

13. Conclusion and Reflection

This chapter presents the overall conclusions on this research project. This thesis aimed to explain and understand the development and the institutionalisation of Science and Innovation Centres (SICs) as distinct tools of science diplomacy. A need was identified in scholarly literature due to the increasing momentum of science diplomacy as a governmental strategy and the weak empirical basis, which is reinforced by a discourse that is driven by normative perspectives. Accordingly, insights into (the governance of) science diplomacy are largely lacking. This study took account of these shortcomings and was positioned in such a way that it follows a distinct analytical and empirical path. Rather than approaching the notion of science diplomacy in general terms, the study adopts an (inductive) instrument-centred perspective, which makes it possible to translate specific findings to the wider discourse. The instrument that was selected are SICs. They are a unique and underexplored institutional response in the governmental toolbox, which is, however, increasingly being adopted by highly innovative countries. More specifically, an in-depth comparison of two SICs, the German DWIH and the Swiss Swissnex, was conducted in a long-term and nuanced way, which is unprecedented in present scholarship (see chapters 7 and 10) and contributes to scholarly literature on institutionalisation processes of (organisational) instruments.

The key question of this study was answered by deploying a two-step heuristic framework based on the theoretical considerations of Lascoumes & Le Galès (2007). This framework structured the empirical analysis since it specified the analytical path and attempted to trace the trajectory of the instruments, i.e., their careers over time in their national contexts. Specific aspects which deserved attention were the contextual factors, the actors involved, the discourse which accompanied the instruments' design and launch as well as critical junctures in the instruments' subsequent development (Lascoumes & Le Galès, 2007). Secondly, the framework seeks to focus on the use and interpretation of the instrument by key actors to generate an insight which accounts for their development (and institutionalisation). It is argued that the use of the instrument by key actors might create distinct (instrumentation) effects, which push institutionalisation dynamics. To provide a guide as to how and why actors might use the

instrument, the theoretical considerations of meta-organisation were selectively deployed (Ahrne & Brunsson, 2005, 2008), leaving the question aside of whether SICs are themselves meta-organisations. More specifically, these considerations conceptualise why actors agree to participate in collective action in the first place (it can be argued that a key goal of SICs is to promote a certain degree of collective action). This furthermore made it possible to develop a distinctly actor-centred perspective on science diplomacy.

This instrument-centred approach has been identified as a meaningful strategy to empirically contribute to the normatively coloured discourse of science diplomacy and to illuminate its governance. This study generated distinct insights into the longitudinal development of SICs and positioned them in their national contexts. To that end, it drew on qualitative data (interviews and documents) to answer the main research question and built a rich and comprehensive data set, which informed the analysis. This work generated original insights through the comparative analysis of Germany's DWIH and Switzerland's Swissnex.

In the following, the key findings of this thesis are put forward (section 13.1) and positioned with respect to the academic literature which informed my research (section 13.2). More specifically, the findings are translated to the science diplomacy discourse (section 13.3), while conceptual advancements to scholarly literature are proposed. This work is furthermore critically evaluated in terms of its limitations (section 13.4) before distinct avenues for further research are presented, (section 13.5) which help to advance the body of knowledge that surrounds a) science diplomacy and b) SICs.

13.1. Key Findings

The key findings can be best arranged by discussing them in light of the four sub-questions which were formulated (see sections 1.1 and 5.1). The first three sub-questions are discussed in the following sections. Sub-question four is answered in the next section (section 13.3) since it focuses on the conceptual implications of these specific findings for the general scholarship of science diplomacy.

13.1.1. Characterisation of SICs (Sub-Question 1)²⁴²

This study provided a characterisation of SICs, which so far had constituted a gap in scholarly literature (chapter 3). Based on a comparative exercise, this study finds evidence of a (growing) isomorphic trend among highly innovative countries to establish SICs. A SIC has been defined as a *distinct unit or satellite institute which has been established in another country by a government and which operates at the nexus of higher education, research, innovation and diplomacy* (Epping, 2020). SICs have further been characterised as *operating within a network structure* (ibid.). The findings show that the exact national representations of SICs differ, but they reflect coherence in being a governmental response which aims to improve a country's international position in a competitive science and technology environment. What is more, SICs are designed in a way that facilitates their national branding and helps to secure their access to distinct resources. More specifically, this study showed that SICs are situated in the larger dynamics of cooperation and competition. They were established in locations which can be considered centres of excellence, key technology hubs or emerging markets (although this varies for each national SIC).

This thesis evaluated SICs according to distinct key characteristics, which ultimately led to the development of a typology. This typology distinguished between three different types of SICs, *the representational model*, which has an irreducible bureaucratic core and a way of operating that is largely determined by key stakeholders, b) *the service-oriented model*, which offers services and caters to the needs of stakeholders on an ad hoc contractual basis, while also responding to market developments to provide the latest insights, and c) *the policy-led model*, which is closely tied to political goals and primarily responds to these (political) needs. Policy-led models are an integral part of a country's diplomatic representative body and presumably operate within this (bureaucratic) framework. Each of these types has been characterised in an ideal-typical way to underline its distinctness. This typology structures the SIC landscape in terms of its organisational set-up and method of operation, and serves as an entry point to further research in the sense of validating these three SIC types. It further marks a conceptual advancement and a distinct contribution to understanding the rise of SICs. In this study, the representational model (DWIH) and the service-oriented model (Swissnex) were selected for clos-

242 Sub-question 1: What are SICs and how can they be characterised?

er analysis. Studying a representational model and a service-oriented model enabled a high level of innovation in the findings due to the network-based structures of these SIC types and their stronger detachment from political goals in comparison to the policy-led model. What is more, both SICs have established distinct organisational units, which largely operate outside the diplomatic umbrella (thus, they are less hierarchically organised) and are hybrid concepts in terms of their actors, themes and set-up. Therefore, studying these two cases revealed a higher degree of institutional innovation, which ultimately generated novel insights into the governance of science diplomacy and enabled unique patterns of interactions and distinct actor constellations to be identified. What is more, given their network character, the opportunities for appropriation by key actors were seen to be higher, which enabled us to develop a distinctly actor-centred perspective on science diplomacy (see section 5.2.4).

13.1.2. Longitudinal Analysis of Two SICs (Sub- Question 2)²⁴³

Both SIC instruments, Swissnex and the DIWH, were analysed in a nuanced and longitudinal way to reconstruct their development, i.e., “*their careers*” (Lascoumes & Le Galès, 2007) over time and in their national contexts. This approach constitutes an advancement to SIC scholarship and contributes to the body of knowledge on the institutionalisation dynamics of organisational instruments. Particular attention was paid to the instruments’ establishment phase and their subsequent development (chapters 7 and 10). This thesis showed in a nuanced way how these two SIC instruments were established over time and identified potential effects which may have reinforced institutionalisation dynamics. The following aspects were singled out as being explanatory for the development of SICs and ultimately as explaining the current model (for a more detailed analysis, see chapter 12):

- (1) This thesis found evidence that SICs developed in light of distinct pressures and given favourable conditions.
- (2) The analysis of the two SIC models reveals that both models are inextricably connected to their national environments and are impacted by system characteristics. In other words, they embody and reflect wider

243 Sub-question 2: Why did SICs emerge and how have they developed since their genesis? How can the current model be explained?

national governance arrangements and inherent system beliefs in such a way that they explain SICs' design principles and the way that SICs were set-up.

- (3) Their development and institutionalisation can be understood as being strongly shaped by contingent events.
- (4) Their shape is, to a large extent, explained by their national environment and the distinct design principles which immediately derive from this (such as the degree of actor involvement in the governance of SICs or funding principles) and remained stable over time.
- (5) The SICs' development is further explained by critical junctures which had an impact on their functioning and led to reorganisation of the instruments.
- (6) The development of the two SICs over time must be understood according to distinct actor constellations which gave rise to instrumentation effects. These instrumentation effects had a consolidating effect and seemed to reinforce institutionalisation dynamics. The data reflects aggregation effects, representation effects and appropriation effects, which, in combination, reinforce a process of institutionalisation and seem to explain the longevity of the instruments, despite critical junctures such as audit exercises.
- (7) The analysis revealed appropriation by key actors in such a way that the two instruments have created their own context which differs from the apparent (political) objectives that were tied to the SICs.

13.1.3. Actor-Centred Perspective: Stakeholder Rationales (Sub-Question 3)²⁴⁴

The analysis of the trajectory made it possible to reveal key actors in the SICs and their involvement in the instruments (see chapters 8 and 11). The analysis reflects clear differences concerning stakeholder involvement, which was most visible by looking at governance aspects: actor-led governance (DWIH) compared to a lean-actor structure (Swissnex). An explanation for this key difference was found in prevailing national system characteristics, which are deeply rooted in the two systems. These varied degrees of involvement were also seen as explaining how the respective

244 Sub-question 3: Which actor groups are involved in SICs and what explains their participation?

model developed. Furthermore, the rationales that guide actors to participate in SICs were unearthed and pointed in both cases to rational considerations. Irrespective of their national context, key actors were primarily concerned with using the instrument in such a way that it would maximise their individual impact. This thesis found evidence that the SICs were used as a platform for their own strategic behaviour or competence advancements (this was also seen as reaffirming certain power relations among key stakeholders). What is more, this study has found evidence that SICs are used in a way which exceeds primarily individual considerations by key stakeholders. More specifically, the instrument seems to create a new context and a sense of collectivity (nationally and on-site) among actors. In other words, the findings show that SICs are valued because they facilitate a stronger appearance of the national research and innovation ecosystem abroad and work as a stepping stone for those actors that do not have a presence abroad. What is more, the findings have shown that actors deliberately support the SICs because of these considerations, in addition to the potential impact for other actors in the national system and because of the idea they encapsulate. This reflects a certain sense-making exercise, which led to distinct stakeholder configurations and new interaction patterns: stakeholders collaborated on-site to support the SIC (although they would not do so otherwise). Accordingly, a key finding of this study is the sense of collectivity which developed among key actors in the national research and education ecosystem in the light of SICs. The next sections will discuss the contribution of this thesis and its findings to scholarly literature.

13.2. Contributions to Scholarship

This thesis was set-up as an inductive and exploratory research project to account for the novelty of the phenomenon. As such it did not primarily aim to test theory. This study drew on and was informed by several theoretical considerations, such as institutional theory. In that vein, this work did not provide an original theoretical contribution to a distinct body of scholarship; instead, it aimed to develop conceptual insights to understand SICs as distinct instruments in the governmental toolbox in order to empirically and conceptually anchor science diplomacy. In addition, it can be argued that it also contributed to scholarly literature on the institutionalisation processes of (organisational) instruments. This thesis has hence prepared

the scene for subsequent studies. In the following section, the findings of this study are discussed with regard to the scholarship it is positioned in.

Policy Instruments Literature

This study has been situated as a policy instruments study and used distinct insights into instruments and policy design (Bali et al., 2019; Capano & Lippi, 2017; Howlett & Mukherjee, 2017) in a way that has informed this thesis and provided a framework for understanding SICs as a distinct (governmental) response. This work was able to confirm some of the key propositions of that body of scholarly literature, most prominently that the launch of SICs has been seen as a (governmental) solution with which to tackle (societal) problems (Salamon, 2000). It also confirmed that the instruments' design processes were constrained and influenced by prior choices and situational logic (Howlett, 2014a). While conventional scholarly literature assigns a functional understanding to policy instruments, this thesis applied the theoretical assumptions of the sociological approach to policy instruments. It contributed to this (novel) stream of scholarly literature and responded to calls to apply these considerations in an empirical sense (Lascoumes & Le Galès, 2004, 2007). Thus, key propositions of this framework were confirmed. In contrast to previous studies, this one, however, focused on one aspect of the framework in detail: the use of the instrument by distinct actors. This was done to establish an actor-centred perspective on science diplomacy and develop an understanding of the instrumentation of SICs to ultimately understand institutionalisation. This selective analysis constitutes a novelty to scholarship since it focuses to a lesser degree on the instruments' choices as part of instrumentation. Instead, it shifted its focus to appropriation and the way that the instrument (as an institution) is interpreted and used by actors. Accordingly, this thesis examined a distinct part of that framework in depth and advanced the theoretical framework by Lascoumes and Le Galès (2007) (which is pointed to in other contributions, as well (Ravinet, 2011)). What is more, this thesis contributed to scholarly literature on institutionalisation processes of (organisational) instruments.

Cooperation and Competition

What is more, this thesis contributes to scholarly understanding of governmental responses to navigating between the logic of competition and cooperation, which characterise the research and science and innovation landscape (Edler & Fagerberg, 2017; J. J. W. Powell, 2020). While scholarly

literature sees distinct approaches to tackling this, such as excellence initiatives (Cremonini et al., 2018) or internationalisation policies (de Wit & Altbach, 2021; Huisman & van der Wende, 2005; van der Wende, 2001), these responses are largely designed in such a way that they work in the national context. In other words, these approaches aim to equip national actors with resources to secure their competitive advantage internationally. This work, in contrast, focuses on the understanding of an instrument which operates beyond this national context and aims to develop an impact abroad, which feeds back into the national system. This can be seen as a shift of focus and an inversion of the ways previous instruments worked. This also identified distinct governance structures, i.e., seeing the foreign ministry in the driver's seat and key stakeholders from the science and innovation landscape. So far, scholarly literature has been divided according to these two perspectives: those instruments which aim to generate an impact within the system (mostly sectoral ministry-funded) and those instruments which aim to create an impact abroad, which feeds back and advances the national system (which reflects the foreign affairs ministry's way of thinking). This study can be seen as bridging these two perspectives.

To add to the previous section, SICs in particular were situated alongside the spectrum of competition vs. cooperation (J. J. W. Powell et al., 2017; J. J. W. Powell, 2020; Ruffini, 2020a). This was observed at a national level and at the level of actors. SICs in both countries were viewed from the start as a response to being internationally competitive since their core goals were to showcase and promote the two countries internationally as top destinations for science, research and innovation. This was deemed relevant considering their scarce natural resources. Moreover, the German case reflected that the AA deliberately analysed how competitors position themselves in light of these pressures and aimed to adopt comparable responses. This overarching objective is reflected in the set-up, core goals and geographical spread of both SICs (such as navigating between emerging economies and key tech hubs). Furthermore, the analysis of actors' use of the SICs in question shows that forms of competitive logic are at stake. Stakeholders used the SICs to secure their position nationally and internationally. On the other side of the coin, the focus on cooperation has been a complementary element. This is most notable when looking at the German case and the placement of SICs in the third pillar of foreign policy, which generally emphasises cooperation. Furthermore, SICs have been viewed in both cases as instruments which make it possible to build bridges and encourage international research cooperation. Accordingly, cooperation is viewed as a central

element which guides SICs. This is also reflected in their design, which aims to promote exchange with the national and international academic communities. Accordingly, this study emphasises and reaffirms that the two logics of competition and cooperation, which characterise the international science and research system, are manifested in SICs too (Ruffini, 2020a).

International (Research) Collaborations

In addition, this study also contributes to an understanding of the conditions under which international collaborations might take place. More specially, light is shed on the question of how international research collaborations might be organisationally facilitated and what logic drives institutional actors to engage in international collaborations (Dusdal & Powell, 2021). Accordingly, the actor-driven rationales for participating in SICs which were identified in this thesis might offer meaningful insights which help us to understand (international) collaborations in the research and innovation ecosystem in general terms. Please note that this study does not shed light on the individual considerations of academics; instead, it pays attention to organisational structures, such as intermediary organisations, research councils and higher education institutions. The next section outlines the specific contributions to scholarship of science diplomacy.

13.3. Reflections on Science Diplomacy (Sub-Question 4)

In response to empirically and conceptually weak science diplomacy scholarship, this thesis provides empirical insights to advance science diplomacy scholarship and moves beyond the normative expectations which often characterise current discussions (Ruffini, 2020b). This study, accordingly, responds to the distinct critique that has been raised previously: the lack of empirical evidence (see section 2.6). In addition, it drew on neighbouring academic fields and concepts to create insights. Thereby, this study aims to overcome the frequent claims of new forms of diplomacy that opt for an “*explanation by naming*” approach (Sending et al., 2011, p. 534). The study’s instrument-centred approach allows for its key findings to be transferred to the wider discourse and illuminate the governance of science diplomacy (actors, rationales and instruments). It further generated a distinctly

actor-centred perspective²⁴⁵. These findings have the potential to structure the ongoing science diplomacy debate in more rigorously grounded and policy-relevant terms. Whilst some findings are distinctly original, others reaffirm those of previous studies.

13.3.1. A New Focus on Science Diplomacy Instruments

The science diplomacy toolbox is richer than is commonly conceived in scholarly literature and includes SICs.

This study enriches the understanding of the governmental toolbox of science diplomacy. So far, scholarship has largely paid attention to the same kinds of instruments, such as CERN or SESAME (Rüffin & Schreiterer, 2017a; Rungius, 2020). These instruments are viewed as best-case scenarios and ideal-typical cases of science diplomacy. However, this study shifts the focus away from these multinational research organisations and towards national instruments, which are in the academic focus to a lesser degree (an exception is the work by Sabzalieva et al., 2021). More specifically, SICs were selected because of their hybrid nature and since they are increasingly being adopted by innovative countries. What is more, SICs have largely been neglected in scholarly literature (exceptions to this are Berg, 2010; Epping, 2020; Rüffin, 2018). This thesis accordingly makes a distinct and original contribution to the body of literature since it is set up as a longitudinal and bi-national comparative analysis. What is more, the specific instrument-centred approach constitutes a distinct entry point for scholarship, which allows for insights into science diplomacy that are based on empirical observations: SICs serve as magnifiers for understanding science diplomacy in terms of its governance, national embeddedness, etc. Accordingly, the analysis of SICs here overcomes normatively coloured explanatory patterns, which dominate the discourse. What is more, it singles out alternative instruments in the governmental toolbox which are worthwhile studying since they enrich the body of knowledge of instruments that aim to promote science diplomacy.

245 Sub-question 4: How can the study of SICs be used to further understand and advance the concept of science diplomacy?

A typology to classify SICs

The instrument-centred approach of this study facilitates an attempt to systematise and typologise (science diplomacy) instruments, which are increasingly being adopted as instruments in highly innovative countries. Based on a comparative exercise, a three-model typology of SICs has been developed which classifies them. The typology shows that SICs share similarities, yet they are distinct and can only be fully understood in their national contexts. While this typology is certainly subject to verification, it marks an attempt to structure the empirical SIC landscape. So far, there have been few attempts to classify science diplomacy instruments in scholarly literature, although there are distinct tools for doing this (see section 4.1.2). This typology creation can be seen as an advancement to the prevailing scholarship and it underpins the finding that science diplomacy approaches differ between countries (Flink & Schreiterer, 2010): there is no one-size-fits-all definition and approach to science diplomacy.

13.3.2. Science Diplomacy is National

Science diplomacy primarily responds to (changing) national needs

This study shows that science diplomacy is strongly anchored in its national context and can only be fully understood by unravelling the underlying structures of the (institutional) environment, system beliefs and objectives. The shape of SICs, and hence the shape of science diplomacy, is deeply rooted in the national context and mediated, for instance, by organisational capacities, institutional positioning or funding and governance principles. This thesis has shown that behind the smokescreen of normative assumptions about science diplomacy, there are distinct political objectives and goals attached to SICs as instruments which have changed slightly over time (suggesting layering of objectives). From the start, the two SICs in this study were used as instruments to facilitate national objectives such as promoting internationalisation and combatting brain drain (Swissnex), while also serving as a one-stop-shop opportunity abroad (DWIH). In both cases, the instruments are seen to promote international visibility and reflect a deliberate branding exercise. This underlines a symbolic dimension which is tied to SICs in terms of generating an external impact.

Accordingly, SICs are viewed as a distinct tool of public diplomacy (Melissen, 2005) intended to promote a national image abroad. In contrast

to the normative conceptualisations that guide the science diplomacy discourse (see chapter 2), the findings of this study show that the decisions to adopt a particular instrument are driven primarily by national interests (rather than transcending boundaries). This largely corresponds to previous findings (cf. the rationales of science diplomacy as mentioned by Flink and Schreiterer (2010) but also cf. Ruffini, 2020b; Rungius & Flink, 2020). What is more, this underlines the aspect of intentionality of science diplomacy activities (cf. Van Langenhove, 2016). Rather than being a side-product, this study has shown that science diplomacy is intentional and ultimately driven by political ambitions; it is primarily concerned with national interests (rather than tackling common global challenges), although arguably cross-border activities are also relevant (cf. Gluckmann et al., 2017). The German case study, in particular, nevertheless showed tendencies towards more universal values, such as promoting academic freedom. In terms of creating boundaries, science diplomacy can be defined as purposive governmental action, which is manifested in instruments or policies, rather than being a coincidental by-product (though side effects might be observed). Aligning this to the Royal Society and AAAS (2010) definition, this comes closest to being an expression of *diplomacy for science*. A noteworthy finding points to the role of influence (cf. T. C. Wang, 2013). While the normatively driven discourse assumes this to be a key concern in the promotion of international science cooperation, this was observed to a lesser degree in this study, while this might arguably be an implicit goal since SICs are part of the wider policy frame.

Challenging normative claims: science diplomacy and its instruments are context-specific and develop in line with national characteristics

This thesis demonstrates that science diplomacy is strongly embedded in and linked to its national context. More specifically, national system characteristics and interests are seen as providing the framework conditions for science diplomacy to take shape. In fact, they constitute limits to what can be realised and also provide opportunities. While this aspect is neglected in the advocacy literature, this finding is of utmost importance since it adds a realistic perspective to the normative discourse. To underpin this, although the national interest of science diplomacy activities is not a new finding in scholarship (Flink & Schreiterer, 2010; Ruffini, 2020a), the way that this translates into the choices and set-up of instruments constitutes a new finding. This study has found that responses to science diplomacy (such as instruments and policies) are impacted by distinct national charac-

teristics, which may place a limit on what is politically anticipated. This work was able to show that framework conditions, such as the institutional environment or distinct actor constellations, were constraining factors in terms of the instrument's design and capabilities, and even its core themes were subject to negotiation processes. This led to outcomes that were based on a lowest common denominator. Furthermore, the findings show that contingency aspects are at stake and science diplomacy responses might successfully be adopted under certain circumstances (in light of momentum), while at other times, these ideas cannot generate a similar impact (which is most evident from the failed policy transfer of the DWIH). Accordingly, the findings in this thesis add a realistic policy-making (and policy design) focus to the normatively coloured debate on science diplomacy, which traditionally assumes win-win situations and deliberate policy-making. This contradicts the often “romanticized” narrative of science diplomacy (Rungius & Flink, 2020) by bringing in a realistic dimension.

13.3.3. Science Diplomacy Actors

Ministerial actors are in charge

This thesis further shows that the national context reveals insights into the actor structures of science diplomacy. Scholarly literature identified governmental actors, such as foreign ministries and ministries of education and research (Flink, 2009), as key stakeholders. This study was able to confirm that these two actors play a crucial role in terms of SICs. Furthermore, it was also able to identify struggles over competence between these two actors, which has also been observed elsewhere (Raev, 2020; Rüffin, 2018). Thereby, it was revealed that the degree of involvement in SICs (and hence science diplomacy) varies in the two cases studied. In the Swiss case, the ministry for education and research (SERI) was identified as being the key ministerial actor, while in the case of Germany, the AA is credited as playing a crucial role. However, both cases pointed to cooperation with other governmental actors. These differences are explained by initial design principles which were institutionalised over time.

Key stakeholders in the science and innovation landscape operate as agents of science diplomacy and can actively shape and influence it

Apart from these key governmental actors, the data reveals a diversified actor structure which is involved in the steering of science diplomacy

activities. This is in line with the findings of Legrand and Stone (2018), who observe a fragmented science diplomacy actor structure, and more generally with Salamon (2000), who argues for network governance structures of non-state actors. The DWIH, for instance, assign a key role to actors in the national science and innovation landscape in terms of a) shaping the design of the instrument and b) being involved in its governance and steering. To illustrate this, relevant stakeholders were actors in the science and research system (Alliance of Science Organisations) in addition to stakeholders from the business and innovation sectors. What is more, this thesis has shown that key actors may operate as agents of wider (political) objectives, while they also have gate-keeping roles which might limit the instrument. SICs might work according to the lowest common denominator and certain activities are subject to actors' approval. The crucial role of stakeholders, which has been identified in this study, has not been adequately captured in scholarly literature and ultimately constitutes a clear limitation (The Royal Society & AAAS, 2010). SICs place key stakeholders in a position to operate as agents, to deploy the instrument and to generate an impact to carry forward national objectives.

Therefore, this thesis argues for an analysis of the national context to identify those actors who have a governing or steering role and who possess the competences and resources to determine science diplomacy structures, and are hence actors in science diplomacy. This might generate a more refined understanding of science diplomacy actors than is commonly conceived in scholarly literature. In essence, this study argues that those actors who have the discretion and power to determine and influence science diplomacy activities in the sense of governing and steering should be identified as primary actors (and distinguished from those who use the instruments but do not have a governing role; these are presumably secondary actors). On a different note, it is subject to discussion and additional research whether these primary actors would, in fact, consider themselves to be actors in science diplomacy or not.

13.3.4. Science Diplomacy Is Used by (Key) Stakeholders as a Platform to Convey Their Goals

SICs create arenas that actors use according to their own agendas and in line with their own needs. This might lead to goal conflicts.

This study has shown that science diplomacy instruments reflect and are shaped by key stakeholder needs. While SICs are vehicles with which to convey these (political) objectives, the success and impact of this instrument depends on its use by actors in the end. However, these operate according to their own logic and reflect reasoning that is largely driven by individual (strategic) considerations. In other words, this study has shown that despite this new value-loaded science diplomacy instrument, stakeholders seem to continue doing what they would do anyhow, irrespective of whether SICs are seen to be an instrument of science diplomacy. Classical notions that are tied to the science diplomacy discourse, such as bridge building or facilitating mutual understanding (representing the science diplomacy discourse, see chapter 2) were hardly mentioned as explanatory elements for participation and seem to be more of a political concern (with the limits shown in section 8.1). Instead, actors mainly operated according to their own benefit, which reflected their own sense-making of SICs (actors even distanced themselves from responding to political objectives). This finding suggests that certain conflicts over goals might have been encountered (possibly impacting on the instrument's performance). The data thus underlines that the rationales for participation in the instrument rarely adhere to the political (science diplomacy) aspirations which are tied to the instrument (see chapter 2).

13.3.5. Science Diplomacy Creates a Sense of Collectivity (in Research Ecosystems)

Science diplomacy creates distinct effects

The actor-centred perspective which was adopted in this study reveals a distinct use of SICs in the sense of them being transformative and having a structuring role. This study was able to show that SICs, as instruments of science diplomacy, reflect distinct instrumentation by their key actors, which creates a new frame of reference. Most notably, the findings identify a sense of collectivity that emerged among stakeholders who considered

themselves to be part of this joint (science diplomacy) endeavour. In other words, SICs create distinct actor configurations and collective action that would otherwise presumably not have been encountered. New platforms of exchange and interaction patterns emerged as a result of this instrument. Therefore, this study sees evidence that instruments of science diplomacy, though originally designed to create an impact on the external (international) environment, also have an impact on national actor structures and create (or reinforce) a distinct sense of collectivity among them. One could speculate whether this sense of collectivity among national actors facilitates the SICs in operating abroad and potentially fosters national branding exercises.

This effect has not been politically formulated, yet the findings show science diplomacy has a positive impact on national science and innovation ecosystems in the sense that it creates a sense of collectivity. Yet as far as the international environment is concerned, the data shows that bringing together different actors under the SIC umbrella constructs new international spaces that promote the national research eco-system. In other words, it can be argued that science diplomacy redefines space and relationships by linking actors both nationally and internationally. This attests to the structuring and transformative role of science diplomacy and thereby confirms one of its normative assumptions: science diplomacy has the potential to impact and reinforce relations with international partners. Hence, the findings can also be seen as providing insights into the aspects that explain international collaboration: expectations of collaborating, a sense of solidarity among key actors and collaboration primarily in line with (rational) strategic considerations.

To sum up, the findings of this study make it possible to define science diplomacy as intentional governmental action rather than as a side project. More specifically, science diplomacy relates to cooperation between political actors and science and innovation actors in a common framework and towards a common goal. However, science diplomacy clearly needs to be understood in its distinct national context.

13.4. Reflections and Limitations

Finally, critical reflection is engaged in during this research exercise. This study generated insights into how distinct instruments of science diplomacy emerged and how they gradually became institutionalised and formalised

over time. Four aspects should be reflected on in more detail. Firstly, limitations apply in terms of the data sources which inform this thesis, most specifically interviews. These considerations were already addressed in detail in a previous section (section 5.5) but are noteworthy in a concluding sense. Interviews were selected as one of the two key data sources that inform this study. Given that the German case was poorly documented, interviews were used as compensation to trace the DWIH's development over time and to reveal actors' perspectives. The data processing (and analysis) signalled that a skewed and selective memory among interview partners might have been at stake because the different interview sources revealed ambiguities. For instance, these related to the timing of certain events and the stakeholders that were involved. This was also observed in the Swiss case, where the data was ambiguous at times, and a tendency was observed for various actors to want their part of the pie and get the glory. These ambiguities were clearly identified in the case study presentations, and triangulation was attempted by relying on documents. Overall, however, the impact of these ambiguities was not so severe and did not significantly limit the findings of this study or impact the quality of the data. Moreover, the use of SICs by key actors was extracted by my mainly drawing on their self-reported use. This can be seen as a shortcoming since there might be a discrepancy between the SICs' anticipated use and their actual use by stakeholders (this could, however, not be monitored; to contextualise these findings the annual reports of key actors were inspected with regard to the use of SICs). Furthermore, particularly in the German case, this proved to be a sensitive issue, and a certain degree of reluctance on the side of interview partners was observed. Accordingly, strict measures that ensure anonymity were taken, such as presenting the use of SICs by actors in an aggregated way.

Secondly, the data collection process, more specifically the interviews were impacted by sampling factors. The sample for this study was, for instance, impacted by the non-availability of certain stakeholders or by gatekeeping expressed through the denial of access to certain interview partners, which presumably limited critical perspectives on SICs. As regards the actual sample, key actors were sampled who were involved in the SICs' governance structures. It became clear that these actors seem to be comparatively strong and well-equipped. To balance these findings and generate more nuanced instrumentation of SICs, a more diversified sample would have been necessary (although this was not the research focus). An even more diverse sample in terms of stronger and weaker actors

(resource-wise) would also shed light on the added value of the instrument for weaker actors. This was elaborated in more detail (in section 12.2.8) and propositions were made for specific appropriation aspects which may be encountered by weaker actors, such as SICs being a door-opener, gains in visibility, prestige or social benefits.

Thirdly, the aspect of generalisability should also be discussed. These findings inform the wider science diplomacy discourse and scholarship on SICs. This study can be held accountable for the insights which it generated by analysing two national SICs models, while the findings need to be critically evaluated for the third model which was identified in this study: the policy-led model. Given the different set-up of the policy-led model (see section 3.4.3), findings regarding appropriation by key stakeholders are unlikely to hold true in the same terms for the policy-led model. While policy-led models also involve stakeholder interactions, they differ in terms of their degree and intensity compared to the other two models (see chapter 3). Also, appropriation effects, such as the development of a collective identity (see section 12.2) are not likely to be encountered for the policy-led model. In terms of understanding the institutionalisation of the policy-led model, the present findings might, however, be transferable to the third model, too. Aspects such as national characteristics seem to be relevant considerations which could explain the development of the policy-led model. In addition, the policy-led is characterised by a dual ministerial responsibility (at least in the case of the UK's SIN, while the information on the other two countries is incomplete), which was identified as a decisive element in this study (chapter 3). Accordingly, the findings of this study are only transferable and generalisable to the understanding of policy-led models to a limited degree. This thesis argues for an in-depth analysis of this model (see section 13.5 for avenues for further research on policy-led models).

Fourthly, besides being a distinct and valuable instrument, it is essential to point out that SICs are just one instrument in the wider governmental toolbox which aims to promote international collaboration and address national competitiveness at the global level (BMBF, 2020b; Schweizer Bundesrat, 2020b). Previous sections identified other instruments (see sections 6.4 and 9.4.2) (tool-mixes) in this realm which have similar purposes; it is assumed that these instruments work in concert. However, it should be highlighted that SICs operate with comparatively little public funding, despite having the potential to create distinct effects.

13.5. Avenues for Further Research

This study proposes an agenda for further research and suggests five distinct avenues that will be outlined in the following section. These aim to advance the research on SICs and science diplomacy.

Analysis of a Policy-Led Model

This study developed a typology to structure the SIC landscape. Of the three models which were identified, this thesis analysed two. To further advance the body of knowledge on SICs, the typology is subject to validation and (potentially modification). More specifically, a promising avenue for further research is the analysis of the third model that has been identified, yet not analysed in this study: policy-led SICs. This analysis would be useful to understand general patterns of SICs and science diplomacy governance structures. In addition, this analysis would help to contrast and position the findings regarding the policy-led model in relation to the findings of this study. The Science and Innovation Network (UK) as well as the Holland Innovation Network and the Flemish network have all previously been identified as ideal types of policy-led models (see section 3.4.3), although more specific information is required for the latter two.

To gain an empirical understanding of their ways of working, it would be useful to trace their development and institutionalisation in a way similar to that done in this study (drawing on interviews and documents). Three distinct strategies could be followed: Firstly, it could be revealing to comparatively analyse the Dutch and the Flemish models since both the Netherlands and Belgium are comparable in size and are neighbouring countries. What is more, the Flemish model has been newly set up, and one could assume that this model has been strongly influenced by already existing SICs. Secondly, a comparative analysis of the UK model with one of the other two countries could also be revealing to gain a deeper insight into how these SICs are governed and whether country size makes a difference. Thirdly, the most promising strategy would be a comparison of a policy-led model and another service-oriented model (such as the Danish case or Nordic Innovation House (see section 3.4.1)). This would reveal insights into a policy-led model and verify this study's typology exercise. In other words, it would enrich the body of knowledge on SICs in general and the two models in particular (*service-oriented* and *policy-led* SICs), keeping in mind that appropriation by key actors is presumably found to a lesser degree in policy-led models (compared to the findings of this study).

All three comparative studies, as outlined above, would benefit from in-depth expert interviews with ministerial key actors and on-site observations for data collection. This has been demonstrated to be a useful strategy for examining the appropriation of the newly created spaces by key actors. To conclude, the previously outlined strategies would presumably make it possible to generate distinct insights into the policy-led model and would contribute to a greater understanding of these SICs.

Expanding and Diversifying SICs' Stakeholders

Moreover, in line with the actor-centred perspective on science diplomacy and underlining the instrumentation effects that were observed, it would be beneficial to expand and diversify the number of stakeholders. In the case of Germany, it has been suggested that this should be extended to those actors that are not involved in the governing structures and should also include those that have fewer resources of their own. One would expect that these actors' instrumentation of SICs might differ and reveal considerations such as SICs being used as a stepping stone or providing legitimacy and a brand for operating abroad.

On-Site Perspectives on SICs

In addition, the findings of this study would benefit from being aligned with an on-site perspective on SICs. Given that this thesis has largely focused on the national arrangements and characteristics that explain the development of the instruments, it has not delved into the richness of activities and the often unique constellations that arise on-site due to this instrument. Accordingly, an in-depth analysis of on-site locations would complement the understanding of the SICs since it might also put some of the findings that were observed here into perspective. Furthermore, this could generate new insights, for instance, into how stakeholders collaborate on-site and whether that differs from collaborations (struggles) in their national contexts. It further enriches the distinct actor-centred perspective on science diplomacy by also including those actors that engage on-site with the SICs, or in the case of Germany, are supporters of the instrument, not to mention the political perspective that could be contrasted (pointing to the aspect of effectiveness). This would shed light on how national science diplomacy responses operate abroad.

Measuring the Effectiveness of SICs

The question of the impact and the effectiveness of SICs has not been explicitly answered in this study. However, these constitute relevant questions which help to position SICs as an instrument in the wider governmental toolbox and to evaluate their added value compared to other (funding) instruments. Assessing the effectiveness of SICs is not an easy task given the complexity of this instrument and the different objectives to which it responds. Based on the findings of this study, it can be argued that measuring effectiveness requires a context-specific and an actor-specific focus. One might, of course, turn to quantitative numbers and key performance indicators, such as measuring the number of events or third-party funding. However, it is more revealing to analyse effectiveness in a qualitative way in order to understand it in terms of the collaborations which may emerge, the networks which may have been strengthened and the impact that these instruments may have had on the wider national ecosystem (such as the sense of collectivity), as well as on individual actors (such as opportunities for repositioning or new collaborations which emerge). Measuring this added value could be achieved even more by drawing on counterfactual elements which address a hypothetical situation, for instance closing SICs. This was also a strategy in this study (see section 5.4.2). This approach makes it possible to identify the perceived importance of SICs, while also providing further insights into actors' sense-making and the added value of SICs. The data pointed to several joint activities between actors and SICs that were considered to have made an impact. Qualitative follow-up interviews could presumably shed light on this perceived impact. What is more, the data identified the work of SICs in terms of creating distinct new channels for cooperation and communication, which also constitute a qualitative element for analysing and understanding effectiveness. To sum up, based on the findings of this study, there should be an awareness that the effectiveness of SICs in policy terms and their effectiveness from an actor-perspective might diverge. Hence, an approach is needed which is sensitive to the national context and distinct actor appropriation to effectively measure the impact of SICs in a qualitative way and to go beyond image building and beyond purely quantitative considerations.

Reflecting Upon Science Diplomacy in Light of Recent Geopolitical Events

A final avenue for research on the use of SICs and science diplomacy derives from recent geopolitical events. Without going into too much detail,

this normative view of science diplomacy has been strongly shaken up and disrupted by the Ukraine–Russia conflict (since February 2022). While science diplomacy has been praised as a bridge builder and a channel of communication that remains open even in times of conflict, these events have shown the limits of the concept and marked an unprecedented case of science diplomacy being put on hold. This implies a need for conceptual modification of the notion. For instance, at CERN²⁴⁶, a prestigious science diplomacy instrument, Russia's observer status has been suspended. In a similar vein, organisations such as the German DAAD have stopped individual funding arrangements with Russia (i.e., funding the mobility of German researchers to Russia in line with sanctions that aim to isolate Russia economically) or have refrained from communicating with government officials (cf. J. Mukherjee, 2022). Mobility from Russia should, however, be maintained to keep these channels of communication open. This demonstrates that there are in fact limits to science diplomacy in certain situations, which had not previously been considered to that extent. The conflict also shows the limits of soft power when it is confronted with hard power (cf. Schütte, 2022). In addition, prestigious research organisations, such as the German DFG, have been confronted with a situation where their authorisation to operate in Russia has been withdrawn, although this is subject to further analysis. Thus, the implications for the DWIH's ability to operate in Russia are still unclear²⁴⁷. Arguably, these cases seem to constitute a critical juncture for the study of science diplomacy and are a stress test for its (normative) considerations. Ultimately, current definitions and assumptions need to be reconsidered.

13.6. Conclusion

This thesis explained the development and institutionalisation of *Science and Innovation Centres* (SICs). SICs were identified as unique and under-explored instruments in the science diplomacy toolbox; they are increas-

246 For more information on how these developments have affected CERN, please see: <https://home.cern/news/news/cern/cern-council-responds-russian-invasion-ukraine> (accessed 14.03.2022).

247 Personal communication indicated that the DWIH have taken on an observer role for the time being rather than actively organising events or engaging with local actors. However, the DWIH are seen as a valuable instrument, a stepping stone which might quickly take up its work again if the time comes (personal communication, 12.05.2022).

ingly being adopted by highly innovative countries in order to promote international cooperation and respond to international competition. While SICs are just one instrument in the governmental toolbox for promoting international collaboration and enhancing international visibility, they are distinct due to their holistic set-up and their role as a nucleus for the wider research and innovation system they represent. Moreover, SICs appear to have the potential to create a distinct impact despite their limited financial resources. The findings of this study have reaffirmed that there is no one-size-fits-all approach to science diplomacy. Furthermore, to answer the main research question put forward by this thesis, this study has shown that the German and Swiss SICs were developed as responses to wider societal trends, although these trends differed between the two cases. Their specific developments have been characterised by aspects such as timing, contingency and critical junctures. Furthermore, SICs were identified as being inextricably connected to their national contexts and they reflect distinct system characteristics, such as governance arrangements or the degree of actor involvement. These aspects were also seen as explaining the exact shape that SICs take. In addition, this study has found evidence of appropriation of SICs by key actors, and this has contributed to their institutionalisation. Key actors primarily use SICs in line with their organisational interests. In the case of the DWIH, this impacted and even limited the DWIH's (potential) design and ways of operating. However, the analysis of SICs' appropriation also revealed a distinct sense of collectivity, which developed among actors in the national research and innovation ecosystem due to the instrument. Accordingly, the development and institutionalisation of SICs can be explained by the national context, aspects of timing, contingent events and critical junctures, as well as distinct actor appropriation.

In combination, the findings of this thesis reaffirm that science diplomacy is clearly driven by national agendas; furthermore, its governance (actors, rationales and instruments) can only be fully understood by analysing its national context. Moreover, this study positioned science diplomacy as a distinct governmental response to the dynamics of cooperation and competition. These considerations were also found to be key aspects that guide SICs. With regard to the normative assumptions that seem to drive science diplomacy discourse, this study has found evidence that SICs have the potential to create an impact in ways such as creating new channels of communication and by linking actors. However, it is questionable to what extent SICs are instruments that shape diplomacy or, in fact, improve international relations. SICs are certainly a suitable instrument for

a country's international positioning and the creation of an image (which aligns with ideas of soft power). However, in terms of their connections to diplomacy, SICs can be described as operating under the umbrella of, or alongside, diplomatic representations abroad, rather than actually shaping them. In other words, the normative idea that science diplomacy, or more specifically a SIC, is a vehicle through which to strengthen international relations and create an impact should be viewed cautiously and should not be overemphasised. While a certain impact cannot be excluded, the evidence is unclear and there is no distinct and immediately observable effect (however, a counterfactual situation cannot be examined either). Rather than overemphasising SICs' potential impact on international relations, there should be a focus on their role as a nucleus and their contributions to highlighting national research and innovation systems in a holistic way, as well as the effects and potential this creates for individual actors and the collective ecosystem.