Institutional Differences and Integration Difficulties: How Location of Headquarters and Component Sourcing Affect Firm Responsiveness

Purpose - The purpose of this paper is to examine how the location of a firm's headquarters and component sourcing impact a firm's responsiveness in a product-harm crisis in local market.

Design/ methodology/approach – We collected data on 1251 vehicle recalls from 12 manufacturers, six in the United States, three in Germany, and three in Japan. All of the recalls occurred in the United States between 2002 and 2010. The time the product was first released into the marketplace was used as the starting point while the time the recall was initiated (if at all) was used to record the probability of the product recall over time. Specifically, a survival analysis with an accelerated failure time model was employed to examine the speed with which a product is recalled. We examined the impact of foreign composition using information provided by the American Automobile Labeling Act (AALA), which lists the proportion of each vehicle that is composed of domestic parts (US/Canada) and foreign parts. Organizational characteristics (i.e., size, market share, assets, net income, and reputation) and recall size (i.e., number of affected vehicles) that might have an effect on time to recall were controlled for.

Findings – We found that firms headquartered outside the local market would take longer to issue a product recall than firms that were headquartered in the local market. Firm headquartered outside the local market can reduce the time take to recall by sourcing parts from the local marketplace, rather than from abroad. Interestingly, even local firms are affected by the location of component sourcing, such that they take longer to issue a recall if they sourced parts from abroad.

Originality/value – Research in international marketing has examined the benefits of integration to firms, but has not studied the risks of integration. By highlighting the challenges of managing institutional differences and integration difficulties, we show that location of headquarters and the location from where components are sourced have an effect on firm responsiveness in product-harm crises. Further, we build on the global supply chain management literature that has shown the effect of upstream activities (i.e., foreign production) on downstream activities (i.e., product quality). Specifically, we show that upstream activities can not only affect product quality, but also the ability of firms to respond to those product qualities in a timely fashion.

Keywords – Responsiveness, product recall, headquarters location, component sourcing

Paper type - Research paper

The topic of product safety and security is an emerging area within the domains of product safety, supply chain risk management, and marketing management (Lee and Whang 2005, Marucheck et al. 2011, Pyke and Tang 2010). Previous research has shown that product recalls have been on the rise due to slippages in global supply chains, which manifested as design and manufacturing flaws (Beamish & Bapuji, 2008). Providing further evidence to the risks of global supply chains, research found that the location where a firm manufactures its products can impact the overall product quality (Gray, Roth, and Leiblein 2011). The recall costs the firm both directly in the form of fixing the defective product and lowered market share (Rhee and Haunschild 2006) and indirectly through damaged brand reputation (Dawar and Pillutla 2000).

While previous research has underscored the costs of product recalls to firms, an issue of utmost importance to consumers is how quickly firms respond to and issue a recall. A delayed recall of a defective product can result in injuries to users of those products, and even deaths in some cases. In recognition of this, recently researchers have begun to study the responsiveness of firms in a recall situation. For example, Hora, Bapuji, and Roth (2011) have shown that recall strategy, type of product flaw, and position of recalling firm in supply chain are related to the swiftness with which a product recall is issued. Further, Muralidharan, Bapuji and Laplume (2015) have shown that product recalls are swifter if the manufacturing country has an unfavourable institutional profile. This research has not, however, examined how firm headquarters' location and component sourcing influence its responsiveness in a product recall

situation. These issues are important because previous research has shown that outsourcing production to a foreign location lowers product quality (Gray et al, 2011).

In this paper, we examine the relationship between headquarters' location and component sourcing on the responsiveness of firms in the context of product-harm crises. Product-harm crises refer to instances where products are found to be defective and dangerous to consumers (Siomkos and Kurzbard 1994). By responsiveness, we mean how quickly the firm has identified product defects posing harm to consumers, and issued a recall. Responsiveness of organizations during a product-harm crisis is vital because a delayed response can not only harm the firm's reputation and hurt performance in that market (Rhee and Haunschild, 2006), but can also permeate throughout the organization and affect performance across multiple markets (Bapuji, 2011).

We argue that firm responsiveness in issuing a recall in a particular market is related to the headquarters location of the firm and the extent of local and foreign components in the recalled product. Specifically, firm responsiveness is influenced by two major challenges faced by firms operating in multiple markets - understanding and responding to different institutional environments, and information flows within the organizational network. These challenges can be best illustrated by one of the largest recalls in the history issued by Toyota in 2009-10 due to issues with unintended acceleration (NBC Wire Service, 2010). When Toyota recalled the vehicles, it was criticized because it took several years to realize the problem and issue a recall in the US (Trottman and Mitchell 2010). Many attributed the massive recall to the overly rapid expansion of Toyota's international production networks and the complexity of managing

them (Minhyung 2010). Further, stakeholders around the world criticized Toyota for taking months to issue the same recall for an additional two million vehicles in non-U.S. markets because of the perceived weaknesses in the institutional environment of those markets (Andrews, Simon, Tian, and Zhao, 2011. We tested our hypotheses using data on 1,251 recalls involving 1,059 passenger vehicles introduced into the US marketplace between 2002-2010. We collected this data on recalls and recalling firms by painstakingly combing through multiple data sources. We employed a survival analysis, using an accelerated failure time model with an exponential distribution.

The remainder of this paper is organized as follows. First, we provide the theoretical background on firm responsiveness in product recall situations, as well as the challenges of balancing integration and institutional differences. Then, we develop hypotheses linking headquarters location and component sourcing – both domestic and foreign, with firm responsiveness. Next, we present methods and results and conclude with a discussion of the implications of our findings to research and practice.

Theoretical Background

Firm responsiveness to product-harm crises

It is well established that firms benefit by engaging in a strategy of market orientation (Ghauri et al., 2008; Kohli and Jaworski, 1990; Kohli and Jaworski, 1993). A component of this strategy is the level of responsiveness that firms display towards threats in the marketplace. In our context the threat is a product-harm crisis, and the speed with which the firm responds is a measure of the responsiveness of the firm. In cases of product-harm

crises that involve physical danger to users, products are recalled to eliminate the possible threat of harm. It is important to note that a product-harm crisis or a recall does not necessarily indicate poor manufacturing or poor management practices on the part of the firm, but may in fact be an unintended consequence of innovative design and manufacturing (Majid and Rhee, 2014). Despite advances in product design and testing, real-life conditions of usage can rarely be replicated during the product-testing phase. Therefore, some flaws are revealed only after the item has been released into the marketplace, necessitating a recall at that stage in the product's life cycle (Bapuji, 2011). For example, the conditions leading to accelerator pedal concerns in Toyota vehicles were not revealed during product testing, but surfaced only after the vehicles spent a year in the marketplace (Allen 2010).

Delays in recalling a product can reflect negatively on the firm's reputation, since firms can be viewed as unresponsive and/or untrustworthy if they do not respond to consumer-safety issues in an appropriate – *and* swift – manner (Dawar and Pillutla, 2000; Mowen, Jolly, and Nickell, 1981). However, issuing a recall is not easy for firms because of the direct and indirect costs involved. Further, recalling a product when it is not required could not only create a panic among consumers, but also affect the equity of the brand and reputation of the firm. Therefore, a firm is unlikely to recall a product unless it can determine that the product flaw poses serious danger to consumers and that reports of the flaw are not merely isolated cases of product failure due to consumer misuse. This is influenced by organizational factors that facilitate or inhibit information flows. Further, a firm is unlikely to issue a recall if the flaw does not violate a known safety standard or a

law of the specific market place. This is influenced by the strength of the regulatory environment in that country.

Integration and firm responsiveness

Organizational crises like product recalls can force the firm to direct resources towards the event, which in turn creates organizational knowledge that the firm can draw upon to improve its future products (Haunschild and Rhee, 2004). Accordingly, the speed with which an organization can absorb information from consumers, assess that information to identify the underlying cause of the problem, and then mobilize its resources toward a solution serves to maximize the firm's responsiveness in a product-harm crisis (Bapuji, 2011). In global firms, these capabilities rely on central management or integration, i.e., I central management of geographically dispersed activities (Prahalad and Doz, 1987). The degree of a firm's integration is reflected in the extent to which that firm's value-chain activities are centrally managed at the MNE headquarters, as opposed to being decentralized across its subsidiaries.

The traditional dyadic headquarters-subsidiary relationship in MNCs has given way to the firm becoming a network of foreign units (Ghoshal and Bartlett, 1990; Rowley, 1997). The relationships between different units within this network are influenced by the level of integration, and the level of interdependence between various units (Jones, Hesterly, and Borgatti, 1997; Kotabe, Parente, and Murray, 2007; Zenger and Hesterly, 1997). Linkages between the units of a firm will be stronger if the firm integrates all of its functions in its headquarters (Prahalad and Doz, 1987; Tadelis and

Williamson, 2010). However, performing all of these activities in the headquarters fails to take advantage of the arbitrage opportunities available in various markets in which the MNC operates (Dunning, 1988; Prahalad and Doz, 1987). Therefore, MNCs resort to component sourcing from multiple markets and from multiple suppliers, thus creating interdependencies among the units.

The core of any firm's global production strategy is to organize its specialized divisions toward a common goal (Dunning, 1988; Williamson, 1975). The manufacture of a complex product represents a unique challenge for the coordination of cross-border activities, particularly so when components are sourced from suppliers. Upstream activities, such as component sourcing, are highly dependent upon the co-ordination with suppliers, which in turn depends upon the systems and processes of the manufacturing firm that designs the product and initiates the order. For example, although component suppliers in the automobile sector function autonomously, manufacturing firms act as the coordinators for these suppliers. In other words, the manufacturer and supplier are mutually dependent upon each other to ensure proper integration of components into the final product (Kotabe et al., 2007).

The ability of MNC units that are highly dependent upon one another to perform is a function of the level of integration (coordination and communication) among these units (Prahalad and Doz, 1987). For example, in the 1970s, automaker Volkswagen assembled some of its models in Mexico, but sourced many of its parts from Germany, which created problems of coordination and communication for Volkswagen. After the North American Free Trade Agreement was implemented, barriers between the U.S.

market for auto parts and Mexican assembly plants diminished and parts were increasingly sourced from the United States (Kim, 2003). If barriers associated with geographic distance affect the ability of organizational units to function smoothly, then the relationship breaks down and the chain of communication is broken. On the other hand, if the firm is tightly integrated, then the large network spanning several countries creates bureaucracy and associated organizational challenges between different units within that network. More over, high levels of integration might make it difficult for the firm to respond to differences in the institutional environments of the markets in which it operates.

Institutions and responsiveness

Institutions are considered to be the formal and/or informal constraints that influence and shape human interactions within a society (North 1990). The institutions necessary to accomplish economic exchange include a hierarchy of rules, such as constitutional law, statute law, common law and bylaws. These rules define the formal structure of rights in a specific exchange, and determine how costly it is to make the exchange. Accordingly, these structures vary in their complexity across markets (North 1990).

Institutions can be understood as the "regulative, normative and cognitive" structures and activities that influence and shape organizational actions (Scott, 1995). The regulatory dimension of institutions deals with the "setting, monitoring and enforcing of rules" (Xu and Shenkar 2002:610). They are the "existing laws and rules in a particular national environment which promote certain types of behaviors and restrict others"

(Kostova 1997:180). These laws can operate through an enforcement mechanism by which violators are punished and then learn from their mistakes, or alternatively, the simple threat of action can often compel such behaviors (Chao and Kumar 2010). In a recall situation, the relevant laws include the standards for usage of materials, specifications related to safety features of the product, and emission standards.

The normative dimension of institutions consists of "social norms, values, beliefs, and assumptions about human nature and human behavior that are socially shared and are carried by individuals" (Kostova, 1997: 180). This dimension stems from societal norms and beliefs and prescribes the goals and the means to achieve them (Xu and Shenkar, 2002). Accordingly, these norms and beliefs include procedures or customs that are taken for granted within a society. For an organization, these procedures or customs guide action through social obligation or professionalism. In a recall situation, these norms can include expectations related to swift action by the firm to address product problems as well as engaging with consumers to fix those problems.

The cognitive dimension of institutions includes the "schemas, frames, and inferential sets, which people use when selecting and interpreting information" (Kostova, 1997: 180). These influences involve symbols, words, signs and gestures as well as the rules and regulations of a cultural framework. Firms follow these cultural rules and regulations without any resistance or conscious thought (Zucker, 1983). In a recall situation, these cultural rules can include how customers of recalled products are treated. It is common for firms to provide different remedies and respond differently across markets. For example, when Maclaren recalled a million of its strollers due to finger tip

amputation hazard, it actively provided to the US consumers a fabric cover that eliminated the hazard by covering the stroller hinges. However, the company did not make such active efforts to provide the same remedy to consumers in UK, France, and Canada. Instead, the company did not issue a recall, but issued a simple communication stating that consumers who felt the need for the remedy should contact the company.

In sum, firm responsiveness in case of product-harm crises is important to maintain its reputation and market share. As MNCs attempt to achieve efficiencies by exploiting arbitrage opportunities in their markets, they create interdependencies among the units. To manage such interdependencies, they attempt high levels of integration, which could affect the ability of firms to understand the requirements in various markets and respond to them. Furthering these arguments, we develop hypotheses lining headquarters' location of the firm and component sourcing with firm responsiveness in recalls.

Hypotheses Development

Location of headquarters and organizational responsiveness
Firms that are headquartered in the local market often have a thorough understanding of the institutional environment of the county, specifically, the rules and regulations, norms governing business relationships, and the cognitive frames used by individuals to interpret information. In addition, firms headquartered in the local market have the advantage of established networks and relationships with key stakeholders (Rugman et al., 2009). However, when the firm expands to a foreign market it must then deal not

only with the challenges of managing the operations across borders, such as managing the foreign institutional environment, but also managing the linkages between different units of the organization (Dunning, 1988). These twin challenges – of managing the institutional environment and managing the complexity of MNC operations – will influence firm responsiveness in case of product-harm crises.

Product-harm crises typically occur after a product has been introduced into a market and has been used by consumers[1]. When reports of product failure, and any associated harm to consumer surface in the local market, the local subsidiary will have to coordinate with company headquarters. If the headquarters are located in the same country, then both the headquarters and subsidiary interpret the information in a similar fashion because they tend to have a shared understanding about the rules and regulations. They also have a shared understanding with respect to consumer expectations.

When headquarters are located in a foreign country, the subsidiary might not immediately share the information with the headquarters for multiple reasons. First, it might attempt to make sure the issue is substantial enough to report back to the headquarters. Second, it might attempt to find a potential solution on their own or in the expectation that the headquarters will ask for it (Cannon & Edmondson, 2005; Tucker, Edmondson, & Spear, 2001). Third, even when both these occur, the subsidiary managers might be hesitant to report the issues back to the headquarters in fear that the issue might

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[1] If the flaw is known at the product manufacturing and testing phases, the firm would take a corrective action before introducing the product into the marketplace, rather than risk the direct and reputational costs of recalling.

reflect poorly on subsidiary's performance or that they might be blamed for the issue (Edmondson, 2011).

On receipt of information from the subsidiary, the managers in headquarters need to appreciate the gravity of the issue before they turn their attention to it. This might be impeded by differences in safety between the local market and headquarters. As importantly, conflicting objectives of headquarters and subsidiaries might hamper a collaborative approach to understand the issue (Ellis, Mendel, & Nir, 2006; Tucker, 2004). Finally, managers in the headquarters might not immediately turn their attention to the issue because incentives within the organization are rarely aligned with detecting and correcting failures (Baumard & Starbuck, 2005). As a result, the managers in the headquarters are likely to attribute the failures to environmental causes in the domestic marketplace, particularly because of the institutional differences between headquarters market and local market (Baumard & Starbuck, 2005).

In addition to the problem of understanding the gravity of the product failure, and its need to identify the underlying cause by devoting resources to it, yet another issue that could affect the responsiveness of firm in the local market is the remedy to be offered for the recalled product. In some markets, particularly the US, consumers expect an immediate resolution of the issue, with least inconvenience to them. Further, they also expect high level of compensation for the inconvenience caused to them. If the company headquarters are located in the marketplace, then these norms are understood equally well by all managers – both in the headquarters as well as the subsidiary. However, when the headquarters are located outside the marketplace, local managers might have to persuade

the headquarters managers about the need for high remedial measures in announcing the recall. Such persuasion might hamper a quick response from the company.

In sum, understanding the reports of product quality failure, identifying the underlying cause, and developing a remedy will involve a thorough understanding of the institutional environment where the incidences of failure have occurred. When headquarters of the firm are located outside the local market, coordination of these activities poses additional challenges and more time is spent in dealing with those. Accordingly, we hypothesize:

H1: *Organizational responsiveness in a country market will be lower (i.e., time to recall will be longer) for a firm whose headquarters are located outside that country. Similarly, organizational responsiveness in a country market will be higher (i.e., time to recall will be shorter) for a firm whose headquarters are also located in the same country.*

Component Sourcing and Organizational Responsiveness

We have argued above that an MNE whose headquarters are not located in the local market, will be less responsive in product-harm crises because of institutional differences and integration difficulties. These challenges can be alleviated or amplified by the location from where the organization sources its components. When a firm headquartered outside the country sources its components from the local market, its responsiveness improves because, as explained below, the firm is more likely to immediately attend to

flaws and the suppliers are more likely to use their knowledge of the institutional environment to deal with the reports of flaws.

Component suppliers from the local market are embedded in the institutional environment of the marketplace. Therefore, they are likely to have intimate knowledge about safety standards in the country, as well as regulatory expectations. Further, being located in and focused on the local market, the supplier is likely to attend to the flaws quickly lest it affects its reputation and consequently, its performance. In addition, local suppliers are also likely to be aware of the norms governing consumer and stakeholder expectations about how a quality failure should be addressed. Finally, the suppliers are more likely better understand information received from consumers and regulators, as they share the same cognitive schemas common to their institutional context. As a result, when product failure reports are traced back to the suppliers, they are more likely to understand the institutional context, and act fast and appropriately on the issues reported.

In sum, when a foreign MNE sources components from local market, its challenges of integration are fewer. Further, the suppliers better understand the local institutional environment and thus can address the product-harm crisis in an appropriate manner. Accordingly, we hypothesize:

H2a: Component sourcing from local market will increase the local market responsiveness (i.e., time to recall will be shorter) of a firm whose headquarters are located outside the local market.

Foreign companies can source components from domestic suppliers. Similarly, domestic companies may source components from suppliers based outside of the local market. In such case, the domestic company introduces the integration difficulties and institutional differences into its operations, thus reducing its responsiveness. When a domestic company sources its components from foreign markets, those suppliers may not be aware of the institutional environment in the local marketplace. Specifically, they might not be familiar with the safety standards of the local marketplace, the expectations of consumers, and the norms about customer service. Further, due to differences in cognitive frames, the suppliers might find it difficult to interpret the information emanating from consumers and other stakeholders in the local marketplace. As a result, foreign component suppliers might not act as fast and/or as appropriately as domestic suppliers in dealing with product-harm reports arising from the domestic market.

In addition, when a domestic firm resorts to foreign sourcing of components, it may be aiming to achieve economies of scale, i.e., pursuing higher levels of integration (Yang 1995). As detailed in hypotheses 1, it may result in communication and coordination difficulties, because coordinating with suppliers in a foreign country is more challenging than coordinating with domestic suppliers.

In sum, when a local firm sources components from foreign suppliers, its challenges of integration will increase, and the suppliers might not act as fast and as appropriately as domestic suppliers. This reduces the firm's responsiveness in the local market. Accordingly, we hypothesize:

H2b: Component sourcing from a foreign market will decrease the local market responsiveness (i.e., time to recall will be longer) of a firm whose headquarters are located inside the local market.

Methods

Research Context: Automobile Sector in the United States

The automobile industry offers an ideal context in which to examine responsiveness due to the global nature of its production and efforts to balance global integration and local responsiveness (Kotabe, Parente, and Murray, 2007). Further, we chose the United States' automobile sector because of the availability of reliable data on study variables. Specifically, since 1992, the American Automobile Labeling Act (AALA) has required automobile manufacturers to specify the percentage of US/Canadian parts content, the country of assembly, and the countries of origin of the engine and transmission (National Highway Traffic Safety Administration). The percentage of US/Canadian parts represents the value of those parts as a percentage of the total value of the automobile. For example, if the US/Canadian manufactured parts represented 40% of the total value of the automobile, then the domestic content would be listed as 40%. This enactment of the AALA was motivated by a desire on the part of lawmakers to help consumers to make their automobile purchase decisions based on the amount of domestic content the vehicle contained. At the same time, consumers may also use the country of origin to ascertain the quality of the vehicle (Moon and Jain, 2002), thus giving an edge to Japanese and German manufacturers because of the positive associations that consumers have of the cars made by these manufacturers (Moon and Jain, 2002).

Recalls that dominate media attention represent only a small portion of the millions of recalls issued each year. To ensure the completeness of our sample, we collected data from the regulatory agency responsible for auto recalls rather than from newspaper records. In the US, responsibility for the safety of new cars lies with the National Highway and Traffic Safety Administration (NHTSA). Since 1966, when the US Congress passed the National Traffic and Motor Vehicle Safety Act, automakers have been required to meet federally set standards concerning auto safety. These standards are applicable to cars manufactured within the country and to those imported from abroad. When a discrepancy between the federally set safety standards and product features of the automobile becomes known through product-related incidents or accidents, the automaker investigates the product defect in order to ascertain whether the automobile should be recalled. It should be noted that even if the defective part was manufactured by a supplier, and not the automaker, the automaker is responsible for the recall.

As soon as a firm becomes aware of any safety concerns with its vehicles, it is obligated to report the incident to the NHTSA, which conducts its own investigations and is vested with the authority to issue a mandatory recall if necessary. In the majority of cases, however, the automakers pre-empt a mandatory recall by agreeing to a voluntary recall. Through their own testing and product monitoring, firms often uncover a product flaw before regulatory agencies are able to do so and can thus pre-empt mandatory recalls (Haunschild and Rhee, 2004). Once the recall is issued, the firm then contacts the affected consumers directly, issuing notices to individual customers through its dealer network and to the general public via press releases in collaboration with the NHTSA.

Upon issuing the recall, the manufacturer then becomes responsible for any and all costs associated with fixing the product defect.

During the period of our analysis, over 100 million vehicles were sold within the US (The Automotive News 2002-2010). The majority of new vehicles sold during the specified time period were made by six manufacturers: Chrysler, Ford, General Motors, Honda, Toyota, and Volkswagen (The Automotive News 2002-2010). These six manufacturers had a combined market share (for total vehicles sold) of approximately 60% in 2010, but this percentage is significantly smaller than the approximately 70% market share that the six firms held in 2002 (Ward's Automotive Yearbook 2002-2010). This loss in market share can be attributed to the growth of traditionally smaller manufacturers with a more specialized product line, such as Lexus and Hyundai.

Sample

We collected data on all passenger vehicle models introduced into the United States marketplace from 2002 to 2010. Vehicles that are intended for private consumers, and not for commercial consumers (such as trucks or commercial vans), are categorized as Passenger Vehicles by the *Automotive News*. When we use the term vehicle, we refer to all models and all trims. For example, in our sample the Toyota Corolla SE and the Toyota Corolla LE would be counted as two different vehicles even though they share the same manufacturer and similar designs. We considered the parent producer of a vehicle as its manufacturer. Each manufacturer produces multiple vehicles under its umbrella, but ultimately controls the production process. For example, Toyota is the manufacturer of the following vehicles: Toyota Camry and the Lexus RX.

In order to obtain the date the U.S. models were first manufactured, we conducted a search through the following sources: *Car and Driver Magazine*, *The Automotive News*, *Ward's Automotive Database*, and, in one case (Ford), from the manufacturer itself. This information was available largely because the automakers announced their production plans before the product launches. It must be noted that we also researched the date that vehicles which were never recalled (the right-censored vehicles) in our analysis were first manufactured. NHTSA compiles a database of vehicles that have been recalled in the United States. The database details when the recall was issued to the public and when the vehicle was first manufactured. We used the date January 1, 2010 as the end date for the sample. To calculate the probability of a recall occurring over time, we treated each recall as an independent event regardless of the type of vehicle or brand. For example, the 2008 Toyota Camry LE may have been recalled in 2009 and then again 2010.

During the period of analysis, a total of 1,059 vehicles were released into the marketplace. Of these, 738 were recalled a total of 1,251 times; some vehicles were recalled multiple times. In the interest of compiling accurate information on the study variables, we included the 12 largest (by sales volume) manufacturers. Six of these manufacturers were headquartered in the United States, three were based in Germany, and three were based in Japan. We created a sample of all available models produced by the twelve manufacturers by examining sales figures provided by the Automotive News. Each vehicle that was sold was included in the sample and then matched with whether it had been recalled or not during the time period of the analysis. In Table 1, we provide a summary of the sample, indicating each manufacturer, its headquarters, number of

models, number vehicles released, number vehicles recalled, and the number of vehicles not recalled (right censored).

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Variable Operationalization

We presented a full listing of all variables and sources in Table 2 and elaborated in the following paragraphs.

Responsiveness

Following prior research (Hora et al., 2011; Muralidharan et al., 2015), we operationalized responsiveness as the time between the product manufacture and the recall, calculated in months. Ideally, responsiveness should be measured as the time taken by a company to recall a product after it became aware of the problem, but given the legal liabilities, firms do not reveal when they first became aware of the problem. In a few highly publicized and scrutinized cases, this information might become available as a result of media investigations or regulatory penalties, but firms often contest – and rarely confirm – such information. Given these constraints, we used the best proxy that researchers have adopted to operationalize responsiveness. It should also be noted that all of the recalls used in our sample were voluntary recalls and not forced by the regulatory authorities.

Location of Headquarters

We collected data on the headquarters location of the manufacturing firm from publicly available information in the 2011 annual report for each firm. We then coded the headquarters location as domestic if the headquarters of the firm is in the US, and coded it as foreign if the headquarters is located outside the US. As a result, companies whose headquarters were in Japan and Germany were coded as foreign.

Component Sourcing

We calculated domestic and foreign component sourcing using the value of American parts as a proportion of the total value of the vehicle. Information on U.S. content and final assembly, as well as foreign content, was obtained from the NHTSA, which publishes this information annually. A shortcoming of this information is that the exact locations of components listed under the umbrella of other, i.e., foreign sourcing, are not listed. Therefore, our analysis categorize component sourcing into domestic sourcing (sourcing from the US/Canada) and foreign sourcing (sourcing from outside the US/Canada).

Control Variables

We controlled for a number of organizational characteristics that may affect a firm's responsiveness: firm assets, firm employees, net income of the firm, and firm market share. We obtained data on these variables for each year from the *Compustat* database. Firm assets refer to the total value of all assets held by the firm in the year that the recall occurred. We included this variable because a firm that has a large number of assets may be more adept at assigning resources to deal with the product recall. In line

21

with previous research (Kotabe, Martin, and Domoto, 2003), we included the number of employees as a proxy for firm size. Our rationale for including firm size is that a large firm may be able to assign employees to specific product flaws. Alternatively, firms with a large number of employees may have a more bureaucratic structure that inhibits its responsiveness. To account for either occurrence, we included the total number of employees for each firm in each year of a product recall as a control variable. The net income for a firm represents its short-term profitability. Firms that have a large net income may be able to absorb the costs of a recall and thus respond promptly to a product flaw. Therefore, we used the net income earned in the year that the recall occurred as a control variable. Firms that have a higher share of the local market have a reason to protect their reputation and market share. Accordingly, they may recall faulty products sooner than those that have a small market share. Alternatively, firms with smaller market share might recall faster to gain reputation, and thus market share. To account for either possibility, we controlled for the market share of each automaker. Using sales data from the *Automotive News* (2002 – 2010) we summed the total sales volume for each automaker and divided it by total vehicle sales that year. This was done for each automaker in each year of our sample.

In addition to firm characteristics, we have also controlled for the reputation of an automaker because reputed firms are likely to respond quickly to product failures in order to protect their reputations. Reputation refers to awareness and associations that consumers have of a firm and its products (Dawar and Parker, 1994; Wheatley and Chiu, 1977). Our measure of firm reputation was extracted from the aggregate measure

22

developed by Rhee and Haunschild (2006), which went beyond the often-criticized single-item measure by aggregating multiple sources. These authors relied on third-party ratings given by technical experts; these were published by J.D. Power and Associates. Further, Rhee and Haunschild (2006) also integrated consumer feedback obtained from the publication *Consumer Reports* in order to capture firm reputation. We further refined this measure by incorporating the depreciation rates for used cars (depreciation rates taken from the N.A.D.A Official Used Car Guide). By incorporating depreciation rates, we were able to incorporate demand for the automobile into the measure of reputation, thus making it even more comprehensive.

In addition to the above, the specific characteristics of a recall might also affect a firm's responsiveness. For example, recalls that involve a larger number of vehicles will proportionately increase the direct and indirect costs. Therefore, we controlled for the number of potential vehicles affected by the recall, as indicated in the notices given by the NHTSA. The number of vehicles subject to a recall ranged from a high of 4.5 million to a low of two. In order to enhance comparability, we calculated the natural logarithm of the size of the recall.

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Analysis

To test our hypotheses, we conducted a survival analysis using an accelerated failure time model with an exponential distribution. Previous work on product recalls has commonly employed ordinary least squares (OLS) regression techniques (e.g., Cheah et al., 2007;

Chen et al., 2009; Hora et al., 2011), a method that limits the analysis to only those products that were recalled and does not take into account the fact that some members of the sample may never experience the event.

Of the available survival analysis techniques, we chose to develop an accelerated failure time model because we expected our covariates to have a disproportionate impact on the probability of the hazard earlier rather than later. The survival analysis would enable to determine the probability that a recall is issued each month after the product is released into the marketplace. For example, the probability of a manufacturer issuing a recall would be higher twelve months after the car was released than it would be after one month it was released. We developed a model with an exponential distribution, which was deemed to provide the best fit for our data, as indicated by the scale variable (which was only 1) and a visual representation of the hazard plot. We used the Lagrange multiplier to ascertain the model significance. A chi-square value of 113.815 ($p < 0.001$) indicated that the constant hazard was untenable, thus further justifying our choice of the accelerated failure time model.

The estimate for both the Scale and the Weibull Shape was 1, which indicated a constantly increasing hazard in our model. A plot of the Weibull hazard function showed a sudden increase early on, followed by a constant increase over the remaining time. The time that the product was first released into the marketplace represents the beginning of the time period for that particular product. The equation for our accelerated failure time model was as follows:

$$T_i = e^{\substack{\beta_0 + \beta_1 \log(PotAff) + \beta_2 \log(As) + \beta_3 \log(E) + \beta_4 \log(NI) + \beta_5 (MktShare) + \beta_6 (R) \\ + \beta_7 (Foreign) + \beta_8 (USA) + \beta_9 (PercentUS) + \beta_{10} (PercentOther) + \\ \beta_{11} (Foreign)*(PercentUS) + \beta_{12} (USA)*(PercentOther)}}$$

Results

Based on the significance of the parameter estimates (Table 3), the first hypothesis (H1a) was supported. Firms headquartered outside of the U.S took longer to recall cars $(\beta_7 = 1.354, p < 0.05)$ while firms headquartered in the United States took less $(\beta_8 = -0.652, p < 0.05)$, thus indicating that headquartering in the local market can positively impact responsiveness. This is noteworthy because it reinforces how local firms have an institutional advantage from being based in the local environment. Our next hypothesis (H2a) argued that sourcing components from the local market would enhance responsiveness for a firm that whose headquarters is located outside the country. This hypothesis was supported $(\beta_{11} = -1.772, p < 0.05)$, foreign firms that sourced from the local market enhanced their responsiveness whey they sourced a greater proportion of local components. For example, if Toyota sourced 80% of its components for its Camry from the United States and 20% of its components for the Prius from the local market then Toyota is likely to recall the Camry faster than the Prius. We built upon Hypothesis 2a in our final hypothesis (H2b), local firms would have an advantage in terms of responsiveness but they would lose this advantage if they sourced from a foreign market. This hypothesis was supported $(\beta_{12} = 2.380, p < 0.05)$ which adds strength to the earlier hypothesis (H2a) and furthers are argument that local sourcing increases responsiveness

while foreign sourcing decreases it. In terms of our control variables, the larger the recall the more likely it was to get recalled faster. This is inline with previous work (Rhee and Haunschild 2006) which found that severe recalls would garner greater attention from the firm. The number of employees also had a negative relationship (faster recall) on probability of recall over time which indicates that firms which combine their operations in one country (corresponding with a large proportion of the operations in the given country). Lastly, firms with a better reputation were slower to issue a recall which is also in line with the prior work of Rhee and Haunshild (2006) which found that firms with a positive reputation have the most to lose. Thus, firms with a positive reputation may be delaying the initiation of the recall.

We checked how well the data fit our hypothesized model and the model fit improved significantly when we added our last interaction terms that tested H2a and H2b. In terms of the model fit, our final model which included the tests for tests for H2a and H2b, provided the best fit as evidenced by the low AIC (3388.882) and -2LL (3362.882). The change in the log-likelihood was significantly lower ($p < 0.05$) when we added the interaction terms in Model 3 versus Model 2 which further justifies our choice of model.

("Please insert Table 3 about here")

Discussion

Global production is important for firms to exploit the various arbitrage opportunities presented in the markets where they operate. The rise in global production and supply chains has resulted in increased product failures, and subsequently product recalls.

Product recalls can be very damaging to firms because recalls not only involve high costs to an organization, but they also affect consumer attitudes and market share. Further, product failures can cause harm to consumers, in the form of loss of limb and life. Consequently, it has become imperative for MNEs to be responsive when faced with product flaws that can potentially harm consumers.

Drawing on insights from institutional theory (Kostova, 1997; North, 1990; Scott, 1995) and the integration-responsiveness framework (Prahalad and Doz, 1987; Ghoshal and Bartlett, 1990), we hypothesized that the location of a firm's headquarters and its component sourcing influence a firm's responsiveness in product-harm crises. Our testing of hypotheses revealed that firms headquartered outside a particular market are slower to issue recalls, while firms headquartered in the same country issues faster recalls. Further, we found that local sourcing can improve the responsiveness of foreign firms, such that they reduce the time taken to issue a recall. Similarly, foreign sourcing can deteriorate the responsiveness of local firms, such that they take longer to issue a recall in their own market place.

Limitations

Our findings must be interpreted within the limitations of our study. First, our empirical context of automobile sector is unique because of the differences in safety standards across countries, and the dependence within the network of automobile manufacturers and component suppliers. Although interdependence is a common feature in many industries, such as pharmaceuticals or even the film industry (Rowley, 1997), auto industry is unique in the level of complexity in supply chains, and thus, the level of interdependence. In dealing with institutional differences, such interdependence may cause firms to be slow in responding. Second, the US auto industry is a highly developed

market, and the regulatory framework led by NHTSA is particularly stringent in comparison to other markets in the world. As a result, responsiveness of foreign firms may be particularly influenced by the peculiarities of the US market place and its regulatory framework. Third, data availability limitations have precluded us from developing a fine-grained measure of component sourcing. The records of NHTSA categorize components from both US and Canada as US; and all other foreign components are labelled as other, even if they originated from the company's home country. As a result, we were unable to ascertain where the foreign components originated from if they did not originate from US and Canada. Also, we could not distinguish between US and Canada for component sourcing. It is likely that parts obtained from the manufacturer's home country (Japan or Germany) may expedite the firm's responsiveness compared to parts sourced from a country other than the home or the local market. Finally, like other studies relying on quantitative analysis of the data, our findings maybe a result of the model specification. Although model specification is guided by theory, we cannot confirm that other specifications guided by different theoretical underpinnings will yield the same results.

Theoretical Insights

Out study contributes to international marketing research by highlighting the factors that affect a firm's responsiveness in product-harm situations. Firms that operate in foreign markets face many challenges, ranging from communication difficulties between units to the increased costs of operating in a foreign market (Rugman et al., 2009). While these challenges have been revealed by previous research, how operating in a foreign market would affect a firm's ability to deal with product-harm crises. Our research reveals that due to institutional differences, and coordination difficulties, a firm's ability to respond to product-harm crisis is affected in the local market.

Interestingly, these challenges affect both foreign firms selling products in the local market, and local firms sourcing components from foreign markets. In other words, challenges faced by foreign firms in a local market place are understandable. What is noteworthy is that despite being embedded in the local institutional environment, even local firms lose their advantage of high responsiveness when they source components from a foreign supplier. It appears that even the most intimate knowledge about the local marketplace is not a sufficient guard against the perils of component sourcing from foreign markets.

The framework of integration-responsiveness has been used extensively in international business literature to study MNEs. Since the conceptualization of the integration-responsiveness framework, researchers have employed this model to classify firms along the twin dimensions of integration and responsiveness (Harzing, 2000) and to identify factors that would cause the firm to favor responsiveness in one market and integration in another (Johnson, 1995; Roth and Morrison, 1990). Research studies examining how integration influences a firm's responsiveness in a marketplace are rare. In a rare example, Lee and colleagues (2009) found that greater integration between subsidiaries increased the firm's responsiveness, specifically in new market entries and in effectively addressing customer problems. Our study shows that efforts at greater integration have the potential to adversely affect a firm's responsiveness in a product-harm situation. In other words, even if greater integration enhances a firm's market responsiveness as found by Lee and colleagues (2009), such responsiveness might not extend to greater responsiveness in handling product-harm crises. In highlighting this, our study underscores the need to distinguish between market responsiveness and responsiveness in a product-harm crisis. Further, our study illustrates the potential of the

integration-responsiveness framework to study responsiveness of firms in multiple markets.

Our study also contributes to the literature on global supply chain management. Previous research in this area has shown that the location where a firm manufactures its products can impact the overall product quality (Gray, Roth, and Leiblein 2011). By examining the location of manufacturing, Gray and colleagues (2011) found that upstream activities can have a negative impact on downstream activities. Our work goes a step further to show that upstream activities can also affect a firm's ability to deal with the negative impact on downstream activities. In other words, not only does offshore manufacturing affect quality, but also influence a firm's ability to deal with such quality failures.

Managerial Insights

Our study offers important implications for managerial practice. By highlighting the factors that affect firm responsiveness in a product-harm situation, our study shows the importance of paying attention to the challenges of managing institutional differences and integration difficulties. Specifically, institutional differences and coordination difficulties make it difficult for foreign firms to respond quickly in a product-harm situation. These challenges can, however, be managed by increasing sourcing of components from local market. In addition, our findings also reveal that local firms can also lose their responsiveness if they source components from foreign locations.

With the rise in global supply chains, recalls have not only increased, but also have become commonplace (Beamish & Bapuji, 2008). As a result, stakeholder attention has shifted from recalls themselves to effective management of recalls, such as issuing a quicker recall, and offering a suitable remedy to aid in the recovery of faulty products

from the hands of consumers (Bapuji, 2011). Subsequently, recent research attention has also been shifted to understand the factors associated with a quicker issue of a recall. Studying toy recalls in the US, Hora and colleagues (2001) found that a firm's recall strategy, flaw causing the recall, and the position of a recalling firm in the supply chain influence time to recall. Specifically, (i) recalls following incidents of harm are issued faster compared with those that did not involve incidents of harm, (ii) recalls involving manufacturing flaws are issued faster than those involving design flaws, and (iii) retailers issued a recall faster than the brand-owning companies. Further, Muralidharan and colleagues (2015) found that firms issue a recall faster if manufacturing of the defective product was done in a country with poor reputation for manufacturing. This is because recalling firms can maintain and enhance their reputation with a quicker recall by attributing the flaw to the institutional weaknesses of the country of manufacturing. Our study builds on the institutional differences and upstream/downstream activities to further shed light on how time to recall is affected by headquarters' location and component sourcing.

Conclusion

In order to take advantage of the benefits of operating in different markets, firms that manufacture complex goods must organize their production and sales across multiple markets. Prior research has shown that firms can gain competitive advantage by using a network of both internal and external suppliers, spread around the world. Such dispersion can, however, affect a firm's ability to respond to product-harm crises in the local marketplace. Our findings not only reveal this risk of losing responsiveness in the local marketplace, but also suggest how firms can mitigate that risk. Further research aimed at understanding how global dispersion of manufacturing influences firm performance, as

well as responsiveness in product-harm situations can help managers to reap the benefits

of global operations, without compromising on their ability to respond to product failures.

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Table 1. Summary of Sample.

Summary of Sample

Brand	Location of Headquarters	Number of Models	Total Number of Vehicles Released	Number of Vehicles Recalled	Number of Vehicles Not Recalled (Right Censored)	Average time to recall (in months)
Acura	Foreign	7	28	20	8	47
Audi	Foreign	18	56	38	18	62
BMW	Foreign	23	83	48	35	19
Cadillac	United States	12	77	62	15	18
Chevrolet	United States	22	136	71	65	28
Chrysler	United States	14	72	50	22	27
Dodge	United States	20	135	111	24	25
Ford	United States	33	153	102	51	44
GMC	United States	10	60	49	11	18
Honda	Foreign	13	87	43	44	35
Toyota	Foreign	23	124	108	16	44
Volkswagen	Foreign	11	48	36	12	28
		Total	**1059**	**738**	**321**	

Table 2. Summary of Variables.

Abbreviation	Description	Coded
T_i	Expected time to recall for car i	Continuous variable
PotAff	The number of potentially affected units	Continuous variable
As	The total number of firm assets in the given year	Continuous variable
E	The total number of employees in the given year	Continuous variable
NI	The total amount of net income in the given year	Continuous variable
MktShare	The market share for the car brand in a given year	Continuous variable
R	Reputation of the firm in the given year	Continuous variable
Foreign	Firm is headquartered outside of the USA	Dichotomous variable coded as 0 or 1
USA	Firm is headquartered in the USA	Dichotomous variable coded as 0 or 1
PerecentUS	Percentage of content manufactured by U.S. suppliers	Continuous variable
PercentOther	Percentage of content not manufactured by U.S. suppliers	Continuous variable

Table 3. Parameter Estimates for Hypothesized Model.

Parameter estimates for covariates, dependent variable: Expected probability of recall over time

Variables	Model 1	Model 2	Model 3	Model 4
Constant	-1.723	-3.615**	-4.216**	-4.709***
	(1.141)	(1.292)	(1.511)	(1.479)
Log of Potential Affected	-0.365***	-0.370***	-0.374***	-0.366***
	(0.017)	(0.017)	(0.017)	(0.018)
Log of Assets	-0.018	-0.066	0.155	0.104
	(0.126)	(0.130)	(0.150)	(0.154)
Log of Employees	1.116***	1.445***	1.199***	1.181***
	(0.228)	(0.253)	(0.265)	(0.265)
Log of Net Income	0.004	-0.009	-0.007	-0.004
	(0.029)	(0.030)	(0.031)	(0.031)
MarketShare	0.464	0.476	-0.959	-0.033
	(0.800)	(0.802)	(0.907)	(1.004)
Reputation	0.445**	1.913***	1.002*	1.587**
	(0.179)	(0.524)	(0.581)	(0.646)
Foreign (Hypothesis 1)		0.151	1.258**	1.354*
		(0.210)	(0.424)	(0.764)
USA (Hypothesis 1)		-0.762**	-0.812*	-0.652*
		(0.257)	(0.617)	(0.412)
PercentUS			-1.258**	-1.861**
			(0.424)	(0.571)
PercentOther			0.771*	0.484
			(0.452)	(0.712)
Foreign x PercentUS (Hypothesis 2a)				-1.772*
				(0.929)
USA x PercentOther (Hypothesis 2b)				2.380*
				(1.010)
Lagrange Multiplier (Chi-Square Value)	118.042***	116.051***	114.346***	113.815***
AIC	3390.803	3384.597	3323.730	3322.118
SBC	3425.411	3424.149	3373.005	3361.249

-2LL	3376.803	3368.597	3303.730	3228.118
Change in -2LL (df)		8.206	64.867	75.612
p		> 0.05	< 0.05	<0.05

Notes:
1. Standardized coefficients are shown
2. Standard errors are shown in parentheses
* *p* = 0.05, ** *p* = 0.01, *** *p* = 0.001