presented in Table 2. Models 1 – 3 are the marginal effects at variable means from Probit estimates of the probability of an Ombudsman complaint being made against a legal service provider in the two-year period 2016-18. Models 4-6 are the incidence rate ratios from the Negative Binomial estimates relating to the number of Ombudsman complaints against each firm during the two-year period 2016-18. We include different innovation indicators in these models: the level of innovative sales (Models 1 and 4); a binary indicator of service innovation (Models 2 and 5); and a binary indicator of delivery innovation (Models 3 and 6). Across all models, the remaining control variables are identical. Sample sizes differ between models due primarily to missing values (non-response) in the survey data. Not all firms were able to estimate what proportion of revenues were derived from innovative products (see Table 1), estimation samples in the models with Innovative Sales as

[13] Of the three moderators, the competition variable is the only one included in initial baseline models, as all survey respondents provide information on competitors. The team-working and collaboration with clients survey questions are only asked of innovators, and therefore these variables are only available for a subset of firms in the sample. Therefore, team-working and collaboration with clients are not included in the initial baseline models.

[14] We also experimented with the Poisson and Zero Inflated Negative Binomial and Poisson estimators. The results prove identical. However, the standard log likelihood and BIC tests identified the Negative Binomial as the most appropriate count model estimator. In addition, we explored the potential for an inverted u-shaped relationship between the percentage of innovation sales and complaints and found no significant difference in the core relationship between innovation sales and complaints.

an independent variable are therefore marginally smaller (Table 2, Model 1) than those with the related dummy variable (Table 2, Model 2).

Our results suggest that firms which have higher levels of innovative sales have an increased probability of complaints. Firms that reported a higher percentage of sales from innovation in 2015 were significantly more likely to be subject to a complaint in the subsequent period 2016-18 (Table 2, Model 1). For every percentage increase in innovative sales, the probability of facing an Ombudsman complaint increases by 0.1 percentage point. This finding is significant at the 1 per cent level. This result is consistent across our Negative Binomial models (Table 2, Model 4), with an increase in the number of complaints in the two years following firms' innovation activity.

In terms of the binary measure of service innovation we again see that innovation increases the probability of a legal firm subsequently facing a Legal Services Ombudsman complaint (Table 2, Models 2 and 5). Undertaking service innovation increases the probability of attracting customer complaints by 6.6 percentage points (Table 2, Model 2). This result is significant at the 5 per cent level. This result is again supported by our Negative Binomial model (Table 2, Model 5). However, as Table 2, Models 3 and 6 suggest we find no significant link between delivery innovation – i.e., changes to the way legal services firms deliver services – and the probability or number of complaints. Our findings demonstrate support for Hypothesis 1: undertaking service innovation increases both the probability that customer complaints will occur and that the number of complaints will increase. However, we find no evidence of a complaints effect from delivery innovation.

Next, we test the potential moderating effects of (a) collaboration with customers for innovation (Table 3), (b) team-working during the innovation process (Table 4) and (c) international competition (Table 5) on the relationship between innovation activity and customer complaints. Specifically, Hypothesis 2 suggests that customer engagement in innovation will reduce the probability that innovation leads to customer complaints. In Table 3, the models include innovation variables which are therefore partitioned to reflect whether firms engaged in collaboration with clients as part of their innovation activity (see Equation 2). This amounts to relaxing the restriction implicit in the baseline models in Table 2 that these two coefficients are identical. We primarily report Probit models here, however the same restrictions have been applied within the Negative Binomial models (see Appendix A1) with

broadly similar results. Model 1 relates to innovative sales, Model 2 to the binary indicator of service innovation and Model 3 to the delivery innovation indicator.

For both innovative sales and service innovation (where we found statistically significant links to complaints previously) the impacts on the probability of receiving complaints is larger and notably more significant when innovation is undertaken without customer collaboration (Table 3, Models 1 and 2). However, equality tests do not confirm that the coefficients are statistically significantly different for innovative sales. Specifically, for the binary service innovation indicator, consumer complaints are 11.5 per cent more likely when service innovation is conducted without involving customers. In addition, the equality tests confirm that the coefficients are statistically significantly different for service innovation. This relationship also holds for the negative binomial estimations (Table A1, Model 2).

For delivery innovation, we see the opposite effect, i.e., complaints are less likely where there is no collaboration (Table 3, Model 3), although the coefficients here are not statistically significant. However, the opposite relationship is found in the negative binomial estimations (Table A1, Model 3). It is worth noting that there is no significant direct effect of delivery innovation on customer complaints. We therefore find some support for Hypothesis 2 that customer collaboration negatively moderates the effect of innovation on the probability of customer complaints, albeit specifically where firms are undertaking service innovation.

Our results here are consistent with previous studies which suggest that customer collaboration during the innovation process can enable the co-creation of services and better ensure the acceptability of the innovation to customers and potential customers (Astebro and Michela, 2005; Kumar et al., 2010; Chen et al., 2011). Engaging customers as 'partners' in driving and developing innovation (Roper et al., 2015) may also help overcome resistance to innovation in traditionally conservative sectors such as legal services (Schreier and Prugl, 2008; Pedersen 2016; Mattsson and Helmersson, 2007; Busse and Siebert, 2018). Indeed, one recent analysis suggests that service innovation fully meditates the relationship between customer engagement and firm performance (Chen et al., 2018). Customer collaboration can take place at any point in the service development process (Alam, 2006), although previous evidence suggests that UK legal services firms are more likely to collaborate with customers (and other external partners) in the ideation or exploratory element of the innovation process (Roper et al., 2015). Previous studies have highlighted, however, that firms often lack the ability to absorb the

knowledge acquired in adapting service provision (Storey and Larbig, 2018), meaning that over-collaboration is possible leading to diminishing returns to externally sourced knowledge (Jibril et al., 2019). The implication is that while customer collaboration can help to provide valuable feedback and insights for new service innovation firms need to carefully manage these relationships to maximise the value of their customer insight.

Our next hypothesis (Hypothesis 3) suggests that team-working during the innovation process will also reduce the probability of customer complaints (Table 4). Equation coefficients suggest a significantly higher probability of complaints occurring where there is no team-working during a service innovation process (Table 4, Model 1 and 2). Our results here are like those of earlier studies which suggest that team-working is an important influence on firms' innovation quality and performance (Nakata and Im, 2010; Tidd and Bodley, 2002; Hipp and Grupp, 2005). However, the equality tests do not confirm that the coefficients with and without team-working are statistically different. We therefore find little clear support for Hypothesis 3.

Our final hypothesis relates to the impact of competition on the probability that innovation will lead to customer complaints. We anticipate in H4 that where competition is international and therefore more intensive the potential reputational or financial damage from customer complaints may be greater encouraging firms to be more careful or incremental in their approach to innovation. Although the proportion of firms reporting that they faced international competition is relatively small (around 5 per cent, Table 1), we find strong and consistent support for this proposition across our three innovation indicators (Table 5). In each case the probability that complaints will be received is significantly lower where firms face international competition and higher otherwise. In other words, where a legal services firm faces international competition, innovation can reduce the probability of receiving customer complaints. Undertaking service innovation in the face of international competition reduces the probability of complaints by 11.4 per cent relative to not innovating. Delivery innovation with international competition reduces the probability of complaints by 10.4 per cent. For each of the innovation indicators the equality tests are also significant, albeit only at 10 per cent for delivery innovation. This provides strong support for Hypothesis 4 and is consistent with other studies which have emphasised the potential for exposure to international competition to improve firms' innovation quality (Love and Ganotakis, 2013). As noted earlier, however,

these effects relate to a small proportion of our overall sample which are operating in market segments where international trading and competition may be more common[15].

Finally, in terms of the control variables in our estimations, larger firms are more likely to face complaints and a larger number of complaints (Table 2). This may relate simply to the scale of firms in our sample, however, studies of innovation failure have suggested that larger firms may be better able to avoid innovation failure (and therefore complaints) than smaller firms with more limited functional capabilities (Desai, 2010a). In addition, there is some evidence that older firms are more likely to face complaints. Again, this result contrasts with previous studies of innovation failure which have suggested that older firms might have had more scope to develop and test innovation routines reducing the likelihood of innovation failure (Desai, 2010b; Leoncini et al., 2016). Family law practitioners and immigration lawyers seem more prone to receiving customer complaints than firms in other areas of law (Table 2), and we also find some persistence in firms' receipt of complaints: firms which received complaints in 2015 were also significantly more likely to receive complaints in subsequent periods. Non-lawyer ownership has no significant impact on either the probability of receiving complaints or the number of complaints received.

6. Conclusion

This paper highlights some of the unintended and negative consequences faced by innovating firms and adds to the limited literature which explores the darker side of firms' innovation activity (Coad et al. 2021). We also show how firms can offset these unintended consequences and consider the role of competition in shaping negative innovation outcomes. Our analysis suggests that undertaking service innovation increases the future probability and number of customer complaints against innovating firms notified to an industry ombudsman. This is important as these complaints may have negative reputational and financial implications for innovating companies. Understanding this relationship is possible due to a new matched data source linking legal services firms' innovation activity (2015 SILS dataset) with data on customers complaints (Legal Ombudsman 2016; 2018 data). The implication is that alongside

[15] Firms reporting international competition were marginally larger than other firms in the sample (median employment 14 compared to 8), marginally more likely to be non-lawyer owned (25 per cent compared to 22 per cent) but significantly more likely to be exporting (45.9 per cent compared to 3.7 per cent).

its benefits for the innovating firm and its customers, innovation may have unanticipated and potentially negative effects which either stem directly from the innovation itself or from related business disruption effects. Both deserve more attention in the broader innovation studies literature which focuses almost exclusively on the more positive aspects of firms' innovation (Meijer and Thaens, 2021).

Our analysis also suggests that legal services firms which adopt collaborative innovation strategies with clients reduce the potential for customer complaints arising from service innovation.[16] Previous studies have shown that engaging consumers in the innovation process can enhance creativity and innovation quality and help overcome potential customer resistance to innovation (Schreier and Prugl, 2008; Pedersen, 2016; Mattsson and Helmersson, 2007; Busse and Siebert, 2018; Shipton et al., 2005; Ancona and Caldwell, 1992; Love and Roper, 2004; Love et al., 2011). Such collaboration can not only add to innovation quality but also reduce the risk of un-intended and negative consequences (Song et al. 2011).

In terms of team-working during the innovation process, our results suggest no robust moderation effect on the innovation-complaints relationship. This is perhaps surprising as the innovation literature consistently presents the benefits of team-working for innovation performance (Cabrales et al., 2008; Rivas and Wu, 2019; Talke et al., 2011). It would therefore be interesting in future studies to consider alternative measures of team-working to that adopted here - e.g., team diversity or functional diversity – to explore whether these aspects of team composition are stronger moderators of the innovation-complaints relationship.

We also consider the impact of the level of competition faced by legal services firms on the innovation-complaints relationship. This is important as recent reports by competition authorities in the UK have suggested that levels of competition in UK legal services are low leading to a lack of transparency in pricing and low levels of innovation (C&MA, 2016). Our results suggest that innovating firms facing more intensive international competition are significantly less likely to experience customer complaints in future. In our sample the group of firms reporting international competition are also much more likely to be trading

[16] It is important to note that a moderating collaboration effect was found where firms are service innovators; however this moderating effect was not evident for alternative innovation measures, namely innovative sales and delivery innovation.

internationally, suggesting a relationship between international exposure, competition and the quality and acceptability of innovations. The suggestion is that more intensive competition in legal services, linked potentially to these firms' engagement with international markets, improves the acceptability and quality of new innovations introduced as well having the potential to increase the level of innovation activity itself.

Our empirical analysis relates to the legal services sector which has been the focus of recent regulatory changes in the UK and internationally to stimulate innovation. Initial examinations of these regulatory changes point towards cost reductions and service improvements (Engstrom, 2013; Johnson, Yazdi, and Gelb, 1993; Parker, Gordon, and Mark, 2010; Roper et al., 2015). Our results highlight the potentially negative implications for firms and regulatory agencies from such initiatives. Higher levels of innovative activity may generate additional value for consumers, but our evidence suggests that they may also lead to an increase in consumer complaints. This emphasises the importance of organisations such as the Legal Ombudsman which can help to resolve any issues which arise between legal service providers and their customers. These potentially negative effects may be reduced where regulatory reforms increase competition which our analysis suggests may reduce any unintended effects from innovation. For legal service providers, our results suggest that engaging with customers as part of their innovation activity can help to mitigate the risk of complaints and any potential reputational and commercial damage.

Our analysis is subject to several limitations. First, our investigation is conducted in a single jurisdiction. Other jurisdictions, no doubt, have similar regulatory bodies to the UK's Legal Services Ombudsman which investigate consumers' complaints about legal services. Matching customer complaints data with innovation survey data elsewhere would enable replication studies to be undertaken building on this paper's findings. Our findings may also be unique to legal services and not necessarily generalizable across other sectors. Traditionally considered a conservative sector, legal services customers may be less appreciative of innovative activity than those elsewhere. Extending the analysis to other sectors may therefore be valuable. For example, the UK financial services sector operates a similar Ombudsman system to that in legal services. To date our analysis is also based on a single innovation survey. Repeating the investigation for other time periods may also be useful given changes in the regulatory structure within which legal services firms operate. Further survey analysis may also enable future studies to extend the range of control variables available to reduce any effects of unobserved

heterogeneity and explore more robust causal links between innovation and complaining behaviour. It would be interesting to explore the relationship between competition in the sector, innovation and complaints using a more detailed profile of the location and market orientation of firms' competitors.

Table 1: Sample descriptives

	Obs.	Timeframe	Mean.	SD.	Min.	Max.
Ombudsman complaints variables						
Ombudsman complaint (d)	1,102	2016-2018	0.23	0.42	0	1
Ombudsman complaint (count)	1,102	2016-2018	0.48	1.43	0	30
Lagged Ombudsman complaint (d)	1,102	2015-2016	0.16	0.37	0	1
Lagged Ombudsman complaint (count)	1,102	2015-2016	0.27	0.92	0	16
Innovation variables						
Service innovation (d)	1,087	2013-2015	0.33	0.47	0	1
Delivery innovation (d)	1,084	2013-2015	0.29	0.46	0	1
Innovative sales (% of sales)	1,060	2013-2015	5.55	14.67	0	100
Firm characteristics						
Exporting firm (% of sales)	1,087	2015	5.63	15.54	0	100
Firm size (number of employees)	1,101	2015	45.40	169.85	0	3000
Firm age	1,099	2015	18.10	11.65	0.5	30
Non-lawyer owned	1,102	2015	0.13	0.34	0	1
Legal Activity						
Property and planning (d)	1,102	2015	0.25	0.43	0	1
Criminal (d)	1,102	2015	0.10	0.30	0	1
Wills, Trust & Probate (d)	1,102	2015	0.05	0.22	0	1
Personal Injury (d)	1,102	2015	0.07	0.26	0	1
Family (d)	1,102	2015	0.10	0.29	0	1
Commercial and Intellectual Property (d)	1,102	2015	0.08	0.28	0	1
Immigration (d)	1,102	2015	0.05	0.21	0	1
Other (d)	1,102	2015	0.30	0.46	0	1
Barristers' chambers (d)	1,102	2015	0.12	0.33	0	1
Other Legal Service Provider – regulated (d)	1,102	2015	0.06	0.24	0	1
Competition variables						
Facing regional competition (d)	1,102	2015	0.64	0.48	0	1
Facing national competition (d)	1,102	2015	0.29	0.45	0	1
Facing international competition (d)	1,102	2015	0.05	0.22	0	1
Collaboration & team-work variables						
Collaboration with clients for innovation (d)	1,102	2013-2015	0.22	0.42	0	1
Team-work (d)	1,102	2013-2015	0.25	0.43	0	1

Notes: Variable definitions in Annex 1. Observations are weighted. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Table 2: Impact of innovation on the probability and number of complaints

	Probability of complaints (Probit, marginal effects)			Number of complaints (Negative Binomial, incidence rate ratios)		
	(1)	(2)	(3)	(4)	(5)	(6)
Innovative sales (% of sales)	0.001***			1.015***		
	(0.001)			(0.005)		
Service innovation (d)		0.065**			1.733***	
		(0.027)			(0.307)	
Delivery innovation (d)			0.007			1.225
			(0.024)			(0.230)
National Competition	0.002	0.005	0.004	0.868	0.85	0.853
	(0.020)	(0.025)	(0.025)	(0.181)	(0.175)	(0.180)
International Competition	-0.075***	-0.119***	-0.123***	0.104***	0.006*	0.004*
	(0.014)	(0.013)	(0.013)	(0.078)	(0.016)	(0.013)
Exporting firm	0.000	0.000	0.000	1.004	0.999	1.000
	(0.001)	(0.001)	(0.001)	(0.007)	(0.008)	(0.009)
Firm size	0.003***	0.001***	0.001***	1.033***	1.012***	1.013***
	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.003)
Firm size – squared	-0.000***	-0.000***	-0.000***	1.000***	1.000***	1.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm age	0.001	0.002**	0.002**	1.019**	1.025***	1.024***
	(0.001)	(0.001)	(0.001)	(0.009)	(0.009)	(0.009)
Barristers' Chambers	-0.036**	-0.038	-0.037	0.563**	0.684*	0.698
	(0.018)	(0.024)	(0.025)	(0.136)	(0.156)	(0.163)
Property-related and planning	0.047	0.04	0.039	1.649*	1.405	1.382
	(0.031)	(0.035)	(0.035)	(0.423)	(0.336)	(0.329)
Criminal	0.079	0.068	0.072	2.354***	1.775*	1.839*
	(-0.049)	(0.052)	(0.054)	(0.767)	(0.564)	(0.579)
Wills, Trust & Probate	0.113*	0.107	0.111	2.031**	1.621	1.69
	(0.063)	(0.070)	(0.071)	(0.662)	(0.535)	(0.557)
Personal Injury	0.073	0.09	0.101	1.836*	1.694	1.796*
	(0.056)	(0.063)	(0.066)	(0.634)	(0.561)	(0.598)
Family	0.112**	0.100*	0.099*	2.743***	2.131**	2.145**
	(0.054)	(0.058)	(0.057)	(0.892)	(0.714)	(0.707)
Commercial & IP	-0.018	-0.008	-0.014	0.758	0.775	0.738
	(0.029)	(0.039)	(0.038)	(0.321)	(0.339)	(0.323)
Immigration	0.141**	0.174**	0.188**	3.512***	3.108***	3.529***
	(0.071)	(0.084)	(0.086)	(1.364	(1.195)	(1.371)
Non-lawyer Ownership	-0.029	-0.032	-0.027	0.613*	0.623*	0.669
	(0.020)	(0.026)	(0.027)	(0.158)	(0.151)	(0.164)
Complaints (bin. lagged)	0.182***	0.238***	0.251***			
	(0.054)	(0.058)	(0.058)			
Complaints (count lagged)				1.697***	1.802***	1.825***
				(0.244)	(0.310)	(0.305)
N	1043	1068	1066	1043	1068	1066
chi2	183.533	128.397	120.604	228.696	127.881	114.497
p	0.000	0.000	0.000	0.000	0.000	0.000

r2_p	0.186	0.152	0.138	0.153	0.121	0.113
Bayesian information criterion	804.076	855.542	871.491	624.248	657.792	664.174
Log Likelihood				-246.101	-262.647	-265.856

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Table 3: Effects of customer collaboration on innovation effects on complaints

	Probability of complaints (Probit, marginal effects)		
	(1)	(2)	(3)
Innovative sales with collaboration	0.001		
	(0.001		
Innovative sales – no collaboration	0.002**		
	(0.001		
Service innovation with collaboration		0.017	
		(0.03	
Service innovation – no collaboration		0.115***	
		(0.043	
Delivery innovation with collaboration			0.056
			(0.035
Delivery innovation – no collaboration			-0.042
			(0.027
National Competition	0.002	0.006	0.001
	(0.020)	(0.025)	(0.025)
International Competition	-0.075***	-0.118***	-0.121***
	(0.014)	(0.013)	(0.013)
Exporting firm	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)
Firm size	0.003***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Firm size – squared	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Firm age	0.001	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
Barristers' Chambers	-0.035**	-0.035	-0.037
	(0.018)	(0.024)	(0.025)
Property-related and planning	0.046	0.035	0.046
	(0.031)	(0.034)	(0.036)
Criminal	0.079	0.066	0.076
	(0.049)	(0.052)	(0.054)
Wills, Trust & Probate	0.110*	0.103	0.113
	(0.062)	(0.068)	(0.073)
Personal Injury	0.068	0.072	0.113*
	(0.055)	(0.060)	(0.068)
Family	0.110**	0.094*	0.095*
	(0.054)	(0.057)	(0.056)
Commercial & IP	-0.016	-0.005	-0.018
	(0.029)	(0.039)	(0.037)
Immigration	0.134*	0.156*	0.191**
	(0.070)	(0.080)	(0.087)
Non-lawyer ownership	-0.030	-0.032	-0.027
	(0.020)	(0.025)	(0.027)
Complaints (lagged)	0.182***	0.238***	0.248***
	(0.053)	(0.057)	(0.057)

N	1043	1068	1066
chi2	185.761	129.673	127.568
P	0.000	0.000	0.000
r2_p	0.187	0.158	0.147
Bayesian information criterion	810.259	857.523	871.407
Equality test:			
$\chi^2(1)$	0.73	4.59	5.64
ρ	0.391	0.032	0.018

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Table 4: Effects of team-working on innovation effects on complaints

	Probability of complaints (Probit, marginal effects)		
	(1)	(2)	(3)
Innovative sales with team-working	0.001		
	(0.001)		
Innovative sales – no team-working	0.002***		
	(0.001)		
Service innovation with team-working		0.046	
		(0.034)	
Service innovation – no team-working		0.083**	
		(0.040)	
Delivery innovation with team-working			0.015
			(0.033)
Delivery innovation – no team-working			0.002
			(0.031)
National Competition	0.001	0.005	0.003
	(0.020)	(0.025)	(0.025)
International Competition	-0.075***	-0.119***	-0.123***
	(0.014)	(0.013)	(0.013)
Exporting firm	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)
Firm size	0.003***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Firm size – squared	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Firm age	0.001	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
Barristers' Chambers	-0.033*	-0.034	-0.038
	(0.019)	(0.024)	(0.025)
Property-related and planning	0.047	0.039	0.039
	(0.031)	(0.035)	(0.035)
Criminal	0.082*	0.068	0.072
	(0.049)	(0.051)	(0.054)
Wills, Trust & Probate	0.112*	0.109	0.109
	(0.063)	(0.070)	(0.071)
Personal Injury	0.073	0.088	0.101
	(0.056)	(0.063)	(0.066)
Family	0.112**	0.098*	0.098*
	(0.054)	(0.058)	(0.057)
Commercial & IP	-0.014	-0.006	-0.015
	(0.029)	(0.039)	(0.038)
Immigration	0.148**	0.176**	0.187**
	(0.073)	(0.084)	(0.086)
Non-lawyer ownership	-0.032	-0.034	-0.027
	(0.020)	(0.026)	(0.028)
Complaints (lagged)	0.180***	0.236***	0.250***
	(0.053)	(0.058)	(0.057)
N	1043	1068	1066

chi2	184.781	127.994	121.754
p	0.000	0.000	0.000
r2_p	0.188	0.153	0.138
Bayesian information criterion	809.483	861.794	878.356
Equality test:			
$\chi 2(1)$	1.32	0.67	0.09
ρ	0.251	0.412	0.760

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Table 5: Effects of competition on innovation effects on complaints

	Probability of complaints (Probit, marginal effects)		
	(1)	(2)	(3)
Innovative sales with international competition	-0.011*		
	(0.006)		
Innovative sales – no international competition	0.001***		
	(0.001)		
Service innovation with international competition		-0.114***	
		(0.012)	
Service innovation – no international competition		0.076***	
		(0.029)	
Delivery innovation with international competition			-0.104***
			(0.024)
Delivery innovation – no international competition			0.013
			(0.027)
National Competition	0.005	0.011	0.014
	(0.020)	(0.026)	(0.027)
Exporting firm	0.000	-0.001	-0.001
	(0.001)	(0.001)	-0.001)
Firm size	0.003***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Firm size – squared	-0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)
Firm age	0.001	0.003**	0.002**
	(0.001)	(0.001)	(0.001)
Barristers' Chambers	-0.038**	-0.041*	-0.041
	(0.018)	(0.024)	(0.027)
Property-related and planning	0.051	0.045	0.048
	(0.032)	(0.037)	(0.038)
Criminal	0.086*	0.076	0.085
	(0.050)	(0.054)	(0.057)
Wills, Trust & Probate	0.123*	0.118	0.129*
	(0.065)	(0.073)	(0.074)
Personal Injury	0.077	0.095	0.115*
	(0.057)	(0.064)	(0.068)
Family	0.120**	0.109*	0.113*
	(0.055)	(0.061)	(0.060)
Commercial & IP	-0.020	-0.008	-0.018
	(0.028)	(0.041)	(0.040)
Immigration	0.149**	0.177**	0.203**
	(0.072)	(0.083)	(0.088)
Non-lawyer ownership	-0.030	-0.032	-0.026
	(0.020)	(0.027)	(0.029)
Complaints (lagged)	0.189***	0.261***	0.282***
	(0.054)	(0.057)	(0.057)
N	1043	1068	1066
chi2	180.485	134.596	118.07
p	0.000	0.000	0.000

r2_p	0.183	0.148	0.126
Bayesian information criterion	806.697	859.261	881.888
Equality test:			
$\chi 2(1)$	4.92	6.466	3.30
ρ	0.027	0.011	0.069

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Annex 1: Variable definitions

Ombudsman complaints	
Ombudsman complaint (d)	A binary indicator of whether a complaint in relation to an organisation was referred to the Legal Ombudsman.
Ombudsman complaints (count)	A count indicator of the number of complaints in relation to an organisation referred to the Legal Ombudsman.
Innovation variables	
Sales innovation	A binary indicator of whether a firm had services which have been newly introduced or improved over the last three years
Delivery innovation	A binary indicator of whether a firm had newly introduced or improved how it delivered services over the last three years
Innovative sales	Percentage of sales derived from services which have been newly introduced or improved over the last three years
Competition variables	
Facing regional competition	A binary variable taking value 1 where the main competition is other regional organisations
Facing national competition	A binary variable taking value 1 where the main competition is other organisations throughout England and Wales
Facing international competition	A binary variable taking value 1 where the main competition is other organisations internationally
Firm characteristics	
Employment	Full time employees in the organisation in 2012 (including all partners, managing partners, barristers and directors but excluding management consultants on short term contracts)
Age of the enterprise	Number of years since the enterprise was established
Exporting (% of sales)	A scale variable (%) reflecting the percentage of sales relating to exports
Legal activity	
Property-related and planning	A binary variable taking value 1 where a solicitors' principal legal activity is property and planning.
Criminal	A binary variable taking value 1 where a solicitors' principal legal activity is criminal law.
Wills, Trust & Probate	A binary variable taking value 1 where a solicitors' principal legal activity is wills, trust, probate & tax planning.
Personal Injury	A binary variable taking value 1 where a solicitors' principal legal activity is personal injury.
Family	A binary variable taking value 1 where a solicitors' principal legal activity is family, matrimonial and child law.
Commercial and Intellectual Property	A binary variable taking value 1 where a solicitors' principal legal activity is commercial/corporate work for list and non-listed companies and intellectual property law.
Immigration	A binary variable taking value 1 where a solicitors' principal legal activity is immigration law
Other	A binary variable taking value 1 where a solicitors' principal legal activity is another legal activity other than those listed above.
Barristers' chambers	A binary variable taking value 1 where an organisation is a barristers' chambers.
Other Legal Service Provider (regulated)	A binary variable taking value 1 where an organisation is an Other Legal Service Provider (regulated).

Collaboration and teamwork (partition) variables	
Collaboration for innovation	A binary variable taking value 1 where an organisation collaborates with clients as part of its innovation activity
Team-working	A binary variable taking value 1 where team-working occurs as part of firms' innovation activity.

Annex 2: Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Ombudsman complaint (d)	1.00															
2	Ombudsman complaint (count)	0.60	1.00														
3	Service innovation (%)	0.11	0.11	1.00													
4	Delivery innovation (%)	0.04	0.10	0.34	1.00												
5	Innovative sales (% of sales)	0.04	0.01	0.58	0.24	1.00											
6	Exporting firm (% of sales)	-0.10	-0.07	0.03	-0.04	0.01	1.00										
7	Firm size	0.08	0.13	0.11	0.07	-0.02	0.25	1.00									
8	Firm age	0.21	0.12	0.03	0.12	-0.09	-0.01	0.20	1.00								
9	Facing regional competition (d)	0.07	0.01	-0.09	0.00	-0.13	-0.22	-0.14	0.14	1.00							
10	Facing national competition (d)	-0.02	0.03	0.10	0.04	0.15	-0.05	-0.02	-0.13	-0.86	1.00						
11	Facing international competition (d)	-0.10	-0.07	0.04	-0.03	0.00	0.60	0.39	0.02	-0.30	-0.14	1.00					
12	Collaboration for innovation (d)	0.10	0.08	0.49	0.51	0.30	0.02	0.11	0.06	-0.06	0.06	0.03	1.00				
13	Teamwork (d)	0.11	0.15	0.52	0.46	0.22	0.03	0.18	0.10	-0.06	0.07	0.04	0.48	1.00			
14	Lagged complaint (d)	0.37	0.36	0.09	0.07	-0.02	-0.08	0.13	0.19	0.06	-0.03	-0.06	0.05	0.12	1.00		
15	Lagged complaint (count)	0.31	0.68	0.10	0.10	-0.01	-0.06	0.17	0.12	-0.01	0.04	-0.05	0.02	0.16	0.67	1.00	
16	Non-lawyer owned (d)	0.02	0.06	0.12	0.05	0.04	-0.03	0.01	-0.12	-0.14	0.18	-0.04	0.05	0.02	0.06	0.09	1.00

Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018). Notes: Variable definitions in Annex 1. n = 1,106. The correlation matrix applies listwise deletion and is computed only for those cases which do not have any missing value in any of the variables on the list.

Appendix A

Table A1: Effects of customer collaboration on innovation effects on complaints

	Number of complaints (Negative Binomial, incidence rate ratios)		
	(1)	(2)	(3)
Innovative sales with collaboration	1.008		
	(0.006)		
Innovative sales – no collaboration	1.019***		
	(0.006)		
Service innovation with collaboration		1.176	
		(0.248)	
Service innovation – no collaboration		2.310***	
		(0.510)	
Delivery innovation with collaboration			1.653**
			(0.343)
Delivery innovation – no collaboration			0.792
			(0.245)
National Competition	0.867	0.862	0.837
	(0.180)	(0.174)	(0.176)
International Competition	0.101***	0.003*	0.005*
	(0.077)	(0.011)	(0.014)
Exporting firm	1.005	0.999	1.000
	(0.007)	(0.008)	(0.008)
Firm size	1.033***	1.013***	1.012***
	(0.003)	(0.003)	(0.003)
Firm size – squared	1.000***	1.000***	1.000***
	(0.000)	(0.000)	(0.000)
Firm age	1.019**	1.025***	1.023***
	(0.009)	(0.009)	(0.009)
Barristers' Chambers	0.565**	0.708	0.699
	(0.137)	(0.162)	(0.162)
Property and planning	1.627*	1.347	1.487*
	(0.416)	(0.319)	(0.354)
Criminal	2.329***	1.767*	1.886**
	(0.755)	(0.559)	(0.590)
Wills, Trust & Probate	1.975**	1.620	1.730
	(0.648)	(0.535)	(0.587)
Personal Injury	1.751	1.532	1.896*
	(0.607)	(0.505)	(0.634)
Family	2.647***	2.051**	2.115**
	(0.850)	(0.668)	(0.689)
Commercial & IP	0.780	0.801	0.720
	(0.333)	(0.352	(0.313)
Immigration	3.290***	2.758***	3.596***
	(1.281)	(1.062)	(1.393)
Non-lawyer ownership	0.605*	0.608**	0.684
	(0.156)	(0.147)	(0.167)
Complaints (lagged)	1.704***	1.806***	1.808***

	(0.245)	(0.318)	(0.302)
N	1043	1068	1066
chi2	230.798	124.053	131.563
P	0.000	0.000	0.000
r2_p	0.154	0.125	0.117
Bayesian information criterion	630.514	662.443	668.675
Log Likelihood	-245.758	-261.486	-264.621
Equality test:			
$\chi^2(1)$	1.93	6.51	4.61
ρ	0.165	0.011	0.032

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Table A2: Effects of team-working on innovation effects on complaints

	Number of complaints (Negative Binomial, incidence rate ratios)		
	(1)	(2)	(3)
Innovative sales with team-working	1.007		
	(0.008)		
Innovative sales – no team-working	1.020***		
	(0.005)		
Service innovation with team-working		1.627**	
		(0.391)	
Service innovation – no team-working		1.817***	
		(0.390)	
Delivery innovation with team-working			1.35
			(0.342)
Delivery innovation – no team-working			1.137
			(0.275)
National Competition	0.849	0.851	0.847
	(0.178)	(0.175)	(0.179)
International Competition	0.108***	0.005*	0.005*
	(0.080)	(0.015)	(0.014)
Exporting firm	1.004	0.999	1.000
	(0.007)	(0.008)	(0.009)
Firm size	1.033***	1.012***	1.013***
	(0.003)	(0.003)	(0.003)
Firm size – squared	1.000***	1.000***	1.000***
	0.000	0.000	0.000
Firm age	1.018**	1.025***	1.024***
	(0.009)	(0.009)	(0.009)
Barristers' Chambers	0.597**	0.696	0.685
	(0.149)	(0.161)	(0.160)
Property and planning	1.643*	1.404	1.382
	(0.422)	(0.336)	(0.329)
Criminal	2.372***	1.774*	1.835*
	(0.768)	(0.563)	(0.576)
Wills, Trust & Probate	1.993**	1.633	1.662
	(0.649)	(0.539)	(0.554)
Personal Injury	1.836*	1.692	1.795*
	(0.630)	(0.559)	(0.599)
Family	2.695***	2.118**	2.140**
	(0.862)	(0.707)	(0.708)
Commercial & IP	0.797	0.78	0.735
	(0.342)	(0.340)	(0.318)
Immigration	3.652***	3.113***	3.506***
	(1.434)	(1.201)	(1.363)
Non-lawyer ownership	0.588**	0.615**	0.675
	(0.150)	(0.149)	(0.167)
Complaints (lagged)	1.696***	1.795***	1.823***
	(0.242)	(0.310)	(0.304)
N	1043	1068	1066

chi2	237.559	128.679	115.498
p	0.000	0.000	0.000
r2_p	0.154	0.121	0.113
Bayesian information criterion	630.332	664.702	671.008
Log Likelihood	-245.667	-262.616	-265.787
Equality test:			
$\chi 2(1)$	2.05	0.15	0.29
ρ	0.152	0.697	0.593

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

Table A3: Effects of competition on innovation effects on complaints

	Number of complaints (Negative Binomial, incidence rate ratios)		
	(1)	(2)	(3)
Innovative sales with international competition	0.892**		
	(0.043)		
Innovative sales – no international competition	1.016***		
	(0.005)		
Service innovation with international competition		0.006*	
		(0.017)	
Service innovation – no international competition		1.818***	
		(0.325)	
Delivery innovation with international competition			0.052*
			(0.092)
Delivery innovation – no international competition			1.271
			(0.242)
National Competition	0.895	0.883	0.907
	(0.186)	(0.181)	(0.189)
Exporting firm	1.001	0.994	0.994
	(0.006)	(0.008)	(0.009)
Firm size	1.033***	1.011***	1.011***
	(0.003)	(0.003)	(0.003)
Firm size – squared	1.000***	1.000***	1.000***
	(0.000)	(0.000)	(0.000)
Firm age	1.018**	1.026***	1.024***
	(0.009)	(0.009)	(0.009)
Barristers' Chambers	0.548**	0.667*	0.681
	(0.132)	(0.152)	(0.159)
Property and planning	1.712**	1.451	1.444
	(0.442)	(0.349)	(0.347)
Criminal	2.461***	1.828*	1.924**
	(0.799)	(0.579)	(0.606)
Wills, Trust & Probate	2.138**	1.693	1.804*
	(0.697)	(0.559)	(0.592)
Personal Injury	1.886*	1.751*	1.921**
	(0.651)	(0.576)	(0.635)
Family	2.869***	2.203**	2.255**
	(0.926)	(0.738)	(0.740)
Commercial & IP	0.731	0.757	0.696
	(0.317)	(0.344)	(0.309)
Immigration	3.695***	3.214***	3.808***
	(1.399)	(1.208)	(1.446)
Non-lawyer ownership	0.607*	0.628*	0.673
	(0.156)	(0.151)	(0.162)
Complaints (lagged)	1.736***	1.910***	1.988***
	(0.243)	(0.325)	(0.325)
N	1043	1068	1066
chi2	221.429	123.972	108.001
p	0.000	0.000	0.000

r2_p	0.15	0.116	0.105
Bayesian information criterion	625.824	660.473	669.132
Log Likelihood	-246.888	-263.988	-268.335
Equality test:			
$\chi 2(1)$	7.08	3.93	3.21
ρ	0.008	0.048	0.073

Notes: Observations are weighted. * denotes significance at 10 per cent, ** at 5 per cent and *** at 1 per cent. Reference categories include: regional competition; other solicitors, other legal service providers. Source: Survey of Legal Service Providers (2015) and Legal Ombudsman for England & Wales Annual Reports (2016, 2017, 2018).

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