

# Functional Knowledge versus Strategic Knowledge: What Type of Knowledge Matters Most for the Long-Term Performance of Startups

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**ABSTRACT** Past studies have shown that the flow of knowledge from incumbent firms is associated with the creation of startups and their subsequent performance. While much research has focused on the mechanisms of how incumbent-to-startup knowledge transfer takes place, such as entrepreneurs pursuing opportunities that their previous employers do not want to pursue, we explore with detailed qualitative analysis of six private startups in the Chinese synthetic-dye industry what type of knowledge actually flows and what type is more important for the long-term success of startups. We discover eight types of knowledge that flow from incumbents to new firms during the foundation of startups. Abstracting these eight types of knowledge into two general categories of *functional knowledge* and *strategic knowledge*, we find the reception of strategic (not functional) knowledge shapes the long-term competitiveness of surviving startups. Receiving technical knowledge – one type of functional knowledge – during the founding period is necessary for startups' short-term survival but insufficient for long-term success. Our findings show that the performance implications of initial knowledge flows from incumbents hinge on the type of knowledge, contributing to a more explicit explanation of how incumbent-to-startup knowledge flows affect entrepreneurial performance.

**KEYWORDS** China, comparative case study, incumbent-to-startup knowledge transfer, industry evolution studies, long-term entrepreneurial success, types of knowledge

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## INTRODUCTION

A growing body of research on knowledge-inheriting spinoffs (Agarwal, Echambadi, Franco, & Sarkar, 2004; Basu, Sahaym, Howard, & Boeker, 2015; Klepper, 2001) and knowledge spillover entrepreneurship (Acs, Audretsch, & Lehmann, 2013; Plummer & Acs, 2014) links startup performance to knowledge originating from incumbents. These studies generally focus on emerging high-

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tech industries or complex product systems industries and emphasize the flows of technical knowledge particularly (Agarwal et al., 2004; Klepper & Thompson, 2010; Minola, Hahn, & Cassia, 2021; Sahaym, Howard, Basu, & Boeker, 2016). As startups conducting technology-intensive businesses tend to source more technical knowledge from incumbent firms (Chatterji, 2009), and their fates hinge more on technical innovativeness (Dencker, Gruber, & Shah, 2009), the current literature may be skewed toward overstating the effects of technical knowledge passed from incumbents while undervaluing other knowledge (Chatterji, 2009; Feldman, Ozcan, & Reichstein, 2019). Important questions that emerge in the context of this literature are what knowledge (aside from technical knowledge) actually flows from incumbents to startups and relative contributions of different knowledge to startups.

Our study advances a more nuanced and comprehensive understanding of these questions. We propose an inductive typology of incumbent-to-startup knowledge flows and explore both the short- and long-run implications of each type on startup performance. Given the novelty of this project and its exploratory nature, we utilize a multi-case research design and limit inquiry to the Chinese synthetic-dye industry – a technologically mature industry that represents an empirical context insufficiently considered in prior research on incumbent-to-startup knowledge flows. We find eight types of knowledge, categorized as either *functional* or *strategic* in nature, flow from incumbents during the founding period of startups. Even more significantly, we find startups that receive functional knowledge (including technical knowledge) during the foundation period are more likely to survive than startups not receiving such knowledge – but this advantage only exists for a short time. The reception of initial strategic knowledge, by contrast, has the capacity to generate long-term success.

This study makes several important contributions to the knowledge inheritance theory and knowledge spillover theory of entrepreneurship. First, while our study corroborates prior research showing that incumbent-to-startup knowledge flows matter for the success of startups, it extends the empirical foundation of this finding by replicating it in a underexamined industrial context – a technologically mature industry (Tsang & Kwan, 1999). Second, our study goes beyond the predominant approach, operationalizing knowledge by proxies, and captures more precisely the *nature* of knowledge that flows from incumbents to startups, yielding greater insight into the relationship between types of concrete knowledge and startup outcomes. Third, our study reveals that startups receiving sufficient functional knowledge only, which allows for success in the early years, are distinguished from those that have received strategic knowledge, a distinction bearing in significant ways on short-term versus long-term performance. These results confirm a formerly neglected speculation (Chatterji, 2009; Klepper, 2001; Wennberg, Wiklund, & Wright, 2011) that technical knowledge may not constitute the most important component of startup outcomes. Our analysis points to promising avenues for future research on how different types of incumbent-to-startup

knowledge flows impact both firms and regions in which they are embedded and how such flows differ in different institutional settings.

## LITERATURE BACKGROUND

In the last two decades, a vibrant body of research on knowledge inheritance and knowledge spillover suggests that incumbents serve as an effective source of initial knowledge for startups. The knowledge inheritance theory of entrepreneurship (Agarwal et al., 2004; Buenstorf & Fornahl, 2009; Furlan & Grandinetti, 2016; Klepper & Sleeper, 2005) posits that spinoffs inherit substantial industry-specific knowledge and well-functioning routines ‘suited to their activities’ (Klepper, 2001) from their founders’ prior employment. This theory argues that the knowledge created but not commercialized by incumbents creates underexploited opportunities, which leads to entrepreneurship external to its origin and drives startups’ future performance. The knowledge spillover theory of entrepreneurship (Acs et al., 2013; Ghio, Guerini, Lehmann, & Rossi-Lamastra, 2015; Plummer & Acs, 2014) more broadly links knowledge flows from incumbent firms to new firms that are not confined to spinoffs. This theory has sought to establish the influence of knowledge transfer on the performance of startups and industrial agglomeration (Furlan & Cainelli, 2020). Although the two streams of literature attend to different kinds of startups and adopt different perspectives on the vehicles and channels through which knowledge flows occur, both work on the notion that startups receiving existing knowledge from incumbents translate it into a benefit.

The numerous studies on knowledge inheritance and knowledge spillover from incumbents typically illustrate the vehicles and mechanisms through which knowledge generated within established firms is transmitted and enables startups to exploit opportunities using the knowledge (Acs et al., 2013; Audretsch & Belitski, 2013; Di Lorenzo & van de Vrande, 2019; Feldman et al., 2019; Gambardella, Ganco, & Honoré, 2015). Some most frequently discussed mechanisms include entrepreneurs pursuing opportunities proximate to the businesses of their prior employers but not exploited by these incumbents yet (Klepper, 2001), startup founding team members and employees using their knowledge accumulated through experiential learning in their former organizations (Agarwal, Campbell, Franco, & Ganco, 2016), and startups seeking for knowledge from incumbent employees through social networks (Phillips, 2002). Yet, even as these studies have established a positive relationship between incumbent-to-startup knowledge flows and new firm superiority, they provide little explicit evidence of actual knowledge flows, especially a full view of the knowledge flows *per se* that go into startups and their potentially distinct effects.

First, the current literature either does not specify the knowledge that flows from incumbents to startups, or it concentrates only on a very narrow scope of relevant knowledge. It stands to reason that these knowledge flows encompass a variety of knowledge (Klepper & Sleeper, 2005), but the literature lacks an integrative

framework for systematically examining the initial knowledge passed from incumbent firms and then explaining the influence of different types of knowledge. Current studies of incumbent-to-startup knowledge flows predominantly consider technical knowledge and its impact (Agarwal et al., 2004; Basu et al., 2015; Franco & Filson, 2006; Gambardella et al., 2015; Minola et al., 2021; Sahaym et al., 2016). Although a handful of studies have mentioned or discussed the flow of business ideas (Fryges & Wright, 2014), market-related know-how (Adams, Fontana, & Malerba, 2016; Agarwal et al., 2004; Cantù, 2017), and organizational routines (Adams et al., 2016; Feldman et al., 2019; Klepper, 2001; Klepper & Sleeper, 2005; Muendler, Rauch, & Tocoian, 2012; Phillips, 2002) – particular ways of conducting organizational functions (Kostova, 1999), empirical research on the flows of these other types of knowledge is rather limited. However, a few researchers have speculated that nontechnical knowledge, such as the knowledge of problem formulation (Cross, Borgatti, & Parker, 2001), contributes as much if not more than technical knowledge to the performance of startups (Gilbert, McDougall, & Audretsch, 2008; Maliranta, Mohnen, & Rouvinen, 2009; Wennberg et al., 2011). Some (Chatterji, 2009; Klepper, 2001) have even challenged the conventional conjecture that technical knowledge plays a critical role in startup performance, a contention that supports our call for a more comprehensive consideration of the elements of incumbent-to-startup knowledge flows.

Second, empirical evidence in support of a positive relationship between incumbent-to-startup knowledge flows and startup superiority mainly focus on startup creation and survival, while other salient performance indicators more closely related to sustained competitiveness are insufficiently investigated. Many studies show receiving knowledge from incumbent firms fosters the formation of startups (Adams et al., 2016; Gambardella et al., 2015; Knoblen, Ponds, & Van Oort, 2011; Yeganegi, Laplume, Dass, & Huynh, 2016) and improves the probability of their survival (Agarwal et al., 2004; Furlan, 2016; Muendler et al., 2012; Phillips, 2002). While startup creation and survival deserve scholarly attention, a drawback of relying only on survival to approximate performance is that there is not always a correlation between a firm's life span and its financial performance (Furlan & Grandinetti, 2016). For instance, startup exits include M&A and IPOs that represent success rather than failure. Yet, investigations of whether and how incumbent-to-startup knowledge flows affect other startup performance indicators that better capture sustained competitive advantages, such as innovation and growth, remain scant. The only five exceptions thus far are studies by Gifford, Buenstorf, Ljungberg, McKelvey, and Zaring (2021), Basu et al. (2015), Fryges, Müller, and Niefert (2014), Gilbert et al. (2008), and Wennberg et al. (2011). Of these studies, two concern startup innovation and three concern startup growth in terms of sales and employment, while still presenting inconsistent results. For example, Wennberg et al. (2011) find the commercial knowledge passed from incumbents raises the sales growth rate of spinoffs, whereas Gilbert et al. (2008) suggest the spillover of technical knowledge from incumbents

has no effect on startups' sales growth. The inconsistency may stem from the different types of knowledge or the different time periods considered, while the sample startups in Wennberg et al. (2011) provide performance data for two to nine years after foundation, Gilbert et al. (2008) collect only startup growth through two years after IPO. Thus, it is fair to say previous empirical literature is underdeveloped when it comes to scrutinizing whether the success of startups, especially competitiveness over a relatively longer period, is influenced by incumbent-to-startup knowledge flows.

Third, empirical studies usually operationalize the amount and quality of incumbent-to-startup knowledge flows using rough proxies as opposed to examining knowledge flows directly. The proxies recurring most often are the properties of incumbents and knowledge agents (e.g., spinoff founders or employees hired from incumbent firms). A number of studies employ survival (Dahl & Reichstein, 2007; Eriksson & Kuhn, 2006; Furlan & Cainelli, 2020; Phillips, 2002), longevity (Dahl & Sorenson, 2013; Franco & Filson, 2006; Klepper, 2001; Sørensen & Phillips, 2011), scale (Elfenbein, Hamilton, & Zenger, 2010; Sørensen, 2007; Sørensen & Phillips, 2011), research and development (R&D) strategies (Andersson, Baltzopoulos, & Lööf, 2012), and new market entry (Agarwal et al., 2004) of incumbent firms to gauge the quality of knowledge that spills over from these firms. Other studies use the rank of knowledge agents at incumbent firms (Andersson & Klepper, 2013; Wezel, Cattani, & Pennings, 2006) or their industry-specific experiences (Andersson & Klepper, 2013; Dahl & Reichstein, 2007; Dahl & Sorenson, 2013; Eriksson & Kuhn, 2006; Gifford et al., 2021; Wennberg et al., 2011). A common shortcoming of these measures is that they assume a strong link between the knowledge possessed by incumbent firms and knowledge passed from them to startups – a link for which few studies have provided explicit evidence. While proxies such as a longer life span do imply an incumbent firm's knowledge enjoys a better evolutionary fit within the given environment, this relationship does not necessarily imply flows of that knowledge (in higher quality or in greater volume) to startups (Fryges et al., 2014).

Finally, industrial settings that have been introduced in prior studies are within a limited range of emerging high-tech industries or technologically complex industries, whereas traditional or technologically mature industries are largely missing from the discussion. The industries that have been given priority involve semiconductors (Adams et al., 2016; Di Lorenzo & van de Vrande, 2019; Klepper & Thompson, 2010), disk drives (Agarwal et al., 2004; Franco & Filson, 2006), biotech (Basu et al., 2015; Stuart & Sørensen, 2003), ICT (Lasch, Robert, & Le Roy, 2013), and automotive (Klepper, 2002), as well as knowledge-intensive service industries (Andersson et al., 2012; Agarwal et al., 2016; Chatterji, 2009; Wennberg et al., 2011). Only a few scholars perform analysis at a sectorally aggregated level without regard to specific industries (Dahl & Sorenson, 2013; Gambardella et al., 2015; Minola et al., 2021; Santarelli & Tran, 2012; Yeganegi et al., 2016). Even fewer take into account traditional

domains such as the tire (Buenstorf & Klepper, 2009) and laser (Klepper & Sleeper, 2005) industries. However, startups are constantly created in technologically mature industries since technical innovation is not the only entrepreneurial thrust and many startups are more reproducers of existing technologies (Aldrich & Martinez, 2001). In addition, current findings within high-tech industries may not be generalizable to other industries, as the characteristics of production technologies and complexity of products create different patterns of interactions between startups and incumbent firms (Rosenkopf & Schilling, 2007). Thus, technologically mature industries, which may exhibit distinct patterns from those found in emerging high-tech industries, deserve more attention.

In sum, while incumbent-to-startup knowledge flows are accepted as a crucial driver of startup creation and survival, a more complete and detailed picture of what knowledge actually flows and how the knowledge impacts the receiving startups would be a valuable addition to the literature. This study aims to help fill this gap by answering two questions: (1) *What types of knowledge flow into startups from incumbent firms during the founding period of startups?* and (2) *How do different types of knowledge passed in this manner influence the survival and success of startups?* To go beyond the high-tech industries already well considered in the literature, we focus on a technologically mature industry – the post-1978 Chinese synthetic-dye industry.

In the interest of achieving a more systematic understanding of knowledge passed from incumbents to startups, our inquiry begins with a phenomenon rather than any extant theory, allowing us the opportunity to produce an inductive categorization of knowledge. Prominent categorizations of knowledge – tacit versus explicit (Grant, 1996) and procedural versus declarative (Moorman & Miner, 1998) – differentiate knowledge in an abstract way. Although useful to comprehend the mechanisms of knowledge transfer – for example, the widely accepted idea of turning tacit knowledge explicit to facilitate knowledge transfer and absorption – which a majority of current research on incumbent-to-startup knowledge inheritance and spillover concerns, these categorizations insufficiently indicate the types of concrete knowledge flows (Bingham & Eisenhardt, 2011: 1439) which is the foci of our study. What's more, since prior studies on incumbent-to-startup knowledge flows place an undue emphasis on technical knowledge, it is useful to take a phenomenon-driven approach to go beyond technical knowledge and to identify other types of knowledge that might potentially flow from incumbent firms to startups.

## METHODS

Our research design is a multi-case study that employs a replication logic as well as cross-group comparison logic for exploration (Yin, 1994). It allows us to track the chronological implications (Fraenkel & Wallen, 1996; Santos & Eisenhardt, 2009) of incumbent-to-startup knowledge flows during the founding period of startups, a period we define as the first four years of a startup given that over 60% of startups



survive no more than five years (Kirchhoff, 1994). Since the focus of our study is concrete incumbent-to-startup knowledge flows *per se* rather than the process of knowledge transfer, the case here is the individual startups whereas the unit of analysis is the different type of knowledge received by startups at founding (Patton, 2015).

## Research Setting

The Chinese synthetic-dye industry, a technologically mature industry, was chosen as our focal empirical setting for several reasons. First, it was a fertile site for independent entrepreneurship in the 1980s (Jiang & Murmann, 2012). When the formerly suppressed domestic demand for dyes was suddenly released by the economic reform of 1978, hundreds of private startups emerged throughout the next decade. Second, our pilot studies suggest incumbent firms were the key source of initial knowledge for these startups due to their low legitimacy in China at the time. The fewer the other sources of knowledge, the more likely incumbent-to-startup knowledge flows would expose effects. Third, private startups were the largest beneficiary in the upheaval of this industry, even while still exhibiting significant variation in performance by the 2000s. This offers a three-decade window through which to assess both the short- and long-term impact of initial knowledge flows.

Private Chinese synthetic-dye startups in the 1980s relied heavily on full-time employees from incumbents, mostly state-owned enterprises (SOEs), for initial knowledge. Before the private sector was fully legitimized in 1992,<sup>[1]</sup> private startup founders were unable to recruit chemistry graduates or experienced engineers because such workers were, by state plan, allocated to SOEs. Meanwhile, SOE employees did not see it as wrong to provide intellectual assistance to other firms, even to their direct competitors such as emerging startups, due to a traditional belief that intellectual property is a public good (Alford, 1995). Neither did they run significant risks by divulging knowledge, because intellectual property rights (IPR) were not effectively enforced, and their salaries were not performance-based at the time. Some of them got paid by startups but not every time they shared knowledge, while some only received minimal gifts such as fresh food for the valuable knowledge they provided. No matter if they received money or not, mutual trust generally formed the basis of these knowledge flows. This mutual trust commonly stemmed from kinship, friendship, or from coming from the same hometown. Independent of material rewards, these SOE employees were motivated to share knowledge by the desire for self-realization and to enhance their reputation in their local family and village circles.

After 1978, the development of private startups in the focal industry proceeded in two stages that differed in market environment and competitive requirements. Initially, the nationwide dye shortage of the early 1980s led to profitability for a large number of startups. Many new private entrants competed by offering cheap products of poor (yet acceptable) quality to meet a surging demand. Once the dye shortage ended in 1988–1989 and the market was saturated, price

became the compelling selling point. Small firms that had survived previously by offering low-quality products at higher costs were forced out of business by large-scale, low-cost rivals. While most of the startups dwindled in ever-stiffer competition, a small community that had started to combine low cost and a focus on a narrow range of products eventually grew into world-class companies and turned China from a trivial player in synthetic-dye production (10% of global output in 1978) to a global leader in terms of output (50% of global output in 2007). In retrospect, the most effective strategy for Chinese synthetic-dye startups in the 1980s was to compete through cost reduction by scaling up. A differentiation strategy did not work in this technologically mature industry where no radical innovations were introduced between 1978 and 2010 and where no sustainable advantage could be built on unique products or processes.

### Case Selection

We adopted the theoretical sampling approach (Glaser & Strauss, 2017) involving deliberate selection of cases that provide rich information on incumbent-to-startup knowledge flows – the focal unit of our analysis. Our sampling was thus guided by the goal to choose cases that can help to gain a full picture of concrete incumbent-to-startup knowledge flows following a replication logic, to maximize understandings of whether the variance in the types of knowledge passed into startups translate into the variance in performance following a comparison logic, and to eliminate potential confusing effects of other influential factors on startup performance.

To meet the goal of controlling for potential confounding factors on startup performance, we purposively limited the geographical scope of our investigation to the Zhejiang Province of China, where we sampled all the six startup cases founded in the first development stage (1979–88) of our industrial setting, for two reasons: First, the majority of Zhejiang-based synthetic-dye startups were privately owned,<sup>[2]</sup> while their peers elsewhere exhibited more diverse ownership forms. As state-owned and collectively owned firms enjoyed privileged access to valuable state-controlled resources in the 1980s, the private synthetic-dye firm population in Zhejiang had more similar and therefore equivalent in terms of the initial resource base. Second, focusing on only one province helps to control for possible regional influences, in particular proximity to knowledge (Stuart & Sørensen, 2003) and local institutions. This is especially important in China, where regional differences are high, and institutions play a key role in economic growth.

For the selection of final cases at the firm level, we set four criteria to implement our sampling strategy. First, firms were founded in the booming years between 1979 and 1988 and confronted the same favorable market, so as to eliminate the differences of market environment at founding. Second, the startup remained in business for at least five years. This time period is long enough to demonstrate the founder's intention to grow, which would affect a startup's development (Delmar & Johan, 2008). Third, founder's background, which is argued to



cause significant impacts on startup performance, was held as constant as possible across cases. The startups sampled were all created by entrepreneurs from humble beginnings with respect to social status, education, and prior (i.e., senior management, entrepreneurial, and industry-specific) experiences. The founders were also poorly financed initially, and every founder collected only limited funds from family and/or friends. Finally, and most importantly, we selected two thriving, two marginally surviving, and two later failing firms to form three performance-based groups. Such a sample would allow for replication logic in establishing the reality of what knowledge actually flows from incumbents to startups and enhance the validity of our findings by cross-case checking (Eisenhardt, 1989). In addition, it would enable intra-group replication and inter-group comparison, which can help to corroborate whether the cases of the same group received similar types of knowledge from incumbent firms and whether the cases of different groups differed in the knowledge received. This provides a strong foundation for identifying the links between different types of incumbent-to-startup knowledge flows and startup performance.

To ensure that we could distinguish startup success from real failure, we expended considerable effort finding two failed cases in addition to finding really successful firms. The two marginally surviving firms were also included as a separate group because the causes of a startup's survival may differ from those of its growth (Cooper, Gimeno-Gascón, & Woo, 1994).

The three performance outcomes that were evaluated decades after the startup foundation are (1) outright failure (i.e., the firm no longer exists), (2) success, and (3) marginal survival. Being successful after years of existence indicates sustained competitiveness of the startup. We distinguished success from marginal survival by showing that successful firms had much higher sales (market share and growth) and employment (size and growth) as shown in Table 1. We do not focus on profitability, as all the firms were privately owned in 2008 with the exception of one, and they did not have a legal obligation to disclose these data. In 2008, both high-performing cases occupied a market share of over 30% in terms of sales volume in at least one of the dye segments and had hired more than 1,000 employees, whereas the two moderate survivors had a much lower and decreasing share in all of the segments and hired fewer than 500 employees (see Table 1 for an overview of the key features of the six firms).

## Data Collection

Our primary source of data is 71 interviews with individual respondents between December 2009 and October 2017. (A list can be found in Supplementary Appendix 1.) The 63 interviews conducted before April 2014 were open-ended in order to probe any unexpected leads and to remain close to the interviewees' actual experiences, while the last eight interviews, conducted in 2017, were more structured, allowing us to focus on specific questions and better understand

Table 1. General profiles of cases

	<i>High-performing cases</i>		<i>Marginally surviving cases</i>		<i>Failing cases</i>	
	<i>SA</i>	<i>SB</i>	<i>MA</i>	<i>MB</i>	<i>FA</i>	<i>FB</i>
Founder Ownership	Gang <ul style="list-style-type: none"> <li>Privately owned at foundation</li> <li>IPO in the 2000s<sup>[1]</sup></li> </ul>	Gao <ul style="list-style-type: none"> <li>Privately owned since foundation</li> </ul>	Shan <ul style="list-style-type: none"> <li>Privately owned since foundation</li> </ul>	Ding <ul style="list-style-type: none"> <li>Privately owned since foundation</li> </ul>	Shu <ul style="list-style-type: none"> <li>Privately owned since foundation</li> </ul>	Jian <ul style="list-style-type: none"> <li>Privately owned since foundation</li> </ul>
Life span	1979–present	1985–present	1986–present	1982–present	1983–1990	1985–1994/ 1996 <sup>[2]</sup>
Educational background of the founder	Primary school graduate	Junior middle school graduate	Junior middle school graduate	High school graduate	Primary school graduate	Junior middle school graduate
Prior working experiences of the founder (in chronological order)	<ul style="list-style-type: none"> <li>Peddler</li> <li>Farmer</li> <li>Pesticide mill cofounder</li> </ul>	<ul style="list-style-type: none"> <li>Farmer</li> <li>Construction worker</li> </ul>	<ul style="list-style-type: none"> <li>Farmer</li> <li>Textile salesman</li> </ul>	<ul style="list-style-type: none"> <li>Famer</li> <li>Textile salesman</li> </ul>	<ul style="list-style-type: none"> <li>Dyeing mill worker</li> <li>Fabric shop clerk</li> <li>Farmer</li> </ul>	<ul style="list-style-type: none"> <li>Farmer</li> <li>Grocery employee</li> </ul>
Primary knowledge source during foundation	<ul style="list-style-type: none"> <li>Shanghai Dyestuff Co., Ltd.</li> <li>Shanghai No.1 Silk Dyeing Factory</li> </ul>	Shanghai Dyestuff Co., Ltd.	Shanghai Dyestuff Co., Ltd.	<ul style="list-style-type: none"> <li>Shanghai Dyestuff Co., Ltd.</li> <li>A dye factory in Changshu</li> </ul>	<ul style="list-style-type: none"> <li>Shanghai Dyestuff Co., Ltd.</li> <li>Changzhou Dyestuff Factory</li> </ul>	Shanghai Dyestuff Co., Ltd.

Table 1. Continued

	<i>High-performing cases</i>		<i>Marginally surviving cases</i>		<i>Failing cases</i>	
	<i>SA</i>	<i>SB</i>	<i>MA</i>	<i>MB</i>	<i>FA</i>	<i>FB</i>
Number of employees at foundation	Below 20	Below 20	About 70 (mostly part-time workers)	About 30	Below 20	Below 10
Number of employees during the founding period		Over 70 (3rd year)	About 60, mostly full-time employees (3rd year)			<ul style="list-style-type: none"> <li>• 48, all full-time employees (3rd year)</li> <li>• Over 60 (4th year)</li> </ul>
Number of employees in 2009	Over 6,500	Over 1,600	About 300	Less than 200	–	–
Sales volume of dyes in 2009	Over 70,000 tons	About 15,000 tons	About 3,000 tons	Just over 800 tons	–	–
Sales revenue of dye businesses in 2009	CNY 4.5 billion (US \$ 660 million)	Over CNY1.3 billion (US \$ 190 million)	Not revealed	About CNY 30 million (US \$ 4.4 million)	–	–
Domestic market share of primary dye products in 2009	Over 50%	<i>‘The only dominant producer of its main products’</i>	<i>‘Not much’</i>	<i>‘Very trivial and still declining’</i>	–	–
Primary sources of data:						
• Insiders	I.2, 3, 4, 7, 8, 70	I.24, 34, 35, 42, 69	I.22, 24, 25, 71	I.6, 9, 67, 68	I.49, 50, 52, 64	I.53, 55, 66
• Outsiders	I.11, 12, 15, 17, 21, 43, 44, 59, 65	I.1, 12, 27, 28, 29, 30, 40, 41, 60	I.10, 14, 23, 32, 33, 36, 37, 38, 39, 46	I.1, 5, 13, 16, 18, 19, 20, 32, 45	I.57, 61, 62, 63	I.48, 51, 54, 56, 58

Table 1. Continued

	<i>High-performing cases</i>		<i>Marginally surviving cases</i>		<i>Failing cases</i>	
	<i>SA</i>	<i>SB</i>	<i>MA</i>	<i>MB</i>	<i>FA</i>	<i>FB</i>
• Primary documents	R.7, 8, 12, 15, 16	R.1, 20, 21	R.4, 14, 19	P.1; R.9, 18	R.2, 3, 10, 11	P.2; R.17
• Secondary documents	J.11, 16,, 18, 19, 21, 32; M.5, 6; T.2, 5, 7, 8	J.7, 20, 21, 27, 28, 29, 30, 31; F.1, 2; M.1, 4	J.24; F3; T.1, 4, 6	J.7, 14, 15, 22, 24; T.1, 4, 6	J.2, 12, 17; F4	J.5; T.1, 4, 6

*Notes:* <sup>[1]</sup> To uphold confidentiality, we do not specify the firm's IPO year because there are currently no more than five public synthetic-dye companies in China.

<sup>[2]</sup>The related interviews provided inconsistent information on the exact shutdown year of FB, which ranged between 1994 and 1996. The reasons that we justified it as a failed case are: (1) There was consistent and reliable interview information showing that FB had stopped dye manufacturing by 1995. It is a reasonable inference that the firm was at most selling stock if it was still operational in 1996. (2) FB was much smaller than the high-performing cases in 1994 (ten years after FB's foundation).

the sequence of events in particular firms. All the interviewees but three had worked or were working in the Zhejiang Province or neighboring provinces where the six focal firms searched the most for initial knowledge due to geographical proximity. A typical interview lasted between 90 and 150 min, with the longest interaction lasting over six hours. Each session was recorded whenever possible, and detailed notes were taken for every interview. Finally, roughly 100 short follow-up phone calls were made for information verification.

Since we focus on a not-so-recent sample of firms to look beyond the survival of startups and to facilitate the collection of formerly sensitive or even confidential information, this study may be subject to retrospect sensemaking (Eisenhardt & Graebner, 2007). We take several measures to mitigate potential maturation and subjective biases of interviewees, which meanwhile increase research validity and reliability (Lincoln & Guba, 1985). First, no prompts were made to pursue specific questions on incumbent-to-startup knowledge flows unless the theme was first raised by the interviewees. This way, respondents would not be induced to make sense of the knowledge flows. Since every respondent in the pilot interviews emphasized incumbent firms as the vital source of knowledge for startup creation and success, we constantly kept an eye on this theme but carefully avoided any directed questions. In the 63 interviews before April 2014, respondents were asked to first remark broadly on the startup's performance and its impacting factors. Only when the knowledge received from incumbent firms was referred to as an important contributing factor would we follow up with questions regarding what *types* of knowledge were passed and what was the influence of this knowledge on the startup.

Second, the diverse background of interviewees provides a rich range of perspectives on events at different times so that the eventual accounts we synthesized would not suffer from distorted accounts given by any particular respondents. For each focal firm, we interviewed founders (all were still owners or directors in the surviving cases) and present managerial/R&D personnel to ensure within-firm accuracy. We also interviewed outsiders that include previous employees who had left the focal firms, industry experts, competitors, and primary knowledge providers and gatekeepers at incumbents. All of the outsider interviewees had worked in the industry for over 15 years (some even over 50 years) at the time of the interview, and they possessed information that can serve to verify the insiders' perceptions. Because they were introduced to us by the China Dyestuff Industry Association and other industry associations, and because the sensitivity of some information decreased as time went on, they were open to discussing these previously sensitive issues in an intensive, detailed, and trusting manner (Hill, McGowan, & Drummond, 1999). For example, several interviewees confirmed that they divulged market information to startups which enabled the startups to approach new clients before their own incumbent firms – a fact that they would not have admitted in the 1990s when they had not yet retired and their former employers were still active in business.

Third, interviews were enriched by a broad search for other complementary data sources. As a result, most of the important events and stories collected from

interviewees were verified using documents contemporaneous with or very close in time to the period when the events occurred. These sources include secondary materials such as industry journals, published books, yearbooks, reports, and firm releases, plus primary materials such as personal notes and internal materials of firms and governments (the most informative ones can be found in Supplementary Appendix 2).

These materials helped to reduce retrospective bias in at least two ways. First, we could cross-check the figures (e.g., output volume, profit, prices of dyes, and raw materials), timelines of events, and other information provided by interviewees against early records wherever available. More importantly, we were able to distinguish the interviewees who recalled more accurately from those who did not. If information on one event collected from an interviewee was very consistent with evidence in documents, the other information and remarks on this event from the same interviewee, even if not covered by documents, could be taken as credible. Otherwise, we would drop the interviewee's descriptions about this event especially when his/her accounts were quite different from what we found in documents. For example, we dropped one respondent's descriptions of how MB launched new products in its early years because the sequence of product introduction differed significantly from what was listed in MB's internal records.

Second, we made great use of primary materials to make sure the evidence chain was not built on the maturation effect. It can be expected that some respondents – in particular, knowledge providers and gatekeepers at the incumbent firms – were likely to overevaluate incumbent-to-startup knowledge flows, whereas some others – in particular, startup founders and their early R&D employees – might attribute firm survival and success more to their own foresight and capabilities with the passage of time. Therefore, we paid special attention to whether the flows of some knowledge emphasized by interviewees actually changed the startup's behavior and were seen as important at the time of knowledge transfer and not later. For example, several outsiders noted that one senior engineer from the Shanghai No.8 Dyestuff Factory brought very impactful knowledge to SB in the 1980s. Their statements were enhanced by SB's internal annual report that mentioned this engineer and his contribution as early as the third year after its foundation.

## Data Analysis

With no formal hypotheses developed *a priori*, our analysis followed an established process of inductive theory building (Strauss & Corbin, 1998). We summarized and coded the interview data and other materials and developed analytical tables to navigate through the data (Miles & Huberman, 1994). The coding procedure was constructed building on emerging typologies and causation (Creswell, 1994: 162). While our overall analysis involved iteration between the data and emerging theoretical categories, it can be generally divided into three stages.



We began our data analysis by constructing individual histories of the six cases, describing the chronology and rationale for a startup's key moves that informants considered important for the firm's performance. In the iterative process of data collection and analysis, knowledge passed from incumbents at founding soon emerged as a frequently and consistently mentioned element of startup performance. Hence, we narrowed our focus to incumbent-to-startup knowledge flows, tracking what knowledge underpinned a startup's key moves, whether the knowledge came from incumbent firms, and how the knowledge was put into use and what effect it had. To improve external reliability, we only considered knowledge flows to have taken place when at least one insider and one outsider interviewee described it consistently and when the descriptions tallied closely with other records. In this way, we ensured that what we coded as knowledge flows reflected a collective understanding independent of individual bias or possible memory distortion. To get ready for evaluating the impacts of incumbent-to-startup knowledge flows, we traced, in particular, the chronology of startup's knowledge reception and key moves to confirm that what the interviewees claimed startups learned from incumbents was eventually put to use in the firm.

After synthesized individual case histories had been developed, we employed the standard two-cycle coding techniques to extract the precise types and categories of knowledge passed from incumbent firms to startups during the founding period of startup. In the first cycle of coding, we compared and categorized the materials in regard to the knowledge that flowed. As the analysis went on, some knowledge was found repeatedly to be present and hence was extracted as first-order codes. In the second cycle of coding, we sought for similarities and differences between first-order codes and integrated similar first-order codes to generate the second-order themes, which emerged to be the eight types of knowledge in [Figure 1](#). Meanwhile, it became gradually clearer that our respondents related some types of knowledge to decisions about where (e.g., selecting a niche market) and how (e.g., selecting a technical trajectory that fits a niche market) to carve out a spot in the competitive landscape, and related other knowledge (e.g., manufacturing technologies) to functions that enabled a firm to provide offerings once its market positioning was decided. Eventually, we created a framework that includes eight types of knowledge, which in turn can be theoretically aggregated into two broad categories (see [Table 2](#)).

Once the categorization of incumbent-to-startup knowledge flows was completed, we sorted the six cases into three groups: failure, marginal survival, and success as detailed above. We then conducted two types of analyses: intra-group and inter-group. Intra-group analysis centered on uncovering precisely what types of knowledge each group received from incumbent firms during foundation. For this purpose, we juxtaposed and compared the two cases in every group to note their similarities and differences. After we had a good understanding of each group, we started inter-group analysis to look for the emergence of patterns showing how incumbent-to-startup knowledge flows may have contributed to

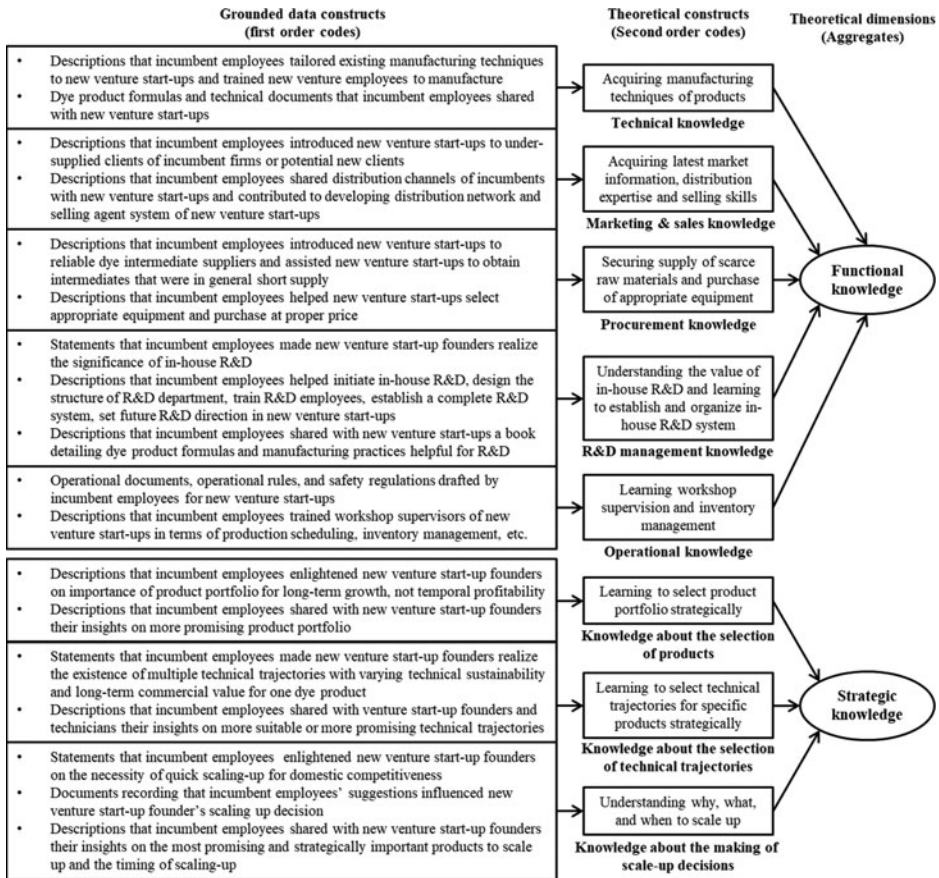


Figure 1. Coding structure

startup performance (see Table 3). On this basis, we formed tentative theoretical conjectures and refined them by frequently revisiting the raw data and consistently reconsidering our insights.

**EMPIRICAL FINDINGS**

**Incumbent-to-Startup Flows of Functional Knowledge**

Five types of functional knowledge are found to flow from incumbents to startups. Unexpectedly, the four underperforming cases and the two very successful cases are quite similar in the initial mix of functional knowledge acquired from incumbent firms (see Table 4).

*Technical knowledge.* All six cases received this knowledge from incumbent firm employees during their foundation. A good example is FA, which produced Sulfur Black (a sulfur dye) as its first product. SA sourced its earliest manufacturing techniques of Sulfur Black from a subsidiary of the state-owned Shanghai No.10

Table 2. Categorization of knowledge transferred from incumbent firms to sampled startups during their foundation

<i>Types of knowledge</i>	<i>Descriptions</i>
Functional knowledge	The knowledge that guides how a firm performs the basic tasks that are involved in providing products and services
<i>Technical knowledge</i>	<i>The knowledge about manufacturing techniques<sup>[1]</sup> that can be used for specific products</i>
<i>Marketing and sales knowledge</i>	<i>The knowledge about market information (e.g., information about promising new clients), distribution expertise, and sales skills</i>
<i>Procurement knowledge</i>	<i>The knowledge about the supply of raw materials (especially dye intermediates) and the provision of equipment</i>
<i>R&amp;D<sup>[2]</sup> management knowledge</i>	<i>The knowledge about when and how to establish in-house R&amp;D systems and how to organize R&amp;D projects</i>
<i>Operational knowledge</i>	<i>The knowledge about workshop supervision, inventory management, and production safety</i>
Strategic knowledge	The knowledge that guides a firm’s understanding of market opportunities and its position in the market
<i>Knowledge for the selection of products</i>	<i>The knowledge concerning the deliberate selection of appropriate products to manufacture (and which to ignore or to abandon)</i>
<i>Knowledge about the selection of technical trajectories</i>	<i>The knowledge related to the existence of different technical trajectories for making a specific product(s) and on how to select the most promising trajectory</i>
<i>Knowledge about the making of scale-up decision</i>	<i>The knowledge about whether, when, and which products to scale up</i>

Notes: <sup>[1]</sup> Knowing how to produce a product is different than knowing how to improve its manufacturing techniques, which is classified as R&D management knowledge in this framework. <sup>[2]</sup> In our focal context, R&D refers to the introduction of existing products that are new to the firm and/or incremental shop-floor improvements in the manufacturing procedures for existing products, as ‘no completely new dyes or new procedures have been discovered in China’ (I.14) in the past three decades. The success of these R&D activities hinged more upon managerial than innovative capabilities.

Table 3. Knowledge transferred from incumbent firms during startup foundation and the startup’s long-term performance

<i>Types of knowledge</i>	<i>Success</i>		<i>Marginal survival</i>		<i>Failure</i>	
	<i>SA</i>	<i>SB</i>	<i>MA</i>	<i>MB</i>	<i>FA</i>	<i>FB</i>
Functional knowledge	●	●	●	●	●	●
<i>Technical knowledge</i>	√	√	√	√	√	√
<i>Marketing and sales knowledge</i>	√	√	√	√	√	√
<i>Procurement knowledge</i>	√	√	√	√	√	√
<i>R&amp;D management knowledge</i>	√	√	√	√	√	√
<i>Operational knowledge</i>	√	√	√	√	√	√
Strategic knowledge	●	●				
<i>Knowledge about the selection of products</i>	√	√				
<i>Knowledge about the selection of technical trajectories</i>	√	√				
<i>Knowledge about the making of scale-up decision</i>	√	√				

Table 4. Functional knowledge transferred from incumbent firms to sampled startups during their foundation

Type of knowledge	Success		Marginal survival		Failure	
	SA	SB	MA	MB	FA	FB
Technical	<i>‘During the first two years of SA, I [an incumbent engineer] invited over 50 experienced workers [from incumbent firm] to work on weekends for SA. These workers taught SA workers how to handle important processing steps properly hand by hand.’</i>	<i>‘Three engineers from the Shanghai No.8 Dyestuff Factory helped us lay the technical foundation for dye manufacturing. The initial technics of making dyes and intermediates were exactly the same as those used in the Shanghai No.8 Dyestuff Factory’.</i>	<i>‘Every time I [the founder] requested, an engineer from the Shanghai No.9 Dyestuff Factory would make time to work out solutions [to technical problems] on the site’.</i>	<i>‘An engineer from the Shanghai No.10 Dyestuff Factory helped us check on what was wrong with our production of Vat Blue RSN regularly. He also invited his colleagues to identify problems. Only with their assistance did we eventually achieve steady production’.</i>	<i>‘The most challenging was to start production using our ‘primitive’ equipment. My boss [the founder] found an experienced worker from the Shanghai No.10 Factory, who tailored the procedures to our equipment. He did this in front of us over and over. We gradually understood how and why’.</i>	<i>‘The founder asked me [an incumbent engineer] to train his employees who had no idea of what to do in the workshop. At least four other employees from the state-owned Shanghai No.3 Dyestuff Factory went there from time to time to provide on-the-spot technical guidance’.</i>
Marketing & sales	<i>‘My [the founder] relative at the Shanghai No.1 Silk Dyeing Factory wrote a recommendation letter to the Suzhou Silk Dyeing Factory – our first client. The letter enabled me to meet the factory leaders and I secured a 10-ton order of our first product. It was impossible to get such a large order without recommendation’.</i>	<i>‘Once Gao [the founder] asked me: “How do you think of our meta-ester product?” I answered: “If the quality is acceptable, I could help you sell one tote-bin per month, namely 120 tons per year [more than SB’s annual output of meta-ester at that time].” I did what I promised’.</i>	<i>‘Employees from some other factories of Shanghai Dyestuff Co., Ltd. introduced MA to us. We [an incumbent factory] then shared with MA the information of some clients who were in urgent need for Direct Blue. Sometimes we asked MA to send their dyes here and sold using our brand through our distribution channels’.</i>	<i>‘After MB’s establishment, there was a short-term over-supply of Vat Blue RSN. We [the Shanghai No.10 Dyestuff Factory] still sold this dye well because of high quality, but we could not produce enough crude dyes. I made MB one of the crude dye suppliers for us and we purchased most of its Vat Blue RSN output. We also</i>	<i>‘Our difficulty in selling was not because that we did not know how to sell. We were taught enough about this by the employees from the Shanghai No.10 Dyestuff Factory in the first year. But the market of Sulfur Black turned crowded too soon’.</i>	<i>‘Almost all the large clients were state-owned, and they did not treat me seriously. My friend at the Shanghai No.3 Dyestuff Factory led me directly to the long queue of customer trucks waiting for newly-made dyes in front of their factory’s gate. There she introduced me to dealers and helped me negotiate. This was how I started to</i>

Table 4. Continued

Type of knowledge	Success		Marginal survival		Failure	
	SA	SB	MA	MB	FA	FB
Procurement	<i>'A 0.5-ton reactive vessel was needed to make Resin CPU [the first product of SA]. SA did not have the quota of steel in the state plan to purchase it. My [the founder] relative worked at the Shanghai No.1 Silk Dyeing Factory at that time. He told me that his factory had the equipment and helped us to borrow it [...].'</i>	<i>'In the second year, we had a hard time securing the supply of H-acid [an intermediate]. A senior manager and his close colleagues at Shanghai Dyestuff Co., Ltd. provided us the latest information on potential suppliers. They knew which factory had imported H-acid left and which factory wanted to sell some inside-plan H-acid to collect money.'</i>	<i>'Intermediate supply, such as m-phenylenediamine, was very instable in 1988. Several managers and engineers at Shanghai Dyestuff Co., Ltd. told me where to look for these intermediates, who was the de facto decision maker [of supplier] in each deal, etc. This was especially valuable in the second half year when intermediates were in severe shortage'.</i>	<i>directed them to establish a dealer network'. 'In 1982, we planned to close for months until 1-aminoanthraquinone were gained. Luckily, our boss' [the founder] friends at the Shanghai No.10 Dyestuff Factory directed us to a mill that just started to produce this intermediate in collaboration with their factory. Thanks to our boss' friends, the factory gave us priority in buying intermediate at fair price'.</i>	<i>'I [the founder] wanted to buy cheap and sustainable equipment, but where? An engineer from the Shanghai No.9 Dyestuff Factory led me to a dye factory that was about to renew equipment. They insisted that buyers must purchase the entire set. The engineer pointed out some defects of their old equipment. He sounded so persuasive that they agreed to sell only what I needed'.</i>	<i>build my own network of dealers and customers'. 'A large proportion of our raw materials were bought at the introduction of employees at Shanghai Dyestuff Co., Ltd. They told me what to purchase and where, and I followed their advice. The outcome was usually satisfactory'.</i>
R&D management	<i>'SA's employees started to learn what tests were the most important and how to conduct tests from the staff of the Shanghai Auxiliary Factory, the Shanghai No.1 Silk Dyeing Factory, and the Shanghai No.4 Dyestuff Factory, etc. SA created a</i>	<i>'I was recruited by SB in 1987. After I started to work on the production line, I was appointed to accompany an engineer from the Shanghai No.8 Dyestuff Factory whenever we needed to launch new products. I saw how he</i>	<i>'Two engineers from the Shanghai No.9 Dyestuff Factory, told us a R&amp;D department should include at least three units: one of new product introduction, one of quality control and after-sale service, and one of sample analysis and</i>	<i>'By the time I left MB, the sketch of its R&amp;D system was still based on what two engineers from the Shanghai No.10 Dyestuff Factory informed us in the early years. All my R&amp;D team members at MB learnt how to do a R&amp;D project and what</i>	<i>'I [workshop supervisor of FA] got to know what were the focal R&amp;D concerns regarding Sulfur Black and several sulfur blue dyes from the employees at Shanghai Dyestuff Co., Ltd. They also told</i>	<i>'Initially our R&amp;D teams were organized and led by workers or engineers from large state-owned firms. I had never entered a formal lab before. But, they drew me into projects for new product introduction and quality improvement one</i>

Table 4. Continued

Type of knowledge	Success		Marginal survival		Failure	
	SA	SB	MA	MB	FA	FB
	<i>small internal research institute in its sixth year [1985]. All the initial members of the institute were all young employees who learned how to conduct R&amp;D from incumbent firm staff.</i>	<i>coordinated our efforts and how he organized new product development projects. This was helpful [when I started R&amp;D].</i>	<i>chromatic examination. Our earliest lab equipment was mostly purchased following their advice, since we not know what was the most proper.</i>	<i>points to pay special attention to in a product improvement project from them.</i>	<i>me how they organized new product teams.</i>	<i>after another. I learned where to start if I wanted to introduce new products, especially how to control the pace of R&amp;D activities so that it would not disrupt manufacturing.</i>
Operational	<i>‘Our earliest operational documents such as safety handbooks, general operational manuals, inventory management methods, workshop regulations, and quality control handbooks, were drawn up with the help of engineers from Shanghai Dyestuff Co., Ltd.’</i>	<i>‘The founder of SB did not have product introduction brochure or user guide for his dyes at the beginning. I [an incumbent employee] told him these were all must-to-do. Otherwise, your firm would never look like a serious business. He took my advice quickly.’</i>	<i>‘There were so many other wrong things in MA’s workshop. We [incumbent engineers] pointed them out one by one, such as, how to efficiently arrange the sequence of production of different dyes so as to minimize the time ofclave cleaning.’</i>	<i>‘Because of the guidance of engineers and old workers from the Shanghai No.9 Dyestuff Factory, the two earliest workshops supervisors of our own learnt to independently manage a workshop within 50 months. It should have taken much longer if we had to dig all this out on our own, and would have generated more waste.’</i>	<i>‘Those selected to be SA’s initial supervisors had been purposively assigned to work with incumbent experts who helped to make production plans. A manager from a state-owned dye firm in Changshu [a town at Jiangsu Province] did this for us. He was willing to explain to our employees in detail why he made such arrangements of production plan and why he changed the schedule.’</i>	<i>‘When I [the founder] saw problems in the workshop that I could not solve – these might have nothing to do with machinery or manufacturing procedure, perhaps merely about whether to assign one or two workers to a specific step – I asked my friends at Shanghai [Dyestuff Co., Ltd.] The answers could be very straightforward and simple, but they worked.’</i>



Dyestuff Factory. As its founder said, ‘*A workshop director of the Shanghai No.10 Dyestuff Factory gave us a copy of “The Procedure to Make Sulfur Black”, which was published internally by his factory. We had two workers who graduated from junior middle school read the book first. The two then tried to start production and told other workers who only finished primary school what to do. We also printed by stencil a simplified procedure handbook to facilitate workers’ understanding*’ (I.52). A comparison between the two books (R.3, 10) showed that FA’s product formulas and manufacturing procedure and those of the incumbent were exactly alike. Yet, the procedure needed to be tailored to FA’s equipment, and knowledge required also came from incumbent factory. One of the two FA workers who got to know the manufacturing procedure first noted, ‘*The most challenging part was how to start production using our “primitive” equipment. My boss found an old worker from the Shanghai No.10 Factory. He was able to decide the proper temperature – sometimes five degrees higher or lower, and the appropriate amount of raw materials to put in. He did this in front of us over and over, as the quality of raw materials was unstable and we had to adjust these details each time. We got to know under which conditions we should make the temperature a bit lower than that explicated in the standard instructions*’ (I.49, 50).

The other five cases also gleaned initial manufacturing techniques from incumbents. These startups, without exception, started businesses by making technologically mature products using product formulas and manufacturing procedures shared by incumbent employees. For instance, to initiate production of Resin CPU (a dyeing auxiliary) – the earliest product of SA, the unskilled workers at SA learned not only product formulas and manufacturing procedures of this product but also know-how to tailor manufacturing procedures all from state-owned incumbents. (For more detailed evidence about this case, see Supplementary Appendix 3).

*Marketing & sales knowledge.* Six startups we studied received this knowledge from incumbent firms during their founding years. To illustrate, the founder and employees of SA sourced sales-related know-who and know-how from Shanghai Dyestuff Co., Ltd. and the Shanghai No.1 Silk Dyeing Factory. Regarding the know-who for locating clients, SA found its very first customer and many early customers owing to the assistance offered by incumbent employees. The founder said, ‘*My relative at the Shanghai No.1 Silk Dyeing Factory introduced me to our first client – the Suzhou Silk Dyeing Factory. He wrote a recommendation letter in July 1979 [when SA just started full-scale production]. This enabled me to meet the leaders of the Suzhou Silk Dyeing Factory. They would not have taken us seriously and it was impossible for us to get such a large order without my relative’s recommendation*’ (I.8; M.6). Later on, the startup utilized information from incumbent firms to identify potential customers, approach customers, and close sales. A factory director of the Shanghai Dyestuff Co., Ltd. summarized (I.43), ‘*I particularly required Ma<sup>[3]</sup>, the Retail Department Director of Shanghai Dyestuff Co., Ltd., to notify SA whenever clients inquired about any products that SA could make.*’ Once, in 1981, SA received information from Ma on an emerging buyer even before his retail department officially informed a subsidiary of its

own company. SA was able to make the first move and secure this new client who did not intend to contact non-SOE suppliers (I.43, 44; R.8).

Regarding the know-how of selling tactics, the introduction of the industry-specific common sales agency model into SA was largely based on the insights of incumbent firm employees. As SA tried to sell to more customers from 1981 to 1982, the sales team discovered the ‘kickback’ approach that had worked well for small township enterprises did not perform well with large collectively owned and SOEs. Two sales representatives from the Shanghai No.1 Dyestuff Factory identified the reason. One explained, ‘*Unlike small dyeing factories that procured from different local suppliers, large clients were accustomed to purchasing from stable large distributors. SA should attempt to create relationships with established distributors of good reputation, rather than trying to sell all the products directly*’ (I.40). Assisted by these incumbent employees, SA ‘*quickly understood the agency model widely used in the industry, developed distributors of their own, and marketed to large clients through their own agents*’ (I.40).

The other five cases also reported receiving and utilizing marketing & sales knowledge from incumbent firms during their founding period. For instance, MA was able to close sufficient sales immediately after establishment because of marketing channels offered by the Shanghai No.9 Dyestuff Factory. (More detailed evidence about this case is in Supplementary Appendix 3.)

*Procurement knowledge.* Interviewees also highlighted the flow of this type of knowledge into six cases during foundation, when dye-related products including key intermediates and some dye production equipment ‘*were still purchased and sold according to government plans in the 1980s*’ (I.1; T.5). The startups sampled received the know-how and valuable contacts concerning raw material provision and, as a result, ensured supply of intermediates shortly after foundation. The experiences of SB are revealing. This startup encountered a nationwide shortage of H-acid and 1-aminoanthraquinone – two key intermediates for making its earliest products – when it was erected in 1985. As one early SB manager described, ‘*We were running out of supply and sent purchasing agents everywhere to search for H-acid. Our boss [the founder of SB] turned to a senior manager in the Planning Department of Shanghai Dyestuff Co., Ltd. who was in charge of material plan-making for the company. He and his colleagues provided us the latest information to guide our search for intermediates. They knew which factory had imported H-acid left in warehouse and which factory wanted to sell inside-plan H-acid to collect outside-plan money*’ (I.24). The director himself confirmed that ‘*I accurately informed SB the factories that produced the two intermediates, the amount these factories could spare or sell out of plan, and the prices they may ask for. I introduced SB to these factories and helped them build relationships with multiple intermediate suppliers*’ (I.29). Multiple reliable suppliers enabled SB to feed production lines continually with high-quality intermediates at very fair prices (I.24, 42; R.16).

The reception of knowledge regarding the acquisition of cost-effective equipment was also noted by interviewees. Startup founders had to be very careful in deciding what equipment to get and how, meaning that many favorable deals

were initiated and facilitated thanks to information from incumbent employees. Take SA for example: it was able to obtain necessary equipment to start production only with the assistance of incumbent employees. As its founder said, '*A 0.5-ton reactive vessel was indispensable to make Resin CPU [the first product of SA]. We did not have the quota of steel in the state plan to purchase it. My relative worked at the Shanghai No.1 Silk Dyeing Factory. He told me that his factory had the equipment and helped us to borrow it. Otherwise, we had to wait god knows how long to get the quota and equipment. It would be impossible for us to start production on time in 1979*' (I.8; M.6). Later on, at the introduction of two employees at Shanghai Dyestuff Co., Ltd., SA found and bought '*some well-maintained old equipment lying idle in a branch [of Shanghai Dyestuff Co., Ltd.], which was more than enough and qualified to make acceptable products at an incredibly low price*' (I.21). Another example is FA. It replaced its initial primitive equipment with suitable albeit not the most advanced equipment in the second year after foundation, based on knowledge provided by incumbent employees. (More detailed evidence about this case is in Supplementary Appendix 3.)

*R&D management knowledge.* Reception of this knowledge from incumbents during the founding period was observed in each of the six cases. It encouraged the initiation of organized in-house R&D and fueled the introduction of new products. One revealing illustration is MA. The founder admitted, '*I did not understand the difficulty and importance of establishing a complete lab for a dye firm, let alone what facilities and human resources composed a minimum R&D system*' (I.22). Enlightened by a manager at the Shanghai No.9 Dyestuff Factory and three engineers from Shanghai Dyestuff Co., Ltd., he quickly realized the need to create a formal R&D department after startup foundation. '*They told me that a R&D department performed at least three functions*', he explained: '*(1) new product introduction, (2) quality control & after-sale service, and (3) sample analysis & chromatic examination*' (I.22). Ever since 1987 – the second year after MA was founded – the founder has frequently pursued advice on lab construction from incumbent employees and invested accordingly as long as the startup's finances permitted. First, to cultivate R&D personnel of its own, capable workers were carefully selected and appointed to work closely with incumbent engineers invited to help on site. One of these former workers who were selected said, '*We were told to pay special attention to the three R&D functions and to gain the skills of managing an entire R&D project*' (I.24). Second, MA also received codified knowledge – a book that detailed the formulas and prevailing technical trajectories of all synthetic dyes made in China. It substantially helped MA employees make sense of the tacit know-how learned by doing or watching.<sup>[4]</sup> For example, a few written instructions could clarify the reasons whether and why it was plausible to eliminate several filtration steps (as they occasionally observed incumbent workers doing) without significantly lowering product quality (I.37, 38). Third, this knowledge received set the tone for MA's subsequent R&D direction. The firm erected an R&D department in 1992 – the sixth year after its foundation – once China's policies changed to enable the hiring of R&D personnel

from the open market. However, as the founder and former employees commented, ‘our first R&D director and over two thirds of key members were early employees who learned R&D and R&D organization from incumbent employees’ (I.2 2, 25, 37). Another example is SB, where ‘three experienced engineers from the Shanghai No.8 Dyestuff Factory laid the managerial and structural foundation for the entire R&D system’ (I.35, 42). (More detailed evidence about this case is in Supplementary Appendix 3.)

*Operational knowledge.* This type of knowledge was received from incumbents by all six startups during their founding periods. For example, MB’s earliest workshop supervisors were cultivated by four engineers from the Shanghai No.9 and No.10 Dyestuff Factories. As the founder and a former employee said, ‘It took much longer to train workshop supervisors than ordinary workers. These supervisors should know well not only about our products and our workers but also about how to coordinate production and material storage, how to eliminate waste, how to arrange production schedules of different dyes and so on. Because of the explicit guidance of engineers and old workers from the Shanghai No.9 Dyestuff Factory, our own two earliest workshops supervisors learnt to independently manage a workshop within about 50 months [after MB’s establishment]. Usually, it should have taken much longer if we had to dig these tricks out all by ourselves, and would have generated much more waste’ (I.9, 67). These remarks were confirmed by interviews with incumbent engineers (I.5, 13). Comparatively, we encountered several other new firms founded during the same period, which also aimed to launch vat dyes of high procedure complexity as MB. However, they confronted a persistent inadequacy of operational knowledge and spent five to six years in general exploring the appropriate way to operate on their own. Ultimately, they had to quit this segment due to below-average efficiency. The other five cases parallel MB in terms of receiving operational knowledge. (More illustrative evidence, for instance the evidence regarding the case of SA, can be found in Supplementary Appendix 3.)

### **Incumbent-to-Startup Flows of Strategic Knowledge**

In addition to functional knowledge, two longer-term successful cases received also three types of strategic knowledge from incumbents whereas the four cases that languished or failed in the long term did not receive any (see Table 5). The lack of initial strategic knowledge inflows impeded more effective efforts to search for, to acquire and to utilize functional knowledge in a targeted and persistent manner, and as a result hindered startup’s subsequent development.

*Knowledge about the selection of products.* The two longer-term successful cases received and benefited from knowledge about the selection of products during the founding period. While this knowledge was often passed as rules of thumb, not as fine-grained principles, it directed startup executives to make decisions about their product portfolios very early.

Table 5. Strategic knowledge transferred from incumbent firms to sampled startups during their foundation

Type of knowledge	Success		Marginal survival		Failure	
	SA	SB	MA	MB	FA	FB
Selection of products	‘The engineers and managers of Shanghai Dyestuff Co., Ltd. told my old boss [the cofounder of SA] in 1981 or 1982 that the demand for auxiliaries was not large enough to cultivate strong manufacturers having advantage of scale. In addition, the technologies of dyeing auxiliaries were too simple to form entry barrier. To stay in this business, SA needed to take on the production of dyes and dye-related products that were more technologically complex. They suggested disperse dyes as a promising choice. The output of synthetic fibers was rising quickly in China [and the demand for disperse dyes to dye synthetic dyes would rise]’.	‘A senior engineer from an incumbent firm in Shanghai suggested we [SB] stop putting discriminate efforts to make dyes of any colors from highly-priced procured intermediates. He said [the production of] many types of dyes in small volume did bring in money right then, but it was too distracting. Making Reactive Blue 19 alone could keep a large dye enterprise running. This dye was of very large demand because it could be used to dye not only cotton but also wool, polyester, and many other fabrics. This was the first time I [SB staff] heard of this idea. That was really a bold suggestion, because it meant that you would let go some highly profitable projects’.				
Selection of technical trajectories		‘A manager from Shanghai Dyestuff Co., Ltd. suggested us to use a relatively new technical trajectory – Late Esterification – to make Reactive Blue 19. He explained that the dyes made using the Late Esterification trajectory generated a greenish shade, not the reddish shade of the dyes made using the conventional Early Esterification trajectory. While customers were accustomed to reddish shade, he believed we could change customers’ preference as long as we consistently provided cheaper Reactive Blue 19 with higher strength, which was possible using the Late Esterification trajectory’.				
Scale-up decision-making	‘We [incumbent employees] saw too many examples of R&D projects that produced only samples for testing and exhibition, but not enough products for sale. We warned SA against being exhausted by chasing seemingly attractive projects and new products, and suggested they scale up the production of major products as fast as possible’.	‘I told the founder of SB it was useless to make only 15–20 tons of meta-ester [an intermediate for reactive dyes] a month. Producing intermediates on such a small scale did not make much sense in lowering costs and prices. They should produce at least 100 tons of meta-ester a month, namely over 1,200 tons a year. As 700 kilos of meta-ester were needed to make one ton of Reactive Blue 19, this implied that the firm could produce about 2,000 tons of Reactive Blue 19 using in-house supplied meta-ester annually. This would substantively lower SB’s manufacturing costs’.				

In the case of SA, its product lines in the 1990s were to a large extent shaped by the strategic mindset passed from the managers at Shanghai Dyestuff Co., Ltd. during the mid-1980s. The incumbent employees not only criticized SA's initial arbitrary selection of new products but also recommended a more appropriate product portfolio. Benefiting from the knowledge received, SA was the first among all Chinese township enterprises to produce disperse dyes. This allowed it to quickly respond to policy changes in 1992 and expand on an unprecedented scale afterward by producing disperse dyes that were in large, increasing demand. The startup became the largest disperse dye manufacturer in terms of output volume in 1998 and the largest dye firm in 2005, but its primary products remained disperse dyes and related chemicals, just as suggested by the employees at Shanghai Dyestuff Co., Ltd. thirty years before. (More detailed evidence about this case is in Supplementary Appendix 3.)

SB, the other longer-term success case, also received from incumbent employees important suggestions on advantageous products and changed accordingly from a general manufacturer to a specialist on Reactive Blue 19 and related intermediates. The startup produced miscellaneous dye-related products for which it could source technical support in its first three years. Although no crisis seemed to be looming, two senior managers at Shanghai Dyestuff Co., Ltd. separately suggested that SB quit producing other dyes and focus on Reactive Blue 19, which alone would constitute a large market segment because of its diverse uses (I.28, 34, 42). SB followed the advice, withdrawing from all products other than Reactive Blue 19<sup>[5]</sup> and related intermediates after 1989 (the fourth year after its foundation). As with SA, the change in the product line of SB began with intermediates that were less complex technically, followed by the dye of Reactive Blue 19 itself. To our knowledge, SB was the only Chinese dye firm that concentrated on such a narrow range of products, but this choice proved prescient. Having all the crucial raw materials internally supplied, SB's production cost of Reactive Blue 19 was 10% lower than that of its competitors, enabling it to start a price war and drive out all rivals.

In contrast, the other four cases did not receive the knowledge on product selection early on. Nor did they purposefully introduce a mix of dyes and intermediates that would jointly constitute a low-cost strategy. Their founders and executives were either ignorant of the value of having a well-structured product portfolio to facilitate cost reduction (MA and FA) or they realized the importance but did not have sufficient knowledge themselves to make the right choice (MB and FB). The founders recalled they '*casually introduced profitable dyes for which manufacturing technologies or distribution channels were available*' (I.22, 52, 53, 67), which is to say they missed the opportunity to penetrate the most promising dye segments as early as possible.

The failure of FA is illustrative. Its founder positioned this startup in the niche of the Sulfur Black 1 dye without a clear strategic orientation, but simply because '*it was easy to make and* [a workshop director at the Shanghai No.10 Dyestuff Factory]



would help sell it' (I.52). This *ad hoc* selection of a first product, which was the most low-end dye made in China and which launched a price war shortly after its birth, deprived FA of growth potential although it made money within a very short time. In 1984, one year after FA's establishment, 'the inside-plan<sup>[6]</sup> prices of raw materials for Sulfur Black 1 all increased, but the inside-plan price of Sulfur Black 1 did not rise' (I.57). Large SOEs found little motivation to make a planned amount of this dye and contracted out production. When the incumbent workshop director helped to place FA on the list of Sulfur Black 1 suppliers for the Shanghai No.10 Dyestuff Factory, the founder believed 'this would be a stable customer' (I.52) and put all funds into this product. FA launched and sold Sulfur Black 1 after the Spring Festival of 1984 with the director's help, as expected. Yet, neither the director nor other informants stressed to FA's founder that the sulfur dye segment was already overpopulated. When the inside-plan price of Sulfur Black 1 went up 25% in 1985, SOEs reopened their production lines for it. This caused an immediate nationwide oversupply and SOEs responded by cutting prices 5%–10%. FA ran into great difficulties before it secured an initial set of clients. However, with hope that the market of sulfur dyes might recover soon, it escalated its commitment to Sulfur Black 1, which was indispensable for a full-fledged sulfur dye manufacturer, as FA's initial investments actually positioned itself. This financially weak startup was outpaced by large SOEs in capacity expansion, new product introduction, and/or cost reduction ever after, despite all of its functional efforts. In fact, sulfur dyes remain the only dye segment that is to this day led by SOEs that were all established before 1978. As the founder admitted, 'The first step was wrong, and all the steps that followed continued the downward trend of the firm' (I.52). He disbanded FA in 1990.

*Knowledge about the selection of technical trajectories.* This type of knowledge is found to be received by both longer-term high-performing cases in the form of simple heuristics. By alerting entrepreneurs to multiple technical trajectories for a specific product(s), and the need to select appropriate trajectories carefully, it led the two firms to pursue the most promising ones based on explicit rationales and allowed them to build enduring first-mover advantages.

For example, when SB chose to focus on Reactive Blue 19 in 1989, as mentioned above, there existed two competing technical trajectories for this dye – the conventional and widely applied *Early Esterification* versus the new and rarely implemented *Late Esterification*. SB initially opted for the former one without much consideration, but its founder's friends at Shanghai Dyestuff Co., Ltd. soon informed the founder of latest developments in the latter trajectory and advised a switch to this more economically efficient mode. The founder, a former SB employee, and one of the founder's friends at an incumbent firm explained the rationale. 'The *Late Esterification* trajectory was relatively new and immature at that time. SOEs knew it but did not implement it. However, the strength [an index showing the capability of dyes to dye fabrics and a higher index indicating stronger capability] of *Reactive Blue 19* made

following this trajectory easily go up to over 120%, while the strength of output made using the Early Esterification trajectory could hardly reach 115%. As a result, the Late Esterification trajectory could reduce significantly the manufacturing costs of Reactive Blue 19 and the client's dyeing costs. Meanwhile, this trajectory also had a disadvantage. It generated a greenish shade, not the reddish shade that Chinese dyeing firms took as the "standard" shade of Reactive Blue 19 at that time' (I.34, 42, 60). The cofounder and managers of SB received the above knowledge as early as 1988 (the third year after SB's foundation) and discussed with incumbent employees a potential switch to the Late Esterification trajectory many times. They were still hesitant about making this significant switch in 1989 when they decided to focus on the business of Reactive Blue 19 and started to build a new section of the plant to accommodate this. Nevertheless, they were eventually convinced by two managers at Shanghai Dyestuff Co., Ltd., who both accentuated that 'clients' preference would change as long as you can keep providing the greenish dyes cheaper' (I.34).

As the earliest Chinese reactive-dye firm to launch *Late Esterification* in mass production, SB spent two years (1990–1992) and heavy investments on the switch that proved worth the expense. Using this trajectory, SB increased the strength of Reactive Blue 19 to 200% in 1993 (M.4; J.27) and penetrated this market segment with a compelling low price. As incumbent employees expected, Chinese dyeing firms came to favor the greenish shade of inexpensive Reactive Blue 19 and this shade was accepted as the new 'standard' by the late 1990s. Witnessing this steady change in demand, other Chinese reactive-dye manufacturers began to implement the *Late Esterification* trajectory too. But it would take years to accomplish the change. This gave SB sufficient time to expand the production of Reactive Blue 19, to start in-house manufacturing of intermediates for further cost reduction, and to consolidate its position as the globally dominant supplier of Reactive Blue 19 and related intermediates. The case of SA is similar to SB in that it consistently obtained explanatory information and suggestions for technical trajectories of new products (I.8, 70). The available evidence, however, does not unequivocally suggest that the particular technological trajectories SA chose were a direct result of the advice of incumbent firms rather than their own evaluation of the relative merits of different technological trajectories they had clearly learned about from incumbent firms. To be conservative, we do not count this instance as transfer of strategic knowledge (see row 2 in Table 5).

There is no evidence that the longer-term marginally surviving cases and the failed cases received the knowledge of this type from experts working in incumbent firms. Since the differences in technical trajectories could not be easily discerned from final products, the startup founders and employees who were all poorly educated in chemistry were either unaware of other technical trajectories or did not understand the respective strategic and economic values of various technical trajectories when deciding which one was suitable. Consequently, the four cases did not select the technical trajectories for early products on a well-informed comparison across different trajectories, but simply employed the most common or traditional

one for which ‘*technical assistance was readily available*’ (I.6, 9, 22, 52). How much value they could appropriate from the trajectories and whether they could do better than competitors by these random choices was completely a matter of luck.

Take MA and FB as examples. MA founder remarked on their haphazard selection, ‘*I did not see the necessity of checking other ways to make Direct Yellow G [MA’s early product] in the first few years after I founded the firm. Nor did I have time or capabilities to do the search. My friends at the Shanghai No.9 Dyestuff Factory did not mention other technical trajectories when they said they could share with me the manufacturing techniques of this dye. I just went on with what they could offer me. It was the same for Direct Black EX [another early product of MA]’* (I.22). Many other startups were fatally trapped by poorly selected early technical trajectories given the high costs of shifting to other trajectories. For instance, FB – a failed reactive-dye firm – did not attach importance to the selection of the technical trajectory for making Reactive Blue 19 due to the absence of relevant knowledge until SB exploited the potential of the *Late Esterification* trajectory as described above. The FB founder said, ‘*the employees from the Shanghai No.3 Dyestuff Factory told us how to make this dye, but did not lead me to think about other technical trajectories or tell me other trajectories*’ (I.53). Following the popular *Early Esterification* trajectory, the firm was quickly squeezed out of this dye segment when the *Late Esterification* trajectory became dominant.

*Knowledge about the making of scale-up decisions.* This type of strategic knowledge was channeled from incumbent employees into both of the longer-term successful firms during their foundation. It raised awareness of the importance of early and rapid scale-up, directing firms to take the lead in implementing a (focused) low-cost strategy, to consistently follow the strategy, and to preempt potential rivals by achieving economies of scale at a faster pace.

SA owes its expansion decisions largely to several informants from Shanghai Dyestuff Co., Ltd. As one of these incumbent employees recalled, in the early 1980s they counseled SA that it was not worth chasing the latest or the most advanced products since the firm’s limited funds ‘*would be exhausted by intensive R&D on too many advanced products before it could put any into mass production or extract revenues from any*’ (I.21). Instead, they expected that ‘*scale and cost would soon rule and suggested SA take down competitors by scaling up at the earliest opportunity*’ (I.21). Beyond clarifying the strategic importance of achieving economies of scale, incumbent employees further advised SA to give the highest priority in the scaling-up process to products that experienced the largest demand rather than products that had the highest profit margin at that moment. This was partly why they proposed disperse dyes and related products to SA in 1981–1982. As the General R&D Manager who joined SA in 1993 – the year SA started mass production of disperse dyes – recalled: ‘*My old boss [the cofounder] told me that, thanks to the advice from employees at Shanghai Dyestuff Co., Ltd., the firm had a clear road map for expansion early in the 1980s. These outsiders advised that Disperse Blue 2BLN and Disperse Black 300 – the two most abundantly consumed disperse dyes – would be a very good starting point to enter the*

*segment of disperse dyes when SA could afford the move. Also, SA should try to arrive at minimum efficient scale consumption of key intermediates for disperse dyes as early as possible, which would deliver cost-effective in-house production and drive down the costs of dyes' (I.4).*

SA's continual improvement and expansion of dispersant manufacturing in the middle 1980s, as well as its sequence of product introduction in the early 1990s, once it started to make disperse dyes, mirrored the large-scale, low-cost strategy principles of '*scaling up and reducing the costs of the highest-volume dyes*' (I.2, 3, 4). The firm launched Disperse Blue 2BLN in 1992 and then Disperse Black 300 in 1994, to which it devoted all its R&D and financial resources. In the meantime, it kept an eye on the potential production of key intermediates for further cost reduction. The son of SA's cofounder and the current president explained, '*We made a plan in 1993 – as soon as we started the [disperse] dye business – that we would start the manufacturing of lentine [one key intermediate for disperse dyes] whenever our annual consumption of this intermediate reached 2,000 tons<sup>[7]</sup>*' (I.7). After purposely scaling up its production of Disperse Black 300, which consumed lentine in large amounts, and while extending its business to include several other dyes (e.g., a disperse purple) that shared this intermediate, SA's annual lentine consumption went beyond the preset threshold amount of 2,000 tons in 2002. The firm then initiated a project in 2003 to produce lentine in-house. By the end of 2005, SA's '*production cost of lentine was CNY 6,000/ton below the industry's average and could make remarkable profits at a price at which competitors could not break even*' (I.2, 3, 4).

SB, the other longer-term success case, resembles SA in terms of receiving valuable advice during its founding years on the overwhelming importance of scaling up, on the products to scale up, and on the minimum production scale for key products. (More detailed evidence is in Supplementary Appendix 3.) To summarize, the knowledge SB received about scaling-up decisions made it pursue a low-cost strategy ever since its fourth year and encouraged it to scale up the production of key products (Reactive Blue 19 and related intermediates) at the first chance available.

By contrast, all the four cases of low longer-term performance did not receive such knowledge about the necessity for and means by which to scale up early. In the absence of a clear strategic focus to attain low-cost advantages earlier than competitors, these startups allocated valuable resources in an *ad hoc* manner. First, they expanded blindly the production of any products that could temporarily offer high profitability and they stopped making those that no longer seemed highly lucrative. Second, unlike SA and SB, which set a proper schedule for new product introduction to balance scaling-up and resource constraints, these startups did not sequence and integrate product launches at different time points; rather, they focused on isolated trends in the present. As a consequence, these four new ventures ran into trouble when large-scale production and low prices became a competitive requirement in the post-1990 market.

To illustrate, MA introduced a diverse range of reactive dyes – polycondensation dyes and acid dyes – aimlessly in its ten years and therefore passed on a

valuable opportunity to scale up early and at a relatively low cost. It occasionally enhanced manufacturing capacities of the dyes ‘*that sold well and were technically feasible*’ (I.22) and frequently withdrew from ongoing expansion projects to launch new products with higher profit margins. This strained MA’s ‘*limited funds and technical capabilities and slowed down its growth*’ (I.22). Spreading scarce resources thinly across several dye categories, MA had never increased its capacity of any product to a level at which a decisive economy of scale could have emerged. Because none of the dyes it launched was produced at a volume of more than 400 tons annually, it made less economic sense for MA to start in-house production of intermediates. When the industrial boom came to an end in 1989, MA had to meticulously and painfully manage its supply of intermediates, of which the prices fluctuated very strongly (I.25). Due to high material costs and a gross profit rate that was ‘*so low that cost control was central for survival*’ (I.22), MA remained a marginal player afterward. The founder told us in 2009 that they were ‘*prepared to shut down the firm anytime*’ (I.22).

### **Implications for Startup Performance of Incumbent-to-Startup Knowledge Flows**

As we have seen, all six cases received functional knowledge from incumbent firms during foundation but only the two longer-term successful startups received *strategic* knowledge. This is significant as it indicates that different categories of knowledge can have a differential impact on startup performance. The utility of incumbent-to-startup knowledge flows for startups depends not only on the amount and quality of knowledge delivered but also on the precise category of knowledge. Put differently, if somewhat informally, it’s not simply a matter of ‘yes versus no’, or ‘more versus less’, but actually a matter of asking the fundamental question of ‘what’ knowledge.

While prior studies emphasize that functional knowledge – especially technical knowledge – from incumbents can predict startup performance in emerging high-tech industries, we find that, in a technologically mature industry, this category of knowledge relates only to the creation and short-term survival of startups as opposed to their long-term success. For one thing, founders of the six cases agreed that receiving functional knowledge prompted entrepreneurship. As they generally summarized, ‘*It is prerequisite to know manufacturing technologies, who would be our customers, how many and how we could sell, where to find raw materials, how to launch new products, how to manage a production line, and how we could keep a workshop running safely. Otherwise, we would lack the minimum inputs to start a dye business and would always remain nascent entrepreneurs*’ (I.8, similar points by I.22, 42, 52, 53, 67). Additionally, incumbent firms were the only reliable source of all ‘prerequisite’ functional knowledge because professional human resources, chemical materials, distribution channels, and manufacturing equipment in the synthetic-dye industry were under government control in the China of the 1980s. The Secretary-General of the China Dyestuff Industry Association, who has worked in the industry since

the 1960s, commented on this by noting, *'All the private new firms that managed to produce and sell some dyes received more or less initial functional knowledge from incumbent firms. Those that did not could register as a dye firm but in name only. They were definitely unable to become a serious business'* (I.1).

Additionally, the functional knowledge that flowed from incumbents helped startups overcome knowledge scarcity and survive through their founding years. Whereas all Chinese private startups that successfully entered the synthetic-dye industry in the 1980s sourced functional knowledge from incumbents, they differed significantly in the amount and quality of knowledge received. Consistent with prior research that incumbent-to-startup knowledge flows endow startups with a survival superiority (Agarwal et al., 2004; Furlan, 2016; Muendler et al., 2012; Phillips, 2002), we find startups receiving more and better functional knowledge from incumbents during foundation were more likely to survive the early phases of existence. Take technical knowledge – the type of functional knowledge that has attracted the most scholarly attention – as an example. The likelihood of survival shortly after foundation increases for startups that received more specific technical knowledge to modify mature manufacturing techniques to fit their conditions. As two incumbent employees who provided technical support to SB remarked, *'SB and many other cationic dye startups copied techniques from our incumbent firms. These startups' initial techniques were also quite identical. But there were still differences after we helped to make the techniques more adapted to the materials and equipment that SB had. These differences were small and cheap but could help SB save a lot. Comparatively, our factory [the Shanghai No.3 Dyestuff Factory] formally collaborated with a collectively-owned firm in Jiangsu to produce cationic dyes. We sent engineers there regularly to help with the technology. But the enterprise was run in a state-owned way and these engineers were not well motivated. Rather than spending time adjusting techniques to each batch of materials they purchased, we simply told them to try to use materials of higher purity most of the time. This was not easy in the 1980s. Their production was frequently discontinued'* (I.48, 56). The founder of FB confirmed, *'I heard that the material cost of Cationic Red 2GL [one of SB's early products] was nearly CNY 49000/ton for some of my rivals in 1986. The incumbent engineers helped us to produce using cheap low-purity materials and our material cost was on average CNY 46000/ton. This was very significant since we had to compete by offering cheaper dyes than SOEs'* (I.53; P.2).

Whereas the reception of functional knowledge from incumbent firms does facilitate startup creation and survival during the founding years, it does not account for longer-term performance differences in the startups that had acquired sufficient functional knowledge to make it through their infant stages. Chinese customers in the 1980s did not have many choices other than to *'accept any dyes that could color fabrics'* (I.13, 19, 27) in the generally undersupplied market. Meanwhile, technologies of dye products introduced by Chinese startups were all mature and *'readily copied or applied without much additional R&D effort'* (I.14). Given the favorable market condition and low technical entry barriers, a startup could not build an enduring edge on more or better functional knowledge received over its rivals who also received sufficient functional knowledge to keep themselves running



through the first few years. A new firm that received more of this knowledge was more likely to survive early years to the extent that this knowledge helped with tailored techniques, latest market information, supply of scarce materials and proper equipment, R&D management, and daily operation. However, a startup that received less (albeit enough to meet the basic requirement to stay in business) of this knowledge initially could enhance and extend its base of functional knowledge through learning by doing. The startup's inferiority in functional effectiveness during foundation, if stemming only from incumbent-to-startup knowledge flows, would disappear in the long run. Take procurement knowledge for example. The founder of FB said, '*Since we could use raw materials of relatively lower purity [to make cationic dyes], we had a bit [of an] advantage over some cationic dye makers in terms of finding and securing qualified suppliers. But other startups could gradually develop reliable suppliers of their own and catch up with us as long as they could find enough materials to stay in business through the early years. Our initial advantage based on external assistance no longer mattered then. It was especially so when the government began to lift the control over chemical distribution and the industry got rid of a nationwide raw material shortage by the late 1980s*' (L53). Likewise, the reception of less functional knowledge of other types during foundation would not hinder the long-term growth of startups. This partly explained why the six cases that all received sufficient functional knowledge and survived the first four years exhibited such different long-term performances. In sum, our case studies offer a conjecture to be investigated with a larger sample of firms:

*Generalized Conjecture 1: For startups in a technologically mature sector, incumbent-to-startup flows of functional knowledge during the foundation period increase the likelihood of short-term survival, but do not increase the likelihood of high performance in the long term.*

Contrary to our expectations based on existing literature, the strategic knowledge flowing from incumbents to startups in their founding years – a category of knowledge underexamined in prior studies – is of paramount importance for startups as they seek to create a sustained advantage in a technologically mature industry, although this knowledge does less for firms facing immediate survival challenges in the founding period. Several factors support this important distinction. First, the relative richness of initial strategic knowledge received did not set a startup apart until strategic moves equipped the firm with idiosyncratic characteristics (e.g., costs significantly lower than average competitors), especially when the industry flourished in the early-to-middle 1980s. At that time, a Chinese dye startup that met the low threshold requirements of functional effectiveness could achieve enough sales, survive, and even *grow* regardless of production scale, product quality, and cost structure. This can be seen from a comparison of early performance between SB and FB, both established in 1985–1986. As described above, SB received insightful strategic guidance from incumbent employees and acted on knowledge received during its founding years, while FB lacked such knowledge and made indiscriminate choices of products, manufacturing

trajectories, as well as investment decisions. However, this difference did not immediately translate into a difference in growth. As can be seen from Table 1, the number of employees in SB grew by 250% (from below 20 to over 70) in its first three years and FB exhibited an employment growth rate of 500% in its first four years (from below 10 to over 60). Two former SB employees said, *'It was not until 1993 [the eighth year of SB's existence] that we saw the good effects of early strategic investments to concentrate on the production of Reactive Blue 19. Before that we were still at the risk of being driven out of business as our costs were close to competitors'* (I.34, 35). This suggests that the initial absence of strategic knowledge did not determine which startups were likely to survive the founding period.

Second, the strategic knowledge received during foundation would substantially distinguish a startup from the strategically opportunistic competitors once the industry reached high production volumes and an industry-wide shake-out took place. In particular, when the Chinese dye market turned down sharply in 1988–1989, most Chinese dye firms tried to weather the unfavorable change by introducing more low-volume products. Yet, the two longer-term successful cases continued with their predetermined strategies and established strong cost advantages.

To be specific, receiving the **knowledge about the selection of products** during its foundation warned a startup against *'rushing into a product segment just for quick money'* (I.4) or *'putting indiscriminate efforts to make dyes that could bring in money right then'* (I.34). These insights enabled a startup to intentionally avoid being distracted by ephemeral profitability in the period of exuberance and to establish a product mix of dyes and key intermediates that fit with a low-cost/high-volume strategy. This allowed the startup to boost its market share in the forthcoming recession with a higher price/performance ratio. Combined with this type of knowledge, the **knowledge about the selection of technical trajectories** and the **knowledge about the making of scale-up decisions** shared by the incumbent employees equipped a startup with key strategic ideas. This enabled SA and SB to see what the priority of investments should be – an economy of scale, what products and technical trajectories were suitable for large-scale production, as well as the proper timing and rhythm of expansion. Following these principles, a startup could steadfastly consolidate a cost advantage and prepare to beat its competitors in a price war. By contrast, many other startups exhausted funds in a directionless and temporary expansion of random profitable products during the early years using prevailing or easily accessed technical trajectories. Their fate was destined by haphazard selections, and those that followed less promising choices were doomed to be quickly overwhelmed when the market tumbled. In sum, the eventual outcomes for a startup that survived the first few years are attributable to the strategic knowledge received, which guided the firm to avoid lower-value opportunities when higher-value ones existed, and it sets the direction in which the firm's functional efforts were aimed in its aftermath. In light of this, we develop a second conjecture to be tested with a larger sample of firms:

*Generalized Conjecture 2: For startups in a technologically mature sector, incumbent-to-startup flows of strategic knowledge during the foundation period do not increase the likelihood of short-term survival but do increase the likelihood of higher performance in the long term.*

It is imperative to rule out two alternative explanations for entrepreneurial superiority. The first one is that the startups ending up as winners are simply a function of the environmental change in the late 1980s rather than of superior knowledge. The key argument against this explanation is that the two winning startups altered their strategies with clear awareness that it is necessary to initiate new strategies before environmental changes had their full influence. The strategic knowledge received during foundation equipped the startups with ‘a superior ability to overcome focal behavioral bounds’ (Gavetti, 2012) and allowed them to make ‘long jumps’ (Levinthal, 1997) when environmental changes and new opportunities seemed distant. This is important regardless of whether environmental changes favored low-cost or specialization strategies.

The other alternative explanation relates to what can be called the ‘born superior hypothesis’. This hypothesis asserts that the higher long-term performance of a startup may not result from knowledge received during its foundation but may instead be a function of those endogenous characteristics that enabled it to perform well in the first place. These characteristics may include the ability of entrepreneurs to obtain financing, innovate, or manage a startup. Although our research design does not fully eliminate the effects of such factors, it is important to emphasize that we control for many of such potential confounding variables – i.e., finance, innovation, startup experiences, industry-specific experiences, and senior management experiences – by holding them as equal as possible across the six cases in the sampling process. Furthermore, these factors do not seem to influence our findings concerning the correlation between the knowledge received during foundation and a startup’s longer-term performance. We undertook additional interviews in 2017 to establish with even greater accuracy the early performance of our six cases. Data show the thriving cases in the long run did not necessarily outperform other cases during their founding years. For example, consider a longer-term successful firm (SB), a longer-term moderately surviving performer (MA), and a firm that failed in the longer term (FB) – all of which were created in 1985–1986. When performance is measured by the number of employees in the third or fourth year after their foundation, the three firms were still quite close in terms of employment size as shown in Table 1 (60–70 full-time employees). This lends support for our key finding that the reception of strategic knowledge from incumbent firms during a startup’s foundation plays a pivotal role in determining long-term success as compared to startups that performed well in the short and medium terms.

## DISCUSSION

We contribute to the knowledge inheritance theory and knowledge spillover theory of entrepreneurship research by clarifying the *type* of knowledge is central to

understanding the utility of incumbent-to-startup knowledge flows. Previous research indicates the importance of knowledge flows from incumbent firms, but it leaves unaddressed precisely *what* specific types of knowledge are received, which type of knowledge received accounts for superior performance in startups, and the rationale for why this would be so. To the best of our knowledge, our study is the first to explore these questions.

### **A Framework of Incumbent-to-Startup Knowledge Flows and Their Impacts on Startup Performance over Time**

This study develops a richly grounded framework for considering what types of knowledge flow from incumbents to startups and what influence of different types of knowledge have on the performance of startups over time. First, our findings reveal that startups receive two categories of knowledge – strategic and functional – from incumbent firms during their founding period. As reviewed above, existing literature on knowledge-inheriting spinoffs and knowledge spillover entrepreneurship rarely assesses the incumbent-to-startup knowledge flows *per se* but instead uses proxies such as the identity of knowledge holders and the longevity of incumbents (Andersson & Klepper, 2013; Dahl & Reichstein, 2007; Eriksson & Kuhn, 2006; Sørensen & Phillips, 2011). Meanwhile, the literature emphasizes technical knowledge and tends to ignore nontechnical knowledge. Few studies that also consider nontechnical knowledge typically focus on other types of functional knowledge (Adams et al., 2016; Klepper, 2001; Klepper & Sleeper, 2005) but do not touch upon *strategic* knowledge. By investigating the incumbent-to-startup knowledge flows directly and systematically, we bring this previously overlooked category into the foreground. Although many startups exploiting the knowledge of incumbent firms invoke technologies and relevant managerial skills, we find that some startups explicitly receive strategic knowledge from incumbents. This suggests the focus on technical knowledge or even functional knowledge alone is too limited and a broader and more nuanced exploration of incumbent-to-startup knowledge flows is appropriate.

Second and more importantly, different types of knowledge received from incumbent firms correspond with the shorter-term survival and longer-term sustained competitiveness of startups. Existing studies on incumbent-to-startup knowledge flows mainly relate to the positive effects of this phenomenon with respect to the formation and survival of startups but not much as to other performance indicators. We go beyond current literature to distinguish long-term prosperity from short-term survival and assess, in an explicit manner, how the two categories of knowledge influence startups. In doing so, we were surprised to find that, within our technologically mature industry, the commonly proposed advantages of receiving technical knowledge from incumbent firms during foundation (e.g., Basu et al., 2015; Franco & Filson, 2006; Gambardella et al., 2015; Sahaym et al., 2016) generally only address a startup's immediate survival as opposed to its enduring

competitiveness. By comparison, *strategic* knowledge received in the founding period drives a startup's long-term success although it does not necessarily facilitate a firm's immediate survival. These findings provide the first and strongest evidence whether knowledge passed from incumbent firms is generative of startup advantage and how long the advantage can last vary by the *type* of knowledge and span of time concerned; at its core, our research offers a revised and more detailed understanding of how incumbent-to-startup knowledge flows are associated with startup outcomes. We do this by separating different knowledge and tracing their different effects – competitive advantage versus competitive parity – over time.

### **Generalizability: Beyond Technologically Mature Industries and Beyond China**

As one of our reviewers pointed out, our single-industry exploratory study potentially suffers from low generalizability given that the focal industry represents an empirical context – technologically mature industries – that has not received as much attention in previous research on incumbent-to-startup knowledge flows. We expect that the first conjecture holds only for latecomer startups in technologically mature industries but not necessarily for emerging high-tech industries. However, the second conjecture strikes us as broadly generalizable to both technologically mature and high-tech sectors.

Our first conjecture is that incumbent-to-startup flows of functional knowledge during a startup's foundation increase the likelihood of short-term survival for that startup but do not increase the likelihood that the startup will achieve better long-term performance. This effect is probably idiosyncratic to mature technologies. As our interviewees agreed, there have been no radical product or process innovations in our focal industry since 1978. The prospect of specific technologies and the technical solution to achieve a specific strategy (e.g., an economy of scale) are predictable. The six startup cases and their Chinese peers founded in the 1980s are latecomers that imitate, reproduce, and exploit the technologies of an incumbent population (Aldrich & Martinez, 2001). Their technical differences regard mainly incremental improvements of existing technologies in a predictable direction, improvements which were not significant enough to change the technological environment or make a startup unique. Thus, it is difficult to build high technical barriers to entry and sustainable technology-based advantages in technologically mature industries, leaving sufficient room for latecomer startups to catch up technologically by adopting mature technologies from incumbents.

In a high-tech industrial setting, the reception of functional knowledge, in particular technical knowledge, probably also matters for startup's long-term performance. In this setting, startups that enter early and accumulate technical knowledge may have a strong advantage over latecomer startups that would find it extremely difficult to catch up. In most cases, early exposure to a broad scope of advanced

technical knowledge from incumbents would help an early startup recognize new high-potential technological opportunities, search externally for related technologies, create or recombine impactful technologies (Basu et al., 2015), and pioneer in unexpected shifts of favorable products. For example, extant research finds that exploiting the inventions that are patented but under-appropriated by incumbents strongly predicts corporate spinoff performance (Gambardella et al., 2015; Klepper & Thompson, 2010). Later startups would face strong competition not only from incumbents but also from earlier startups who are ahead in the learning curve and can more readily keep up with a fast-moving technological frontier. In sum, the utility of incumbent-to-startup flows of technical knowledge during a startup's foundation is conditional on the rate of technological change. Thus, our first conjecture probably applies only to technologically mature industries.

However, it is important to note that our key finding regarding the central and lasting role of incumbent-to-startup flows of strategic knowledge during foundation in the long run is broadly generalizable. A review of prior literature strengthens our confidence that the strategic knowledge received by startups bears more importance than the commonly emphasized technical knowledge for a startup's long-term outcomes even in new technology-intensive sectors. Without explicitly distinguishing strategic knowledge from functional knowledge, the studies on high-tech spinoffs have speculated that receiving nontechnical knowledge – for example, market-related know-how (Agarwal et al., 2004; Klepper & Sleeper, 2005) and knowledge on regulatory institutions (Chatterji, 2009) – may carry more value than technical knowledge. For example, Chatterji (2009) uses patent data to measure incumbent-to-spinoff flows of technical knowledge and finds the superior performance of corporate spinoffs is not driven by the delivery of this type of knowledge in the medical device industry. Interestingly, Chatterji's follow-up interviews with startup founders suggest the knowledge inherited from incumbents regarding how to choose appropriate strategies and how to identify market opportunities boosts the performance of spinoffs. While prior studies have merely conjectured based on unsystematic observations that nontechnical knowledge flows from incumbents are a more important contributing cause of startup performance than technical knowledge flows, we are the first to provide explicit evidence for what previously was only a speculation. The lack of strategic knowledge during the foundation period impedes a startup's effective deployment of its limited resources to source and utilize functional knowledge in a targeted persistent manner, which, as a result, hinders its subsequent development. Instead, the strategic knowledge passed from incumbents helps startups get positioned to adapt, utilize, and develop functional knowledge including technologies based on strategic understandings of where the industry is headed. This enables new firms to continually improve their knowledge base and performance in the most promising way. As this speculation originates from new, technology-intensive industries, and as we find evidence in a different context – a



technologically mature industry – our conclusions regarding the beneficial role of strategic knowledge for longer-term success appear broadly generalizable.

In addition, we are confident that our empirical context does not hinder or bias our findings. First, incumbent-to-startup knowledge flows, especially the flows of strategic knowledge, are not confined between SOEs and private startups under the particular conditions of a transition economy but a common phenomenon. While state ownership of incumbents and weak intellectual property protection in the 1980s China might have made the knowledge flows easier, incumbents of other ownership forms can also be effective sources of external knowledge for startups. In more market-type conditions prevalent in most advanced economies, there are several vehicles to ship knowledge from incumbents to startups. Typical examples may include not only spinoffs, which are founded by entrepreneurs employed by established firms before, but also incumbent employees walking with their knowledge to startups when incumbents downsize or go bankrupt. This can be found widely throughout the world, such as the talented engineers freed up over a decade of downsizing at Nokia bringing their expertise to new firms and generating a flourishing startup community in Oulu – the Finnish town where Nokia Electronics was located.

Second, the relative value of strategic knowledge would be even more revealing in other contexts where private entrepreneurship is endowed with stronger institutional support and a more developed technology and labor market than was present in 1980s China. As mentioned above, private startup founders in our focal industry, seeking to overcome initial knowledge scarcity, could not find reliable sources of knowledge other than incumbents. In other contexts where the sources of knowledge are more diverse, impacts of receiving strategic knowledge during foundation would remain the same for startups as long as incumbents housed the people who possessed and could share necessary knowledge. Furthermore, the relative value of functional knowledge from incumbents would tend to decrease under more market-oriented conditions since this knowledge can be sourced through market mechanisms more easily than strategic knowledge. For example, while technical knowledge can be purchased in the form of a patent, strategic knowledge typically resides in people and cannot be traded without the person moving between incumbent and startup. Nascent entrepreneurs, whether in transition economies (Xu, Lu, & Gu, 2014) or more developed economies, would thus find themselves in situations similar to their counterparts in China 30 years before, when the strategic knowledge received from incumbent firms tended to be more idiosyncratic and was more likely to yield long-term differences than functional knowledge would.

## Future Research

Our study provides a starting point for further empirical and theoretical investigation of the conjectured causal relationship between different types of incumbent-to-



startup knowledge flows and the short-term and long-term performance of those startups. Most importantly, we believe our findings on the importance of strategic knowledge for the long-term success of startups are broadly generalizable. A key task for future research is to confirm the robustness of this link.

First, efforts can be made to assess the strength of the connection between strategic knowledge derived from incumbents and the long-term success of startups across industries and within other domains. Our typology of different types of knowledge and their effects was induced from a grounded analysis of the technically mature synthetic-dye industry, but investigations in other contexts might reveal more types of knowledge and similar or different performance effects over time. The more contexts, in terms of technologies, industries, and knowledge sources studied, the more confident we can be in the explanatory reach and predictive power of our generalized conjecture.

Second, our study does not address the issue of startup's absorptive capacity explicitly even though we control for the differences in startup founder's properties by carefully sampling startups with identical founder backgrounds. Absorptive capacity (Cohen & Levinthal, 1989) plays a critical role in determining whether and how much a startup can recognize the value of external knowledge, assimilate it, and apply it to commercial ends. The relationship between incumbent-to-startup knowledge flows of the same type and the performance of startups may differ depending on the startup's absorptive capacity. This limitation is worth further exploration in future analyses.

Third, we recommend that future research be conducted into the dynamic process of knowledge transfer between incumbents and startups, as well as the impacting factors such as institutional changes over the process. While detailed insights to intra-organizational knowledge transfer as a process (Szulanski, 1996, 2000) are available, there are much fewer studies discussing explicitly the process of inter-organizational knowledge and even fewer on the specific process from incumbent to startups (Feldman et al., 2019). Our initial results invite further processual investigation to account for whether the eight types of knowledge, which vary in their tacitness and in other dimensions, possess different enablers and barriers when transferred from incumbents to startups. Future research should also look into what factors may enhance or hinder the process of transfer of each type of knowledge, and how the processes and contexts of knowledge transfer link to startup outcomes (Pettigrew, 1997). In particular, the roles of contextual factors such as local institutions and endogenous factors such as incumbent's response in the knowledge transfer process deserve attention. For instance, how the strength and forms of IPR protection affect the specific type and amount of knowledge transferred, the difficulties of knowledge transfer, and the adoption of knowledge from incumbents remain unknown. While some startups receiving knowledge confront hostility from incumbents and others get supported (Vaznyte, Andries, & Demeulemeester, 2021), the impact of incumbent reactions on the process of incumbent-startup knowledge, as well as how the impact may

vary across the type of knowledge and over different time periods, also warrants research.

Fourth, while our study thoroughly evaluated the types of knowledge that are explicitly passed, as well as the impact of those types of knowledge, to further guard against retrospective biases and maturation effects, a crucial next step in this research agenda would be to trace inward-knowledge flows and their impact in a real-time environment, from a startup's inception through its maturation and to its demise. Only such forward-looking studies, where one would follow firms in real time without knowing the end result, would convince skeptics to accept our causal conjecture that the possession of strategic knowledge improves long-term performance.

## SUPPLEMENTARY MATERIAL

The supplementary material for this article can be found at <https://doi.org/10.1017/mor.2021.77>.

## NOTES

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- [1] In October 1992, the 14th Congress of the Chinese Communist Party officially endorsed a 'socialist market economy' and declared that market mechanisms must be extended to almost all industrial sectors. From this date forward, the private sector has been officially endorsed by the central government.
- [2] Many of the Zhejiang-based private dye firms of the 1980s were under the *de facto* control of private owners but guised as collectively owned enterprises to lower the potential political and economic risks. We refer to these firms (including the six cases in this study) also as privately owned.
- [3] All names in this study are aliases.
- [4] We obtained a copy of the book and had a German dye chemist confirm that the instructions in it are very helpful for learning to make dyes.
- [5] Another dye, Reactive Blue 198, was added to SB's product line later but remained trivial in terms of output.
- [6] When the planned economic regime was still in place in China, enterprises and deals could be divided into those that were part of government plans and those that were not. SOEs were all in the plans, and they had to sell their planned outputs at 'inside-plan price' which was also set by the government.

- [7] This threshold was set based on the fact that ‘a *lentine system with an annual capability of 5,000-tons could break even and keep running on its own when SA consumed 2,000 tons of lentine a year*’, even if they ‘could not find any clients for lentine’ (I.4).

## DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article and the Supplementary Appendix.

## REFERENCES

- Acs, Z. J., Audretsch, D. B., & Lehmann, E. E. 2013. The knowledge spillover theory of entrepreneurship. *Small Business Economics*, 41(4): 757–774.
- Adams, P., Fontana, R., & Malerba, F. 2016. User-industry spinouts: Downstream industry knowledge as a source of new firm entry and survival. *Organization Science*, 27(1): 18–35.
- Agarwal, R., Campbell, B. A., Franco, A. M., & Ganco, M. 2016. What do I take with me? The mediating effect of spin-out team size and tenure on the founder-firm performance relationship. *Academy of Management Journal*, 59(3): 1060–1087.
- Agarwal, R., Echambadi, R., Franco, A. M., & Sarkar, M. 2004. Knowledge transfer through inheritance: Spin-out generation, development, and survival. *Academy of Management Journal*, 47(4): 501–522.
- Aldrich, H. E., & Martinez, M. 2001. Many are called, but few are chosen: An evolutionary perspective for the study of entrepreneurship. *Entrepreneurship Theory and Practice*, 25(4): 41–56.
- Alford, W. P. 1995. *To steal a book is an elegant offense: Intellectual property law in Chinese civilization*. Stanford, CA: Stanford University Press.
- Andersson, M., & Klepper, S. 2013. Characteristics and performance of new firms and spinoffs in Sweden. *Industrial and Corporate Change*, 22(1): 245–280.
- Andersson, M., Baltzopoulos, A., & Löf, H. 2012. R&D strategies and entrepreneurial spawning. *Research Policy*, 41(1): 54–68.
- Audretsch, D. B., & Belitski, M. 2013. The missing pillar: The creativity theory of knowledge spillover entrepreneurship. *Small Business Economics*, 41(4): 819–836.
- Basu, S., Sahaym, A., Howard, M. D., & Boeker, W. 2015. Parent inheritance, founder expertise, and venture strategy: Determinants of new venture knowledge impact. *Journal of Business Venturing*, 30(2): 322–337.
- Bingham, C. B., & Eisenhardt, K. M. 2011. Rational heuristics: The ‘simple rules’ that strategists learn from process experience. *Strategic Management Journal*, 32(13): 1437–1464.
- Buenstorf, G., & Fornahl, D. 2009. B2C-bubble to cluster: The dot-com boom, spin-off entrepreneurship, and regional agglomeration. *Journal of Evolutionary Economics*, 19(3): 349–378.
- Buenstorf, G., & Klepper, S. 2009. Heritage and agglomeration: The Akron tyre cluster revisited. *The Economic Journal*, 119(573): 705–733.
- Cantù, C. 2017. Entrepreneurial knowledge spillovers: Discovering opportunities through understanding mediated spatial relationships. *Industrial Marketing Management*, 61: 30–42.
- Chatterji, A. K. 2009. Spawned with a silver spoon? Entrepreneurial performance and innovation in the medical device industry. *Strategic Management Journal*, 30(2): 185–206.
- Cohen, W. M., & Levinthal, D. A. 1989. Innovation and learning: The two faces of R&D. *Economic Journal*, 99(397): 569–596.
- Cooper, A. C., Gimeno-Gascón, F. J., & Woo, C. Y. 1994. Initial human and financial capital as predictors of new venture performance. *Journal of Business Venturing*, 9(5): 371–395.
- Creswell, J. W. 1994. *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.
- Cross, R., Borgatti, S. P., & Parker, A. 2001. Beyond answers: Dimensions of the advice network. *Social Networks*, 23(3): 215–235.
- Dahl, M. S., & Reichstein, T. 2007. Are you experienced? Prior experience and the survival of new organizations. *Industry and Innovation*, 14(5): 497–511.

- Dahl, M. S., & Sorenson, O. 2013. The who, why, and how of spinoffs. *Industrial and Corporate Change*, 23(3): 661–688.
- Delmar, F., & Johan, W. 2008. The effect of small business managers' growth motivation on firm growth: A longitudinal study. *Entrepreneurship Theory and Practice*, 32(3): 437–458.
- Dencker, J. C., Gruber, M., & Shah, S. K. 2009. Pre-entry knowledge, learning, and the survival of new firms. *Organization Science*, 20(3): 516–537.
- Di Lorenzo, F., & van de Vrande, V. 2019. Tapping into the knowledge of incumbents: The role of corporate venture capital investments and inventor mobility. *Strategic Entrepreneurship Journal*, 13(1): 24–46.
- Eisenhardt, K. M. 1989. Building theories from case study research. *Academy of Management Review*, 14(4): 532–550.
- Eisenhardt, K. M., & Graebner, M. E. 2007. Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1): 25–32.
- Elfenbein, D. W., Hamilton, B. H., & Zenger, T. R. 2010. The small firm effect and the entrepreneurial spawning of scientists and engineers. *Management Science*, 56(4): 659–681.
- Eriksson, T., & Kuhn, J. M. 2006. Firm spin-offs in Denmark 1981–2000 – Patterns of entry and exit. *International Journal of Industrial Organization*, 24(5): 1021–1040.
- Feldman, M. P., Ozcan, S., & Reichstein, T. 2019. Falling not far from the tree: Entrepreneurs and organizational heritage. *Organization Science*, 30(2): 337–360.
- Fraenkel, J. R., & Wallen, N. E. 1996. *How to design and evaluate research in education*. New York: McGraw-Hill.
- Franco, A. M., & Filson, D. 2006. Spin-outs: Knowledge diffusion through employee mobility. *The RAND Journal of Economics*, 37(4): 841–860.
- Fryges, H., Müller, B., & Niefert, M. 2014. Job machine, think tank, or both: What makes corporate spin-offs different? *Small Business Economics*, 43(2): 369–391.
- Fryges, H., & Wright, M. 2014. The origin of spin-offs: A typology of corporate and academic spin-offs. *Small Business Economics*, 43(2): 245–259.
- Furlan, A. 2016. Who lives longer? Startups vs spinoffs founded as proprietorships. *International Journal of Entrepreneurial Behavior & Research*, 22(3): 416–435.
- Furlan, A., & Cainelli, G. 2020. Spinoffs or startups? The effects of spatial agglomeration. *Industrial and Corporate Change*, 29(6): 1451–1470.
- Furlan, A., & Grandinetti, R. 2016. Spinoffs and their endowments: Beyond knowledge inheritance theory. *Journal of Intellectual Capital*, 17(3): 570–589.
- Gambardella, A., Ganco, M., & Honoré, F. 2015. Using what you know: Patented knowledge in incumbent firms and employee entrepreneurship. *Organization Science*, 26(2): 456–474.
- Gavetti, G. 2012. Toward a behavioral theory of strategy. *Organization Science*, 23(1): 286–287.
- Ghio, N., Guerini, M., Lehmann, E. E., & Rossi-Lamastra, C. 2015. The emergence of the knowledge spillover theory of entrepreneurship. *Small Business Economics*, 44(1): 1–18.
- Gifford, E., Buenstorf, G., Ljungberg, D., McKelvey, M., & Zaring, O. 2021. Variety in founder experience and the performance of knowledge-intensive innovative firms. *Journal of Evolutionary Economics*, 31: 677–713.
- Gilbert, B. A., McDougall, P. P., & Audretsch, D. B. 2008. Clusters, knowledge spillovers and new venture performance: An empirical examination. *Journal of Business Venturing*, 23(4): 405–422.
- Glaser, B. G., & Strauss, A. L. 2017. Theoretical sampling. In N. K. Denzin (Ed.), *Sociological methods: A sourcebook*: 105–114. New York: Routledge.
- Grant, R. M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(S2): 109–122.
- Hill, J., McGowan, P., & Drummond, P. 1999. The development and application of a qualitative approach to researching the marketing networks of small firm entrepreneurs. *Qualitative Market Research: An International Journal*, 2(2): 71–81.
- Jiang, H., & Murmann, J. P. 2012. Regional institutions, ownership transformation, and migration of industrial leadership in China: The case of the Chinese synthetic dye industry, 1978–2008. *Industrial and Corporate Change*, 21(4): 933–970.
- Kirchhoff, B. A. 1994. *Entrepreneurship and dynamic capitalism*. Westport, CT: Praeger.
- Klepper, S. 2001. Employee startups in high-tech industries. *Industrial and Corporate Change*, 10(3): 639–674.
- Klepper, S. 2002. The capabilities of new firms and the evolution of the US automobile industry. *Industrial and Corporate Change*, 11(4): 645–666.

- Klepper, S., & Sleeper, S. 2005. Entry by spinoffs. *Management Science*, 51(8): 1291–1306.
- Klepper, S., & Thompson, P. 2010. Disagreements and intra-industry spinoffs. *International Journal of Industrial Organization*, 28(5): 526–538.
- Knoben, J., Ponds, R., & Van Oort, F. 2011. Employment from new firm formation in the Netherlands: Agglomeration economies and the knowledge spillover theory of entrepreneurship. *Entrepreneurship & Regional Development*, 23(3–4): 135–157.
- Kostova, T. 1999. Transnational transfer of strategic organizational practices: A contextual perspective. *Academy of Management Review*, 24(2): 308–324.
- Lasch, F., Robert, F., & Le Roy, F. 2013. Regional determinants of ICT new firm formation. *Small Business Economics*, 40(3): 671–686.
- Levinthal, D. A. 1997. Adaptation on rugged landscapes. *Management Science*, 43(7): 934–950.
- Lincoln, Y. S., & Guba, E. G. 1985. *Naturalistic inquiry*. Newbury Park, CA: Sage.
- Maliranta, M., Mohnen, P., & Rouvinen, P. 2009. Is inter-firm labor mobility a channel of knowledge spillovers? Evidence from a linked employer–employee panel. *Industrial and Corporate Change*, 18(6): 1161–1191.
- Miles, M. B., & Huberman, M. 1994. *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage Publications.
- Minola, T., Hahn, D., & Cassia, L. 2021. The relationship between origin and performance of innovative start-ups: The role of technological knowledge at founding. *Small Business Economics*, 56(2): 553–569.
- Moorman, C., & Miner, A. S. 1998. Organizational improvisation and organizational memory. *Academy of Management Review*, 23(4): 698–723.
- Muendler, M.-A. A., Rauch, J. E., & Tocoian, O. 2012. Employee spinoffs and other entrants: Stylized facts from Brazil. *International Journal of Industrial Organization*, 30(5): 447–458.
- Patton, M. Q. 2015. *Qualitative research and evaluation methods: Integrating theory and practice*. Thousand Oaks, CA: Sage Publications.
- Pettigrew, A. W. 1997. What is a processual analysis? *Scandinavian Journal of Management*, 13(4): 337–348.
- Phillips, D. J. 2002. A genealogical approach to organizational life chances: The parent-progeny transfer among Silicon Valley law firms, 1946–1996. *Administrative Science Quarterly*, 47(3): 474–506.
- Plummer, L. A., & Acs, Z. J. 2014. Localized competition in the knowledge spillover theory of entrepreneurship. *Journal of Business Venturing*, 29(1): 121–136.
- Rosenkopf, L., & Schilling, M. A. 2007. Comparing alliance network structure across industries: Observations and explanations. *Strategic Entrepreneurship Journal*, 1(3–4): 191–209.
- Sahaym, A., Howard, M. D., Basu, S., & Boeker, W. 2016. The parent's legacy: Firm founders and technological choice. *Journal of Business Research*, 69(8): 2624–2633.
- Santarelli, E., & Tran, H. T. 2012. Growth of incumbent firms entrepreneurship in Vietnam. *Growth and Change*, 43(4): 638–666.
- Santos, F. M., & Eisenhardt, K. M. 2009. Constructing markets and shaping boundaries: Entrepreneurial agency in nascent fields. *Academy of Management Journal*, 52(4): 643–671.
- Sørensen, J. B. 2007. Bureaucracy and entrepreneurship: Workplace effects on entrepreneurial entry. *Administrative Science Quarterly*, 52(3): 387–412.
- Sørensen, J. B., & Phillips, D. J. 2011. Competence and commitment: Employer size and entrepreneurial endurance. *Industrial and Corporate Change*, 20(5): 1277–1304.
- Strauss, A. L., & Corbin, J. 1998. *Basics of qualitative research*, 2nd ed. Thousand Oaks, CA: Sage Publications.
- Stuart, T. E., & Sørensen, O. 2003. Liquidity events and the geographic distribution of entrepreneurial activity. *Administrative Science Quarterly*, 48(2): 175–201.
- Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17(1): 27–43.
- Szulanski, G. 2000. The process of knowledge transfer: A diachronic analysis of stickiness. *Organizational Behavior and Human Decision Processes*, 82(1): 9–27.
- Tsang, E. W. K., & Kwan, K.-M. 1999. Replication and theory development in organizational science: A critical realist perspective. *Academy of Management Review*, 24(4): 759–780.
- Vaznyte, E., Andries, P., & Demeulemeester, S. 2021. “Don’t leave me this way!” Drivers of parental hostility and employee spin-offs’ performance. *Small Business Economics*, 57(1): 265–293.

- Wennberg, K., Wiklund, J., & Wright, M. 2011. The effectiveness of university knowledge spillovers: Performance differences between university spinoffs and corporate spinoffs. *Research Policy*, 40(8): 1128–1143.
- Wezel, F. C., Cattani, G., & Pennings, J. M. 2006. Competitive implications of interfirm mobility. *Organization Science*, 17(6): 691–709.
- Xu, D., Lu, J. W., & Gu, Q. 2014. Organizational forms and multi-population dynamics: Economic transition in China. *Administrative Science Quarterly*, 59(3): 517–547.
- Yeganegi, S., Laplume, A. O., Dass, P., & Huynh, C. L. 2016. Where do spinouts come from? The role of technology relatedness and institutional context. *Research Policy*, 45(5): 1103–1112.
- Yin, R. K. 1994. *Case study research: Design and methods*. Newbury Park, CA: Sage Publications.

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