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Candidate: Ge Zehui
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本论文经答辩委员会全体委员审查，确认符合上海大学博士学位论文质量要求.

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答辩委员会对论文的评语

论文《基于研发协作和供应链管理的企业竞合研究》的选题具有重要的理论价值和实际意义。

论文探讨了企业间竞争与合作的可能模式，梳理示横向协议竞合、纵向协议竞合，非协议竞合以及松散的竞合四种类型对协议竞合，证明了在同等溢出水平下具有横向关系的企业结成联盟是最有效的组织关系，提出了供应链中的企业应该结合自身的谈判能力和技术关系水平选择相应的伙伴和组织形式进行研发协作。对非协议竞合，证明了纳什均衡的存在性，并提出了“领导者应该利他，追随者可以利己”的管理见解。对更松散的研发竞合，提出了偏好弃利和平衡决策束的概念，发现了一定条件下弃利向量是凸集并存在最小弃利点其研究成果具有创新性。

论文结构合理，层次清晰，论证充分。说明作者掌握了坚实宽广的基础理论和系统深入的专门知识，具有独立从事科学研究的能力。

答辩中阐述清晰，回答问题正确。经答辩委员会无记名投票，一致通过答辩，建议授予葛泽慧同学管理学博士学位。

答辩委员会表决结果

全票通过，建议授予葛泽慧管理学博士学位。

答辩委员会主任签名：王效俐

2007年7月17日

摘　要

在现实中，企业经常要面临跨区域、跨产业、跨文化、跨系统的运营管理与战略决策问题. 在如此复杂的经济环境中，企业间构成了竞争与合作共存的组织关系，本文称之为竞合. 企业间的竞合现象形式多样，无处不在，然而对它的研究才刚刚起步.

在目前有关竞合现象的研究中，存在两种理论基础，我们称之为个体理性和集体理性. 在研究方法上同时考虑个体理性和集体理性、对竞合现象进行部分地定量分析的文献还不是很多. 而这种工作对于企业的管理和决策实践非常重要. 因此，本文以研发协作和供应链管理为背景，同时考虑企业的个体理性和集体理性，对企业之间的竞合现象进行了初步探讨，得出了一些具有理论指导意义和应用价值的结果.

本文依照横向协议竞合、纵向协议竞合、非协议竞合以至更松散的竞合四种类型，对研发协作和供应链管理领域内的企业间竞合现象进行了定量分析.

一、基于协议的横向竞合关系

多个面临同一市场的竞争者协作组织研发是常见的具有协议约束的横向竞合现象. 关于横向研发协作的研究，本文主要围绕以下两点进行：(1) 如何系统地、全面地考察，哪些因素在协作研发决策中非常重要？它们又是如何影响企业的决策？(2) 如何建立一种理性模式，揭示企业竞争与合作共存的动机？

我们将市场份额与投资份额视作相互独立的决策项，并消

除企业的事前对称性假设. 同时,为了体现企业的合作动机,本文引入虚拟局中人的概念. 通过考虑虚拟局中人和真实局中人共同参与的博弈,在弱于传统二阶段研发合作博弈模型的条件下,我们发现在研发协作团体中较高的研发投入份额必须通过较高的市场份额保证. 进一步,本文得出了与传统观点不同的两个主要结论:(1) 同等溢出水平下,研发卡特尔优于其他的研发模式. 进而我们指出,这种优越性源于合作与竞争共存,即我们对集体理性和个体理性的同时考虑. 同时,对集体利益的关注也使得企业之间的互动关系变得复杂,取决于多种效应相综合的结果;(2) 在引入企业吸收能力和成本减少函数之后,知识溢出水平起着双重但仍然是非常重要的作用,特别是企业在能够内生化技术溢出水平时. 当企业提升研发协作团体内部的溢出水平时,企业自身的特征,诸如吸收能力、风险规避度、市场竞争等,严重影响着企业的研发决策.

二、基于协议的纵向竞合关系

本文在这一部分考察了由一个上游企业和一个下游企业所组成的二级供应链所面临的研发合作与生产销售竞争. 进一步,本文集中研究两点内容:(1) 企业谈判能力对企业伙伴选择所造成的影响;(2) 企业的合作模式选择问题.

本文在更广泛的应用背景下论证了几种研发合作模式定义的合理性,以及企业如何选择合作模式. 首先,伙伴选择的均衡结果是企业将选择与自身谈判能力相近的企业结成研发卡特尔,因此两者在总体利润中被重视的程度几乎相同. 其次,我们还分析了企业如何根据自身的技术贡献水平和知识溢出水平而选取适当的合作模式.

三、非协议竞合关系

在这一部分,我们从两个层面考察由一个制造商和一个零

售商所组成的供应链内的竞争与合作共存现象.一个是决策层面上的,它涉及批发定价、零售定价、商品订购、上游企业的品牌广告以及下游企业的销售努力等决策变量.在这些变量中,批发价决策将招致企业之间的竞争性行为,而企业努力水平的提高是完全利于合作的.这两种类型的变量在供应链中同时存在.另一个层面是关于企业效用的,在本文中通过引入企业的利己偏好来体现.此时,供应链中的企业不仅考虑自身利润,而且考虑伙伴(或者竞争者)的利润.除此之外,分散供应链和集成供应链情形也在本章中得到研究,并将三者进行比较.我们通过求解一个关于增广边际利润的单变量方程,给出这三种情形的纳什均衡存在性及其求解方法.在三种情形中,竞合供应链的绩效和订购水平处于另两者之间,是一种中间状态.进一步,我们还分析了利己偏好对企业决策和利润的影响.最后的数值分析证实了相应的理论结果,而且得出了一些理论分析所不能完成的重要结论.我们的一个主要的管理见解为:为提高供应链整体的绩效,作为领导者的制造商更应该利他,而作为追随者的零售商只需依照利己行事即可.

四、更松散的竞合关系

企业之间除了通过事前沟通而达成合作外,也可以依赖对社会规范、文化、价值等的理解与认同来促成非正式的合作(默会合作)形成更为松散的竞合关系.本文在这一部分指出,默会合作具有规则模糊性、高度的主体相关性、双重性、决策分散性等特点;同时,企业的合作动机不仅来自互惠从属关系或者避免相互报复,还来自对总体利益的关注.因此,我们引入虚拟局中人以体现总体利润的多少,同时提出偏好弃利和 η-平衡决策束的概念,并研究了弃利向量集的结构.结果发现在一定条件下企业的弃利向量集是凸集,而且在合作企业的偏好弃利具有

不变权重的条件下，系统存在唯一的最小弃利点，以达成或维持默会合作.

总之，针对具体的应用背景，对集体理性和个体理性的同时考虑，是本文的重要创新之一. 通过对具体问题建立模型并进行定量分析，本文得出了有意义的理论与试验结果以及管理见解，其中某些观点区别于传统的观点.

关键词 竞合，研发，供应链管理，个体理性，集体理性

Abstract

In reality, firms often face inter-area, inter-industry, inter-culture, or inter-system problems in operational managements and strategic decisions. Then, firms in such a complex context form an organizational relationship in which cooperation and competition coexist. This relationship is called coopetition, which is still under-researched.

In the literature on coopetition, there are two separate theories, called individual rationalization and collective rationalization. Yet, there is few study synthesizing these two theories and giving quantitative analysis. Since it is very important and meaningful to management practices for firms, we study the coopetition at firm level. By incorporating collective rationality with individual one, we find some theoretical results and practical insights based on R&D collaboration and supply chain management.

In the thesis, we give quantitative analysis on firms' coopetition in R&D collaboration and in supply chain management, including horizontal coopetition with contract, vertical coopetition with contract, coopetition without contract, and a looser coopetitive relationship.

Ⅰ. Horizontal coopetition with contract

Firms in the same industry may cooperate in R&D

activities while compete in the future market after R&D success. This is a familiar horizontal coopetition with contract in the literature. In this thesis, we mainly focus on two issues: (1) how to investigate the determinants of R&D cooperation systematically? and (2) how to rationalize firms' utilities to reveal the two incentives: cooperative and competitive?

In this part, we study the strategic R&D collaboration by introducing a virtual player to reveal cooperative incentives, dispelling ante-symmetries, and keeping investment shares and market shares independent of each other. We show that high R&D investments must incur high market shares. Not consistently with the prevailing viewpoint, we also get two main findings as follows.

(1) The superiority of the R&D cartel is due to the coexistence of cooperation and competition, i. e., the existence of the virtual player. Moreover, firms' inter-actions become more complex when the collective interests are considered, depending on the integration of multiple effects.

(2) After introducing the firm-specific absorptive capacity and the cost-reducing function, we claim that the spillover level plays a dual but still significant role in deciding the R&D investment. Firms take different actions on the R&D investment when the spillovers are endogenous. Namely, when firms in a RJV or a cartelized RJV increase the spillover level, whether or not they increase their investment with spillovers are determined by the firm-specific

determinants such as the absorptive capacity, the market competition, the degree of risk-aversion, etc.

Ⅱ. Vertical coopetition with contract

We study a two-level supply chain composed of an upstream firm and a downstream firm which cooperate in R&D while compete in production and retaining. Moreover, we mainly investigate: (1) the effects of the firm's bargaining power on his partner selection, and (2) how to select a cooperative mode.

Under an extended setting, we prove the validity of several modes of R&D cooperation, extensively used in the literature, and solve how to select the mode. First, the equilibrium result on the partner selection is that the firms with close bargaining powers will form an R&D cartel, which in turn leads to equal weights in collective interests. Second, a firm selects an appropriate mode according to his technological contributions and his spillovers of knowledge.

Ⅲ. Coopetition without contract

In this part, two levels of the coopetition are studied in a supply chain consisting of one manufacturer and one retailer. One is in the decision level where such decision variables as wholesale price, retailer price, order quantity, and advertising/sales efforts are involved. Here, the wholesale price is completely for competition while the advertising/sales efforts are completely for cooperation. But both of these two types of decisions coexist in the supply chain. The other level of the coopetition is in the utilities of the firms in the supply

chain by introducing egoistic preferences for them. Then, each firm in the supply chain will consider not only his/her own profit but also his partner/competitor's profit. We call it coopetition scenario. Besides coopetition scenario, both the integrated (i.e., centralized) and the decentralized scenarios are also studied. We show the existence of Nash equilibria for these three scenarios, and obtain the Nash equilibria by solving a one-variable equation for both the manufacturer and the retailer. We show that the performance under the coopetition is a mediacy between those of the decentralization and the integration. We analyze the effect of the egoistic preferences on the Nash equilibria for the coopetition scenario. Finally, numerical analysis illustrated the relative results we obtained. Furthermore it is illustrated that it will be better for the supply chain and the retailer if the manufacturer is altruistic and the retailer is egoistic, and that it will be better for the supplier if she gives such policy as "share".

Ⅳ. A looser coopetitive relationship

Besides formal cooperation which depends on ex ante communications, firms can cooperate unformally through tacit understanding and agreement on social norms, culture, values, and beliefs, etc. Such a cooperation is called tacit cooperation, which has four significant characters: fuzzy behavior patterns, high dependence on subjects, duality, and decision decentralization. This paper shows that cooperative incentives come from not only reciprocal subordination (or

the avoidance of reciprocal retaliation), but also the concern about the total profits. Therefore, a virtual player whose utility is the total profits is introduced. Furthermore, the contributive preferences to collaboration and the η - balanced strategic bundle are defined. By studying on the structure of the set of the contributive preferences to collaboration, we show that the set of firms' contributive preferences to collaboration is convex. Under some conditions, all of the optimal contributive preferences to collaboration must be in the same isometric super-surface of a convex function.

All in all, it is one of our contributions to consider individual rationality and collective rationality simultaneously. By modeling and quantitatively analyzing the problems in R&D collaboration and in supply chain management, we give some meaningful theoretical and numerical results and some management insights, which are different with traditional opinions.

Key words coopetition, research and development, supply chain management, individual rationality, collective rationality