

Changing Vertical Integration Strategies under Pressure from Foreign Competition: The Case of US and German Multinationals

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ABSTRACT This study contributes to the emerging body of research into the influence of foreign competition on firm scope. Industrial organization economics, the resource-based view of the firm, and transaction cost economics consistently predict vertical de-integration in the face of intensifying pressure from imports and foreign direct investment. We show this was the case for 407 US firms between 1987 and 2003. Results for a panel of 95 German firms reveal a similar reaction to pressure from an increase in imports, but show no reaction to increased exposure to incoming foreign direct investment during the same time frame.

INTRODUCTION

Foreign competition has been growing for decades through cross-border trade, investment, and mergers and acquisitions, posing a challenge to firms in their home countries (Sachs et al., 1995; UNCTAD, 2002). At the same time, many firms have reconfigured their value chain through vertical integration, de-integration, and sometimes reintegration, leveraging new delivery models that involve functional specialization and the outsourcing of entire value chain segments (Feenstra, 1998; UNCTAD, 2002). Scholars have argued that '... the strength of competition ... can be expected to mold the scope of a firm's activities' (Teece et al., 1994, p. 28). This raises an obvious yet important question that is of relevance both to researchers and to managers in charge of corporate scope and value chain strategy: Does changing foreign competition pressure influence the vertical integration strategies of firms?

Past research on foreign competition has assessed the different causes and effects of international trade and investment on industries (e.g. Driffield and Love, 2007; Ghosal, 2002). Research focusing on industrial organization, transaction cost, and property rights theory has found that foreign competition has a negative or U-shaped effect on vertical scope at the industry-level (e.g. Aghion et al., 2006; Nor et al., 2006). Other work has

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taken a policy perspective, assessing the anti-competitive effects of vertical integration, and discussing the merits of vertical disintegration (e.g. Chemla, 2003; Hackner, 2003; Sappington, 2006). Looking at an industry as a unit of analysis has provided insights into market structure and dynamics that aid the formulation of public policy and competitive strategy for a given industry and for respective business units of firms. Clearly, industry-level research cannot provide conclusive insights on the mechanisms that determine corporate strategy and the configurations of firm boundaries across industries. We see a strong mandate for taking a firm-level perspective in the many efforts that have been made to understand the determinants of firm boundaries, such as their vertical scope, which has become firmly established as one of the fundamental concerns of strategy research (Bromiley and Johnson, 2005; Lafontaine and Sladc, 2007).

A number of studies have begun to explore product and geographic scope in the context of the dynamics of foreign competition (e.g. Bowen and Wiersema, 2005; Meyer, 2006; Rondi and Vannoni, 2005; Wiersema and Bowen, 2008). However, most extant work focuses on competition in relatively general terms, more often than not implicitly domestic rather than explicitly foreign. Furthermore, most studies are positioned within the industrial organization or transaction cost research traditions, and so suggest that competition is negatively related to vertical scope (e.g. Balakrishnan and Wernerfelt, 1986; Elberfeld, 2002; Harrigan, 1984, 1986). More recent studies have begun to incorporate firm capability-related concepts from the resource-based view of the firm (e.g. Díez-Vial, 2007; Leiblein and Miller, 2003). Scholars recognize that vertical scope is a function of firms' individual resources as well as external influences (such as foreign competition). Aiming to maximize gains from trade, firms' vertical scope must therefore be analysed in the dynamic context of changing transaction partners and competitors (Jacobides and Hitt, 2005). Nonetheless, explicit firm-level analysis of foreign competition and vertical scope is still limited.

McLaren (2000, p. 1239) presents a formal equilibrium model and demonstrates that opening national markets to competition 'thickens the market, facilitating leaner, less integrated firms'. Toulan (2002) assesses the impact of market liberalization in Argentina on vertical scope, and finds that liberalized market conditions encourage outsourcing. Coucke and colleagues assess the impact of import competition on exits from the Belgian manufacturing sector and find vertically specialized firms that rely on outsourcing to be less likely to exit under import pressure (Coucke and Sleuwaegen, 2007; Coucke, 2005). While it is true that these studies treat general aspects of globalization, we are not aware of any firm-level empirical studies that explicitly operationalize foreign competition to analyse the impact of foreign competition on vertical scope.

Vertical integration strategies remain by and large a blind spot in the context of firm-level foreign competition research. This is somewhat surprising considering the amount of attention that topics such as outsourcing and offshoring have received both in current research and in the media (e.g. Doh, 2005; Farrell, 2005; Linder, 2004).

Scholars have long argued that corporate scope is defined along at least three dimensions: vertical, product, and geographic (e.g. Andrews, 1971/1987; Chandler, 1962; Porter, 1985), with the last two receiving more attention in strategic management research. However, we believe that research on vertical scope under foreign competition is in and of itself important to a full understanding of firm scope determinants.

To complement extant foreign competition and firm scope research with a new perspective on vertical scope, we start by outlining the theoretical reasons why foreign competition can be expected to affect vertical scope, providing a definition of foreign competition and a brief discussion of key propositions. We then develop hypotheses on the influence of foreign competition dynamics on vertical scope changes and present our research methodology. We test our hypotheses with panel data for 407 US and 95 German firms from 1987 to 2003. We conclude with a discussion of our results, acknowledge limitations, and suggest avenues for future research.

BACKGROUND

Foreign Competition

Foreign competition encompasses a range of offensive activities undertaken by firms to compete outside their home market. These activities involve the cross-border exchange of physical goods, services, resources, or knowledge about markets, competitors, products or technologies, to extract economic gain from foreign demand or supply markets. Incumbents, that are firms that were already established in the target market, may be faced with foreign competition not only in their home market but also in outside markets where they have interests.

Foreign competition has been shown to decrease margins, enhance industry productivity, and speed up the quest for innovation and differentiation (e.g. Baldwin and Gu, 2004; Driffield and Love, 2007; UNCTAD, 1997). This can be explained by increased market efficiency that results from an increase in the number of competitors. Looking beyond market structure considerations, foreign competitors may also be able to leverage international economies of scale and scope: the ability to integrate and share technology or physical assets, or to access low-cost supplies, strategic assets or knowledge across geographies can create competitive advantage. That competitive advantage can only be captured by firms that operate an international business portfolio and orchestrate cross-border value chains. This implies competitive advantage and intensity that goes beyond what is feasible at the domestic level. For all these reasons, we find that foreign competition adds intensity to inter-firm rivalry.

Imports and foreign direct investment (FDI) are the two main 'transmission mechanisms of change' (Buckley and Ghauri, 2004, p. 83). We differentiate our definition of foreign competition along those lines. We look at imports as a way that foreign multinational enterprises compete from their own base with domestic firms, that is, firms already established in the target market. We refer to such arm's length competition through imports as abroad-based foreign competition (AFC). In contrast, FDI entails the establishment of a presence in the target market, therefore we refer to it as locally-established foreign competition (LFC).

Industrial Organization, Transaction Cost, and Capability Perspectives of Vertical Scope

Firm scope research focuses on the dimensions that attract and bind resources, and that motivate investment or de-investment to earn economic rents. Scope dimensions are

typically discussed in terms of growth trajectories that characterize firm boundaries, including horizontal, geographical and vertical scope (Andrews, 1971/1987; Chandler, 1962; Porter, 1985). As we have said, this study addresses a gap that has existed heretofore in the literature by focusing on vertical scope, which comprises the range of functional activities firms are engaged in along the value chain. Vertical scope analysis is concerned with market and firm-level determinants of the internalization or externalization of different elements of the vertical value chain (Lafontaine and Slade, 2007). A number of theoretical perspectives have been developed to explain how market and industry forces shape vertical scope, what firm-specific resources and capabilities shape vertical scope configuration and reconfiguration, and what mechanisms come into play when the relative benefits and costs of internalized vs. externalized economic transactions are assessed.

Beginning in the 1970s, much of the vertical scope related work has been dominated by transaction cost theory that builds on Ronald Coase's (1937) seminal article on the nature of the firm. Much of this work has focused on the factors that lead to the internalization or externalization of intermediary transactions based on comparative transaction efficiency (Klein et al., 1978; Williamson, 1971). A sizeable body of empirical work assesses key theoretical constructs such as transaction uncertainty, frequency or transaction-specific assets and their influence on vertical scope (see Carter and Hodgson, 2006; David and Han, 2004 for surveys; also Geyskens et al., 2006). For the most part, it is assumed that the internalization of transactions along the value chain, i.e. vertical integration, is favoured if transactions take place in market environments that are characterized by high uncertainty associated with transaction volumes, technology, and actor behaviour, as well as by asset specificity, i.e. physical, human, site-specific or other dedicated assets that cannot easily be redeployed for other purposes (Geyskens et al., 2006; Joskow, 1988; Williamson, 1983).

Industrial organization offers another perspective on vertical scope (e.g. Porter, 1985; Schmalensee, 1988; Stigler, 1951). This research stream has focused on competitive considerations at the industry level, i.e. an 'outside-in' perspective, and assesses vertical integration drivers such as market power in growing or concentrating markets, foreclosure, price discrimination, or collusion (for a survey, see Lafontaine and Slade, 2007). According to industrial organization theory, vertical integration occurs if it enables firms to achieve oligopolistic or monopolistic market power to extract superior economic rents (Hastings and Gilbert, 2005; Mason and Philips, 2000), or to achieve competitive advantages through foreclosure or pre-emptive merging along their value chain (Chipty, 2001; Colangelo, 1995).

More recently, the resource-based view of the firm has advanced an 'inside-out' perspective on vertical integration (e.g., Argyres, 1996; Barney, 1999; Combs and Ketchen, 1999; Leiblein and Miller, 2003). According to this view, vertical scope depends on the comparative advantage that a firm has in a particular segment of its value chain in the respective market context (Jacobides and Hitt, 2005; Jacobides and Winter, 2005). The comparative advantage, in turn, is seen to originate from a firm's superior capabilities and resources, which have formed over time as a result of a specific, path-dependent learning process and are thus imperfectly imitable (Barney, 1991; Teece et al., 1997). Consequently, firms focus on functions that represent the core of their competitive

advantage based on superior capabilities and resources, and rely on external parties for non-core activities (Araujo et al., 2003; Mota and Castro, 2004; Rothaermel et al., 2006). This notion can be restated from an 'outside-in' perspective: vertical scope configurations are subject to boundary conditions imposed by the respective market structure. Sufficiently large and efficient markets support vertical focusing on core capabilities. They relax limits to specialization, and firms can rely on efficient transaction mechanisms when contracting non-core capabilities. In smaller, less efficient markets, broader vertical scope that internalizes non-core capabilities may be more beneficial in reducing transaction risks or exerting market power.

In summary, these three well-established theories of vertical integration offer complementary explanations based on industry, firm, and transaction-specific characteristics. Furthermore, previous research has recognized that market characteristics, transaction economies, and firm-specific economies based on strategic assets, organizational capabilities or technologies are equally important when assessing vertical scope, and has suggested multi-theoretic research approaches (Balakrishnan and Wernerfelt, 1986; Diez-Vial, 2007; Jacobides and Winter, 2007; Perry, 1989; Stuckey and White, 1993). In essence, vertical scope theories describe different constituent parts of the same phenomenon, and can therefore be combined for a comprehensive view.

Foreign Competition Dynamics and the Determinants of Vertical Scope

Changes in foreign competition influence a number of the vertical scope determinants we have briefly outlined. First and foremost, increased pressure from foreign competition intensifies competitive rivalry simply because there are more competitors, and foreign competitors may very well have superior capabilities due to international economies of scale and scope. Additionally, expanding particular idiosyncratic firm advantages (Hymer, 1960/1976), foreign competitors may enter the market with superior know-how, products or processes, thereby further intensifying competitive rivalry. With a greater number of capable competitors, incumbents feel a greater need to reduce costs or differentiate their value propositions given accelerated product and industry life cycles (Jacobs et al., 1997; Stuckey and White, 1993). In addition, foreign competition contributes to accelerated innovation and diffusion of new technologies, which adds turbulence (Afuah, 2001; Geyskens et al., 2006; Leiblein et al., 2002). In such accelerated, dynamic environments, weaknesses in areas where firms may not be fully competitive are quickly exposed.

A more turbulent competitive environment with a broader choice of potential transaction partners and greater uncertainty regarding technology and innovation implies greater strategic complexity for incumbents. It may become increasingly difficult for them to secure the best supplies and output channels at all times along an integrated internalized value chain (Balakrishnan and Wernerfelt, 1986; Harrigan, 1986). Consequently, incumbents will seek greater flexibility that will allow them to leverage opportunities to contract more efficient outside transactions. This may entail more frequently switching transaction partners (Araujo et al., 2003; Rothaermel et al., 2006). Moreover, firms may choose to redraw their boundaries, gradually instituting permeable vertical boundaries. Jacobides and Billinger (2006), for example, provide a case study on a firm,

whose permeable architecture is partly integrated and partly open, enabling the firm to buy inputs from and sell to intermediate markets.

The quest for flexibility is reinforced by a number of broader globalization trends (Dunning, 2000; Porter, 1986). Advances in communication technology and logistics mitigate the competitive benefits of site-specific investments, and lower the costs of external transactions and coordination (Hitt, 1999). The co-location of specific value chain elements may no longer be beneficial. The emergence of flexible, multi-purpose manufacturing technologies that allow rapid retooling or remote, real-time, network-based production management makes physical asset-specific investments less differentiating (Stuckey and White, 1993). A mobile, professional international workforce is increasingly at ease with managing quasi-integration and dynamically changing transaction relationships (D'Aveni and Ilinitich, 1992; Stuckey and White, 1993),^[1] which potentially reduces the benefits of human asset-specific investments.

Overall, investments into transaction-specific assets may become less economical in the face of foreign competition compared to less competitive, less dynamic, and less integrated environments. In fact, transaction-specific investments may even present strategic liabilities as they create exit barriers and engender the risk of sunk costs (Mahoney, 1992; Williamson, 1983). Consequently, domestic firms faced with foreign competition will reconsider the way they structure intermediate transactions, and increasingly resort to technologies or contractual set-ups designed to enhance flexibility with its related economic benefits. In the aggregate, the efforts firms make to deal with pressure from foreign competition should ultimately alter intermediate exchange conditions and practices in the broader industry context, resulting in lower average levels of asset specificity (Jacobides, 2006; Jacobides et al, 2006; Mahoney, 1992; Toulan, 2002).

Finally, increased foreign competition extends the market boundaries that define competitive environments (Feenstra, 1998; UNCTAD, 2002). An increasing presence of foreign competitors in an industry indicates increasing global integration in that industry (UNCTAD, 1997). Global integration not only tends to enhance industry growth, but also results in market convergence across geographies (Porter, 1986). As a result, relevant market boundaries and the pool of intermediary transaction partners are extended beyond the domestic level (Diez-Vial, 2007; Jacobides, 2008; Nor et al., 2006). Foreign competition enhances market efficiency as it increases the number of buyers and sellers. As a result, firms have new opportunities for vertical specialization, or put another way, there are fewer possibilities for market power through vertical foreclosure or collusive behaviour (Harrigan, 1985b; Stuckey and White, 1993).

There are some marked differences in the way domestic firms react to competition from imports, abroad-based foreign competition (AFC), FDI, and locally-established foreign competition (LFC). Imports are characterized by a lower strategic commitment, while FDI locks foreign challengers into the competitive arena through local assets (Ghemawat and del Sol, 1998; Johanson and Vahlne, 2003). Consequently, AFC may mean a greater frequency of disturbances as challengers can enter the market, or withdraw from it, more easily than in the case of LFC. As a result, AFC attacks will mean a more complex competitive environment. LFC, on the other hand, may result in a greater magnitude of disturbances, as those challengers typically operate at critical scale levels and can leverage their firms' internationally integrated supply chain. Whether the

disturbances are frequent or are serious in magnitude, the result will be increased uncertainty in the market.

In terms of asset specificity, the key difference between the influence of competition from imports as opposed to from FDI is grounded in the nature of the geographical location of strategic assets. By definition, abroad-based foreign competition comes from outside of the domestic market, whereas in the case of FDI, locally-established foreign competitors operate at, or very close to, their domestic opponents' home locations. So, while site-specific investments may be a strategic differentiator in the case of AFC, in that of LFC, shared geographical locations eliminate some of the differentiation benefits, making location-specific investments relatively less economical and contributing to lower average asset specificity.

In summary, foreign competition can be expected to increase market dynamics and related uncertainty in intermediate transactions, to extend market boundaries and raise the number of viable transaction partners, and as a consequence, to lower the average level of asset specificity. Yet, because the differences between AFC and LFC are complex and diverse, it is difficult to predict when one type of foreign competition may exert a greater influence on vertical scope determinants than the other.

HYPOTHESES

The influence of intensifying foreign competition on the competitive environment carries some positive implications for incumbents in terms of vertical integration. Increased competition intensity results in a need for greater flexibility, and more adaptability in forming supply chains. Increasingly dynamic environments due to global competition make vertically integrated value chains too rigid with their potentially costly long-term commitments to individual internalized transactions (Geyskens et al., 2006; Harrigan, 1986). Firms can become trapped in a disadvantageous location, may employ more personnel than is optimal, and keep using obsolescent technologies. As a result, those firms are not in a position to capitalize on favourable market or price developments nor to benefit from new technology (Afuah, 2001; D'Aveni and Ravenscraft, 1994; Harrigan 1985a): 'Vertical integration is a risky strategy — complex, expensive, and hard to reverse' (Stuckey and White, 1993, p. 71).

As competition grows firms may find it increasingly difficult and costly to organize integrated supply chains to deliver differentiation and cost efficiency from end to end, and to maintain best practices across every vertical segment. Complexity can become especially burdensome if firms operate multiple parallel value chains in different globalizing industries. In fact, foreign competition will create a situation where weaknesses and inefficiencies along integrated value chains will become more prevalent due to more dynamic rivalry and accelerated product life cycles (Jacobs et al., 1997). Investments that commit resources to individual transactions may no longer be economical. Transaction-specific assets will yield only short-term advantage and face rapid obsolescence. In addition, foreign competition dynamics may induce a 'low-trust atmosphere' (Buckley and Ghauri, 2004, p. 85) in large organizations: internal organizational complexity paired with increasing competition turbulence may enhance the threat of opportunism

on the part of internal suppliers or distributors. Firms may no longer be willing to rely on internalized transactions to source supplies, or to distribute products and services.

The transaction environment is bound to change. When intensifying rivalry exposes weaknesses and inherent risks in specific segments of the value chains of firms, decision-makers may conclude that the firm does not possess the capabilities needed to address the challenges they face, and so they will turn to external sources to operate that particular segment of the value chain. To facilitate transactions with external partners, firms will reduce the asset specificity inherent in their transactions (David and Han, 2004; Jacobides et al., 2006; Williamson, 1991). Firms will seek to redesign their value chains in ways that will allow them to add and to remove external transaction partners more rapidly and at less cost (much like service-oriented architectures in information technology) as strategic requirements evolve. In dynamic industries under foreign competition pressure, the benefits of ongoing, sustainable dynamic capabilities that may be achieved through de-integration and flexible transaction contracting capabilities should outweigh the benefits of integration (Argyres and Mayer, 2007; Teece et al., 1997).

Increased competition extends the number of potential transaction partners at all stages of an industry's value chain (Jacobides, 2008; Macher et al., 2002; Nor et al., 2006). Hence specialization is less 'limited by the extent of the market' (Stigler, 1951) and incumbents have broader opportunities to capture specialization advantages in the core segments of their value chains, e.g. through stage-specific scale economies (Fontenay and Hogendorn, 2005). As external contracting becomes less constrained by transaction-specific asset requirements, firms are likely to reallocate resources from non-core competence functions to those segments of the value chain where their productive capabilities are put to their best competitive advantage (e.g. R&D, marketing or design), and to subcontract non-strategic activities (e.g. product assembly or distribution) to partners that have core competencies in complementary areas (Buckley and Ghauri, 2004; Jacobides and Hitt, 2005; Rasheed and Gilley, 2005).

Competitive pressure and dynamic complexity challenges on one side, and globalized market opportunities on the other, encourage vertical specialization on competitive core capabilities, and the de-integration of non-core activities (Jacobides and Hitt, 2005; Mahoney, 1992; Stuckey and White, 1993). Therefore, increasing foreign competition exposure will prompt firms to take advantage of the broader possibilities for efficient external transaction contracting that are inherent in their larger supra-national market. More efficient international markets encourage firms to specialize on those value chain elements where they are the most competitive, that is, where they possess special productive capabilities, and to increasingly turn to outsourcing or quasi-integration forms of organization in value chain segments where they possess less competitive capabilities (Jacobides and Billinger, 2006; Rothaermel et al., 2006).

This conclusion is consistent with industrial organization and transaction cost considerations which hold that increasingly integrated and efficient international markets reduce the risk of supply or demand fluctuation as well as the threat of foreclosure that could justify backward or forward integration in narrow markets. Larger markets with a greater number of competitors or potential transaction partners also limit opportunities for incumbents to exert market power through foreclosure or other collusive behaviour, and result in lower asset specificity. In essence, entry into the less competitive segment of

a vertically integrated industry can tip the entire industry toward disintegration (Elberfeld, 2002; Fontenay and Hogendorn, 2005; Perry, 1989).

Taking into consideration the industrial organization, transaction cost, and capability arguments, we conclude the following. First, there are a number of different but complementary theoretical concepts that explain vertical scope changes, ranging from market power to core capabilities to efficient transaction contracting. Second, despite their different theoretical origins, these arguments lead us to a consistent conclusion regarding the hypothesized influence of foreign competition dynamics on vertical scope changes. Consequently, we expect 'a negative relationship between competition and integration' (Balakrishnan and Wernerfelt, 1986, p. 348).

Hypothesis la: Firms will reduce their vertical scope when exposed to an increase in competition from imports in their home market (i.e. A AFC).

Hypothesis lb: Firms will reduce their vertical scope when exposed to an increase in competition from FDI in their home market (i.e. A LFC).

Hypotheses la and lb lead us to another question: Assuming that foreign competition does in fact drive a firm to reduce its vertical scope, does its ex-ante vertical scope level have an influence on the intensity of this effect? Given that we expect firms to shed all the activities in their internalized value chain that are not core, vertical scope reduction should ultimately lead to nuclear firms that focus on their competitive capability core. The intensity of scope restructuring has been argued to depend on firms' previous scope configuration paths, as represented by the level of scope (Johnson, 1996). The amount of de-integration pressure on non-competitive internalized value chain activities should be the greatest if, simply put, there are many of them. Broader ex-ante scope levels open room for strategic and financial control inefficiencies (Hoskisson and Johnson, 1992) that leave synergy potential to be addressed via more coherent, focused scope configuration. Studies have cited lack of scope fit (Duhaime and Grant, 1984), management and control challenges (Hoskisson and Johnson, 1992), and the prospect of releasing financial resources to be deployed to core operations (Hamilton and Chow, 1993; Markides, 1992) as motivations for restructuring activities. Consequently, firms with high ex-ante vertical scope levels will have more opportunities, or seek more urgently, to engage in vertical de-integration than firms that are already fairly lean and focused on the more competitive links in their value chain.

Hypothesis 2a: The higher the ex-ante vertical scope, the greater the reduction in vertical scope caused by an increase in competition from imports (i.e. A AFC).

Hypothesis 2b: The higher the ex-ante vertical scope, the greater the reduction in vertical scope caused by an increase in competition from FDI (i.e. A LFC).

Turning to foreign competition as the other component of the hypothesized foreign competition-vertical scope relationship, we ask a similar question: If foreign competition does in fact drive firms to reduce their vertical scope, is this relationship moderated by

ex-ante levels of foreign penetration? Firm behaviour theorists have argued that competitive actions (such as increasing foreign competition pressure) need to breach managers' attention threshold before they trigger a competitive response (Cyert and March, 1963; March, 1988). Foreign competition needs to reach a level of intensity that is sufficiently visible to be noticed and taken seriously in the context of the complex range of environmental stimuli managers are commonly exposed to (Chen et al., 2002). Given our focus on multinational enterprises (MNEs) (i.e. rather large firms), this notion seems particularly relevant, as we can expect the presence of scale efficiency to raise MNEs' comfort level vis-a-vis low foreign competition penetration levels. Consequently, we expect that it takes a minimum level of foreign competition penetration before incumbent firms will perceive it as a sufficiently credible threat to make them change their scope. For example, a 10 per cent increase from a very low penetration level may not cause incumbent managers concern, but a 10 per cent increase from an already elevated import-penetration level may be seen as alarming and so drive managers to react. Therefore we expect the following:

Hypothesis 3a: The higher the ex-ante level of import penetration, the greater the reduction in vertical scope caused by an increase in competition from imports (i.e. A AFC).

Hypothesis 3b: The higher the ex-ante level of competition from FDI, the greater the reduction in vertical scope caused by an increase in competition from FDI (i.e. A LFC).

RESEARCH METHODOLOGY

Context and Approach

Our primary objective is to uncover evidence that shows whether and how firms reconfigure their vertical scope under pressure from foreign competition. Consequently, we designed our research model to support causal inference, ergo we took a longitudinal approach (Greve and Goldeng, 2004; Hitt et al., 2004). Our models relate changes in foreign competition intensity in one time period to vertical scope changes in the next. This is because it takes time for the managers of incumbent firms to register the extent of the change, consider possible responses to it, and then to make scope changes.

We highlight industry and firm-level perspectives as two different research lenses. To fully assess our research question, our analysis captures two basic scenarios depending on whether the incumbent firm does business in a single industry or in more than one industry. Figure 1 provides a conceptual illustration of them. First, increasing foreign competition in a given industry i may have an impact on vertical scope changes in single-business incumbent firms that operate in that industry. This scenario could be assessed with an industry-level approach. However, many firms operate in more than one industry. An equally relevant scenario is one in which foreign competition in industry i or another industry j impacts multi-business firms that are active in industries i and j , especially if industries i and j are not adjacent, but sequential in terms of upstream vs. downstream business activities in the broader economic value chain system. Firms

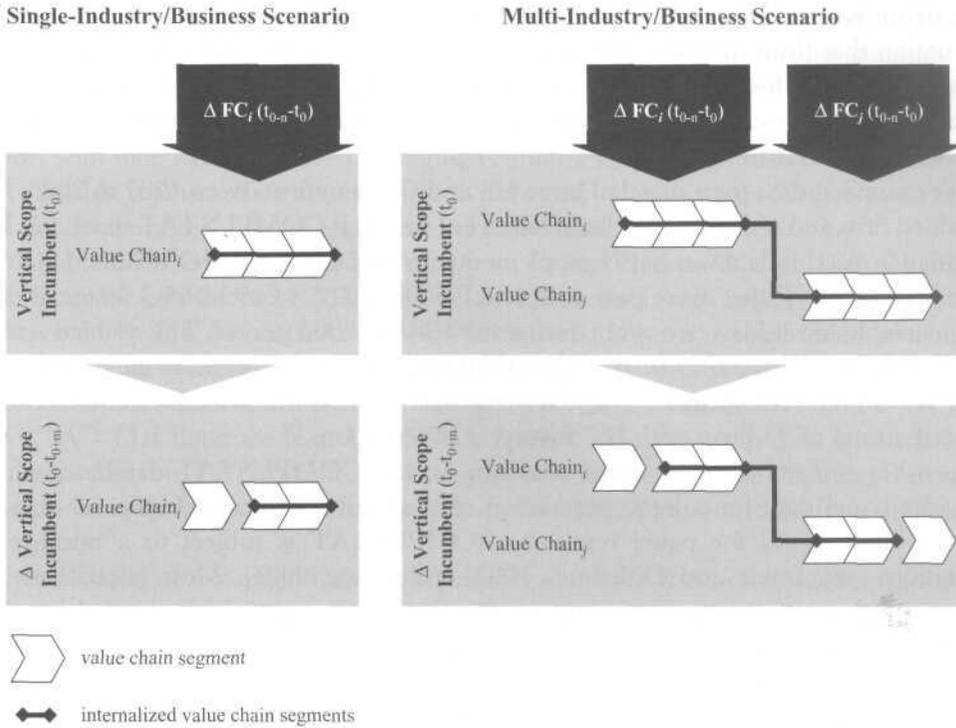


Figure 1. Illustration of single- vs. multi-industry/business perspectives

may vertically integrate across industries, as illustrated by industry input/output tables that indicate supply relationships between industries (Fan and Lang, 2000). Such a scenario warrants a firm-level research approach that captures firm business portfolios across multiple industries. In the end, it will always be difficult to define industry or value chain boundaries. Almost any industry or value chain can be regarded as a sub-element within a broader industry or value system context (Porter, 1985). A firm-level perspective can overcome some of the constraints inherent in industry classifications and related definitions.

Data and Sample

We focus in our analysis on rivalry within the home market of incumbents. While this may limit the scope of our study, it provides a clear frame of reference within which we can conduct a solid empirical analysis, and allows us to draw effective comparisons with extant research which has a predominantly national focus. Furthermore, such markets still account for the vast majority of the business of large firms. Rugman and Verbeke (2004) found that the world's 500 largest multinational enterprises still conduct on average more than 70 per cent of their business in their home region, and that only nine of those 500 firms could truly be characterized as global. Our data show that the domestic market accounts for more than 50 per cent of the total sales of German firms.

The figure is even higher for US firms at more than 80 per cent of total sales. Based on the notion that firms are likely to focus their attention and resources on areas with the greatest potential for economic success, these statistics strongly suggest that domestic markets are the most appropriate research lens for studying the determinants of corporate strategy and firm scope.

We compiled data for a panel of large US and German firms from 1987 to 2003. We obtained firm and segment-level financials from the S&P COMPUSTAT database. For German firms, this data was partly supplemented with data from THOMSON. US firms were selected if: (1) they were part of the S&P 500; and (2) segment-level financial data was available for at least two years during the 1987 to 2003 period. This yielded a total of 407 US firms with 5972 firm-year observations. German MNEs were included if they were part of the HDAX index,^[2] and if segment-level data was available. These criteria yielded a total of 95 firms with 867 firm-year observations^[3]

As other researchers have done, we draw on the COMPUSTAT database, which provides panel data for a large population of international firms. Despite its obvious benefits and appeal for panel research, COMPUSTAT is subject to a number of limitations (see Davis and Duhaime, 1992; Villalonga, 2004). Most importantly, it captures only up to ten business segments per firm. This imposes an arbitrary cap that may force artificial aggregation of segment data by highly diversified firms. However, in our sample, over 95 per cent of all firm-year observations contained data for five business segments or less. In fact, only 23 observations, just 0.3 per cent, contained data for the possible maximum number of segments^[4] While we cannot rule out the possibility that some firms under-reported segment data to aggregate separate business lines into one COMPUSTAT segment for the purpose of limiting transparency or reducing reporting effort, as the share of borderline cases is well below 1 per cent, we are confident that distortions from forced segment aggregation will be limited and so the possibility of reporting bias will be relatively consistent across firms. Considering that alternative data sources like the BITS or the TRINET databases are also subject to significant limitations, most notably their exclusive focus on the USA, on plants/establishments as opposed to firms as units of analysis, and on shorter, less recent^[5] reporting time frames (Davis and Duhaime, 1992; Villalonga, 2000), we found COMPUSTAT to be the best database for our purposes.

We selected US and German MNEs for a number of reasons. First, both countries have developed economies that have been home to a large number of MNEs for decades, which is crucial for us as we are interested in doing a longitudinal study of corporate strategy in an international context.^[6] According to the 2007 UN World Investment Report (UNCTAD, 2007), which lists the world's 100 largest transnational corporations, the USA is the country with the largest number of MNEs at 24, followed by Germany, France, and the UK, each with 13. Looking at the USA and Germany is also interesting because they represent two distinct varieties of capitalism with different business systems and institutional contexts. Obviously, the USA is Anglo-Saxon in nature, which tends to mean it is more or less characterized by unilateral decision-making and firm independence is geared towards shareholder interests. Germany represents a more collaborative variety of continental European capitalism with a greater emphasis on balancing the interests of a broader set of stakeholders (Soskice and Hall, 2001; Whitley, 1994). We also

had to take into consideration the feasibility of getting the required panel data. Finally, we had to be realistic about what would be practical to cover within the confines of a single journal article. While it would undoubtedly be interesting to extend our analysis to France and the UK, or to Japan which is fifth on the 2007 UN annual world investment report with nine MNEs, or even emerging economies such as the BRIC^[7] countries, we were unable to find sufficiently trustworthy secondary data sources that we could leverage for comparable business segment-level panel data.^[8]

We obtained our import and FDI data from United Nations sources. We took import data from the UN COMTRADE database, which consolidates import and export data as reported by national statistics offices. We captured imports as aggregated trade flows from exporting countries into the USA or Germany, broken down by Standard International Trade Classification (SITC) (rev. 2) trade category. Our FDI data is from the UNCTAD FDI database (e.g. UNCTAD, 2002, 2007). We measured investments as aggregated inward FDI stocks from all originating countries into the USA and Germany, broken down by International Standard Industrial Classification (ISIC) (rev. 2) industry categories.^[9]

In addition, we compiled industry-level data as a basis for the calculation of foreign competition penetration ratios and control variables. We took data on industry size, growth, and productivity from the Groningen Growth and Development Centre (GGDC) 60-industry database which provides an internationally comparable dataset on industrial performance for OECD countries (GGDC, 2005). To measure industry concentration, we obtained output concentration among the top four industry players from the US Census Bureau, and output concentration among the top six industry players from the German Statistisches Bundesamt. We mapped import, FDI, and other industry-level data to the sample firms' business segments using correspondence tables available through the United Nations Statistics Division and the EUROSTAT websites.

Dependent Variable: Vertical Scope Changes

We apply two complementary empirical perspectives to capture different aspects of vertical scope changes, one to reflect within-industry vertical integration changes, and another to reflect changes in vertical integration between different industry segments a firm may be engaged in. Empirical measurement of vertical scope is still a surprisingly open issue despite decades of research on vertical scope itself. There are a host of hybrid quantitative-qualitative methods, but the most widely used measurement approaches are the value-added to sales (VA/S) approach and the input-output connection approach (I/O) (Lajili et al., 2007). Hybrid methods are unsuitable for large sample cross-industry research as they require in-depth assessments of firm and industry-specific value chain characteristics. We focus our attention on the VA/S and I/O connection approaches. VA/S has traditionally been the method of choice in economic research and it is still popular today (Adelman, 1955; Nor et al., 2006). It rests on the assumption that as firms participate in more segments of the value chain, they increase the amount of value-added (i.e. sales minus external purchases) they generate compared to the share of external purchases.

$$VA/S = \frac{\text{Sales} - \text{Purchases}}{\text{Sales}}$$

Although VA/S has obvious simplistic appeal, it is subject to a number of limitations. Most importantly, it is biased depending on the stage in the value chain in which firms operate. The further downstream firms operate, the higher the share of purchased inputs, and the lower the degree of vertical integration in terms of VA/S. Also, VA/S captures only implicitly that many firms are active in different industries that may or may not be vertically related, as it is usually applied at the aggregate firm level as opposed to business segment-level analysis. Finally, VA/S may be distorted by changes in profitability trends or by the accounting treatment of tax and depreciation (Buzzell, 1983; Lindstrom and Rozell, 1993; Tucker and Wilder, 1977). Tucker and Wilder (1977) as well as Buzzell (1983), propose adjustments to VA/S measures to address such distortion:^[10]

$$VA/S_{\text{Buzzell}} = \frac{VA - (\text{net profits} + 20\% * \text{investment})}{\text{Sales} - (\text{net profits} + 20\% * \text{investment})}$$

$$VA/S_{\text{Tucker \& Wilder}} = \frac{VA - (\text{net income} + \text{income taxes})}{\text{Sales} - (\text{net income} + \text{income taxes})}$$

The I/O connection method is a more sophisticated approach as it takes advantage of national input/output matrix data, which is applied at the firm level. In essence, we assume that two business segments are linked vertically if, at the industry-level, one segment's outputs serve as the other segment's inputs. Input/output data is then used to derive vertical connection scores, which express the relative importance of one industry's inputs for another industry in comparison to the second industry's overall inputs, and vice versa (Fan and Lang, 2000; Maddigan, 1981). The more goods or services flow from one industry to another in relative value terms, the greater their vertical connection. This approach has been implemented in a number of studies (see Lajili et al., 2007 for a survey).

For the purpose of this study, we build on Fan and Lang's (2000) vertical relatedness concept and use backward (i.e. based on input data) and forward (i.e. based on output data) vertical relatedness scores as the basis for a set of I/O connection measures.^[11] Drawing on the weighted average relatedness concept proposed by Tcece et al. (1994), we calculated weighted-average measures of backward and forward vertical connection between firms' non-core business segments *i* and their core business segment *c*, yielding an average *i-to-core* vertical connection score per firm-year. In addition, we calculated a weighted average measure of vertical connections between all possible combinations of segments across a business portfolio, i.e. an average *i-to-j* vertical connection score. We computed all three measures for every firm-year observation in our sample, applying firm segment sales as weights.

$$\text{Backward Vertical Connection} = \frac{\sum_{i \neq c} \text{Backward Relatedness}_{ci} * \text{Sales}_i}{\sum_{i \neq c} \text{Sales}_i}$$

$$\text{Forward Vertical Connection} = \frac{\sum_{i \neq c} \text{Forward Relatedness}_{ci} * \text{Sales}_i}{\sum_{i \neq c} \text{Sales}_i}$$

$$\text{Portfolio Vertical Interconnection} = \left(\frac{\sum_{j \neq i} \text{Forward Relatedness}_{ij} * \text{Sales}_j}{\sum_{j \neq i} \text{Sales}_j} + \frac{\sum_{j \neq i} \text{Backward Relatedness}_{ij} * \text{Sales}_j}{\sum_{j \neq i} \text{Sales}_j} \right) / 2$$

Compared to the VA/S, the I/O connection approach offers some key advantages. First, it explicitly captures vertical connections between business segments in multi-business firms. Second, by design, the measure is not distorted by a firm's relative position in the value chain. Consequently, I/O connection measures are not subject to downstream bias and this provides enhanced cross-firm comparability. However, I/O measures are not free of shortcomings. Applying national input/output data at the firm level assumes that national industry aggregates are applicable to individual firms. The input/output matrix may introduce inaccuracy if it is too aggregated, or if its classification structure does not appropriately match firm segment structures (Lindstrom and Rozell, 1993). Also, the issues relating to profitability and accounting changes remain. Finally, the I/O connection approach does not detect vertical integration within firm business segments. Single-business firms, for example, would always show a vertical I/O connection score of zero. So, while both the VA/S and I/O connection approaches have merits and shortcomings, at the same time, they are complementary: the VA/S approach is used most appropriately as a within-industry integration measure, while the I/O connection approach explicitly captures cross-industry vertical connections (Davies and Morris, 1995). We concluded that by using both approaches we could have a balanced trade-off and check our results for consistency (Lindstrom and Rozell, 1993). Table I indicates that our two measures are, at best, only moderately correlated, whereas within the respective measurement approaches, correlations are considerably higher, as indicated by the correlation coefficients in bold font.^[12] This suggests discriminant validity and thus that we indeed have two distinct variants of the same underlying broader vertical scope concept.

This study assesses how pressure from increasing foreign competition influences changes in vertical scope. This means that we need to capture whether firms become more or less vertically integrated over time. How many value chain segments a firm participates in, and how deeply these are integrated in absolute terms is of secondary concern. Therefore, we computed change scores for the six specified VA/S and I/O connection measures. We cumulated changes between t0 and t2 to reflect the fact that

Table I. Correlations between VA/S and I/O connection measures

	Std. dev.	1	2	3	4	5	
<i>US firms</i>							
1 Value-added to sales (VA/S)	0.19						
2 Adjusted VA/S (Buzzell, 1983)	0.25	0.78*					
3 Adjusted VA/S (Tucker and Wilder, 1977)	0.53	0.36*	0.85*				
4 Forward vertical connection	0.35	0.13*	0.16*	0.07*			
5 Backward vertical connection	0.33	0.14*	0.17*	0.03*	0.89*		
6 Portfolio vertical interconnection	0.04	0.25*	0.10*	0.05*	0.40*	0.37*	
<i>German firms</i>							
1 Value-added to sales (VA/S)	0.24						
2 Adjusted VA/S (Buzzell, 1983)	0.29	0.96*					
3 Adjusted VA/S (Tucker and Wilder, 1977)	0.42	0.86*	0.95*				
4 Forward vertical connection	0.28	-0.00	0.05	0.09*			
5 Backward vertical connection	0.29	-0.01	0.04	0.09*	0.98*		
6 Portfolio vertical interconnection	0.04	0.03	0.05	0.03*	0.59*	0.60*	

Notes: Values have been adjusted for time effects by de-meaning.

* $p < 0.05$ (two-tailed).

Correlations for measures for common overarching construct are shown in **bold**.

vertical scope changes such as the integration or outsourcing of value chain segments are complex and time-consuming endeavours.^[13]

In line with correlation analyses (see Table I), construct reliability analyses revealed high internal consistency across the individual VA/S and I/O measures, respectively.^[14] Factor extraction permitted us to reduce VA/S and I/O connection change scores into two factor-score based indicators, one aggregate A VA/S and the other A I/O connection measure. With the confidence of reliable constructs, this allowed us to condense our analysis and results presentation while making sure that the underlying constructs are properly represented.^[15] Table II provides an overview of the average direction of vertical scope changes for the firms in our sample, aggregated by industry sector.^[16]

Independent Variables: Foreign Competition Changes

Abroad-based foreign competition penetration changes were calculated from import data and locally-established foreign competition penetration changes were determined from inward FDI stock data. Industry AFC and LFC penetration ratios, AFC and LFC stock in a given industry divided by the value-added of that industry, were calculated using data on industry value-added from the GGDC 60 industry database. In order to reflect the influence of foreign competition across all the businesses of a firm, we weighted each of its business segments by the corresponding AFC or LFC penetration ratio to obtain a business segment-sales-weighted average AFC or LFC penetration score.^[17]

We capture AFC changes as import penetration changes between $t-i$ and t . Previous studies suggest a single-year lag (e.g. Bowen and Wierscma, 2005; Liu, 2006). Because it

Table II. Vertical scope increases and decreases, US and German firms

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
<i>US firms</i>																	
Value-added to sales																	
Primary sector ^a	+	-	+	+	-	-	+	-	-	+	-	+	-	+	+	+	-
Secondary sector ^b	-	+	-	-	-	+	+	+	-	+	+	+	+	-	-	-	-
Tertiary sector ^c	-	-	-	-	+	+	-	+	-	-	+	-	+	+	+	+	-
Overall	-	-	-	+	+	+	+	+	-	+	+	-	+	-	-	-	-
I/O connection																	
Primary sector ^a	+	+	+	+	-	-	+	+	+	+	-	+	+	-	+	+	-
Secondary sector ^b	-	+	-	-	-	-	+	-	-	-	-	+	-	-	+	+	-
Tertiary sector ^c	+	+	+	-	-	+	+	+	+	-	+	+	-	+	-	-	+
Overall	+	+	+	-	-	+	+	+	+	-	+	+	-	-	-	-	+
<i>German firms</i>																	
Value-added to sales																	
Primary sector ^a	+	-	-	+	+	+	-	-	+	+	+	+	+	+	+	-	-
Secondary sector ^b	+	-	+	+	-	-	-	-	+	+	-	-	+	-	+	+	-
Tertiary sector ^c	-	+	-	+	+	+	-	-	+	-	-	-	-	+	-	+	+
Overall	-	-	-	+	+	+	-	-	+	+	-	-	+	-	+	+	-
I/O Connection																	
Primary sector ^a	+	+	-	-	-	-	-	-	+	+	+	+	+	-	+	+	+
Secondary sector ^b	+	+	-	-	-	+	-	+	+	-	+	-	+	+	+	+	+
Tertiary sector ^c	-	-	+	-	-	+	+	-	-	-	-	+	+	-	-	+	+
Overall	+	+	-	-	-	+	+	+	+	+	+	+	+	-	+	+	+

Notes: Plus (+) indicates a scope increase compared to the previous year; minus (-) indicates a scope decrease.

^a Comprises all panel firms with a corporate SIC code below 2000 (i.e. agriculture, raw materials).

^b Comprises all panel firms with a corporate SIC code between 2000 and 3999 (i.e. manufacturing).

^c Comprises all panel firms with a corporate SIC code of 4000 or above (i.e. services, excluding financial institutions).

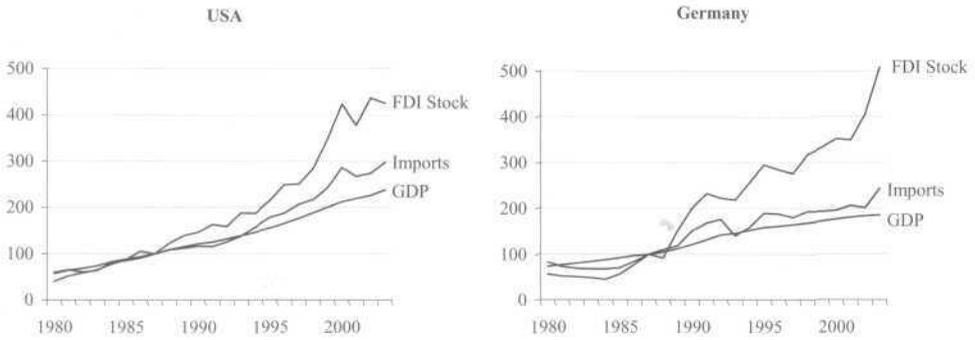


Figure 2. Imports, foreign direct investment, and GDP in the USA and Germany

takes a bit longer to ramp up or restructure foreign investments, we used two-year lags (t_{-2} to t_0) for LFC. Similar periods have been used previously when the immediacy of reactions was theoretically uncertain (e.g. Baker and Cullen, 1993; Swenson, 2005, 2007).^[18]

Figure 2 shows the comparative evolution of imports, FDI stocks and GDP for the USA and Germany. Increases in imports and FDI have outpaced GDP growth in both countries, suggesting that there has been an overall increase in pressure from foreign competition both in the USA and Germany. In fact, according to the UN data, US and German imports grew by an average 7 per cent during our 1987-2003 window. Average FDI stock increases during that period were even greater, at 9 per cent growth in the USA and 13 per cent in Germany. At the same time GDP grew by close to 5 per cent in the USA and about 4 per cent in Germany.

Firm- and Industry-Level Control Variables

As in previous research, we included a number of control variables to capture firm- and industry-level effects. Change in firm performance can either be an important motivator for scope change or can constrain it (Keats and Hitt, 1988). Reducing vertical scope is a way for firms to become more competitive by reallocating resources to core functions. Alternatively, at times successful firms end up with excess resources that can be redirected to acquire or develop additional upstream or downstream capabilities outside of their own core functions, resulting in vertical scope expansion. We included two indicators of ex-ante firm success, sales growth, which we measured as the percentage change in sales between t_i and t_0 , and profit growth, measured as the change in return on assets between t_i and t_0 . Based on previous research, we also included a firm's change in asset intensity, measured as its change in asset-to-sales ratio between t_i and t_0 (Brouthers and Hennart, 2007; Harrigan, 1986; Mahoney, 1992).

It is likely that ex-ante vertical scope configurations will have an important influence on later scope changes. Firms with already deeply integrated value chains have greater opportunities for enhancing their competitive positions by focusing on highly competitive core functions. Alternatively, high vertical scope levels may be an indication of past

scope expansion momentum or success which suggests that such firms could continue on a vertical integration path. We included ex-ante vertical scope, measured at t_0 , based on the same vertical scope measurement approach outlined earlier. This also ensures individual representation of all of the interaction term components that are required to test Hypotheses 2a and 2b.

In addition to these firm-level control variables, we included a number of industry-level control variables. Industry growth, productivity, and concentration measures have been used in previous vertical scope research, and have been cited as indicators of industry attractiveness, competition intensity, or uncertainty in the e-transaction cost economics literature (Brouthers and Hennart, 2007). Industry growth, measured as the percentage change in industry value-added between t_{-1} and t_0 , may allow firms to develop market power with a specialized offering, or it may compel them to avoid supply shortages through vertical integration. Industry productivity growth, captured as the change in an industry value-added per employee between t_{-1} and t_0 , implies an increase in market efficiency that intensifies competition and decreases industry profitability. More productive environments are typically associated with margin erosion and cost pressures, indicating decreasing industry attractiveness. Consequently, a firm exposed to industry productivity gains may try to enhance its competitive position through vertical de-integration for greater cost efficiency and specialization on core competences. Changes in industry concentration, measured between t_{-1} and t_0 , may also have an influence. For example, in industries with few suppliers, firms tend to vertically integrate in order to avoid small numbers hold-up situations. Decreasing industry concentration, on the other hand, indicates intensifying competition and greater market efficiencies that may cause firms to de-integrate the non-competitive segments of their value chain.

Finally, we included AFC and LFC penetration levels to control for possible influences of an industry's degree of integration in the global competitive arena. In highly globalized industries, that is, ones in which there are high AFC and LFC penetration levels, firms may be prompted to vertically de-integrate as it allows them to focus on their most competitive competences, and to leverage broader options for intermediate contracting of non-core activities in globalized market environments. Again, these control variables ensure individual representation of all interaction term components that are required to test Hypotheses 3a and 3b.

All industry-level control variables had to be matched to the individual firms, which in many cases comprise business segments across several industries. We took the same approach as for our independent variables: we used a firm's sales in each of its segments as weights to calculate the values of the control variables.

Country-Level Control Variables

Previous research suggests that firm scope is influenced not only by firm- and industry-level parameters, but also by boundary conditions in the broader institutional environment (Peng, 2002; Peng et al., 2005). As a proxy for overall domestic economic stability and prosperity, we include ex-ante GDP growth, measured between t_{-1} and t_0 . In addition, we captured significant policy changes that occurred during the period of our study through a set of dummy variables, 0 before the event and 1 after. One such event

was the implementation in 1994 of the North American Free Trade Agreement (NAFTA) between the USA, Canada and Mexico, which has had a significant impact on regional trade flows and market strategies (Burfisher et al., 2001). Less than a year earlier the European Union had implemented the European 'single market' under the Maastricht Treaty which was designed to enhance market openness and to simplify economic exchange between member countries (Bowen and Sleuwaegen, 2004; Kahrs, 2002). Germany had just completed the re-unification of East and West Germany in 1990 with significant impact on domestic investment and market size (Sinn, 2002). Descriptive statistics for all of the variables described above are summarized in Appendix Tables A1 and A2.

Model Overview and Estimation Approach

The empirical model was designed to assess how mounting pressure from increasing foreign competition influences changes in vertical scope. Change in vertical scope is represented with two complementary measurement approaches: the value-added to sales (VA/S) approach and the input-output connection (I/O) approach. Hypotheses are tested with panel data for large US and German firms. To better understand our sample data characteristics and the related estimation requirements we conducted a number of specification tests. Hausman specification tests confirmed the presence of fixed firm effects in our US and German samples ($p < 0.001$; Greene, 2003). In addition, Wooldridge (2002) and Breusch—Pagan (Breusch and Pagan, 1979) tests detected serial correlation and heteroskedasticity in our data ($p < 0.001$). The longitudinal nature of our data set required us to also control for possible time effects (Greve and Goldeng, 2004). In summary, our estimation approach needed to ensure accurate results in the presence of firm effects, time effects, heteroskedasticity, and serial correlation.

The extant time series cross section (TSGS) methodological literature includes several different approaches for dealing with unbalanced panels (e.g. Beck and Katz, 1995; Green et al., 2001; Wooldridge, 2002). The ordinary least squares fixed effects method (OLS FE) with Huber—White's heteroskedasticity-corrected robust standard errors emerges as a viable approach for dealing with fixed firm effects and potential bias from heteroskedasticity and serial correlation (Kristensen and Wawro, 2007; Shor et al., 2005). To address time effects, we recalculated all variables as differences from the respective time period mean before submitting the data to robust OLS FE estimation (Greve and Goldeng, 2004).^[19] We conducted panel regression analyses using Stata 9.2 with the robust OLS FE procedure suggested by the methodological literature (see Kristensen and Wawro, 2007).

RESULTS

Results for US Firms

Tables III and IV summarize the results for US firms using robust OLS FE regression and our two different measurement constructs for vertical scope change. Table III shows

Table III. Regression results, US firms (value-added to sales measure)

Δ Vertical scope (value-added to sales, t_0-t_2)					
Variables	US(t_0) Base model	US(t_1) Main effect	US(t_2) Scope interaction	US(t_1) FC interaction	US(t_2) Complete model
Independent variables					
Δ AFC penetration (t_{1-t_0})		-0.023 (0.012)*	-0.024 (0.012)*	-0.025 (0.012)*	-0.026 (0.012)*
Δ LFC penetration (t_{2-t_0})		-0.035 (0.010)***	-0.038 (0.010)***	-0.035 (0.010)***	-0.037 (0.010)***
Interaction effects					
Δ AFC penetration (t_{1-t_0}) * vertical scope (t_0)			0.013 (0.003)**		0.013 (0.003)***
Δ LFC penetration (t_{2-t_0}) * vertical scope (t_0)			0.071 (0.020)***		0.069 (0.020)***
Δ AFC penetration (t_{1-t_0}) * AFC penetration (t_0)				0.045 (0.060)	0.060 (0.059)
Δ LFC penetration (t_{2-t_0}) * LFC penetration (t_0)				0.020 (0.006)**	0.019 (0.006)**
Firm-level controls					
Δ Firm size (t_{1-t_0}) ^a	-0.491 (0.289) [†]	-0.528 (0.286) [†]	-0.510 (0.239)*	-0.486 (0.299)	-0.485 (0.247)*
Δ Firm asset intensity (t_{1-t_0})	0.111 (0.052)*	0.111 (0.052)*	0.114 (0.052)*	0.109 (0.052)*	0.111 (0.052)*
Δ Firm profit (t_{1-t_0}) ^a	0.008 (0.009)	0.008 (0.008)	0.010 (0.009)	0.008 (0.008)	0.011 (0.009)
Vertical scope (t_0)	0.707 (0.252)**	0.706 (0.251)**	0.674 (0.240)**	0.704 (0.250)**	0.673 (0.239)**
Industry-level controls					
Δ Industry size (t_{1-t_0})	0.158 (0.131)	0.157 (0.132)	0.134 (0.131)	0.151 (0.132)	0.126 (0.131)
Δ Industry productivity (t_{1-t_0}) ^a	-0.547 (0.768)	-0.501 (0.776)	-0.451 (0.785)	-0.512 (0.788)	-0.463 (0.796)
Δ Industry concentration (t_{1-t_0})	0.058 (0.146)	0.054 (0.145)	0.037 (0.145)	0.056 (0.145)	0.040 (0.145)
AFC penetration (t_0)	-0.031 (0.169)	-0.026 (0.166)	-0.010 (0.165)	-0.060 (0.169)	-0.044 (0.168)
LFC penetration (t_0)	0.229 (0.240)	0.332 (0.244)	0.297 (0.235)	-0.188 (0.295)	-0.181 (0.288)
Country-level controls					
Δ GDP (t_{1-t_0})	0.035 (0.009)***	0.028 (0.010)**	0.024 (0.010)*	0.029 (0.010)**	0.025 (0.010)*
NAFTA (t_0)	-0.031 (0.030)	-0.031 (0.030)	-0.031 (0.030)	-0.035 (0.030)	-0.036 (0.030)
N	5972	5972	5972	5972	5972
Adjusted R ²	0.241	0.243	0.307	0.245	0.255
F	3.59***	5.16***	15.16***	5.92***	14.69***

Notes: Unstandardized coefficients are reported with standard errors in parentheses. Standard errors are corrected with the Huber/White sandwich estimator. Intercept is not shown.
^a Coefficient and standard error have been multiplied by 100.
[†] $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table IV. Regression results, US firms (I/O connection measure)

Variables	Δ Vertical scope (I/O connection, $t_T - t_0$)				
	US(2a) Base model	US(2b) Main effect	US(2c) Scope interaction	US(2d) FC interaction	US(2e) Complete model
Independent variables					
Δ AFC penetration ($t_{-1} - t_0$)		-0.033 (0.014)*	-0.036 (0.014)**	-0.037 (0.014)**	-0.040 (0.014)**
Δ LFC penetration ($t_{-2} - t_0$)		-0.046 (0.022)*	-0.059 (0.02)**	-0.053 (0.021)*	-0.066 (0.021)**
Interaction effects					
Δ AFC penetration ($t_{-1} - t_0$) * vertical scope (t_0)			0.034 (0.012)**		0.030 (0.012)**
Δ LFC penetration ($t_{-2} - t_0$) * vertical scope (t_0)			0.053 (0.011)***		0.051 (0.011)***
Δ AFC penetration ($t_{-1} - t_0$) * AFC penetration (t_0)				0.063 (0.010)***	0.062 (0.010)***
Δ LFC penetration ($t_{-2} - t_0$) * LFC penetration (t_0)				0.071 (0.063)	0.086 (0.059)
Firm-level controls					
Δ Firm size ($t_{-1} - t_0$) ^a	0.161 (0.167)	0.102 (0.171)	0.126 (0.170)	0.340 (0.239)	0.313 (0.236)
Δ Firm asset intensity ($t_{-1} - t_0$)	-0.068 (0.031)*	-0.070 (0.031)*	-0.070 (0.031)*	-0.073 (0.032)*	-0.074 (0.032)*
Δ Firm profit ($t_{-1} - t_0$) ^b	0.040 (0.027)	0.039 (0.027)	0.041 (0.026)	0.036 (0.025)	0.037 (0.025)
Vertical scope (t_0)	0.973 (0.049)***	0.976 (0.049)***	1.162 (0.062)***	0.969 (0.048)***	1.141 (0.062)***
Industry-level controls					
Δ Industry size ($t_{-1} - t_0$)	0.368 (0.113)**	0.358 (0.113)**	0.329 (0.114)**	0.264 (0.112)*	0.234 (0.112)*
Δ Industry productivity ($t_{-1} - t_0$) ^b	-0.382 (0.274)	-0.352 (0.277)	-0.348 (0.269)	-0.382 (0.317)	-0.378 (0.309)
Δ Industry concentration ($t_{-1} - t_0$)	-0.005 (0.100)	-0.008 (0.100)	-0.016 (0.101)	-0.011 (0.102)	-0.002 (0.102)
AFC penetration (t_0)	-0.196 (0.214)	-0.202 (0.215)	-0.200 (0.212)	-0.296 (0.216)	-0.296 (0.214)
LFC penetration (t_0)	-0.044 (0.177)	-0.024 (0.178)	-0.013 (0.177)	0.128 (0.178)	0.154 (0.173)
Country-level controls					
Δ GDP ($t_{-1} - t_0$)	0.011 (0.008)	0.010 (0.008)	0.008 (0.008)	0.010 (0.008)	0.008 (0.008)
NAFTA (t_0)	0.663 (0.031)***	0.666 (0.031)***	0.664 (0.031)***	0.664 (0.031)***	0.662 (0.031)***
N	5972	5972	5972	5972	5972
Adjusted R ²	0.264	0.267	0.278	0.265	0.28
F	104.68***	90.12***	84.89***	80.81***	77.82***

Notes: Unstandardized coefficients are reported with standard errors in parentheses. Standard errors are corrected with the Huber/White sandwich estimator. Intercept is not shown.

^a Coefficient and standard error have been multiplied by 100.

[†] $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

results based on the value-added to sales measurement approach. Table IV reports results for the input—output connection approach. Each table has columns with coefficients, robust standard errors and significance levels for a base model (i.e. control variables only), a main effect model to test Hypotheses 1a and 1b, two interaction effect models to assess Hypotheses 2a, 2b, 3a and 3b, and a complete model with all variables and interaction terms.

Model US(1b) indicates negative coefficients for the influence of AFC penetration changes (-0.023) and LFC penetration changes (-0.035) that are significant at the 5 per cent and 0.1 per cent levels, respectively. These results are consistent with model US(2b), where coefficient signs indicate the same effect direction (-0.033 and -0.046), and are significant at the 5 per cent level. Models with both measurement constructs clearly support Hypotheses 1a and 1b. In the case of US firms, foreign competition increases appear to have the expected negative effect on vertical scope changes. This is confirmed in models US(1e) to US(1e), and US(2c) and US(2e).

In addition, models US(1c) and US(2c) show highly significant ($p < 0.01$) positive coefficients for the interaction terms of AFC and LFC changes with ex-ante vertical scope levels at 0.013 and 0.071 in model US(1c), and 0.034 and 0.053 in model US(2c). These results support the hypothesis of vertical scope convergence made in Hypotheses 2a and 2b: US firms with higher ex-ante vertical scope levels react more strongly to changes in foreign competition than firms with lower ex-ante vertical scope levels. However, the results are mixed in terms of the moderating effect of ex-ante foreign competition penetration levels. For the ex-ante AFC penetration level-interaction term, the coefficient in model US(1d) is positive (0.045) as hypothesized, but not statistically significant ($t = 0.459$). In model US(2d), on the other hand, the coefficient is positive (0.063) and highly significant ($p < 0.001$). For the ex-ante LFC penetration level-interaction term, the situation is the other way around. The coefficient in model US(1d) is positive and significant (0.020, $p < 0.01$), while the coefficient in model US(2d) is not significant (0.071; $t = 0.026$). Consequently, our results neither fully support Hypotheses 3a and 3b, nor do they allow us to clearly reject them. Finally, the complete models US(1e) and US(2e) show coefficients that are fully in line with the other models, giving us no reason to question any of our conclusions for the individual hypotheses.

Results for German Firms

Results for German firms are reported in Tables V and VI. Models GER(3b) and GER(4b) reveal negative coefficients for AFC penetration changes (-0.058 and -0.072) that are significant at the 5 per cent and 0.1 per cent level respectively. However, LFC penetration changes do not appear to have a significant influence on changes in vertical scope, as shown by non-significant coefficients in Table V. In Table VI, coefficients take the expected negative sign, but are also not statistically significant with the exception of model GER(4d), and there is but moderate significance at the 10 per cent level in model GER(4e). Therefore, Hypothesis 1b must be rejected. These results indicate that only foreign competition through imports drives German firms to reduce their vertical scope.

Table VI. Regression results, German FIRMS(I/O connection measure)

<i>Δ Vertical scope (I/O Connections_t to t₀)</i>		<i>GER(4a)</i>	<i>GER(4b)</i>	<i>GER(4c)</i>	<i>GER(4d)</i>	<i>GER(4e)</i>
<i>Variables</i>		<i>Base model</i>	<i>Main effect scope interaction</i>	<i>FC interaction</i>	<i>Complete model</i>	
Independent variables						
Δ AFC penetration (t-1-t ₀)			-0.072 (0.018)***	-0.073 (0.018)***	-0.075 (0.019)***	-0.075 (0.018)***
Δ LFC penetration (t-2-t ₀)			-0.019 (0.014)	-0.033 (0.026)	-0.038 (0.018)*	-0.062 (0.034) [†]
Interaction effects						
Δ AFC penetration (t-1-t ₀) * vertical scope (t ₀)				-0.053 (0.067)		-0.051 (0.066)
Δ LFC penetration (t-2-t ₀) * vertical scope (t ₀)				-0.016 (0.017)		-0.022 (0.019)
Δ AFC penetration (t-1-t ₀) * AFC penetration (t ₀)					0.047 (0.019)*	0.046 (0.018)*
Δ LFC penetration (t-2-t ₀) * LFC penetration (t ₀)					0.097 (0.041)*	0.123 (0.051)*
Firm-level controls						
Δ Firm size (t-1-t ₀) ^a		0.442 (0.395)	0.296 (0.449)	0.320 (0.449)	-0.115 (0.477)	-0.183 (0.469)
Δ Firm asset intensity (t-1-t ₀) ^a		-0.597 (0.474)	-0.754 (0.536)	-0.768 (0.535)	-0.357 (0.548)	-0.263 (0.535)
Δ Firm profit (t-1-t ₀) ^a		-0.014 (0.142)	-0.050 (0.142)	-0.040 (0.141)	-0.042 (0.139)	-0.027 (0.137)
Vertical scope (t ₀)		0.913 (0.305)**	1.088 (0.295)***	1.096 (0.294)***	1.094 (0.293)***	1.102 (0.292)***
Industry-level controls						
Δ Industry size (t-1-t ₀)		-0.325 (0.105)**	-0.249 (0.161)**	-0.259 (0.085)**	-0.242 (0.078)**	-0.253 (0.083)**
Δ Industry productivity (t-1-t ₀)		0.302 (0.177) [†]	0.279 (0.161) [†]	0.276 (0.161) [†]	0.282 (0.161) [†]	0.279 (0.162) [†]
Δ Industry concentration (t-1-t ₀) ^a		0.006 (0.007)	0.004 (0.007)	0.004 (0.007)	0.004 (0.007)	0.004 (0.007)
AFC penetration (t ₀)		-0.043 (0.046)	-0.040 (0.046)	-0.040 (0.046)	-0.045 (0.046)	-0.046 (0.046)
LFC penetration (t ₀)		0.034 (0.072)	0.025 (0.069)	0.037 (0.068)	-0.019 (0.072)	-0.015 (0.072)
Country-level controls						
Δ GDP (t-1-t ₀) ^b		0.450 (0.988)	-0.019 (0.007)**	-0.019 (0.007)**	-0.017 (0.007)*	-0.017 (0.007)*
Maastricht Treaty (t ₀)		0.132 (0.085)	0.053 (0.055)	0.053 (0.054)	0.064 (0.055)	0.068 (0.056)
Reunification (t ₀)		-0.111 (0.043)**	-0.053 (0.035)	-0.057 (0.036)	-0.048 (0.035)	-0.053 (0.036)
N		867	867	867	867	867
Adjusted R ²		0.284	0.321	0.321	0.323	0.324
F		6.63***	5.79***	5.19***	5.15***	4.63***

N/A: Unstandardized coefficients are reported with standard errors in parentheses. Standard errors are corrected with the Huber/White sandwich estimator. Intercept is not shown.
[†] p < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001.

Turning to models GER(3c) and GER(4c), we see that none of the coefficients for the moderating effect of firms' ex-ante vertical scope levels are significant. Therefore, Hypotheses 2a and 2b are rejected for German firms. However, ex-ante foreign competition levels do apparently have the expected positive moderating effect on AFC-driven vertical scope changes. Model GER(4d) shows positive coefficients (0.047 and 0.097) that are both significant at the 5 per cent significance level. The same is true for the ex-ante AFC penetration level moderator coefficient (i.e. 0.071) in model GER(3d), which supports Hypothesis 3a. Support for Hypothesis 3b is mixed: model GER(4d) does confirm the hypotheses. The coefficient in model GER(3d) is, as hypothesized, positive (0.048), but not significantly so ($t = 0.156$).

DISCUSSION

Our analysis shows that intensifying foreign competition, whether from imports, or from locally-established foreign investment, is in fact associated with vertical de-integration across a large set of US firms. In addition, our analysis of US firms has revealed that highly vertically integrated firms react more strongly to pressure from foreign competition, while less integrated firms display weaker vertical de-integration responses. In a similar vein, our interaction analyses indicate that a minimum level of foreign competition must be reached before US firms feel the heat and react by vertically disintegrating.

With given statistically significant relationships, changes in foreign competition apparently exert an important economic influence on vertical scope changes in US firms. Keeping all other variables constant, a one-percentage point change of AFC or LFC penetration will trigger vertical scope reductions in the 2–4 percentage point range. Theory as well as statistically significant control variables suggests that there are numerous other factors that drive firms' vertical integration strategies, including internal resource and capabilities, domestic competition and other industry-level influences, and the broader institutional or national environment. Still, our results do show that changes in foreign competition have a significant influence on US firms, and as such represent an important piece of a puzzle made up of many different determinants that, taken together, explain vertical integration strategies.

The situation is less clear-cut for German firms. Only increasing abroad-based foreign competition seems to result in vertical scope reduction. Unlike in the US case, increases in locally-based foreign competition show no significant effect on vertical integration by German firms. Also, German firms' ex-ante vertical scope levels do not have a moderating effect on vertical de-integration. Ex-ante foreign competition levels, on the other hand, do have a similar effect-enhancing influence in Germany as they do in the USA. We conclude overall that for German firms changes in vertical scope are less influenced by changes in foreign competition than in the US case. This warrants further discussion.

Country Differences and Institutional Context

As outlined above, we observed differences in regard to vertical scope changes in German firms: our empirical results only lend support to Hypotheses 1a and 3a.

Hypothesis 3b received only mixed support, and all other hypotheses must be rejected. This implies that German firms, unlike US firms, do not show a consistent, significant vertical scope reaction to increases in foreign competition.

There are a number of possible explanations for these differences. The German market for outsourcing and offshoring services is relatively less efficient than that of the USA (Farrell, 2005). In addition, this constraint to vertical de-integration is reinforced by Germany's overall institutional environment, which has historically been somewhat less flexible in terms of firm scope changes than Anglo-Saxon environments. As opposed to their Anglo-Saxon peers, German firms must deal with relatively rigid employment legislation constraints and strong labour unions, both of which have an impact on strategic decision-making (Geppert et al., 2003; Williams and Geppert, 2006). In fact, the low level of flexibility in restructuring the workforce in Germany has been seen as 'at the other extreme' from the Anglo-Saxon regime (Gooderham et al., 1999, p. 526). This institutional context makes radical vertical de-integration initiatives relatively more difficult and costly than in more liberal market economies such as the USA (Farrell, 2005; Soskice and Hall, 2001). As a consequence, German firms tend to be more protective of existing practices, employing a more consensual, long-term focused management approach (Mayer and Whittington, 2004; Whitley, 1994).

A recent example illustrates this phenomenon. In order to catch up with foreign competitors such as France Telecom and Spain's Telefonica, Deutsche Telekom has come under intense pressure to restructure its bloated customer service operations for greater financial performance and operational flexibility (*Financial Times*, 2007a). While many Anglo-Saxon firms would strongly consider outsourcing service operations such as call centres or field services as a viable restructuring option, Deutsche Telekom addressed the issue differently. After months of negotiations with ver.di, the incumbent trade union, Deutsche Telekom announced that it would transfer around 50,000 employees into three new service subsidiaries. Under a new agreement, union-represented employees conceded an increase in working hours from 34 to 38 per week as well as a gradual 6.5 per cent pay cut, but secured explicit protection from outsourcing and redundancy for several years, a result that was described in the *Financial Times* as a 'classic German compromise' (*Financial Times*, 2007a, p. 22) that balances the interests of management, employees, unions, and the government (*Financial Times*, 2007b). It appears plausible in light of such examples that a vertical de-integration response to foreign competition pressures on German firms may be somewhat less drastic than it might be in US firms. In the specific case of Deutsche Telekom's service operations, vertical scope remained unchanged.

Overall, we conclude that our theoretical and empirical analyses provide evidence that, under Anglo-Saxon conditions, foreign competition dynamics have a significant influence on the vertical scope strategies of firms. We have also shown that this conclusion cannot be easily generalized. As in the case of Deutsche Telekom, the extent of vertical scope adaptation seems to depend not only on firm or industry-specific influences such as pressure from foreign competition, but also on the broader economic environment. While the relationship between changes in foreign competition and changes in vertical scope seems relatively clear-cut in an Anglo-Saxon country such as the USA, the story may be somewhat different in other contexts.

Research Contribution

The goal of our study was to assess whether increases in foreign competition are a significant factor in shaping the vertical integration strategies of firms. Our assessment of the impact of increasing imports and FDI on vertical scope change adds a new perspective to the emerging body of research that looks at the impact of foreign competition on firm scope. Our study adds new insights in a number of important ways.

First, we integrate three major theory streams, namely industrial organization economics, the resource-based view of the firm, and transaction cost economics, within a single comprehensive argument. In doing so, we show that these three schools of thought are relevant, consistent in terms of predictions, and thus offer complementary explanations vertical scope determinants.

Second, we add the missing link between existing industry-level research on foreign competition and vertical scope on the one side (e.g. Aghion et al., 2006; Driffield and Love, 2007; Nor et al., 2006), and firm-level research on foreign competition and product and geographical scope on the other (e.g. Bowen and Wiersema, 2005; Meyer, 2006; Wiersema and Bowen, 2008). Doing so, we focus on scope for the firm as a whole (Jacobides and Winter, 2007; Teece et al., 1994), as opposed to make or buy decisions at the transaction-level. We add a large sample panel analysis perspective to recent works that explore how firms adapt their scope in the context of competition and other dynamic influences along firms' value chains, using theoretical reasoning (Santos and Eisenhardt, 2005; Zander, 2007) as well as case studies (Jacobides and Billinger, 2006). Our firm-level analysis of changes in vertical scope across their entire business portfolios broadens the industry-level research perspective that has often been applied in past studies.

Third, we contribute to the literature on foreign competition. Previous research has often relied on single indicators (e.g. Bowen and Wiersema, 2005; Driffield and Love, 2007; Liu, 2006), or chosen market environments that are assumed to be subject to foreign competition though there are no explicit measurements (e.g. Rondi and Vannoni, 2005; Toulan, 2002). We do measure foreign competition explicitly, and with two different indicators (i.e. imports and FDI). We also provide two measures of vertical integration based on value-added to sales (VA/S) and input—output (I/O) connections. This is especially important because there are still doubts about whether extant vertical scope measurement approaches actually capture the same underlying construct (Lindstrom and Rozell, 1993; Maddigan and Zaima, 1985). Our empirical analyses display a high level of consistency across both measurement approaches, underlining the robustness of our results, and the applicability of our hypotheses to both variants of vertical scope measurement.

Fourth, we add to the body of literature that focuses on corporate divestment (e.g. Johnson, 1996; Wright, 1986; Wright and Thompson, 1986). Previous studies have explained divestment decisions in the context of industry growth, financial performance or firm governance and organization. With our perspective on foreign competition, we deliver an additional explanation for why companies externalize initially internal transactions. Finally, our study provides an empirical perspective across two countries, the USA and Germany, which adds to the literature revealing insights into the differences between two different varieties of capitalism (Soskice and Hall, 2001; Whitley, 1994). In

particular our study demonstrates how the broader institutional environment may affect the way in which firms react to competition as they shape scope.

Limitations

We must point out a number of methodological constraints and trade-offs regarding measures and data sources. First, our goal was to draw from three theory streams, industrial organization, the resource-based view of the firm, and transaction cost economics. However, in order to keep model complexity and article length under control, we focus our empirical analyses on the independent variables of primary interest, namely abroad-based and locally-established foreign competition. We do not provide comprehensive micro-analytic empirical tests of all underlying theory constructs, such as market power, asset specificity, or firm capabilities, which have been analysed in more detail elsewhere (Carter and Hodgson, 2006; Geyskens et al., 2006; Lafontaine and Slade, 2007). While we made an effort to include a broad set of control variables, we cannot rule out that other factors may be statistically important. Nonetheless, while we do not fully operationalize each relevant construct from industrial organization (IO), transaction cost economics (TCE) or resource-based view (RBV) theory, our results are consistent with the theories from which we draw. In this context, we must also emphasize that our vertical scope measures take a firm-level perspective. This implies that analysis results are not compatible with transaction-level perspectives.

Second, we focus on foreign competition dynamics in the home countries of incumbents, but exclude the other markets in which they may be active. This allows us to capture changes in the market that matter most to incumbents and provides a clear frame of reference for empirical analysis, even though it does represent a limitation in regard to multi-point competition or rivalry at the global level.

Third, despite our differentiated treatment of foreign competition, we do not assess its qualitative aspects such as its motivations, resource base, geographic origin, or competitive modes, other than imports and FDI, for instance, licensing or alliances. While a small sample or case study approach would have provided for a richer analysis, we chose a large-sample approach and were therefore constrained by the availability of secondary data sources. A broader sample of small and large firms from multiple countries would allow for richer testing and more generally applicable conclusion, if such data were readily available. Finally, on a general note, the limited availability of rich longitudinal panel data continues to be a serious constraint in terms of the limitations outlined above, and beyond. Addressing these limitations will undoubtedly require new and creative approaches to compiling panel data from primary sources. This will entail resolving several methodological issues that will make serious demands on researchers' resources, which may be a roadblock to future empirical research.

Opportunities for Future Research

The vertical de-integration phenomenon and the theoretical argument we have outlined have important implications for future research. First and foremost, it is evident that changing vertical integration strategies require researchers to reconsider the traditional definition of vertical scope. We have shown that firms reduce their vertical scope under

pressure from foreign competition, and hypothesize that this is the result of strategic initiatives that entail vertical specialization and a greater emphasis on flexible outside contracting for non-core activities. Recent literature has framed this phenomenon by differentiating between direct capabilities, i.e. internalized, and indirect capabilities, i.e. meta-capabilities to manage the internalization and contracting process. It has argued that these capabilities, when combined intentionally and effectively, lead to permeable, more open and responsive, yet focused vertical architectures that enhance agility and competitiveness (Jacobides and Billinger, 2006; Mota and Castro, 2004; Rothacrmel et al., 2006). However, this requires an empirical approach that captures firms' direct and indirect capabilities, characterizes their strategic importance, and measures scope not only inside the firm, but also across its external value chain affiliates.

Another line of inquiry relates to the question of firm performance. We have identified a vertical de-integration effect under foreign competition pressure, and we have shown that this effect is more marked in the case of US firms than it is for German firms. This raises two related questions: Are firms that reduce vertical scope in response to changes in foreign competition more profitable? If this is the case, do firms that enjoy a greater degree of freedom in making scope adjustments have a profit advantage over firms that face more constraints in making such adjustments? We believe that until these questions are tackled, more research is needed on the underlying strategy for adjusting vertical scope and vertical scope causalities.

In this context, work towards a more comprehensive treatment of firm scope will be particularly important. In this study, we have focused on vertical scope exclusively. We have argued that firms reduce vertical scope under pressure from foreign competition to benefit from specialization and to increase their agility. Since firms organize their value chains across different geographies, and may span more than one product line, it would be interesting to study how these other dimensions of vertical scope change as well. A holistic perspective on firm scope may reveal important insights on the inherent trade-offs and endogenous relationships, contributing to a fuller understanding of the drivers of firm scope.

On a related note, our results suggest that national institutional characteristics or common business practices have an important moderating effect on the relationship between changes in foreign competition and firm scope. This clearly indicates that there is potential for further research, be it through perspectives from other varieties of capitalism (Soskice and Hall, 2001; Whitley, 1994), in other developed European or Asian economies, or in emerging markets, or through a more explicit theoretical and empirical treatment of economic boundary conditions and their influence on firm scope (Kristensen and Morgan, 2007; Peng et al., 2005).

In the present study we approached vertical integration using two different measures. While our empirical analyses display a high level of consistency across both measurement approaches, the measurements itself are only moderately correlated. Hence, future research may want to build on a similar approach and further develop the measures employed. The analysis of vertical scope cohesion or de-integration with a dynamic, firm-level perspective (as opposed to transaction-focused analysis) certainly warrants further attention in our quest for a holistic understanding of firm boundary determinants.

Finally, although we are not able to look at the details of how globalization shapes a firm's permeability, our results are consistent with the findings of case analyses on vertical permeability (e.g. Jacobides and Billinger, 2006). Hence, future research should aim at developing an augmented toolkit of vertical scope measures to assess the impact foreign competition has on the development of more flexible, permeable firm boundaries. In doing so, large-sample evidence could complement the existing literature on permeability, which has been up to now primarily case study-based.

Implications for Management Practice

Our study has a number of implications for management practitioners. Our results suggest that managers change firm boundaries when foreign competition becomes more intense, lending credibility to the notion of flexibility as the 'new strategic imperative' (Buckley and Ghauri, 2004, p. 83). This implies that the main task of managers may no longer be to seek the single best vertical scope configuration, or to optimize a static value chain, but instead, to enable their organizations to pro-actively shape their vertical architecture by adding functional capabilities to their firms' internalized and contract-based vertical scope, or indeed by removing them. This may turn out to be the key to making optimal product and geographic scope changes. 'In rapidly changing environments, there is obviously value in the ability to sense the need to reconfigure the firm's asset structure and to accomplish the necessary internal and external transformation' (Teece et al., 1997, p. 520).

Consequently, developing focused and flexible vertical value chains should be at the top of managers' agendas (Jacobides and Billinger, 2006). Quasi-integration and hybrid transaction configurations make vertical scope more open and flexible (Harrigan, 1986; Jacobides and Billinger, 2006; Rothaermel et al., 2006). As Jacobides and Billinger (2006, p. 249) put it, 'Permeable vertical architectures are partly integrated and partly open to the markets. . . . Increased permeability enables more effective use of resources and capacities, better matching of capabilities with market needs, and benchmarking to improve efficiency. Partial integration promotes a more dynamic, open innovation platform and enhances strategic capabilities. . . .'

This could create an adaptable structural foundation for the dynamic capabilities that would enable firms to launch new strategies and reshape firm boundaries as required in different competitive scenarios or life cycle stages (Linder, 2004). Since every firm 'must now constantly seek the next advantage' (Barkema et al., 2002, p. 919), managers must ensure rapid innovation, continuous organizational learning, and an optimal balance of internal activities and efficient inputs in dynamic competitive conditions. Such distinctive capabilities 'of coordinating and combining' (Teece et al., 1997, p. 509) have been recognized as key pre-conditions of wealth creation. They are especially important in the light of increasing competitive pressure experienced throughout the various segments of firms' value chains, which is generating multiple, competing vertical architectures within the affected industries (Jacobides and Billinger, 2006; Jacobides et al., 2006).

CONCLUDING COMMENT

Intensifying foreign competition increases turbulence, raises uncertainty, and contributes to larger, more competitive markets with a wider range of participants. In such environ-

merits, firms have more opportunities to specialize, and require greater flexibility and agility to adapt their value chains. As a consequence of pressure resulting from foreign competition, firms are likely to engage in vertical de-integration, converging towards a vertical scope configuration that is focused on core capabilities. The results obtained in the present study imply that managers may have to rethink static value chain structure, and instead embrace open, more flexible vertical architectures. In doing so, the study also provides a starting point for future research into permeable vertical architectures, the influence of vertical scope changes on firm profitability, and the theory of firm scope in its many dimension.

NOTES

- [1] Thriving outsourcing and offshoring service movements illustrate this (c.g. Rasheed and Gillcy, 2005).
- [2] The HDAX index combines the DAX, which includes Germany's 30 largest public firms by market capitalization, the MDAX, which includes the next 70 largest public firms, and the TecDAX, which includes public technology-focused firms.
- [3] Financial institutions, real estate companies, and financial holdings were not included, as their corporate strategies are significantly influenced by portfolio optimization objectives that are outside the focus of this study. All other industries are included.
- [4] The segment count average across our sample is 2.42 with a standard deviation of 1.60.
- [5] BITS covers 1989-96, TRINET covers every other year between 1979 and 1989.
- [6] This also implies an emphasis on large firms, as, generally speaking, greater firm size goes hand in hand with multinational activity (Rugman and Verbcke, 2004).
- [7] BRIC = Brazil, Russia, India, China.
- [8] COMPUSTAT reports segment-level data for firms that are listed or cross-listed on a US exchange, including firms from the UK (54 firms), France (32), Japan (31), Brazil (40), Russia (6), India (11), China (13), and a number of other countries. However, we deemed the selection bias and small number of firms inappropriate to fulfil sampling criteria.
- [9] The level of detail available varied according to the base data reported by the respective national statistics offices. US data was broken down into 237 ISIC industries; German data was broken down into 68 ISIC industry sectors. In the case of Germany, industry sector-level figures were applied to all industries included in the respective sector.
- [10] Robert Buzzell (1983) argues that 20 per cent of investments represent a 'normal' profit rate that is in line with a pre-tax profit rate he obtained from the PIMS database.
- [11] Joseph Fan kindly made his coefficient database available through his website: http://ihomc.cuhk.edu.hk/~b_109671/index.html.
- [12] As outlined earlier, this also allowed us to condense the individual vertical scope change scores into two factor scores.
- [13] We conducted robustness analyses using one and three year lags. Results were consistent with the results shown.
- [14] For US firms, Cronbach's $\alpha = 0.667$ (Δ VA/S measures) and $\alpha = 0.807$ (Δ I/O connection measures). For German firms, Cronbach's $\alpha = 0.702$ (Δ VA/S measures) and 0.735 (Δ I/O connection measures).
- [15] Results from analyses of the individual indicators are consistent with results based on aggregate factor scores.
- [16] Note that this table contains average directions calculated from unbalanced panel data, which can therefore only be regarded as indicative. Data is not representative of the respective industry sectors, and is unsuitable as the basis for national- or industry-level trend conclusions.
- [17] For example, 80% sales in segment A and 20% sales in segment B with exposure to a 10% import increase in industry A and 50% in industry B would be reflected with AFC impact of $80\% \times 10\% + 20\% \times 50\% = 18\%$.
- [18] We tested our models with a lag approaches that ranged from 1 to up to 10 years. We found results to be fairly stable.
- [19] This approach is conceptually equivalent to including time dummies, but does not take up as many degrees of freedom.

APPENDIX

Table A1. Descriptive statistics, US firms

Variable	Std. dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Δ AFC penetration ($t_{-1}-t_0$)	0.44															
2 Δ LFC penetration ($t_{-2}-t_0$)	0.49		-0.03*													
3 AFC penetration (t_0)	0.24		0.04*	0.03*												
4 LFC penetration (t_0)	0.12		0.00	0.03*	0.65*											
5 Δ Vertical scope (I/O connection, t_0-t_2)	1.08		-0.01	-0.02	-0.02	-0.02										
6 Δ Vertical scope (value-added to sales, t_0-t_2)	1.04		0.02	0.02	0.02	0.02	-0.02									
7 Vertical scope (I/O connection, t_0)	0.87		0.03*	-0.06*	-0.02	0.00	0.16*	0.01								
8 Vertical scope (value-added to sales, t_0)	0.97		0.00	-0.01	0.10*	0.01	0.01	0.34*	0.16*							
9 Δ Firm size ($t_{-1}-t_0$)	4.55		-0.19*	-0.01	0.02	0.02	0.00	-0.02	0.04*	0.03*						
10 Δ Firm asset intensity ($t_{-1}-t_0$)	0.30		-0.01	-0.02	0.04*	0.01	-0.02	0.05*	0.02	0.04*	0.03*					
11 Δ Firm profit ($t_{-1}-t_0$)	39.37		0.00	0.00	0.03*	0.01	0.00	0.01	-0.01	0.01	0.00	-0.01				
12 Δ Industry size ($t_{-1}-t_0$)	0.12		-0.08*	0.04*	-0.16*	-0.08*	0.03*	0.01	0.12*	0.04*	0.05*	0.02	0.01			
13 Δ Industry productivity ($t_{-1}-t_0$)	1.66		-0.01	0.00	0.05*	0.02	0.00	-0.01	0.02	0.01	0.00	0.01	0.00	0.03*		
14 Δ Industry concentration ($t_{-1}-t_0$)	0.10		-0.01	-0.01	-0.02	-0.02	-0.02	0.01	-0.02	0.00	0.00	0.01	0.00	0.00	0.06*	
15 Δ GDP ($t_{-1}-t_0$)	1.31		0.00	0.09*	-0.01	-0.01	0.09*	0.04*	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
16 NAFTA (t_0)	0.49		0.00	-0.04*	0.00	0.00	0.27*	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24*

Notes: Values have been centred around their time period mean to account for time effects.
* p < 0.05 (two-tailed).

Table A2. Descriptive statistics, German firms

Variable	Std. dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Δ AFC penetration ($t_{t-1}-t_0$)	0.91																
2 Δ LFC penetration ($t_{t-2}-t_0$)	0.82	0.06															
3 AFC penetration (t_0)	0.26	0.00	0.11*														
4 LFC penetration (t_0)	0.15	-0.02	0.12*	0.30*													
5 Δ Vertical scope (I/O connection, $t_{t-1}-t_0$)	0.33	0.03	0.03	-0.01	-0.01												
6 Δ Vertical scope (value-added to sales, $t_{t-1}-t_0$)	0.71	-0.07*	0.05	0.10*	0.07*	-0.01											
7 Vertical scope (I/O connection, t_0)	0.69	0.01	0.05	0.05	-0.02	0.20*											
8 Vertical scope (value-added to sales, t_0)	1.15	-0.00	0.09*	0.17*	-0.04	0.00	0.12*	0.05									
9 Δ Firm size ($t_{t-1}-t_0$)	3.42	-0.11*	-0.05	0.03	0.04	-0.01	-0.01	0.00	0.02								
10 Δ Firm asset intensity ($t_{t-1}-t_0$)	1.85	0.02	0.00	0.00	0.00	-0.01	0.02	-0.01	0.01	-0.01							
11 Δ Firm profit ($t_{t-1}-t_0$)	5.55	-0.05	-0.02	-0.01	0.05	-0.00	0.02	-0.01	0.01	-0.04	0.00						
12 Δ Industry size ($t_{t-1}-t_0$)	0.11	-0.02	-0.11*	-0.05	0.13*	0.02	0.13*	0.19*	-0.05	0.04	0.06	0.10*					
13 Δ Industry productivity ($t_{t-1}-t_0$)	0.12	0.01	0.01	0.19*	0.09*	0.13*	0.04	0.16*	-0.03	-0.03	-0.00	-0.03	0.28*				
14 Δ Industry concentration ($t_{t-1}-t_0$)	76.82	-0.00	0.04	-0.00	0.01	0.05	0.30	-0.02	0.05	-0.01	0.02	0.02	0.07*	0.04			
15 Δ GDP ($t_{t-1}-t_0$)	1.39	0.13*	0.15*	-0.01	-0.01	-0.01	-0.03	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00		
16 Maastricht Treaty (t_0)	0.37	0.02	-0.37*	0.00	0.00	-0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.61*
17 Reunification (t_0)	0.21	0.07*	-0.20*	0.00	0.00	-0.03	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.30*
																	0.50*

Note: Values have been centred around their time period mean to account for time effects.

* $p < 0.05$ (two-tailed).

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