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MPIfG Discussion Paper 08/6

On the Discrepancies between Macro and Micro Level Identification of Competitive Strategies

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Abstract

As economic internationalization advances, the question of how firms cope with increasing pressure for competitiveness gains momentum. While scholars agree that firms need a competitive advantage, they debate whether firms exploit the comparative advantage of their economy and converge on that strategy facilitated by national institutions. "No," argue strategic management proponents of the resource-based view. "Yes," claim contributors to the competitiveness literature. My micro-level studies of these opposing views show that firms within one economy do not converge on the institutionally supported strategy. The discrepancies between these findings and the analyses of the competitiveness literature are attributed to differences in the indicators employed to measure corporate strategies. Whenever macro-level indicators are used, the related loss of information on micro-level variety entails that convergence effects are more pronounced – possibly exaggerated.

Zusammenfassung

Mit voranschreitender Internationalisierung von Wirtschaftsbeziehungen gewinnt die Frage an Bedeutung, wie Unternehmen mit steigendem Wettbewerbsdruck umgehen. Zwar stimmen Wissenschaftler überein, dass Firmen eines Wettbewerbsvorsprungs bedürfen. Doch herrscht Uneinigkeit darüber, ob Unternehmen dazu den komparativen Vorteil ihres Landes nutzen und sich auf die institutionell geförderte Strategie stützen. „Nein", argumentieren Managementstrategen als Vertreter der marktorientierten Sichtweise. „Ja", halten Anhänger der Wettbewerbsliteratur dagegen. Die von mir vorgeschlagenen Mikroanalysen zeigen, dass sich Unternehmen innerhalb eines Landes nicht auf die institutionell geförderte Wettbewerbsstrategie spezialisieren. Unterschiede zwischen meinen Ergebnissen und denen der Wettbewerbsliteratur führe ich auf die unterschiedlichen Indikatoren zurück, mit denen Unternehmensstrategien ermittelt werden. Immer wenn Makroindikatoren verwendet werden, führt der damit einhergehende Informationsverlust bezüglich der Vielfalt von Unternehmen auf der Mikroebene dazu, dass die Spezialisierung in derselben Strategie betont – vielleicht überschätzt – wird.

Contents

Introduction

How do firms adapt to the pressures of increasing international competition? Do they exploit the comparative advantage offered by national institutions[1] and converge on the facilitated competitive strategy? Agreement is broad among scholars of competitiveness that firms need a sustainable *competitive advantage* if they want to succeed in their business in the long run. Firms need to pursue a strategy through which they achieve superior performance to their competitors by offering special value to customers (Kogut 1985; Porter 1985; Barney 1991: 102–103; Teece et al. 1997; Walker 2003: 17–18). Customer value can be provided in the form of an entirely new, an improved, or a low-cost product (Porter 1985; Grant 1998: part III; Hall and Soskice 2001a: 36–44; Walker 2003: 20–34, see also section 2.1).

However, disagreement concerns the question of whether firms should use the *comparative advantage* of their institutional environment as the main source of *competitive advantage*. Should firms choose their competitive strategy in line with national institutions? "No," argue advocates of the "resource-based view" (henceforth RBV). Firms need to exploit their individual resources in order to distinguish themselves from competitors. Only if they use their exclusive capabilities can firms gain competitive advantage and implement a value-creating strategy not imitated by their rivals (e.g. Rumelt 1984; Wernerfelt 1984; Barney 1991; Conner 1991; Peteraf 1993; Barney and Clark 2007; Newbert 2007).

"Yes," claim proponents of the convergence argument[2] – including scholars of classical and neoliberal trade theory,[3] the market-based view within strategic management studies,[4] the literature on national innovation systems,[5] and the varieties-of-capitalism literature.[6] Since national institutions provide specific types of input factors – most importantly finance and labor qualifications – which, in turn, facilitate specific strategies, firms maximize their competitiveness if they choose the particular strategy supported by national institutions.

This article seeks to assess the two opposing arguments by asking: Do firms within one economy converge on the same competitive strategy? To answer this question,

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1 In line with Streeck and Thelen (2005: 9–16), I understand institutions as "formalized rules that may be enforced by calling upon a third party" (Streeck/Thelen 2005: 10).

2 It should be noted that the term "convergence" is understood here more from a strategic management perspective than a political economic one. More concretely, it means that the plurality or majority of firms *within* one economy pursue, or specialize in, the same competitive strategy. It is thus not to be understood in the sense of the convergence debate of political economy studies which analyze convergence effects *across* economies.

3 See, for example Heckscher (1919); Ohlin (1933); Lindbeck/Snower (2001); Sinn (2005).

4 Porter (1987, 1990) is to be named as the most important proponent of this view.

5 See Pavitt/Patel (1999); Lundvall/Maskell (2000); Casper/Matraves (2003); Casper/Whitley (2004).

6 See in particular Hall/Soskice (2001b); Amable (2003); Hancké/Herrmann (2007).

the strategies of pharmaceutical firms in the UK, Germany, and Italy are identified.[7] Here, my analysis differs from most competitiveness studies in that the latter measure competitive strategies mostly through macro-level indicators, i.e. by using a firm's *industry* as a proxy for its strategy. For example, they interpret participation in an innovative industry as an indicator of firms pursuing an innovative strategy, while participation in a non-innovative industry is taken as an indicator of firms pursuing a non-innovative strategy. Contrary to these conventional approaches, strategies are identified here at the micro level, i.e. by considering the *technology intensity* of pharmaceutical firms. This makes it possible to reveal how many firms pursue the same strategies across *and* within different economies. Will this micro-level assessment support the strategy convergence argument?

While the answer, in short, is "no," the particularly interesting aspect about this answer is its reason. The latter is of a methodological nature and consists in the loss of information that is related to the use of macro-level indicators as proxies for firms' competitive strategies. Since competitiveness scholars have based their argument mostly on studies which use macro-level indicators, the related loss of information on micro-level variety explains why these studies reveal pronounced convergence effects. The micro-level measure employed here, combining a firm's product novelty and its value-chain focus, demonstrates that variety in the pursuit of different strategies is more pronounced than the use of macro-level indicators can reveal.

To illustrate this argument, the remainder of this article is organized as follows. Section 1 conceptualizes competitive strategies and develops the theoretical framework, illustrating why we should expect strategy convergence within economies. Section 2 develops the analytical framework: It operationalizes competitive strategies and suggests a novel approach to identifying strategies at the micro level. This approach is applied in section 3 when one of the largest pharmaceutical databases is sampled. Building on the insights obtained, the summary assessment of section 4 casts doubt on the convergence idea. Section 5 summarizes and interprets the previous findings.

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7 It should be noted that I follow the commonly acknowledged definitions here and distinguish between a pharmaceutical firm, a biotechnology firm, a traditional pharmaceutical firm, and a generics firm as follows. A "pharmaceutical firm" is an umbrella term for any company that is active in the drugs industry, including biotechnology, traditional pharmaceutical, and generics firms. Consequently, a company is identified as a pharmaceutical firm on the basis of the *product* it manufactures, namely a drug that cures or alleviates a disease. The distinction between a biotechnology firm, a traditional pharmaceutical firm, and a generics firm is however made on the basis of the company's *technological approach*. Thus, "biotechnology firms" are said to employ the most modern technology as they use processes on the level of the cell and sub-cell to create industrially useful substances. While "traditional pharmaceutical firms" are aware of, and also resort to, biotechnological opportunities, they tend to use experimental and, hence, less deliberate approaches to drug design. Finally, "generics firms" are the least technology-intensive, as they do not engage in any research and clinical development activities. Instead, they imitate drugs as soon as their patent protection expires (see Drews 2000; Orsenigo et al. 2001; Pammolli et al. 2002; Muffatto/Giardina 2003; Wittner 2003).

1 How to distinguish competitive strategies: Conceptualization and theoretical framework

In line with major analysts of corporate competitiveness (Porter 1980: chapter 1; Porter 1985: chapter 1; Andrews 1987: chapter 2; Grant 1998: chapter 1; Walker 2003: 17–18; see also Hall/Soskice 2001a: 14–17), a competitive strategy is understood here as a process that translates into the development of products which offer unique customer value. If pursued successfully, a competitive strategy enables firms to achieve a competitive advantage, i.e. superior performance to their competitors.

The competitiveness literature distinguishes between three, inherently different strategies on the basis of their technology intensity. If a sustainable advantage arises from the development of entirely new products, being the result of a *radical technological innovation*, the developing firm is said to pursue a strategy of "radical product innovation."[8] If a firm competes by selling known but improved products as a result of an *incremental technological innovation*, it is found to be engaged in diversified quality production.[9] Finally, if firms sell standardized goods, resulting from the *imitation* of an established technology, they are held to pursue a strategy of low cost production.[10] I here follow the typology proposed by the literature and distinguish accordingly between *radical product innovation* (henceforth RPI), *diversified quality production* (henceforth DQP) and *low cost production* (henceforth LCP).

But how do RBV and competitiveness theories differ in their expectations of why national institutions are able – or, conversely, ought not – to bring firms within the same economy to converge in the pursuit of these strategies? To begin with RBV theory, the latter is mostly concerned with understanding how firms can use their individual capabilities as sources of competitive advantage. In short, RBV theory claims that those resources hold the potential for competitive advantage which are valuable, rare, hard-to-imitate, and strategically non-substitutable (Barney 1991; see also Rumelt 1984; Wernerfelt 1984; Conner 1991; Peteraf 1993; Barney/Clark 2007; Newbert 2007). Following this reasoning, the comparative advantages offered by national institutions, e.g. the abundance of venture capital or inexpensive labor, can be transformed into a unique resource. However, the ubiquitous exploitation of such comparative institutional advantages seems incompatible with the search for uniqueness. How can firms build unique capabilities if they all exploit the same

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8 See Lundvall (1992a: 11–12); Lundvall (1992c: 58–59); Estevez-Abe et al. (2001: 149, 174); Casper (2001: 398); Hall/Soskice (2001a: 38–39).

9 See in particular Streeck (1991); see also Porter (1985: 14); Lundvall (1992a: 11–12); Lundvall (1992c: 57–58); Estevez-Abe et al. (2001: 148–149, 174); Casper (2001: 399–400); Hall/Soskice (2001a: 39).

10 Proponents are Porter (1985: 12–14); Estevez-Abe et al. (2001: 148, 175); Casper (2001: 398–399); see also Ohlin (1924: 89); Heckscher (1919: 55–58); Sinn (2005: 18–19).

institutional advantages? Focusing on the internal resources of firms rather than the impact of external contexts (see Bresser 2004: 1275), RBV theory thus suggests that, in order to be unique, firms within one economy should not converge in the pursuit of the same competitive strategy.

This is different for contributors to the competitiveness literature which goes back to the trade theorem of Heckscher–Ohlin (Heckscher 1919; Ohlin 1933) and includes the market-based view of strategic management studies (Porter 1980; 1985; 1990), theories on national innovation systems (Lundvall 1992b; Nelson 1993; Pavitt/Patel 1999), and the literature on varieties of capitalism (Hall/Soskice 2001b; Amable 2003; Hancké et al. 2007). Despite their different foci, all these strands agree that economies are differently endowed with input factors which, in turn, are required for particular competitive strategies. While the originators of this literature consider how the abundance of labor and capital influences corporate production decisions (Heckscher 1919; Ohlin 1933), its subsequent developers distinguish between different types of these production factors and illustrate how they are at the basis of RPI, DQP, and LCP strategies. Since national corporate-governance and labor-market institutions are found to influence the availability of these crucially required factor types,[11] the four abovementioned strands of the competitiveness literature furthermore concur in the claim that firms should exploit the comparative institutional advantages of their economy and embark on the institutionally facilitated strategy.

More concretely, the institutional environment of *coordinated economies* like Germany or Sweden is said to facilitate competition through product quality and, hence convergence in, *DQP strategies*. Collective bargaining procedures between the social partners do not simply entail comparatively high and homogeneous wages; they also facilitate an education and training system that provides employees with highly specific vocational skills. The latter are at the root of extraordinary labor productivity and high-value added strategies. Since the corporate governance system grants shareholders important control rights, managers cannot take major financial decisions at short notice, which is necessary to rapidly invest in, or divest from, radically innovative projects. Yet, firms have access to "patient" capital, required for incrementally innovative projects, because major stakeholders – such as banks, suppliers, employees, or the founding family – also tend to be major shareholders. Cooperation enhancing labor-market institutions and corporate-governance systems thus constitute important comparative advantages for the pursuit of DQP strategies.[12]

11 The reason why finance and labor are perceived as crucial is that – contrary to, say, raw materials – firms cannot secure them on their own but only after the successful solution of a coordination problem with their financiers and employees (Hall/Soskice 2001a: 6–7; see also Andersen 1992: 68–69; Lundvall 1992a: 13–15; Patel/Pavitt 1994: 91–92; Hollingsworth 2000: 626–630).

12 Proponents are, in particular, Porter (1990: 355–382); Pavitt/Patel (1999); Hollingsworth (2000); Estevez-Abe et al. (2001); Hall/Soskice (2001a: 36–44); Vitols (2001); Amable (2003); Casper/Matraves (2003); Casper/Whitley (2004); Sinn (2005); see also Christensen (1992); Freeman

The opposite applies to *liberal economies* like the UK or the US, where the institutional setting is found to motivate competition through *RPI strategies*. Since collective bargaining processes are decentralized, it is difficult to put in place an education and training system where firms collaborate to provide trainees with specific skills. But, wages are flexible. High bonuses can therefore be paid to motivate employees to relentlessly develop radically new innovations. Furthermore, deregulated financial markets give firms easy access to share capital. This, however, needs to be invested in (radical innovation) projects promising high returns in the short run because, if the profit expectations of shareholders are not fulfilled, the latter rapidly withdraw funds as they have only reduced monitoring possibilities to understand how their investment is used. Flexible labor markets and deregulated corporate governance systems thus seem to offer compelling comparative advantages for the pursuit of RPI strategies.[13]

Finally, firms in – what I term here – *low investment economies*, such as Italy, Spain, or Greece, are likely to converge in the pursuit of LCP strategies. Where labor-market institutions allow for comparatively low wage levels, employers are unlikely to participate in sophisticated education and training programs, while employees, once they have finished compulsory schooling, often decide to start working rather than invest in further education. Whenever opportunities for low wage levels are coupled with nontransparent financial-market institutions, firms are all the more likely to engage in LCP as share capital and bank credit, required for radical and incremental innovation alike, are difficult to obtain. Firms in low investment economies seem thus best advised to exploit the cost advantage of the economy and converge on LCP strategies.[14]

Contrary to their RBV colleagues, competitiveness scholars thus argue that comparative institutional advantages are an important source of competitive advantage. With increasing competitive pressure, firms are therefore expected to gain competitiveness by exploiting these comparative institutional advantages and pursuing the facilitated strategies. To gain a better understanding of how economic internationalization impacts on corporate strategy choices, the remainder of this article attempts to test the idea of strategy convergence. Does a plurality, or even the majority, of firms within one economy pursue the same competitive strategies?

(1992); Keck (1993).

13 See in particular Porter (1990: 482–507); Pavitt/Patel (1999); Estevez-Abe et al. (2001); Hall/Soskice (2001a: 36–44); Vitols (2001); Amable (2003); Casper/Matraves (2003); Casper/Whitley (2004); see also Christensen (1992); Freeman (1992); Walker (1993); Hollingsworth (2000).

14 See Estevez-Abe et al. (2001: 175–176); Amable (2003: in particular 102–114, 197–213); see also Porter (1990: 421–453); Malerba (1993); King/Wood (1999: 376); Trento (2005).

2 How to distinguish competitive strategies: Operationalization and analytical framework

When consulting the literature for advice on how to measure strategy convergence, two peculiarities are striking. First, competitiveness scholars hardly provide reference points for assessing convergence patterns *within one economy*. They usually take the "revealed comparative advantage" as an indicator of strategy convergence, which compares, for a certain industry, the export performance of one economy relative to the export performance of a reference group of countries. If firms in this economy export more than firms of the reference group, the former are said to have specialized in, or converged on, the production of the studied industry's goods.[15] Standardized measures of patent registrations or citations are used as an alternative measure of relative strategy convergence.[16] But do all, the absolute majority, or simply a plurality of firms *within one industry of one country* need to pursue the same strategy in order to constitute empirical instances of convergence effects?

These measures entail a second peculiarity. Strategy convergence is systematically assessed through macro characteristics of firms. That is, firms are attributed a strategy on the basis of the *industry* in which they are active. The finding that specific high, medium, or low-tech industries are more developed in one economy than in others is cited as empirical proof of the idea that firms in this economy have converged on high, medium, or low-innovation strategies respectively. But whenever the technology intensity of entire industries is taken as a proxy for competitive strategies, this entails the simplifying assumption that all firms of this industry pursue the same strategy (Rumelt 1984: 559–560; Barney 1991: 100). Yet, is it not more plausible to assume that firms can pursue different strategies?

A noteworthy exception to the identification of relative convergence patterns at the industry level is provided by innovation studies which compare the absolute development of "market segments" (Casper et al. 1999) or "sub-sectors" (Casper/Soskice 2004; Casper/Whitley 2004) within the biotech industry. These studies suggest that biotech firms developing *therapeutics* pursue a radical innovation strategy, as this market segment is characterized by discrete technological innovation. On the other hand, firms in the market segment of *platform technologies* are said to engage in diversified quality strategy, since this segment is particularly susceptible to "cumulative or incremental patterns of technical change" (Casper/Soskice 2004: 368; see also Casper et al. 1999: 15). Mostly based on studies of the late 1990s, the share of radically innovative therapeutics firms is found to be above average in the UK, whereas the percentage of incrementally innovative platform providers

15 For examples, see Fagerberg (1992); Dalum (1992); Keck (1993: 133–137); Hancké/Herrmann (2007); see also Porter (1990: 179–541); Amable (2003: 200–209); Sinn (2005).

16 See Chesnais (1993: 220–226); Walker (1993: 168–169); Pavitt/Patel (1999); Estevez-Abe et al. (2001: 174–176); Hall/Soskice (2001a: 36–44); also Amable (2003: 200–209).

is above average in Germany (Casper et al. 1999: 20–21; Casper/Soskice 2004: 365–366; Casper/Whitley 2004: 98).

However, two difficulties are related to identifying strategies of biotech firms via their industrial sub-sector. First, any young biotech industry is characterized by a high proportion of platform-technology providers. Since it now takes almost 15 years to turn a pharmaceutical discovery into a profitable drug (Muffatto/Giardina 2003: 109), many young biotech start-ups which ultimately aim at developing a therapeutic product (have to) commercialize their knowledge by providing platform technologies. But this usually is a temporary way of securing finance, rather than a strategy in itself (Freyberg 2004). Once providers of platform services have developed their discovery far enough to acquire venture capital, they often turn into dedicated therapeutics firms. With the increasing maturity of a country's biotech industry, the share of platform-technology firms decreases and convergence patterns disappear – as occurs in Germany, too (Ernst & Young 2005: 65, 2006: 47). Second, "platform-technology firms create the research tools used in therapeutics" (Casper et al. 1999: 21). In other words, they are service providers, whereas therapeutics firms seek to develop products (Freyberg 2004). Since the provision of services might follow a different operational logic than manufacturing activities, it seems risky to compare firms of the secondary and tertiary sector. Differences in the organizational structure might be a consequence of special sectoral requirements rather than of particular strategies.

To identify corporate strategies across *and* within different economies, I therefore decided to combine two micro-level indicators: the technological novelty of a firm's products, and its value-chain focus. To this end, the study of the pharmaceuticals industry seems particularly promising as competitive strategies can be identified in a straightforward way due to the scientifically established notion of a "new chemical entity" (henceforth NCE). An NCE constitutes a chemical entity which has not previously been discovered. It is scientific practice to indicate whether active ingredients or excipients of a pharmaceutical product are NCEs, modifications of already discovered entities, or mere imitations.[17] Accordingly, patent-protected pharmaceuticals can take one of two forms. They may be radically new, as they are based on an NCE, or they may be incrementally new in that they introduce slight changes to already discovered chemical entities which improve the drugs' efficiency. For example, undesired side effects are limited, or the frequency or quantity with which a drug has to be consumed is reduced. Yet not all pharmaceutical companies engage in research and development (henceforth R&D) activities. As soon as patent protection expires, (generics) firms compete by imitating a product's excipients or active compounds so as to sell the imitated drug at the lowest possible price (see

17 For a better understanding, it should be noted that *active ingredients* are those compounds in a pharmaceutical preparation that exert a pharmacological effect, whereas *excipients* are inactive substances used as carriers for the active ingredients of a medication.

Wittner 2003). Using this classification, I propose the following differentiation between competitive strategies (see Bottazzi et al. 2001: 1162–1167). Pharmaceutical firms inventing drugs based on NCEs pursue an RPI strategy, whereas firms improving already discovered chemical entities compete through DQP. Firms which do not engage in R&D, but focus on imitating innovations made by others, pursue an LCP strategy.

The PHID database, one of the largest pharmaceutical databases worldwide, allows the identification of a firm's competitive strategy via the chemical entities employed in that firm's drugs.[18] Developed by a group of researchers at the University of Siena, the PHID database keeps track of 16751 pharmaceutical projects carried out by 3522 firms and public research organizations in 7 countries.[19,20] The latter include Germany, Italy, and the UK, in addition to France, Japan, Switzerland, and the USA.[21] It should furthermore be noted that a pharmaceutical firm is included in the PHID database once it has been involved in at least one pharmaceutical project which has reached the stage of preclinical development since the 1980s. Even firms whose pharmaceutical projects have not been granted patent protection are thus recorded. Only (generics) companies which abstain from traditional R&D activities are not considered in the database. Furthermore, and importantly for the aim of this study, pharmaceutical firms are considered only if their projects translate(d) into therapeutic drugs curing or alleviating human diseases. Providers of platform technologies active in the service sector are not included. The comparison of firms in the manufacturing and service sector is thus avoided (see Casper et al. 1999; Casper/Soskice 2004; Casper/Whitley 2004).

In addition to the novelty of chemical entities, the PHID database contains a second micro-level measure which allows the identification of a firm's strategy: its value-chain focus. The latter can be derived from the database's classification of firms as *developers*, *licensors*, and *licensees*. To understand these terms, it is important to note that the pharmaceutical industry is characterized by a remarkable division of labor (see Gambardella et al. 2001: 36–53). Any drug that is sold on the market must have passed through three major stages. The first is the *research stage* (drug discovery and preclinical development), during which a firm discovers how a chemical entity interacts with other molecules in such a way that a curative effect can be obtained. The second, namely the *development stage*, consists in turning this discovery into a pharmaceutical product. During the phases of clinical development I, II, and III, a firm experiments with the form and dosage in which the drug should

18 An overview of the database's population, the sampling strategy employed, and possible sampling biases is provided in the technical appendix.

19 A firm is defined as a legal entity, and its nationality is determined by the location of its headquarters.

20 Since this database is constantly updated, these figures refer to November 2004.

21 To be precise, the PHID database covers 67 countries. However, the number of pharmaceutical projects considered in the other 60 countries is too limited to provide representative results.

be administered. Furthermore, undesired side effects are recorded and, if possible, reduced or eliminated. Finally, any relevant information regarding both the drug's features and its production process are documented in the third stage, i.e. the *registration stage*. This documentation is then handed to the responsible national or international authorities in order to obtain a marketing authorization (see Muffatto/ Giardina 2003: 112–116; Drews 1999: 117–154).

The researchers administering the PHID database show that these three stages are often not carried out by the same firm. Instead, pharmaceutical companies tend to divide labor, and specialize in upstream, midstream, or downstream activities (see Orsenigo et al. 2001; Bottazzi et al. 2001; Owen-Smith et al. 2002; Pammolli et al. 2002). Interestingly, the division of labor is not only pronounced between innovative pharmaceutical firms on the one hand and generics firms on the other (see Pammolli et al. 2002). It also importantly takes place between innovative firms (see Orsenigo et al. 2001; Bottazzi et al. 2001; Owen-Smith et al. 2002).

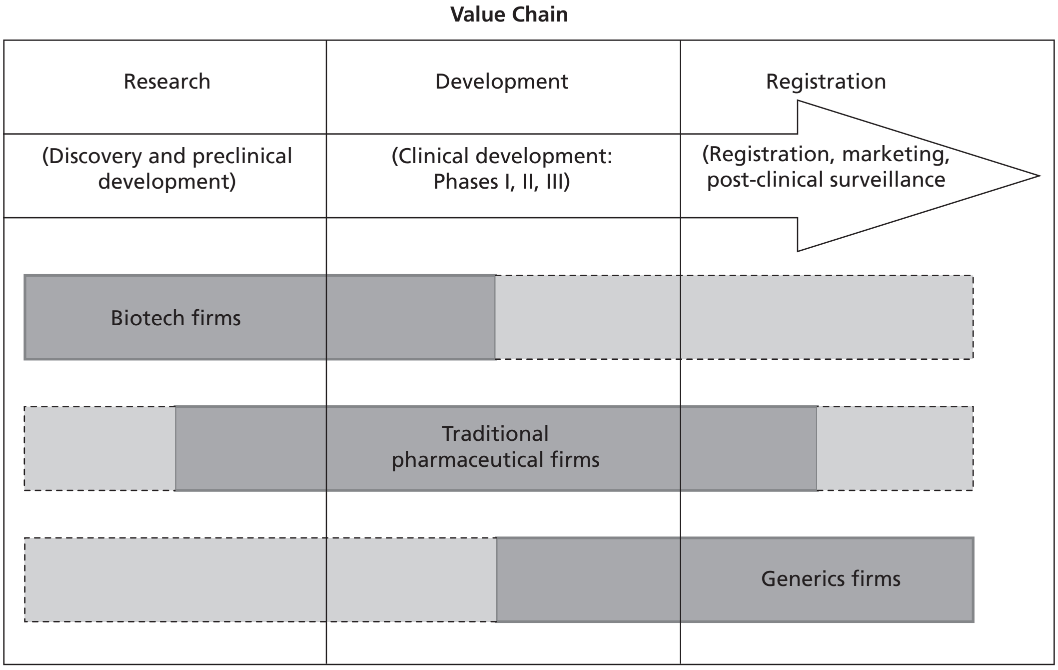
The latter division of labor is reported in the PHID database by the previously mentioned distinction between *developers*, *licensors*, and *licensees*. A *developer* is a firm with a fully integrated value chain, as it carries out all stages on its own. A drug is thus discovered, developed, and registered by the same firm. A *licensor*, on the other hand, initiates a project which ultimately translates into a new drug. However, focusing on the research stage (i.e. on discovery and preclinical development), the licensor decides at a certain point to out-license its discovery to another firm, which continues the clinical development and registration process. Accordingly, a *licensee* focuses on the stages of (late) clinical development and registration in order to translate the respective discovery into a marketable drug. Using this distinction, the Italian researchers show that biotech firms tend to be licensors, whereas traditional pharmaceutical firms are often licensees (Orsenigo et al. 2001). Figure 1 provides an overview of the division of labor in the pharmaceutical industry.

Combining information on product novelty and value-chain focus makes it possible to identify radical product innovators, diversified quality producers, and low cost producers as follows.

A firm pursues an RPI strategy whenever it is the *developer* or *licensor* of a pharmaceutical project which translates into a drug based on an NCE. Since the discovery of the NCE is made by the licensor, the latter is *radically innovative* irrespective of whether the licensing agreement is made at the development or the registration stage of a pharmaceutical project.

Following this logic, a firm pursues a DQP strategy whenever it *develops* or *out-licenses* a project that improves a previously discovered chemical entity. In addition to this, a firm also pursues a DQP strategy if it *in-licenses* a pharmaceutical project based on an NCE *at the stage of clinical development*. At this moment, the

Figure 1 Labor Division in the Pharmaceutical Industry



Source: Own illustration based on the work of Gambardella et al. (2001), Orsenigo et al. (2001), and Pammolli et al. (2002).

previously unknown chemical entity has been discovered so that it is the task of the licensee to improve the chemical entity such as to optimize its effectiveness and dosage. Hence, both licensees of a clinical development agreement and developers or licensors of an improved drug pursue a DQP strategy, as they are not radically but *incrementally innovative*.

This leaves us with a third group of firms that conclude *in-licensing* agreements with the purpose of registering and marketing both radically or incrementally new drugs. Interestingly, these firms concur with generics firms in that both abstain from engaging in expensive R&D activities. Instead, their strategy consists in producing and selling drugs at the *lowest possible costs*.

3 Do firms in Germany, Italy, and the UK converge on the same strategy?

Will this micro-level approach to identifying competitive strategies provide empirical support for the idea that firms use the comparative institutional advantages of their economy and converge on the facilitated strategy? To answer this question, it is first necessary to decide which countries to include in the analyses. From the perspective of the competitiveness literature, those countries should be selected which offer the most ideal institutional environment for the pursuit of RPI, DQP, and LCP strategies respectively. However, as illustrated in a particularly exhaustive manner by contributors to the market-based view (most notably, Porter 1990), the external factors that can affect the strategy choices of firms often exceed an economy's institutions. In the pharmaceutical sector, these non-institutional factors include, most importantly, patent legislation, legal price ceilings on pharmaceutical products, and legislative requirements for the quality, safety, and efficacy of medicines. Where patent legislation is lax, where price ceilings are low, and where legislative requirements for pharmaceutical quality, safety, and efficacy are notably different from those of other countries, firms are discouraged to engage in R&D and, hence, in RPI or DQP strategies (Gambardella et al. 2001; Wittner 2003; Thomas III 2004).

To control for these factors which influence strategy choices other than those institutions retained as essential by the competitiveness literature, a comparison of EU member states seems particularly appropriate. Following the Maastricht treaty of December 1991, the single market project was fostered not only through the harmonization of national competition law, but also through the establishment of coordinating agencies at the European level. In the pharmaceutical sector, the foundation of the European Medicines Agency in 1995 ensured that the evaluation and supervision of the quality, safety, and efficacy of medicines is today homogeneous across the EU. Similarly, the European Patent Office guarantees that pharmaceutical inventions enjoy the same protection in all EU member states (Gambardella et al. 2001; Casper/Matraves 2003: 1868; Wittner 2003; EMEA 2006). Pharmaceutical firms within the EU member states thus face very similar legislative requirements, which can therefore be excluded as determinants of corporate strategy choices.

Interestingly, though, national corporate-governance and labor-market institutions continue to be of strikingly different shapes, even in those countries that make up part of the European Union (Hall/Soskice 2001a: 51–54). To test the competitiveness literature's argument, it is thus advisable to compare those EU member states which are most different from each other in their corporate-governance and labor-market institutions, thereby offering ideal environments for the pursuit of RPI, DQP, and LCP strategies respectively. Across the competitiveness literature, agreement is broad that – among the EU member states for which PHID data is available – these countries are the UK, Germany, and Italy. As illustrated in section 1, the deregulated labor market and flexible corporate-governance system of the UK encourages outstanding employee performance and the provision of seed (venture) capital required for RPI. The coordinating institutions of the German economy, by contrast, support DQP as they motivate employees to invest in highly specific skills, and financiers to provide 'patient' capital to firms. Finally, Italy's comparatively low wage levels and relationship-based provision of finance are said to be at the basis of LCP strategies.

So, do British firms mostly engage in RPI, whereas German companies converge on DQP, while their Italian counterparts prefer the pursuit of an LCP strategy? Tables 1 to 3 summarize the results obtained from sampling the PHID database. Given that it takes on average 14 years to develop a pharmaceutical product (Muffatto/Giardina 2003: 108–109), the sample has been limited to the last 20 years in order to cover a sufficiently long time span, while eliminating outdated results. Accordingly, only those firms were considered which have been involved in the advancement of at least one pharmaceutical project since 1985.

The most important finding for the question of strategy convergence is that the obtained strategy patterns of firms are very similar for the UK, Germany, and Italy. Since a considerable number of radical product innovators, diversified quality producers, and low cost producers can be found in the UK, Germany, and Italy alike, strong convergence effects cannot be assessed.

Regarding the sample size, it is noteworthy that the British sample is slightly larger, as comparatively few biotech firms are included in the German sample, and hardly any in the Italian sample. The reason for this is the difference in age of the British, German, and Italian biotech industries. While this industry began to crystallize in Britain in the 1980s (see Ernst & Young 2003; Thomson Financial 2004), most biotech firms in Germany were founded in the mid- and late 1990s (ibid., see also Hinze et al. 2001: 18–24). Italian biotech firms are even younger, as they were mostly founded around the turn of the millennium (Chiesa 2004: 10–18; Pozzali 2004; Vingiani 2006). Therefore, many successful biotech firms in Germany and Italy today had not yet, or had only just recently, brought a pharmaceutical project beyond the stage of preclinical development and were thus not included in the PHID database when I sampled the latter in November 2004. This explains the smaller size of the German and Italian sample.

Interestingly, though, these age differences do *not* lead to differences in the share of firms pursuing an RPI strategy. Accordingly, tables 1 to 3 illustrate how labor division in Britain takes place *between* biotechnology and traditional pharmaceutical firms. In Germany and Italy, by contrast, the lower number of biotech firms means that labor division is more pronounced *within* the traditional pharmaceutical industry, namely between (small) research-oriented and (large) development-oriented firms (see also Gambardella et al. 2001: 45).

A more in-depth interpretation of the results reported in tables 1 to 3 allows us to classify firms with regard to the competitive strategy they pursue. The most clear-cut distinction between competitive strategies can be made between non-innovative low cost producers on the one hand and innovation-driven pharmaceutical firms on the other. As mentioned above, generics firms are not included in the PHID database and, consequently, in any of the three samples, as they do not engage in R&D activities. Imitating a once patent-protected drug, generics producers are not

Table 1 Radical product innovators, diversified quality producers and low cost producers in the UK

Firm type	Company name	Technology focus	Number of employees	Firm age	Developer NCE	Licensor NCE	Developer non-NCE	Licensor non-NCE	Licensee dev. phase NCE	Licensee dev. phase non-NCE	Licensee reg. phase	Competitive strategy
Discoverers of NCE	Cancer Research Technology	TrPh	67	41		1		3				RPI
	Celltech Group	BioT	724	24		1		1			1	RPI
	Imperial Cancer Research	TrPh	19	102		1		1				RPI
	Pharmagene	BioT	79	7		1		1				RPI
	Protherics	BioT	219	5		2		1				RPI
Ambiguous cases	Acambis	BioT	270	12			1*				1	RPI
	Amarin	BioT	24	15				3			1	RPI
	Antisoma	BioT	45	16			1*					RPI
	CeNeS	BioT	14	7			7*				1	RPI
	Henderson Morley	BioT	6	8			1*					RPI
	KS Biomedix	BioT	65	n.a.			1*				2	RPI
	Onyvax	BioT	37	7			1*				1	RPI
	PowderJect	BioT	750	11				2				RPI
	Scotia	BioT	n.a.	20				4				RPI
	SkyePharma	BioT	476	8				4			1	RPI
	Xenova	BioT	105	17				3(*)				RPI
Diversified quality producers	Axis Genetics	BioT	n.a.	n.a.			1*			2		DQP
	Britannia	TrPh	130	23			1					DQP
	Galen	TrPh	104	36			1					DQP
	Nycomed Amersham	TrPh	n.a.	130			3	5		3	3	DQP
	Provalis	BioT	107	7			1					DQP
DQPs and RPIs	AstraZeneca	TrPh	11,500	91	4	6	16	8	1	12	9	RPI/DQP
	GlaxoSmithKline	TrPh	44,679	174	6	20	22	60	3	41	26	RPI/DQP
	Shire	TrPh	475	18		1		9		5	5	RPI/DQP
Pure diversified quality producers	Amersham Pharmacia Biotech	TrPh	4,500	n.a.						1		DQP
	Bioglan	BioT	567	72					1	1		DQP
	British Biotech	BioT	250	18						1		DQP
	Cambridge Antibody Technology	BioT	290	14						1		DQP
	Crusade Laboratories	BioT	n.a.	5						1		DQP
	DevCo	TrPh	8	5						1		DQP
	Napp	TrPh	321	81						1		DQP
	Oxford Glyco Sciences	BioT	219	n.a.						1		DQP
	Smith & Nephew	TrPh	1,419	73						1		DQP
Marketing specialists	Allergy Therapeutics	TrPh	180	70							1	LCP
	Biopharm (UK)	BioT	n.a.	n.a.							1	LCP
	Cambridge Laboratories	TrPh	63	17							1	LCP
	Virogen	BioT	n.a.	n.a.							1	LCP

* Project(s) in-licensed at discovery (i.e. research or preclinical development) stage usually from PROs (universities or research institutes). (*) Part of projects in-licensed at discovery (i.e. research or preclinical development) stage usually from PROs (universities or research institutes). Source: PHID database (November 2004).

Table 2 Radical product innovators, diversified quality producers and low cost producers in Germany

Firm type	Company name	Technology focus	Number of employees	Firm age	Developer NCE	Licensor NCE	Developer non-NCE	Licensor non-NCE	Licensee dev. phase NCE	Licensee dev. phase non-NCE	Licensee reg. phase	Competitive strategy
Discoverers of NCE	BASF	TrPh	37,444	139		1		1				RPI
	Merz	TrPh	800	96		1		4				RPI
Ambiguous cases	Curacyte	BioT	22	5			1*					RPI
	Degussa	TrPh	6,000	5			1*					DQP
	Falk	TrPh	99	44			1*					DQP
	GPC Biotech	BioT	115	7			1*					RPI
	Jerini Bio Tools	BioT	108	10			1*					RPI
	MediGene	BioT	120	10			1*					RPI
	MorphoSys	BioT	132	12			1*					RPI
	Scil Biomedicals	BioT	100	5			1*				1	RPI
	Wilex Biotechnology	BioT	22	7			1*					RPI
Diversified quality producers	Altana	TrPh	2,800	27				9		1	5	DQP
	Gruenenthal	TrPh	1,900	58			2				5	DQP
	Jenapharm	TrPh	450	54			2					DQP
	Madaus	TrPh	930	85				5	1	2		DQP
	Merck KGaA	TrPh	1,800	336			2	6		4		DQP
	Merckle	TrPh	2,000	59			2				1	DQP
	Schwarz Pharma	TrPh	1,200	58			2		1	2	7	DQP
DQPs and RPIs	ASTA Medica	TrPh	600	169		1		1	1	1	3	RPI/DQP
	Bayer	TrPh	5,181	141	1	3	1	18	1	8	5	RPI/DQP
	Boehringer Ingelheim	TrPh	8,000	119		7	1	26		5	11	RPI/DQP
	Schering AG	TrPh	10,042	133	2	2	15	6		8	4	RPI/DQP
Pure diversified quality producers	GLE Medicon	TrPh	n.a.	n.a.						1		DQP
	Medac	BioT	400	34						2		DQP
	Paion	BioT	60	4						1		DQP
	Revotar	BioT	22	4						1		DQP
Marketing specialists	Plantorgan	TrPh	100	30							1	LCP
	Schwabe	TrPh	695	138							1	LCP
	Strathmann	TrPh	460	30							1	LCP

* Project(s) in-licensed at discovery (i.e. research or preclinical development) stage usually from PROs (universities or research institutes).
(*) Part of projects in-licensed at discovery (i.e. research or preclinical development) stage usually from PROs (universities or research institutes).
Source: PHID database (November 2004).

Table 3 Radical product innovators, diversified quality producers and low cost producers in Italy

Firm Type	Company name	Technology focus	Number of employees	Firm age	Developer NCE	Licensor NCE	Developer non-NCE	Licensor non-NCE	Licensee dev. phase NCE	Licensee dev. phase non-NCE	Licensee reg. phase	Competitive strategy
Discoverers of NCE	Abiogen	BioT	257	7	1	1		7				RPI
	Alfa Wassermann	TrPh	700	56		1		4			3	RPI
	Ausonia	n.a.	n.a.	n.a.		1		3				RPI
	Istituto di Ricerche Sigma Tau	TrPh	67	19		2		5			5	RPI
	Medioloanum	TrPh	253	32		1	1*	4			1	RPI
	Poli	TrPh	126	25	1		3(*)					RPI
	SPA	TrPh	211	57		1		1				RPI
Ambiguous cases	Fidia	TrPh	n.a.	58			1*					DQP
	Italpharmaco	TrPh	600	66			1*				1	DQP
	Rotta Research	BioT	188	43				1				RPI
Diversified quality producers	Chiesi	TrPh	2,600	69			2	7	2	2		DQP
	Recordati	TrPh	1,013	78				8	1	1	4	DQP
	Zambon	TrPh	836	98			3		1	2	1	DQP
DQPs and RPIs	Bracco	TrPh	1,456	77	1	1	1	3		1	1	RPI/DQP
	Menarini	TrPh	2,050	118	1		4		1	1	5	RPI/DQP
Pure diversified quality producers	Bruno	TrPh	n.a.	n.a.					1	1		DQP
	Dompe	TrPh	600	64						1	2	DQP
	Eurand	TrPh	343	35						1		DQP
	Geymonat	TrPh	83	76					1	1		DQP
Marketing specialists	Biotoscana	BioT	n.a.	n.a.							1	LCP
	Formenti	TrPh	450	50							1	LCP
	Guidotti	TrPh	480	90							2	LCP
	Lusopharmaco	TrPh	600	53							2	LCP
	Mipharm	TrPh	243	6							1	LCP
	Neopharmed	TrPh	332	n.a.							1	LCP
	Rottapharm	TrPh	371	43							1	LCP
	Segix	TrPh	74	42							1	LCP

* Project(s) in-licensed at discovery (i.e. research or preclinical development) stage usually from PROs (universities or research institutes).
(*) Part of projects in-licensed at discovery (i.e. research or preclinical development) stage usually from PROs (universities or research institutes). Source: PHID database (November 2004).

legally obliged to perform clinical trials as long as they can demonstrate that the imitated drug is bioequivalent to the original pharmaceutical. Avoiding the extremely expensive stages of clinical development is precisely what allows generics firms to produce and market drugs at low prices. The absence of any generics firm from the sample thus shows that this category of firm does indeed pursue an LCP strategy.

A second group of low cost producers consists in those firms that specialize in the registration phase of pharmaceutical products. In addition to these *marketing specialists*, several pharmaceutical firms conclude marketing agreements at the registration stage, even though they are also active in R&D. It is noteworthy that these seemingly ambiguous cases are almost exclusively constituted by large, internationally active firms with an extensive product range. In these cases, the in-licensing of pharmaceutical products does not constitute a competitive strategy in itself, driven by technological considerations. It is rather a commercial tool to grant partner firms access to the home market in order to secure their own international presence. Since these pharmaceutical firms do not pursue a genuine LCP strategy, only the pure marketing specialists are counted as low cost producers.

Among the pharmaceutical firms which are active in R&D, the distinction between radical product innovators, on the one hand, and diversified quality producers, on the other, requires particular attention. While one group of *pure diversified quality producers* which in-license pharmaceutical projects at the development stage can be unambiguously recognized, the identification of pure radical product innovators is more difficult.

Interestingly, not a single firm exists that merely develops or out-licenses pharmaceutical products based on an NCE. The reason for this resides in the unpredictability of radical pharmaceutical innovation. As in any research project, the chance element involved in pharmaceutical research is high (Muffatto/Giardina 2003: 111). Hence, a pharmaceutical firm *cannot be sure* that it will discover an NCE. It can make every possible effort, yet it may ultimately end up using its research outcomes for improving an already known chemical entity. The discovery of an NCE is therefore by far less frequent than the improvement of a known chemical entity (Bottazzi et al. 2001: 1163). However, a pharmaceutical firm *can decide to focus* on the research stage, i.e. on the discovery and preclinical development of pharmaceutical projects, in that it out-licenses their development and registration. Accordingly, licensors of both NCE and non-NCE projects are more innovative than their licensees. All pharmaceutical firms which have (developed and/or) out-licensed *at least one* pharmaceutical project *based on an NCE* are therefore classified as radical product innovators because they are *discoverers of NCEs* with a strong propensity to out-license downstream activities, i.e. clinical development and registration.

This leaves us with a group of *ambiguous cases*. It is composed of those firms which are either pure licensors of already discovered chemical entities or developers of known chemical entities that were in-licensed at the research stage from public research organizations (henceforth PROs), namely universities or research institutes. On the one hand, these firms are not particularly innovative as the resulting drugs are based on known chemical entities. On the other hand, they are innovative as the *licensors* focus on the research stage of a pharmaceutical project. Similarly, the *developers* of this group have a research focus, as they collaborate closely with PROs from which they in-licensed pharmaceutical projects before the development stage. Since it has not been possible to classify them purely on the basis of their involvement in the different stages of pharmaceutical projects, I have consulted their websites and asked representatives of these firms about their companies' strategies. These additional sources of information reveal that the respective firms are 'ambiguous cases' to the extent that they are unclear about whether their innovative potential suffices to engage in, or respectively focus on, upstream research activities so as to embark on RPI strategies in the long run. Seeking to balance the firms' quest for radical innovativeness and their as yet limited success in advancing NCE projects, I have categorized these firms on the basis of their technological approach. I have thus classified all biotechnology firms as radical product innovators, because they use modern approaches of molecular biology and genomic sciences, which, in turn, enable a more deliberate drug design. On the other hand, traditional pharmaceutical firms using experimental approaches to drug design (see Drews 2000) are classified as diversified quality producers.

Another, partly similar, group of firms can be identified. It is similar to the group of ambiguous cases in that firms are either developers and/or licensors of already discovered chemical entities. However, unlike the ambiguous cases, these firms do *not* in-license pharmaceutical projects at the *research* but at the *development* stage. This, in turn, suggests that they are more incrementally than radically innovative. Accordingly, they are classified as *diversified quality producers*. In addition, all those firms which are exclusive developers of pharmaceutical products based on known chemical entities are also categorized as diversified quality producers.

Finally, the last group of cases consists of those pharmaceutical firms which pursue both an *RPI and a DQP* strategy. On the one hand, they are radical product innovators, as they out-license (and develop) pharmaceutical products based on NCEs. On the other hand, these firms also pursue a DQP strategy by developing drugs based on previously discovered chemical entities, or by in-licensing pharmaceutical projects at the development stage. Interestingly, this group of firms consists almost exclusively of the industry's international giants. Interviews with representatives, and webpage analyses, of these RPI/DQP firms reveal that the latter usually embed each strategy in a separate business unit. From an operational point of view, these units are independent as they encompass all departments necessary for discovering, developing, and producing drugs. Accordingly, interviewees repeatedly described the RPI and DQP units as organizationally separate entities, which are only interdependent insofar as they are financed by the same holding company. From a transaction-cost perspective, this interdependence seems to be explained by accounting practices. Given that the development of radically and incrementally new drugs is both risky and extremely expensive, losses of one business unit can be balanced by the profits of the other unit (see also Drews 1999). Despite this financial interdependence, I decided to adopt the view of my interviewees that *one* RPI/DQP firm does not pursue *two* different competitive strategies, but that *two* different business units belonging to one holding company pursue *one* competitive strategy apiece. I have therefore classified each of these firms as two cases: one radical product innovator and one diversified quality producer.

In sum, while the identification of a firm's competitive strategy at the micro level is not without its problems, the classification approach used in this section clearly illustrates one point. Patterns in the strategies of pharmaceutical firms are strikingly homogenous in Italy, Germany, and the UK alike.

4 Final assessments

But to what extent do firms in different political economies vary in their pursuit of competitive strategies? Does the above micro-level identification of competitive strategies support the convergence argument of the competitiveness literature, which has thus far mostly been corroborated through macro-level indicators? Do firms in the UK converge on the pursuit of an RPI strategy, whereas German companies pursue a DQP strategy, while their Italian counterparts engage mostly in LCP? Table 4 summarizes the results obtained from sampling the PHID database[22] and negates the idea that the *majority* of firms in one economy specialize in the same strategy. Instead, table 4 shows that firms in Germany, Italy, and the UK pursue RPI, DQP, and LCP strategies to a similar extent. While 47.5 % of pharmaceutical firms in the UK are *RPI* strategists, 39.4 % of firms pursue this strategy in Germany and 34.5 % of their counterparts do so in Italy. A *DQP* strategy is pursued by 51.5 % of German firms, 37.9 % of Italian firms, and 42.5 % of British firms. Finally, the probability that firms engage in *LCP* is 27.6 % in Italy, 10.0 % in the UK, and 9.1 % in Germany. Thus, even though the share of firms engaged in the same strategy varies slightly from one economy to another, it is not drastically different between the countries considered.

Nevertheless, slight convergence patterns can be observed. Table 4 accordingly reports the average probability with which firms in Germany, Italy, and the UK pursue RPI, DQP, or LCP strategies. Interestingly, British firms are 6.3 % more likely to engage in radical product innovation than the average pharmaceutical firm

22 The nine firms which pursue both an RPI and a DQP strategy are counted as two cases each.

Table 4 Summary results: RPI, DQP, and LCP strategists in the UK, Germany, and Italy (excluding generics firms)

	Radical product innovators		Diversified quality producers		Low cost producers		Total	
	No. firms	% firms	No. firms	% firms	No. firms	% firms	No. firms	% firms
UK	19	47.5	17	42.5	4	10.0	40	39.2
Germany	13	39.4	17	51.5	3	9.1	33	32.4
Italy	10	34.5	11	37.9	8	27.6	29	28.4
Total	42		45		15		102	100.0
Average	14	41.2	15	44.1	5	14.7	34	
Above average		6.3		7.4		12.9		

Source: PHID database (November 2004).

included in the sample. Similarly, the probability of pursuing a DQP strategy is 7.4% higher for a German firm than for the sample's average company. Finally, Italian firms show a preference for low cost production, as they pursue this strategy 12.9% more often than the average pharmaceutical company. British companies thus seem to prefer RPI, German firms DQP, and Italian firms LCP strategy.

Does this finding suggest that firms in one economy converge on the institutionally supported strategy because a *plurality*, rather than the majority, pursues this strategic approach? This idea would be supported empirically if the observed convergence patterns were pronounced enough to provide statistically significant results. A cross-tab analysis assessing the strength of association between a firm's *country* and its *strategy* offers insights. The results obtained reveal that the modest convergence patterns observed in table 4 are not statistically significant, which is true for both the χ^2 value (χ^2 = 5.996; 2 cells = 22.2% with expected count less than 5; p = .199) and the value of Cramer's V (Cramer's V = .171; p = .199).[23] Hence, the identification of competitive strategies through micro-level indicators does not lend empirical support to the idea that a plurality of pharmaceutical firms within the same economy converge on the same strategy.

What are we to think about these results? How are the above micro-level findings compatible with the convergence argument of the competitiveness literature based on macro-level analyses? Ever since the seminal article of Robinson (1950; see also Coleman 1986, 1990), social scientists are warned not to test theories about micro-level relationships on the basis of macro-level data, as the discrepancies between correlations of micro-level indicators and their aggregation at the macro level are substantial. The reason is that, depending on the array rules employed, important information on individual cases is lost when the latter are aggregated at a higher level. This causes correlations of aggregated indicators to deliver stronger results

23 The full documentation of the abovementioned and all following cross-tab analyses can be obtained from the author upon request.

Table 5 Summary results: Biotechnology and Traditional Pharmaceutical Firms in the UK, Germany, and Italy

	Biotechnology firms		Traditional pharma. firms		Total	
	No. firms	% firms	No. firms	% firms	No. firms	% firms
UK	23	62.2	14	37.8	37	40.2
Germany	10	34.5	19	65.5	29	31.5
Italy	3	11.5	23	88.5	26	28.3
Total	36		56		92	100.0
Average	12	39.1	18.67	60.9	30.67	
Above average		23.1		27.6		

Source: PHID database (November 2004).

than correlations of the same, disaggregated measures. The higher the level of data aggregation, the less representative are macro-level correlations of micro-level effects (Feige/Watts 1972).

A similar argument seems to explain why the above convergence effects are weak compared to the convergence effects revealed by the competitiveness literature.[24] Whenever a firm's strategy is identified through a macro-level indicator, e.g. its industry, less information on each individual case is preserved than when the firm's strategy is identified through micro-level measures, such as product novelty and value-chain focus. This loss of information seems to explain why strategy convergence is stronger when measured by a macro indicator. Imagine that a firm's industry had been taken as a proxy for its strategy, so that all biotech firms were identified as radical product innovators and all traditional pharmaceutical firms as diversified quality producers. Then the sample obtained from the PHID database, as summarized in table 5, would tell a different story about strategy convergence, namely that 62.2 % of British firms converge in the pursuit of RPI strategies, while 65.5 % of German and even 88.5 % of Italian pharmaceutical firms converge in DQP strategies.

Contrary to the results of the above cross-tab analysis, an assessment of the strength of association between a firm's *country* and its strategy identified by the firms' *industry* reveals that the observed convergence patterns are statistically significant.[25] Accordingly, both χ^2 (=16.814; 0 cells=0 % with expected count less than 5; $p < .001$) and Cramer's V (=.428; $p<.001$) assume comparatively high and statistically significant values. Thus, as soon as a firm's industry is taken as a proxy for its competitive strategy, strong convergence effects are revealed which, in

24 For examples, see Porter (1990: 179–541); Keck (1993); Walker (1993); Pavitt/Patel (1999); Hall/Soskice (2001a: 36–44); Amable (2003); Hancké/Herrmann (2007).

25 The nine traditional pharmaceutical firms, which were previously identified as RPI and DQP strategists, are now counted as only one case each, following the strategy-identification approach taken by most competitiveness scholars.

turn, provides empirical support for the competitiveness literature's argument that national institutions have a strong impact on the strategy choices of firms.

It is a pity for the sake of this argument that the PHID database does not include generics firms (see section 3). Attempting to evaluate how the inclusion of these low cost producers might affect the previous strategy convergence patterns, I looked for other data sources that reveal how many generics firms with a clear national scope were active in the UK, Germany, and Italy at the start of the new millennium.[26] The generics outlook by Wittner (2003) provides a particularly useful source, as it is written at about the same time I sampled the PHID database. Unfortunately, though, the generics outlook only offers an up-to-date overview of all *then active* generics firms, whereas the PHID database covers a *20-year time span* of pharmaceutical firms that have been involved in a pharmaceutical project which reached the stage of preclinical development. Furthermore, of the generics firms identified in Wittner's report at the start of the millennium, only two British,[27] three German,[28] and one Italian[29] generics producer had *not* been acquired by a foreign holding company at the start of 2008 (see Wittner 2003: 51–54, 70–73, 133–134).

This consolidation of national generics firms (see Wittner 2005) seems to reflect the increased vulnerability to change on the part of LCP strategies. The reasons are twofold. First, the absence of radical or incremental innovation as a source of value added means that profit margins are small, while price competition is high. As soon as LCP strategists come under financial pressure, they are particularly susceptible to takeover or bankruptcy because additional expenses cannot be covered by proportionate price increases (see Läsker 2005). Second, takeovers of LCP firms are easier than those of R&D intensive firms because technological barriers are lower (see Schröder 2004). In order to achieve the necessary economies of scale, mergers and acquisitions are thus the order of the day in the generics industry (see Wittner 2005). The greater instability of LCP might also explain why the two more recent strands of the competitiveness literature, i.e. theories on national innovation systems and on varieties of capitalism, focus on the importance of national institutions for RPI and DQP, rather than LCP, strategies. In other words, differences in the propensity of RPI, DQP, and LCP strategies to change make comparison inherently difficult, which is particularly true for studies of generics firms, as comparable data cannot be obtained from the PHID database.

That said, it is nevertheless worth exploring how the PHID sample changes when the six aforementioned generics firms are added – even though this does not

26 According to the approach used by the PHID database, a generics firm is said to have a national scope if it has its headquarters in, and concentrates its activities on, the national territory of the same country.

27 Namely *Kent Pharmaceuticals* and *Tillomed Laboratories*.

28 These are *Aliud Pharma*, *CT Arzneimittel*, and *Stada Arzneimittel*.

29 Namely *DOC Generici*.

profoundly alter the previous results. To begin with, it is revealing that generics producers were, and continue to be, active in the UK, Germany, and Italy alike. Consequently, the strategy convergence patterns observed in table 4 become even less distinct when generics producers are added (see table A.1 reproduced in the technical appendix). It is thus hardly surprising that a cross-tab analysis of the firms' *country* and *competitive strategies* shows these modest convergence patterns not to be statistically significant,[30] which, again, challenges the convergence argument of the competitiveness literature.

However, as soon as the *industry* of firms is taken as a macro-level indicator of their competitive strategy (see table A.2 of the technical appendix), cross-tab analyses reveal statistically significant convergence patterns.[31] Given that British, German, and Italian firms vary only modestly in their generics activities, the statistical significance results from the pronounced engagement of British pharmaceutical firms in biotechnology activities, while German and Italian firms are predominantly active in the traditional pharmaceutical sector. Yet, this macro-level assessment of competitive strategies also entails the simplifying assumption that all firms in one industry pursue the same competitive strategy. All biotech firms engaged in DQP and all traditional pharmaceutical firms pursuing RPI or LCP strategies are ignored. It is this loss of information on micro-level variety that enables the competitiveness literature to identify convergence trends due to the use of macro-level indicators.

5 Conclusion and outlook for future research

The previous assessment of whether firms in different economies converge in the pursuit of one competitive strategy has illustrated one crucial point. Whether or not statistically significant convergence patterns are observed depends on the sophistication of the strategy measures employed. The widely diffused approach of competitiveness scholars of identifying competitive strategies through *macro-level indicators* based on the industries of different firms yields strong convergence results. Importantly, though, this approach entails the simplifying assumption that all firms within the same industry pursue the same competitive strategy. The more fine-grained indicator used here, combining the technological novelty of a firm's products and its value-chain focus, has shown however that firms within the same industry can pursue different strategies. And, as soon as this indicator, capturing richer micro-level information, is employed, the previously strong convergence

30 $\chi^2 = 3.643$ (0 cells = 0 % with expected count less than 5); $p = .457$. Cramer's V = .130; $p = .457$

31 $\chi^2 = 18.037$ (3 cells = 33.3 % with expected count less than 5); $p < .01$. Cramer's V = .303; $p < .01$

results are seen to be decisively more modest and, even, statistically insignificant. In other words, the loss of information that is related to the use of macro-level indictors seems to explain why competitiveness scholars find strong effects of strategy convergence within the same economy.

What does this finding teach us about the viability of the RBV approach, on the one hand, and the competitiveness literature, on the other? To be clear, the analyses of this paper do *not* show that national institutions are *of no relevance* to firms. On the contrary; national institutions possibly explain an essential part of industrial development, e.g. why the biotechnology industry is more developed in the UK than in other European countries. Crucially, though, the above analyses alert us not to confuse the expansion of *industries* with the corporate choices made over *competitive strategies*. If at all, a firm's industry seems to be a very crude measure of its competitive strategy. Consequently, the findings of this paper challenge one of the core arguments of the competitiveness literature: *that* firms (start to) compete through the same strategy in response to globalization. Second, it indicates *why* the convergence effects revealed by this literature are, maybe overly, pronounced: because the use of macro-level indicators for competitive strategies could well miss important micro-level information. However, what the previous results do not teach us is: *how* firms can so numerously compete through strategies that are not supported by national institutions?

To be clear, it is less surprising that firms within one economy, and even within one industry, engage in different strategies. In order to gain a competitive advantage, they need to distinguish themselves from other firms through having a better strategy. Each firm needs to do something different from its competitors so as to produce either newer, better, or cheaper products. However, one puzzle that remains to be solved by future research is how firms can pursue diverse strategies. Can the RBV approach offer the advice that, in order to pursue the same strategy, firms can randomly employ different types of a single input factor, as long as the latter is turned into a valuable, rare, imperfectly imitable, and strategically non-substitutable resource (Barney 1991)? Does a systematic approach for such transformation procedures exist? Or is the competitiveness literature nevertheless able to provide answers? Do firms need specific types of a single input factor to pursue a given strategy? And, if so, how can firms secure the required factor types in those economies where they are not provided by national institutions? The present article can thus be no more than the beginning of a broader analysis of how firms cope with increasing pressures for competitiveness in the wake of globalization.

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Technical Appendix

Table A.1 Summary results: RPI, DQP, and LCP strategists in the UK, Germany, and Italy (including generics firms)

	Radical Product Innovators		Diversified Quality Producers		Low Cost Producers		Total	
	No. firms	% firms	No. firms	% firms	No. firms	% firms	No. firms	% firms
UK	19	45.0	17	40.0	6	15.0	42	38.9
Germany	13	36.1	17	47.2	6	16.7	36	33.3
Italy	10	33.3	11	36.7	9	30.0	30	27.8
Total	42		45		21		108	100.0
Average	14	38.9	15	41.7	7	19.4	36	
Above average		6.1		5.5		10.6		

Source: PHID database (November 2004) and Wittner (2003: 51–54, 70–73, 133–134).

Table A.2 Summary results: Biotechnology, traditional pharmaceutical, and generics firms in the UK, Germany, and Italy

	Biotechnology firms		Traditional pharma. firms		Generics		Total	
	No. firms	% firms	No. firms	% firms	No. firms	% firms	No. firms	% firms
UK	23	59.0	14	35.9	2	5.1	39	39.8
Germany	10	31.3	19	59.4	3	9.3	32	32.7
Italy	3	11.1	23	85.2	1	3.7	27	27.6
Total	36		56		6		98	100.0
Average	12	36.7	18.67	57.2	2	6.1	32.67	
Above average		22.3		28.0		3.2		

Source: PHID database (November 2004) and Wittner (2003: 51–54, 70–73, 133–134).

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