'It's a love interest' – Enthusiasts and regional industry cultures of practice

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A B S T R A C T

Non-firm actors have emerged in economic geography as significant in shaping regional industrial cultures and new industry pathways, though how knowledge and practice is shared with firm actors remains unclear. The case of enthusiasts or hobbyists is especially interesting when there are industry counterparts given the blurred lines between work and hobby. There has been limited discussion of such interactions, and how they might contribute to regional development or an industrial culture of problem solving. This paper explores this gap through a case study of beekeepers in Western Australia. It analyses the interview results from hobbyist and commercial operators to understand how practice is shared, the construction of group meaning and identity and how place-based problem solving occurs through a regional culture of exchange and mutual benefit. The findings point to the importance of informal non-firm actors in the development of regional industry culture of practice and entrepreneurship, and that supporting collaborations between enthusiasts and local business may produce broad industry and societal benefits.

1. Introduction

In economic geography, culture has been examined in the context of the societal beliefs, attitudes, values, etc shaping decision-making and practice within economic systems of capital, production, exchange, etc, as well as in the context of how these economic systems are 'discursively [and] materially constructed, practised, and performed at different spatial scales' (James et al., 2006, p.3; also see Gibson and Kong, 2005). But yet, how culture and cultural practices manifest geographically as a specific and observable regional industrial culture is less well understood, as it is associated with the negotiation of community meaning and identity across a complex range of regional factors (Bole, 2021; Spiegel, 2017). Despite the significance of non-firm actors in shaping regional industrial cultures and new industry pathways, innovative outcomes (for examples see Eaton, 2016; Harfst et al., 2018; Sadler and Thompson, 2001) or the varieties of knowledge needed for new growth paths or innovation, there is surprising little research on how knowledge and practice are exchanged between non-firm and firm actors with different underlying motivations but who draw on similar knowledge types and use similar practices.

This research aims to fill this gap by examining the case study of beekeeping where there are both hobbyist and commercial counterparts, and where industry particularities motivate the sharing of practice. Indeed, the contribution of hobbyists or enthusiasts, as non-firm actors, is most frequently recognised in economic geography literature as

providing work-life balance or as alternative knowledge sources in systems of open innovation (Azeveda, 2013; Brinks, 2020; Brinks and Ibert, 2015; Gong, 2020; Kendall, 2008; Martinus, 2022). Broadly, economic geography literature has tended to focus on how the activities of hobbyists or enthusiasts contribute to regional development or an industrial culture, with limited discussion on how the practices of informal groups and commercial counterparts follow an industrial or regional culture logic which drives mutual problem-solving.

Beekeeping in Australia is an interesting case to examine how firm and non-firm learning and sharing of practice produce a regional industrial culture. Geographically, Western Australia is isolated by the Indian Ocean and deserts and its biosecurity bee import ban means its bees are contained within its boundaries with no interaction with bees from elsewhere. Beekeeping needs both scientific, practical and place-based knowledge. Its low barriers to entry attract growing hobbyists and commercial beekeepers, the latter enticed by the high price of Australian honey. Hobbyists and commercial groups operate largely separately. Hobbyists keep bees mainly close to their urban homes, spend hours entranced by their bees, tinker and spend money on their hives, and harvest multi-floral honey from neighbour gardens. Commercial beekeepers put hives mostly in remote or State registered forests, produce mono-floral high premium honey, are time poor and invest in large equipment. Beekeeping is an isolated activity, though learning how to keep bee is often social. Beekeeping practice is embedded in place, being shared in and shaped by communities of practices. Given

the dispersed nature of beekeeping, beekeeping associations provide a meeting and learning space for hobbyist and commercial operators.

This paper is structured as follows. The next section outlines the way regional and/or industrial culture has been discussed in economic geography, particularly in the context of non-firm actors where the different motivations of hobbyists and professional counterparts are highlighted. Drawing on understandings from communities of practice literature, it then identifies the key factors facilitating how practice is shared and learned across geographic or other boundaries – including the creation of community meaning and identity. The third section provides the case study context of beekeeping in Western Australia, before the fourth section describes the research design and analysis methods to understand the findings of 30 hobbyist and commercial beekeeper interviews (given in the fifth section). The final section presents a concluding discussion. The findings point to the importance of informal non-firm actors in placed-specific problem solving through a culture of exchange and mutual endeavour. This suggests that developing a regional industry culture of practice and entrepreneurship may support collaborations between hobbyists or enthusiasts and local business counterparts, which in turn will enhance regional competitiveness, identity and placemaking.

2. Regional industrial culture and communities of practice

Mainstream economic geography has long interpreted the logics of 'culture' in the context of the innovative and entrepreneurial environment surrounding *firm* activity driving regional development and economic growth (Audretsch, 2020; Fritsch and Wyrwich, 2017; Gertler, 2003). This view has in part been informed by the sub-field of cultural economic geography, arising in the 1990s 'cultural' turn (cf. James et al., 2006) which also has a long tradition of examining the cultural logics of underlying economic processes. For example, how interactions in and out of work impact collaborative decision making and performance (Ettlinger, 2003), or the practices highlighting firm disassociation from negative brandings (Ibert et al., 2019). Yet, the concept of culture in economic geography more broadly – and its influence on regional development – remains abstract and ill-defined given difficulties in critically assessing and identifying causal mechanisms of culture (Bole ,2021; Spiegel ,2017).

As Bole (2021) observed, industrial culture is typically the "leftover' intangible characteristics that cannot be explained under the auspices of firm-based structures' (p.6), and must be understood of across a range of regional development aspects of: material; values, preferences and identities; tacit knowledge and skills; norms, rules and habits; and, experiences and stories. Bole (2021) and Spiegel (2017) found that the negotiation of meaning and creation of identity generated social practice and industrial culture within a group. Spiegel (2017) demonstrated that regional variations in mentorship rates and dynamics were due to differences in entrepreneurial practice and industrial culture – as the social forces or context influencing individual actions. Recognising the role of industrial culture and firm 'embeddedness' in different development trajectories, technology adoption and innovation, others explored how *non-firm* actors influence various aspects of the economy, social culture and social identity (cf. Eaton, 2016; Harfst et al., 2018; Sadler and Thompson, 2001). For example, in their study of northeast England, Sadler and Thompson (2001) argued that organized labour connected the region's economy and culture to produce a distinctive regional industrial culture. And Eaton (2016) that renewable energy technical adoption and regional development for two towns in Michigan differed depending on local 'stories, discourses, orientations, and practices around industrial development' (p.76). As Bole (2021) points out, non-firm actors are understood as a regional asset or resource who can help shape new industry paths.

These studies point to the key role played by non-firm actors and regional discourse in fostering regional or industrial culture; this paper contributes to these understandings by examining the case of hobbyists

or enthusiasts (as informal non-firm actors) where there are professional counterparts. Hobbyists and enthusiasts (hereafter used interchangeably) can be defined as engaging in activities during spare or uncommitted time (to work or home duties), where the activity is associated with a passion or interest, attracts no income and has provides no industry benefit outside of achieving a work-life balance for workers (Brinks and Ibert, 2015; Martinus, 2022). This in contrast to intrinsically-motivated jobs which are also linked to passion, pleasure and satisfaction (Fineman, 2000; Furnham et al., 2013), but where extrinsic rewards (eg, enumeration, conditions of annual leave, hours, superannuation, etc) detract from its pleasure (Kohn, 1993). Nonetheless, a jobs' intrinsic motivation will drive a person to do a job (like an enthusiast), countering the fear effects of life-threatening jobs (Haq et al., 2019) and being an attribute in professional sport workplaces (Swanson and Kent, 2017).

It is not surprising then that considerable research highlights how enthusiasts engage with and contribute to organisations or industry. For example, when hobbyists cross-over into professional roles (cf. Berridge and Kringelbach, 2015; Winwood and Bakker, 2007) or professionals mentor non-professionals (Hemphill and Leskowitz, 2012; Mena et al., 2017) or how an organisation benefits from fresh insights when workers receive external informal mentoring (Singh et al., 2002). For Lave and Wenger (1991), hobbyist-professional interactions are part of a broader situated learning system contributing to communities of practice (CoP), where hobbyists can be conceived as 'apprentices' engaged in legitimate peripheral participation where learning and mastery occurs through participation in community practice. As such, I draw on CoP literature to understand how practices exist and persist, through a process of member joint identity and negotiated meaning as individuals share learning, experience, practice and understandings across social systems (Amin and Roberts, 2008; Pyrko et al., 2017; Wenger, 2010) producing individual or group practice and culture (Amin and Cohendet, 2004; Wenger, 2010).

The CoP body of work has been frequently used in economic geography to understand geographies of innovation, learning and knowledge flows (cf. Müller and Ibert, 2015; Qian et al., 2021), spatialities of practice (Faulconbridge, 2010) and innovation networks (Coe and Bunnell, 2003), as well as inform practice-oriented research (cf. Jones and Murphy, 2011). Overall, CoP views the learning of practice as an iterative process where interactions between individuals produce a shared identity, related to both individual skill acquisition and an individuals' existence within a certain context of and having competencies within a group (Wenger, 2010). As argued by Qian et al. (2021), it is the 'everyday' informal or grassroots levels of practice that contribute to a regional culture of innovation to support and strengthen more formal production economies through a CoP where both cultural and material circuits interact.

The learning of practice then does not always occur in the same locality or in organised forms (e.g. work teams), but also informally through shared experience, passion or expertise and can occur across space and may include professionals, semi-professionals and hobbyists (cf. Martinus, 2022). There are three key factors which are relevant in facilitating learning of practice between hobbyists and professional counterparts. First, there is similarity in knowledge bases or cognitive proximity. This follows Capdevila's (2018) findings that cognitive proximity – being the bond defining knowing communities – may be a greater determinant of sharing of practice between spatially distant communities than physical co-location. Second, there is a place of exchange. Grandadam et al. (2013) proposed that such interactions between hobbyists and professionals can be conceptualised as occurring in places and spaces where 'upper-ground' institutions and 'underground' informal individuals connect. Cohendet et al. (2014) added that 'middle-ground' intermediary platforms (constituting places, spaces, projects and events; see Cohendet et al., 2021 for review) might provide this place or space, while Cohendet et al. (2021) argued that it also included formal or informal activity-oriented associations. Third, there is a group

meaning and identity, which is constructed through an active process of *learning by doing* and is related to three CoP dimensions (Wenger, 1998): 1) *mutual engagement* in the how and why of practice (the domain); 2) *joint enterprise* being the mutually cared for problems and issues (the community); and, 3) *shared repertoire* as the co-created concepts and artefacts (the practice) (cf. Pyrko et al., 2017).

The concept of places or spaces or events being the intermediary ground where upper institutional (global) and individuals or informal processes (local) interact is inherently a geographic concept, and therefore one central to economic geography thinking. Indeed, Faulconbridge (2010) argued that the CoP dimensions themselves manifest in geographical studies of local clusters which connect globally via 'spatially distributed individuals who share a joint enterprise and shared repertoire interact and learn from one another through conversation/ talk – what is often referred to as 'buzz'' (p.2844). He noted that in other geographic approaches, such as actor-network theory, this negotiation of meaning and creation of identity around practice occurred in tandem with non-humans (e.g. machine interactions) developing shared repertoires between dispersed individuals. Bathelt et al. (2003) found spatially-sensitive tacit knowledge and practice were exchanged via temporary 'pipelines' connecting otherwise spatially distant persons at conferences, fairs, events, etc.

Others in economic geography have also sought to understand how knowledge is exchanged, focusing on different types of knowledge bases. For example, Amin and Roberts (2008) argued for more nuanced understanding of knowing in action in CoPs where 'knowing' communities form identity 'through participation and [where] the negotiation of meaning [is] central to learning and knowledge generation' (p.355). They presented four types of knowledge: craft/task based; professional; epistemic/creative; and virtual. Each having different organisation, spatial dynamics, innovation outcomes, and knowledge processes. Similarly, Asheim et al. (2011) distinguish three types: engineering-based (synthetic), science-based (analytical), and arts-based (symbolic); each with different needs in the virtual and physical worlds. Tödtling and Grillitsch (2015) argued that the 'pure form' of each knowledge type was likely less effective that a combination.

Whilst there is much research on the variety of knowledge sources needed for innovation and on how knowledge cognitive proximity enables exchange, there is less on how knowledge and practice exchange occurs between two groups with similar knowledge bases and practices but different motivations shaping meaning and identity. The remainder of this paper examines this through a study of hobbyist and commercial beekeepers.

3. Case study: Beekeeping hobbyists and commercial operators in Western Australia

Western Australia (WA) is a low populous Australian State of just over 2.5 million people, most of which (around two million) are found in its capital city of Perth. The majority of the State is native forest, with public lands occupying around 92 per cent of the total WA land mass (Horticulture Innovation Australia, 2015). It has high biodiversity with 34 hotspots located in its southwest region (WA Herbarium, 2018), a large agricultural industry and strict bio-security laws making the State one of the most bio-secure and disease-free regions in the world (DPIRD, 2018a). WA is extremely isolated surrounded entirely by the Indian Ocean and deserts; the biosecurity bee import ban means WA bees have no interaction with bees elsewhere. This has led to one of the most disease-free areas in the world. While in 2018, 90 percent of its 950 registered beekeepers (and 29,000 hives) were hobbyists (DPIRD, 2018b), the number rises rapidly each year and in 2020 there was over 3500 registered beekeepers (WAAS, 2020).

As illustrated in Fig. 1, COs and semi-CO are members of the peak industry body of the Beekeeping Industry Council of Western Australian (BICWA)[1]. BICWA operates alongside the Western Australian Beekeeping Association (WABA), where declining and aging or retiring membership means around 40 members of around 150 or so commercial operators. Both organisations aim to support industry needs such as the uptake of new technology, bee health, training as well as national funding and industry development (WABA, 2007). Though HO can join WABA, they are not generally members. CO engage in similar practices as semi-CO, the latter operating with less hives and having alternative incomes aside from beekeeping.

The HO are defined as having between 1 and 50 hives, and frequently members of the Western Australian Apiarist Society (WAAS) being a volunteer association focused on amateur or HO needs (WAAS, 2020). WAAS and its local chapters have grown rapidly since 2015 from around 50 to almost 1,000 members in 2018 and 3000 members in 2020. It also attracts semi-CO and CO members (around 10), as well as HO with a wide range of beekeeping experience (some were previously CO). Not all HO are part of WAAS. It hosts a *bee buddy* mentor program, which pairs novice beekeepers with the more experienced. There are 300 to 400 attendees at WAAS monthly meetings, which includes gadget nights and panel sessions with CO or experienced HO. Local chapter members meet more regularly (10 to 20 people) and are in frequently contact through messaging and phone. WAAS publishes and sends out a monthly *Smoke Signals* newsletter to all members. HO beekeeping is governed by their respective local government and depends on the level of nuisance caused by bees, with urban areas more anti-beekeeping than regional ones.

Other actors described in Fig. 1 are various research institutes, such as the Centre of Excellence for Honey Bee Products (CRC HBP)[2], ChemCentre (does pollen analysis) and Centre for Integrative Bee Research (CIBER). Researchers from these institutes have had increasing interaction with CO over the last 10 years and are active in presenting research to WAAS and BICWA. The WA Government Department of Primary Industries and Regional Development (DPIRD) requires all beekeepers, including HOs, to register hives for biosecurity reasons.

4. Methods

This study focused on the WA hobbyist (HO) and commercial (CO) beekeepers and associated key government and association bodies. Beekeeping presents an interesting case to explore how firm and non-firm learning and sharing of practice generated regional industrial culture. It is an activity that requires both scientific and practical knowledge on bee behaviours, husbandry and hive care, as well knowledge that is deeply embedded in 'place' such as weather, flowering times and places, state and local laws around bee management and ownership. It has low barriers to entry, which attracts an increasing number of hobbyists who are passionate about bees and beekeeping. Recently also there have been a growing number of commercial beekeepers with Australia honey attracting premium on global markets. Hobbyists and commercial groups operate largely separately. Hobbyists practice beekeeping largely in urban areas close to home, harvesting multi-floral honey (from neighbours' gardens) dedicating hours to tinkering with hives or money on hive upgrades; commercial beekeepers mostly have hives in remote or State registered forests, harvest mono-floral honey, are time poor and invest heavily in large equipment (trucks, cranes). Whilst beekeeping itself can be performed individually, acquiring beekeeping knowledge and skills is a social learning experience for both groups. The practice of beekeeping then is place-based, being shared in and shaped by communities of practices. Given the dispersed nature of hives and beekeepers, beekeeping associations provide hobbyist and commercial operators a middleground to learn practice and discuss techniques.

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[1] See https://www.bicwa.com.au/about-bicwa.

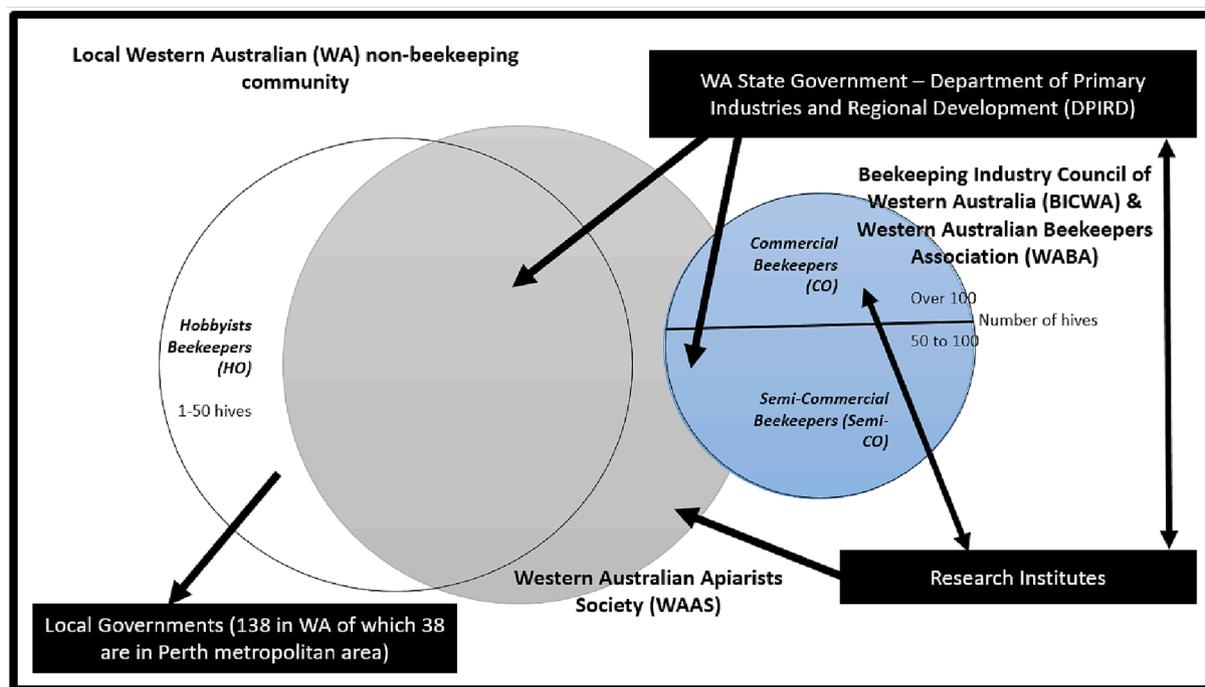[2] See https://www.crchoneybeeproducts.com/.

Fig. 1. Conceptual diagram of HO, Semi-CO and CO and key memberships and government interactions.

This paper presents the results of 30 one-hour semi-structured interviews conducted in 2017 with HO and CO to better understand beekeeper interactions and the regional industrial culture of beekeeping. A literature review informed the interview questions and later the coding themes for the data, desktop research provided the context and background to the case study. Maximum variation sampling was used to purposefully select beekeepers with a range of experiences and opinions, but largely found through WAAS or WABA meetings, WAAS newsletter notices or contacts of the CRC HBP. Snowball sampling during interviews was also used. Table 1 profiles interviewees who self-identified as either HO (19) or CO (11).

The greater numbers of HO interviewees represented their higher presence in the registered beekeeping community (cf. DPIRD, 2018b). Participants were all over 30 years old, from both genders and a range of occupations and backgrounds. HO interviewees had one to 35 years beekeeping experience and placed hives in urban or agricultural areas, while CO interviewees had one to 55 years and placed hives more on registered native bushland sites[3]. Interviewees completed a general background survey (age, years beekeeping, occupation), and were asked open-ended questions to understand the underlying regional industrial culture in how knowledge and practice was: 1) shared or articulated between and by different individuals; 2) used and by whom; and, 3) adopted and trialled to solve place-specific or industry problems. Interviewees were also asked if practices had changed due to policy changes (relating to beekeeping in urban areas or State registration laws), environmental concerns (e.g. climate change, bush fires, pests) or urban encroachment (on bush or agricultural land). Interviews were taped and transcribed, with the analysis following two coding rounds after data familiarisation (cf. Nowell et al., 2017).

The first round applied the three CoP dimensions of mutual engagement, joint enterprise and shared repertoire (cf. Wenger, 1998) in

two different ways. First, given the combined scientific, practical and place-based needs of beekeeping (cf. author, 2022), knowledge related to each dimension was coded by where it was extracted from – either global (scientific) or local (specific to time, place and space) with additional coding disaggregating why this knowledge was needed. Second, interviews were coded by the practice contributing to the specific cultural dynamic of either HO (motivated by pleasure) or CO (motivated by profit) across the three dimensions to understand similarities and differences. Finally, a second round of coding identified the themes related to why HO and CO were motivated to collaboratively solve context specific problems and share practice. These findings are presented below, with *italics* used to denote an interviewees' own words and give texture to the themes which emerged from the coding rounds.

5. Findings

This section provides the findings of the two different coding rounds; first, using the CoP dimensions to understand knowledge source, knowledge needs and specific practices contributing to cultural dynamics; and second, according to themes associated with HO or CO motivations to collaborate to solve place-specific issues and share practices despite the differences found in the first coding round.

5.1. HO and CO construction of community meaning and identity

Here, I detail emergent coding themes across the three CoP dimensions, as summarised in Table 2. It is subdivided into three sections, where each reviews a dimension type in terms of knowledge source (local or global), why knowledge was needed as well as the differences and similarities in practices between HO and CO beekeepers.

<u>Mutual engagement:</u> The *how and why* of beekeeping practice was largely the same for all being global scientific knowledge. One CO observed '*the reality is new methods and ideas don't come to the front very often*', and HO reported learning through old books as it '*[had] not really changed in 100 years*'. This *what* essentially related to bee management (of swarming behaviours, methods to combat starving during non-flowering periods, identification of disease in the hive, re-queening), honey extraction, knowledge on flowering seasons, etc. These

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[3] Public land is made available by the State government as registered beekeeping lots. These leases are usually held by commercial beekeepers given the cost, that they are in highly remote areas far from the metropolitan, the commercial value of particular forest types and the need to produce mono-floral honey for commercial operators (such as Eucalyptus Jarrah or Marri).

Table 1
Profile of interviewees (n = 30: HO = 19; Semi-CO/CO = 11).

Age cohort	Sex	Occupation	Years beekeeping	Hobbyist (HO) / Semi-CO / commercial (CO)
50+	M	Gardener/handyman	10+	HO
50+	M	Tree farmer	1 to 3	HO
50+	M	Mechanical engineer	10+	HO
30–50	F	Regional operations coordinator	0 to 1	HO
30–50	M	Plasterer	0 to 1	HO
50+	F	Registered nurse	3 to 5	HO
30–50	M	Engineer	1 to 3	HO
50+	F	Part-time sales assistant	0 to 1	HO
30–50	M	Project manager/ engineer	1 to 3	HO
50+	F	Librarian	3 to 5	HO
50+	M	Retired cabinet maker	10+	HO
50+	F	Journalist	0 to 1	HO
50+	M	Manager public sector	1 to 3	HO
50+	M	Hospitality, retired geologist/paleobotanist	5 to 10	HO
50+	M	Environmental consultant	10+	HO
50+	M	retired construction manager	0 to 1	HO
50+	F	Tourism consultant, PhD student	0 to 1	HO
50+	M	Retired international sales	3 to 5	HO
30–50	M	Manager public sector - biologist	3 to 5	HO
50+	M	Company director / investor	1 to 3	Semi CO
30–50	M	Beekeeper	0 to 1	Semi CO
50+	M	Medical doctor	10+	Semi CO
30–50	M	Heavy duty mechanic	10+	Semi CO
30–50	F	Project manager	3 to 5	CO
50+	M	Plant pathologist/ professor	10+(55 yrs)	CO
50+	M	Beekeeper / bee material supplier	10+	CO
50+	M	Beekeeper / adjunct professor	10+ (43 yrs)	CO
30–50	M	beekeeper	3 to 5	CO
50+	F	beekeeper	10+	CO
50+	M	Beekeeper / retired sea captain	10+	CO

practices were similar even if hive technology was used (e.g. remote sensing monitors and scales, variations in hive design). Both HO and CO valued access to knowledge and information. As one CO noted: '*there doesn't seem to be any end …even Dad with 30 + years' experience is still learning new things*'. All interviewees saw face-to-face interaction as most effective in gaining place-based (local) information and knowledge given the lack of published material. One CO stated, '*some beekeepers have handwritten diaries … about when and where things flower*', another said the diaries represented valuable local history and knowledge embedded in the old-timers which needed to be published for others to read. Yet, another noted the knowledge was not necessarily '*unique*' but had '*been honed*' and '*built up over years and generations*'. Others emphasised the need to understand WA beekeeping specifically: '*Australia is very different. Even the size of WA boxes and frames, we run full depth honeybee frames and over East generally have half-size*'.

Despite similarities, two key differences informed the respective how and why of HO and CO practices. Firstly, in the location and management beehives which depended on if there was profit or not. As one CO summarised: '*on the hobby side, you're not really thinking about bottling honey and making money, you haven't factored in all your labour, costs, certifications, qualifications or insurance*'. That is, HO kept bees alongside work, and appeared happy to produce honey for personal use or to give friends. Beehives were placed in primarily urban or semi-urban areas close to HO homes or in friends' backyards, even those in rural areas had hives in easy access. This maximised time available for experimenting, trialling and observing outside of other priorities (e.g. work) but were not locations of high value monofloral honey or for large quantities of beehives. Honey production for HO had a social component, many reported engaging with other beekeepers or bartering honey for other goods produced by neighbours. Some HO stated not liking honey but enjoyed its production and the community connection.

In contrast, CO saw beekeeping as work even though they also loved bees. Beekeeping practices were structured around some level of profit, with new technology adopted to increase time efficiency, honey productivity and hive security. As one semi-CO noted '*curiosity and striving for efficiency drives me*'. The greater number of hives meant CO preferred government registered (and costly) sites in natural bushland over urban or semi-urban locations. This implied travelling vast distances across the State to check hives. CO cited the sunken technology costs of equipment (e.g., to lift heavy hives) and limited profits as discouraging additional capital investment. One observed: '*the successful guys are quite well established and they have trucks and cranes fit-for-purpose, so if they were to innovate [and] scrap what they have then there isn't much money in honey [to make it viable]*'. As such, the adoption of new ideas was round '*mostly very small things*'. Practices were related to reducing job physicality, exhaustion of long driving hours to check hives 100's to 1000's of kilometres apart, and the risk of hives in remote unmonitored areas (e.g. to fire, vandalism). CO generally had less time to trial, experiment and merely '*watch*' hives as HO reported doing.

Secondly, HO generally had lesser knowledge than CO and were more willing to spend time seeking and sharing knowledge and assigned proportionally more time for this. One CO summarized:

…[HO] go deeper on a different level, because they might only have five to ten hives [and]can really zone into the intricacies. Whereas we are running 300 hives, and do not have the one-on-one with each hive. It is all about efficiency in our side. For them, it is a love interest.

And another: '[HO] want to share stuff, because the prime source of information is from colleagues. [CO] operate in different area together, there's not much relevant communication'. As one HO confirmed '…my journey is about collecting as much information from anywhere I can get it, I latch onto [CO when I can] and talk as much as they're willing to'.

In contrast, CO were protective of industry secrets and information, as one noted '*the local market used to be really strong. I could never satisfy it. It is now not there. It's gone*'. Knowledge itself represented profits and inter-generational hard-learnt lessons, highlighted by the following:

…[CO] that have been in the industry for a long time have hard fought lessons [which have] cost them years of their lives to learn. [They] see [giving information away] as a threat to people coming in, taking up sites, potentially creating disease issues and taking honey sales.
… backyard beekeepers will lose a few hives because if they have [get disease], but for [CO] it's a terrible loss.
…as an industry, we're in competition with other people looking for the [same] resource and so there are many who won't tell you where they found a honey flow until it's all over.

Joint enterprise: All interviewees felt beekeepers had a unique place in society and responsibility. As one noted, '*you can improve loaders, extractors and uncappers [etc.] but machines will never take over basic looking after bees, hives and extracting honey*'. And another: '*you can't just throw a beehive in your back garden and hope for the best. There are legal responsibilities*'. All recognised joint enterprise on issues of local biosecurity and the protection of WA's low pest and disease levels (compared to the rest of the world), being a threat to the honey industry and bees. One CO noting: '*both groups [HO and CO] will come together when it comes to matters of biosecurity*'. The proper education of HO in

Table 2
Summary of coding results across mutual engagement, joint enterprise and shared repertoire dimensions.

| | Knowledge source, type and needs | | Practice contributing to cultural dynamic | |
	Global (scientific)	Local (place or context specific)	HO practices (pleasure motive)	CO practices (profit motive)
Mutual engagement	– Little change in methods, even with technology	– Need region specific knowledge, e.g. seasonal	– Long hours of hive watching, seeking/sharing knowledge	– Many hives, focus on time efficiency, reduce physicality of work, improve hive productivity & security
			– Hives in backyards, easy access rural locations	– Various natural bush, urban, semi-urban locations
		– Accumulated knowledge of experienced beekeepers, sometime inter-generational	– Honey production is social, eg, bartering with neighbours	– Often travel vast distances to hives
			– Hives close at or close to home	– Large capital investment in cranes, trucks for heavy hives
		– Honey production for different regions across the State and Australia		– Protect industry secrets and information, i.e. where best honey is
Joint enterprise	N/A (no joint enterprise found at global level)	– WA Biosecurity	– Make beekeeping easier, eg, via trial and error, technology adoption	– Protect industry profits and business viability
			– Focus on local threats to urban beekeeping, eg, pesticides	– Education of less experienced to protect industry
			– Enhance HO community via sharing (training for less experienced)	– Collaborate on issues, e.g. prescribed burning, research to realise honey value, reduce physicality and improve safety
			– Collaborate to change local beekeeping laws and policy	– Adopt techniques/technologies if improve profit/productivity or job physicality
Shared repertoire	– Use of traditional methods	– Preservation of beekeeping traditions	– Social acceptance/sense of belonging/status via experience/ knowledge exchange	– Status via hives number as proxy for profitability/seriousness
			– Set up hives and interactive website for public / school children / global audience	– Improve industry standards / business efficiency / bee genetics
	– Status acquired via year of / success in beekeeping	– Provided by engagement with local CO and HO beekeeping associations	– Shared knowledge to change local beekeeping laws	– Engage via meeting at distant hive locations, phone, or at conferences
			– Engage via associations, branches, individuals	– Engage via meeting at distant hive locations, phone, or at conferences
			– Trial new techniques/technologies for more fun / easier / more accessible beekeeping	

hive health, and how to recognise a diseased hive, was seen as critical in preventing disease outbreaks (such as Varroa Mite or Colony Collapse Disorder). Some interviewees had adapted hives for the quick isolation of diseased bees, with CO stating: '*if we were unlucky enough or our practices were bad enough to get a disease in the future, we've got a barrier system in place to limit losses and allow us to control it*'.

Aside from this, HO and CO worked on different issues largely due to the different locations of and risks to hives. In general, HO focussed on beekeeping in urban areas (e.g. pesticide use by councils or in private gardens, minimising bee nuisance to neighbours), ease of doing beekeeping, and enhancing the beekeeping community by the sharing ideas and experiences. For example, some HOs expressed concern over lifting heavy hives (COs used heavy machinery and large trucks), citing '*back problems*' and '*beekeepers at a certain age can get musculoskeletal problems and find it difficult to lift the supers*'. As a result, many HOs used smaller Langstroth hives or horizontal hives[4] which were traditional Langstroth hive adaptions created during a design trialling and testing process where small adjustments were made to hive construction and then shared with other HOs.

Another example was a HO who researched beekeeping laws in urban areas across the world for a local government submission to revise

local beekeeping policy[5] away from the current Perth ad hoc approach (largely based on if a neighbour complained or not). As one HO explained:

> …I've got a 600 square metre block with a laneway and street front which restricts me. [My hives] are against the fence in front of large trees, but bees don't fly through the trees. They take the flight path that is easiest for them [across my yard]. I'm breaking local guidelines or planning requirements [distance of a hive from a boundary around a property]. But no one knows and my neighbours get free honey, so they are not going to complain.

HO also worked jointly to ensure place-based knowledge and information access, largely via monthly WAAS meetings and a bee buddy system pairing new HO with more experienced beekeepers for hands-on training and experience. This ensured all beekeepers were minimally trained in bee behaviours to stop swarming, identify diseased hives and create a knowledge pool enhancing HO experience. CO, on the other hand, worked jointly on issues to support business profits and viability. They were particularly concerned with State prescribed burning of native forest land, citing a need for scientific research on the honey value of native environments. One argued: the '*one burn policy*' where native bush is systematically burnt '*every fourth or fifth year … is appropriate for Jarrah forests, but applied universally*' has '*destroyed a lot of the native flora throughout WA. [You] see gradually less and less different [floral] species important for honey production*'. Others argued for better government coordination:

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[4] A normal hive has stacked boxes, the lowest being the brood box with the queen bee and the upper (or *supers*) for honey production. Supers are lifted to harvest honey and check the brood box. In a horizontal hive, the brood box sits horizontally between two supers on a custom-built frame making checking easy.

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[5] The City of Wanneroo (CoW) is a local government in Perth who shifted its beekeeping policy from under the *1999 Animals Local Law* (CoW 2016) to its current *2016 Bee Keeping Law*.

… You've waited four years for Jarrah [to flower], it's going to be a fantastic honey flow and they burn it. You think why couldn't they have just burnt it the year after?

Another area of joint CO enterprise was to reduce the physicality of the work. For example, some called for an overhaul of '*industry recommendations*' to address fatigue as exemplified by the death of a beekeeper '*working long hours to prepare the bees, waiting until dusk to move [200 hives] onto the truck, trap them down and then drive the long haul. He had driven about six hours fatigued. [Started to fall asleep,] corrected the truck, lost control of the trailer. He was unfortunately killed only at 42*' (also see Dupe, 2017). One noted the unpreparedness of response operations:

…there was no action plan. You just kill the bees, because obviously they were flying and crazy whilst [the police] were trying to [rescue the man]. A [State Emergency Services] guy had a heart attack because he got stung so many times and the hospital ran out of adrenaline and antihistamines. It's things like that we could do it better [through] policy or recommendations.

Another example of how CO worked to jointly reduce the physicality was in information sharing at the annual local BICWA beekeeping conference or in assisting '*mates*' during busy times of the year. As one CO stated on the latter: '*If we are in the field and the timing works, we will show each other how we do things differently. We just help each other out to improve our apiaries and businesses. … I have a couple of mates - we share where we are and what is flowering, which helps us with logistics and when we move [hives]*'.

<u>Shared repertoire:</u> Shared artefacts, experience and stories worked to reinforce and sustain practice, as well as shaped group identity and meaning. All interviewees were found to share a sense of local beekeeping tradition and long-time commitment, as represented by the large numbers still using the Langcroft hive as opposed to alternative hive constructions. This was partly as other methods were not seen as commercially viable for CO, with a large capital investment in equipment making it difficult to change. But also because it was seen as not being authentic practice, such as was the case of the Flow Hive (Hassall, 2016) - a major invention reshaping honey harvesting (engineered hives where honey is extracted via a tap to minimise hive disturbance) and increasing HO numbers as it made beekeeping easier and got '*people interested*'. CO comments on the Flow Hive were exemplified by: '*[it's] great for one or two boxes but for 700 or 800, it's a slow process. You're doing one at a time, there is production loss with the flow hive*'. HO who used it were seen as short-lived, cutting corners and not grounded '*real*' beekeeping. One HO noted '*distinctions between [the Flow Hive] kind of beekeeper and the others who get really pulled into the fascinating subject matter of these little passionate insects that are just so unbelievable*'. Another saw it as '*selling out*' and '*creating lazy beekeepers*' who are '*just wearing a uniform, like a cosmonaut … opening the tab and watching the honey [coming out]*'. Both CO and HO felt the Flow Hive was a biosecurity threat if hives weren't checked regularly by inexperienced beekeepers who thought there was nothing to do. One noted:

…the problem is people don't manipulate their hives, they don't want to be stung, they just want to turn the tap on and get honey. If they don't requeen a hive and look after it, then pretty quickly there will be no honey.

HO and CO also had distinct shared repertoire related to respective practices. This was apparent in how WABA and WAAS were discussed by all interviewees, being artefacts of respective CO or HO practices – even though neither memberships were exclusive. For example, WABA meetings were more focused on science or knowledge related to industry, such as bush fire threats. Whereas WAAS presented information and exchanged ideas for a wider audience with '*so many experienced beekeepers there [and] … the beginner's corner*'.

HO reported sharing repertoire through several means. First, status was assigned via beekeeping years as proxy for level of beekeeping knowledge and success over time. As one stated: '*it is frightening when you first start as a novice beekeeper, because there seems to be so much to learn*'. Less experienced beekeepers appeared highly dependent on the knowledge of more experienced and depended on '*belief in the person*'. Some HO noted that accessing knowledge was difficult as it tended to be '*insulated*' within specific social groups. Most felt they received more information than they passed on, and that information was '*unlocked*' through a gradual process of increased community status and credibility as they gained knowledge, experience and skill. This translated to how individual HO were viewed (and discussed) in the entire social network '*because everyone knows everyone*'.

Second, an artefact of HO practices was how learning processes generated a sense of belonging and contribution through the knowledge transferal, integration and identity construction process. This occurred primarily at WAAS meetings via presentations, bringing new ideas and/or technology to a '*gadget night*', or through the bee buddy program. Two new HO (less than a year) reported instigating local WAAS chapters to trade knowledge, one - excited to find others in his area interested in the Flow Hive - was looking forward to '*informal meetings [to] see what we can do to improve the [Flow Hive] experience*'. Another example from several HO (and a semi-CO) was the negotiation with a local high school to hold WAAS chapter meetings in exchange for keeping a Flow Hive on-site and contributing to the school agricultural program on '*animal husbandry and fish farming and everything like that*'. The Flow Hive had become a high tech experiment with cameras to '*zoom into the entrance [and] watch the bees coming and going, … [or] when a young bee come out for their first flight*', temperature sensors and an electronic weighing scale to know when bees have left or when the hive is '*filling it up with honey*'. The beekeepers involved reported creating a website to share the collected data globally. Thirdly, WAAS member efforts to improve local beekeeping laws had produced '*a code of [best] practice or management guideline*' for urban beekeeping. Several HO noted being one of '*half a dozen to ten people*' who had worked on it before sending out '*to the membership [comment when there were] probably 600 or 700*', and that it was currently being used to get '*local governments to look at beekeeping more like keeping [chickens]*'.

In contrast, CO shared repertoire occurred differently. First, status was assigned through hive numbers as a proxy for profitability levels or seriousness of a CO's business. As one stated:

… a lot of older guys carry ego. You go to [bee] conferences and the first question is: how many hives do you run? If he runs more hives than you, then straightaway he puts himself higher. It's like 'I know I'm better than you are'. You can just see that shift in conversation.

Second, learning and sharing of practice occurred more during meetings in the bush, phones calls, helping during busy periods and at annual conferences. These shared artefacts revolved around improvements in industry standards and business efficiency. Indeed, some CO cited involvement in a queen breeding and colony raising program where they were '*constantly searching for and tweaking older methods and creating new methods*', and focused on '*genetics… to develop strong stud lines with lineage… and get the quality of their stock higher*'. The CO explained that improving bee genetics meant '*becoming a better beekeeper*' as bees '*were easier to handle*' because they are '*friendlier*' and don't want to '*sting you to death*'. The motivations for this went beyond their own businesses, with one CO reporting that queen breeding was in '*high demand*' and enhancing breeding programs was critical for industry. One CO related it to a need for industry efficiency:

We're better at managing bees, [despite] other industries pouring more chemicals in the world, the world getting hotter, less [floral] resources, and prescribed burning. We're managing what we're doing with less resources.

5.2. Situated problem solving via a culture of exchange and mutual benefit

Here, I describe the emergent themes on what motivated HO and CO to collaborate in solving context-specific problems and share practices despite the differences detailed above. The first theme coalesced around *benefits to the beekeeping community and related to practices of learning specific to the locality*. For example, some HO reported transitioning to CO and that learning when small scale was less costly than loosing 100 hives due to an avoidable mistake. Though the HO to CO conversion rate was low as large scale beekeeping required a level of commitment and access to registered State sites which were '*pegged by [CO who] don't use them. It's very hard for new beekeepers to get land unless they know private sites*'. Further, some retiring CO became mentors to less experienced beekeepers with arrangements by HO to volunteer labour during CO busy times. All interviewees reported continual learning and benefits in such exchanges, though knowledge tended to move from CO to HO rather than visa versa. As one CO stated '*I'm always learning [including from hobbyists if they] come up with something that is worth learning. Most are just reaching out for information that we have*'. Whilst another:

> *When someone new comes with new ideas, they might introduce things that improve practices, outcomes to reduce fatigue, disease identification or open a new market overseas. There are many positives coming with more people involved.*

In contrast, a HO explained that '*rather than take 5–6 years to gather knowledge, it's easier to spend a couple of weeks with [a CO] and learn a lot more*'. All interviewees recognised that every beekeeper had different ways of doing the same thing - '*there is no right or wrong*'. HO sought exposure '*to try different ways and see what works*' and talking to CO was part of this. For example, recommendations on re-queening (changing the queen bee) for good honey flow ranged from one to four years. And, on hive construction, one CO noted '*transitioning to polystyrene hives to compensate for summer heat means hive productivity goes up*' as traditional timber hives '*developed in Europe protect bees against extremely cold winters*' were not best for the WA climate.

Both CO and HO had helped raise the local and national profile of beekeeping generally, with one CO commenting that the industry used to be '*out*' but now it was '*in*'. Many HO reported a community role in rehousing bees: '*bees make a home which doesn't work out. It's not right to take them away for $150. If [people] can't afford it, they just spray. We'd rather save them*'. Whilst some CO noted helping new beekeepers by breeding bees '*to give a 4 frame and eggs to new people to start up*', being '*happy to show what to do to get started, they're mostly either friends or become friends*'.

There was a strong sense of collaboration between beekeepers, with the local associations seen as raising '*awareness of the industry and bees. People are thinking about what's happening to bees, pollination and climate change [etc]. The associations] definitely have had a positive impact*'. Nonetheless, interviewees highlighted a complicated relationship given '*WABA members [or CO] used to be part of WAAS, but [there was] a fall out … a difference in opinion*'. The return of CO to WAAS indicated growing value in HO, with WAAS becoming a platform for HO and CO sharing of practice. One CO relayed that the associations were important in '*almost stop[ping tensions] before they start*', and another that it was about '*joining forces with the right intent*' with '*opportunities to fix things if you worked as a group like the wine industry do*'. This might be through formal activities such as with research centres, or informal activities such as HO trial-and-error activities and online discussion forums promoting science and research. As one CO stated:

> *…what [CO] crave is scientific proof of how good their honey is. If Jarrah is poor in one area, they can know why [and] change, as opposed to being penalised for having poor honey. Then they can justify charging higher prices.*

The second emergent theme was the *trialling and testing of technology advancements and innovation particularly in the context of adapting knowhow and technologies from elsewhere to the local environment*. CO saw innovation related to the local environment as crucial to wider competitive advantage and commercial survival in the industry, with one CO commenting '*if you're not innovative in beekeeping it's very hard to keep making a good living*'. While for HO, it related to knowing what worked best being a process of '*trial and error*' or '*incremental [learning] … like an evolution*'. The varying levels of local know-how, different personal experiences and/or industry backgrounds of beekeepers was a benefit to industry particularly if combined with scientific knowledge. CO suggested WA beekeeping had always been science-oriented, linking the current queen bee artificial insemination program to one almost 50 years ago on an Island close to Perth.

The time and money HO devoted to tinkering and trialling new methods and technologies to adapt them for local conditions as well as their willingness to share ideas and discoveries was seen as beneficial to industry. One CO noted: HO '*have a lot more time to look at [hives], think about and observe things you might not commercially*'. Another cited less experienced HO as the best source of practical ideas, such as using an electric '*Makita to blow bees out of the honey supers*'. One HO said he was installing high-tech systems on CO beehive operations, such as '*[weighing] scales, temperature probes, video cameras, [etc]*', explaining that a CO '*talked to someone [after my WAAS presentation], got my name and tracked me down*'.

The third theme focussed on the *protection of the WA beekeeping industry (e.g. biosecurity)*, being mentioned by all interviewees '*because [CO and HO] have the same interests that need protecting. [Even though] on a day-to-day basis, they're in two totally different worlds and will stay separate*'. One HO spoke proudly of '*playing part in the eradication of disease*'. All saw HO at the disease identification and control frontline, as HO hives were cited as the most likely place for disease breakout. This led to general interviewee consensus that HO education was important for industry protection, with CO playing their part through presentations at WAAS and teaching HO individually by letting them work as labourers, etc.

6. Concluding discussion

There has been little research to date in economic geography on how non-firm actors might shape regional industrial culture, particularly hobbyists or enthusiasts whose contributions are often viewed in the context of providing a work-life balance or as alternative knowledge sources in open innovation systems. Research has found that regional industrial cultures vary according to differences in local socio-economic practice, discourse and storytelling, which in turn shape industry paths (Eaton, 2016; Harfst et al., 2018; Sadler and Thompson, 2001). Yet, there is limited exploration of how knowledge and practices are shared between firm and non-firm actors to emerge as a specific and observable regional industrial culture. This paper examines this through a case study of interactions between beekeeping hobbyist and commercial counterparts. Indeed, beekeeping industry particularities motivate both groups to share practice and engage in mutual problem-solving. Beekeeping requires scientific, practical and local knowledge, has low barriers to entry, attracts those passionate about bees and beekeeping, and Australia honey sells at a premium on global markets. Therefore, while hobbyist and commercial beekeepers operate largely separately and beekeeping itself is an isolated activity, both acquire practice by learning from others.

A literature review found three critical aspects in this learning. First, cognitive proximity where the type of knowledge required is similar (Capdevila, 2018), which for all beekeepers is similar scientific, practical and local knowledge. Second, a middle-ground place or space of geographical or virtual interaction (cf. Cohendet et al., 2014), such as beekeeping associations where HO and CO discuss new methods and technologies, share practice and match mentor or intern opportunities. Third, that there was group negotiation of meaning and creation of

identity facilitating the exchange of knowledge and practice. In community of practice (CoP) literature, this occurs through the structural dimensions of mutual engagement (the how and why), joint enterprise (the community) and shared repertoires (the practice) (Pyrko et al., 2017; Wenger, 1998).

CoP literature views CO and HO as existing in the same community of practice but having different roles and positions (cf. Lave and Wenger, 1991). The CoP dimensions became the analytical framing for the interview data to understand how meaning was negotiated and identity created in the region, and how each mapped onto the dimension types in terms of knowledge source (local or global), needs and practice. The *mutual engagement* dimension of both groups was strongly influenced by hive number and location, though the how (technology used) and why (love of bees) was largely the same in both groups. CO engaged in practice to increase efficiency and profits, whereas HO were more motived by the pleasure of the hobby. This led to some differences in the *joint enterprise* dimension based on the different issues faced by the two groups. CO worked to decrease the physicality of work and increase efficiencies, and HO worked to improve urban beekeeping laws and knowledge access. The *shared repertoire* of both coalesced around the love of bees as well as a strong sense of belonging and contribution, allowing a regional industry culture of practice to emerge.

The findings demonstrated that community learning and sharing of practice was a deeply embedded local experience across all dimensions as considerable place-based knowledge was needed (e.g. plant species, flowering times, weather, local laws, etc). The analysis found several characteristics of HO in the community. First, there were substantially more HO; second, HO spent more time knowledge-gathering with enjoyment of learning and socialising part of the hobby. Finally, HO shared knowledge readily, as they were not protective of commercial 'secrets'. Therefore, despite both HO and CO driven by a strong intrinsic love of bees and using largely the same technology, the extrinsic aspects of professional beekeeping (i.e. income, work conditions, etc) motivated CO slightly differently (cf. Furnham et al., 2013; Kohn, 1993). Whilst this resulted in a slight barrier, there were substantial interactions between HO and CO.

In particular, HO and CO collaborated to solve context-specific or local problems and share practice for primarily three place-based reasons. First, the benefit to industry of hobbyists who crossed over and became commercial beekeepers, where sharing of practice a component of business succession planning. However, unlike the CoP apprentice-master interactions described by Lave and Wenger (1991), hobbyists were *not* necessarily interested in or transitioned to professional. Becoming a professional was a more process of incremental place-based learning of practice and increasing participation with more and more beehives acquired to the point where honey production was too much to give away. Therefore, unlike Lave and Wenger (1991), 'teaching the ropes' to an apprentice was less of a motivator for CO to share practice with HO than other placed-based reasons (e.g. industry biosecurity, educate public). For example, interactions with the public or other organisations (research institutes, government) promoted bees and the industry, making it easier for urban beekeeping and to protect highly valuable forests for commercial use.

Second, the informal trialling and testing of new technology and innovations, especially to adapt for local conditions. This was done by HO for enjoyment and by CO to improve productivity and efficiency, and meant knowledge and practices were largely generated by and for beekeeping in a specific region. For example, the CO genetic engineering and insemination trials to breed more robust disease-free easy-to-handle bees for Western Australian environmental conditions (and perhaps similar environments) aimed to increase competitiveness of bee and honey sales. In contrast, Cohendet et al. (2021) found firms, middle-ground organisations and user communities developed video games for use in global (not specifically local) markets. Third, the protection of the local industry, e.g. biosecurity threats, given the importance of educating and training hobbyists in disease detection and bee

management.

The findings of this study point to the need to support interactions between local informal and industry counterparts. Such interactions may generate a regional industrial culture of exchange and mutual endeavour as group meaning and identity is constructed via the activities of both firm and non-firm community members such as sharing geographically-embedded knowledge (weather, flowering times and places, state and local laws) and collaborating on place-specific problem-solving. Greater research is needed to understand how such informal non-firm and work groups, such as enthusiasts, could collaborate with industry in areas of mutual interest and endeavour. Indeed, stimulating areas of non-firm (informal institutions, enthusiasts, etc) and commercial community overlaps in practice and entrepreneurship will support the development of a regional culture of industry innovation and problem-solving, which in turn may enhance broader societal and economic benefits around regional competitiveness, identity and placemaking.

CRediT authorship contribution statement

Kirsten Martinus: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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References

Amin, A., Cohendet, P., 2004. Architectures of Knowledge: Firms, Capabilities, and Communities. Oxford University Press, Oxford.

Amin, A., Roberts, J., 2008. Knowing in action: beyond communities of practice. Res. Policy 37 (2), 353–369.

Audretsch, D.B., 2020. Entrepreneurship and culture. Eurasian Econ. Rev. 10 (1), 1–8.

Azeveda, F., 2013. The tailored practice of hobbies and its implications for the design of interest-driven learning environments. J. Learn. Sci. 22 (3), 462–510.

Bathelt, H., Malmberg, A., Maskell, P., 2003. Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. Prog. Hum. Geogr. 28 (1), 31–56.

Berridge, K., Kringelbach, M., 2015. Pleasure systems in the brain. Neuron 86 (3), 646–664.

Asheim, B.T., Boschma, R., Cooke, P., 2011. Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases. Reg. Stud. 45 (7), 893–904. https://doi.org/10.1080/00343404.2010.543126.

Bole, D., 2021. 'What is industrial culture anyway?' Theoretical framing of the concept in economic geography. Geogr. Compass 15 (11), e12595.

Brinks, V., 2020. Fun or frustration? How emotions shape user innovation processes. Emot. Space Soc. 34, 100651.

Brinks, V., Ibert, O., 2015. Mushrooming entrepreneurship: The dynamic geography of enthusiast-driven innovation. Geoforum 65, 363–373.

Capdevila, I., 2018. Knowing communities and the innovative capacity of cities. City Cult. Soc. 13, 8–12.

Coe, N., Bunnell, T., 2003. 'Spatialising' knowledge communities: towards a conceptualisation of transnational innovation networks. Global Netw. 3 (4), 437–456.

Cohendet, P., Grandadam, D., Simon, L., Capdevila, I., 2014. Epistemic communities, localization and the dynamics of knowledge creation. J. Econ. Geogr. 14 (5), 929–954.

Cohendet, P., Simon, L., Mehouachi, C., 2021. From business ecosystems to ecosystems of innovation: the case of the video game industry in Montréal. Ind. Innov. 28 (8), 1046–1076.

CoW, 2016. Beekeeping local law 2016. Western Australian Government Gazette 2017 (11), 356–359.

Department of Primary Industries and Regional Development, DPIRD (2018a) *Western Australia Biosecurity Strategy*. Available at: https://www.agric.wa.gov.au/biosecurity/western-australian-biosecurity-strategy.

DPIRD (2018b) Beekeeping for small landholders in Western Australia. https://www.agric.wa.gov.au/small-landholders-western-australia/beekeeping-small-landholders-western-australia.

Dupe, C. (2017) Beekeeper dies in rollover. *The West Australian*, Dec 22 2017, https://thewest.com.au/countryman/horticulture/beekeeper-dies-in-rollover-ng-b88694347z.

Eaton, W., 2016. What's the problem? How 'industrial culture' shapes community responses to proposed bioenergy development in northern Michigan, USA. J. Rural. Stud. 45, 76–87.

Ettlinger, N., 2003. Cultural economic geography and a relational and microspace approach to trusts, rationalities, networks, and change in collaborative workplaces. J. Econ. Geogr. 3 (1), 145–171.

Faulconbridge, J., 2010. Global architects: learning and innovation through communities and constellations of practice. Environ Plan A 42 (12), 2842–2858.

Fineman, S., 2000. Emotion in Organisations. Sage, London.

Fritsch, M., Wyrwich, M., 2017. The effect of entrepreneurship on economic development – an empirical analysis using regional entrepreneurship culture. J. Econ. Geogr. 17 (1), 157–189.

Furnham, A., 2013. Passion in organisations. In: Burke, R., Cooper, C. (Eds.), The Fulfilling Workplace: The Organisation's Role in Achieving Individual and Organisational Health. Routledge, London, pp. 91–105.

Gertler, G., 2003. Tacit knowledge and the economic geography of context, or The undefinable tacitness of being (there). J. Econ. Geogr. 3 (1), 75–99.

Gibson, C., Kong, L., 2005. Cultural economy: a critical review. Prog. Hum. Geogr. 29 (5), 541–561. https://doi.org/10.1191/0309132505ph567oa.

Gong, H., 2020. Multi-scalar legitimation of a contested industry: A case study of the Hamburg video games industry. Geoforum 114, 1–9.

Grandadam, D., Cohendet, P., Simon, L., 2013. Places, spaces and the dynamics of creativity: the video game industry in Montreal. Reg. Stud. 47 (10), 1701–1714.

Haq, I.U., De Clercq, D., Azeem, M.U., 2019. Can employees perform well if they fear for their lives? Yes – if they have a passion for work. Pers. Rev. 49 (2), 469–490.

Harfst, J., Wust, A., Nadler, R., 2018. Conceptualizing industrial culture. Conceptualizing industrial culture. *GeoScape* 12 (1), 1–9.

Hassall, G. (2016) Flow hive: Cedar and Stuart Anderson talk about life one year after crowdfunding success. *ABC News*, Sept 12. http://www.abc.net.au/news/2016-09-12/australian-story-flow-hive-family-talks-about-life-now/7828436.

Hemphill, D., Leskowitz, S., 2012. DIY activists: communities of practices, cultural dialogism, and radical knowledge sharing. Adult Educ. Q. 63 (1), 57–77.

Horticulture Innovation Australia (2015) *Western Australia Fact Sheet*. Available at: https://www.agrifutures.com.au/wp-content/uploads/publications/15-030.pdf.

Ibert, O., Hess, M., Kleibert, J., Müller, F., Power, D., 2019. Geographies of dissociation: Value creation, 'dark' places, and 'missing' links. Dialogues in Human Geography 9 (1), 43–63.

James, A., Martin, R., & Sunley, P. (2006) The rise of cultural economic geography. In: Martin, R. & Sunley, P. (eds.) *Critical Concepts in Economic Geography: Volume IV, Cultural Economy*, pp.3-18. London: Routledge.

Jones, A., Murphy, J.T., 2011. Theorizing practice in economic geography: Foundations, challenges, and possibilities. Prog. Hum. Geogr. 35 (3), 366–392.

Kendall, L., 2008. 'Noobs' and 'chicks' on Animutation Portal: power and status in a community of practice. Int. J. Web Based Communities 4 (4), 491–502.

Kohn, A., 1993. Punished by Rewards: The Trouble with Gold Stars, Incentives Plans, A's, Praise, and Other Bribes. Houghton Mifflin and Co, Boston.

Lave, J., Wenger, E., 1991. Situated Learning: Legitimate Peripheral Participation. Cambridge University Press, New York.

Martinus, K., 2022. Informal groups, disruptive innovations, and industry change in low-tech peripheries. Geogr. Res. 60 (2), 256–268.

Mena, J., Hennissen, P., Loughran, J., 2017. Developing pre-service teachers' professional knowledge of teaching: the influence of mentoring. Teach. Teach. Educ. 66, 47–59.

Müller, F., Ibert, O., 2015. (Re-)sources of innovation: understanding and comparing time-spatial innovation dynamics through the lens of communities of practice. Geoforum 65, 338–350.

Nowell, L., Norris, J., White, D., Moules, N., 2017. Thematic analysis: striving to meet the trustworthiness criteria. Int. J. Qual. Methods 16 (1), 1–13.

Pyrko, I., Dörfler, V., Eden, C., 2017. Thinking together: What makes community of practice work? Hum. Relat. 70 (4), 389–409.

Qian, J., Lyu, Z., Guo, J., 2021. Making a grassroots knowledge economy: cultural economies and communities of practice in the Shanzhai electronics industry. Geoforum 125, 66–77.

Sadler, D., Thompson, J., 2001. In search of regional industrial culture: the role of labour organisations in old industrial regions. Antipode 33 (4), 660–686.

Singh, V., Bains, D., Vinnicombe, S., 2002. Informal mentoring as an organisational resource. Long Range Plan. 35 (4), 389–405.

Spiegel, B., 2017. Bourdieu, culture, and the economic geography of practice: entrepreneurial mentorship in Ottawa and Waterloo, Canada. *J. Econ. Geogr.* 17 (2), 287–310.

Swanson, S., Kent, A., 2017. Passion and pride in professional sports: investigating the role of workplace emotion. Sports Manage. Rev. 20 (4), 352–364.

Tödtling, F., Grillitsch, M., 2015. Does Combinatorial Knowledge Lead to a Better Innovation Performance of Firms? Eur. Plan. Stud. 23 (9), 1741–1758. https://doi.org/10.1080/09654313.2015.1056773.

WA Herbarium (2018) *An Introduction to the Western Australian Flora*. Available at: https://florabase.dpaw.wa.gov.au/intro.

WAAS (2020) *Western Australian Apiarists' Society*. Available at: https://waas.org.au/.

WABA (2007) *Standing Committee on Agriculture, Fisheries and Forestry Inquiry into the Future Development of the Honeybee Industry*. Submission to Parliament of Australia. https://www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=/pir/honeybee/subs/sub032.pdf.

Wenger, E., 1998. Communities of Practice: Learning, Meaning, and Identity. Cambridge University Press, Cambridge.

Wenger, E., 2010. Communities of practice and social learning systems: the career of a concept. In: Blackmore, C. (Ed.), Social Learning Systems and Communities of Practice. Springer, London, pp. 179–198.

Winwood, P., Bakker, A., 2007. An investigation of the role of non-work-time behaviour in buffering the effects of world strain. J. Occup. Environ. Med. 49 (8), 862–871.