

Boundary work in the regional innovation policy mix: SME digital technology diffusion policies in Wales

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Abstract

In recent decades, research has begun to examine the concept of the regional policy mix and its implications for regional innovation. While this has highlighted the role of interactions between multilevel policy instruments and the potential for duplication and synergies, it has tended to underplay the contribution of policy actors to managing such policy mix processes. This paper seeks to add to this literature by introducing the concept of boundary work, viewing it as a form of agency practice seeking to create, maintain, and disrupt instruments within the policy mix. Through a case study of digital technology diffusion instruments in Wales (UK), this paper examines the actors, practices, and effects of boundary work in the regional policy mix. The findings show that boundary work can help manage tensions in the policy mix through anticipatory practices but that complexity and uncertainty in the regional innovation policy mix present ongoing challenges to policymakers.

Key words: boundary work; policy mix; policy instruments; agency practices; digital diffusion.

1. Introduction

The regional innovation literature has begun to explore the concept of the policy mix and its implications for regional development objectives (Caloffi et al. 2022; Flanagan et al. 2011; Magro et al. 2014). This has drawn attention not only to the multilevel nature of such mixes and their potential to produce synergies but also to tensions and trade-offs between objectives, policy instruments, and target groups. The governance and functioning of policy mixes have been identified as being important in generating coherence and effectiveness (Flanagan and Uyarra 2016; Magro and Wilson 2019). Questions have been raised, however, as to whether the complex nature of policy mix interactions surrounding innovation can be managed in practice, given the complexity of policy rationales and mechanisms present in regional innovation policy (Flanagan et al. 2011; Magro and Wilson 2019).

Despite the recognition of the importance of policy mixes in supporting innovation at the regional level, the presence of policy mix interactions has been largely treated as somewhat inevitable, with little or no role allocated to actors in managing such processes. Here, the wider regional literature on innovation path development has begun to explore the role of actors such as policy officials, firms, and civil society in managing the functioning of regional innovation systems (Grillitsch and Sotarauta 2019; Sotarauta 2018; Uyarra et al. 2017). This has examined agency through the lens of entrepreneurial and change agencies, as well as agencies focusing on the maintenance and reproduction of structural arrangements (Bækkelund 2021; Grillitsch and Sotarauta 2019; Henderson 2020b; Jolly et al. 2020). Although this highlights the potential for agency to shape regional development, it tends to view interactions between actors from the perspective of collective processes of knowledge transfer (e.g. entrepreneurial discovery processes) and path or place

development activities, rather than the management of policies themselves. To build on this literature, this paper draws on the concept of boundaries and boundary work from the organisational studies literature (Gieryn 1983; Helfen 2015; Lamont and Molnár 2002; Zietsma and Lawrence 2010). This views boundaries as socially created distinctions that categorise people and activities, shaped by material and discursive processes, and provide the basis for actors to acquire status and retain access to resources (Lamont and Molnár 2002; Zietsma and Lawrence 2010). In regional innovation policy, such boundary distinctions exist not only between different rationales for policy (economic, social, energy, and education policies targeting innovation) and administrative levels of policy (supranational, national, and regional) but also between instruments and actors (policymakers, firms, and knowledge providers). Boundary work represents a purposive practice undertaken by human actors to manage boundaries, as they seek to create, maintain, and disrupt activities (Gieryn 1983). This has been identified as an agentic practice that can help create, manage, and disrupt institutional activities through competitive and collaborative practices (Langley et al. 2019; Zietsma and Lawrence 2010).

The purpose of this paper is to examine how regional policy actors such as policymakers, firms, and civil society may be able to employ boundary work practices to manage policy instruments in the regional policy mix. It finds boundary work to be a place-based multi-actor and multi-scalar process with actors from within and outside policy boundaries seeking to create, maintain, and disrupt both boundaries and regional policy outcomes. This, it argues, illustrates how actors employ discursive and negotiative processes to shape distinctions between regional policies in the policy mix but that this may not always succeed to address mixed tensions. These practices can help support the legitimacy of

policy instruments but that policy boundaries, rather than being stable, are in constant flux. This paper illustrates these arguments empirically through case evidence from regional innovation policies for the diffusion of digital technologies to Small and Medium Enterprises (SMEs) in Wales (UK)¹. Such policies form part of an emerging policy agenda to support digital technology innovation, adoption, and economic development at the regional level (Bailey and De Propris 2019).

2. Literature review

2.1 Regional innovation policy mix interactions

Although boundaries have yet to be given extensive attention in the regional innovation policy literature, several concepts have been developed, which allude to their potential importance. The regional innovation policy mix literature draws attention to the potential for interactions to emerge amongst both new and extant policy instruments within a regional setting (Caloffi and Mariani 2017; Flanagan et al. 2011; Magro and Wilson 2013). Here, the policy mix refers to the multiple instruments that may seek to target a particular objective (Okamuro and Nishimura 2021; Radicic and Pugh 2017). Despite examples of deliberately designed mixes (Caloffi et al. 2022), for the most part, they represent a mix that has evolved over time, as new policies become layered on top of existing policies (Streck and Thelen 2005; Uyarra et al. 2017). The innovation policy mix at the regional level is one that has added complexity as different forms of policy instrument (research and development, finance, networking support, cluster building, etc.) interactions can emerge across multiple levels of innovation policy (Magro and Wilson 2019). Moreover, by adopting a policy instrument focus to interactions, this literature provides a broader perspective, beyond the interaction of actors, to include interactions between policy rationales, objectives, and outcomes that collectively help to shape policies within a domain (Enroth 2011; Marsh and Smith 2016).

The regional policy mix literature highlights the importance of coherence and effectiveness in their outcomes (Rogge and Reichardt 2016). These characteristics can, however, be undermined by conflict and tensions between goals, instruments, delivery approaches and policy domains (Matti et al. 2016). This may include instances of policy fragmentation that may harm the functioning of the innovation system (Tödtling and Trippl 2005). It may also create duplication and overlapping policy activity, with tensions and synergies arising between policy instruments and goals in their implementation (Flanagan et al. 2011; Magro and Wilson 2019).

How such policy mixes can be managed by actors, however, has primarily been examined through the lens of coordination (Braun 2008; Magro et al. 2014). Research here has highlighted the importance of both horizontal and vertical coordination mechanisms to manage the multilevel and multidimensional nature of regional innovation policy mix interactions (Guzzo and Gianelle 2021; Magro et al. 2014). Such interactions and associated mechanisms have been described as ‘the hidden face’ of innovation policy, representing a particularly complex challenge for policymakers with multiple modes of coordination often present at the regional level, with agents operating independently within a policy

setting (Magro et al. 2014: 367). Studies have highlighted mechanisms to support these processes, including policy intermediary institutions such as clusters, platforms, thematic working groups, or forums with a remit to support policy processes such as entrepreneurial discovery (Guzzo and Gianelle 2021; Perianez Forte and Wilson 2021). For the most part, however, the nature of policy mix interactions is primarily examined through formal structures and mechanisms (Henderson and Roche 2019; Söderholm et al. 2019).

The prospects for such mechanisms to address synergies and tensions resulting from multilevel and multidimensional regional innovation policy mixes remain open, with some arguing that additional coordination mechanisms may actually lead to greater complexity within a policy mix, potentially ‘in an infinite regress’ (Flanagan et al. 2011: 710). Others have argued that there are dangers that such ‘network management’ may be rendered ineffective as a result of differing levels of power and responsibilities amongst government agencies (Söderholm et al. 2019). Perhaps, the main weakness of the regional policy mix literature, however, is its treatment of actors and agency, with studies tending to present instrumental and technocratic treatments of innovation policy mix interactions. This offers limited agency for actors to manage the interface between regional innovation policy instruments in a less formal manner. That is, while the wider regional innovation literature has begun to pay growing attention to the role of agency in regional path development (Uyarra et al. 2017), the contribution of actors to managing policy mixes, with their attendant possibilities for tensions and synergies to emerge, remains underdeveloped. A better understanding of how policy actors may use their agency in such policy mixes to manage tensions and synergies over time is therefore needed.

2.2 Boundaries and boundary work

The growing attention given to boundaries in the wider social science literature has seen the introduction of a range of different concepts such as ‘boundary crossing’ (Kilpatrick and Wilson 2013) and ‘boundary spanning’ (Conteh and Harding 2023; Kislov et al. 2017; Knorr 2020), with a focus on actors and mechanisms for accessing and transferring knowledge across organisational boundaries. Such conceptualisations tend to treat boundaries as fixed entities. In contrast, boundary work seeks to place more emphasis on the boundary itself and the agency work that may be associated with creating, maintaining, and disrupting distinctions between groups and activities (Helfen 2015; Zietsma and Lawrence 2010). This literature conceptualises boundaries as social demarcations between activities and groups that are supported by discursive practices that underpin such distinctions (Bowker and Star 2000; Lamont and Molnár 2002). In this way, boundaries can ‘demarcate the external limits of the organization legally and financially; and mark the organization’s span of control’ (Llewellyn 1998: 23). Boundaries themselves have also been found to have rhetorical and symbolic dimensions (Lamont and Molnár 2002). This is reflected in arguments in favour or against a demarcation (rhetoric) and objects, functions, and processes that sustain the ideas underpinning the demarcation (Gieryn 1999).

In the science legitimacy literature, for example, scholars have examined boundaries between scientific communities

and other forms of knowledge and expertise and the role of boundary work to create narratives in support of the characteristics of science (and non-science), alongside material functions and practices such as journals, conferences, and experimental spaces to create new ideas (Bowker and Star 2000; Cartel et al. 2018; Gieryn 1999). Such work presents boundaries as contested spaces in which different actors and discursive practices come together to justify or challenge their position in relation to the boundary. It may be undertaken by individuals or collective groups to shape boundaries and enable actors to maximise prestige and resources or challenge power relationships (Helfen 2015; Langley et al. 2019; Llewellyn 1998). It can also help manage interactions between competing domains, by managing conflict, challenging, and sustaining boundaries (Langley et al. 2019; Zietsma and Lawrence 2010). This may include actors seeking to shield activities from external influence by establishing ties with challengers in a range of fields such as professional associations, health care, and academia where demarcations are prevalent (Bucher et al. 2016; Helfen 2015). While such practices may succeed to manage boundary tensions, they may also fail to manage such incursions and for challengers to destabilise extant activities (Fligstein and Mcadam 2011).

Three forms of boundary work are identified in the literature: creation, maintenance, and disruption (Zietsma and Lawrence 2010). Agency activities oriented towards boundary *creation* represent entrepreneurial practices seeking to protect autonomy, monopolise authority, and gain access to resources and prestige (Gieryn 1983). Such work can enable the creation of boundaries through narratives in support of the legitimacy of activities (Bucher et al. 2016). This represents a discursive process in which the normative basis of a boundary is developed to frame and justify activities, but in doing so, it is accompanied by efforts to frame and problematise the activities of actors outside boundaries (Bucher et al. 2016; Järvinen and Kessing 2021). Boundaries, once created, require *maintenance*. Such practices have been examined in relation to sustaining boundaries and have been identified as a practice seeking to deter change through formal rules such as corporate status and control over economic production or policy (Lawrence et al. 2009). Boundary work may also adopt a more collaborative approach in seeking to produce synergies, with a focus on joint working with other actors outside of a boundary (Landau 1969; Langley et al. 2019). *Disruption* of boundaries can occur when other actors seek to challenge the legitimacy of a boundary arrangement (Zietsma and Lawrence 2010). This may be motivated by unequal access to resources and privilege, with practices oriented towards undermining the justification and beliefs associated with a particular boundary (Lamont and Molnár 2002).

Boundary work can therefore add to the literature examining regional innovation policy and path development (Flanagan et al. 2011; Grillitsch and Sotarauta 2019) by focusing on the role of agency work in shaping policy boundaries and managing synergies and tensions in the regional policy mix. It suggests that a wide cast of actors may seek to shape boundaries (Gieryn 1983) and that this work may be targeted at the underpinning rhetorical (e.g. policy rationales) and symbolic (policy instruments) elements of a policy mix and that boundary work may provide a mechanism by which the coherence

and effectiveness of regional innovation policy mixes may be improved.

2.3 Theoretical framework

This paper seeks to explore the forms of boundary work that operate in the regional policy mix through a theoretical framework (Fig. 1). It draws on complementary literature: the regional innovation policy mix, actors and agency in regional innovation processes, and the boundary work literature.

Following extant studies on the regional innovation policy mix (Caloffi and Mariani 2017; Flanagan et al. 2011; Magro and Wilson 2019), the framework situates regional innovation policy mixes (1) in a wider multilevel policy mix setting (2), with the potential for policies outside the region to interact and add to the complexity of the regional policies and associated boundary work. Within such regional policy mix space, multiple policy instruments may be present, each of which is composed of rationales, delivery mechanisms, and targets (3). These elements distinguish policies from others in the regional innovation policy mix and produce mixing between policies as they seek to reach their objectives (Flanagan et al. 2011).

Boundary work is highlighted as a practice that forms an integral part of the design and implementation of a regional innovation policy instrument (as denoted in the case of policy instrument (A)). In this respect, each policy instrument is characterised by a boundary and may interact with multiple policy boundaries within a regional innovation policy mix setting (as denoted by policies B–D). Such boundary work can be undertaken by policymakers engaging in regional policy processes alongside business and civil society (4) as highlighted in studies of the regional innovation policy process (Uyarra et al. 2017). Based on the boundary work literature, such practices may include activities seeking to create, maintain, and disrupt boundaries (5) (Gieryn 1983; Zietsma and Lawrence 2010). Such boundary work is oriented towards the rhetorical and symbolic elements of policies within the regional innovation policy mix. Furthermore, the two-sided nature of boundaries suggests that boundary work may be undertaken by actors within policy boundaries (e.g. actors responsible for a policy instrument) and those seeking to introduce complementary or competing policy instruments (Helfen 2015).

These interactions (6) may produce effects in the form of synergies and tensions between policies and help shape regional innovation policy outcomes (7). Such interaction processes may result in synergies and tensions and may present both challenges and opportunities for boundary work agency to secure alignment and address potential duplication. Equally, they may present the potential for such interactions to produce learning through boundary work interaction, which may influence the operation and the results achieved by an instrument.

The theoretical framework seeks to add to the extant framing of research on the policy mix by highlighting the social foundations of such mixes and their outcomes. In doing so, the framework offers the potential to better understand whether policy mixes can be managed in multilevel settings. Three forms of boundary agency are identified (creation, maintenance, and disruption) in the framework, with these forms of agency work seeking to influence policy rhetoric in the form of rationales, as well as symbolic elements such as policy

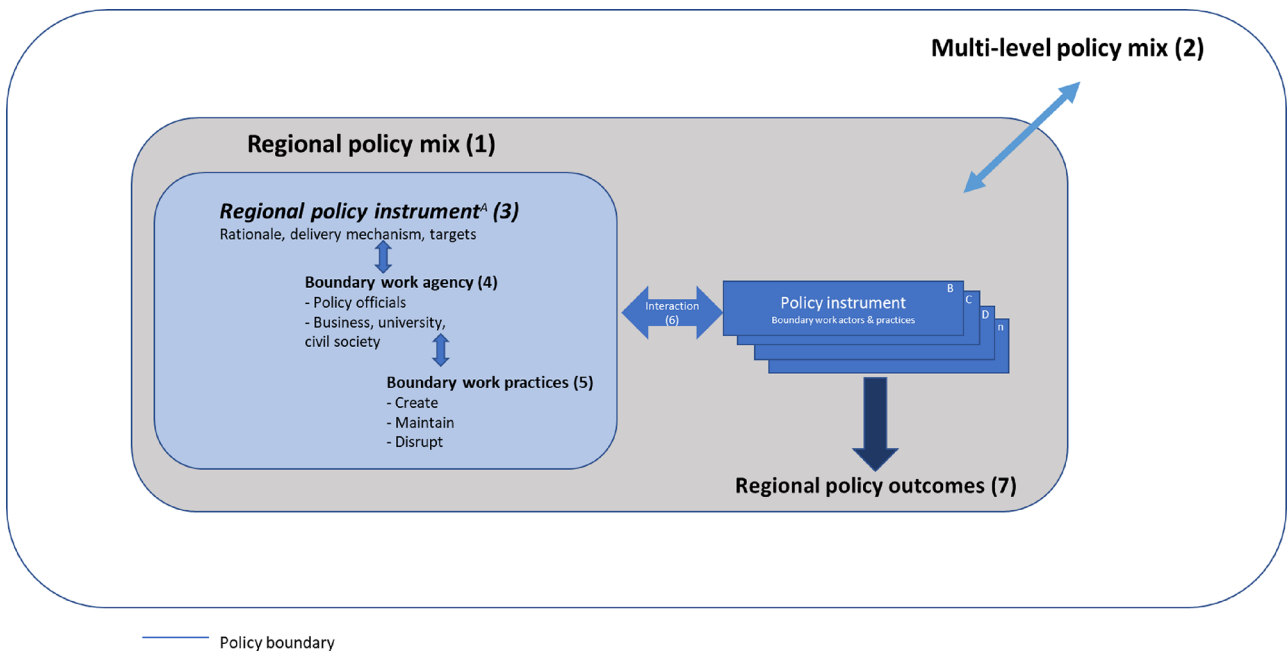


Figure 1. Theoretical framework.

Source: Author elaboration.

mechanisms. The effect of such work is further conceptualised as having the potential effect of shaping synergies and tensions as policies interact in the policy mix. The framework, therefore, adds to the boundary work literature by highlighting the multilevel nature of this work in a policy setting and situating this as a purposive part of the management of policy mixes. The ultimate balance of these practices and their success can therefore help understand the potential for complex policy mixes to be managed and regional policy outcomes achieved.

3. Methodology

This paper explores the theoretical framework with reference to a case study of SME digital technology diffusion policy in Wales and the work of actors to manage tensions and synergies around boundaries over a 6-year period (2014–20). The case was selected based on the region’s longstanding policy support for digital technology use by SMEs and the presence of multilevel linkages to digital technology diffusion support outside the region (Henderson 2020a). This provided a complex policy mix setting to examine boundary work activity over the research period. A single case method is adopted as the basis for exploring the agency practices associated with boundary work in the region, as it provides the opportunity to holistically analyse the complex dynamics of a regional innovation policy mix (Thomas 2019). This method is particularly suitable for capturing multiple data sources and in-depth analysis of research settings (Flyvbjerg 2010; George and Bennett 2005; Yin 2018). The case study method also provides the basis to identify potential implications for future research and policy-making (Yin 2018).

This paper focuses on the primary policy instrument in Wales for digital technology diffusion to SMEs in the research period—the Superfast Broadband Business Exploitation (SFBE) programme. It identifies the policy instrument as

the bounded area (comprising the instrument rationale as well as its delivery mechanisms such as workshops and advisory support, alongside its target actors), delineated from other policy instruments in the regional policy mix. The period selected for the study allows the researchers to focus on the full period of implementation, including SFBE’s startup and closure. This allowed the researchers to explore the changing nature of boundary work over the course of SFBE’s delivery. To examine boundary work in managing these interactions, a total of 31 interviews were undertaken with the members of the regional and national policy mix associated with SME digital technology diffusion support in Wales (some were interviewed multiple times, equating to 23 individual interviewees—see Table A.1). These interviews were selected to capture the views of public and private actors operating in the regional innovation policy mix, including policy actors responsible for SFBE, and those of complementary and competing policy activities within and outside the region. The author coded all interviews and secondary data sources according to the conceptualisation in the theoretical framework (boundary work agency, practices, and effects). With the aid of NVivo software, successive rounds of data synthesis distilled a series of intermediate themes and final codes (see Table A.2). This method followed an iterative approach to the analysis to ‘gain a holistic overview of the context under study ... [and] the perception of local actors “from the inside”’ (Miles and Huberman 1994: 6).

4. The research case—digital technology diffusion policy instruments in Wales

Wales is a devolved region of the UK. In recent decades, the region’s economy has experienced a transition from its former industrial inheritance based on coal and steel towards a mixed economy dominated by services (Morgan 1987).² Economic activity is primarily concentrated in the South Wales corridor

and the North East areas of the region, with distinct differences in economic prosperity between East and West Wales (Blackaby et al., 2018). It has long faced the challenge of improving the level of economic activity in the region, with its economy characterised by '[lower] productive capacity, fewer people in high value added jobs, a greater dependence on the public sector, and with poorer health and housing stock amongst particular communities' (Bristow 2018: 14)³. This has been reflected in the West Wales and the Valleys area of Wales receiving the highest level of European Union funding available in Structural Funding (Ifan et al. 2016) prior to Brexit.

The SFBE programme was the main policy instrument supporting digital technology diffusion to SMEs across Wales in the study period. It comprised a programme of SME assistance delivered by Serco⁴—a major public service outsourcing business headquartered in the UK—including workshops and one-to-one advice to support some 6,600 firms to adopt digital technologies. Its objective was to increase the economic return from SME digital adoption and to increase the exploitation of digital technologies. The programme was funded by the European Regional Development Fund (ERDF) and the Welsh Government's core funding (£12.7 million) for the period of 2016–20 (ICF Consulting 2018).

5. Results

5.1 Boundary work in the period of 2014–20

5.1.1 Boundary work actors

The creation of the boundary surrounding SFBE was undertaken by policy officials of the Welsh Government that had been active in earlier programmes supporting SME adoption of digital technology. They had been able to develop the rationale for a programme of support, with the aid of research evidence from consultants, identifying the limitations of SME digital skills in the region. Funding for this activity was secured by aligning it to wider innovation policy exercises being undertaken, such as the Regional Technology Plan, but also European activity in support of the 'Information Society' (I18, I20). This helped establish the initial rationale for the policy activity, with digital skills perceived to be illustrative of the technological development and diffusion objectives of the Welsh Government (and predecessor bodies such as the Welsh Development Agency). As a former manager of the Welsh Development Agency noted:

I was responsible for inward investment for IT and micro-electronics, for a time. And around 1997-1998, there was a term that was introduced by the European Commission called the Information Society. We commissioned some research from (a local consultancy) ... and at the time the European Commission were interested in regions introducing an Information Society. We were fortunate, along with 28 other regions, to get support to develop this strategy and action plan. (I18)

The creation of SFBE, therefore, followed on from a series of earlier activities and was directly aligned with the objectives (and funding) of the 2014–21 ERDF programme in the region. Here, Welsh Government officials had a privileged position to introduce policy ideas within such programmes, given the 'all

Wales' focus of the body, and sought to reinforce the rationale for action by piloting small-scale support in North Wales and commissioning Cardiff University to provide evidence of impacts (Bryan et al. 2015).

Two boundary work functions were established by Welsh Government officials at the start of the programme—the creation of an Advisory Panel and Partnership Managers. These mechanisms were set out in the business plan and reflected officials' prior experience of delivering business support programmes for digital technology diffusion in Wales. This enabled them to draw lessons on the importance of stakeholder engagement and support not only for the effective delivery of a programme but also for the continuing support of senior managers and politicians within the Welsh Government.

The *Advisory Panel*, comprising outside stakeholders from partner organisations such as local authorities, businesses, and universities, was established by SFBE officials to provide them with advice and support for policy implementation, including policy mix interactions. By drawing together outside stakeholders to become a formal part of the programme's delivery mechanism for a time-limited period (to the end of the programme), the officials hoped to provide the basis for ongoing interactions with external stakeholders and providers of business support. This was described by a senior manager of SFBE as 'ensur[ing] that the programme has advocates and champions out there amongst various stakeholder groups [and] to ensure that we've got healthy relationships and working links with stakeholders' (I1). Its focus on stakeholders included organisations able to support SFBE's goals and provide intelligence on developments in digital support within the region. The membership of the group was further designed to support senior officials in their internal interactions with senior managers and politicians. The benefit to policy officials in drawing together a multi-stakeholder group was described by a member of SFBE's programme management team as:

ceas[ing] to be a government official trying to make a case against a great many questions as to what should be done and why, if you've got that representation from stakeholders in a room together, their collective voice is quite a useful one. (I1)

The creation of the Advisory Panel, therefore, provided the senior officials with opportunities to strengthen the legitimacy of SFBE and engage with external stakeholders to monitor the evolving business support landscape in Wales, raise awareness of the programme, and manage policy mix interactions. Non-governmental actors were willing members of the Advisory Panel, who were aware of their role in supporting officials of the programme. This role was undertaken, however, with the recognition that they would also be able to inform and gain insight into future government policy (I8, I11). As one business representative on the Advisory Panel put it, 'yes, we are there to advise [senior programme official] and contribute but we are there to influence policy thinking ... there is no hiding that' (I14).

Alongside the Advisory Panel, a *Partnership Manager's* role was established by senior officials to provide capacity for close working relationships with partners (e.g. business and local authorities). These roles included regular meetings with other business support providers across the region, attendance

at networking events, responsibility for exploring alignment opportunities with other business support activities, and monitoring regional policy space for new developments such as the launch of a new business support programme (I1, I9). This enabled any emerging synergies or duplications to be managed by the Partnership Managers (e.g. business queries about broadband connections). In other cases, however, more senior engagement was required to manage such interactions. This process of managing potential synergies through referral was described by one of SFBE's Partnership Managers:

There are a few things I have bounced back into Welsh government ... to kind of say, 'They are not going to listen to me, because I'm over here. But they might listen to Welsh government'. (I9)

This highlighted not only the constraint of the Partnership Manager's role but also the distribution of boundary work agency beyond individual roles, allowing strategic all-Wales challenges to be managed by senior managers, often with the support of the Advisory Panel (I11).

5.1.2 Policy mix interactions and boundary work practices

During the business planning phase of SFBE, senior officials were required to follow a structured methodology, which incorporated analysis of the 'strategic fit' of the programme. This was described by a senior SFBE programme manager as an approach that had been in place for some time, allowing it to seek 'fit' 'alongside other service offerings that were in the pipeline for delivery within Welsh government' (I1).

Over the course of SFBE's delivery, several policy mix interactions emerged, which were focused on the business support instrument. In the early period of implementation, officials identified a potential duplication of support with the LEADER programme, also managed by the Welsh Government.⁵ The LEADER programme provided funding for rural development activities. Within this, it included a strand of support for digital technology exploitation projects to be developed by Local Action Groups. This had been motivated by policy official concerns that local areas faced challenges in exploiting digital technology opportunities. The emergence of such duplication was acknowledged by a senior SFBE programme manager, noting that such duplication can be related to the multilevel nature of policy design and delivery:

Unfortunately, what tends to happen when you then go down a couple of rungs of the ladder to the smaller projects at a localised level ... invariably you see duplication. (I1)

Officials from both LEADER and SFBE met to discuss their concerns and to find ways of mitigating potential duplication of business support before the former was launched. This illustrated the presence of boundary work on different sides of a policy boundary, enabling both parties to understand the features of each policy instrument and adapt boundaries by agreeing on mitigation processes—namely that both programmes would not fund the same type of exploitation project. Subsequently, LEADER supported a few digital exploitation projects (I4), mitigating not only the potential for negative duplication but also the potential outcomes under the LEADER strand of funding⁶.

A subsequent policy interaction emerged in the duplication of support for the adoption of social media marketing

and the support for marketing provided by the Welsh Government's much larger mainstream business support programme for SMEs in Wales—Business Wales (I9). While SFBE had established support for businesses to exploit social media marketing since its launch in 2016, the growing digitalisation of the economy in subsequent years led officials to be responsible for Business Wales to create similar forms of support, in part as a result of the demands of SMEs, and the programme's gradual modernisation of its support offer to business (I10). In this instance, the policy interaction was first identified by a member of the Advisory Panel, responsible for the provision of a business support programme (Business Wales), and was addressed through discussions with SFBE programme managers who focused on agreeing how to mitigate potential duplication through adjustments to ensure the sufficient distinction between the policy instruments:

We (Business Wales and SFBE officials) identified this as an issue of potential SME confusion ... we had both come at this from different angles ... we met to thrash out a solution where Business Wales focused on marketing (of which social media is a component), and SFBE focused on social media exclusively. (I9)

While there was no evidence of business confusion in practice, officials from both programmes were keen to ensure that it did not become a problem. They were also concerned that both SFBE and Business Wales were able to harmonise activities, maintain the legitimacy of their programme boundaries, and continue to maximise delivery against the targets that they had. Whether this 'solution' fully addressed the overlap was questionable, given the digital nature of modern marketing. Both SFBE and Business Wales programme managers agreed, however, that in the context of perceived 'minor overlaps ... two delivery channels were better than one' (I9).

A third area of policy mix interaction occurred in the latter period of the SFBE's delivery with the emergence of business support provided by large businesses such as banks and digital platforms (Amazon and Google) and intermediary organisations from outside the region. This included workshops and advisory support delivered on behalf of the businesses by UK-based digital technology consultancies and a business representative organisation and focused on topics such as social media marketing and the adoption of cloud technologies. This formed part of the large businesses' multi-year commitment to providing free digital business support to SMEs in the UK, with the wider aim of raising digital skills⁷ (I9, I11). This shared similarities with the support offered by SFBE, as one member of the Advisory Panel noted: 'Really ... their advisors were giving similar advice to our advisors' (I19). Although such actors primarily saw themselves as contributing towards regional objectives, they were also motivated by their wider commercial rationale, and others had more disruptive objectives with a London-based business representative organisation noting that:

The Welsh Government has got a very strong hold over business support in Wales. Therefore, when we have tried to do things ... the response we've had is a little bit like, 'We're fine in Wales. We don't need private sector business support providers'. So, we haven't managed to get very good traction. (I17)

Table 1. Boundary work practices in the SME digital technology diffusion policy mix in Wales.

Boundary work practices	Case evidence
<i>Boundary creation</i>	
Developing policy rationale	<i>Agency work to:</i> - Draw on earlier Welsh Development Agency policy actions and associated rationale to justify digital technology diffusion in Wales - Commission research to provide evidence in support of SFBE
Establishing a new policy mechanism	<i>Agency work to:</i> - Learn lessons from earlier delivery of digital tech diffusion policies - Implementing the SFBE programme and securing funding (e.g. ERDF)
<i>Boundary maintenance</i>	
Maintaining policy rationale and mechanisms by anticipating tensions and synergies	<i>Agency work to:</i> - Establish formal partnership roles (e.g. SFBE's Partnership Managers) - Create the SFBE's Advisory Panel, drawing together partners from business, policy, and university - Collect regular digital SME adoption evidence from Cardiff University research during SFBE implementation
Maintaining policy rationale and mechanisms by responding to tensions and synergies	<i>Agency work to:</i> - Address potential overlaps and synergies through programme adjustments (e.g. LEADER, Business Wales, and large business digital support) through discussion and negotiation
<i>Boundary disruption</i>	
Disruption and adaptation to new forms of overlapping rationale	<i>Agency work:</i> - Emergence of new policy rationales and actions in the policy mix, with the potential for overlap or synergy (e.g. Business Wales and large business commercial rationales)
Disruption and adaptation to new policy mechanisms	<i>Agency work:</i> - Emergence of new policy mechanisms in the policy mix with the potential for overlapping public and private sector instruments (e.g. large business digital support).

In responding to these potential disruptions, Partnership Managers, and later Welsh Government officials, met with the business representatives responsible for these private instruments to discuss harmonising actions such as joint events (I11). This formed part of their desire to better understand not only the extent of duplication but also opportunities to discuss potential synergies. In this respect, both Welsh Government officials and private sector providers saw such boundary work as an opportunity to adapt and strengthen the outcomes of their respective activities (I12, I20).

Table 1 summarises the multiple forms of boundary work identified in the case study results and points to such work taking place across the three types of boundary work practice identified in the conceptual framework.

The overall impact on these activities is difficult to disentangle from the business support delivered by the programme. These findings suggest, however, that boundary work of the programme officials, Advisory Panel and Partnership Managers from within and outside the policy boundary, helped manage duplication through efforts to secure alignment with other policy instruments, mitigate effects such as business confusion, and support the implementation of digital diffusion policy in the region. They also point to the practices of boundary work in supporting additional benefits such as the legitimacy and ongoing maintenance of the policy instrument within the Welsh Government. These activities and benefits represented an integral component in SFBE's achievement of its outcomes, with the most recent evaluation suggesting that the programme was likely to meet its targets (ICF Consulting 2018).

6. Discussion and conclusion

This paper has examined the role of actors and agencies in managing interactions between innovation policy instruments

as they seek to achieve objectives. It draws on a case study of digital technology diffusion support policies in Wales and seeks to contribute to research on the regional innovation policy mix (Flanagan et al. 2011) and accounts of agency in regional path development (Bækkelund 2021; Grillitsch and Sotarauta 2019; Jolly et al. 2020). It builds on this literature through the introduction of the concept of boundary work from the organisational studies literature (Gieryn 1983; Helfen 2015; Lamont and Molnár 2002; Zietsma and Lawrence 2010) and argues that a focus on boundary work can help understand the potential for such agency work to shape policy instrument boundaries in the regional policy mix. It defines such boundaries as socially created constructs and develops a conceptual framework that highlights policy instruments in the regional innovation policy mix, represented by their constituent rhetorical (policy rationales) and symbolic elements (delivery mechanisms and targets), the role of boundary work agency and practices in seeking to create, maintain, and disrupt such distinctions, and their impacts on regional innovation policy coherence and effectiveness of outcomes.

The findings suggest that boundary work agency is a place-based, multi-actor process, comprising actors from not only within a policy boundary but also beyond (e.g. actors from LEADER, Business Wales, banks, and digital platforms). While the presence of multiple agency types is recognised as a key element of boundary work oriented towards organisational goals (Gieryn 1983; Zietsma and Lawrence 2010), the findings highlight different actor roles in shaping policy mixes and for these to have distributed characteristics, including operational actors with day-to-day responsibilities for boundary work, often at the forefront in identifying and responding to mix interactions (e.g. the SFBE's Partnership Managers). This adds to conceptualisations of agency in the regional innovation and path development literature

by emphasising the agency that is focused on shaping and managing boundary tensions and synergies related to the policy mix. While such agency may be dedicated to this task (e.g. Partnership Managers), it may also be complemented by others who have partial or indirect responsibilities for boundary work, alongside other practices, for example, strategic actors responsible for programmes (e.g. senior policy manager intervention to support Partnership Managers). Moreover, rather than being the sole preserve of policymakers, the findings also suggest that boundary work may include other regional actors from business and civil society (e.g. advisors and researchers), as well as those from outside the region (e.g. private actors such as banks and large digital businesses).

A series of interrelated boundary work practices are identified in the theoretical framework, which focused on helping to create, maintain, and disrupt policies within the regional policy mix. The findings suggest that such practices are central to its dynamism over time. This is highlighted in the case study evidence, which shows that regional innovation policy boundaries can be subject to constant flux, as boundary work agency seeks to create, maintain, and disrupt the distinctiveness of policies in the regional innovation mix. This contrasts with much of the policy mix literature that tends to view it as a stable construct. Within this dynamic context, the findings show that an incumbent policy may occupy a central position within a regional policy mix (e.g. SFBE) and seek to ensure the legitimacy and distinctiveness of policy instruments. This is reflected in the importance attributed to not only identifying policy synergies during the creation of new policy instruments (e.g. the SFBE's business planning process) but also co-opting support (e.g. Advisory Panel) and generating evidence (e.g. research) to manage boundaries over time. While these processes have anticipatory elements in both the design and delivery of a policy, drawing on past lessons, they are also subject to unpredictability, not least in the emergence of new actors and policy instruments from elsewhere in the region and beyond. Moreover, it is this unpredictability that drives maintenance agency practices to address emerging tensions and opportunities for synergy.

The practices of boundary work in the policy mix do not, however, guarantee compromise; indeed, there may be limitations in policy actors' abilities to prevent the introduction of new overlapping instruments into the regional policy mix (e.g. where large digital businesses or other government agencies sought to introduce their own instruments). Negotiation and compromises can, however, lead to alignment (e.g. the agreement between SFBE and LEADER) and compromise (e.g. SFBE's interactions with Business Wales). It may also support temporary adaptations to the policy boundary (e.g. in the case of the Amazon events in Wales), reflecting the bespoke nature of policy boundary work agency in managing regional policy mix interactions. This suggests that while it may not be possible to achieve full coherence in a dynamic context, the findings do show that multiple forms of boundary work can work towards supporting coherence and effectiveness while limiting fragmentation and overlap in the regional innovation policy mix. Indeed, such policy mix interactions represent a process of learning, with opportunities to identify the potential for synergies.

6.1 Study limitations

In casting light on the role of boundary work in the regional innovation policy mix, the findings suggest a number of limitations to the research. First, as a single case study, the scope of the research is limited to a single region and policy domain focus (digital technology diffusion). While the focus of the case is conceptual development, care should be taken when seeking to apply its findings to other areas and policy mixes. Building on these limitations, a number of further avenues for research can be identified. There is potential to examine boundary work in different regional settings and other policy areas using a multi-case research design (with attendant complexity). This may allow researchers to examine how outcomes may differ in cases where there are multiple (or no) forms of actor work present (Lawrence et al. 2009).

A further limitation concerns the linkages between boundary work agency and other forms of agency highlighted in the regional innovation policy literature (e.g. institutional entrepreneurship and maintenance agency). While the research has focused primarily on boundary work agency, interactions between different forms of actor role and agency work in the region and their unintended consequences may be a fruitful area of research, for example, examining the interactions between boundary work and other forms of change agency in path development (Sotarauta et al. 2020) and the wider evolution of regional development processes. The different roles of the private sector and the emergence of private instruments may also provide opportunities for researchers to explore their nature and impact on policy mixes.

6.2 Policy implications

Finally, the results suggest a number of implications for public policymakers. Here, they point to the potential for boundary work to be an integral component of policy instruments, providing the basis for both defining and maintaining public policies over time. Adopting a proactive approach to such maintenance can enable potential tensions to be identified quickly and opportunities for synergies and learning to be developed. Such agency, the findings suggest, can be allocated not only to specific front-line staff but also to senior policy officials. This division of responsibilities may enable not only the use of boundary work to maintain an oversight of regional policy space and learn about new activities but also the opportunity to address new strategic actors and policy instruments and exploit opportunities for collaboration and better alignment. Indeed, together these forms of boundary work agency have the potential to support the coherence and effectiveness of the regional innovation policy mix and its outcomes.

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Notes

1. Following the work by Schumpeter (1934) and others such as Borrás and Edquist (2013), this paper defines diffusion as an integral part of the technological change process, alongside innovation (arrangements for the commercialisation of the invention) and invention (new ideas or processes).
2. Services accounted for 72.6% of gross value added in the Welsh economy in 2020 (<https://stats.wales.gov.wales/v/Lmgf>). Accessed 5 January 2023.
3. <https://www.gov.wales/welsh-economy-numbers-interactive-dashboard>. Accessed 5 January 2023.
4. Serco is a global public outsourcing business, with headquarters in the UK. www.serco.com.
5. LEADER provided funding for 'Exploitation of Digital Technologies' (p. 11). <https://www.gov.wales/sites/default/files/publications/2021-05/leader-guidance.pdf>. Accessed 5 January 2023.
6. LEADER was able to support local projects under a number of other priority themes, meaning that overall objectives could still be met.
7. See, for example, Lloyds Bank, *Helping Britain Prosper Plan*, <https://www.lloydsbankinggroup.com/Our-Group/responsible-business/prosper-plan/> and Google, *Growth Engine Plan*, <https://blog.google/topics/google-europe/google-european-growth-engine-2-million-trained-and-counting/>. Accessed 5 January 2023.

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Appendix

Table A.1. List of interviews.

Number	Interviewee	Date of interview
11	Welsh Government, programme manager—digital	13 July 2017 27 August 2019
12	Former Welsh Development Agency manager	7 July 2017 15 July 2017
13	Welsh Government, Policy	9 August 2017
14	Welsh Government, RDP manager	17 August 2017
15	Gwynedd Council, manager	1 October 2017
16	Monmouthshire County Council, manager	12 October 2017
17	Small business consultant and support provider	15 June 2018
18	Broadband expert/Advisory Panel member	7 January 2018
19	Business Wales, digital advisor	3 December 2018 2 July 2019 28 October 2019
110	Business Wales, programme manager	13 December 2018 13 December 2019
111	Consultant to Welsh Government programme advisor—digital	17 December 2018 9 July 2019
112	Bank, digital business manager	7 January 2019
113	Farming Connect, manager	11 January 2019
114	Small business representative body officer	6 July 2018 11 January 2019
115	Welsh Government, assembly member	15 January 2019
116	Business Wales, digital manager	22 January 2019
117	SME innovation support manager	13 February 2019
118	Business Wales, digital advisor	19 February 2019
119	Business Wales, digital facilitator	1 March 2019
120	Private SME support provider	22 March 2019
121	Small business consultant	10 April 2019
122	Neath and Port Talbot Council, manager	22 May 2019
123	Amazon Web Services	12 October 2019
124	Buzz Start Academy/Facebook consultant	19 October 2019

Table A.2. Conceptual coding table by code, category, theme, and theorisation.

Code	Category	Theme/conceptualisation
Public officials Private actors Intermediary actors Civil society actors Actor interaction Policy process Actor presence over time Scalar dimension	Actor type Boundary position—inside or outside Actor spatial/scalar position Policy process stage Actor temporal roles	Boundary work agency: Multidimensional/multilevel/multi-actor (Theme 1)
Boundary origins Enabling factors to boundary work Constraining factors Agency practices to manage boundary Practice evolution during programme Contextual influences	Boundary establishment/business case/delivery activities/funding Boundary monitoring/scoping Boundary expansion Boundary collaboration Boundary disruption Temporal practices Practice limitations	Boundary work management: creation, maintenance, disruption (Theme 2)
Actual/potential duplication of objectives Actual/potential duplication of delivery approach Actual/potential duplication in target groups	Synergies Tensions Overlaps Practice learning	Boundary work effects: alignment/coherence, clarity/confusion (Theme 3)