

**DATA SUPPLEMENT to MANUSCRIPT:**  
**KNOWLEDGE DIFFUSION IN A GLOBAL SUPPLY NETWORK: A NETWORK  
OF PRACTICE VIEW**

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**INTRODUCTION TO THE DATA SUPPLEMENT**

The aim of this Data Supplement is to offer transparency to and replicability of this research project. This study utilized a large number of data processes and required multiple steps to reach the final results; it involved an innovative mix of qualitative data analysis and social network analysis (SNA) in a network-level case study. To offer transparency this supplement provides a case study timeline, offering readers a longitudinal perspective of how the research was conducted. To aid in replicability, we offer detailed, step-by-step procedures for both the qualitative analysis and the quantitative SNA techniques we used.

The timeline is organized in four phases, following the pattern proposed by Gioia and colleagues (2012). In Phase 1, we conducted the first wave of interviews and started to analyse demographic data and forum data, which resulted in initial first-order codes. Phase 2 involved a second wave of interviews and a validation workshop for refining first-order codes. In Phase 3, we finished the data collection, which resulted in a total of 24 months of forum data. In this phase, we also developed second-order codes and conducted final SNA analysis. The final phase (Phase 4) focused on the development of the propositions derived from connecting second-order codes. Figure DS1 below synthesizes the workflow of our data analysis and theory elaboration phases.

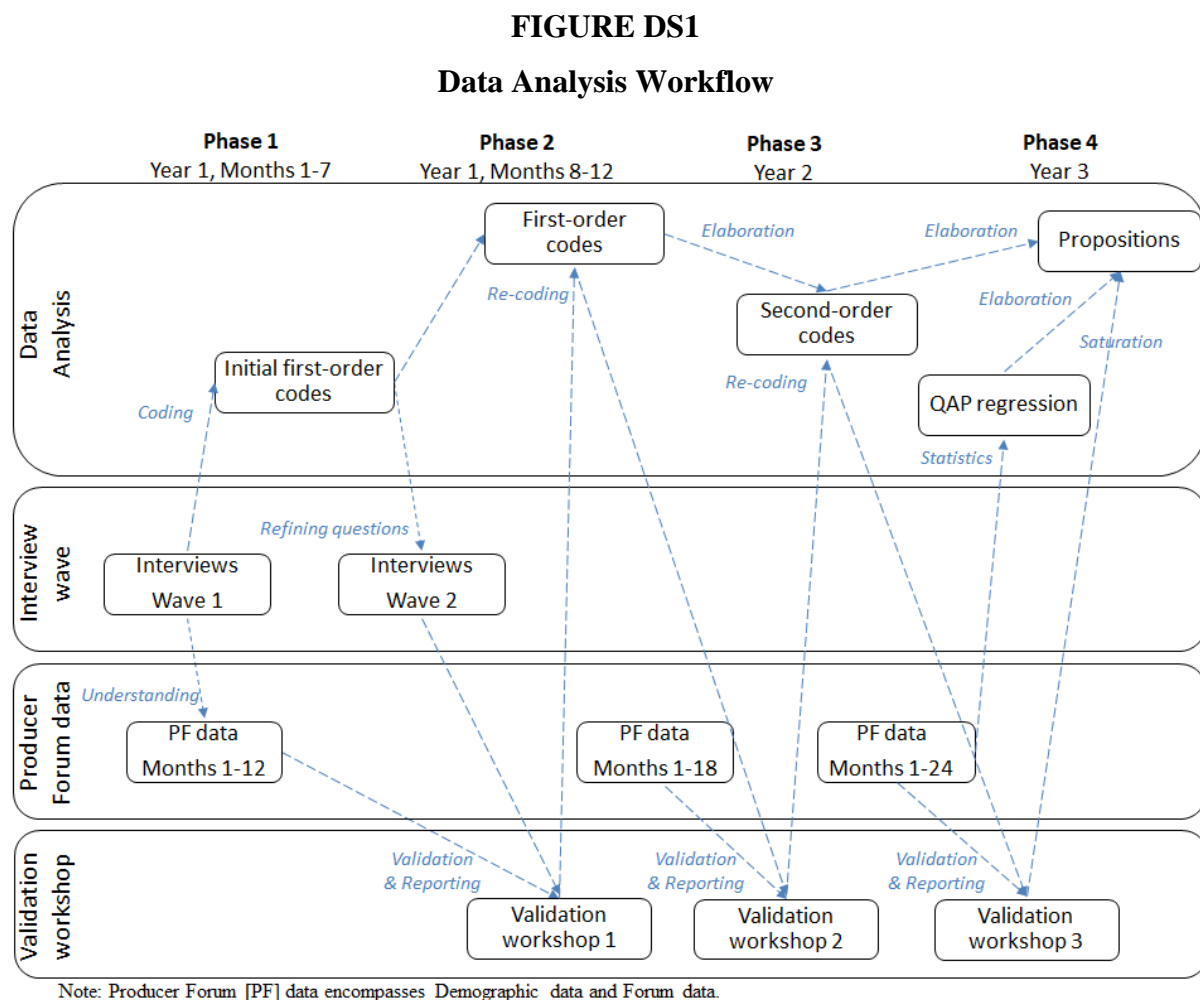


Figure DS1 shows how the research project evolved across the four phases and which set of data was used in each phase. It outlines the process of moving from preliminary

understanding of the context, to developing first-order codes, developing to second-order codes to conducting QAP regression, and finally to developing propositions.

## **PHASE 1: PRELIMINARY UNDERSTANDING (Year 1, Month 1-7)**

### **Data Collection**

In Phase 1, we conducted the first wave of interviews, initiated manipulation of Producer Forum data, and received access to observe live webinars. Specifically, we conducted the following interviews and collected the following data:

- First wave of interviews (11):
  - 1 Sourcing Director (D01)
  - 2 PF managers (T01-02)
  - 1 Technical director (T04)
  - 5 Technical managers (T05-09)
  - 1 PF champion (T03)
  - 1 Expert (E01)
- Producer Forum data (12 months):
  - Demographic data [static data]: name, job, company, and details of the company, including product category, country, supply network role, and contractual ties
  - Forum data [dynamic, written posts]: date, sender, post title, and post content of each post
- Observations of live webinars as silent observers [research memos]

The selection of first-round interviewees was based on the RetailCo's advice about key informants, including the Producer Forum management team, which was composed of the PF Managers (T01-02), the PF Champion (T03), and the Technical Director (T04), and the Sourcing Director and Technical managers that were involved with the initiative. Therefore, the first wave was concentrated on management and 'heavy users'. UK-based interviews were conducted face-to-face (8), and interviews for individuals outside the UK were conducted via Skype (3). All interviews were recorded, transcribed, and sent to interviewees

for review; only one interviewee made minor amendments to the transcript. Qualitative data analysis was supported by NVivo software, producing first-order codes.

In order to complement interviews with unbiased data, the project had access to Producer Forum data for the first 12 months of the initiative. This data covered demographic data and forum data, shared in two separate Excel files produced by the RetailCo's IT department.

The first file contained the demographic data for the 1,485 individuals who participated in the first 12 months of this study. Of the total participants, 115 actively posted to the forums.

This demographic data was used for two purposes: to identify contractual ties (i.e., to determine who supplies to whom) and to classify members according to three key attributes: product category, geographic region, and supply network role. Specifically, these attributes broke the demographic data into the following data sets:

- Product categories: (i) Produce (fruits, vegetables, and seeds); (ii) MFPE (meat, fish, poultry, and eggs); (iii) Dairy (milk products); and (iv) General (all non-product areas of expertise, such as logistics and legal action).
- Geographic regions reflecting RetailCo's sourcing hubs: (i) UK; (ii) Continental Europe; (iii) Africa; (iv) the Americas; and (v) Asia.
- Supply network roles to identify whether members are from: (i) RetailCo; (ii) Direct suppliers; (iii) Sub-suppliers; and (iv) Expert organizations, including universities, consulting firms, and associations.

The second file showed the dynamic forum data, which contained each post made in the Producer Forum as well as research memos from the Produce Forum live webinars. The live webinars were scheduled and announced by RetailCo in advance. RetailCo authorized the lead researcher to login to the Producer Forums and join the webinars as a silent observer; these observations resulted in research memos. Within the Producer Forum, there were 73 forums involving the 115 active members. Each forum could be as simple as one question

with one answer, or as complex as a discussion with 30 comments, lasting for months. Open forums could be read by any member, even inactive ones, but active group forums were restricted to sub-groups to protect the confidentiality of more sensitive data.

Figure DS2 shows an anonymized example of the two Excel files and one anonymized forum involving a supplier from Thailand, a supplier from the UK, and a RetailCo technical manager from the USA Hub.

**FIGURE DS2**

### Sample of Excel Charts for Members and Forum data

(DS2a) Sample of Anonymized Demographic data

Data joined	Member	Position	Firm#	Country	Region	Position	Category	Tier	Supplies To
2012-10-03	M.P.059.001	Technical Manager	059	United Kingdom	1. United Kingdom	3. Supplier	2. Produce	1. Tier 1	R.G.163.078
2012-09-26	S.P.154.001	Sustainability Manager	154	Chile	4. America	3. Supplier	2. Produce	1. Tier 1	R.P.163.011
2013-07-11	R.P.163.001	Buying Manager - Chilled Salads	163	United Kingdom	1. United Kingdom	1. Retail	2. Produce	0. Tier 0	n/a
2012-08-20	S.P.019.001	Director	019	United Kingdom	1. United Kingdom	3. Supplier	2. Produce	1. Tier 1	R.P.163.087
2012-05-21	R.P.163.003	Category TM - European Hub	163	Spain	2. Europe Cont	1. Retail	2. Produce	0. Tier 0	n/a
2013-03-18	M.P.135.001	Managing Director	135	United Kingdom	1. United Kingdom	3. Supplier	2. Produce	1. Tier 1	R.P.163.026
2012-06-29	R.P.163.004	Sourcing Manager	163	United Kingdom	1. United Kingdom	1. Retail	2. Produce	0. Tier 0	n/a
2013-10-15	E.G.138.001	Director	138	United Kingdom	1. United Kingdom	2. Expert	1. General	1. Tier 1	R.G.163.078
2012-05-21	R.P.163.006	Technical Manager	163	South Africa	3. Africa	1. Retail	2. Produce	0. Tier 0	n/a
2012-09-12	M.P.169.001	Quality Manager	169	South Africa	3. Africa	3. Supplier	2. Produce	1. Tier 1	R.P.163.006
2012-11-21	P.P.166.001	Technical Manager	166	United Kingdom	1. United Kingdom	4. Producer	2. Produce	2. Tier 2	n/a
2014-04-02	E.G.025.001	Farm Manager	025	United Kingdom	1. United Kingdom	2. Expert	1. General	1. Tier 1	R.G.163.078

(DS2b) Sample of Anonymized Forum Data

Date posted	Member	Topic title	Post title	Post content	Forum code
2012-06-25	E.G.138.001	Rots in pears	Rots in pears	(...)	F.002
2012-06-28	M.P.059.001	Rots in pears	RE: Rots in pears	(...)	F.002
2013-07-01	M.P.135.001	Rots in pears	RE: Rots in pears	(...)	F.002
2012-07-23	M.P.169.001	Rots in pears	RE: Rots in pears	(...)	F.002
2012-07-23	R.P.163.001	Rots in pears	RE: Rots in pears	(...)	F.002
2013-03-18	R.P.163.003	Fruitlook: Affecting Water Use	Fruitlook: Affecting Water Use	(...)	F.008
2012-03-29	R.P.163.004	Fruitlook: Affecting Water Use	RE: Fruitlook: Affecting Water Use	(...)	F.008
2013-05-15	R.P.163.006	Fruitlook: Affecting Water Use	RE: Fruitlook: Affecting Water Use	(...)	F.008
2012-11-21	S.P.019.001	Cool Farm Tool	Cool Farm Tool	(...)	F.010
2014-11-22	S.P.154.001	Cool Farm Tool	RE: Cool Farm Tool	(...)	F.010

(DS2c) Exemplar of Anonymized Forum

#### **F.022: “How to handle the sea shipment of mango better?”**

S.P.157.001 Tier-1 Supplier, Thailand: Hi Everyone, Thai Mango has normal shelf life around 20-25 days when keep at temp 11c after harvesting at maturity 70-80%. If we want to do sea shipment to UK from Thailand, we need a shelf-life of total 35 days (transit time 25 days + local shelf-life after arrival 10 days). Does anyone have experience of extending life of Mango?”

M.P.182.001, Tier-1 Supplier, UK: “Please explain further so I can provide better assistance. Happy to assist.”

R.P.163.086, RetailCo Hub, USA: “Hi, If M.P.182.001 are willing to help certainly contact them - they have much experience in this area. I would think anyone that can successfully ship Thai mangos that distance will have a competitive advantage. My suggestion is to take a step back from shipping to make sure you have fruit grown with the correct pre- and post-harvest controls as black spot and break down are probably your biggest issues with a journey that long. For the shipment itself certainly ethylene scrubbers and the correct venting will be needed. I am not sure if anyone has done work on step down temperatures or MA technology for Mangos over that distance. For arrival that 10 days needs to include the customer shelf-life so you really want to be able to clear that volume in less than a week.”(...)

Forum data was used in two ways. First, for quantitative purposes, it supported the matrices and diagrams of who interacts with whom. Taking the above forum F.022 as an example, the three participants in this discussion (coded as S.P.157.001, M.P.182.001, and R.P.163.086) have one ‘knowledge exchange tie’ between them as a result of their participation in this forum. Second, for qualitative purposes, it provided data for comparative analysis. The text content of the forum data was upload to NVivo software for qualitative, side-by-side analysis with interview data. Therefore, first-order codes emerged from both interviews and forum data.

The use of multiple data sources was key to building our case study. While interviews provided key informants’ perceptions, Producer Forum data offered the ability to confirm these perceptions by comparing them to (a) quantifying knowledge exchange ties and participant profiles and (b) textual data showing exactly what type of knowledge was shared. Additionally, the observation of webinars provided further insight into how participants were engaging in knowledge diffusion, which participants were more vocal, and how these live webinars complemented forum dynamics.

### **Understanding the Context**

In the first phase, we established the context of the initiative, the strategic goals of RetailCo – as Sourcing Director quote and a researcher memo illustrate:

“We looked at major trends and changes that were happening in the wider environment. One of them is the macro change of food supply and demand in the world and the second one is about the increasing importance and growth of social networking. [Therefore] the strategy was about how we can bring all staff across the world into a social network. Then it occurred to me that we should be doing the same thing with our producers: bringing them into a social network and using that network to help us to address the macro challenges of supply continuity, better end-to-end communication, and how to improve productivity and reduce waste across the supply network” (G01)

“The goal of the Producer Forum seems to be diffusing best practices that had been happening in a local, face-to-face environment to foster supplier-supplier collaboration in a dispersed, global supply network context. For example, before the Producer Forum, the Dairy product category already had a suppliers’ working group in the UK discussing best practices. Now, with the Producer Forum, such working groups can involve suppliers from multiple countries allowing them to exchange knowledge through the online platform.” (Researcher Memo)

This phase consisted of initial first-order codes that reflect participants’ words and identify key elements that help identify the drivers of and barriers to knowledge diffusion [See Table DS1 for the final list].

As a key outcome of this phase, we identified *product category* as a key variable for understanding the dynamics of the Producer Forum. We saw that both RetailCo’s buyers [commercial focus] and technical managers [CSR/sustainability focus] were responsible for specific product categories. Therefore, their face-to-face efforts regarding supplier-supplier collaboration had always been within specific product categories [or even sub-categories]. They have been organized in such way because of the specificities of each product category in terms of technology for farming, post harvesting, warehousing and transportation requirements, and so forth. Discussions such as pesticides, legislation, innovation, sustainability, are product-category-specific. This is not to say that there were common topics that could bring together different product categories, such as working conditions, but they seemed to attract less attention from suppliers. Therefore, the goal of the Producer Forum was to reproduce this category-specific logic in the online environment, as showed below:

“Our goal is to tailor the content [for each product category] such as produce, lamb, fish, poultry and pork. And to organize webinars from experts or from themselves [technical managers] about the key challenges in the industry at the moment” (PF Manager)

“The Producer Forum needs to be clearly split down into dairy, produce, etc, as producers don't want to see issues about other product categories. You know, why would they? They would want to just go directly to their interests” (PF Champion).

The analysis of forum data confirmed the importance of category-specific discussions: the majority of questions and answers were very technical in nature (see above the example in Figure DS2), thus category-specific discussions restricted those involved to be in the same type of practice. For example, discussions of new technologies, adaptations to new regulations, and pesticides all triggered participation of suppliers sharing the same practices.

Therefore, recognizing product category as a proxy for *practice* showed us where to focus on the next phase. At the conclusion of Phase 1, we asked the following questions: Could product category be used as a proxy for practice? Could the Producer Forum reproduce face-to-face supplier-supplier collaboration at a global scale? What was the perspective of non-heavy users? What was the perspective of suppliers? To answer these questions, our research expanded in Phase 2 to include the perspectives of buyers [commercially oriented and different from Technical managers], sourcing hubs [outside the UK], and suppliers.

## **PHASE 2: REFINING FIRST-ORDER CODES (Year 1, Month 8-12)**

### **Data Collection**

At the start of Phase 2, we approved an additional wave of 15 interviews, and access to demographic and forum data for another 12 months. Like in Phase 1, we conducted UK-based interviews in face-to-face meetings (9 interviews), and we conducted all other interviews via Skype (6 interviews), and we followed the same procedures for data validation and research quality.



This phase enabled us to confirm or reject initial impressions and reach the final version of first-order codes assuring that codes were: (i) mutually exclusive, (ii) complementary, and (3) representing behaviour/action that could drive, hinder, or moderate the process of knowledge diffusion. In summary, data in this second phase derived from:

- Second wave of interviews (15):
  - 1 Technical director (T04)
  - 3 Commercial directors (C01-03)
  - 5 Technical managers (T10-14)
  - 2 Buyers (C04-05)
  - 4 Suppliers (S01-04)
- Producer Forum posts (additional six months of demographic and written data)
- Further observation of live webinars as a silent observer
- Validation workshop in Month 10 with PF management team (T02, T03, and T04)

### **Handling Discrepancies**

For the Phase 2 interviews, the focus shifted to an in-depth understanding of specific initiatives within the Producer Forum to capture perspectives other than those of the technical team. This time, we used theoretical sampling to include the RetailCo's commercial side. Specifically, we included three commercial directors, two buyers and four suppliers, all of which could raise barriers to the technical managers' focus on sustainability given the tensions related to price reductions.

As a result of this strategy, we were able to identify discrepancies in data collected from these different sources. Specifically, we found the commercial and technical teams had conflicting perspectives. For instance, the commercial team was generally less confident about the potential of the Producer Forum, when compared to the technical team. This difference in views might be due to their different functional focus. In general, technical managers were more focused on sustainability/CSR, which should drive their involvement with the Producer Forum, while the commercial team was more focused on cost reductions

and deliveries, which is not an objective of the Producer Forum. The discrepancy between views of the commercial and technical teams allows us to better understand both drivers and barriers to the initiative. Most importantly, we discovered that one commercial buyer was very involved with the Producer Forum, and had managed to coordinate the most popular forum related with apple packing. Therefore, the data in the Producer Forum allowed us to see that discrepancies did not necessarily result from a department, but could also derive from personal views. This understanding of discrepancies allows us to see that drivers and barriers of the initiatives could co-exist.

### **Triangulating Data Sources**

We refined first-order codes by triangulating the qualitative data [interview data and forum data imported to NVivo], the quantitative data [quantification of forum data], and the validation workshop data. Our quantitative analysis of forum data showed a high concentration of knowledge diffusion within product categories [76.4% in Year 1]. In addition, it showed the opposite result for geographic dispersion [39.4% in Year 1]. Contrasting qualitative and quantitative data, geographic dispersion emerged as both an opportunity and a barrier to knowledge diffusion. We kept two angles - the negative angle of *“suppliers protecting their competitive advantage”* and the positive angle of *“suppliers perceiving peers from distant geographic regions as non-competitors”* as separate codes to acknowledge the tension between the competition and cooperation, but to avoid collapsing similar codes or discarding one in favour of the other too early in the process. Illustrative interview quotes:

Suppliers protecting their competitive advantage: “Some producers just are not willing to share best practices because they feel this would hurt their competitive advantage” (Expert)

Suppliers perceiving peers from distant geographic regions as non-competitors: “Spanish citrus growers grow at a completely different time to South African citrus, so there is a relationship that we can build

between them, where they can share learning. They tend to do that themselves, anyway. So it is already happening.” (Technical Manager 5)

We also refined the first-order codes through the first validation workshop, which was held at RetailCo’s headquarters with the Producer Forum’s management team. The workshop consisted of a two-hour meeting that began with the lead researcher giving a 30-minute presentation, followed by a group discussion of the Producer Forum. The presentation included first-order codes and SNA results [which were preliminary at this stage]. The discussions provided additional insight into the case study. Researcher memos helped registering the workshop.

The validation workshop confirmed our understanding (based on the qualitative coding) that the management team was focused on tailoring the Producer Forum to allow drive activities for specific product categories. It also confirmed our understanding that the Producer Forum could act as an amplifier of former activities that were previously restricted to face-to-face events. In other words, through a series of support videos and webinars, the Producer Forum was broadcasting practices from high performing producers to a global audience of peers, helping globally dispersed producers of the same product category learn from each other (through videos) and engage with one another (during webinars).

### **PHASE 3: ABSTRACTING TO SECOND-ORDER CODES (Year 2)**

#### **Data Collection**

In Phase 3, we reached 24 months of forum data, which supported the analysis of Year 1 versus Year 2 in terms of how the knowledge exchange network evolved. Additionally, we triangulated our findings with two validation workshops to develop the final version of second-order codes. In summary, the data we collected in this third phase derived from:

- Producer Forum (Additional six months of demographic and forum data for a final total of 24 months of data)

- Further observation of live webinars as a silent observer
- Two validation workshops with PF management team (T02, T03, and T04), held in the same format as the first one to discuss final SNA results and second-order codes

### **Supplement to Social Network Analysis (SNA)**

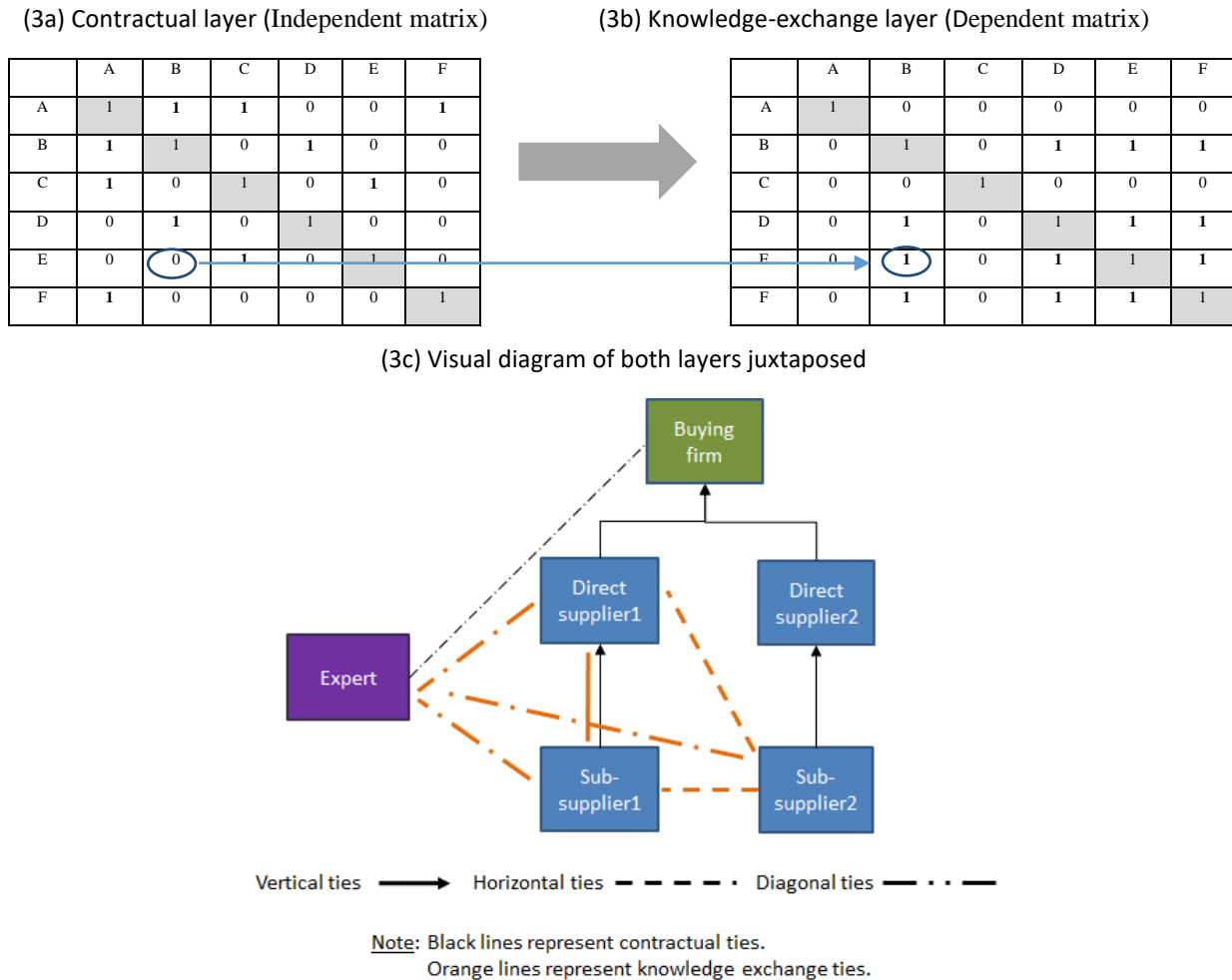
We conducted our final SNA analysis on 24 months of Producer Forum data [both demographic data and forum data]. At this stage, the Producer Forum accounted for 2,779 members, 275 of whom were active members engaging in 255 forums. Through SNA diagrams, we were able to observe a deviation in the Producer Forum from the initial commercial supply network. In other words, we found there had been significant knowledge diffusion activities across participants with no previous commercial relationship, such as competing suppliers from different countries, unrelated suppliers from different tiers, and suppliers and experts. Results are provided in Figure 3 and Table 4 in the main manuscript.

The SNA conducted in this study consisted of visually mapping the network layers and running regression tests using the quadratic assignment procedure (QAP) regression, which is a nonparametric, permutation-based test that preserves the integrity of the observed structures [i.e., it explicitly retains the interdependency among the dyads] (Krackhardt, 1987). We selected QAP regression because it is superior to OLS in multiple regression models based on dyadic data since it maintains the dyadic element in the analysis (Krackhardt, 1988) and is dependent on data of the whole network (Løvås & Sorenson, 2008) [In this case study, the access to the whole network participating in the online platform allowed the QAP regression]. The QAP regression in this study follows previous studies (see: Doreian & Conti, 2012) but expands to an inter-organizational context. SCM studies using this method are scarce due to data constraints.

To run the QAP regression, we represented each network layer by a squared matrix (Cross et al., 2001) with all active network members; in this case, 275 x 275 matrices (active members) were produced. We applied QAP regression tests to all dyads formed by the

equivalent cells in the matrices (independent matrix  $[im_{ij}] \rightarrow$  dependent matrix  $[dm_{ij}]$ ), as represented in the Figure DS3 below [note: QAP ignores the diagonal of the matrix]:

**FIGURE DS3**  
**Visual Representation of QAP Regression**



QAP regression is similar to a normal regression, but it uses matrices [instead of columns] as inputs. In this research, QAP regression was based on three independent matrices [Boolean cells]: (i) practice homophily [product category], (ii) geographic homophily [co-location], and (iii) relational homophily [commercial ties]. In this regression, each dyad [e.g., Member A - Member B] is represented by the value '1' if the members share the same attribute [respectively same practice, same location, or commercial contract] and the value '0' otherwise. These three independent matrices are regressed against one dependent matrix representing knowledge ties. In the knowledge ties matrix, the cells have a value determined

by the total number of interactions for each dyad during the 24-month period. Using valued cells in the knowledge ties matrix is key for distinguishing between a dyad of members who have engaged only once from another dyad of members who have engaged multiple times.

Figure DS4 shows *partial* exemplary matrices:

**FIGURE DS4**  
**Partial Exemplary Matrices (25 by 25 members each)**

Product category matrix	S.P.154.001	S.P.019.001	R.P.163.003	R.P.163.006	M.P.169.001	R.G.163.009	P.P.128.001	S.P.053.001	P.P.106.001	R.P.163.011	M.P.119.001	M.P.073.001	P.P.136.001	E.P.110.001	S.P.186.001	R.P.163.016	E.G.001.001	R.P.163.019	R.P.163.022	R.G.163.024	R.M.163.025	M.P.023.001	S.P.046.001	P.P.033.001
Geography matrix	S.P.154.001	S.P.019.001	R.P.163.003	R.P.163.006	M.P.169.001	R.G.163.009	P.P.128.001	S.P.053.001	P.P.106.001	R.P.163.011	M.P.119.001	M.P.073.001	P.P.136.001	E.P.110.001	S.P.186.001	R.P.163.016	E.G.001.001	R.P.163.019	R.P.163.022	R.G.163.024	R.M.163.025	M.P.023.001	S.P.046.001	P.P.033.001
S.P.154.001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
S.P.019.001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.P.163.003	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.P.163.006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
M.P.169.001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.G.163.009	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P.P.128.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
S.P.053.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P.P.106.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.P.163.011	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
M.P.119.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
M.P.073.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P.P.136.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
E.P.110.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
S.P.186.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.P.163.016	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
E.G.001.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.P.163.019	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.P.163.022	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R.G.163.024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.M.163.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M.P.023.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
S.P.046.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P.P.033.001	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Commercial layer matrix	S.P.154.001	S.P.019.001	R.P.163.003	R.P.163.006	M.P.169.001	R.G.163.009	P.P.128.001	S.P.053.001	P.P.106.001	R.P.163.011	M.P.119.001	M.P.073.001	P.P.136.001	E.P.110.001	S.P.186.001	R.P.163.016	E.G.001.001	R.P.163.019	R.P.163.022	R.G.163.024	R.M.163.025	M.P.023.001	S.P.046.001	P.P.033.001
Knowledge exchange layer matrix	S.P.154.001	S.P.019.001	R.P.163.003	R.P.163.006	M.P.169.001	R.G.163.009	P.P.128.001	S.P.053.001	P.P.106.001	R.P.163.011	M.P.119.001	M.P.073.001	P.P.136.001	E.P.110.001	S.P.186.001	R.P.163.016	E.G.001.001	R.P.163.019	R.P.163.022	R.G.163.024	R.M.163.025	M.P.023.001	S.P.046.001	P.P.033.001
S.P.154.001	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.P.019.001	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.P.163.003	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.P.163.006	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M.P.169.001	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.G.163.009	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P.P.128.001	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.P.053.001	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P.P.106.001	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.P.163.011	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M.P.119.001	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
M.P.073.001	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
P.P.136.001	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
E.P.110.001	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
S.P.186.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
R.P.163.016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
E.G.001.001	1	1	1	3	0	2	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0
R.P.163.019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.P.163.022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.G.163.024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.M.163.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M.P.023.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.P.046.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P.P.033.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

To analyse these matrices, we calculated descriptive percentages for the overlap between each independent matrix and the dependent matrix. Then, we conducted QAP regression. Table 4 in the manuscript shows both descriptive statistics of the overlap in percentage and the results of the QAP regression for Year 1 and Year 2 in order to capture the trend/shift over time. When interpreting the results, we took the density of the matrices into account. In this study, the knowledge exchange matrix was highly sparse [knowledge exchanges represented 2.5% of possible connections], which means that most members did not interact

with each other, thus we expected the  $R^2$  results to be low (Borgatti et al., 2002). This must be taken into consideration when using QAP regression in sparse supply networks.

### Supplement to Second-order Codes

The goal of Phase 3 was to move from first-order codes to second-order codes through a dialogue between theory and data (Ketokivi & Choi, 2014). Moving from first-order to second-order codes permitted the triangulation of different theoretical lenses in the search of a better data-theory fit (Gioia et al., 2012). As noted, this study's data included interviews, forum text data, and research memos from observations and validation workshops. For theory, we explored Social Network Theory more broadly, and we considered the Network of Practice (NoP) view more specifically (Brown & Duguid, 2001), which we discuss in the Manuscript's literature section.

Table DS1 provides supporting data to the Data Analysis Structure presented in the Manuscript's Figure 2, following Pratt and colleagues (2006) and Pratt (2008):

**TABLE DS1**  
**Support to Data Structure**

Exemplary data (interviews, forum data, memos)→	1 <sup>st</sup> Order Coding→	2 <sup>nd</sup> Order Coding
<i>"It is better when we split [activities] in main product categories, such as produce and dairy. (...) More segmentation by product category help to engage suppliers."</i> (Tier-1 Supplier, South Africa)	(+) Suppliers valuing category-specific activities <sup>f q v o</sup>	Practice homophily <i>Data sources: 45</i> <i>Quotes: 98</i>
Interview quote: <i>"There are all sorts of hidden stories about successful farmers, producers, who work with RetailCo indirectly for many, many years and have not really the chance to expose their experience and vice-versa. But who could add much more value in terms of what are their realities? And we often talk about farm to fork, and this is real, you know? The network is the real connection between the farm and the fork, because the two can no longer be detached."</i> (Sourcing Diretor 1)	(+) Producer Forum amplifying face-to-face practice improvement activities <sup>v</sup>	
Forum data: <i>"Please see the attached video that details the reasons for bruising in apples, from one of our top producers, [to foster the discussion] on which preselected methods we can use based on risk analysis"</i> (R.P.163.006, South African Hub in Forum 098)		

Exemplary data (interviews, forum data, memos)→	1 <sup>st</sup> Order Coding→	2 <sup>nd</sup> Order Coding
<i>“There is a genuine confidentiality question that needs to be answered, but I think there are parallels [alternative views] with people who raise that question and people who are generally negative anyway, because I think people who are extremely positive about the future of their businesses are always people who think: ‘my business will be successful if I am always thinking faster and moving quicker I will be one step ahead of the competition’” (PF Champion)</i>	(-) Suppliers resisting due to lack of confidence in their performance <sup>v</sup>	Fear of coopetition <i>Data sources: 14</i> <i>Quotes: 33</i>
<i>“Some producers just are not willing to share best practices because they feel this would hurt their competitive advantage. It’s a very competitive market; hence our biggest challenge is getting producers to understand and wrap their heads around using the network and how it affects what they think is their competitive advantage” (Expert, UK)</i>	(-) Suppliers protecting their competitive advantage <sup>v</sup>	
<i>“Producers do not necessarily want another producer to know what their problem is, what problems they are having in terms of food safety, in terms of sustainability or anything else. So they are hesitant to put their question out there for everyone. I think they need to step back and realize that it is a tool to get answers. And if we are facing it or if someone else is facing it then probably more people are as well. But I think there is a fear in the industry, because it is competitive, to actually put your problems out there” (Tier-1 Supplier, USA)</i>	(-) Suppliers unfamiliar with working with competitors <sup>v o</sup>	
<i>“Direct suppliers are concerned about the transition and that the firm [RetailCo] will start buying directly from these farms instead of using them as the broker and as the intermediary” (PF Manager)</i>	(-) Direct suppliers fearing elimination by the buying firm <sup>v</sup>	Fear of disintermediation <i>Data sources: 9</i> <i>Quotes: 20</i>
<i>“There is hesitation from the direct suppliers [to invite their producers] because it gives us [RetailCo] a direct link to their producers” (Technical Manager 5)</i> <i>“The middlemen [direct suppliers] select growers [sub-suppliers] they have the best relationship with, so we only see part of the supply chain. (...) It is all via the middlemen [direct suppliers]” (Technical Manager 12)</i>	(-) Direct suppliers hesitating to encourage sub-supplier participation <sup>v</sup>	
<i>“Communication is a major challenge when you go down the supply chain, making sure that everyone gets the same information” (PF Manager)</i> <i>“There are all sorts of hidden stories about successful farmers, producers, who work with RetailCo indirectly for many, many years and have not really the chance to expose their experience and vice-versa. But who could add much more value in terms of what are their realities? And we often talk about farm to fork, and this is real, you know? The network is the real connection between the farm and the fork, because the two can no longer be detached.” (Sourcing Director 1)</i>	(+) Buying firm fostering transparency in the network <sup>v</sup>	Procedural justice (Vertical axis) <i>Data sources: 12</i> <i>Quotes: 30</i>
<i>“This is about the neutrality and credibility of the Producer Forum. This is for the producers, not for RetailCo. So this is a key challenge. If we [RetailCo] direct it, it will not work and therefore we need it to be self-directed [by suppliers]” (Technical Director)</i>	(+) Buying firm maintaining a steering committee <sup>v</sup>	



Exemplary data (interviews, forum data, memos)→	1 <sup>st</sup> Order Coding→	2 <sup>nd</sup> Order Coding
<p><i>“We set up a Producer Advisory Board that works as a steering committee so that the Producer Forum gets much better guidance and direction from the producers in the network.” (PF Manager)</i></p> <p><i>“Governance and engagement are key. (...) So it is really about keeping all the key stakeholders [suppliers and experts] aligned for the Producer Forum to get steered by them in the right direction.” (Technical Director)</i></p>		
<p><i>“We ask them [suppliers] to upload their performance so we can give them ‘a league table of results’. And we then confidentially come back to them and compare their performance with benchmarking references.” (Sourcing Director 3)</i></p>	(+) Buying firm ensuring data confidentiality <sup>v o</sup>	
<p><i>“We do not want to breach any competition issues and have people discussing prices. (...) The discussions must be around non-competitive issues and industry-wide issues. (...) The solutions are often based on investments.” (Technical Manager 8, USA)</i></p> <p><i>“[The focus in on] non-competitive information that they [suppliers] can learn from, which is around one common interest, like energy consumption and water usage, which they can access information and expertise that is from around the world but is outside their own narrow network.” (PF Champion)</i></p>	(+) Buying firm restricting type of performance disclosed <sup>v o</sup>	
<p><i>“Spanish citrus growers grow at a completely different time to South African citrus, so there is a relationship that we can build between them, where they can share learning. They tend to do that themselves, anyway. So it is already happening.” (Technical Manager 5)</i></p> <p>Forum data extract of potential collaboration Portugal and UK:</p> <p><i>“We grow brassicas in Portugal and the level of dithio-carbonates found in the residue tests this year is all over the place, no chemicals were applied to the crop. I have spoken to our lab and found some information on the internet about false positives. Is there anything we can do to eliminate these false positives? Does it happen in other countries? Would be great to get some feedback on this topic.” (P.P.052.002, Tier-2 Supplier, Portugal)</i></p> <p><i>“Hi, I do not think it is possible to test for dithio-carbamates in brassicas as the naturally occurring sulphur containing phyto-chemicals breakdown under analysis to carbon disulphide which is the same compound that is measured to test. Regards,” (P.P.009.001, Tier-2 Supplier, UK)</i></p>	(+) Suppliers perceiving peers from distant geographic regions as non-competitors <sup>f v</sup>	Supplier geographic dispersion (Horizontal axis) Data sources: 29 Quotes: 72
<p>Interview quotes:</p> <p><i>“Suppliers benefit from non-competitive knowledge that they can learn from when such knowledge is around one common interest, like energy consumption and water usage, which they can access information and expertise that is from all around the world” (PF Champion)</i></p> <p><i>“A lot of our suppliers are excited about the network because we can introduce them to people who do the same thing non-competitively in other regions and they can learn from each other.” (Technical Director)</i></p>	(+) Suppliers exploring complementarity across geographies <sup>f q v</sup>	

Exemplary data (interviews, forum data, memos)→	1 <sup>st</sup> Order Coding→	2 <sup>nd</sup> Order Coding
<p>Forum data extract of UK and Zimbabwe collaboration:</p> <p><i>“Hello all, I was wondering if anybody could please highlight to me or point me in the right directions as to where I can find any ETI guidelines or any regulations surrounding employees working in cold rooms, such as: (1) How long are employees meant to work in certain temperatures? (2) How often should they have breaks while working in certain temperatures? (3) The correct PPE that must be provided? Any info would be much appreciated, thanks.”</i> (P.P.136.001, Tier-2 Supplier, Zimbabwe)</p> <p><i>“Hi, have you had a look through the HSE guidelines in the following document attached? Regards,”</i> (S.P.074.002, Tier-1 Supplier, UK)</p> <p><i>“Thanks for this Richard this is helpful”</i> (P.P.136.001, Tier-2 Supplier, Zimbabwe)</p> <p>Forum data extract of UK and China collaboration:</p> <p><i>“How to extend the shelf life of red globe in cold storage? We are now re focusing on how to prolong the shelf life of red globe after harvest time, because we want to extend the shelf-life by keeping in cold storage for 2-3 months, have any special way or treatment when goods in cold room which can keep it's fresh?”</i> (S.P.148.001, Tier-1 Supplier, China)</p> <p><i>“Hi, in addition to liner/pad combinations highlighted by X, there is also some new technology, a solution which combines the SO2 pad and the liner into one solution called 'XYZ'. Please see the link below (...). The benefits are highlighted on the link above, but they help (...) Hope this helps”</i> (M.P.119.001, Tier-1 Supplier, UK)</p>		
<p><i>“Through RetailCo's global reach, [we can] access experts who can help producers. So if you are a small producer in South Africa, for example, you might not know who is the best post-harvest expert on your product category, but we can know who he is, for example, in Chile”</i> (Technical Director)</p>	(+) Buying firm inviting experts to the Producer Forum <sup>v</sup>	Nexus organizations (Diagonal axis) Data sources: 30 Quotes: 62
<p>Interview quote: <i>“The expert seminar was very successful because it related directly to what we are producing. (...) So yes, that was a big success”</i> (Technical Manager 7)</p> <p>Forum extract of expert leading discussion:</p> <p><i>“I am tailoring the dialogue with particulars relevant for you so please reply me on the following: (1) Which crops/varieties present the most postharvest challenges to you? (2) What current challenges are you facing regarding in preserving quality for extended shelf life?”</i> (E.P.039.001, Expert, UK)</p> <p><i>“In response to your request above: (1) Our product is ABC, (2) the problems we encounter in long-term store are the following: Spread of rots in store (e.g. Mucor), Spread of storage scab. Your insight / experience / findings of the above would be of much interest.”</i> (P.P.166.001, Tier-1 Supplier, UK)</p> <p><i>“For Table Grapes, I would particularly like to understand if possible the impact on shelf life of the time between the moment the product is harvested in the field and when it arrives in cold</i></p>	(+) Participants learning from experts <sup>f</sup> <sup>o</sup>	

Exemplary data (interviews, forum data, memos)→	1 <sup>st</sup> Order Coding→	2 <sup>nd</sup> Order Coding
<p>chambers. Are there any data about this somewhere available? What is the best way to measure it (tools, protocol). Thanks,” (R.P.163.011, Retail, Chile)</p> <p>“One of our main issues is translucent waste in the packed product on citrus at the start of the season when the product has to be degreed. I was involved in some of your early work on browning of the cut ends on celery. I would like an update on this work if you can share it at this stage. Best regards,” (R.P.163.003, Retail, Spain)</p>		
<p>“We have a key target, which is to set up twelve action groups over the next year; and we already have a few. We are running one on carbon foot printing, so that group is already established. The food waste one which I mentioned before hopefully will work well. Then we have one on renewable energy to be launched soon.” (PF Manager)</p> <p>“Action groups are hosted in a specific area of the Producer Forum. It follows some sort of ‘by invitation only’ that controls access. Some action groups involve disclosure of monthly data and RetailCo is clearly cautious about supplier performance confidentiality.” (Researcher Memo)</p>	Knowledge diffusion with <b>low</b> breadth (reach) of participation <sup>v o</sup>	Action groups Data sources: 52 Quotes: 84
<p>“The decision to quick-off the action group with a pilot project with first adopters has led to the development of a business case that is helping to show other producers the benefits of involvement in the carbon foot printing action group. Live testimonials of first adopters seem very positive to other producers. In addition, live questions from producers clarify implementation issues and help them moving forward. This seems the most successful action group so far.” (Research Memo)</p>	Knowledge diffusion with <b>high</b> depth (tacitness) of knowledge <sup>v o</sup>	
<p>“A few broadcasting forums include recordings of site visits to some producers that have implemented best practices. These videos will remain available for any participant of the Producer Forum to watch at any time.” (Research Memo)</p> <p>Forum extract of video with best practice: “Following on the post about the Solid Rain, you can now watch a video (in Spanish but with English subtitles), available here on this <a href="#">link</a>. Find out more about the technology and how it could potentially be used on a larger scale to reduce irrigation. If you have any questions or want to know more about it, please reply to this post.” (Expert, UK)</p>	Knowledge diffusion with <b>high</b> breadth of participation <sup>f v</sup>	Broadcasting forums Data sources: 50 Quotes: 58
<p>“Despite the breadth of broadcasting forums, most receive limited responses. Therefore, when compared to action groups, the depth of knowledge content is limited.” (Research Memo)</p>	Knowledge diffusion with <b>low</b> depth of knowledge (tacitness) <sup>f v</sup>	

Notes: For the first-order codes, all codes derived from the interviews. We show in superscript when data coding was supplemented by “q” QAP regression; “f” forum data; “v” validation workshops; and “o” online observation. In addition, first-order codes show (+) or (-) to indicate the positive or negative impact to knowledge diffusion. For the second-order codes, we show the total number of sources and quotes of all their first-order codes combined.

At the end of the third phase, second-order codes were mature, which allowed us to abstract the relationships between them and thereby develop our propositions in Phase 4.

#### PHASE 4: DEVELOPING PROPOSITIONS (Year 3)

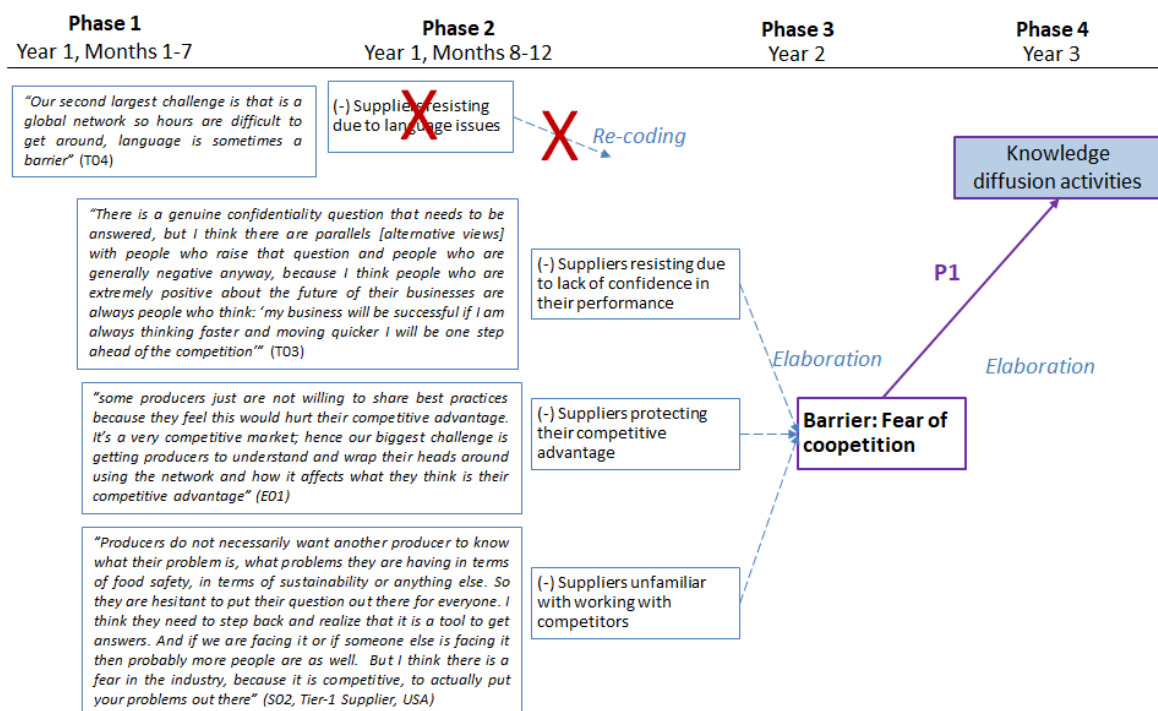
The final phase [Phase 4] focused on theory elaboration, the development of the propositions, and the interactions between the propositions. In this final phase, we built our theoretical model.

#### Supplement to Development of Propositions

Figure DS5 shows our development process of Proposition 2a as an exemplar of the rationale behind the evolution from isolated second-order codes to theoretical propositions.

FIGURE DS5

#### Rationale for Development of Proposition 2a



#### Supplement to Interaction between Propositions

In this phase, we also articulated the interactions between barriers and moderators, resolving clashes and conflicts between issues, such as the dual nature of geographic

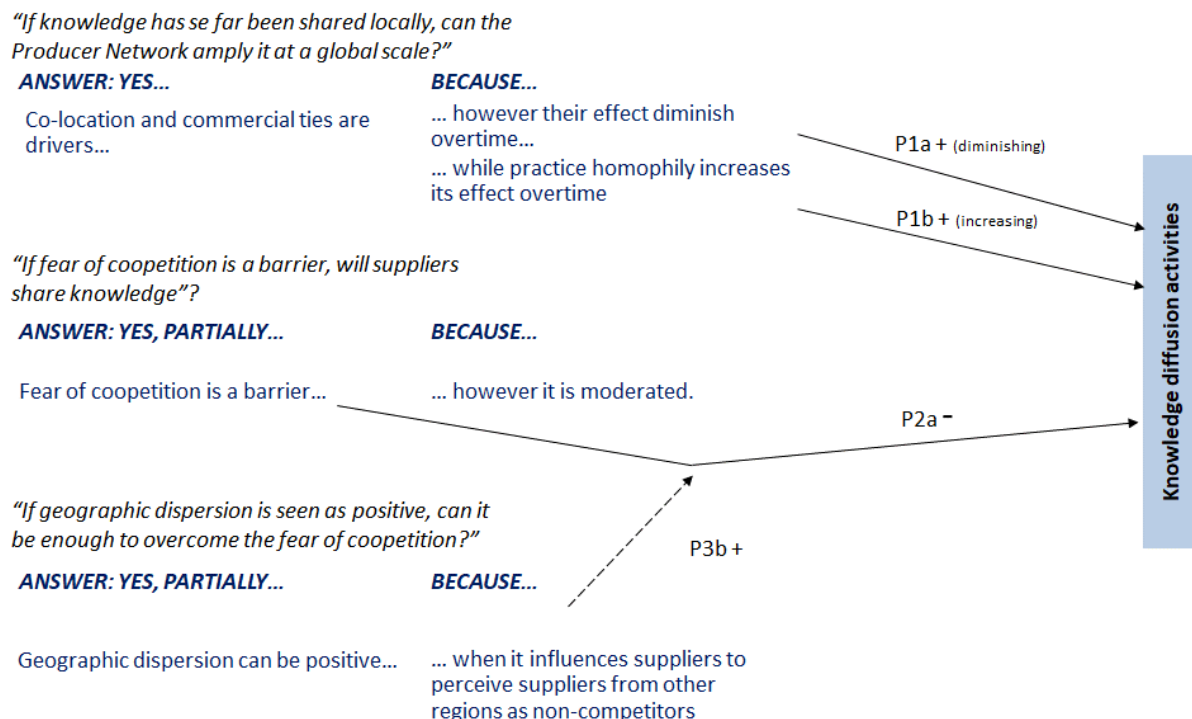
dispersion, in order to make sure our propositions could be combined into a single theoretical framework. To articulate these interactions, we asked ourselves:

- “If knowledge so far has been shared locally, can the Producer Forum amplify it at a global scale?”
- “If fear of coopetition is a barrier, will suppliers share knowledge?”
- “If geographic dispersion is seen as positive, can it be enough to overcome the fear of coopetition?”

Through iteration, we determined whether and how data could simultaneously answer the above questions. The answers to these questions revealed the moderating effects of and inter-connections between propositions. Figure DS6 below outlines the rationale we used to reconcile the answers to these questions and the process we used to develop our final conceptual model of a global supply NoP [pictured in Manuscript’s Figure 4].

**FIGURE DS6**

**Rationale for Elaboration of Propositions 1a, 1b, 2a and 3b**



As seen in Figure DS6, our process exposes the duality of geographic dispersion and shows how it unfolds overtime. At first, low geographic dispersion [i.e. co-location is a driver

of knowledge diffusion because people base their behaviour on previous experiences in face-to-face interactions. However, the effect of co-location diminishes overtime and is replaced by an increasing importance of practice homophily. Then, geographic dispersion becomes a driver of knowledge diffusion when geographic dispersion diminishes suppliers' perception of competition. As such, geographic dispersion has a moderating effect on supplier-supplier interactions. In this example above we reconcile relationships between P1a, P1b, P2a and P3b. We followed the same process when we developed the other propositions, resulting in the final conceptual model pictured in Manuscript's Figure 4.

This Data Supplement intends to offer transparency to this research project, but also support replicability for future studies in SCM using the network level of analysis.

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