

Digital adoption in rural SMEs

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Abstract

This report compares the attitudes and practices of rural and urban-based SMEs with regard to digital technologies. Using data collected from 804 small firms in England, Wales, Scotland and Northern Ireland it identifies three key differences. Firstly, rural firms approach digital technologies differently from urban firms. Secondly, rural firms have lower levels of digital adoption than urban firms. Thirdly, rural firms experience different barriers to digital adoption than their urban counterparts, in particular a lack of sufficient broadband capacity. On the basis of these findings, we identify policy implications and we propose a future research agenda to explore these issues further.

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Executive summary

Industry 4.0, the smart manufacturing revolution which combines connectivity, machine learning, and big data, relies on the widespread adoption of digital technologies. In order to be competitive now and in the future, UK firms will need to embrace these technologies. However, prior research into the adoption of digital technologies in UK businesses has tended to focus on larger firms, and as a consequence digital adoption in small firms is less well understood. Research into digital adoption in rural firms is also relatively rare, but the small body of evidence that does exist indicates differences between rural and urban firms in the UK when it comes to the adoption of these technologies. To explore these differences, we conducted the Business Futures Survey of around 1,000 UK small and medium-sized firms during 2020q4, which examined attitudes towards, and adoption of, digital technologies in UK urban and rural small businesses.

This report compares the attitudes and practices of rural and urban-based SMEs with regard to digital technologies, and asks whether the digital adoption of UK small firms varies depending on their geographical location. We found three main differences:

1. **Rural firms approach digital technologies differently from urban firms.** Rural firms were ten per cent less likely to have a digital strategy than their urban counterparts. 76% of rural firms compared to 82% of urban firms said that they keep up with the latest technologies, while 57% of rural firms compared to 51% of urban firms said that they felt that their business could be successful without digital technologies.
2. **Rural firms have lower levels of digital adoption than urban firms.** 31% of rural vs 39% of urban firms had adopted Computer Aided Design, 58% of rural compared to 67% of urban firms had adopted video conferencing, and Customer Relationship Management software had been adopted by 42% of rural firms compared to 49% of urban firms. While both rural and urban firms that had adopted digital technologies tended to say that their business model had evolved or changed as a consequence, rural firms were more likely than urban firms to assert a partial change (51% vs 59%) than a significant change (12% vs 17%).
3. **Rural firms experience different barriers to digital adoption than their urban counterparts.** 42% of rural firms compared to 31% of urban firms cited broadband capacity as a major obstacle to digital adoption. Rural firms were ten per cent more likely to point to internal resistance to change (39% vs 29%) as an obstacle to digital adoption than their urban counterparts.

The divergence we have identified between rural and urban firms has implications for policy initiatives aimed at driving digital adoption in UK firms. Rural firms are already less engaged with digital technologies than their urban counterparts, a gap which has the potential to drive division. Broadband capacity remains problematic, and will need to be tackled for rural firms to be able to embrace digital technologies now and in the future. Policy initiatives will need to acknowledge and address these differences to ensure that rural firms have the opportunity, skills and confidence to adopt digital technologies. Our

findings also highlight differences between rural and urban firms which merit further investigation and we identify several areas for future research, including:

1. The ways in which rural business leaders' attitudes, and firm level characteristics, can drive digital adoption in rural firms
2. Digital adoption processes in rural firms
3. The ways in which rural firms experience barriers to digital adoption.

1. Introduction

Industry 4.0, also known as the smart manufacturing revolution, encompasses a range of digital technologies related to manufacturing, communication and connectivity. The ways in which these digital technologies are experienced by UK SMEs are not well understood, partly because much research in this area has focused on larger firms. However, evidence suggests that uptake of digital technologies by SMEs has been patchy, has often depended on the vision of a digital champion within the firm, and has typically been restricted to one or two technologies which have been adopted for a specific purpose. When it comes to rural firms, the evidence related to digital adoption is even more sparse, but suggests that distance and low population density lead to low investment in digital connectivity which disadvantages rural firms in general, and remote-rural firms in particular, when it comes to the opportunity to embrace these technologies. The ability of rural firms to adopt digital technology is often presented as challenged by both infrastructure issues and a lack of workplace digital skills.

Evidence suggests that the UK lags behind other developed countries in technology adoption. According to World Economic Forum data, although the UK ranked eighth globally for innovation in 2019, it only ranked 31st in the world for ICT adoption and 29th in the world for digital skills among the active working population (Schwab, 2019). In light of changed working practices driven by COVID-19, the ability to engage with digital technology is an issue which matters to a wide range of rural stakeholders, including businesses and their leaders, employees and those living and working in rural communities. Early evidence suggests that the pandemic has accelerated the adoption of digital technologies in UK firms. For example, between March and July 2020, over 60% of firms said that they had adopted new digital technologies and management practices (Riom and Valero, 2020). This paper contemplates whether the effects of COVID-19 on digital adoption are moderated by rural location, skills or infrastructure challenges. We ask:

1. How, if at all, do digital adoption patterns differ in rural vs urban firms?
2. How has COVID-19 changed firms' plans to adopt or use digital technologies?
3. Is there any evidence that rurality, or rural firm resources moderate this relationship?

The paper proceeds with a review of prior research focusing on the adoption of digital technologies by SMEs, followed by a description of our sample and research method. Finally, we present findings and discuss their implications for a future research agenda.

2. Digital adoption in SMEs: the existing evidence

2.1. SMEs and digital technology: overview

The emphasis on research into Industry 4.0, the smart manufacturing revolution which combines digital technology, machine learning, and big data, has tended to be on larger

firms to the exclusion of SMEs, which means that digital adoption in smaller firms is less well understood (Doherty et al, 2016; Müller et al, 2018; Garzoni et al, 2019). Research has also shown that a firm's size is a stronger predictor of digitization than its production environment, i.e., whether it engages in one-off, batch or mass production (Buer et al, 2020). Thus, although the digital transformation associated with Industry 4.0 presents the opportunity for SMEs to engage with and participate in global digital supply chains, limited resources and skills can make the adoption of such technologies in smaller firms more complex than for larger firms (Garzoni et al, 2019).

Often, smaller firms struggle to know where to begin with digitisation, and may need external help to assess their digital status before they can consider moving forward with investment in digital technologies (Kääriäinen et al, 2019). Lack of awareness of digital development has been identified as a factor holding SMEs back when it comes to digital adoption (Taiminen and Karjaluoto, 2015), and perhaps as a result, research has found that, rather than wholesale embracing of Industry 4.0 technologies, SMEs often restrict themselves to engagement with specific elements, such as cloud computing and the Internet of things. For example, SMEs are more likely to use digital technology to monitor operations rather than to run autonomous production systems (Moeuff et al, 2018). Perhaps because of this piecemeal approach, SMEs have been characterized as being intimidated by Industry 4.0, approaching it with caution, and often expressing worries that the transparency that accompanies it may be detrimental to their business (Müller et al, 2018). Moreover, the 'complexity and idiosyncrasy of SME practice' (Morgan-Thomas, 2016, p1133) implies that a one-size-fits-all approach is insufficient to gain a real understanding of what digital adoption means, or looks like, for this heterogeneous group. The prevalence of smaller firms in some business areas, for example, construction, means that the digital adoption picture can vary by sector (Dainty et al, 2017).

Studies investigating technology adoption have often adopted a social cognitive theory lens to try to explain variations in adoption of new technologies. For example, focusing on individual rather than business-level adoption, the unified theory of acceptance and use of technology (UTAUT) model (Venkatesh et al, 2003) identifies four direct determinants of an individual's intention to use technology – performance expectancy (the extent to which the individual believes the technology will help them to improve their performance), effort expectancy (the degree of ease of use associated with the technology), social influence (the extent to which an individual believes that others think they should adopt the technology) and facilitating conditions (the degree to which the individual believes the organizational infrastructure to support the technology exists). In smaller firm leaders, performance expectancy has been found to be the most powerful determinant of digital adoption, and this has been characterized as a factor related to their resource constraints compared to their larger counterparts (Adamkolo et al, 2018).

Research suggests that adopting digital technologies can have a range of beneficial effects for SMEs, including the increased likelihood of internationalization, but that in order for to have these effects, digitisation must be embedded in wider organizational changes. So, adopting digital technologies as part of broader investments in people and processes is key (Cassetta et al, 2020). And while digitisation of the global economy offers firms the possibility to internationalise, those that succeed in doing so are more likely to already be invested in information systems, value networks, in-house IT skills and cyber-security (Westerlund, 2020). Other research has found that firms with a higher entrepreneurial

orientation (i.e., those which exhibit more innovative and risk-taking behaviors) are more likely to be able to leverage the benefits of digitisation in order to internationalise (Wang, 2020). More generally, an SME's broader strategic approach can influence the extent to which it is able to successfully embrace digital technologies, and those small firms which are able to combine market orientation with learning and entrepreneurial orientations are likely to be best positioned to take advantage of digital opportunities (Quinton et al, 2018). This so-called digital orientation is a function of a firm's sensitivity to external pressures and its internal capabilities, including its IT orientation, its flexibility and the focus of its leadership.

Digital adoption in SMEs has often been characterised as a process or road map, involving a number of incremental stages (Depaoli et al, 2020). This may, for example, begin with digital awareness, and move through digital investigation and digital collaboration to the final phase of digital transformation (e.g., Garzoni et al, 2019). However, such models have been criticised because while they may be appropriate for larger organizations, they fail to take account of the heterogeneity of smaller firms, and more flexible, non-linear approaches have instead been advocated for the SME context (e.g., Depaoli et al, 2020). Moreover, digital transformation is as much about management and process evolution as about the deployment of technical resources, and the context of SMEs means that leaders, often entrepreneurs, have a strong influence on these elements of the firm, while often lacking in-depth knowledge about digital technologies. Strengthening managerial cognition and social capital may help SMEs and their leaders to address these limitations (Li et al, 2018). There is also some suggestion in the literature that age of an SME leader is related to the likelihood of the leader to embrace digital technologies, and that younger leaders are more likely to be open to digital adoption (Camillieri, 2019).

2.2. Barriers to digital adoption in SMEs

Van Dijk and Hacker (2003) offer a typology of four barriers to digital adoption in SMEs. These barriers relate to whether firms want to adopt (motivational access), whether they can get the physical resources required (material access), whether they have the requisite skills (skills access) and whether they have the need or occasion to use digital technology (usage access). Paternalistic decision-making structures that prioritise the head of the firm, inconsistent understanding of what a digital transformation entails and employee resistance can inhibit digital adoption in SMEs (Soluk and Kammerlander, 2021). Costs and lack of knowledge have also been advanced as barriers to digital adoption in SMEs, with some studies suggesting that barriers to digital adoption in SMEs are diminishing as costs decrease and standardisation of digital tools grows (e.g., Stankovska et al, 2016). However, it seems likely that the digital gap between SMEs and larger firms may persist because it is more complex than it appears. It is not necessarily a simple divide between firms with and without digital access, but rather a gap that increases with the complexity of the digital technologies that have been adopted. So, while most firms have embraced simpler digital technologies like internet access, as the technologies move towards advanced business solutions, the gap broadens (Wielicki and Arendt, 2010). Distinguishing between short-term barriers to SME digital adoption, such as cost, and longer-term barriers like lack of knowledge, Wielicki and Arendt (2010) argue that in more knowledge-driven economies it is the latter that are more likely to be cited. Thus, the broader context of an SME influences its approach to the uptake of these technologies.

2.3. Drivers of digital adoption in SMEs

Research has identified a number of antecedents to digital technology adoption in SMEs operating within supply chains, including the use of inter-organisational information systems, the existence of good supply chain relationships, high levels of IT skills and engagement in knowledge sharing activities (Scuotto et al, 2017). The motivation to embrace some marketing-related digital technologies in SMEs has been found to be linked to the perceived advantage it will confer and to customer pressure (Shaltoni et al, 2018). Similarly, expected benefits must be seen to outweigh the costs of implementation of digital technologies in order for firms to be willing to adopt them (Adamkolo et al, 2018). Investments in social capital, notably collaboration within groups, and in advanced manufacturing technologies have been found to be positively associated with the adoption of Industry 4.0 technologies in SMEs (Agostini and Nosella, 2019). The availability of external funding, the presence of a digital strategy and the communication or early success stories related to digitisation have been found to encourage digital adoption in German SMEs (Soluk and Kammerlander, 2021). Management perceptions that digital technology is likely to be useful have been found to be more potent drivers of digital adoption in SMEs than economic or cost-benefits beliefs (Annosi et al, 2019). Generally, factors that are external to an SME have been found to be less influential in their initial decision to adopt some digital technologies than internal factors. However once they have adopted a technology, many find its application within their firm much broader than they had anticipated, and many also report productivity and image benefits (Doherty et al, 2016). SME characteristics such as their ability to rapidly implement and execute decisions, their market proximity and their capacity for adoption and short-term reorientation have been presented as advantages when it comes to the adoption of new digital technologies (Stankovska et al, 2016).

2.4. Rural SMEs and digital adoption

In a review of literature, Saleminik et al (2017) identify the two main strands of rural digital adoption research as focused on connectivity and inclusion, with distance and low population density discouraging investment in connectivity and lack of investment resulting in the exclusion of rural areas and those living in them. In terms of connectivity, in the early 2000s, research already highlighted the absence of high-speed internet access as a particular barrier to digital adoption in rural SMEs (e.g., Grimes, 2003), and two decades later this remains a theme in research focused on rural businesses (e.g., Doherty et al, 2017; Philip and Williams, 2019) with poor digital connectivity blamed for exacerbating other socio-demographic barriers to adoption. Poor connectivity leads to poor development of digital skills in rural firms, and can eventually restrict growth and internationalisation (Bowen and Morris, 2019). It has also been argued that while digital adoption can be seen as an opportunity for rural firms to compete more effectively with those in urban settings, these technologies are equally likely to present rural firms with increased competition in the relatively restricted local area in which they have traditionally operated, and in which they may have been largely unchallenged (Grimes, 2003). High-speed internet access is not the only barrier identified to digital adoption in rural SMEs. Factors such as company size, sector and the attitudes of owner-managers were also found to impact on rural digital adoption in early studies (e.g., Grimes, 2003) and these have remained central to scholarship in this area.

3. Empirical approach

The study uses a new dataset, generated during autumn 2020. The data were collected using a questionnaire in which firms from a range of sectors and in both urban and rural locations were asked about a number of issues, including their strategic approach, their experiences of the Coronavirus pandemic and their environmental attitudes and practices. The questionnaire was applied using Computer Assisted Telephone Interviewing. 1,019 private sector firms with between 7 and 249 employees were surveyed. Northern Ireland was over-sampled relative to the rest of the UK to provide a regionally representative sample with reasonable cell sizes. Of the 1,019 respondents 804 firms (79 per cent) indicated that they were happy for their data to be matched with information from other administrative data sources¹. Postcode data from these firms was matched with the urban-rural indicator relevant for their location, since this varies depending on the devolved nation in which they are located², and these firms form the basis for the analysis in the remainder of this paper.

4. Comparing rural and urban firms

4.1 Baseline characteristics of the sample

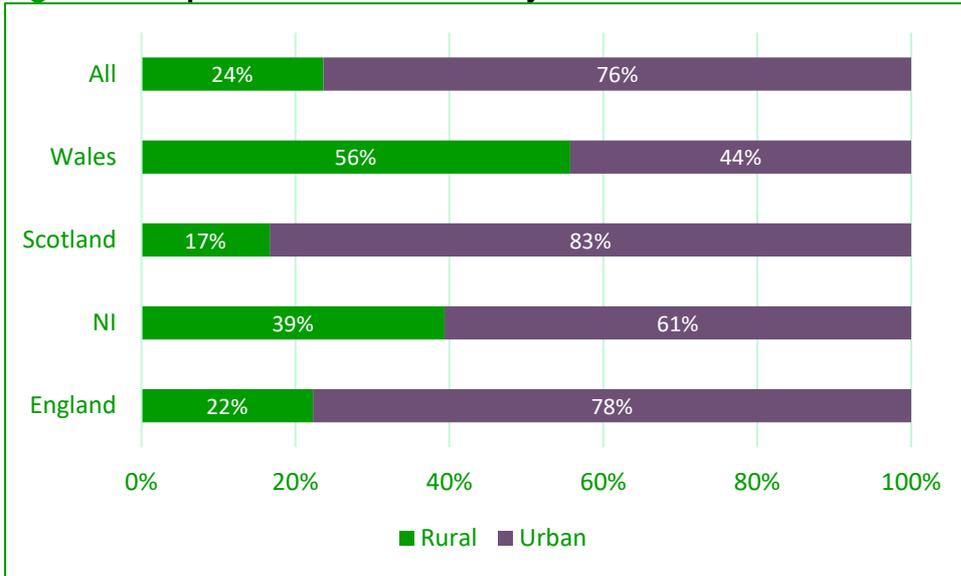
Overall, as shown in Figure 1 around 1 in 4 firms in our group of respondents is rural but there is substantial variation by nation. The rural proportion of firms is notably higher in Wales and Northern Ireland. There is, however, little variation in firm size between rural and urban firms (see Figure 2). In England overall, rural firms account for 23 per cent of all businesses³.

¹ The proportion of respondents giving permission for data matching varied slightly between the devolved nations: England 533 firms of 733 respondents, 73 per cent; NI 138 of 178 respondents, 78 per cent; Scotland 60 of 69 respondents, 87 per cent; Wales 30 of 39 respondents, 77 per cent.

² In England and Wales, postcodes are assigned to the urban or rural category of the Output Area (OA) into which they fall and OAs are treated as 'urban' if the majority of their population live within settlements with a population of 10,000 or more. In Scotland, the urban/rural classification is consistent with the Scottish Executive's core definition of rurality which defines settlements of 3,000 or less people to be rural. In Northern Ireland, there is an eight-band categorisation of settlements ranging from Band A (Belfast Metropolitan Urban Area) to Band H (Small Village, Hamlet or Open Countryside) with bands A – E being classed as 'urban'.

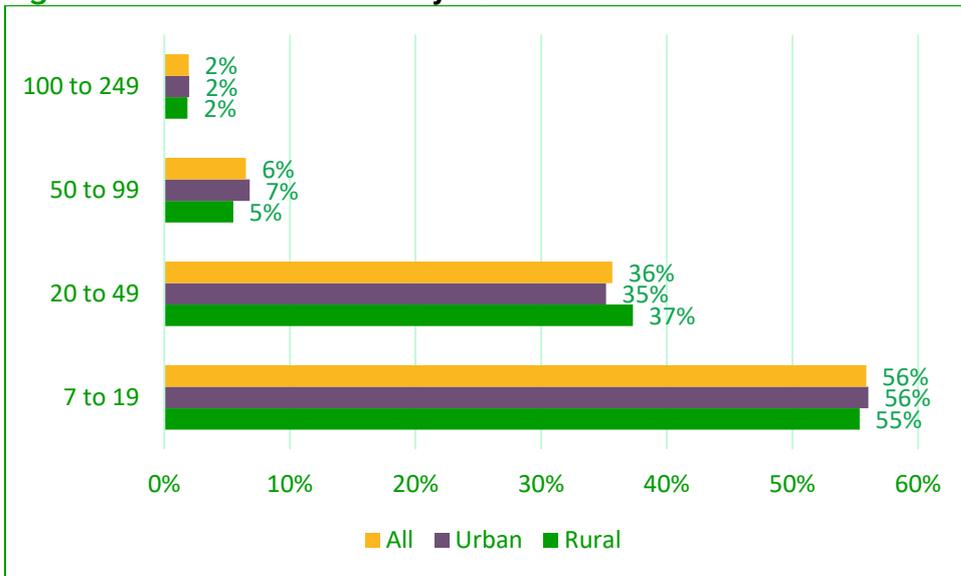
³ DEFRA (2021) Statistical digest of Rural England (Online) Available at: <https://www.gov.uk/government/statistics/statistical-digest-of-rural-england>

Figure 1 Sample of 804 breakdown by nation



Base: 804 firms. England 574, NI 138, Scotland 60, Wales 33

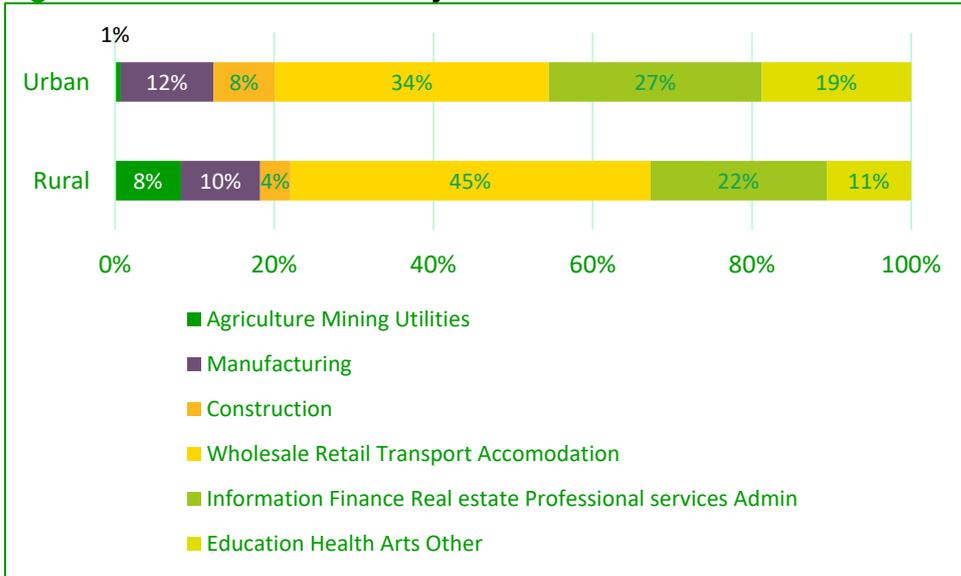
Figure 2 Urban vs rural firms by size



Base: 804 firms. 600 urban, 204 rural

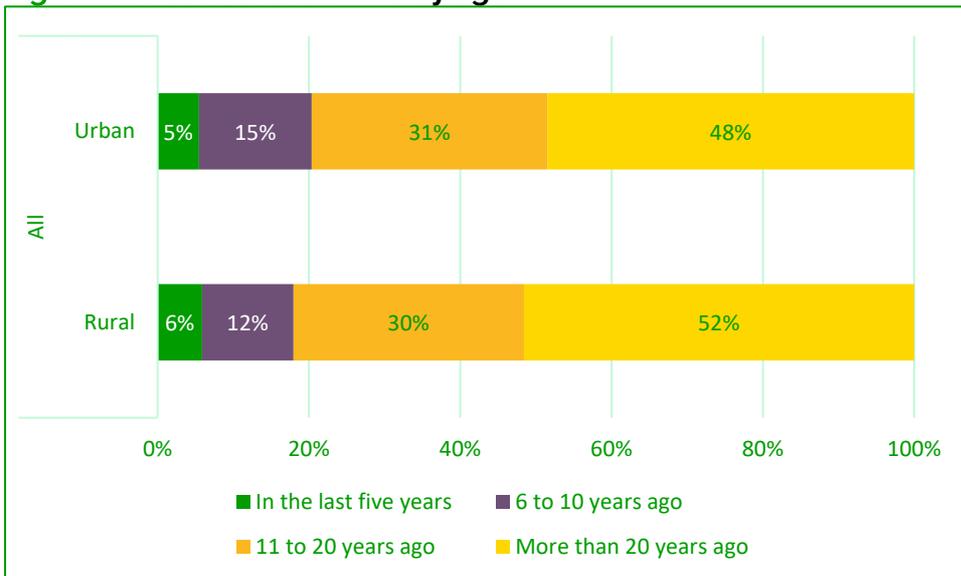
Rural firms differ in sectoral terms from their urban counterparts, and overall have a greater proportion of firms in the Agriculture/Mining/Utilities and Wholesale/Retail/Transport/Accommodation sectors (Figure 3). However, the age profile of urban versus rural respondents to the survey is similar (Figure 4). One aspect of behaviour where we do see a difference between urban and rural firms in our sample is in their propensity to export: rural firms in our sample are less likely to export than urban firms (23% vs 28%) (Figure 5). Urban firms are also more likely to have a business plan than rural firms (65% vs 54%) and this is a statistically significant difference (Figure 6).

Figure 3 Urban vs rural firms by sector



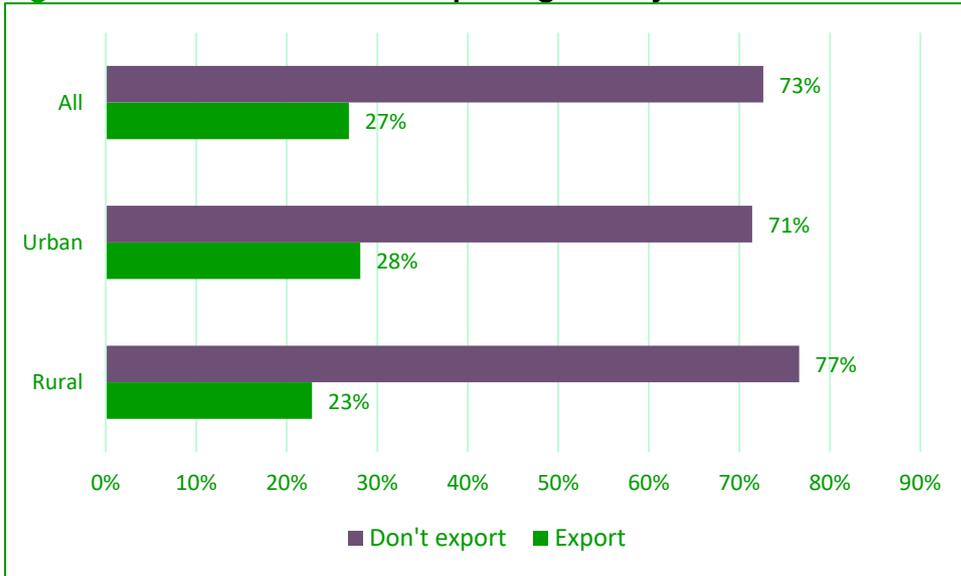
Base: 804 firms. 600 urban, 204 rural

Figure 4 Urban vs rural firms by age



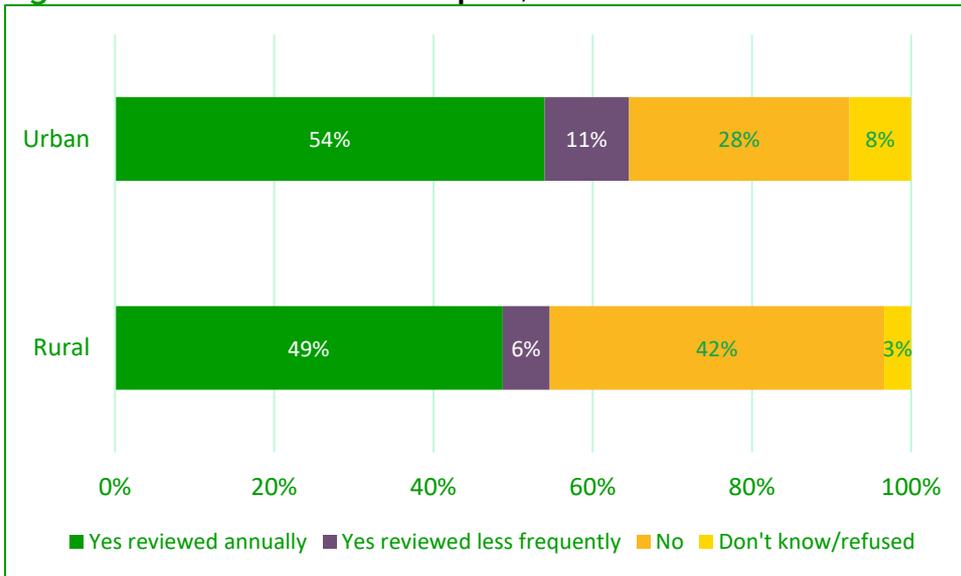
Base: 804 firms. 600 urban, 204 rural

Figure 4 Urban vs rural firms' exporting activity



Base: 804 firms. 600 urban, 204 rural

Figure 6 Presence of a business plan, urban vs rural

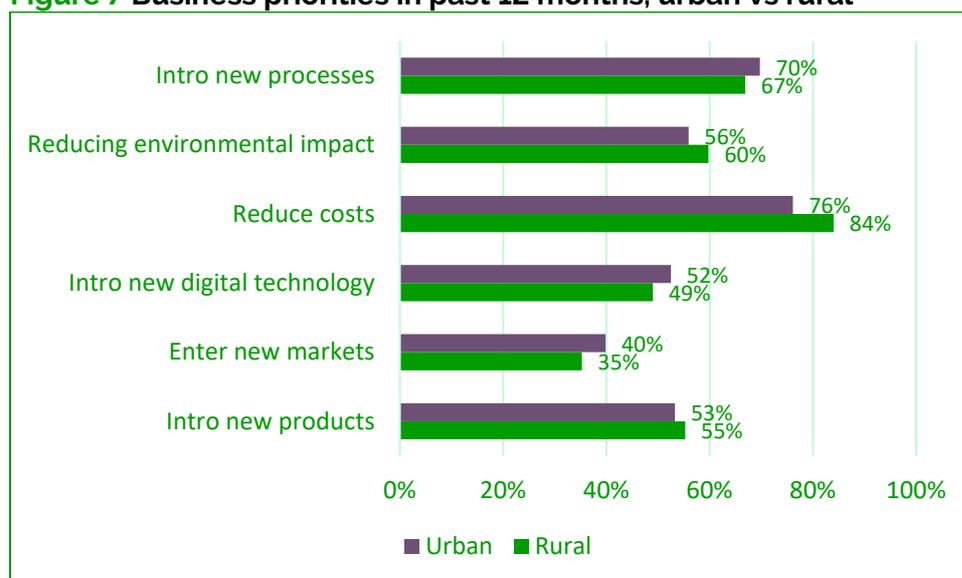


Base: 804 firms. 600 urban, 204 rural

4.2 Strategic approach

Overall, as shown in Figure 7, rural firms were more likely to have prioritised reducing their environmental impact. They were also more likely to have prioritised reducing costs than urban firms in the preceding 12 months, a statistically significant difference. Urban firms were more likely than their rural counterparts to focus on identifying new markets and introducing digital technology.

Figure 7 Business priorities in past 12 months, urban vs rural⁴

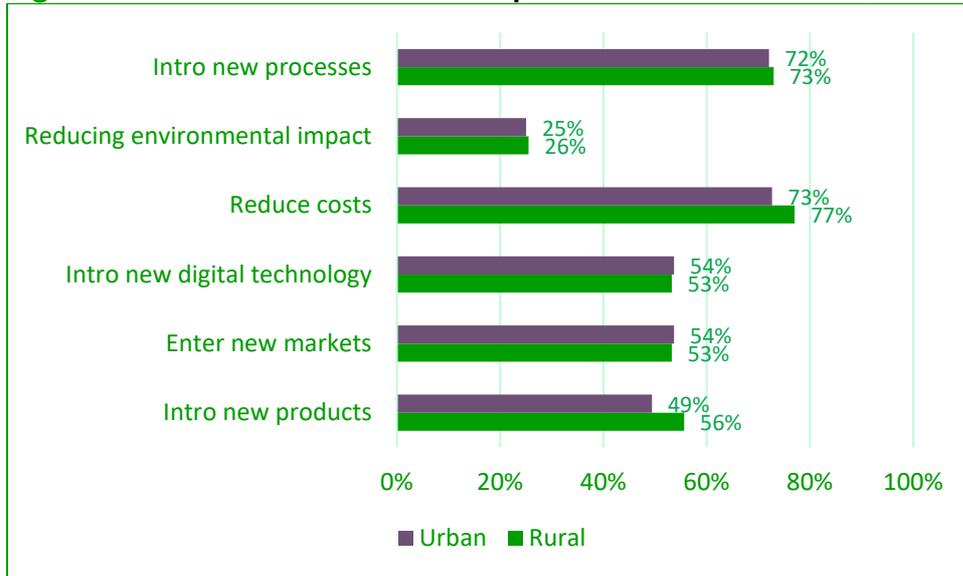


Base: 804 firms. 600 urban, 204 rural

When the survey was conducted in late 2020 we asked firms whether the COVID-19 crisis had made each of these priorities more or less important. Figure 8 shows the proportion of urban and rural firms who said that each of these priorities had become either 'more important' or 'much more important'. Reducing costs and introducing new processes are the most likely to have increased in importance while reducing environmental impact is the least likely to have increased in importance. There is no notable difference between the impact of COVID-19 on the strategic priorities of rural and urban firms.

⁴ Figure 7 shows the percentage of firms that said each item had been a priority for their business in the preceding 12 months.

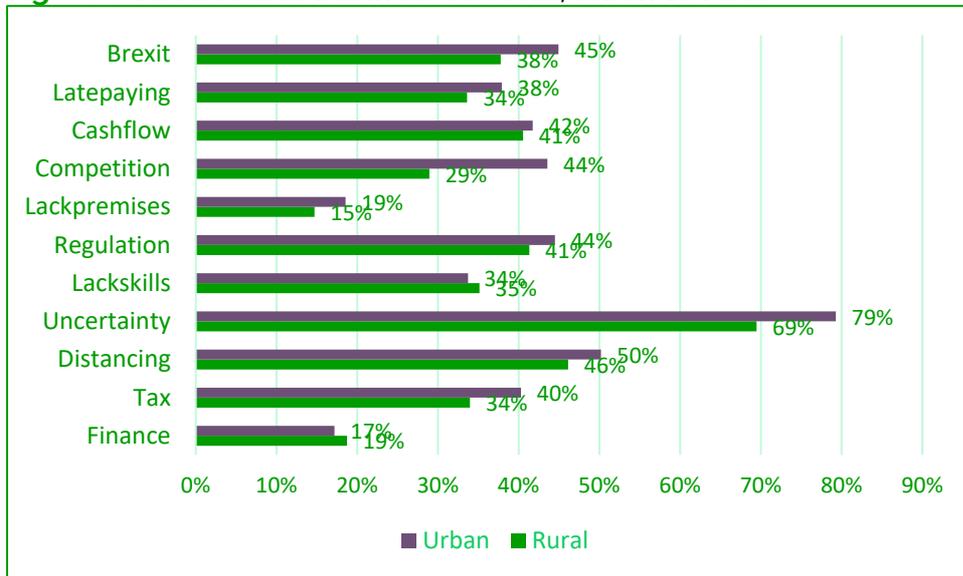
Figure 8 Priorities with increased importance since COVID-19, urban vs rural



Base: 804 firms. 600 urban, 204 rural

The survey also asked firms about a range of obstacles which might be impacting on their success. Figure 9 indicates the proportion of respondents suggesting that each obstacle was either 'important' or 'very important'. Urban firms are more likely to identify most of the possible obstacles as impacting on their firms' success, with the exception of finance and lack of skills.

Figure 9 Obstacles to business success, urban vs rural



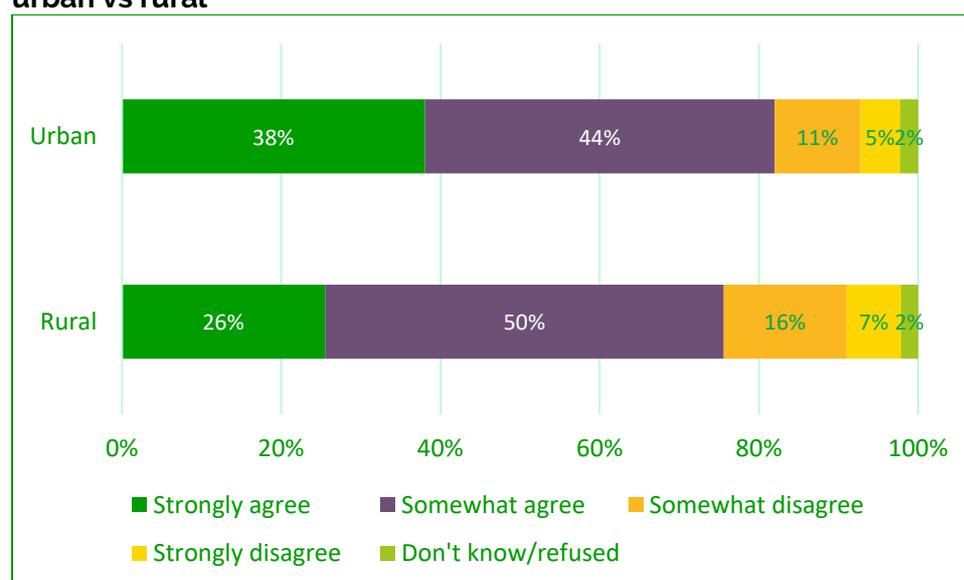
Base: 804 firms. 600 urban, 204 rural

5. Attitudes towards, and adoption of, digital technologies

5.1. Attitudes towards digital technologies

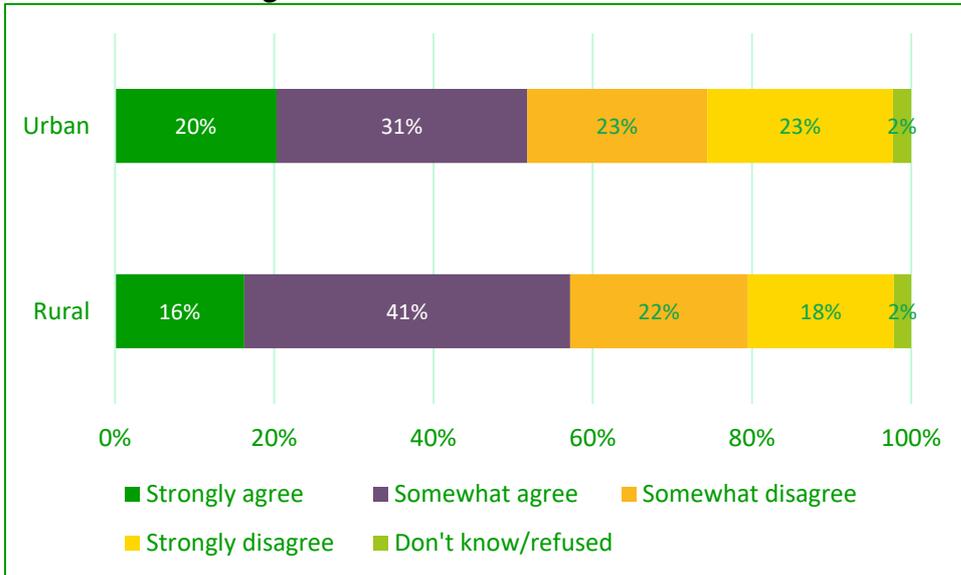
We asked firms in our survey how engaged they felt they were with digital technologies, and how important they felt these technologies were for future success. Urban firms are more likely to 'strongly agree' or to 'somewhat agree' that they keep up with the latest technologies (82% vs 76%) (Figure 10), a result which is statistically significant. They are more likely to 'somewhat disagree' or to 'strongly disagree' that their business can be successful without digital technologies (46% vs 40%) (Figure 11). While rural firms are slightly more likely to 'strongly agree' or to 'somewhat agree' that firms that use digital technologies are more successful (Figure 12), more than 90% of both rural and urban firms 'strongly agree' or 'somewhat agree' that more and more businesses are using digital technologies (Figure 13) and that their businesses will need to use more digital technologies in the future (Figure 14).

Figure 10 Agreement with the statement We keep up with the latest technologies, urban vs rural



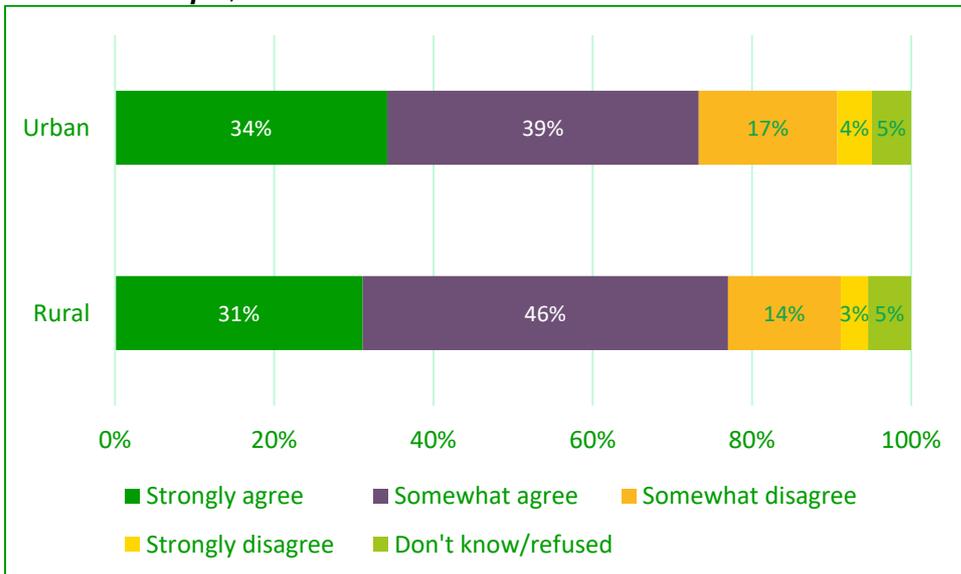
Base: 804 firms. 600 urban, 204 rural

Figure 11 Agreement with the statement *Our business can be successful without using the latest technologies, urban vs rural*



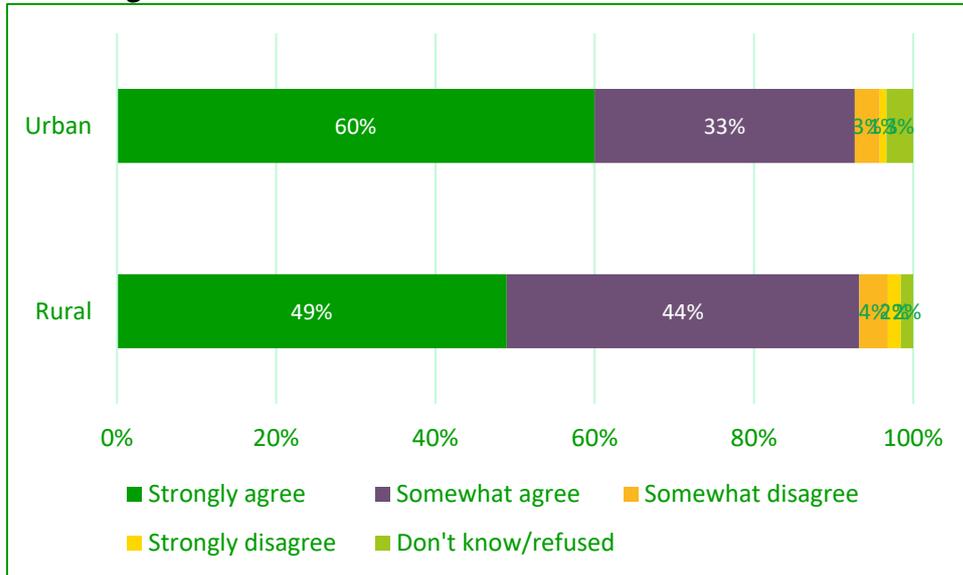
Base: 804 firms. 600 urban, 204 rural

Figure 12 Agreement with the statement *Businesses who use digital technologies are more successful, urban vs rural*



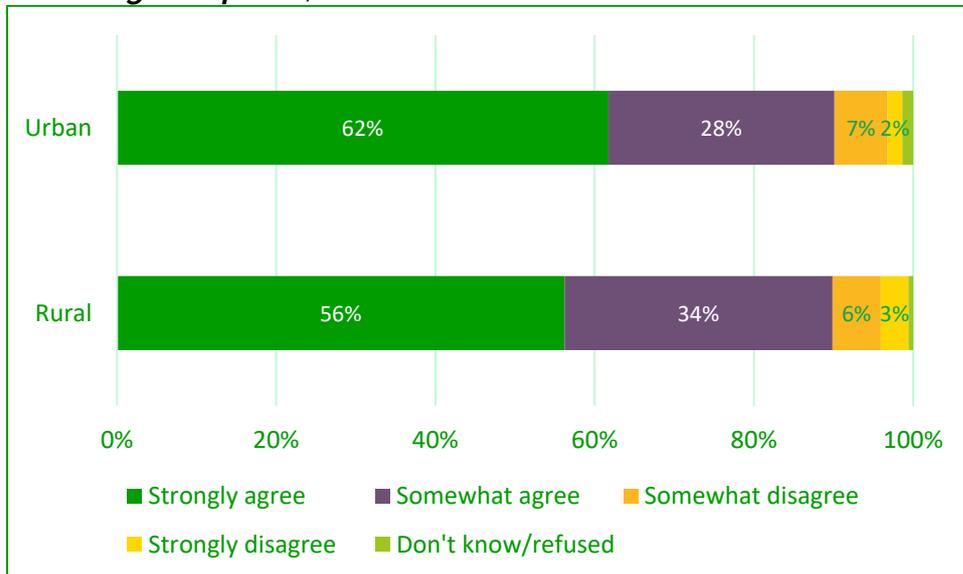
Base: 804 firms. 600 urban, 204 rural

Figure 13 Agreement with the statement *More and more businesses are using new technologies*, urban vs rural



Base: 804 firms. 600 urban, 204 rural

Figure 14 Agreement with the statement *We expect our business will use more digital technologies in future*, urban vs rural

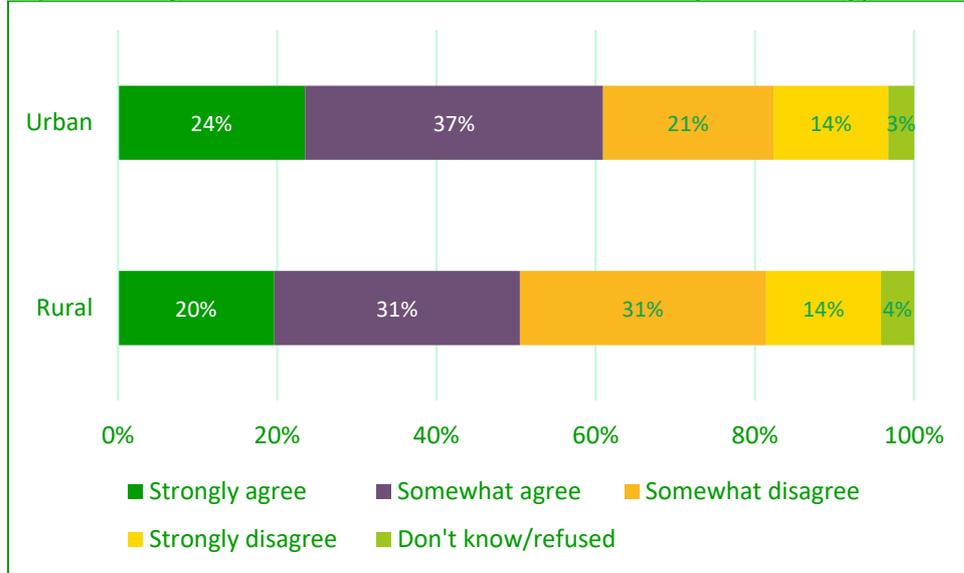


Base: 804 firms. 600 urban, 204 rural

We asked firms a series of questions about their perceptions of digital technologies, mainly focusing on the ways in which they felt these technologies related to their own businesses and strategies. Overall, urban firms were consistently more likely to 'Strongly agree' or 'Agree' with the statements we presented.

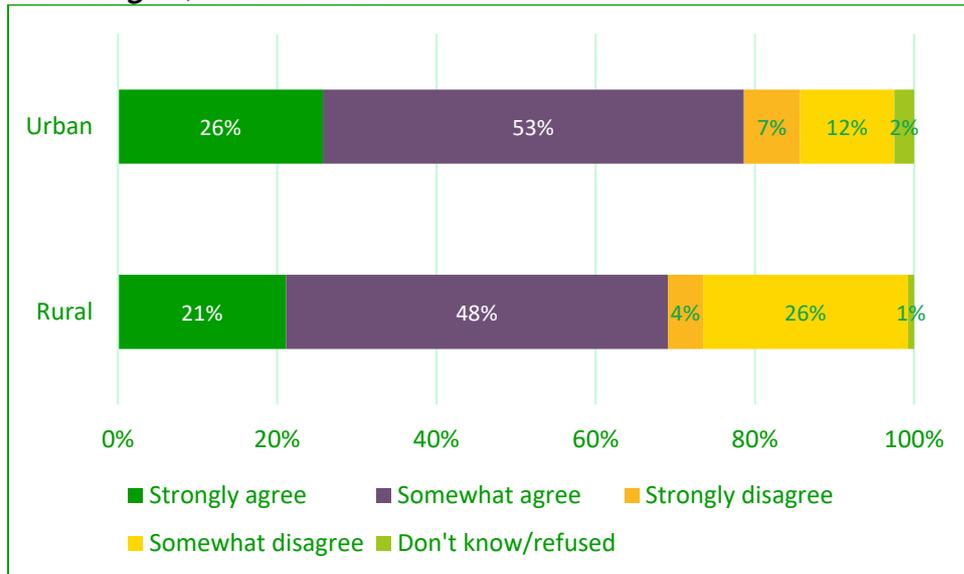
Firstly, urban firms were more likely to 'Strongly agree' or 'Agree' that they have a digital strategy (61% vs 51%) (Figure 15) and that they have the skills to introduce new technologies (79% vs 69%) (Figure 16). These are both statistically significant differences. They were also more positive about digital technologies: more were likely to 'Strongly agree' or 'Agree' that digital technology they have adopted meets their expectations (85% vs 80%) (Figure 17) and that introducing new digital technologies takes time but is worth it (92 vs 88%) (Figure 18).

Figure 15 Agree with the statement *We have a digital strategy*, urban vs rural



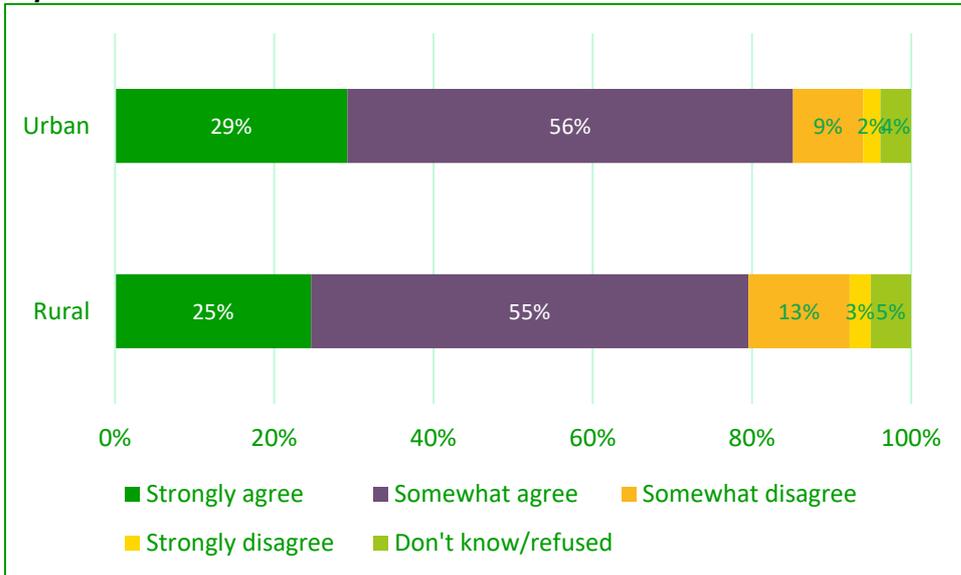
Base: 743 firms 555 urban, 188 rural

Figure 16 Agree with the statement *We have the skills to introduce any new technologies*, urban vs rural



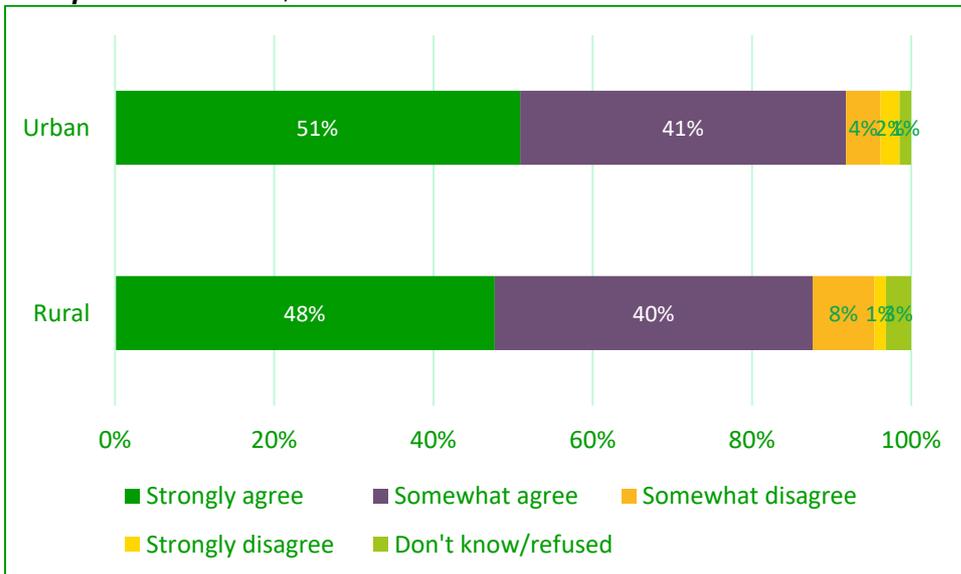
Base: 743 firms 555 urban, 188 rural

Figure 17 Agree with the statement *Digital technology we have adopted met our expectations*, urban vs rural



Base: 743 firms 555 urban, 188 rural

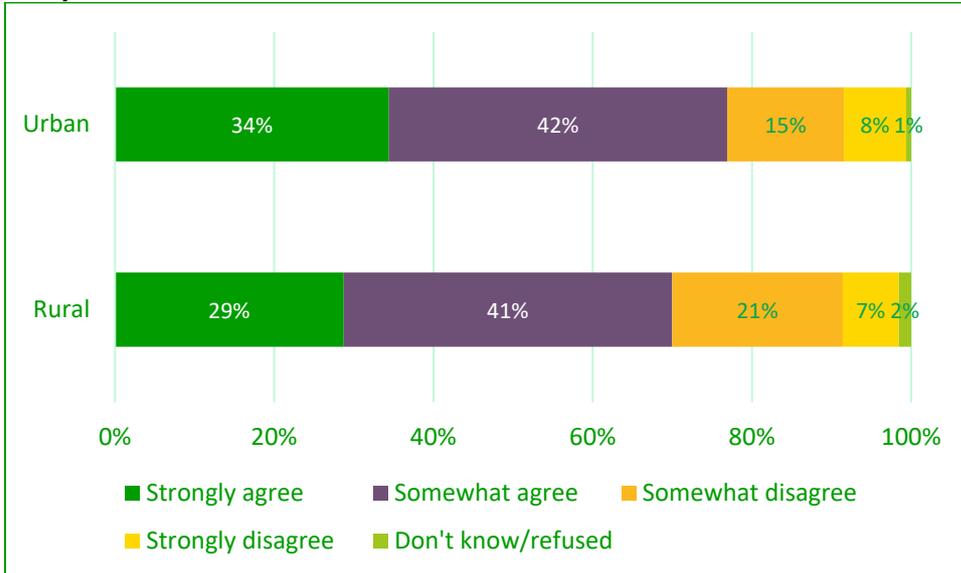
Figure 18 Agree with the statement *Introducing new technologies takes time but the benefits are worth it*, urban vs rural



Base: 743 firms 555 urban, 188 rural

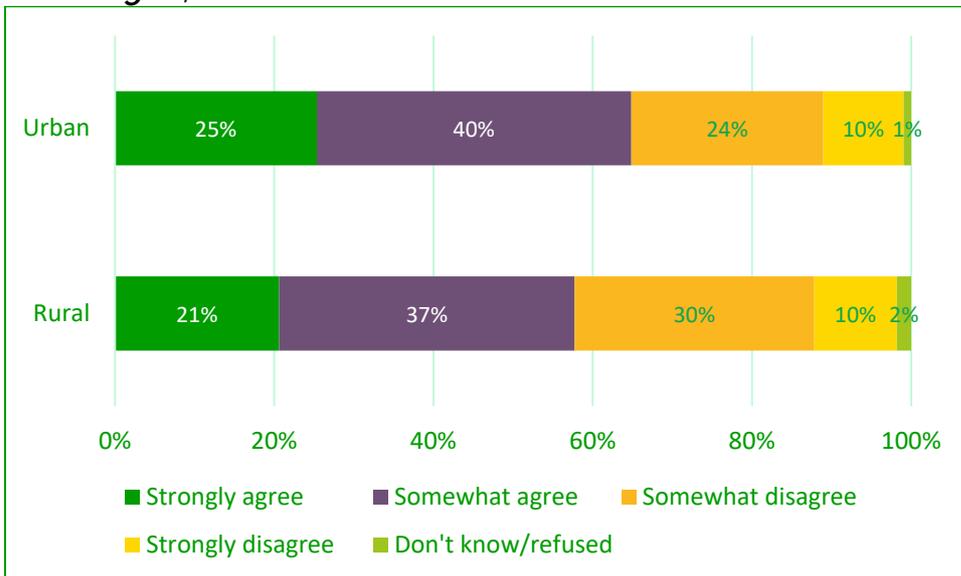
Urban firms are more likely to believe that investing in digital solutions will keep them ahead of competitors (76% vs 70%) (Figure 19), and that customers expect them to use digital technologies (65% vs 58%) (Figure 20). Finally, urban firms are more likely than their rural counterparts to 'Strongly agree' or 'Agree' that their innovation relies upon digital technologies (60% vs 54%) (Figure 21).

Figure 19 Agree with the statement *Investing in digital solutions will keep us ahead of competitors*, urban vs rural



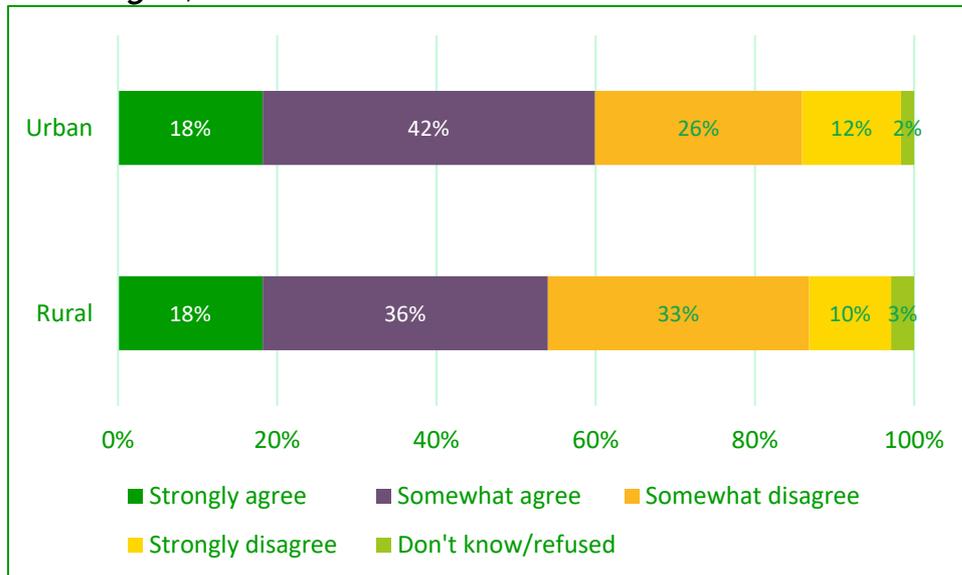
Base: 743 firms 555 urban, 188 rural

Figure 20 Agree with the statement *Customers expect us to use the latest digital technologies*, urban vs rural



Base: 743 firms 555 urban, 188 rural

Figure 21 Agree with the statement *Our innovation relies on having the latest digital technologies*, urban vs rural



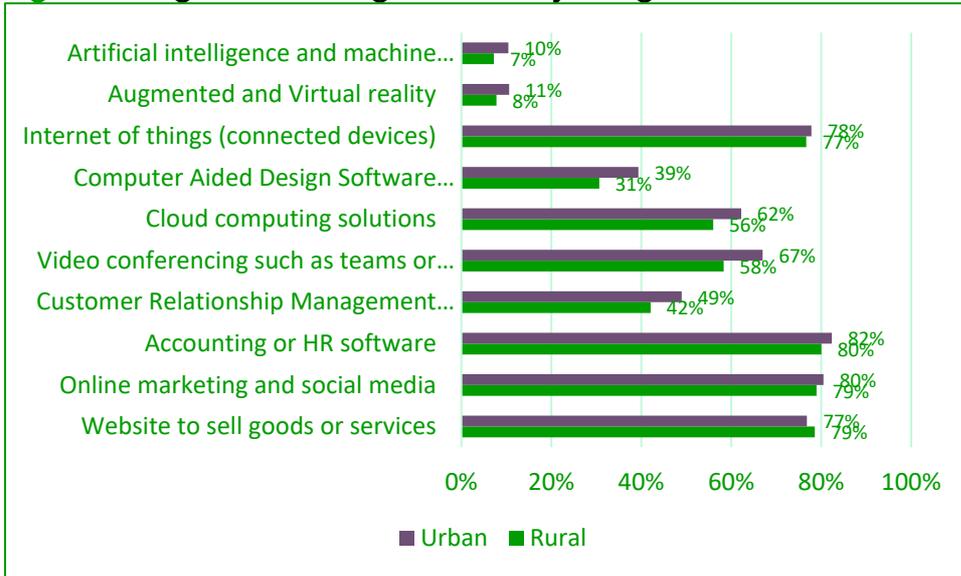
Base: 743 firms 555 urban, 188 rural

5.2. Adoption of digital technologies

Urban firms were more likely than rural firms currently to be using a variety of digital technologies, including Computer Aided Design software (39% vs 31%), and Video Conferencing (67% vs 58%) (Figure 22). These are statistically significant differences. They were also more likely to say that they had changed their use of technology in response to the Coronavirus pandemic (62% vs 57%) (Figure 23) and slightly more likely to say that they intended to introduce new digital technologies because of the pandemic (Figure 24).

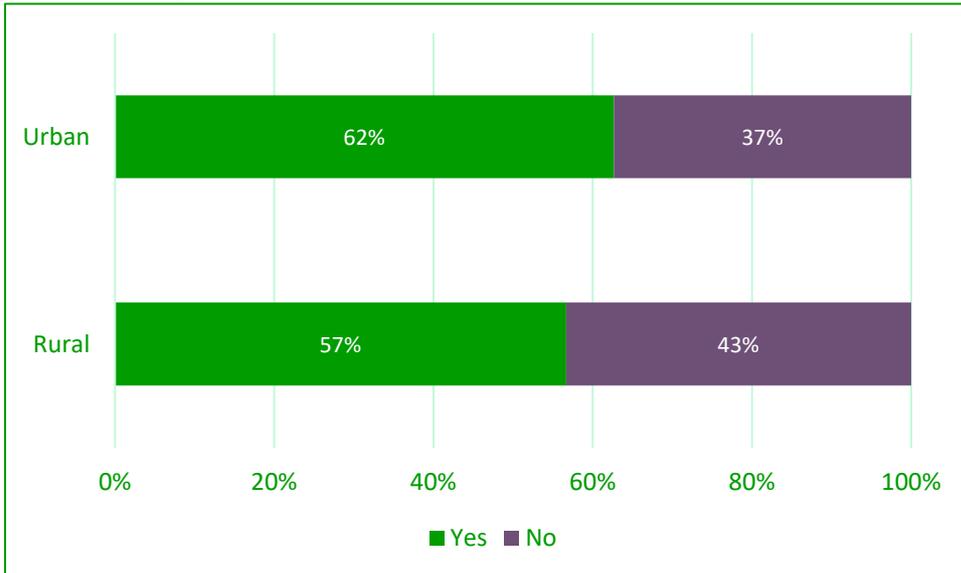
We observe some differences between rural and urban firms in the outcomes of adopting digital technologies that they identify in their businesses. Rural firms are more likely than urban firms to say that sales rose (40% vs 32%) following the adoption of digital technologies, but less likely than urban firms to say that innovation activity increased (33% vs 38%) (Figure 25). Rural and urban firms alike said that their business model had evolved or changed as a result of adopting digital technologies, but rural firms were more likely than urban firms to point to a partial change (51% vs 59%) than a significant change (12% vs 17%) (Figure 26).

Figure 22 Digital technologies currently being used, urban vs rural



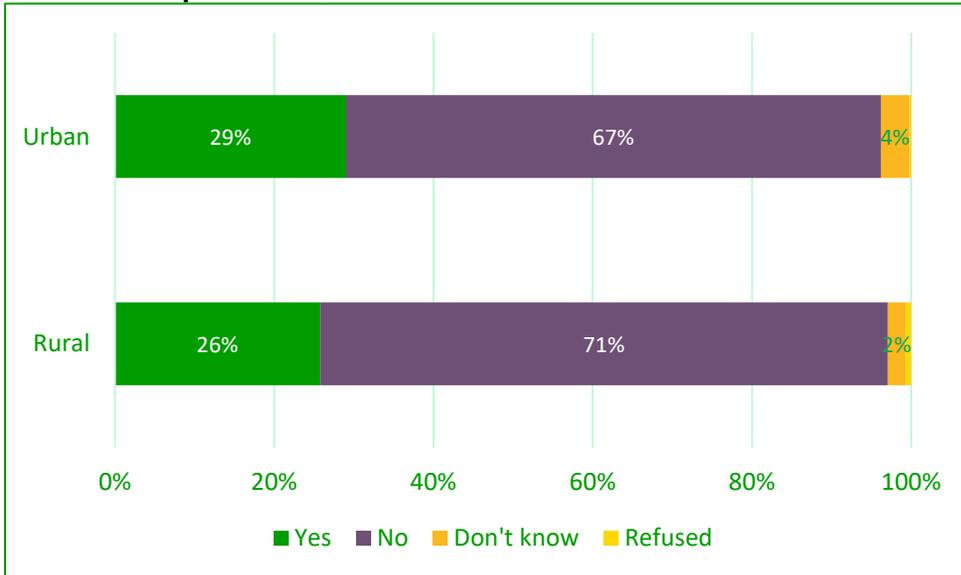
Base: 804 firms. 600 urban, 204 rural

Figure 23 Firms that have made changes to digital technology use in response to Coronavirus, urban vs rural



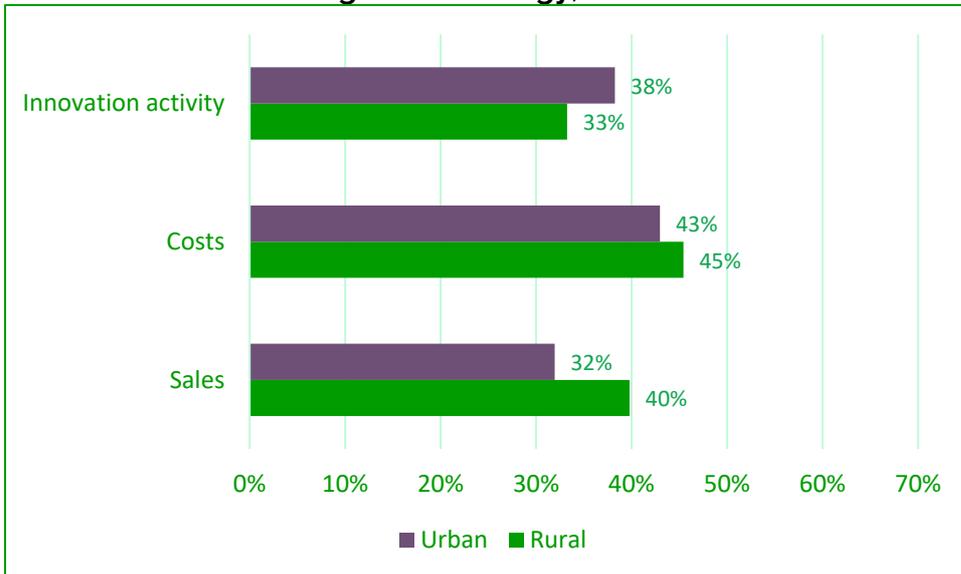
Base: 687 firms. 515 urban, 172 rural

Figure 24 Firms intending to introduce new digital technologies in the light of the Coronavirus pandemic, urban vs rural



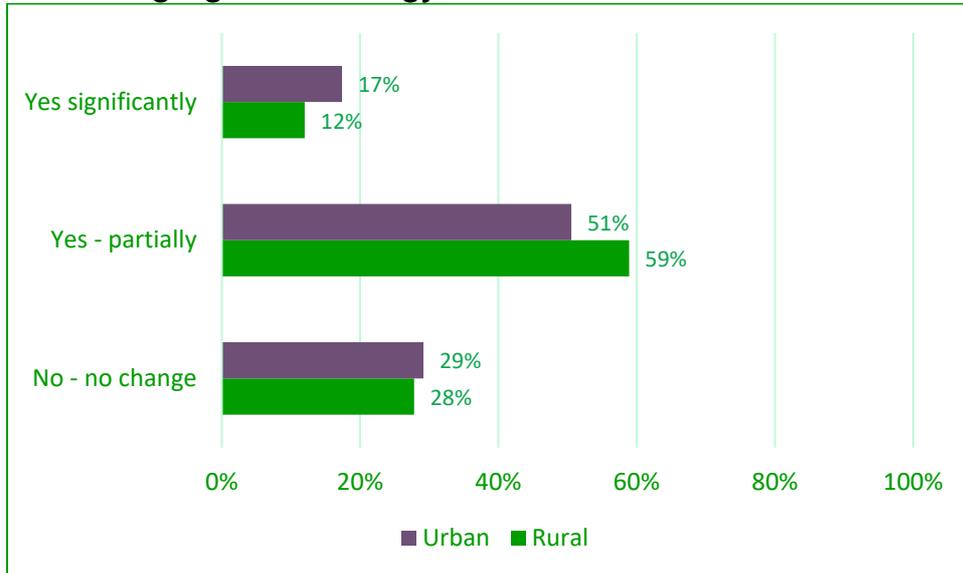
Base: 804 firms. 600 urban, 204 rural

Figure 25 Firms that said innovation activity, costs and sales have increased as a result of the introduction of digital technology, urban vs rural



Base: 743 firms. 555 urban, 188 rural

Figure 26 Extent to which a firm's business model has evolved/changed as a result of introducing digital technology, urban vs rural

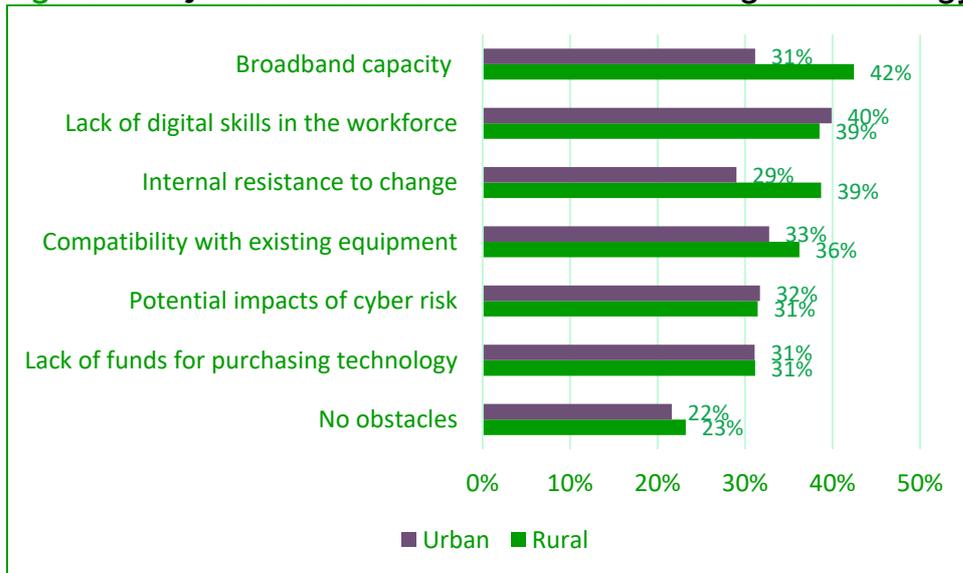


Base: 743 firms. 555 urban, 188 rural

5.3. Obstacles to the adoption of digital technologies

We asked firms to identify the major obstacles they had encountered in their efforts to adopt digital technology. Here, rural firms were considerably more likely to cite broadband capacity (42% vs 31%) as a major obstacle, a statistically significant difference. They were also more likely to cite internal resistance to change (39% vs 29%) as major obstacles (Figure 27) than their urban counterparts.

Figure 27 Major obstacles to the business's use of digital technology, urban vs rural



Base: 752 firms 563 urban, 189 rural

6. Conclusions

Prior research into the adoption of digital technologies has often neglected the small firm context in favour of larger firms. The studies that have focused on small firms advance limited skills and resources as reasons for lower digital adoption in smaller firms (Stankovska, et al, 2016), and often characterise SMEs as engaging in a piecemeal rather than a wholesale way with digital technologies (Moeuff et al, 2018). Decision-making structures that prioritise the firm leader and employee resistance have also been identified as barriers to digital adoption in small firms (Soluk and Kammerlander, 2021). Where small firms have good supply chain links and engage in knowledge sharing (Scuotto et al, 2017) and where they perceive the benefits to outweigh the costs (e.g., Anossi et al, 2019) they are more likely to incorporate these technologies into their business models, and when they do, benefits have been observed, including an increased likelihood of internationalisation (Westerlund, 2020). A recurrent theme of research into rural areas has been the lack of investment in connectivity, particularly relating to high-speed broadband, and this has been seen as a particular disadvantage experienced by rural firms. This study set out to examine differences between rural and urban firms' attitudes towards, and adoption of, digital technologies in the light of the Coronavirus pandemic and the changes in working patterns that have accompanied it.

Our analysis found some clear divergence between attitudes of rural and urban firms towards digital technologies, including key differences which are statistically significant. Rural firms were less likely to assert that they keep up with the latest technologies than urban firms (76% vs 82%) and were more likely to feel that their business could be successful without digital technologies (40% vs 46%). Rural firms were ten per cent less likely to say that they had a digital strategy than their urban counterparts (51% vs 61%). They were also less likely to feel that their innovation relied upon having the latest digital technologies (54% vs 60%).

When it came to adoption of digital technologies, urban firms were more likely than rural firms to have embraced specific digital technologies, notably Computer Aided Design (39% vs 31%), video conferencing (67% vs 58%) and Customer Relationship Management software (CRM) (49% vs 42%). Having adopted digital technologies, both rural and urban firms tended to say that their business model had evolved or changed as a consequence, but rural firms were more likely than urban firms to point to a partial change (51% vs 59%) than a significant change (12% vs 17%). Additionally, after having adopted digital technologies, 33% of rural firms said that their innovation had increased compared to 38% of urban firms. Perhaps most strikingly, when we asked about obstacles to the adoption of digital technologies, rural firms were 11 per cent more likely to cite broadband capacity (42% vs 31%), and ten per cent more likely to point to internal resistance to change (39% vs 29%) than their urban counterparts.

We conclude that there appear to be some underlying differences between rural and urban firms, in their attitudes towards, and adoption of, digital technologies which merit further investigation. In light of the changing working landscape following the Coronavirus crisis, it is more important than ever to understand the barriers to, and enablers of, digital adoption, to ensure that rural and urban firms alike can embrace the technologies that will allow them to work effectively and competitively in the future.

The divergence we have identified between rural and urban firms has implications for policy initiatives aimed at driving digital adoption in UK firms. That rural firms are less likely to have a digital strategy and are more likely to feel that they lack the capabilities to introduce new technologies than urban firms (both statistically significant differences) indicate an important skills gap which has the potential to drive. That a higher proportion of rural firms cite lack of broadband capacity as a major obstacle to digital adoption than urban firms (again a statistically significant difference) indicates that this issue remains problematic, and will need to be tackled for rural firms to be able to embrace digital technologies. That rural firms are less likely than urban firms to say that they keep up with the latest technologies (a statistically significant difference) suggests that rural firms are already falling behind their urban counterparts. Ensuring that policy initiatives acknowledge and address these differences will be vital in ensuring that all firms, rural and urban, have the opportunity, skills and confidence to adopt the digital technologies that will be vital to their future success.

7. A future research agenda

Understanding patterns of digital adoption in UK firms may help to shed light on why the UK currently appears to underperform other industrialized countries when it comes to technology adoption. We note that only 61% of urban and 51% of rural firms in our sample say that have a digital strategy, and while the Coronavirus pandemic appears to have driven more use of digital technologies, more remains to be done if the UK is to catch up with other developed countries. Clearly, further research may allow a more in-depth analysis of attitudes and of barriers to, and drivers for, digital adoption in SMEs in the UK. In addition to this, our analysis consistently points to lower adoption of, and differing attitudes towards, digital technologies in rural firms compared to their urban counterparts, differences which could be examined in future research. We suggest future studies could address:

- **The ways in which rural business leaders' attitudes and perceptions drive digital adoption in their firms.** The role of SME leaders in encouraging their firms to adopt digital technologies has been described (e.g., Anossi et al, 2019) and leaders' perceptions of the usefulness of digital technology have been found to be more potent drivers of digital adoption in SMEs than economic or cost-benefits beliefs (Anossi et al, 2019). Does this connection between leader characteristics and firm adoption of digital technology hold for rural firms?
- **The ways in which external factors work to influence rural firms in their adoption of digital technologies.** Factors that are external to an SME have been found to be less influential in their initial decision to adopt some digital technologies than internal factors. Does this hold for rural firms? We have identified some differences between rural and urban firms but a more in-depth understanding of the ways in which these external influences work for rural firms would allow for more detailed policy recommendations.
- **The link between firm characteristics and the likelihood of adopting digital technologies among rural firms.** Undertaking econometric analysis of the Business

Futures survey data would allow for a more in-depth examination of the association between firm level characteristics and the adoption of digital technologies in rural firms, through regression modelling.

- **The ways in which rural firms experience barriers to digital adoption.** Our study finds that rural firms are 11 per cent more likely to cite broadband capacity and ten per cent more likely to cite internal resistance to change as barriers to digital adoption than their urban counterparts. This marked difference provides a further focus for future research to elucidate the ways in which rural firms experience these barriers.
- **Digital adoption processes in rural firms.** As noted above, digital adoption processes involving a number of incremental stages have already been described in SMEs (e.g., Garzoni et al, 2019; Depaoli et al, 2020). Do these processes adequately reflect the digital adoption journeys of rural firms?

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