Productivity as an Ecosystem

Connecting technology, workplace innovation, sustainability and place in Scotland

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Executive summary

This report reframes regional productivity in Scotland as an ecosystem challenge. It starts from the Scotland Productivity Forum's three-part productivity framework, whose three pillars (technology adoption, workplace innovation and sustainability) this report treats as connected firm-level pathways to productivity (Productivity Institute Scotland Forum, 2025). It then asks what enables those pathways to work in practice. The evidence shows that firms do not encounter technology, skills, housing, transport, finance, business support and net-zero requirements as separate policy domains. They encounter them as one operating environment.

The report draws on a bespoke business survey across five regional categories in Scotland and 44 semi-structured interviews with business leaders, enterprise agencies, regional development bodies and employability organisations. The survey shows that improving productivity or operational efficiency (53%) and growing sales or revenue (51%) were the two most frequently reported business priorities over the previous five years. Economic uncertainty was the dominant reported challenge (69%). When businesses were asked what they would most like to improve, training and development (39%) ranked first, followed by better tools, equipment or digital systems (34%) and access to finance, investment or external business support (32%).

The survey also gives workplace innovation a prominent position. In one set of composite scores built from six-point agreement statements, workplace innovation averaged 4.61, compared with 4.10 for investment and 3.23 for external conditions and structural constraints. In a further set including sustainability, workplace innovation averaged 4.73 and sustainability (a single statement) 4.51, while external conditions averaged 4.07 and investment (two negatively worded statements) 2.91. These descriptive scores do not establish causality, but they show the salience of organisational practice and sustainability within the business responses and provide an important context for the interview evidence.

The interviews explain how these domains intersect. Technology adoption is rarely a technical act alone: firms described it alongside communication, workforce learning, management information and organisational change. Workplace innovation appears in employee voice, leadership development, flexible working and knowledge sharing. Sustainability is described through cost reduction, market positioning, tender requirements and workforce attraction, although one interview also shows how sustainability requirements may become resource-intensive when experienced primarily as compliance.

The regional evidence then moves the analysis beyond the firm level. In the Highlands and Islands, interviewees connected growth opportunities to constraints in workforce availability, housing, business premises and electricity-grid capacity. In the South of Scotland, demographic change, retirement trends, finance and access to land and premises featured strongly in the interviews and published regional strategy evidence (South of Scotland Regional Economic Partnership, 2021) adds connectivity and housing quality. In

West Central Scotland, two Glasgow interviewees described public-sector procurement and funding processes that delayed or failed to deliver work, and competition for skilled staff from larger employers. In Eastern and East Central Scotland, interviewees described specific skills bottlenecks, including welders and fabricators for heat-network infrastructure and the need to develop a Scotland-specific retrofit qualification. The implication is that housing, transport, education and training, energy, digital connectivity, business support and finance can function as productive infrastructure when they determine whether firms can recruit, adopt, adapt and grow.

Five principal findings

- Technology adoption, workplace innovation and sustainability are best understood as interacting productivity pathways rather than separate policy agendas.
- Workplace innovation is a connecting capability: leadership, employee voice, training, knowledge-sharing and organisational learning shape firms' capacity to respond to technological and market change.
- Productivity is partly place-based. Firms depend on labour, housing, transport, skills systems, premises, energy and digital infrastructure that individual businesses cannot provide for themselves.
- The intersection of vertical and horizontal policy matters. Targeted interventions in technology, sectors or firms can be weakened where cross-cutting place-based conditions are absent or poorly aligned.
- Coordination is therefore a productivity capability. National, regional and local institutions need ways of connecting economic development, skills, housing, transport, infrastructure, net zero and enterprise support around the constraints businesses face.

Policy direction

- Treat technology adoption, workplace innovation and sustainability as an integrated productivity agenda.
- Build organisational change, management capability and employee involvement into technology-adoption support.
- Treat relevant social and place-based infrastructure as productive infrastructure, particularly where housing, transport, skills or connectivity constrain labour supply and business growth.
- Organise business support around regional productivity ecosystems, with clearer routes between technology, skills, finance, organisational development and peer learning.
- Build coordination across vertical and horizontal policy into regional productivity governance and monitoring.

1. Introduction: productivity is an ecosystem challenge

Scotland's regional productivity debate often separates policy areas that businesses experience together. Technology adoption can be classified as innovation policy; workplace practices as management or Fair Work; training as skills policy; housing and transport as social or infrastructure policy; sustainability as environmental policy; and business support and finance as enterprise policy. Yet the evidence in this study suggests that the productivity consequences of these domains are interdependent. The Productivity Institute's Productivity Agenda makes a similar argument at national level: it calls for an integrated range of pro-productivity policies coordinated within all levels of government, and it identifies regional productivity differences that have been increasing for some 35 years as a problem requiring institutional reform (The Productivity Institute, 2023).

This report therefore takes the three pillars of the Scotland Productivity Forum's productivity framework (technology adoption, workplace innovation and sustainability) as its starting point but places these within a broader regional productivity ecosystem. The central question is not simply which lever matters most. It is how firm-level capabilities interact with the institutional, social and physical conditions of place, and how policy can support those intersections.

The report makes three contributions. First, it treats technology adoption, workplace innovation and sustainability as connected routes through which businesses seek efficiency, competitiveness, resilience and growth. Second, it extends the analysis beyond the firm to the business ecosystem and productive foundations of place. Third, it frames the policy problem through the intersection of vertical and horizontal policy. In this report, vertical policy refers to interventions targeted at technologies, sectors, organisational capabilities or groups of firms. Horizontal policy refers to the broader conditions that support productivity across sectors, including skills systems, housing, transport, infrastructure, finance and business support institutions. The argument is that productivity outcomes depend not only on the effectiveness of individual interventions, but on how successfully targeted measures align with wider social, institutional and place-based conditions that enable businesses to respond.

1.1 A productivity ecosystem framework

Dimension	Illustrative components	Role in the ecosystem
Firm productivity pathways	Technology adoption; workplace innovation; sustainable business practice	How firms organise, innovate, learn and adapt.
Enabling business ecosystem	Skills and training; finance; business support; colleges and universities; knowledge networks	Connects firms to capabilities and resources that many cannot generate internally.
Productive foundations of place	Housing; transport; digital and energy infrastructure; population and workforce; business premises	Shapes whether workers and firms can locate, connect, recruit and grow.
Coordination capacity	National, regional and local alignment across policy domains	Connects vertical productivity interventions with horizontal place-based conditions.

The framework is not intended as a hierarchy or as a claim that every element has the same effect in every region. Instead, it directs attention to relationships, dependencies and interdependencies. A technology

programme may require specialist skills; skills pipelines may depend on transport and housing; net-zero opportunities may depend on grid capacity; and SMEs may rely on external institutions for knowledge, diagnostic support and leadership development.

1.2 Literature and conceptual background

Recent debate on UK productivity has shifted attention from the performance of leading firms to the diffusion of good practice. Haldane (2018) described the UK's problem as 'hub no spokes', arguing that strong frontier firms have been unable to diffuse productive practices effectively across the wider economy. Similarly, OECD research suggests that productivity slowdowns reflect a widening gap between frontier firms and the rest, highlighting the importance of diffusion processes and the role of public policy in supporting them (OECD, 2015; Andrews, Criscuolo and Gal, 2016). However, the drivers identified by this literature, including skills, management capability, knowledge networks, experimentation, investment and institutional support, point beyond individual firms and towards the wider environments in which firms operate. Diffusion is not simply a matter of transferring successful practices from one organisation to another; it depends on the presence of enabling ecosystems that connect firms to knowledge, skills, finance, infrastructure, and collaborative networks. Scottish research has highlighted both structural weaknesses in productivity performance (Turnbull, Slow and Kenny, 2019; Williams et al., 2025) and the importance of developing productive businesses and regions (Scottish Government, 2022a). This suggests that the key policy question is not only how firms adopt productive practices, technologies, and innovations, but how regional systems of institutions, infrastructure and place-based assets enable firms, particularly SMEs, to adopt, adapt and grow. This perspective provides the rationale for the productivity ecosystem framework developed in this report.

Evidence on technology and productivity points to the importance of organisational complementarities. Brynjolfsson and Hitt (2000) argue that the returns to information technology depend on complementary organisational change and investment, and Bresnahan, Brynjolfsson and Hitt (2002), using firm-level data, find that technology, workplace organisation and the demand for skilled labour are complementary. Management capability also matters: Bloom and Van Reenen (2007) show wide variation in management practices across firms and countries, and an association between better management and firm performance. These studies suggest that technology adoption is better understood as organisational change than as the acquisition of equipment, a premise examined in Section 4.

Workplace innovation refers to organisational practices that seek to improve performance and the quality of working life together, through employee involvement, job design, and learning (Pot, 2011; Totterdill, 2015; Oeij, Rus and Pot, 2017). Its relevance to productivity policy is that it addresses how technology and skills are used in practice. In Scotland, the Fair Work Framework identifies effective voice, opportunity, security, fulfilment, and respect as dimensions of 'good work' (Fair Work Convention, 2016), which provides policy language that overlaps with the workplace innovation concerns of voice, learning and job quality.

Whether sustainability enhances or erodes competitiveness is contested. Porter and van der Linde (1995) argued that well-designed environmental standards can stimulate innovation that offsets compliance costs, while Palmer, Oates and Portney (1995) argued that the evidence does not support a 'no-cost' view and that standards should be assessed against their benefits and costs. In Scotland, the policy framing is a statutory commitment to net zero by 2045, which the Climate Change Plan update presents as offering 'considerable economic opportunities', and links to green jobs and reskilling (Scottish Government, 2020). This debate suggests that the way sustainability is implemented, and not only whether sustainability measures are present, may shape their productivity effects, a question taken up in Section 6.

A further strand concerns place. Barca, McCann and Rodríguez-Pose (2012) make the case for place-based development policy that draws on local knowledge and institutions, in contrast to place-neutral approaches, and Rodríguez-Pose (2013) reviews evidence that institutions matter for regional development. Tödtling and Trippl (2005) show that regions face different innovation-system problems, so uniform innovation policy is unlikely to suit them all. McCann (2016) analyses the UK's spatial disparities in terms of geography, globalisation and governance, Rodríguez-Pose (2018) connects neglected places to political discontent, and the 'levelling up' agenda made such disparities an explicit national policy aim (HM Government, 2022). Ecosystem concepts have been used in related literatures, for example on skills (Finegold, 1999) and entrepreneurship (Stam, 2015), to emphasise interdependence among actors and institutions; Stam offers a sympathetic critique of how the concept is used in regional policy.

The vertical–horizontal distinction used in this report echoes long-standing debates in industrial policy. Rodrik (2004) argues that the central question is not whether to target support but how government and business jointly discover the constraints that bind and coordinate their responses. Together, these literatures suggest that firm-level practices, enabling institutions and place-based conditions interact, but they are often examined separately. This report brings them together using survey and interview evidence from Scotland and treats coordination across vertical and horizontal policy as a distinct productivity capability.

2. Evidence and methodology

The study used a mixed-methods design combining a bespoke business survey, semi-structured interviews, and reflective analytical notes. The research was undertaken in the six ITL2 regions of Scotland, East Central Scotland, Eastern Scotland, Northeastern Scotland, Southern Scotland, West Central Scotland and the Highlands and Islands. The survey covered 102 businesses in these regions and forty-four interviews with businesses and stakeholders were undertaken in the regions.

2.1 Business survey

The survey used multiple-choice, Likert-scale and categorical questions covering business priorities, challenges, investment behaviour, workplace practices, sustainability, and perceptions of external conditions. Respondents were asked for their three main priorities, could select up to three areas for improvement, and could select more than one challenge and effect of challenges. Regional disaggregation was used to explore variation across Scotland. The questionnaire contained 38 questions: three on the respondent and organisation (role level, location and registered company number); four multi-select questions on priorities, challenges, the effects of challenges and areas for improvement; three single-select questions on spending on innovation, training or digital change, expected revenue and cash reserves; and 28 statements rated on a six-point agreement scale from 1 (strongly disagree) to 6 (strongly agree), with 'not sure or not applicable' coded 0. The statements cover workforce practice, fair work, sustainability, external support and collaboration, policy, digital technology, and finance, and were grouped into categories for analysis in two ways (Appendix B). In the first grouping the statements form three categories (workplace innovation; investment; and external conditions and structural constraints); in the second they form four, with sustainability separated out. Category scores are the mean of the responses to the statements in each category; the three negatively worded statements (Q31 to Q33) were reverse scored to give consistency in showing that a higher score always indicates a more favourable position.

The regional categories follow the NUTS 2 (ITL2) areas used by the Scottish Government, with the project's regional overview dividing Eastern Scotland into East Central Scotland (the City of Edinburgh, East Lothian,

Midlothian and Falkirk) and Eastern Scotland (Angus, Dundee City, Clackmannanshire, Fife, Perth and Kinross, and Stirling). The survey dataset records 102 responses with a valid regional location: West Central Scotland (26), East Central Scotland (22), Northeastern Scotland (21), Eastern Scotland (19), and Southern Scotland (14) (Table 1). Question-level response counts range from 102 to 108. The regional subsamples are small, so regional differences are treated as indicative rather than statistically robust. As a guide to the response profile, 66 of the 106 respondents who answered the cash-reserves question could cover at least four months of operating costs, 26 could cover three months or fewer and 14 were unsure or preferred not to say; 75 of the 108 respondents to the revenue question expected revenue to rise over the next 12 months, 12 expected no change and 15 expected a fall. The organisations interviewed are not named. They are cited by anonymised reference (sector and letter, with the region given in the text, for example Manufacturing A, South of Scotland), and short descriptions are given in Appendix A.

Table 1: Survey respondents by region (respondents with a valid regional location)

Region	Respondents	Share of regional total
West Central Scotland	26	25.5%
East Central Scotland	22	21.6%
Northeastern Scotland	21	20.6%
Eastern Scotland	19	18.6%
Southern Scotland	14	13.7%
All with a valid region	**102**	**100%**

2.2 Interviews

Forty-four semi-structured interviews were conducted with business leaders, enterprise agencies, regional development stakeholders, and employability organisations. Purposive sampling sought diversity by sector, business size, ownership, and regional context. Interviewees range from small organisations to exceptionally large contractors. Ownership included an employee-owned firm, a business within a large privately owned group, subsidiaries of national and international groups, and owner-funded or self-funded firms, alongside public and local-authority support bodies. Sectors include construction, food processing, manufacturing, consumer goods, events, occupational health, engineering and the creative industries, and support organisations include regional development, local-authority business support, and employability bodies (Appendix A). The project was guided by an overarching question on how investment, workplace innovation and sustainability practices affect regional productivity outcomes in Scotland, with sub-questions on investment, workplace innovation and sustainability, and attention to infrastructural challenges including housing, skills, population, and transport. Interviews explored investment, workplace innovation, sustainability, and place-based infrastructure. Of the interviews conducted, sixteen are cited in this report which gave the most illuminating insights (Appendix A). The interviews cited lasted from about 40 minutes to just over an hour and took place between October and December 2025. The South of Scotland (Dumfries and Galloway and the Scottish Borders), the area of the development agency interviewed, forms part of the survey region Southern Scotland. Interviews were recorded, transcribed, and coded thematically using NVivo, with coding refined during fieldwork.

2.3 Analysis and integration of methods

The analysis was based in a mixed methods design that seeks to ask questions about connecting parts, segments, or layers of a social whole (Mason, 2006). The survey and the interviews are not used to measure the same thing twice, as in triangulation. They address different layers of the productivity ecosystem set out in Section 1.1: the survey describes what firms across the regions report about their priorities, practices and constraints, and the interviews and reflective notes explain how firm-level capabilities connect to the wider business ecosystem and to place. Mason cautions that this strategy works best when there is a clear model of how the layers connect; here, the ecosystem framework in Section 1.1 provides it. The integration is therefore conceptual and interpretive rather than statistical: the survey cannot evaluate the mechanisms that the interviews describe, and the interviews alone cannot establish how common those mechanisms are (Section 2.4).

Each method was analysed in a way suited to its data. Survey responses were analysed descriptively: the multiple response questions are reported as percentages of respondents, and the twenty-eight agreement statements as category means, compared across regions (Section 3.1 and Appendix B). Because the regional subsamples are small, regional comparisons are indicative. The interviews were recorded, transcribed, and coded thematically (Section 2.2). The interview findings are reported by pathway (Sections 4 to 6) and by place (Section 7), using short quotations and anonymised cases to show how and why firms experience these pathways and constraints.

Reflective notes were used to capture emerging patterns and to compare evidence across methods. In the integrated analysis, the survey identifies reported patterns and priorities; interviews provide explanations of mechanisms and constraints; and reflective notes help identify connections that cut across the original categories.

2.4 Interpretation and limitations

The evidence should be read as a mixed-methods account rather than a causal evaluation. High survey scores for workplace innovation or sustainability do not demonstrate that these practices caused higher productivity, and the category scores are composites of agreement statements whose grouping affects the result (Section 3.1). Likewise, interview cases illuminate mechanisms and constraints but should not automatically be generalised to every firm or region.

3. Findings: Survey evidence – what businesses say they need to become more productive

Sections 3 to 7 present the findings. Section 3 reports the business survey. Sections 4 to 6 draw on the interviews and are organised around the three pillars of the Scotland Productivity Forum framework, treated as firm-level pathways: technology adoption (Section 4), workplace innovation (Section 5), and sustainability (Section 6). Section 7 then moves from the firm to place, using interview and regional evidence on the conditions that shape whether firms can use these pathways. Each section opens by saying what it covers and closes with what the evidence indicates.

3.1 Survey Findings

The survey asked businesses about their priorities, the challenges they faced and the areas they would most like to improve, and about their agreement with twenty-eight statements on workplace practice, external

support, digital technology, finance, and sustainability. Section 3.1.1 reports priorities, challenges, and areas for improvement; Section 3.1.2 reports the agreement statements.

3.1.1 Priorities, challenges, and areas for improvement

The survey indicates that productivity and growth were already central priorities for the participating businesses. Improving productivity or operational efficiency was selected by 53% of respondents and growing sales or revenue by 51% (Figure 1). Investing in staff development or training was selected by 38%, adopting new technologies or digital systems by 31%, developing new products or services by 26%, and enhancing employee wellbeing or workplace culture by 24%. Percentages in this section are calculated on a base of 108 respondents and sum to more than 100% because respondents could select more than one option.

The dominant reported challenge was economic uncertainty, selected by 69%, followed by changing market conditions or customer demands (46%), recruitment, skills shortages or staff retention (35%), policy or regulatory barriers (25%), difficulties accessing appropriate investment or funding (19%), and lack of time or internal capacity (18%; Figure 1). The reported effects included delayed investment, growth or development activity (41% of respondents), reduced profitability (39%), limited capacity to focus on longer-term priorities (31%), reduced capacity to expand, innovate or enter new markets (28%), a stronger focus on short-term survival (26%), difficulty investing in staff development or workplace improvement (24%), and slowed adoption of new technologies or new ways of working (24%; Figure 2).

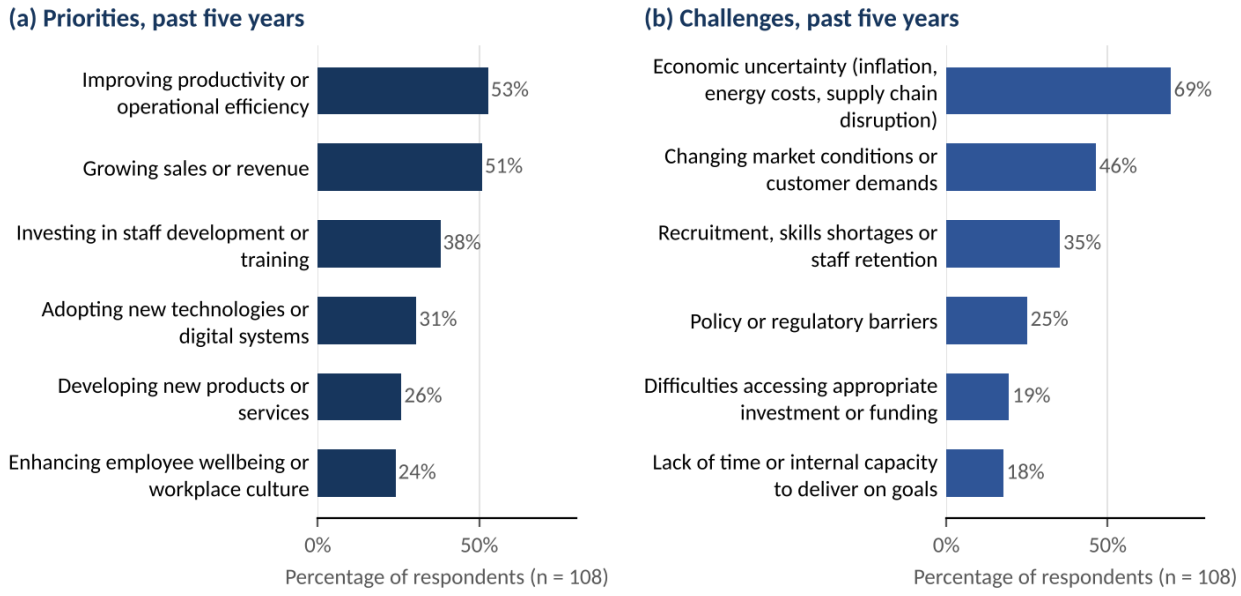


Figure 1: Business priorities and main challenges over the past five years (percentage of respondents selecting each option, n = 108; respondents could select more than one option, so totals exceed 100%). Source: project business survey; percentages calculated from respondent counts.

When asked what they would most like to improve, businesses prioritised training and development (39%), better tools, equipment or digital systems (34%), better access to finance, investment or external business support (32%), improved pay, rewards or benefits (32%), more effective management, leadership and decision-making (30%), and stronger collaboration or partnerships (27%; Figure 2). These responses already point beyond a single productivity lever. Skills, technology, finance, management, and collaboration appear together in firms' own accounts of the capabilities they want to strengthen.



Figure 2: Effects of challenges on ability to achieve goals, and areas respondents would most like to improve (percentage of respondents, n = 108; respondents could select more than one option, with areas for improvement limited to three, so totals exceed 100%). Chart labels are abbreviated from the survey wording. Source: project business survey; percentages calculated from respondent counts.

3.1.2 Workplace innovation and sustainability

Businesses rated their workplace practices favourably. In the first grouping of the 28 agreement statements, workplace innovation had the highest average score (4.61 on the six-point scale), ahead of investment (4.10) and external conditions and structural constraints (3.23), and it was the highest of the three categories in every region shown (Figures 3a and 4a). In the second grouping, which separates sustainability, workplace innovation again scored highest (4.73), followed by sustainability (4.51), external conditions and structural constraints (4.07) and investment (2.91) (Figure 3b); in East Central Scotland, sustainability scored above workplace innovation (Figure 4b). The investment score in the second grouping rests on two negatively worded statements, and the external conditions score in the first grouping includes three, so these scores are reported here but not interpreted further; sustainability rests on a single statement. Appendix B lists the statements in each category. Because the groupings differ, the scores are not comparable across them.

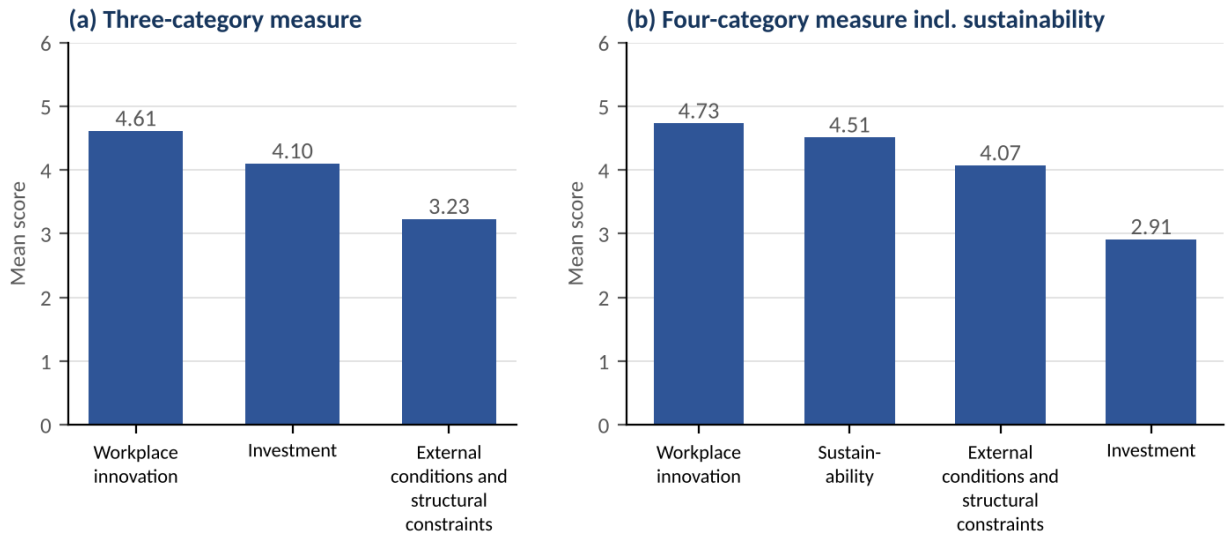


Figure 3: Mean scores by response category on a scale from 1 (strongly disagree) to 6 (strongly agree). (a) First grouping of the twenty-eight statements into three categories (18, 5 and 5 statements). (b) Second grouping into four categories (11, 1, 14 and 2 statements), in which sustainability is a single statement and investment comprises two negatively worded statements. Source: project business survey.

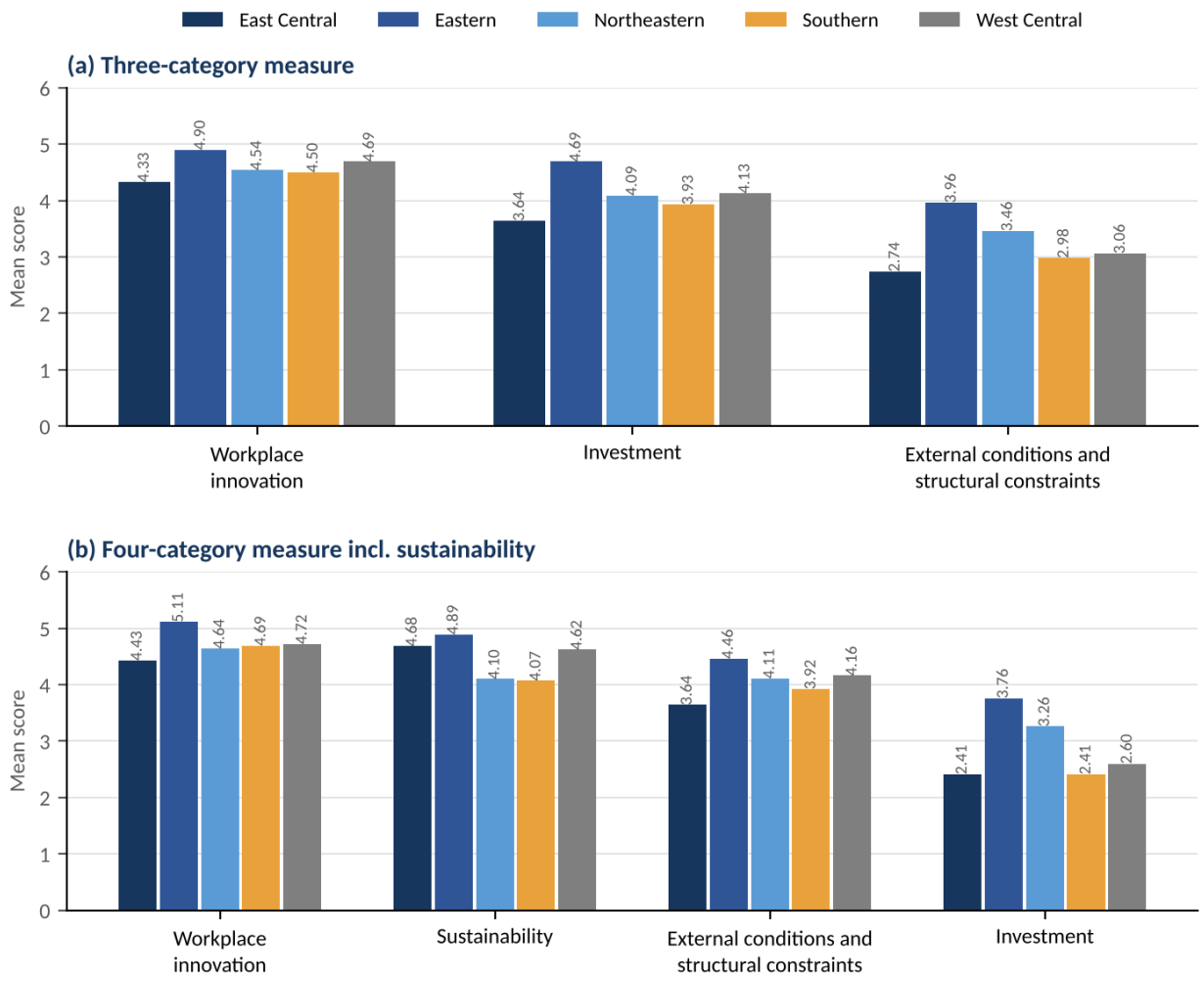


Figure 4: Mean scores by response category and region, for (a) the first grouping and (b) the second grouping of survey statements (Figure 3). Source: project business survey; regional subsamples are small (Table 1).

The interpretation is descriptive and the pattern suggests that workplace innovation, and sustainability as measured by a single statement, are prominent features of respondents' reported practices and perceptions. The interview analysis is therefore important for understanding what those categories mean in organisational life and how they may connect to productivity.

These findings are relevant to the argument of this report in two ways. First, businesses report their workplace practices favourably, with an average score between 'somewhat agree' and 'agree' for workplace innovation, which is why Sections 4 and 5 examine how those practices connect to technology adoption. Second, sustainability, even when measured by a single statement, is also rated favourably; while the survey's most selected challenge was economic uncertainty (69%, Figure 1). The survey therefore shows where firms report capability and what they say constrains them, and the interviews that follow explain what those capabilities and constraints (often) look like in practice.

4. Technology adoption pathway – adoption through organisational change

Technology is a recurring feature of the interview evidence, but the interviews indicate that productivity gains arise not from technology alone, but from the organisational conditions that enable its effective use. Adoption is closely intertwined with workforce engagement, skills development, management capability, and the capacity to reorganise work. This reinforces the view that productivity is the outcome of interacting capabilitie**s**, rather than isolated investments.

An employee-owned food-processing business (Food Processing A, Highlands and Islands) described a £4.2 million investment in automated processing equipment. The account repeatedly linked the equipment to workforce communication, training, and the organisation's employee-ownership structure. Long-serving staff had to understand the case for changing established ways of working, and a partnership council with board voting rights provided a channel for engagement. The significance of the example is not the investment itself but the organisational work surrounding adoption.

An engineering business (Engineering A, Northeastern Scotland) described systems and workflow automation alongside live performance dashboards through which staff could see personal and team performance. The interview framed these systems as a way of strengthening commercial understanding and organisational learning. The same business was developing an internal AI tool with a university partnership to surface knowledge from historical projects and help team members learn more quickly.

Smaller businesses also illustrated the limits to adoption. A medical services business (Medical Services A, Northeastern Scotland) expressed interest in using AI for appointment management but was uncertain about the return, identifying the technology as a considerable additional investment. A business-support stakeholder (Business Support Service A, Northeastern Scotland) described many small firms as focused first on maintaining viable operations ('usually they're trying to keep their front door open'), with basic financial literacy and business fundamentals often preceding more sophisticated technology discussions ('you would never build a house with no foundations').

Implication

Technology adoption should therefore be understood as a socio-technical and organisational process. The capability question is not only whether technology is available, but whether firms have the management knowledge, workforce skills, employee involvement, time, and external support needed to translate technology into changed practice.

5. Findings: Workplace innovation pathway – connective capacity

Workplace innovation provides the strongest connecting theme between the three firm-level pathways of the Scotland Productivity Forum framework. Interviewees described practices that enable organisations to learn, involve employees, adapt roles, and disseminate knowledge. These practices are especially significant because they connect technological adoption to the people and routines through which technology is used.

5.1 Employee voice and participation

Employee voice appeared in the interviews both as formal governance and as everyday team culture. The employee-owned food-processing business (Food Processing A, Highlands and Islands) linked governance, voice, and change. An elected partnership council with representation to board level, together with an annual employee survey, created formal channels for staff involvement; the interviewee described a council that 'sits alongside our senior leadership team,' with elected members holding 'full voting rights' on the board. An engineering interviewee (Engineering A, Northeastern Scotland) used the language of psychological safety to describe the importance of staff being able to surface problems: 'without that psychological safety… you'll never have a high performing team.' In both cases, voice gave staff a way to raise problems and shape change, which is part of the organisational context for the technology adoption described in Section 4.

5.2 Leadership development

Several firms in the Highlands and Islands, East Central and Northeastern Scotland described leadership training as continuing investment rather than an occasional intervention. A food-processing business (Food Processing A, Highlands and Islands) was developing, with the regional enterprise agency, a four-to-five-month programme of group sessions and one-to-one mentoring for production managers who had progressed from the shop floor and were highly competent in the process but 'lacking a little bit in terms of the people management side.' A fast-growing consumer-goods business (Consumer Goods A, East Central Scotland) used executive coaching and external leadership programmes both to strengthen capability and to sustain employee development where promotion opportunities were limited: 'we might bring in an executive coach for somebody more senior,' while filling learning gaps helped to 'keep them engaged and keep them enthused' where there was no space for promotion. An engineering business (Engineering A, Northeastern Scotland) combined apprenticeships, technical certification, and leadership coaching, with entrants taken on 'as young as 16' and supported through a degree. These examples suggest that firms treat management capability as something to build, particularly where managers have been promoted for technical competence, and as a way of keeping people engaged.

5.3 Flexible working and retention

Flexible working was described as a way of keeping a settled workforce, with mixed views on its effect on productivity. A major construction firm (Construction A, Highlands and Islands) described blended working, a shorter finish 'at 3.30 on a Friday' and flexible hours around childcare as part of investment in its workforce, which the interviewee summarised as 'keeping a motivated and settled workforce.' A fast-growing consumer-goods business (Consumer Goods A, East Central Scotland) described varying hybrid arrangements by department rather than applying a single rule: having tried a common three-day office pattern, it moved to arrangements 'on a department basis,' with customer support fully remote and finance and systems in the office one day a week. A design practice (Design Practice A, West Central Scotland) that allowed up to two days a week working from home concluded that 'I don't think that's been effective in terms of productivity' and had introduced a day on which everyone was in the studio, which it described as 'the days that feel the most productive.' Taken together, these accounts show firms adjusting working patterns to retain staff. While the interviews do not settle whether more flexibility raises productivity, it was implied that the two are linked to employee satisfaction and wellbeing, which are likely to enhance their outputs and retention.

5.4 Knowledge sharing

Knowledge sharing took place within large firms and through the wider networks that support smaller ones. A major construction firm (Construction A, Highlands and Islands) used a cross-regional annual conference to share learning across more than twenty constituent businesses: ‘once a year, we’ll have a conference where things come together and we’re sharing learnings.’ A regional development stakeholder (Regional Development Agency A, Highlands and Islands) described peer knowledge diffusion as an important business-support function for an SME-dominated economy, including making firms aware of practices used by comparable businesses: ‘tell your food and drink businesses about what other food and drink businesses are doing.’ These examples illuminate why external networks can substitute, in part, for specialist capabilities that smaller firms cannot maintain internally.

Taken together, the evidence suggests that workplace innovation is not simply a parallel policy strand. It is connective capacity: the organisational means through which firms learn, involve people, and adapt to technological, market and sustainability pressures.

6. Sustainability pathway – a route to productivity, if embedded in operations.

Sustainability appeared in interviews through three core business pathways: operating costs, market position, and workforce strategy. This supports treating sustainability as part of productivity strategy while preserving important variation in how businesses experience it.

6.1 Resource efficiency

In the South of Scotland interviews, energy costs were the route through which sustainability reached operating decisions. A manufacturing business (Manufacturing A, South of Scotland) described a £100,000 solar-panel investment generating around one third of annual electricity, with an estimated five-year payback: ‘a third of our electricity is generated annually by the solar panels’, which ‘are going to be paid off in five years’. A regional development stakeholder (Regional Development Agency B, South of Scotland) described high energy costs after COVID-19 as a route through which firms began to engage more actively with energy use, initially with a sense that ‘we can’t afford this’ and later with ‘a bit more handle on it’. Through these accounts, we find that sustainability affected productivity through operating costs that firms could measure, and act on.

6.2 Market access and differentiation

Sustainability also featured as a requirement for ‘winning work’ and as part of the case for Scottish production. Interviewees in manufacturing and construction (Manufacturing A, South of Scotland; Manufacturing B and Construction B, Eastern Scotland; Construction A, Highlands and Islands) connected sustainability credentials with market differentiation and tendering. A manufacturing business (Manufacturing A, South of Scotland) described sustainability, workforce conditions and other attributes as part of the value proposition supporting Scottish production: if the selling point is ‘made in Scotland,’ ‘you have to give them the full package.’ Construction-sector interviewees (Construction A, Highlands and Islands; Construction B, Eastern Scotland) described carbon commitments and environmental or social criteria as relevant to bids and future work; one said that sustainability is ‘linked directly to work winning,’ and the other that, when bidding, the firm has to ‘produce specific proposals’ on carbon minimisation for big

infrastructure jobs and ‘evidence those things.’ For these firms, sustainability was therefore tied to market access: to compete in bids and to support the value of the products / services they sell.

6.3 Workforce attraction

A third route was through recruitment, The employee-owned food-processing business (Food Processing A, Highlands and Islands) reported that recent graduate applicants had identified the organisation’s environmental and sustainability credentials as one reason for choosing the employer, which the interviewee described as ‘a key reason why we would be an employer of choice,’ something the business had not ‘really appreciate[d]… for quite a while.’ A construction interviewee (Construction B, Eastern Scotland) similarly connected sustainability to attracting younger entrants to the sector, describing environmental and social sustainability as ‘a big driver for them.’ These examples suggest that sustainability credentials can help firms attract and retain younger workers, particularly university leavers. This is particularly important as it ties in with the survey results; at a time when recruitment, skills shortages and/or staff retention was seen as a challenge for 35% of survey respondents (Figure 1), it shows that firms can leverage their (tangible) commitments to sustainability to attract and retain young talent.

6.4 The compliance risk

The evidence also contains a counter-case. A small creative-industries business (Creative Industries A, Highlands and Islands) described public-funding requirements around environment, Fair Work and equality, diversity and inclusion as resource-intensive: in the interviewee’s account, a 12,000-word multi-year funding application devoted around 11,000 words to compliance rather than to the artistic programme. The business also reported that building-efficiency measures at its historic premises had not produced meaningful cost savings: ‘there has been no real cost saving. It’s just cost a lot of money,’ and while the building’s credentials sound impressive in applications, ‘it’s good politically, but it hasn’t actually been good practically.’ This does not negate sustainability as a productivity pathway; it shows why the mode of implementation matters. Strategy embedded in operating models may have different effects from requirements experienced primarily as compliance.

7. Findings: Place - from productive firms to productive places

The firm-level pathways are embedded in places. Businesses depend on workers, housing, transport, education, training, energy, digital connectivity, and premises that no individual employer can fully provide. The data from the interviews suggest that some apparently ‘social’ or ‘infrastructure’ issues have direct productivity consequences when they limit recruitment, adoption, business continuity, or expansion.

For context, GVA per hour worked in 2022 was £38.5 in Scotland, against £39.7 in the UK, and varied widely across the 23 ITL3 areas in Scotland, from £49.0 in the City of Edinburgh and £46.2 in the Orkney Islands to £33.0 in the Scottish Borders and £28.6 in Na h-Eileanan Siar; six areas were above the Scottish average (Williams et al., 2025; The Productivity Institute, 2025). Among the areas discussed below, the figures were £38.3 in Aberdeen City and Aberdeenshire, £36.0 in Glasgow City, £35.9 in Dumfries and Galloway, £33.0 in the Scottish Borders and, in the east, £49.0 in the City of Edinburgh and £34.4 in East Lothian and Midlothian. These figures describe output per hour in each area and do not identify the causes of the differences, which the interview evidence in this section is used to explore.

7.1 Highlands and Islands: opportunity constrained by people and infrastructure.

In the Highlands and Islands, interviewees described large opportunities held back by the availability of people, housing, premises, and grid capacity. A regional development stakeholder (Regional Development Agency A, Highlands and Islands) described population retention and growth as central to the regional economy and linked labour shortages directly to housing availability: businesses had 'offered jobs to people they've come, but they can't stay because they can't find houses. In the same interview, the interview participant argued that the constraint was not a shortage of growth opportunities but a shortage of people available to employ: 'I haven't got the people to employ.' A food-processing business (Food Processing A, Highlands and Islands) described automation and robotics that could be introduced if the existing facility had adequate physical space: 'there's robots, there's automation that we could implement tomorrow if we had… the space.' A construction business (Construction A, Highlands and Islands) identified electricity-grid capacity as a constraint on new housing in some locations: 'you can't build houses because there isn't an electric supply.' Two interviewees referred to potential investment of the order of £100bn in the north of Scotland, and one linked it to the challenge of 'skills and resourcing'. A study reported by Highland Council (2025) counted 251 planned projects with potential investment of up to £100.35bn, about three quarters of it in renewables, and projected around 16,000 jobs at peak construction and development and around 18,000 operational jobs by 2040. Together, these insights show the interdependence of workforce, housing, premises, energy, and business investment.

7.2 Northeastern Scotland: transition, labour competition, and knowledge renewal

Northeastern Scotland interviews combined significant capability and growth experience with labour-market pressure. An engineering business (Engineering A, Northeastern Scotland) described strong recent growth ('three years of growth and three years of pretty healthy profits') but showed concern about changing employer costs and policy pressures, adding that 'this year, I'm not sure that's at all possible.' A business adviser (Business Support Service A, Northeastern Scotland) reported higher salary competition associated with the oil and gas sector, because salaries 'are commanded higher in Aberdeen,' and described how it is 'really hard to get staff,' particularly in rural areas, where 'the connectivity of rural Aberdeenshire is not good' and 'you'd be lucky if you get one bus a day.' The ageing-workforce theme also appeared in neighbouring Eastern Scotland, where a machinery manufacturer (Manufacturing B, Eastern Scotland) described the prospect of substantial accumulated knowledge leaving through retirement, estimating that retirements before the year end could mean 'losing about maybe 140 years of knowledge'. The productivity question is therefore not only sectoral transition but the reproduction, renewal, and movement of skills across the regional economy.

7.3 South of Scotland: demographic, finance, and connectivity pressures

The South of Scotland evidence combines interview accounts of finance, an ageing workforce and young people leaving the region with regional strategy data on connectivity and housing. In the South of Scotland, a regional stakeholder (Regional Development Agency B, South of Scotland) described businesses seeking equipment investment while facing tighter lending conditions: 'the banks aren't lending as much as they used to.' A manufacturing interviewee (Manufacturing A, South of Scotland) described recruiting younger people to 'bring the average age down a bit' and give long-term continuity, 'so we don't have entire departments that just are all going to go overnight.' In the same interview, a job that 'finishes at 1:00 on a

Friday', with no weekend working, was presented as attractive to younger applicants because 'it's certain' and 'you can plan your life'. The regional stakeholder also described expanding firms needing to 'find lands… or property' and an ageing population in which young people leave, for example 'to go to university.' Regional strategy evidence points in the same direction on place conditions: 8% of premises in the South of Scotland were gigabit capable, against 42% across Scotland; 39% of homes in Dumfries and Galloway and 37% in the Scottish Borders failed the energy-efficiency criterion of the Scottish Housing Quality Standard, against 31% in Scotland; and 82% and 87% of commuters respectively travelled by car or van (South of Scotland Regional Economic Partnership, 2021). Together, these reinforce the importance of connecting firm capability with the conditions of place.

7.4 Eastern and East Central Scotland: innovation assets and specific skills gaps

Eastern and East Central Scotland combine strong institutional assets with persistent skills constraints. An employability partnership (Employability Organisation A, East Central Scotland) described a heat-network initiative in Midlothian facing a shortage of welders and fabricators: 'we've got a huge gap in welders and fabricators to put the pipes in,' creating 'a productivity limitation.' A sector-wide example of skills gaps is seen in the retrofit sector, as described by the same partnership (Employability Organisation A). The sector found that it had to develop a Scotland-specific qualification because the available English qualification was not considered suitable for Scottish building stock; the partnership's response was that 'we created a qualification and we got the training provider to create it.' The UK Green Jobs Taskforce similarly reported a shortage of retrofit designers and co-ordinators, with training focused on new-build methods (Green Jobs Taskforce, 2021). Larger organisations in construction (Construction A, Highlands and Islands, as above) and the conference sector (Events Venue A, East Central Scotland) described extensive college, university, business and civic networks as sources of organisational learning. The events venue described a 'very small world' in which 'everybody's having the same challenges' and, because 'we talk openly about it,' organisations help one another to overcome them. Smaller firms more often reported skills, funding, and policy constraints. The evidence here points to specific occupational skills gaps, and to learning networks that larger organisations use more readily than smaller firms.

7.5 West Central Scotland: public-sector demand and competition for talent

The West Central evidence in this report comes from two interviews in Glasgow, so it is illustrative and does not describe the region. Both organisations had relied heavily on public-sector customers and described processes that consumed capacity or failed to deliver work. A design practice (Design Practice A, West Central Scotland), for which more than half of its work was publicly funded, described 'prolonged delays in decision making' in procurement, project planning and project delivery, procurement processes 'that never actually conclude,' and public procurement as 'a massive drain on non-fee earning time.' With more financial headroom, it said, there were things it would like to invest in that 'could give us competitive advantage,' including in the AI and net zero agendas. A digital-health software company (Health Technology A, West Central Scotland) had expected the NHS to collaborate with small firms but found that 'collaboration really didn't exist' and that, on projects running for more than five years, 'there's never enough money to fund it;' it had shifted its commercial focus to health providers other than the NHS. The same company described competition for staff: graduates whom it had sponsored through university would ideally 'at least stay two years before someone offers them double their salary,' which 'has happened a few times' even though it paid above the Glasgow average. Both organisations reported smaller teams than in the past:

the design practice's Glasgow team had fallen from about 27 before 2008 to seven, over several recessions, waves of retirement and rounds of redundancy, and the digital-health company employed nine people, down from 19. In this evidence the binding constraints are the processes and finances of public-sector customers, and competition for skilled staff from larger employers, more than the housing and infrastructure constraints described for the Highlands and Islands.

7.6 Regional variation is not a league table.

The evidence does not support a single ranking of productive versus unproductive places. Instead, it shows different configurations of capability and constraint. In the Highlands and Islands, large investment opportunities depend on people, housing, premises, and grid capacity. In Northeastern Scotland, interviewees described competition for labour, including from higher oil and gas salaries, and difficulty recruiting in rural areas. In the South, the interviews pointed to finance, an ageing workforce and young people leaving, and regional strategy evidence adds connectivity and housing quality. In Eastern and Central Scotland, strong institutional assets sat alongside specific occupational skills gaps. In West Central Scotland, the interviews pointed to the processes and finance of public-sector customers and to competition for staff. This matters for policy design: a standard programme may encounter fundamentally different bottlenecks in a region with tight housing and labour supply than in a region with strong labour access but weak management capability or specialist skills shortages.

8. Where vertical and horizontal productivity policy meet

The central policy implication is that there are advantages to considering vertical and horizontal interventions together. Vertical policy is used here to describe targeted productivity interventions focused on technologies, sectors, capabilities, or types of firms. Horizontal policy refers to cross-cutting conditions that can enable productive activity across sectors and firms, including skills systems, housing, transport, energy and digital infrastructure, finance, and business-support institutions.

The distinction is analytical rather than absolute. Skills policy, for example, can be horizontal when it strengthens broad capabilities and vertical when it is designed for a specific sector or technology. The essential issue is alignment: whether the supporting conditions required by a targeted productivity intervention exist in the places where firms are expected to respond.

Horizontal condition	Technology adoption	Workplace innovation	Sustainability
Education & skills	Technical, digital and adoption skills	Management, leadership, and workforce development	Transition and occupational skills
Business support	Diagnostics, demonstrations, and implementation support	Organisational development and peer learning	Resource-efficiency and transition capability
Housing & transport	Access to specialist labour	Recruitment and retention	Access to emerging green jobs and projects
Finance	Technology and equipment finance	Capability and training support	Transition and resource-efficiency investment
Energy & digital infrastructure	Connectivity and operating capacity	Enables new ways of working and knowledge exchange	Grid capacity and low-carbon transition
Regional institutions	Connect firms to technology and knowledge partners	Diffuse practice across SMEs	Coordinate place-based transition opportunities

This matrix is a policy heuristic rather than a claim that each relationship has been measured. Its purpose is to make dependencies visible and to encourage programme design to evaluate the surrounding conditions as well as the targeted intervention itself.

9. Coordination capacity: a missing productivity capability

The evidence suggests that the challenge is sometimes less the complete absence of policy than the difficulty of connecting policy domains around business and regional needs. These concerns were raised from business-support stakeholders (Regional Development Agency A, Highlands and Islands; Business Support Service A, Northeastern Scotland) about fragmentation and duplication, particularly for SMEs with limited management capacity to navigate multiple schemes. One described new programmes launched 'for political reasons' that leave 'a plethora… of teams with schemes' and 'add to the clutter,' producing 'a very transactional relationship' with businesses; the other described a landscape 'cluttered' with 'a lot of compliance on business to manage.' This matters because a business may simultaneously need skills advice, digital adoption support, finance, leadership development and connections to other firms. The Regional Economic Policy Advisory Group reached a similar conclusion at national level, calling for stronger place-based policy alignment and portfolio coordination across the Scottish Government and noting the strain that complex, short-term funding streams and duplicated reporting place on regions (Scottish Government, 2022b).

Coordination capacity therefore deserves explicit attention in productivity policy. It refers to the ability of institutions to recognise dependencies, sequence interventions and connect national policy ambitions with regional and local conditions. This is especially important where opportunities arising from technology or the net-zero transition depend on skills, housing, transport, planning, energy or premises outside the remit of any single economic-development programme.

A practical coordination test

For each major regional productivity intervention, policymakers and delivery organisations could ask five linked questions:

- What firm-level capability is the intervention intended to strengthen: technology adoption, workplace innovation, sustainability, or a combination?
- What workforce and skills are necessary for firms to respond?
- What place-based conditions are prerequisites, including housing, transport, digital, energy and premises?
- Which institutions provide finance, business support, knowledge and training, and can firms move easily between them?
- Which constraints sit outside the programme's formal remit but could nevertheless limit the productivity outcome?

10. Policy recommendations

Table 2 sets out, for each recommendation, the survey and interview evidence it draws on, and some of the limits of that evidence.

Table 2: Evidence supporting each policy recommendation.

Recommendation	Survey evidence	Interview evidence (report section)	Limits of the evidence
1. Integrate technology adoption, workplace innovation and sustainability	Workplace innovation had the highest mean score in both measures (4.61 and 4.73); training (39%) and tools or digital systems (34%) were the leading areas for improvement (Section 3; Figures 2 and 3).	Technology adopted alongside workforce communication, training and organisational change (Section 4: Food Processing A, Engineering A); sustainability linked to costs, markets and workforce (Section 6).	Survey scores are descriptive composites of agreement statements, and sustainability is measured by a single statement (Section 3.1).
2. Make workplace innovation central to adoption policy	Workplace innovation scored highest of three categories in each displayed region in one measure (Figure 4a); better management and leadership was selected by 30% as an area to improve (Figure 2).	Employee voice, leadership development, flexible working and knowledge sharing (Section 5: Food Processing A, Consumer Goods A, Engineering A, Construction A, Regional Development Agency A).	In the four-category measure, sustainability exceeds workplace innovation in East Central Scotland (Figure 4b). No test of effects on productivity.
3. Treat social and place-based infrastructure as productive infrastructure	Recruitment, skills shortages or staff retention was the third most selected challenge (35%; Figure 1).	Housing, workforce, premises and grid capacity (Section 7.1: Regional Development Agency A, Food Processing A, Construction A); labour competition (7.2); land and premises, and young people leaving (7.3).	Place-based evidence is from interviews and is strongest for the Highlands and Islands. The external conditions score mixes statements on policy, sales confidence and funding (Section 3.1).
4. Build regional skills ecosystems around actual transitions	Training and development were the most selected area for improvement (39%; Figure 2).	Leadership and technical training (Section 5.2); retirements and recruitment of younger workers (7.2, 7.3); Midlothian heat-network welder shortage and Scotland-specific retrofit qualification (7.4: Employability Organisation A).	The heat-network and retrofit examples both come from one organisation.
5. Organise business support around firm journeys, not schemes	Better access to finance, investment or external business support was selected by 32% (Figure 2); difficulty accessing investment or funding by 19% (Figure 1).	Fragmentation, duplication and compliance burden (Section 9: Regional Development Agency A, Business Support Service A); peer knowledge diffusion (5.4); firms focused on survival (Section 4); public-sector procurement and funding processes that absorbed capacity or failed to deliver work (7.5: Design Practice A, Health Technology A).	The evidence on fragmentation comes from two support organisations rather than from firms, and the West Central evidence rests on two interviews.
6. Make technology and AI adoption problem-led	Better tools, equipment or digital systems was selected by 34%, and slowed adoption of new technologies or ways of working by 24% (Figure 2).	Uncertainty about the return on AI (Section 4: Medical Services A); basic financial and business foundations preceding technology (Business Support Service A).	The AI evidence rests on one business and one adviser.

Recommendation	Survey evidence	Interview evidence (report section)	Limits of the evidence
7. Connect sustainability to operating models	Sustainability, measured by a single statement, scored 4.51 in the four-category measure, second to workplace innovation (4.73; Figure 3b).	Energy savings, market access and workforce attraction (Section 6: Manufacturing A, Regional Development Agency B, Construction A and B, Food Processing A); compliance burden as a counter-case (Creative Industries A).	The compliance counter-case rests on one small organisation.
8. Build vertical-horizontal coordination into governance	Indirect only: access to finance, investment or external business support was selected by 32% (Figure 2).	Fragmentation and duplication (Section 9); different binding constraints by region (Section 7).	Conceptual: the Section 8 matrix is a heuristic that has not been measured. Consistent with national reviews (Scottish Government, 2022b; The Productivity Institute, 2023).
9. Develop ecosystem-based regional productivity dashboards	None directly.	None directly; follows from the framework in Section 1.1.	No empirical test. The only baseline data are the ITL3 figures for GVA per hour worked in Section 7.

1. Integrate technology adoption, workplace innovation and sustainability

Scotland's productivity programmes should avoid treating technology, workplace practice and sustainability as self-contained agendas. Technology adoption frequently requires changes in skills, communication, leadership and work organisation; sustainability can alter operating costs, market access and workforce strategy. Programme design and evaluation should therefore identify the organisational changes expected to accompany technical investment or transition.

2. Make workplace innovation central to adoption policy

Workplace innovation should be positioned as enabling capacity rather than an optional management add-on. Support for technology and AI adoption should connect firms to leadership development, employee engagement, training, organisational learning and implementation support. The need is particularly acute for SMEs that do not possess specialist change-management or technology functions internally.

3. Recognise social and place-based infrastructure as productive infrastructure

Where evidence shows that housing, transport, education and training, energy, digital connectivity or premises constrain recruitment and business expansion, these should be treated as part of regional productivity strategy. This does not mean that every housing or transport intervention is justified by productivity. It means that regional productivity assessment should explicitly evaluate whether these systems are binding constraints on productive activity.

4. Build regional skills ecosystems around actual transitions

Regional partnerships between employers, colleges, universities, enterprise agencies and employability organisations should align provision with emerging demand while retaining transferable skills. The Midlothian heat-network example and the development of a Scotland-specific retrofit qualification illustrate why sectoral opportunity must be connected to occupational capability and appropriate qualifications.

5. Organise business support around firm journeys, not schemes

Business support should make it easier for firms to move between technology advice, finance, workforce development, leadership support, sustainability expertise and peer networks. Regional diagnostic approaches and clearer referral routes can help reduce the navigation burden on SMEs. Knowledge diffusion between comparable businesses should be treated as a substantive productivity function, not merely communications activity.

6. Make technology and AI adoption problem-led

The interviews show interest in AI alongside uncertainty about return and capability. Support should begin with specific operating problems and measurable business needs, then assess whether technology is an appropriate response. Demonstration, peer examples, university partnerships and organisational-learning support can help firms assess adoption without treating technology as an end.

7. Connect sustainability to operating models

Productivity policy should support forms of sustainability that connect to resource efficiency, market access, workforce attraction, innovation and resilience, while remaining alert to compliance burdens that may disproportionately affect small organisations. Evaluation should distinguish between embedded changes to the operating model and compliance activity that is additional to it.

8. Build vertical-horizontal coordination into regional productivity governance

Major regional productivity initiatives should include an explicit assessment of dependencies across economic development, skills, transport, housing, planning, energy, net zero and business support. Governance arrangements should identify which institution owns each dependency and how unresolved constraints are escalated. This is particularly important for large transition opportunities where private investment can move faster than enabling infrastructure or workforce development.

9. Develop ecosystem-based regional productivity dashboards

Regional monitoring should combine conventional productivity outcomes with indicators that illuminate the system around them. Alongside output and investment, relevant measures could include technology adoption, management and workplace practices, skills availability, training, housing, connectivity and sustainability. Indicator selection should be parsimonious and based on a clear theory of how each measure relates to the regional productivity ecosystem.

11. Conclusion

The evidence presented here supports a shift in how regional productivity is framed. Productivity is neither solely a property of firms nor simply the outcome of capital investment. It is generated through relationships between firms, workers, institutions and places. Technology adoption, workplace innovation and sustainability provide three powerful pathways through which businesses can change how they operate. Yet each pathway relies on capabilities and infrastructures beyond the boundary of the individual firm.

This is why the intersection between vertical and horizontal policy matters. Targeted support for AI, automation, management or net-zero transition can address real business needs, but the effect will be limited where firms cannot recruit the people they require, workers cannot find appropriate housing or transport, specialist training is unavailable, electricity-grid or digital capacity is inadequate, or business support is difficult to navigate. The relevant unit of analysis is therefore not the programme or firm in isolation, but the productivity ecosystem in which interventions interact.

For Scotland, this reframing has value because regional economies face different combinations of opportunity and constraint. Highlands and Islands interviewees emphasised workforce, housing, premises and grid capacity; Northeastern Scotland evidence highlighted transition, labour competition and skills renewal; South of Scotland evidence pointed to demographic change, recruitment, finance and access to premises, with published regional strategy evidence adding connectivity and housing quality; West Central interviews pointed to public-sector procurement and funding processes and competition for staff; and Eastern and East Central cases showed how innovation opportunities can be checked by specific occupational skills shortages. Place shapes which constraint binds and which combination of policies is likely to be effective.

The Scotland Productivity Forum's three-part productivity framework, built around technology adoption, workplace innovation and sustainability, can therefore be strengthened by adding two further analytical questions: what business and place-based infrastructures enable these pathways, and how well are vertical and horizontal policies coordinated around them? The answer shifts policy attention from isolated levers towards productive relationships. Scotland's productivity challenge is not only to help more firms adopt, innovate and transition. It is to create the institutional and place-based conditions in which they can do so consistently across the country.

References

- The Productivity Institute (2023). The Productivity Agenda. Report No. 001. D. Coyle, B. van Ark and J. Pendrill.
- The Productivity Institute (2025). ITL3 Productivity Dashboard: Scotland.
- Williams, D., Tsoukalas, J., Wessels, B. and Gaska, P. (2025). Scotland's Productivity Challenge: Exploring the Issues. The Productivity Institute, Productivity Insights Paper No. 045.
- Turnbull, J., Slow, J. and Kenny, R. (2019). Sectoral influences on Scotland's productivity performance. Fraser of Allander Economic Commentary, 43(1).
- Scottish Government (2022a). Scotland's National Strategy for Economic Transformation.
- Scottish Government (2022b). Regional Economic Policy Review.
- Fair Work Convention (2016). Fair Work Framework 2016.
- Totterdill, P. (2015). Closing the Gap: The Fifth Element and Workplace Innovation. European Journal of Workplace Innovation, 1(1).

- OECD (2015). The Future of Productivity. OECD Publishing.
- Scottish Government (2020). Securing a Green Recovery on a Path to Net Zero: Climate Change Plan 2018–2032 update.
- Green Jobs Taskforce (2021). Green Jobs Taskforce Report.
- HM Government (2022). Levelling Up the United Kingdom.
- Highland Council (2025). £100bn potential of transformational projects in the Highlands and Islands.
- Andrews, D., Criscuolo, C. and Gal, P.N. (2016). The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy. OECD Productivity Working Papers, No. 5. Paris: OECD Publishing.
- Barca, F., McCann, P. and Rodríguez-Pose, A. (2012). The case for regional development intervention: place-based versus place-neutral approaches. Journal of Regional Science, 52(1), 134–152.
- Bloom, N. and Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. Quarterly Journal of Economics, 122(4), 1351–1408.
- Bresnahan, T.F., Brynjolfsson, E. and Hitt, L.M. (2002). Information technology, workplace organization, and the demand for skilled labour: firm-level evidence. Quarterly Journal of Economics, 117(1), 339–376.
- Brynjolfsson, E. and Hitt, L.M. (2000). Beyond computation: information technology, organizational transformation and business performance. Journal of Economic Perspectives, 14(4), 23–48.
- Finegold, D. (1999). Creating self-sustaining, high-skill ecosystems. Oxford Review of Economic Policy, 15(1), 60–81.
- Haldane, A. (2018). The UK's Productivity Problem: Hub No Spokes. Speech at the Academy of Social Sciences Annual Lecture. London: Bank of England.
- McCann, P. (2016). The UK Regional–National Economic Problem: Geography, Globalisation and Governance. Abingdon: Routledge.
- Mason, J. (2006). Six strategies for mixing methods and linking data in social science research. Real Life Methods Working Paper, July 2006. Manchester: University of Manchester (ESRC National Centre for Research Methods).
- Oeij, P.R.A., Rus, D. and Pot, F.D. (eds) (2017). Workplace Innovation: Theory, Research and Practice. Cham: Springer.
- Palmer, K., Oates, W.E. and Portney, P.R. (1995). Tightening environmental standards: the benefit-cost or the no-cost paradigm? Journal of Economic Perspectives, 9(4), 119–132.
- Porter, M.E. and van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. Journal of Economic Perspectives, 9(4), 97–118.
- Pot, F.D. (2011). Workplace innovation for better jobs and performance. International Journal of Productivity and Performance Management, 60(4), 404–415.
- Productivity Institute Scotland Forum (2026) 'Research in Practice: the Scotland Productivity Forum Approach. The Productivity Institute. https://www.productivity.ac.uk/news/research-in-practice-the-scotland-productivity-forum-approach/ 'Rodríguez-Pose, A. (2013). Do institutions matter for regional development? Regional Studies, 47(7), 1034–1047.
- Rodríguez-Pose, A. (2018). The revenge of the places that don't matter (and what to do about it). Cambridge Journal of Regions, Economy and Society, 11(1), 189–209.
- Rodrik, D. (2004). Industrial Policy for the Twenty-First Century. KSG Working Paper No. RWP04-047. Cambridge, MA: Harvard University.
- South of Scotland Regional Economic Partnership (2021). South of Scotland Regional Economic Strategy: Inclusive Growth Evidence Base. Dumfries and Galloway and Scottish Borders: South of Scotland Regional Economic Partnership, July 2021.

- Stam, E. (2015). Entrepreneurial ecosystems and regional policy: a sympathetic critique. European Planning Studies, 23(9), 1759–1769.
- Tödtling, F. and Trippl, M. (2005). One size fits all? Towards a differentiated regional innovation policy approach. Research Policy, 34(8), 1203–1219.

Appendix A: Interview participants and reference identifiers

This appendix lists the interview participants cited in the report by anonymised reference. References combine a sector label and a letter; descriptions are deliberately general to protect anonymity.

Reference	Region	Description	Cited in section
Creative Industries A	Highlands and Islands	Small creative-industries organisation, heavily dependent on public cultural funding; operates from a historic building.	6.4
Food Processing A	Highlands and Islands	Medium-sized, wholly employee-owned food processor supplying one major retail customer.	4, 5.1, 5.2, 6.3, 7.1
Construction A	Highlands and Islands	Regional business within a large, privately owned construction group of more than 20 businesses; public- and private-sector clients.	5.3, 5.4, 6.2, 7.1, 7.4
Regional Development Agency A	Highlands and Islands	Public economic and community development agency covering the north of Scotland.	5.4, 7.1, 9
Construction B	Eastern Scotland	Very large construction contractor with significant public-sector procurement exposure.	6.2, 6.3
Manufacturing B	Eastern Scotland	Large manufacturer of industrial machinery, part of an international group and selling in over 100 countries.	6.2, 7.2
Employability Organisation A	East Central Scotland	Employability and skills partnership collaborating with the local authority, colleges and universities in the city region.	7.4
Consumer Goods A	East Central Scotland	Fast-growing consumer-products business trading internationally; B Corp certified.	5.2, 5.3
Events Venue A	East Central Scotland	Large conference and events venue in the capital, now financially self-sufficient.	7.4
Medical Services A	Northeastern Scotland	Small-to-medium-sized occupational health and medical services business; growing.	4
Business Support Service A	Northeastern Scotland	Local-authority business advice service for start-ups and existing, mostly small, businesses.	4, 7.2, 9
Engineering A	Northeastern Scotland	Medium-sized engineering, procurement and construction company; self-funded.	4, 5.1, 5.2, 7.2
Manufacturing A	South of Scotland	Small-to-medium-sized textile manufacturer with a long-serving local workforce.	6.1, 6.2, 7.3
Regional Development Agency B	South of Scotland	Economic development agency for the South of Scotland.	6.1, 7.3
Design Practice A	West Central Scotland	Multidisciplinary design practice with studios in several UK cities and a team of about 40 across the UK; more than half of its work is publicly funded.	5.3, 7.5
Health Technology A	West Central Scotland	Small digital-health software company; formerly dependent on the NHS as its main customer.	7.5

Appendix B: Survey statements and groupings

This appendix lists the 28 agreement statements in the survey and the category to which each was assigned in the two groupings used in Section 3.1.2. Respondents rated each statement from 1 (strongly disagree) to 6 (strongly agree), with 'not sure or not applicable' coded 0. Item numbers follow the survey question map.

Item	Statement	First grouping	Second grouping
Q7	People can do their jobs well with the tools and equipment available	Workplace innovation	Workplace innovation
Q8	People have the knowledge and skills they need to do their work	Workplace innovation	Workplace innovation
Q9	People can easily access the training and support they need to do their work well	Workplace innovation	Workplace innovation
Q10	People can adapt and try new ways of working when needed	Workplace innovation	Workplace innovation
Q11	Social and environmental responsibility (e.g. fair supply chains, supporting local communities, sustainability goals) are part of everyday working practices	Workplace innovation	Sustainability
Q12	People have a voice about what is happening in the business and are listened to	Workplace innovation	Workplace innovation
Q13	Everyone is paid at least the Real Living Wage	Workplace innovation	Workplace innovation
Q14	People have secure employment contracts and predictable work patterns	Workplace innovation	Workplace innovation
Q15	We have effective resources and practices to support people's health and wellbeing	Workplace innovation	Workplace innovation
Q16	We know where to go to access external support or funding for our priorities	Investment	External conditions and structural constraints
Q17	Previous external support (e.g. funding, advisory services) helped us make a measurable difference	Investment	External conditions and structural constraints
Q18	We actively collaborate with other organisations/businesses to achieve our goals	Workplace innovation	External conditions and structural constraints
Q19	We would benefit from stronger external partnerships	Workplace innovation	External conditions and structural constraints
Q20	We are confident in the government policies and regulations that affect our business	External conditions and structural constraints	External conditions and structural constraints
Q21	We actively collaborate with universities or other educational institutions to achieve our goals	Workplace innovation	External conditions and structural constraints
Q22	We have a clear strategy for adopting new digital technologies	Workplace innovation	Workplace innovation

Item	Statement	First grouping	Second grouping
Q23	We have the resources to invest in new digital tools and systems	Investment	External conditions and structural constraints
Q24	We have the skills and capacity needed to make effective use of digital tools	Workplace innovation	External conditions and structural constraints
Q25	Effective training is available to employees to use new digital technologies	Workplace innovation	Workplace innovation
Q26	Digital technology helps people do their work more easily	Workplace innovation	Workplace innovation
Q27	We understand any industry-specific requirements or constraints in using new digital technologies	Workplace innovation	External conditions and structural constraints
Q29	We have the financial confidence to invest in its future.	Investment	External conditions and structural constraints
Q30	We are confident we will meet our sales targets in the next 12 months	External conditions and structural constraints	External conditions and structural constraints
Q31	Concerns about access to funding or finance have limited our investment plans (negatively worded)	External conditions and structural constraints	Investment
Q32	Uncertainty about the future has affected our ability to plan or invest (negatively worded)	External conditions and structural constraints	Investment
Q33	We are concerned about current economic conditions (e.g. inflation, supply chain disruption, costs of energy). (negatively worded)	External conditions and structural constraints	External conditions and structural constraints
Q34	There are good opportunities available for our business to invest and grow	Investment	External conditions and structural constraints
Q39	We have effective strategies in place, to adhere to government policies and regulations that affect our business	Workplace innovation	External conditions and structural constraints