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ORIGINAL ARTICLE

Academics' Societal Engagement in Cross-country Perspective: Large-*n* in Small-*n* Comparative Case Studies

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Abstract

This editorial article presents the conceptual approach to researching academics' societal engagement (ASE) in the cross-country study "Academic Profession in Knowledge Societies (APIKS)." Methodologically, the APIKS survey (large-*n*) aims for the cross-country comparative study of academics' work (research, teaching, ASE and (self-governance) of selected country cases (small-*n*). We define ASE broadly as social co-construction of knowledge (and technology) by academics and partners from outside academia. Conceptually, we amended the analytical framework by Perkmann et al. (Res Policy 42:423–442, 2013), for example, by adding a contextual factors box (e.g., network indicators). For the study of ASE, in a collaborative effort, we evaluated ASE-activities or types of ASE-activities and selected 17 ASE-activities, which are applicable in varying national higher education and sciences contexts. We find that concrete ASE-practices are strongly connected to the national higher education and science traditions of the respective countries and disciplinary cultures. The technical and commercial dimension of ASE is dominantly performed in STEM-fields, and knowledge dissemination activities and participation in external science organizations are more common in HSS-fields. We consider the APIKS study of ASE to be a further step toward establishing international knowledge about ASE-activities for cross-country comparison.

Keywords Academics' societal engagement · Knowledge and technology transfer · Cross-country comparison · Large-*n* study · Small-*n* study · International knowledge

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Introduction

This special issue of *Higher Education Policy* presents findings about academics' societal engagement (ASE) from the 2018/2019 cross-country study "Academic Profession in Knowledge Societies (APIKS)." ASE concerns "knowledge-related collaboration by academic researchers with non-academic organizations [and individuals]. These interactions include formal activities such as collaborative research, contract research, and consulting, as well as informal activities like providing *ad hoc* advice and networking with practitioners" (Perkmann et al. 2013, 414). In spite of the strong focus of ASE research and policy on commercial ASE-activities, such as patenting, licensing and spin-off companies (e.g., Agrawal 2001; Bozeman et al. 2015), ASE-activities are nowadays researched in a broader societal perspective and including all disciplines (e.g., Abreu et al. 2009; Olmos-Peñuela et al. 2015; Thune et al. 2016).

Various authors provide a good, historical, overview about how policies by major international organizational players, such as the Organization for Economic Development (OECD) and the European Union (EU), are engaged in pushing ASE (e.g., Jakobi 2007; Maassen and Stensaker 2011). Global policies pushing the "knowledge based economy" (OECD 1996; see also World Bank 2002) and "National Innovation Systems" (OECD 1997) trickle-down into regional policies, for example, the Asia Pacific Economic Cooperation (APEC 2000) and the Lisbon Agenda (2000), formulating the initial ideas of Europe's goal to "strengthen the three poles of its knowledge triangle: education, research and innovation. Universities are essential in all three'' (EC 2005, 152). Like the European Commission, the OECD fosters the knowledge economy through special programs for policy development in (member) countries, for example on the key role of research universities in "strengthening the policy relevance of research," "better informed policy-making" and "policy coherence with regard to investment in innovation, higher education and research" (Kearney 2012, 6). Nowadays, the OECD focus is also on open communication of research and not on disclosure (e.g., patenting) (OECD 2015).

However, we know little about the trickle-down of knowledge economy policies into national higher education and sciences systems, organizational settings of HEIs and into academics' research, teaching and ASE work (e.g., Gläser 2019; Jacob and Hellström 2018). Given the global diffusion of ASE-policies, it seems surprising that cross-national comparisons on ASE are very rare. Systematic reviews on academics' societal engagement (Mascarenhas et al. 2018; Perkmann et al. 2013, 2021) describe that most studies refer to Europe and the USA. Other regional contexts are rarely analyzed. Systematic cross-national comparative studies are even rarer. This shall suffice as a justification for the inclusion of survey questions about ASE in what is probably the only major cross-country comparative research project about the academic profession and the working conditions of academics in the areas of research, teaching and ASE. This cross-country comparative research project was conducted in 2018/2019 under the name of "Academic Profession in Knowledge Societies (APIKS)" for the third time. The

APIKS predecessor research was previously called "Changing Academic Profession (in 2007/2008; see Teichler et al. 2013) and "Carnegie Study of the Academic Profession" (in 1992; see Altbach 1996).

While the majority of questions on research, teaching and HEI-governance were already posed in the "Changing Academic Profession" survey (for concept specification see Teichler et al. 2013), the question and items about ASE-activities were developed for the APIKS-survey. Accordingly, in this editorial, we will describe the selection of ASE-activities and pretest of the ASE-question. Also, with the intention to avoid redundancy in the cross-country comparative analysis of ASE, in this editorial we will provide a theory-led working definition of ASE, discussing methodical strategies for cross-country comparative studies and presenting the analytical framework for the cross-country comparative analysis of ASE. The editorial will end with a short overview of the different articles presented in this special issue.

Definition of ASE as Social Co-construction of Knowledge

> The modes of interaction between the university sector and external organizations are multi-faceted and nuanced. (Abreu et al. 2009, 21)

ASE reflects a mode of science in which goal orientations "embody values and serve material [and social] interests with roots outside science itself" (Ziman 2003, 22), i.e., goals are set by (academics') societal concerns and are not set exclusively by scientific concerns. In addition to the research and teaching functions or missions of individual academics' and higher education institutions (HEIs) as organizations, ASE is also often referred to as the third mission, which addresses primarily HEI/university-industry-linkages (Perkmann et al. 2013, 2021). In literature, we find the terms such as "service role" of academics and "scholarship of engagement" (Ward 2003), "external activities" or "external knowledge exchange relations" (Martinelli et al. 2008, 261), "academic/practice/community research partnerships" (Baker et al. 1999), "academic engagement" (Perkmann et al. 2013, 414) or the more specific "engagement in commercialization activities" (D'Este and Patel 2007, 1309), and "knowledge and technology transfer" (Schneijderberg and Teichler 2012). Benneworth and Jongbloed (2010, 568) stress that ASE is about "valorization," i.e., about "transfer and uptake of knowledge, and is broader than the idea of commercialization, which refers to engagement activity motivated by making a commercial profit." Together, these studies address ASE as interaction with external social partners (see also Kruss 2012). Callon (1999, 82) specifies that, in addition to expert ASE, the democratic "involvement of lay people in the formulation and application of the knowledge and know-how" can also be considered in a "co-production of knowledge model" (Callon 1999, 89) or, more generally, the social co-construction of knowledge (Perkmann et al. 2013, 2021).

According to Camic et al. (2011), knowledge co-construction can be theorized as social making of knowledge. The active making in social knowledge refers to the ubiquitous social phenomena of practices of producing, evaluating and putting to use a "diverse range of social knowledge forms" (Camic et al. 2011, 1). The study

of social making of knowledge provides answers about ASE- "terms of who is doing the transfer, how they are doing it, what is being transferred and to whom" (Bozeman et al. 2015, 35). As social making of knowledge, any technology can be defined as a) a product made of knowledge and b) a generative materiality of social knowledge making. Of course, cognitive technologies, such as theories and methods, vary by academic discipline and scientific search regime (Trowler 2014a, b; Bonaccorsi 2008). Accordingly, the social making of knowledge is socially situated, for example, an ASE-activity has a specific interaction-setting, in which the cognitive and social disciplinary setting is complemented by agents, processes, and structures rooted in the sectors of education, industry, politics, etc. (e.g., Bekkers and Freitas 2008).

Based on the idea of cognitive and social knowledge making, ASE can be defined as a mutual process of knowledge and technology production in a process of interaction among both individual and/or collective agents (Argote and Ingram 2000). This implies that at least two agents contribute knowledge and/or technology to an ASE-activity and that, based on the joint knowledge, the making of new or modified knowledge and/or technology can take place (Inkpen and Tsang 2005). Consequently, the ASE-transfer process can be understood as a process of new knowledge and/or technology production in itself. The ASE-interaction can be formalized and/or be an informal arrangement (Cohen et al. 2002). The two-way ASE-interaction of knowledge and/or technology evaluation, production and diffusion can be assumed to require trustful and possibly long-term cooperation (Meyer-Krahmer and Schmoch 1998). Overall, ASE is characterized by a higher degree of relational linkages, and as bearing the capacity to generate strong learning by interaction effects (Perkmann and Walsh 2009).

The idea of cognitive and social making of knowledge and technology does not exclude *per se* the one-sided ASE-transfer, for example via licensing (e.g., Thursby et al. 2001). Even a one-sided transfer results in knowledge making at the side of the buyer, who adapts and makes use of a knowledge product. However, one-sided transfer has to be considered to be more (commercially) instrumental, as "generating, transmitting, applying, and preserving knowledge for the direct benefit of external audiences that are consistent with university and unit missions" (Fear and Sandman 1995, 113). In a two-sided ASE-transfer cooperation, the direct benefit to HEI external and internal audiences is not always certain. This refers to the fact that the application of theoretical knowledge in research is subject to potential failure (Stokes 1997; Ziman 2003). The uncertainty also points to the fact that the benefit of an ASE-activity might only surface over a longer period of time and/or might require further engagement in the specific ASE-activity.

ASE-Activity Selection for APIKS-Survey

While the general definition of ASE presented above aimed to be applicable for all kinds of ASE-activities, the selection of ASE-activities for the APIKS-questionnaire is based on the rational of addressing ASE in both natural, technological, engineering and mathematical (STEM) and humanities and social sciences

(HSS) disciplines. Accordingly, the selection of ASE-activities has to surpass simple binary distinctions of STEM and HSS stereotypes by considering commercialization- and ASE-activities concerned with societal problems (Olmos-Peñuela et al. 2013). Schneijderberg and Teichler (2012, 273) published a summary of the vast diversity of ASE-activities found in the literature, which shows that most studies construct an individual set of ASE-activities for survey or generate them inductively from the material.

The items on ASE implemented in the APIKS-survey are based on the list of ASE-activities discussed by Abreu et al. (2009) and Schneijderberg and Teichler (2012, 273). However, some slight changes had to be made to implement these activities for the cross-country comparative APIKS-study. In order not to overload the extensive questionnaire, some activities were summarized, such as "patents" and "licenses" and "joint research" and "joint publications," which are categorized to the same type of ASE-activities and often load on the same factor, for example patents and licenses on "commercial" (Thune et al. 2016, 782). Other activities were excluded, such as "advice giving in informal talks and meetings" and "attending conferences" and "sports."

A first set of ASE-activities was quantitatively pretested by the German APIKS-team among pre- and post-doctoral researchers at one university. The pretest led to a change in the sequence of items. To indicate that the ASE-question is also relevant for HSS-academics, non-STEM and commercial items were presented first in the question. However, this led to the paradox of pre-testers failing to understand the question's key concern. It was easier to understand, particularly for pretesters from HSS-disciplines, when *classical* ASE-activities were presented first. In a second, qualitative pre-test round with post-docs and professors, we also learned that sub-dividing the long list of items with headings helped pretesters to see that the question on ASE-activities was of concern to them. However, the categorization by Abreu et al. (2009) was found to be confusing. Therefore, we decided to stress the complementarity of ASE and research and teaching, which created an "other" section of items being intuitively connected neither to research, teaching nor both (Table 1).

The ASE-activities question construction was discussed prior to the presentation of the analytical framework in order to avoid redundancy in this article. Of course, the construction of the ASE-activities question for the APIKS-study was based on the analytical framework, which is presented in the following section. The use of an analytical framework in the research design of a cross-country comparative study has several advantages: First, the special interest ASE-section of the APIKS-survey can be connected to the other parts of the questionnaire concerning academics' working conditions. Second, the construction of questions and items and the analysis of results are connected. Third, the research question determines the theory-led analysis of ASE. This is important for the inclusiveness of research in the APIKS-consortium, which has to consider cultural differences of researchers from more than 30 countries from all five continents, as well as their different disciplinary backgrounds (e.g., economics, (higher) education, history, mathematics, political sciences, physics, psychology, public administration, sociology, etc.).

Table 1 Question and ASE-activities used in the APIKS-survey

X	**In the past three years, have you been involved in any of the following activities with 'external' partners (e.g., industry, government, museums and schools)? (Check all that apply).**
	X.1 Research-based activities
☐	Patenting and licensing
☐	Creation of a spin-off/start-up company
☐	Joint research and publications
☐	Evaluation (of policies and developments of companies, governments, regions, countries, etc.)
☐	Contract research
☐	Consultancy
☐	Use of infrastructure and (technical) equipment (e.g., measuring equipment of a company)
☐	Test and construct prototypes
☐	Work in a research laboratory, science incubator organization (e.g., think tank organization), and/or a science park
	X.2 Teaching-based activities
☐	Curriculum development for external agencies
☐	Supervision of student internships and/or student work placements
☐	Joint supervision with industry of bachelor, master and/or doctoral thesis
☐	Public lectures and speeches
☐	Executive, contract tailor-made programs and courses
	X.3 Other activities
☐	Writing publications for a broader range of readers
☐	Participation in external board(s) and committee(s) (e.g. expert council, board of directors, board of trustees).
☐	Volunteer-based work/consultancy in an honorary capacity (e.g., for community groups; in cultural, educational, political and social institutions, etc.).
☐	Other (please, specify):.....
☐	I am not involved in any activities of knowledge and technology transfer.

Sources: APIKS survey

Framework for the Analysis of ASE as Social Knowledge Making

> Our objective was to establish what is known about (a) the extent and types of academic['s societal] engagement, (b) its determinants, and (c) its impact on academics, universities and other stakeholders. We focused our analysis on individual researchers because the decision to engage is a decision that, in the university context, is primarily taken on an individual level. (Perkmann et al. 2013, 425)

Perkmann et al. (2013) generate an analytical framework of ASE, which considers individual, organizational and institutional, systems-level factors of ASE influencing scientific and societal output (e.g., educational and commercial). For the

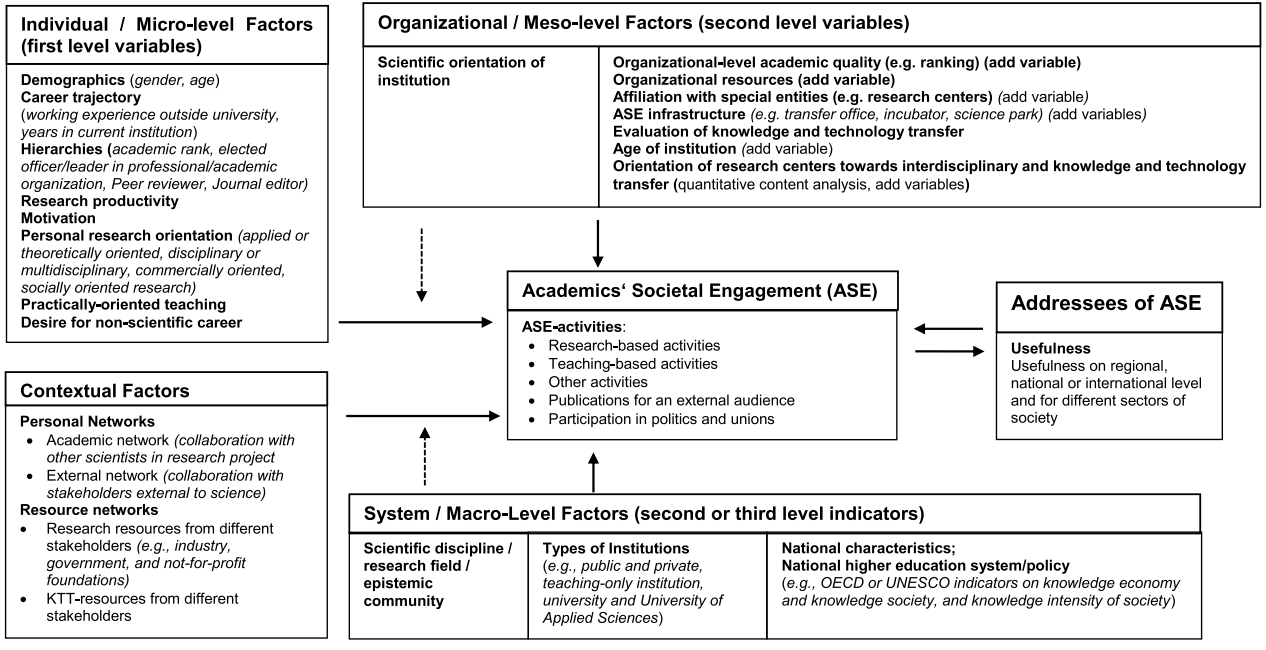
APIKS-study, the analytical framework developed by Perkmann et al. (2013) appeared to be very useful, both for the construction of the ASE survey questions and analysis of survey responses. Due to the focus of the analytical framework on individual academics (Perkmann et al. 2013, 425), the analytical framework can capture commonalities and differences between disciplines and respective academic cultures (e.g., publication behavior) and countries. Based on individual academics' data, the organizational and institutional characteristics can either be studied using aggregated means, for example, publication outputs and representation of disciplines, or by adding new variables, for example organizational resources, infrastructure (e.g., transfer offices), etc.

Perkmann et al.'s (2013) model provides a good overview of possible indicators for the explanation of ASE and related outcomes on the individual, organizational and institutional levels. Nevertheless, an extension is needed, because the model still focuses on commercialization and systematically excludes other ASE-activities. In the modified analytical framework (Figure 1), we first replaced the commercial ASE-activities with a more balanced selection of ASE-activities (see previous section in this article). Second, in accordance with Olmos-Peñuela et al. (2015) the contextual factors box is added, to collect network indicators, which are measurable at the individual level but are more relational than individual characteristics. These indicators are important because scientists "behavior depends on their professional network's" (Olmos-Peñuela et al. 2015, 387).

> If a scholar's network is exclusively related to its own discipline, with little use of external knowledge, then the research outputs will be themselves more bounded by the community. Conversely, where researchers have connections to wider networks with their own norms, either scholars from other institutes, sectors or countries, or scholars from other disciplines, this then increases the ability of knowledge to flow to users (Olmos-Peñuela et al. 2015, 387f.).

The dependency of networks on, for example, the regional economy, percentage of high-tech companies, etc., can also be introduced in the analytic framework via the resource networks.

Boxes, such as individual and organization factors, are taken from Perkmann et al. (2013). We would like to point-out that it is possible to place some factors in other boxes. For example, Perkmann et al. (2013) consider academic achievements as individual factors, but they may also be outcomes of ASE-activities. In addition, the "type of institution" could be an organizational factor instead of an institutional factor, for example, type of legal institution (e.g., public or private university) and organizational HEI type (e.g., university and University of Applied Sciences), depending on the research question and/or hypothesis. With the modified analytic framework, it is possible to analyze ASE based on a differentiated view of ASE.



Arrows with continuous line indicate direct effect(s); Arrows with dashed line indicate moderating effect(s)

Source: Perkmann et al. (2013); amended by authors

Fig. 1 Analytic Framework of Academics' Societal Engagement (ASE). Arrows with continuous line indicate direct effect(s); Arrows with dashed line indicate moderating effect(s)

Large-*n* in Small-*n*: The Methodological Approach to Cross-Country Comparative Study of ASE

Perkmann et al. (2021, 6) conclude in their systematic 2011 to 2019 literature review on academic engagement, that "there are no studies attempting systematic cross-national comparisons." Given the global diversity of higher education systems and traditions, as well as large national variations in higher education systems (e.g. in the economic, political or cultural systems), it seems very important to systematically focus on the context-specific nature of ASE, ideally through cross-national comparative studies. Research on national path dependencies emphasize that endogenous historical mechanisms influence the institutionalization of globally circulating policy models to a great extent (Colyvas and Powell 2006; Pierson 2004). Higher education regulatory and funding systems are national (Teichler 2014). Accordingly, it seems plausible that actors on the organizational, regional and national levels actively shape policy models, for example for ASE. Thus, research conducted in a specific cultural and national context cannot assumed to be valid in other national and cultural contexts. Due to the context-specific nature of previous studies on ASE, which in their *explanandum* are predominantly related to European countries and the USA (Perkmann et al. 2021), the results so far are hardly generalizable and do not systematically reflect country-specific conditions.

Reflecting this lack of comparative studies, the APIKS-study provides the urgently needed "harmonized survey tools" (Perkmann et al. 2013, 432) and "micro measures of engagement" (Perkmann et al. 2013, 432). Thus, APIKS contributes to the internationalization of knowledge by supporting an internationally cooperative and data-based discovery process to evaluate whether the knowledge (on ASE) "is broadly applicable without reference to national and other boundaries" (Smelser 2003, 645) and to support the process of typology development (Collier et al. 2012). The APIKS study of standardized items on ASE, which represents ASE-practice in heterogeneous national and cultural contexts, is a first step toward the internationalization of knowledge on ASE. The APIKS questionnaire (including the ASE section) was surveyed in more than 30 countries. Previous discussions within the APIKS consortium showed that the items are quite representative of ASE-practice and disciplinary contexts in the heterogeneous country.

Teichler (2014, 405) gives a good impression of how tenacious and nerve-racking the research-process is in such broad-based cross-national comparative surveys: "For example, meetings with more than 30 scholars seeking the best possible selection and most desirable formulation of questions often turned out to be a nightmare before compromises were eventually hammered out." For example, a *Babelfish* is required to translate the term "senior academics" into the respective national categories, such as associate and full professors (USA), senior researcher (Russia), tenured assistant, associate and full professors (Portugal), *lektor* (Swedish equivalent to senior lecturer/associate professor).

Additional methodological challenges are created by the different sizes of countries, their population and their higher education and science personnel. Accordingly, it is impossible to apply the same sampling strategy for all countries. To address size issues, minimum standards were set (random sampling, stratified random sampling

Table 2 Methodic characteristics of large-*n* in small-*n* cross-country comparative research

	Large-*n*	Small-*n*	Large-*n* in small-*n*
Ideal selection method	Random	Purposive	Combination of purposive (small-*n*), and random (large-*n*)
Data/method	Standardized/quantitative data	Unstandardized/qualitative case data	Standardized/quantitative (survey) data Unstandardized/qualitative information of phenomena in case contexts
Strengths	Representativeness of case	In-depth understanding of case through thick description	Representativeness within cases (country data) and in-depth understanding of cases Systematized context of comparison between cases (e.g., construction of analytical framework and/or application of theoretical approach)
Weaknesses/limits	Questionable comparability of phenomena in different case contexts Selectivity of analyzed cases often un-reflected	Questionable representativeness of population by cases Questionable representativeness within cases	Questionable global representativeness of population through selected cases Selectivity of analyzed cases often un-reflected
Conditions for application	In-depth knowledge about phenomena in case contexts Measurement equivalence is given Standardized data available	Gain of in-depth knowledge about phenomena in case contexts (e.g., explorative approach) Cross-case phenomena comparability is given No standardized data available	(Gain of) In-depth knowledge about phenomena in case contexts Cross-country phenomena comparability is given Standardized data available

Sources: Ebbinghaus (2005), Seawright and Gerring (2008), Smelser (2002), Teichler (2014), Compiled and amended by authors

or full sample) to ensure the representativeness of the data of the respective country. For example, in the small Slovenian higher education and science system, a full sample of the academic profession was necessary to achieve the minimum number of respondents ($n = 700$). In Germany, the larger higher education and science system generated a respondent number, which almost matched the total population of academics in Slovenia. In Germany, this number of respondents ($n = 7283$; stratified random sample) covers 15 percent of the academic profession in public universities and Universities of Applied Sciences (*Fachhochschulen*). In addition to size, sample selection efforts also varied between countries. When sampling and collecting respondents' contact details, some country teams could rely on a central register for academics. Other country teams had to manually research address data. In sum, the cross-country comparative research process is characterized by a continuous balancing of methodological rigor and adjustments with the respective context and conditions of social reality in a country—adapting methods to the diverse social reality of higher education and science, rather than adapting social reality to the methods.

For this special issue, the APIKS consortium decided to conduct *large-n in small-n* comparative case studies to systematically analyze ASE, with ASE being torn between global convergence, and historical and political contingencies (Smelser 2003). In methods literature "large-*n*" describes the methodology of *quantitative* comparative studies, in which many countries (e.g., all OECD member states) are compared with each other, based on given indicators (e.g., GDP, funding for research and development, patent numbers). In contrast, "small-*n*" stands for qualitative cross-country case studies, aiming for a thick description of the compared cases. Based on authors, such as Ebbinghaus (2005), Seawright and Gerring (2008) and others (e.g., Gerring 2004), we define the term *large-n in small-n* to characterize studies that combine qualitative in-depth analysis of a small number of country cases with quantitative, standardized and representative large-*n* country data (Table 2).

Reflecting the lack of cross-country comparative evidence of ASE in different national contexts, a large-*n* in small-*n* design seems preferable or even superior to a large-*n* comparative study, although the international APIKS-dataset would allow such comparisons of a large number of country-cases. The advantage of this large-*n* in small-*n* design combines the advantages of a quantitative study (representativeness on the country level) with the advantage of an in-depth understanding of case contexts provided by comparative case studies. Especially in knowledge-based fields, such as higher education and science, an in-depth understanding of the case contexts is a necessary condition for systematic comparison. According to Ebbinghaus (2005), all comparative studies face the same problem of contingency of macro-social entities being formations of historical and social processes at a specific point in time. In fields of research with little international knowledge as evidence for comparison, there is a significant risk that "the things being compared are not comparable and the indicators are unrealistic because the comparative contexts in which they are embedded are so different" (Smelser 2003, 646). Studies with a limited number of cases (small-*n* studies) are better suited to systematically reflecting the "historical and political contingency" (Ebbinghaus 2005, 149) of ASE in different national contexts and to "systematizing the context of comparisons" (Smelser 2003, 649). Drawing on Geertz (1973), a small-*n* thick description of ASE comprises the

two elements of (ethnographic) observation of a social phenomenon and of the (analytical) description of patterns, for example social organization and structures in national higher education and science. In cross-country ASE comparison, the understanding and interpretation of large-*n* accounts of ASE and the ability to attribute meaning to the specific ASE culture as a "web of significance" (Geertz 1973, 12), require the case-related expertise of:

1. national higher education and sciences system contexts (including policies, funding schemes, indicator use, academic career structures and promotion schemes, etc.),
2. historical evolution of a higher education and sciences system, and
3. professional, i.e., academic organization of communities.

Of course, in large-*n* studies, we can crunch any kind of numbers and assume that statistical significances are meaningful by itself and without scientists' interpretation of results. However, social knowledge making in Camic et al.'s (2011) continuation of science and technology studies tradition emphasizes the connection between the socio-cognitive process of data collection and data analysis. Accordingly, the manuscripts compiled in this special issue compare three to four country cases selected according to a concept-led purposeful-sampling strategy (small-*n*). The manuscript author groups were created during a three-day workshop at the University of Kassel, Germany at the end of August, 2019. Each manuscript author group included at least one researcher from each of the compared countries. This form of organization was very helpful in overcoming the "lack of information" (Teichler 2014, 399) and the "lack of awareness of the national or cultural relativity of terms and concepts" (Teichler 2014, 399) that often characterizes comparative studies.

Brief Overview of Special Issue Articles

Case selection plays an important role in small-*n* cross-country case studies on higher education and science (Teichler 2014). Seawright and Gerring (2008) stress that purposive sampling in small-*n* studies is superior to random or pragmatic case selection (see also Suri 2011). Therefore, the articles included in this special issue are based on a purposeful case selection. The purposeful case selection was based primarily on theoretical considerations in the articles studying the effects of horizontal and vertical differentiation on ASE. Theoretical considerations of academics' socialization guided the case selection strategies in the articles on ASE in HSS and in STEM.

ASE in STEM-fields, also known as the hard sciences, are the focus of the article "The Determinants of External Engagement of Hard Scientists: A Study of Generational and Country Differences in Europe" (Peksen et al. 2021). This study investigates the generational differences regarding the types of academics' engagement and whether these differ across the HE systems in selected European countries. The study also considers the correlation of university models and innovation ecosystems

according to Higher Education research and development (HERD) (as a proxy for differences in innovation ecosystems). To reflect the historical and cultural legacies of European countries, two countries with a Napoleonic higher education tradition (Lithuania and Portugal) and two countries with a Humboldtian higher education tradition (Finland and Slovenia) were selected. For each academic tradition, one post-Soviet country was selected. The considerable heterogeneity of ASE-practices in the four countries becomes most evident for the youngest academic generation. In addition, ASE-activities vary considerably. For example, in Finland (high HERD) patenting and licensing are more common ASE-activities, and in the Napoleonic higher education systems public lectures and speeches are more common ASE-activities.

The second article studying disciplinary differences of ASE "Academics' Societal Engagement in the Humanities and Social Sciences: A Generational Perspective from Argentina, Germany, Portugal, and Sweden" (Schneijderberg et al. 2021a) addresses the research question as to what extent normative knowledge economy policy expectations are reflected in the views and attitudes of individual academics concerning ASE. In comparison to the study of hard scientists in STEM-fields, the differences between Humboldtian (Germany and Sweden) and Napoleonic (Argentina and Portugal) university systems in HSS-fields is less distinct. In cross-country comparison, there is no strong evidence of the current generation (HEI employment after 2006) of HSS academics having very different attitudes toward ASE than previous generations (1995–2006 and pre 1995). However, the younger generation attributes greater importance to ASE-activities because of the instrumental dimension of ASE for a potential academic career. Addressing the tension between knowledge economy rhetoric—instead of a knowledge society—and academic principles and career aspirations, the authors conclude that ASE-activities have become yet another area where early-career academics experience a need to prove their worth to advance their career. This does not mean that early-career academics are being socialized to conduct research, teaching and related ASE-activities, which are of both academic and of social relevance.

In addition to two articles addressing socialization-driven ASE and disciplinary differences, two articles focus on how horizontal and vertical structures of higher education and sciences systems affect ASE. In the article "Does vertical university stratification foster or hinder academics' societal engagement? Findings from Canada, Germany, Kazakhstan, and Russia" (Schneijderberg et al. 2021b), the theoretical approach of status markets (Aspers 2009) is used to differentiate intra-academic competition-based status assignation and state-assigned status differentiation (Benner and Sandström 2000). For each status assignation model, two countries were selected, with a differentiation between one ideal type and one country with a blurring element. The theory-led purposeful sample was constructed to answer the research question as to whether the level of ASE is higher or lower at universities with Leading Research University (LRU) status compared with institutions at lower status-levels within vertically stratified systems. The results clearly show the differences in the relationship between vertical stratification and ASE along the two status models. In countries with an intra-academic competition-based status model (Germany and Canada), academics in

LRUs do not perform more ASE then academics in universities without LRU-status. In comparison to competition-based status assignation, a clear positive correlation between LRU-status and ASE is observed in countries with a state-assigned status model.

In the paper "Academics' societal engagement in diverse European binary higher education systems—a cross-country comparative analysis" (Götze et al. 2021) the research question is answered as to whether national differences in the institutionalization of the binary system lead to differences in ASE performance by university-academics and academics in Universities of Applied Sciences (UAS). Institutional theory is used to theoretically elaborate two core distinctions of the institutionalization of ASE in binary higher education systems: First, the sequence of UAS-institutionalization and ASE-policy emphasis, and second the political drive for a practically oriented research drift. Finland was chosen as a case in which, due to the late institutionalization of the binary system, ASE had already been emphasized at UAS foundation. Germany and Portugal (UAS-institutionalization in pre-ASE period) are selected as diverse cases according to the second criteria (the political drive for a practically oriented research drift). In Germany, ASE was institutionalized as part of the functional research mission of UAS. In Portugal, policy does not emphasize practically oriented research by actively connecting ASE and research in UAS. Results show that Finnish UAS-academics are generally more involved in ASE than university academics. In Germany, stronger research-ASE linkages were found among UAS academics than university academics. In Portugal, a convergence between university academics and UAS academics was observed. Thus, the results differ according to the theoretically derived national institutionalization differences.

Summing-up the core findings on ASE in the four articles in this special issue, a tentative internationalization of knowledge on ASE can be retained:

1. The 17 ASE-activities or types of ASE-activities (Table 1) are applicable in varying national higher education and sciences contexts. Irrespective of the specific setting of an ASE-project, the types of ASE-activities cover the major ground of ASE-activities. The suggested typology of ASE-activities could be further tested and sustained for research on ASE as social making of knowledge.
2. Epistemic cultures and (re)search regimes are core determinants of ASE in the four articles. The modes of knowledge (and technology) production associated with the different disciplinary cultures seem to have a particularly strong emphasis on which activities are pursued and which are not (very) relevant. Thus, the four articles show that a technical and commercial dimension of ASE is dominantly performed STEM-fields in the analyzed countries. Activities, which are based more on knowledge dissemination activities and participation in external science organizations, are more common in HSS-fields.
3. While we have found a clear convergence in the policy emphasis on ASE, the particular practices of ASE in the analyzed countries are more diverse. Accordingly, concrete ASE-practices are strongly connected to the national higher education and science traditions of the respective countries.
4. To provide a web of significance on ASE beyond an analytical framework (Figure 1), large-*n* in small-*n* cross-country comparative studies (Table 2) seem to

require a minimum small-*n* of three to four country cases. A small-*n* case study comparing two country cases risks overemphasis of country specificities—similar to a single country case. For the comparative research process, a mutual understanding of the thick descriptions of the country cases and an extensive knowledge exchange between the country team members were very important. The thick descriptions for knowledge exchange between the country team members were very helpful in creating a common knowledge base, guiding the research process, and reflecting ASE in diverse case, i.e., country contexts. Because of the word limit of the respective publication outlet, publications might only present the condensed form of these ASE-contexts and still need to provide tables as electronic supplementary material—in case the publication is not a book.

Compliance with Ethical Standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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