



Cooperation bias in regional policy: Is competition neglected?

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Abstract

Rising market power across the OECD countries raises the question how industrial policies address the role of competition, including on the regional level. Based on a multifaceted understanding of competition and cooperation between firms in the conceptual literature, this article examines the role of competition-enhancing interventions in regional innovation policies under the smart specialisation approach. Drawing on quantitative and qualitative analysis of the strategic orientation of smart specialisation strategies in 18 European regions, the article finds that regional policies apply a range of competition-enhancing interventions but still fall short of seizing the ample room for encouraging intraregional interfirm competition. While theory suggests that competition and cooperation are complements in promoting regional innovation, the limited focus of regional policies on interfirm competition might imply a bias in favour of cooperation at the expense of the productivity-enhancing role of interfirm competition. Hence, we argue that regional policies could benefit from a rebalancing by considering the use of more competition-enhancing interventions. This finding is particularly relevant for the process of smart specialisation since balancing competition and cooperation provides an additional rationale for calls in the literature to prevent rent-seeking by incumbent firms in the policymaking process.

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Maximilian Benner: The views expressed are purely those of the author and may not in any circumstances be regarded as stating an official position of the European Commission.

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1 Introduction

Empirical studies have shown that market power is rising in the U.S. as well as in some European economies (OECD 2018; IMF 2019; Feldman et al. 2021). The resulting weakening of competition is associated with adverse economic outcomes such as less investment and innovation as well as lower shares of labour income in national income (Diez et al. 2018). Economic history reveals how periods of economic stagnation are related to decreasing competition. For instance, Crafts (2012) explains the relative economic decline of the British economy between the 1930s and the 1970s as a result of weakened competition while deregulation strengthened competition and reinvigorated productivity growth. In a similar vein, Alder et al. (2014) suggest that the demise of the Rust Belt in the post-war period is also attributable to a lack of competitive pressure in labour and output markets, and that the regional economy stabilized upon increasing competition intensity in the 1980s.

In this study we will provide quantitative and qualitative evidence on the role of intraregional interfirm competition in regional development and policy by investigating regional-level strategic policy documents. To our knowledge, there is no study that systematically analyses this topic. We posit that given the positive impact of interfirm competition on productivity and innovation, regional development needs to consider if and how to support rivalry between firms. Empirically, the article focuses on regional innovation policy in Europe marked by the smart specialisation approach and specifically by regional Research and Innovation Strategies for Smart Specialisation (RIS3).¹ The article pursues three research questions (RQ): How important is competition (relative to cooperation) in RIS3 (RQ1)? What types of pro-competition interventions are proposed in RIS3 (RQ2)? How do RIS3 differ in the role accorded to competition and can differences be explained by the prevailing level of competition (RQ3)?

The role of interfirm competition² figures prominently in the industrial organisation literature and in the debate on new industrial policies (e.g., Landesmann 2015; Radosevic 2017) but less so in the discourse on regional development theories and regional economic or innovation policies. While competition intensity between firms in product markets is regulated by competition policy at the national and European levels, there are a number of factors beyond competition policy that influence competition intensity within nations and regions. Indeed, empirical studies suggest substantial differences in competition intensity between industries, nations, and regions (Koster et al. 2012; Plummer and Acs 2014; Eklund and Lappi 2019). In line with seminal contributions such as Jacobs (1969) or Porter (1990, 1998a), we argue that fierce regional competition between firms can be a powerful driver of productivity growth and innovation and that regional policy could use a number of instruments which aim to influence the degree of competition between regional firms.

¹ RIS3 are strategies to steer funding from EU cohesion policy for innovation on the national or regional level (Foray et al. 2009, 2021; McCann and Ortega-Argilés 2015; Radosevic 2017).

² In what follows, competition refers to competition between firms and rivalry is used as a synonym.

Still, competition is not the only phenomenon that drives innovation. In particular, cooperation between economic agents is of vital importance for regional development, as paradigms such as regional innovation systems emphasise (e.g., Asheim et al. 2011). Still, the importance of competition for driving productivity and innovation suggests that a policy narrative that overemphasises cooperation over competition, or what we call the cooperation bias in regional development, is one-sided. Rather, regional development thinking may benefit from rebalancing the relative importance of cooperation versus competition in formulating policy strategies and applying policy instruments (see also Newlands 2003). Admittedly, reality is complex and shows a plethora of firm behaviour combining elements of both (Brandenburger and Nalebuff 1996). Nevertheless, for the sake of analytical clarity, in this article we follow a stylised dichotomy between competition and cooperation.

The article is divided into four parts. The following section reviews theories on the role of competition in industrial and regional development. Next, the article introduces a conceptual framework for competition in regional policy, the methodology, and the sampling strategy. Then the article investigates a random sample of regional innovation strategies in Europe. The final section draws conclusions and proposes policy implications.

2 Theoretical perspectives on competition and regional development

Competition is a multifaceted economic concept (Moudud et al. 2013). In regional economics, competition is often discussed as competition between jurisdictions which compete for mobile factors of production or in the context of spatial competition models in the tradition of Hotelling (Reiner 2010; Lourenço and Sá 2019; Proost and Thisse 2019). An exception is provided by Jacobs's (1969) notion of localised competition for knowledge between localised firms. For the purposes of this article, we focus on competition between firms as a means for strengthening regional firms' dynamic efficiency and, hence, regional economic performance. Our focus includes not just competition in product markets between incumbent firms but also between incumbents and newly founded firms as well as the competition-enhancing role of market entry by external firms via direct investment. While the industrial organisation literature concentrates on competition in output markets (Cabral 2017), we believe that a regional economics perspective needs to acknowledge also the importance and sometimes fairly localised nature of competition in factor markets for labour and capital (Martin et al. 2005; Manning and Petrongolo 2017; Sin Tian Ho and Berggren 2020). Contrary to textbook treatments of competition in microeconomics which still centres on the notion of perfect competition, our understanding of competition is more dynamic and informed by the works of Hayek (1945) and Schumpeter (1942[2010]).

Industrial organisation theory suggests three channels for competition to increase firm productivity (Tirole 1988; Holmes and Schmitz 2010): (1) competition disciplines management and workers and forces them to reduce organisational slack (within-firm effect); (2) competition reallocates market shares and resources from

less to more efficient firms (between-firm effect); and (3) competition motivates managers to finance risky innovation projects. While there is plenty of empirical evidence for a positive impact of between-firm and within-firm effects on firm productivity (Nickel 1996; Schmitz 2005; Syverson 2011; Xu and Gong 2017), the theoretical link between competition and innovation is more complex. On the one hand, the Arrow effect (Arrow 1962) postulates a positive effect of competition on innovation while, on the other hand, the so-called Schumpeter effect suggests an inverse relationship and a positive impact of firm size on innovation (Schumpeter 1942[2010]). The debate on the nexus between competition and innovation has received new attention due to Aghion et al. (2005) who suggest a non-linear relationship between competition and innovation. Accordingly, starting from low levels of competition, an increase in competitive pressure induces an increase in innovation activities. When competition is very intense to start with, any further increase may reduce innovation because firms cannot recoup the fixed costs of innovation projects due to rapid imitation by rivals (Aghion et al. 2005). Whereas this finding suggests a nuanced policy approach towards increasing competition in certain sectors, by and large the case for pro-competition policies is strong and based on solid evidence (Shapiro 2012; Bloom et al. 2019; Philippon 2019; Levine et al. 2020), at least because of a general rise in market power in a number of OECD economies (IMF 2019).

Contrary to the findings presented above, anecdotal evidence suggests that regional policymakers tend to follow the logic that the performance of regional firms is best supported by fostering their cooperation while competition between them will weaken their ability to compete on national or international markets (Schmitz 1999). Cooperation between firms can comprise a diverse array of activities such as R&D, training, marketing, or procurement. However, too much cooperation might lead to collusion, stifle dynamism, and hence adversely impact economic outcomes, as is demonstrated by monopoly and oligopoly theory and the social capital literature which shows how too strong social bonds can inhibit innovation and variety (Grabher 1993; Roth 2009; Malecki 2012).

Yet, literature on industrial and regional development acknowledges that cooperation and competition are not opposites but complements (Newlands 2003; Aghion et al. 2015; Landesmann 2015). Conforming to the widespread critique of traditional, anti-competitive industrial policy, instead of policymakers determining the priorities of industrial development, newer approaches embrace the idea of public-private self-discovery (Hausmann and Rodrik 2003; Landesmann 2015; Martínez-López and Palazuelos-Martínez 2015; Radošević 2017). The fundamental prerequisite of these policies is “learning what one is good at producing” (Hausmann and Rodrik 2003: 605) and thus harnessing the forces of competitive markets. The idea of using competition for discovery dates back to John Stuart Mill (1849 [1909]) and to Hayek’s (1945) argument on the limited and dispersed knowledge of all actors in a market economy (see also Radošević 2017). Self-discovery cannot be isolated from the dynamics of markets because opportunities in markets need to be discovered and therefore markets need to be contestable (Kyriakou 2017). In this sense, competition is at the heart of new industrial policies. Indeed, Aghion et al. (2015) show how industrial policy interventions become more effective when the targeted

sector displays higher competition intensities. This finding mirrors studies on the role of industrial policy in the “East Asian miracle” which combined selective interventions with international competition and governmentally organised economic performance contests between domestic companies (Stiglitz 1996; World Bank 1993). Taking into account the spatial dimension of economic activity, Landesmann (2015) stresses the advantages but also the disadvantages of conducting such a self-discovery process on the regional level.

The cluster concept serves as the major example for a regional development theory that stresses the importance of interfirm competition. Competition and cooperation are implicit to the literature on industrial districts dating back to Marshall (1890 [1920], 1919 [1927]) since industrial districts are characterized by “the networking of many small firms (...), through relations of competition and cooperation” (Torre and Wallet 2014: 7). Porter (1990) included fierce rivalry between firms in a competitive market as one of the basic elements in his “diamond model”. Later, Porter (2000b: 15) defined clusters as “geographic concentrations of interconnected companies (...) that compete but also cooperate” and stressed that in dynamic clusters competition and cooperation are complementary (Porter 1998a, b, 2000b). In his evolutionary model of path dependence, Martin (2010) refers to the role of competition in driving variation and experimentation and, hence, the evolution of regional industries through innovation. Empirical evidence seems to support these views. Firstly, and similar to Porter’s argument, Saxenian (1996) argues that the success of Silicon Valley is the result of a mixture between cooperation and competition and that its development is due “as much to its rich social, technical, and commercial relationships as to competitive rivalries and the initiative of individual entrepreneurs” (Saxenian 1996: 164). Secondly, based on a number of different case studies, Markusen (1985) identifies substantial adverse effects of anti-competitive practices of the local business sector on regional economies and shows that oligopolistic structures of a dominant industry can have a long-term negative impact on regional development. Thirdly, Glaeser et al. (1992) and Feldman and Audretsch (1999) find localized competition to be more conducive to the regional creation of employment and new ideas as opposed to regional specialisation and local monopolies, confirming Jacobs’s (1969) and Porter’s (1990) arguments. Plummer and Acs (2014) follow this line of research and show how greater localized competition leads to higher rates of knowledge-driven entrepreneurship in addition to more knowledge production. Finally, a review of empirical studies by Goodwin and Pierola (2015) shows that higher domestic competition intensity tends to be associated with higher exports, corroborating the positive effects of competition on economic performance.

Spatial proximity may intensify rivalry through the possibility of competing firms to monitor each other’s actions because of the shared institutional, legal, socio-economic, and regulatory context (Porter 1998a, b, 2000a, b). Hence, localised competition between firms occurs via market and non-market relationships, with the latter gaining importance in a regional context due to spatial proximity (see also Newlands 2003). Building on Marshall’s (1890 [1920]) focus on variation and on Porter’s argumentation, Maskell (2001) and Malmberg and Maskell (2002) stress that learning by monitoring is a spillover which can occur in unintended and sometimes unconscious ways and stimulate experimentation and variation, aided and motivated by

the demonstration effects of localised competitors. Further, Malmberg and Maskell lay out how the shared context found in a cluster enables firms to understand and interpret complex tacit knowledge spilling over through monitoring which provides a basis for non-interactive learning among rival firms (Glückler 2013). In addition, peer pressure and entrepreneurs' and managers' competition for prestige can provide additional incentives for fierce rivalry in a cluster and, more generally, in a regional economy (Porter 1998a, b, 2000a, b; Maskell 2001; Malmberg and Maskell 2002; Benner 2009, 2012b).

Having said this, spatial proximity also has the potential to incentivise collusion (Brooks et al. 2016) and cooperation in activities as diverse as R&D or marketing (Narula and Santangelo 2009; Felzensztein et al. 2012; Torre and Wallet 2014). Empirical and theoretical research in industrial organisation provides evidence that interfirm cooperation can be anti-competitive and hence possibly detrimental to social welfare (Tirole 1988). For instance, domestic joint ventures lead to more market power of incumbents while international joint ventures stimulate competition in the home market (Tong and Reuer 2010), and research joint ventures may facilitate collusion among member firms which are typically rivals in product markets (Helland and Sovinsky 2019). On this basis, it can be concluded that the incentives offered by spatial proximity for competition or horizontal cooperation are ambiguous. Thus, there is a strong argument for promoting not only cooperation but also competition in clusters (Malmberg and Maskell 2002).

Still, the policymaking discourse during the 1990s and 2000s almost exclusively focused on cooperation (Kiese 2008; Benner 2012a, b; Kiese and Wrobel 2011). For example, an OECD study on cluster policies in the 2000s indicates that instruments used focus predominantly on collective services and collaborative innovation projects (OECD 2007) and Kiese (2008) finds that cluster policies in Germany tend to equate clusters with cooperative networks and to neglect competition as a vital source for externalities (see also Kiese and Wrobel 2011). This discrepancy is paradoxical since, according to Porter (1998a, b, 2000a, b) and the empirical work presented above, intense local rivalry drives firm upgrading towards higher levels of productivity and involves a shift from cost competition to differentiation and from imitation to genuinely original innovation.

Addressing the question of what deeper factors account for the proposed lack of pro-competition policies on the regional level is an interesting and intellectually challenging endeavour. While there is no simple answer and alternative or additional explanations may surely exist, we propose a few possible explanations derived from the literature.

In a market economy, competition cannot be regarded as a natural state or equilibrium outcome. Since Adam Smith, the tendency of capitalist firms to outmanoeuvre competition authorities and monopolize their markets is recognised (Zingales 2017). A systematic explanation for why competition is in danger of being eliminated is provided by Olson's theory of the logic of collective action (Olson 1965) in that the losers of competition tend to be concentrated in certain sectors or regions, whereas the winners are dispersed over many firms and households. As a result, losers face much stronger incentives to organize against pro-competition measures than winners

and the public good of competition is in permanent danger of being underprovided (Olson 1965; Philippon 2019).

Focussing on the specific context of this study, four explanations for why competition may play a weak role in European regional policies are suggested. Firstly, economic policies during the 1980s shifted towards pro-business policies (Harvey 2007). The idea that regions are in competition with each other for mobile capital in a global economy gained traction under the concept of “new regionalism” (Keating 2017), resulting in calls by firms for tax cuts or selective deregulation (Brenner 2000). We hypothesise that economic policy including regional policy became at least partly prone to this new mainstream of pro-business policies which protect or create monopoly rents and prevailed over pro-market policies and wider welfare considerations (Hadjimichalis and Hudson 2014; Feldman et al. 2021).

Secondly, there might be a systematic bias against pro-competition policies on a regional level. After all, a firm arguably has higher bargaining power and influence over regional policy makers than over national governments because its importance for the regional economy is higher than its relevance for the national economy. In addition, the social network between managers of regional firms and regional policy makers is likely to be closer and hence the influence of regional firms higher than at the national level (Bischoff and Krabel 2017). Assuming that large incumbent firms are more influential and oppose pro-competition policies which are likely to reduce their economic rents, regional policies may exhibit a less pro-competitive orientation than national policies. Furthermore, cooperation does not generate obvious losers and collaboration against “foreign” competition serves to build a regional consensus and political support. Pro-competition measures, in contrast, may instigate fears among firms whose competitive position is potentially weakened by fierce rivalry and opposition against pro-competition policy actions is likely to arise (Acemoglu and Robinson 2000; Landy et al. 2007; Plummer and Acs 2014; Grillitsch 2016; Dellis and Sondermann 2017; Zingales 2017; Benner 2020a).

Thirdly, regional policy makers may simply lack the awareness³ and competences to introduce pro-competition measures. They might assume an implicit division of labour with national governments and agencies being responsible for competition policy and regional government focusing more on supporting collaborative schemes. On a related note, behavioural constraints that regional-level policymaking processes can face (Benner 2020a) may lead policymakers to adopt a narrow frame (in the sense of Tversky and Kahneman 1981; Kahneman 2011) that does not include a focus on competition. However, the next section suggests that there are several competition-enhancing policy instruments available to regional policymakers (see also World Bank 2018).

Fourthly, conceptual underpinnings of regional policies may also contribute to a focus on cooperation and a neglect of competition (Malmberg and Maskell 2002; Newlands 2003). Alternatively, although competition plays some role in the academic literature on regional development it might figure less prominently in applied

³ See also Grillitsch (2016) for a broader discussion of the role of ignorance in the EDP, understood as “knowledge, which has not been thought before” (p. 30).

policy studies which translate abstract academic concepts into concrete policy actions. Kiese and Wrobel (2011) offer an explanation centred on differing rationalities between policymakers, practitioners, and academics while Wren-Lewis (2015) introduced the concept of a “knowledge transmission mechanism” and explains how well-meaning policy makers rely on intermediaries misrepresenting academic theory which can lead to one-sided and badly designed policies.

While clusters were popular in regional policy during the 1990s and 2000s, recent years have seen a growing interest in the smart specialisation approach (S3) deployed all across the EU. S3 calls for regional policymakers to focus policy interventions on those activities that offer promising opportunities for growth and diversification, based on capabilities and competences such as those localised in universities or labour markets.⁴ Consistent with new industrial policies, S3 emphasises self-discovery (Hausmann and Rodrik 2003; Martínez-López and Palazuelos-Martínez 2015) through a collective, public–private “entrepreneurial discovery process” (EDP) that leads to the formulation of a regional strategy called Research and Innovation Strategy for Smart Specialisation (RIS3) and to related action plans (Foray et al. 2009, 2012; McCann and Ortega-Argilés 2015; Grillitsch 2016; Radošević 2017; Hassink and Gong 2019).

As S3 can be understood as a regional-level form of a new industrial policy based on self-discovery (Hausmann and Rodrik 2003; Martínez-López and Palazuelos-Martínez 2015), it follows that interfirm competition should play a crucial role (Radošević 2017; Benner 2020b). However, the policy attention afforded to competition in actually applied regional policy may be much weaker. Although competition is implicit to the idea of self-discovery, the collective nature of the entrepreneurial discovery process (EDP) may encourage the perception that S3 is primarily about cooperation. Our hypothesis (H1) is that contrary to the complementary relationships between interfirm competition and cooperation evident on the conceptual level, applied regional policy exhibits a cooperation bias that selectively focuses on interfirm cooperation while neglecting interfirm competition.

The next section sets the stage for the empirical analysis by proposing a conceptual framework for promoting interfirm competition in regional development and by laying out our empirical methodology.

3 Conceptual framework, methodology, and sampling

If competition is an important complementary concept to cooperation in regional development, we should expect regional policy to define at least some interventions designed to promote interfirm competition. Here, cooperation and competition refer to the micro level of firms’ day-to-day business, not to the meso level of policy design. Sure enough, different agents including firms have to cooperate when participating in a regional self-discovery process to formulate a RIS3, but whether a

⁴ See also Asheim et al. (2011) for a summary of the role of local labour markets in the regional innovation systems literature.

Table 1 Regional competition-stimulating mechanisms and regional policy instruments. *Source:* Authors' elaboration based on Benner (2009: 13–15; 2012a: 10–12, b: 156–159) with permission from LIT Verlag

Mechanisms of stimulating competition in spatial proximity	Possible instruments applied by regional policy
<i>Learning by monitoring between competing firms</i>	1. Common regional standards, labels and certification to further standardize the parameters for competition in the regional economy
<i>Labour mobility between competing firms</i>	2. High quality standards in public procurement 3. Job fairs or online job exchanges
<i>Entry of new firms through new business formation</i>	4. Direct matching (e.g., by intermediaries such as cluster managers, network managers, technology brokers, or technology park staff) 5. Publication of vacancies (including in social-media channels) 6. Business planning competitions 7. Training and coaching, incubation space and services 8. Acceleration programmes 9. Stipends for entrepreneurs 10. Awareness raising for entrepreneurship
<i>Entry of new firms through direct investment</i>	11. Locational marketing 12. Investment promotion 13. Consulting of possible investors 14. Incentives for investments, e.g., subsidies 15. Designation of industrial zones or science parks
<i>Competition in the local social hierarchy and related peer pressure</i>	16. Dissemination of success stories and good practices (including in social-media channels) 17. Awards for competitive success
<i>Competition for capital</i>	18. Public or semi-public venture capital funds or public aid to entrepreneurial finance 19. Matching policies for access to capital (e.g., elevator pitches, business angel networks) 20. Training schemes for access to capital

RIS3 includes interventions promoting interfirm cooperation and competition is a different matter.

Building on the arguments presented in the previous section and based by analogy on the mechanisms and instruments of cluster policy proposed by Benner (2009, 2012a, b), we propose a menu of mechanisms and instruments driving interfirm competition at the regional level. Table 1 summarizes these mechanisms and proposes a non-comprehensive list of regional policy interventions that can affect these mechanisms.⁵ Still, it is important to note that the regional-level instruments in Table 1 complement but do not replace traditional national-level competition policies. Furthermore, some of the instruments may have ambiguous effects and

⁵ See also OECD (2007) for a different categorization of similar mechanisms and instruments used in cluster promotion.

their effective threat to the market power of local incumbent firms is likely to vary substantially.

To look in more detail at the policy attention devoted to competition within the context of regional development, the remainder of this article analyses 18 randomly selected RIS3 from across the EU. While RIS3 are typically rather broad strategic documents, the fields of action they define still give an indication of strategic narratives pursued by policy makers (Benner 2020a).

We applied a multistep stratified random sampling procedure to identify the RIS3 for our empirical analysis. Firstly, all regions in EU member states were included in a database, provided that (1) the regions were registered on the European Commission's S3 platform website (European Commission 2018); (2) a link to the full versions of their strategies was included on the website; and (3) the strategies were available in English, French, German, Italian, or Spanish, as of March 2019. According to these pre-selection criteria, the database included a total of 101 regional or, in some cases, national strategies.

In a second step, countries were classified according to their overall degree of market competition by a cluster analytic algorithm and categorised into three groups as shown in Table 2. The idea behind this classification is based on the insight by Aghion et al. (2005) whereby the lower the initial level of competition, the higher the expected social return from fostering interfirm competition. As a consequence, the impact of competition-enhancing policy interventions depends on the initial level of competition. Assuming rational policymaking, this efficiency-based argument leads us to hypothesise that regions in countries with low competition levels have a higher probability to adopt competition-enhancing regional policies. An alternative, political-economic explanation is that countries with a low level of competition are advised by international organisations such as the OECD to implement structural reforms for raising competition in markets (see, for instance, OECD 2017, 2021a, 2021b). Hence and addressing RQ3, regions in countries with initially low competition intensities might engage more actively in pro-competition policies than those in countries with high competition intensities. We refer to this hypothesis of a negative correlation between the level of competition and the frequency of pro-competition policy interventions as H2.

A classification of countries according to their overall level of competition can provide only rough estimates. To capture the complexity of the phenomenon and the associated measurement challenges, we used a combination of indicators including (1) World Bank data on the ease of starting a business as an institutional indicator for barriers to entry (World Bank 2019); (2) work from the OECD on the effectiveness of competition policy (Alemani et al. 2013) as institutional indicators; (3) managerial views on the intensity of domestic competition from the Global Competitiveness Report (World Economic Forum 2019); (4) empirical results on the persistence of profits (Eklund and Lappi 2019); and (5) mark-ups for the manufacturing sector according to Roeger's (1995) methodology (Böheim and Pichler 2016). Countries displaying high (low) barriers to entry, low (high) effectiveness of competition policy, and a high (low) degree of market power are classified as countries with a low (high) competition intensity. Methodologically,

Table 2 Stratified sampling of countries and regions. *Source:* Authors' elaboration

Countries with low competition intensity	Countries with intermediate competition intensity	Countries with high competition intensity
Czech Republic	Austria (5)	Belgium
Greece	Lower Austria (LA)	United Kingdom
France (17)	Styria (ST)	Denmark (3)
Corsica (CO)	Vienna (VI)	Central Denmark (CD)
Picardie (PI)	Germany (8)	Southern Denmark (SD)
Italy (20)	Lower Saxony (LS)	Netherlands (3)
Marche (MA)	Saxony (SX)	East Netherlands (EN)
Valle d'Aosta (AO)	Saxony-Anhalt (SA)	West Netherlands (WN)
Spain (16)		Sweden (7)
Rioja (RI)		Dalarna (DA)
Valencia (VA)		Västra Götaland (VG)

the classification of countries in Table 2 is based on a hierarchical agglomerative clustering algorithm and the usage of Euclidean distance and average linkage to measure the similarity between objects and clusters, respectively (Hair et al. 2014).⁶

To allow for meaningful inter-regional comparison within a country, countries with fewer than three regional strategies as well as national-level strategies were excluded from the database. In Table 2, the remaining eight countries are underlined and the numbers of available strategies per country are added in parentheses. These eight countries represent the strata from which simple random samples of RIS3 were drawn. To get a balanced sample size for each of the three country groups, we selected a simple random sample of two RIS3 from each of the six countries in the low and high competition country groups respectively, while from the two countries with intermediate competition a simple random sample of three RIS3 per country was drawn.⁷ The final sample of 18 RIS3 with a total of 1241 pages is shown in italics in Table 2 (see Appendix 1 for detailed references and sources).

These 18 regional RIS3 were studied and their content was analysed through qualitative and quantitative text analysis as well as through multivariate statistical analysis. On an abstract level and in a first approximation to assess the relative importance of these concepts in RIS3, signal terms such as “market power”, “competition” or “cooperation” were counted in each RIS3 by using the search function in the digitally available strategy documents. Doing so yielded a general picture of the strategic narratives pursued by the RIS3. Going into more detail on the instrument level, we applied the framework of policy instruments presented in Table 1 by checking the prevalence of these instruments for each RIS3. In contrast to the word count, this analysis included an in-depth engagement with the strategies because a given instrument can be described in different terms, thus requiring a certain degree of interpretation in coding. As a way of deductive coding (Mayring and Fenzl 2019) along the list of pro-competition instruments given in Table 1, planned policy interventions corresponding to the framework’s interventions to promote competition were looked for in each strategy, and an analysis matrix relating strategies with competition-related interventions derived from the framework was compiled. Robustness checks were performed and included replicability checks as described in Appendix 3. For the sake of objectivity and replicability, we opted for a conservative coding strategy that does not rely on excessive interpretation. Hence, we cannot rule out that our results somewhat underestimate the instruments actually used and overestimate the cooperation bias to some extent, but the minor differences that emerged during the replication checks and the strong empirical evidence found suggest that

⁶ Further details on the cluster analysis are presented in Appendix 2.

⁷ In one case, the original random sample was modified because one of the initially selected strategy documents (Emilia-Romagna) was considered an outlier due to its high degree of detail and high page number (332) which risked reducing the comparability among strategies. Statistically, the identification of Emilia-Romagna as an outlier is justified by both the *z*-value criterion (*z*-value=3.3) and the IQR criterion (distance to the third quartile is way larger than 1.5*interquartile range) (Camm et al. 2019). Hence, we took another random draw and replaced the strategy for Emilia-Romagna by the one for Valle d’Aosta which consists of 107 pages (see also Appendix 3).

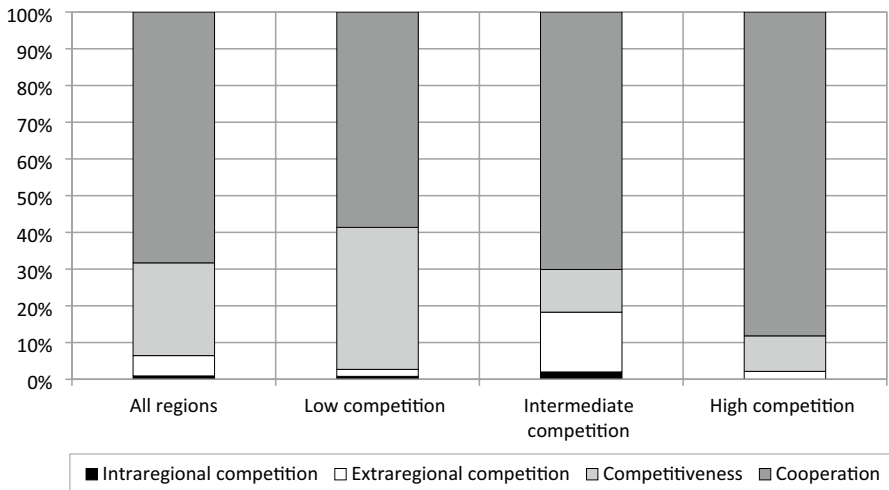


Fig. 1 Relative prevalence of grouped terms according to competition intensity. *Source:* Authors’ elaboration. Notes: Intraregional competition encompasses competition between firms within a region, barriers to entry, market power and competition law. Extraregional competition consists of competition between regional firms and non-regional firms as well as competition between jurisdictions. Cooperation also includes the signal term “collaboration” (see Appendix 4 for details)

possible differences in interpretation could only slightly affect the size of the cooperation bias (see Appendix 3 for details).

4 Empirical results

How important is competition as opposed to cooperation in RIS3 (RQ1)? To analyse this question empirically, we distinguish between (1) different forms of competition (intraregional versus extraregional; interfirm versus interregional) according to the context in which the term “competition” is used; (2) three concepts related to competition intensity (competition law, barriers to entry, market power); (3) competitiveness; and (4) cooperation. While the focus of the article is on intraregional interfirm competition, the empirical analysis of signal terms includes results for alternative conceptualizations of competition to shed light on the relative importance of interfirm competition (see Appendix 4 for detailed results). As Fig. 1 illustrates, cooperation-related terms show a much higher relative prevalence than competition-related terms. In absolute numbers, there are about 80 instances of competition (intra- and extraregional competition) but more than 800 references of cooperation. Although this quantitative word count can only give a first and rough impression, it does provide *prima facie* evidence for the cooperation bias and confirms our hypothesis (H1). Furthermore, competition is much less important than the vague term of “competitiveness” (Krugman 1994) that was found more than 300 times. Among competition-related terms, intraregional interfirm competition plays a negligible role. Extraregional competition is more prominent in the strategies analysed with

competition between jurisdictions and extraregional interfirm competition receiving roughly the same attention. In these cases, the whole region is seen as competing with other regions and firms from within the region are considered to compete with firms from other regions and countries.

Considering differences between low, intermediate, and high competition countries, Fig. 1 shows that the main results hold true for every subgroup, i.e., the cooperation bias is a robust finding. Yet, there are differences between groups with regions in high-competition countries showing the strongest cooperation bias and regions located in intermediate competition countries displaying the highest relative prevalence of competition-related terms.

Regarding RQ1, the evidence suggests that on the level of signal terms, competition appears much less important than cooperation and signal terms on intraregional interfirm competition are almost absent in the RIS3. Hence, the preliminary evidence hints at the existence of a cooperation bias. However, the method applied has its limitations, as will be laid out in the concluding section.

In a next step we examined the relevance of competition-stimulating instruments derived from Table 1 for each strategy analysed. Across all regions, the strategies exhibit a prevalence of 71 competition-stimulating interventions⁸ or less than 20% of all possible pro-competition measures.⁹ Put differently, ample room seems available to introduce additional pro-competition measures. Again, this result suggests that competition plays a subordinate role in RIS3 although with a qualifier. Expecting full utilization of the competition-enhancing interventions in all RIS3 would be somewhat unrealistic, given that not every instrument might be appropriate in every region. Hence, while the prevalence of pro-competition measures found seems low at first sight, assessing the space for additional interventions is a question of each individual case that our analysis cannot answer (see Appendix 5 for the distribution of competition-stimulating policy interventions across regions).¹⁰

Addressing RQ2, Fig. 2 displays a frequency distribution of the pro-competition interventions. Training and incubator services and the provision of public and semi-public venture capital are the two most important pro-competition interventions and together account for about one third of all pro-competition interventions. Both measures aim to foster entrepreneurship in general and firm entry in particular. Policies aiming to raise awareness for entrepreneurship follow basically the same goal and are foreseen by ca. 40% of all regions. Instruments promoting firm entry through direct investment, i.e., investment promotion and the designation of industrial zones or science parks, also figure prominently, making up roughly 20% of all pro-competition interventions. The instrument of public procurement is used in almost 40% of strategies and may be the only intervention of relevance that directly spurs competition between regional incumbent firms. Labour mobility between competing firms,

⁸ Interventions are understood here as types of instruments; hence each policy instrument (see Table 1) found is counted only once per strategy.

⁹ The theoretical maximum would be each of the 20 instruments (see Table 1) foreseen in each of the 18 strategies analysed.

¹⁰ We are particularly grateful to an anonymous reviewer for drawing our attention to this limitation.

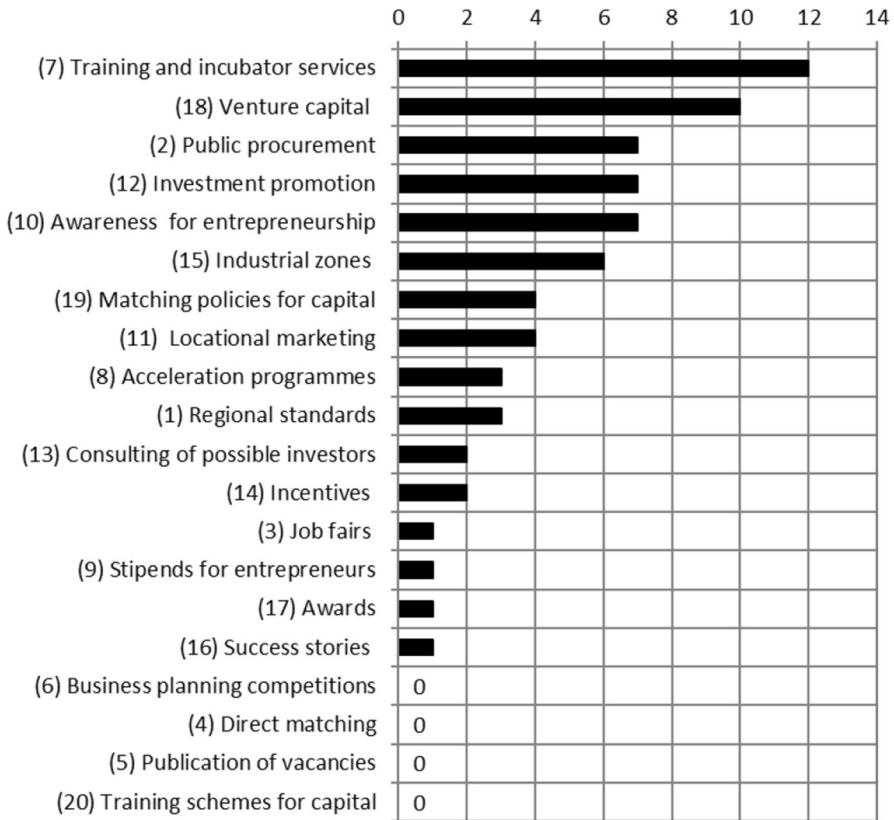


Fig. 2 Absolute prevalence of competition-stimulating policy interventions (numbering according to Table 1, $n=71$). *Source:* Authors' elaboration

competition in the local social hierarchy, and peer pressure remain largely unaddressed. These interventions would directly affect competition intensity between firms and may risk resistance by established firms (see also, e.g., Porter 1998a, b, 2000a). Overall and with the exception of business planning competitions, measures supporting entrepreneurship and new firm formation dominate, followed by interventions incentivising the market entry of extraregional firms. Fostering competition between regional incumbent firms is only of minor relevance.

RQ3 addresses differences between RIS3 concerning the proposed role of competition. The empirical analysis reveals a sample median of 3.5, a sample mean of 3.9, and substantial variation of the prevalence of pro-competition interventions between the 18 strategies, with a difference between the maximum and the minimum of 10 and a standard deviation of 2.8. One possible explanation for the variation can be found in our hypothesis H2 that regions in countries with initially low competition intensities engage more actively in pro-competition policies than those in countries with high competition intensities. Indeed, Fig. 3 supports this hypothesis. While the average region in low-competition countries applies six pro-competition

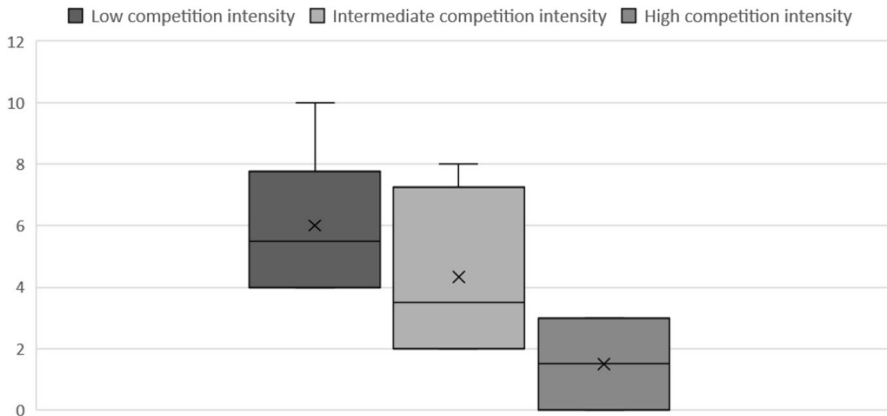


Fig. 3 Boxplot of pro-competition interventions by cluster of regions according to competition intensity. *Note* The cross in the box refers to the arithmetic mean. *Source:* Authors' elaboration

interventions, the average regions in intermediate and high-competition countries deploy 4.3 and 1.5 interventions, respectively, implying an inverse relationship between competition intensity and pro-competition policy interventions. To test whether this result also holds true for the population of RIS3, an ANOVA was applied with the number of pro-competition policy interventions as independent and the grouping variable of competition intensity as explanatory variable. The assumptions of common variance in all groups and normal distribution within each group were tested by a Bartlett test and a Shapiro–Wilk test. With the exception of some indication of non-normality for the group of regions with intermediate competition intensities (p value=0.09), all other tests show no violation of assumptions. Results of the ANOVA are highly significant (p value=0.0098). Overall, the grouping variable explains about 46% in total variation of pro-competition interventions. A check of the robustness of the results by applying the Kruskal–Wallis test, the non-parametric equivalent to the ANOVA, gives similar results (p value=0.02) (see Appendix 6 for further statistical analysis).

5 Discussion, limitations, conclusions, and policy implications

The literature on industrial organisation considers competition between firms to be a crucial driver of productivity and innovation. In the regional development literature, the general tendency is that both cooperation and competition are relevant for innovation and considers both as complements. Yet, the translation of this balanced view into actual policy implementation is a different matter. The empirical examination of RIS3 suggests the existence of a cooperation bias, i.e., a relative neglect of issues related to competition as opposed to cooperation, thereby confirming hypothesis

H1. In RIS3, terms related to cooperation are about ten times as frequent as terms related to competition in general and about 70 times as frequent as terms related to intraregional interfirm competition. Additionally, word counts in RIS3 confirm that competitiveness is accorded much higher relevance than competition-related terms. However, since a word count performed with a search function in digital texts is a rather crude method, there is a possibility that the prevalence of terms is somewhat underestimated by the results because different terms, terms that slightly deviate from the precise signal terms for grammatical reasons, or more generic terms might relate to the same underlying phenomena without being considered by the count (see Appendix 4 for details). Further, the underlying phenomena might be considered by policymakers even when signal terms are not used. Last but not least, signal terms allow only for a superficial assessment of policy substance because they may be used for political or marketing reasons and the terms are not formally defined.¹¹ For example, due to the vagueness of the term “competitiveness”, it is possible that policymakers attach different meanings to the term, including general ideas about stimulating competition.

Insofar as competition-promoting interventions are foreseen, entrepreneurship support dominates, followed by incentives for the market entry of extraregional firms. In contrast, fostering competition between regional incumbent firms is only of minor relevance. But if cooperation seems to be more popular than competition, why do RIS3 promote competition with new or extraregional firms? We presume that there is a political trade-off involved. Promoting competition with intraregional firms comes at a political cost that seems worth taking if and when employment creation is deemed likely. Fostering competition between incumbent firms, however, does not promise immediate employment gains and initially may even threaten job losses until a higher-productivity equilibrium is achieved.

There is substantial variation between the strategies in their attention to competition, although the majority of them do not assign a crucial role to pro-competition interventions. Out of 20 possible interventions, the median regional strategy foresees only three pro-competition interventions. Some variation between the RIS3 can be explained by competition intensity: RIS3 of regions located in countries with a higher initial level of competition exhibit a lower number of pro-competition interventions. This finding is consistent with our hypothesis H2 that regional policymakers in low-competition countries may be more aware of competition issues and have more to gain from raising regional competition intensities (Aghion et al. 2005).

In our interpretation, the results suggest that there are unseized opportunities for regional policy, in line with Plummer and Acs (2014) who stress the role of pro-competition policies in setting incentives for innovation. Applied regional policy could benefit from a more explicit awareness of the role competition can play within a regional economy, notably when pursuing ambitious diversification strategies that require institutional patterns such as competitive attitudes (Benner 2020b). Recently,

¹¹ We are particularly grateful to an anonymous reviewer for drawing our attention to these limitations.

the innovation policy discourse has seen an increasing orientation towards transformation and sustainability (Tödting et al. 2021). If regional innovation policies under the smart specialisation approach are to be geared more towards these goals in the coming years (McCann and Soete 2020), it seems plausible to argue that inter-firm competition is likely to be a driver of innovation not to be neglected in generating new solutions. After all, established companies with a business model based on environmentally “dirty” technologies are using their dominant market positions to lobby against stricter environmental regulations (e.g., Mattioli et al. 2020). Of course, regional specificities of the business sector will have to be addressed. Self-discovery processes such as the EDP offer a suitable forum to do so. Stakeholders should use the EDP to carefully analyse the state of competition in priority sectors and to identify adequate and targeted interventions accordingly. In fact, competition analysis and competition monitoring are an essential element of modern competition policy (World Bank 2018).

The crucial question for how such a turn towards pro-competition policy can be achieved is difficult to answer. While applying more of the competition-stimulating instruments proposed is a straightforward remedy to rebalance cooperation and competition, the explanations discussed in the theory section of this article suggest that the implementation of effective policy responses may depend on more fundamental issues. For instance, to the degree that global tendencies towards pro-business policies are important, rebalancing might hinge on a larger shift in the paradigm of economic policymaking towards competition-enhancing pro-market policies (Rodrik 2017). If powerful incumbent firms can exert higher influence on the regional level (Landesmann 2015), provisions for pro-competitive regional policies could be foreseen on higher spatial levels. This argument is based on the work by Gutiérrez and Philippon (2018) who identify the assignment of competition policy from the national to the EU level (see also Landesmann 2015) as the crucial factor behind the different developments in the EU and the U.S. By analogy, mainstreaming a pro-competition orientation of smart specialisation strategies could prove an important lever. A simple lack of awareness regarding pro-competition instruments or misinterpretations of theoretical concepts would be the most benign explanation and make remedies obvious and easy to implement. In this case, this article provides guidance for regional policymakers on which instruments are available to them.

Probably the most critical aspect in making the most of the complementarity of cooperation and competition is to limit the role of market power in the policy-making process to prevent lock-in (Grabher 1993) and rent-seeking (Krueger 1974) by incumbent firms and to keep “the EDP arena open to and contestable by new entrants” (Kyriakou 2017: 21) such as new entrepreneurs and other outsiders (Benner 2014, 2017, 2020a; Landesmann 2015; McCann and Ortega-Argilés 2015; Grillitsch 2016; Kyriakou 2017; Radosevic 2017; Hassink and Gong 2019).

Evaluating policy documents, as we did, has its peculiar drawbacks. Apart from the variance in detail, the abstract and sometimes superficial character of strategies

may limit the validity of findings. Since we did not analyse any national-level RIS3, we cannot rule out the possibility that strategies on this level adopt a different view on competition. However, this limitation does not directly affect the validity of our results for the regional level. In addition, RIS3 are embedded in the particular context of EU cohesion policy (Foray et al. 2012; McCann and Ortega-Argilés 2015) albeit this context probably makes them “the biggest ongoing innovation policy experiment in the EU, if not in the world” (Radosevic 2017: 30). The analysis presented here should be seen as a necessary first step to approach the topic of competition in regional development, given that strategy documents are the highest level of any policy architecture. Our findings are valid for the strategies pursued by policy-makers, but priorities in implementation and spending allocation could possibly differ. Looking below the strategic level, e.g., by analysing operational programmes for EU structural funds and projects funded would extend the analysis to the ultimate level of policy implementation and should be the next step. As a further caveat, due to a lack of available regional competition intensity indicators, it is not possible to account for the fact that competition is likely to vary not just between countries but also within countries, i.e., between regions. Concerning RQ3 and H2, the inherent difficulty and complexity of explaining different policy choices between countries or regions has to be considered. Economies differ along several variables (see, for instance, Hall and Soskice 2001) and, due to the lack of a valid natural experiment, the empirical methods applied cannot rule out the existence of alternative explanations for the observed differences. Hence, our reasoning is based on the combination of a significant correlation between the variables of interest and theoretical reasoning. Finally, we did not consider regulatory instruments such as product or labour market regulations. While these regulations are likely to have a substantial impact on competition intensity (Schiantarelli 2016), they are not the subject of RIS3 and nation states differ widely in terms of legislative competencies at the regional level to amend product or labour market regulations.

According to Feldman et al. (2021: 42), issues related to market power and anti-competitive behaviour of firms are “forces the economic geography literature seems to have forgotten.” In line with Feldman et al., we believe that the ramifications of market structure, competition, and corporate power on regional development are too important to ignore. Indeed, early work in the field of industrial organisation by Robinson (1969) on monopsony power in labour markets applied a spatial perspective, arguing that dominant firms in local labour markets can exploit workers with scarce opportunities of alternative local employment.¹² Current research shows the prevalence of monopsony power and how wages are lower in areas with greater concentration of workers among larger firms (Ashenfelter et al. 2010). In such circumstances, raising competition in the labour market can contribute to alleviating problems of rising income inequality.

¹² See also Kyriakou (2017) for a broader discussion on the role of monopsony and monopoly in science and technology.

Fruitful lines of further research include conceptual work on the relationship between spatial proximity, competition, and innovation, empirical studies on the degree and importance of interfirm competition within regions as opposed to external competition, analyses of how interfirm competition actually occurs and varies between regions, and evaluations of regional policy instruments to foster welfare-enhancing modes of competition in product markets and factor markets. Research on regional policies might also benefit from a more explicit consideration of the political-economic processes supporting or constraining the implementation of policies that aim at raising regional competition intensities. In this regard, the crucial issue of EDP openness merits further applied and empirical research.

Our findings on the cooperation bias do not invalidate the complementary relationship between competition and cooperation. On the contrary, competition without some degree of cooperation is likely to lead to static cut-throat competition (see also Tirole 1988), while cooperation without competition risks resulting in adverse outcomes such as lock-in effects (Grabher 1993), thus undermining the transformative aims of smart specialisation (Kyriakou 2017). Our argument is about striking the right balance between competition and cooperation. What precisely the right balance is needs to be identified in a context-specific self-discovery process, and openness of this process to various kinds of economic agents might prove a highly important prerequisite for designing balanced policies without a cooperation bias.

Appendix 1: Analysed RIS3

Region (Abbreviation)	Strategy and source
<i>Corsica (CO)</i>	Collectivité Territoriale de Corse (n.d.). Stratégie de spécialisation Intel-ligente (3S) en Corse, http://s3platform.jrc.ec.europa.eu/documents/20182/228916/FR_Corse_RIS3_Final.pdf/d9385154-49fe-4016-af45-0abb844fcf9 (Accessed 01.07.2019)
<i>Central Denmark (CD)</i>	Central Denmark Region (2011). Growth and development strategy Central Denmark Region: executive summary, http://s3platform.jrc.ec.europa.eu/documents/20182/232200/DK_Midtjylland_Growth_%26_Develop_Strategy_Final.pdf/41e46dea-3ed0-4267-a147-57227bb62d3b (Accessed 01.07.2019)
<i>Dalarna (DA)</i>	Region Dalarna (n.d.). Mobilize for growth: agenda for smart specialization in Dalarna, http://s3platform.jrc.ec.europa.eu/documents/20182/232763/SE_Dalarna_RIS3_Final.pdf/67305db8-2cd4-4e7a-b59f-f7bc7dcc5948 (Accessed 01.07.2019)
<i>East Netherlands (EN)</i>	Province of Gelderland (2013). Smart specialisation strategy East Netherlands, https://www.op-oost.eu/bestanden/Documenten/OP-Oost/Over_OP-Oost/Smart%20specialisation%20strategy%20East%20Netherlands_sept_2013.pdf (Accessed 01.07.2019)

Region (Abbreviation)	Strategy and source
<i>Lower Austria (LA)</i>	Office of the Provincial Government of Lower Austria (2014). Economic strategy Lower Austria 2020, http://s3platform.jrc.ec.europa.eu/documents/20182/230939/AT_Lower_Austria_RIS3_Final.pdf/f692c5f4-087d-4b49-8c3e-3d6b59f2755c (Accessed 01.07.2019)
<i>Lower Saxony (LS)</i>	Niedersächsische Staatskanzlei (2014). Regional- und Strukturpolitik der EU im Zeitraum 2014–2020: Niedersächsische regionale Innovationsstrategie für intelligente Spezialisierung (RIS3), http://s3platform.jrc.ec.europa.eu/documents/20182/229963/DE_Niedersachsen_RIS3_201411_Final.pdf/0c766dab-f5d3-4048-af5e-3dd36a8e7854 (Accessed 01.07.2019)
<i>Marche (MA)</i>	Regione Marche (n.d.). Strategia per la ricerca e l'innovazione per la smart specialisation, http://s3platform.jrc.ec.europa.eu/documents/20182/225192/IT_Marche_RIS3_201611_Final.pdf/79ffbc0f-aa4d-48c9-9d48-952e48791a7c (Accessed 01.07.2019)
<i>Östergötland (OG)^a</i>	Region Östergötland (2014). Smart Specialisation Strategy for Östergötland: summary, https://s3platform.jrc.ec.europa.eu/documents/20182/232763/SE_%C3%96sterg%C3%B6tland_RIS3_201412_Final.pdf/7e7cc8da-6b00-46f7-a838-1b82b711fe01 (Accessed 18.07.2019)
<i>Picardie (PI)</i>	Région Picardie (n.d.). Stratégie de spécialisation intelligente, http://s3platform.jrc.ec.europa.eu/documents/20182/228916/FR_Picardie_RIS3_Final.pdf/04d27efb-1d0b-4060-90bd-28f7a61b1c3b (Accessed 01.07.2019)
<i>Rioja (RI)</i>	Gobierno de la Rioja (2013). Estrategia de especialización inteligente de la Rioja 2014–2020, http://s3platform.jrc.ec.europa.eu/documents/20182/224535/ES_La_Rioja_RIS3_201310_Final.pdf/1db74953-4142-489f-9efb-5d48b3edabfd (Accessed 01.07.2019)
<i>Saxony (SX)</i>	Sächsisches Staatsministerium für Wirtschaft, Arbeit und Verkehr (2013). Innovationsstrategie des Freistaates Sachsen, http://s3platform.jrc.ec.europa.eu/documents/20182/229963/DE_Sachsen_RIS3_201307_Final.pdf/ca3f42e8-7720-4edf-9737-be2383e9bdf2 (Accessed 01.07.2019)
<i>Saxony-Anhalt (SA)</i>	Ministerium für Wissenschaft und Arbeit (2014). Regionale Innovationsstrategie Sachsen-Anhalt 2014–2020, http://s3platform.jrc.ec.europa.eu/documents/20182/229963/DE_Sachsen_Anhalt_RIS3_201402_Final.pdf/5ca4bc54-fcff-4ffc-8346-1a9f4b863d35 (Accessed 01.07.2019)
<i>Southern Denmark (SD)</i>	Region of Southern Denmark (2017). The good life as a driver of growth: regional growth and development strategy, https://issuu.com/region-syddanmark/docs/10448_regional_udviklingsplan_2016_ (Accessed 01.07.2019)
<i>Styria (ST)</i>	Office of the Styrian State Government (n.d.). Economic strategy Styria 2025: growth through innovation, http://s3platform.jrc.ec.europa.eu/documents/20182/230939/AT_Styria_RIS3_Final.pdf/3467797f-de20-4450-998e-fbeaf68170f5 (Accessed 01.07.2019)
<i>Valencia (VA)</i>	Generalitat Valenciana (2014). Estrategia de especialización inteligente para la investigación e innovación en la Comunitat Valenciana, http://s3platform.jrc.ec.europa.eu/documents/20182/224535/ES_RIS3_CValenciana_Final.pdf/0accb2d4-9990-4cb7-85dc-54b90d032ef5 (Accessed 01.07.2019)
<i>Valle d'Aosta (AO)</i>	Regione Autonoma Valle d'Aosta (n.d.). Smart specialisation strategy in Valle d'Aosta, https://s3platform.jrc.ec.europa.eu/documents/20182/225192/IT_VDA_RIS3_Final.pdf/ef922c65-08cb-414e-a02c-7ae8751535f1 (Accessed 22.07.2019)
<i>Värmland (VÄ)^a</i>	Region Värmland (2015). Värmland's Research and Innovation Strategy for Smart Specialisation 2015–2020, https://s3platform.jrc.ec.europa.eu/documents/20182/232763/SE_V%C3%A4rmland_RIS3_2015_Final.pdf/9235776f-2438-4fa3-b91e-7748234b9633 (Accessed 18.07.2019)

Region (Abbreviation)	Strategy and source
<i>Västra Götaland (VG)</i>	Västra Götalandsregionen (n.d.). Smart specialisation in Västra Götaland, http://s3platform.jrc.ec.europa.eu/documents/20182/232763/SE_V%C3%A4stra+G%C3%B6taland_RIS3_Final.pdf/700f7d05-afb1-4d13-9abb-94bb3e38a484 (Accessed 01.07.2019)
<i>Vienna (VI)</i>	City of Vienna (2015). Innovatives Wien 2020: Wiener Strategie für Forschung, Technologie und Innovation, http://s3platform.jrc.ec.europa.eu/documents/20182/230939/AT_Vienna_RIS3_201509_Final.pdf/fb820238-6a1f-4c27-ba83-54bdd939ffb (Accessed 01.07.2019)
<i>West Netherlands (WN)</i>	Kansen voor West (2014). RIS3 strategy for smart specialisation Western Netherlands: final version, http://s3platform.jrc.ec.europa.eu/documents/20182/225903/NL_Western_Netherlands_RIS3_201014_Final.pdf/434df449-3143-4ce1-838f-b6663fbb1d1a (Accessed 01.07.2019)

Source: Authors' elaboration

^aUsed for the robustness check (see Appendix 3)

Appendix 2: Cluster analysis

The agglomerative coefficient is 0.58, suggesting that the dataset is appropriate for a cluster analysis (Hatzinger et al. 2014). Cluster analysis is regarded as an explorative method, and the results should make sense in view of the subject matter (Hatzinger et al. 2014; Hair et al. 2014). Hence, we deviated from the suggested grouping of the countries by reclassifying France as a country with low competition intensity. France performs very well in terms of the two institutional indicators (i.e., ease of starting a business and effectiveness of competition policy) according to the World Bank (2019) and Alemani et al. (2013), respectively, but underperforms when it comes to the actual intensity of competition and the degree of market power. Evidence provided by the low level of economic openness (Aiginger 2011) and a number of studies (e.g., OECD 2019) corroborate the assessment of France as a country with a rather low level of competition.

Table 3 displays the average values of the five indicators used to measure competition intensity for the three clusters.

While the main results in this article are based on the classification presented in Fig. 4, we reproduced all results without the reclassification of France. The

Table 3 Average indicator values per cluster. *Source:* Authors' elaboration based on data from Alemani et al. 2013; Böheim and Pichler 2016; Eklund and Lappi 2019; World Bank 2019; World Economic Forum 2019

Indicator	Interpretation	Countries with low competition intensity	Countries with intermediate competition intensity	Countries with high competition intensity
Persistence of profits	Lower value indicates a lower persistence of profits, i.e. more competition	0.31	0.26	0.22
Degree of domestic competition	1–7, higher value indicates more competition	4.46	5.05	5.28
Markups	Lower value indicates lower markups, i.e. more competition	2.86	2.25	2.04
Starting a business score	0–100, higher value indicates a better performance	89.13	83.40	93.83
Effectiveness of competition policy	Lower value indicates a better performance	0.26	0.66	0.39

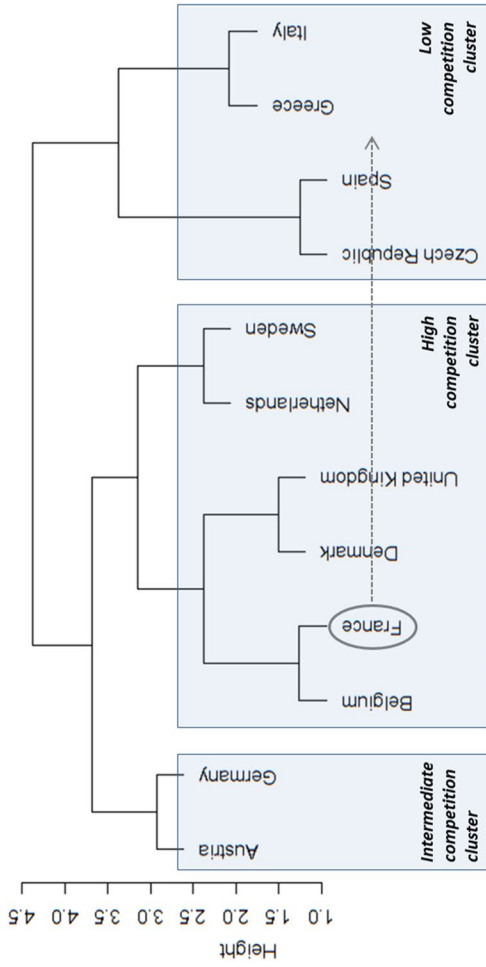


Fig. 4 Dendrogram. *Source:* Authors' elaboration based on R output from the "cluster" package (Maechler et al. 2019)

main findings of the study remain unchanged if we proceed with a country classification as suggested by the cluster analysis in Fig. 4. In particular, the descriptive findings and the results of the ANOVA hold also for the data set without the reclassification of France.

Appendix 3: Robustness checks

The robustness of the results was investigated (1) concerning the data source, i.e., the 18 RIS3, and its validity for analysing the research questions; (2) regarding the statistical results presented in section 4; and (3) whether our coding strategy of the strategy documents is replicable and hence largely insensitive to the person performing the coding.

Firstly, concerning the validity of the data source, the search and identification of competition-related terms and proposed pro-competition interventions are not completely free from ambiguity. For instance, in some cases (e.g., DA, RI), entrepreneurship was mentioned as a topic but without giving further details on planned interventions. Hence, we cannot claim with full confidence that the results on the prevalence of pro-competition interventions give a complete picture of the role of competition-related policy instruments foreseen in RIS3. This is true not least because some possibly important but low-profile mechanisms such as direct job matching performed by cluster or network managers could happen on a day-to-day basis within cooperative schemes such as cluster policies but not be explicitly planned on the strategic level. Still, strategies give an indication of policy priorities, albeit concisely, and thus show the relative role of competition-related policy interventions.¹³

Secondly, the results from descriptive and inferential statistics are based on the analysis of strategies which vary in their level of detail, ranging from superficial documents outlining a long-term regional development vision to comprehensive plans, as is evident by the number of pages ranging from seven (VG) to 195 (MA). The average length is 69 pages and the median length is 57 pages. In addition, it might be the case that further variables confound our finding of an inverse relationship between competition intensity and proposed pro-competition policy interventions. To address those issues, a multiple regression analysis was performed to control for number of pages of the strategies and regional real GDP per capita. The latter variable should capture differences due to the level of economic development and may explain, for instance, the pursuit of an infant-industry strategy of regions. In such a case, poor regions would apply fewer pro-competition policy instruments than rich regions.

Column (1) in Table 4 shows the results. Results for the low and intermediate-competition groups are positive and significant at the 10% level (high competition

¹³ For example, it is remarkable that the extremely compact VG strategy prominently mentions the innovation-enhancing function of public procurement.

Table 4 Estimation results, robustness checks via multiple regression, dependent variable: number of pro-competition interventions per RIS3. *Source:* Authors' elaboration

	(1)	(2)
Grouplow comp	4.230 (0.086)	3.450 (0.135)
Groupmiddle comp	2.763 (0.073)	2.395 (0.108)
Pages	0.008 (0.680)	0.010 (0.608)
gdppc2017	0.000 (0.585)	0.000 (0.850)
Constant	- 0.858 (0.835)	0.693 (0.869)
R^2	0.478	0.428
F Statistic	2.977 (0.060)	2.436 (0.099)
Observations	18	18

p values in parantheses

is the reference group), while the number of pages and per-capita GDP have no significant influence. Given the small sample size, a test of normally distributed errors was applied but no evidence of non-normality emerged (Shapiro–Wilk test, p value = 0.27). Yet, there is some indication of heteroscedasticity (Breusch–Pagan test, p value = 0.07) due to the skewed distribution.¹⁴ Overall, by showing that the length of the strategies and the level of economic development have no partial effect on our dependent variable, the robustness of our conclusions is corroborated.

The two Swedish regions in the sample (DA, VG) have the shortest strategies (eight and seven pages, respectively). To check whether this peculiarity has any impact on our results, we substituted them with the two longest RIS3 available for Sweden (OG, VÄ), with a length of 25 and 52 pages, respectively. Column (2) in Table 4 shows the results for this adjusted sample.

While the coefficients of the grouping variable remain quite stable, the p values are smaller. Yet, taking into account the small sample size, a p value of 0.135 might still be considered to be at least marginally significant (Verbeek 2008). Again, pages and per-capita GDP are not significant. Regression diagnostics show a non-significant Breusch–Pagan test but some indication of a non-normally distributed error term (Shapiro–Wilk test, p value = 0.10). Taken together, the results do not change substantially when the sample is varied as described above, underscoring the robustness of the main findings.

To check the sensitivity of our coding strategy, intracoder and intercoder checks (Mayring and Fenzl 2019) were performed on a sample basis. To test the intracoder reliability, the coding author (M.B.) replicated the coding for a sample of three strategies (DA, LA, VG) which largely confirmed the original coding and led only to minor deviations which were discussed among the authors and to one minor modification. To test the intercoder reliability, we asked a colleague to replicate the coding for one strategy (LA). The tendency of the results of this sensitivity check were largely similar to our coding author's (M.B.) analysis, although on some instruments there were slight differences due to the fact that strategies do not always clearly

¹⁴ Due to the existence of two RIS3 with zero pro-competition interventions, a log-transformation could not be readily applied.

address measures but discuss larger fields of action. These slight intercoder differences can be explained with the conservative approach we adopted. To minimize the risk of excessive interpretation on our part, we did not count instruments as included in strategies if the phrasing in the text was ambiguous or unclear. For example, in the absence of more specific information, more generic notions of contests were not qualified as businesses planning competitions, and phrases like “assistance” were understood as too broad to be classified as more specific forms of support if not described in more detail in the strategies. However, some of the instruments proposed were more generic (e.g., “investment promotion”) which enabled us to capture even more generic phrasings. Consequently, our results may underestimate the instruments actually used to some extent, but judged by the replication exercise, the differences seem minor and should not change the main results markedly.

Appendix 4: Absolute prevalence of competition and cooperation-related terms in RIS3

Table 5 provides the detailed results of the word count of signal terms related to competition, competitiveness, and cooperation for all 18 RIS3 analysed, grouped along the degree of competition intensity of national economies.

In RIS3 that were available in French, German, Italian, or Spanish, adequate translations of the signal terms were used (see Table 6). Since the list of equivalents may not in all cases perfectly match the scope of English terms, the results could slightly

Table 5 Results of the word count of signal terms. *Source:* Authors' elaboration

Dimension	Competition intensity	Low										Intermediate										High					All regions						
		Signal term																				All regions											
		CO	PI	MA	AO	RI	VA	LA	ST	VI	LS	SX	SA	CD	SD	EN	WN	DA	VG	DA	VG												
<i>Intraregional competition</i>	(1) Competition [used in the sense of intraregional interfirm competition]	0	0	0	0	0	0	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7		
	(2) Competition law	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
	(3) Barriers to entry	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
	(4) Market power	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Sum rows (1)+(2)+(3)+(4)	0	0	0	0	2	3	0	2	3	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11		
<i>Extraregional competition</i>	(5) Competition [used in the sense of extraregional interfirm competition]	1	0	3	0	2	3	0	2	3	0	4	0	5	17	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	38		
	(6) Competition [used in the sense of interregional competition, i.e., between jurisdictions]	0	0	0	0	0	0	3	1	4	0	7	5	4	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	29		
	Sum rows (5)+(6)	1	0	3	0	2	6	1	8	0	12	22	6	0	4	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	67		
<i>Competitiveness</i>	(7) Competitiveness	13	45	32	26	79	49	0	3	3	4	18	7	6	8	0	11	2	0	306													
<i>Cooperation</i>	(8) Cooperation/collaboration/cooperative/cooperate/colaborate	49	27	64	57	87	86	11	27	14	43	80	36	17	107	83	23	14	2	827													

Table 6 Equivalents of English-language signal terms. *Source:* Authors' elaboration

English	French	German	Italian	Spanish
Competition	Concurrence	Wettbewerb	Concorrenza	Competencia
Competitiveness	Compétitivité	Wettbewerbsfähigkeit	Competitività	Competitividad
Competition law	Droit de la concurrence	Wettbewerbsrecht	Diritto alle libera concorrenza/ diritto della concorrenza	Derecho a la competencia/ derecho de la competencia
Barriers to entry	Barrière à l'entrée du marché	Markteintrittsbarrieren	Barriera d'ingresso	Barrera de entrada
Market power	Pouvoir de marché	Marktmacht	Potere di mercato	Poder de mercado
Cooperation, collaboration, and derivatives	Coopération, collaboration, and derivatives	Kooperation, Zusammenarbeit, and derivatives	Cooperazione, collaborazione, and derivatives	Cooperación, colaboración, and derivatives

underestimate their prevalence. Some grammatical derivatives (e.g., those with differing endings, adjectives, verbs) were considered in some instances where feasible, notably given the multitude of forms derived from “cooperation” and “collaboration” and their equivalents in other languages. Nevertheless, not all possible grammatical forms or modifications of all signal terms may have been captured (e.g., due to hyphenation), as described as a limitation of the method in the main article.

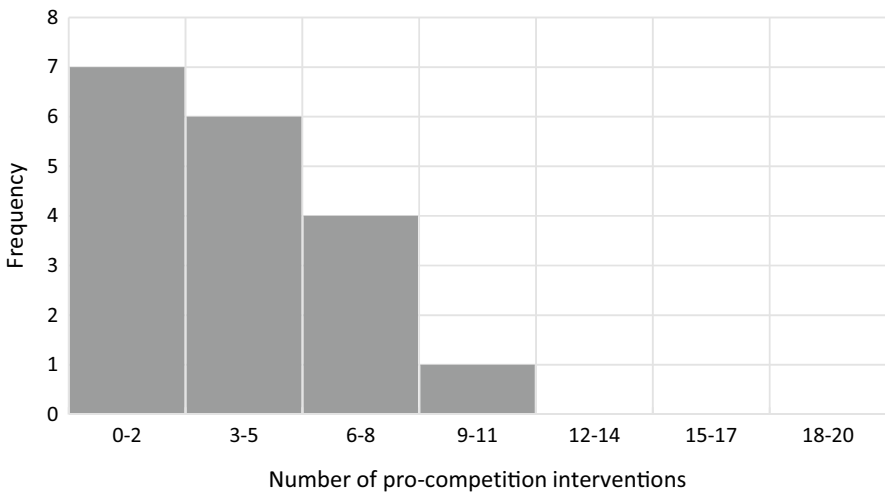


Fig. 5 Histogram of competition-stimulating interventions ($n = 18$). *Source:* Authors' elaboration

Appendix 5: Distribution of competition-stimulating policy interventions

Figure 5 shows the distribution of the prevalence of pro-competition interventions in the 18 strategies. The shape of the histogram is skewed right, indicating the predominance of regions with a rather low number of pro-competition interventions in the sample (skewness = 0.53). Most of the regions apply between 0 to 2 pro-competition interventions, whereas no region deploys more than 50% of the 20 possible instruments; Valle d'Aosta (AO) applied 10 pro-competition interventions, the maximum in the sample. The median RIS3 cites 3.5 pro-competition interventions, which translates into a 95% confidence interval of 2 to 5.

Appendix 6: Post-hoc test

Tukey's HSD method was used as a post-hoc test to find out which groups show significant differences. Significant differences at the 10% level are identified between the low-competition intensity and high-competition intensity groups (p value = 0.008) as well as between the intermediate-competition intensity and the high-competition intensity groups (0.099); no significant differences exist between the low and intermediate groups.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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