

Recall and Response: Relationship Adjustments to Supply-Chain Shocks*

Emek Basker Fariha Kamal
U.S. Census Bureau U.S. Census Bureau

January 2019

Preliminary: Please Do Not Distribute

Abstract

We study changes in firms' sourcing behavior following negative shocks to their supply chains. We identify the impact of shocks to relationships between U.S. buyers and their foreign suppliers using recalls of consumer products for health or safety reasons. Compared to a control group, U.S. firms that source a recalled product from an unaffiliated supplier are more likely to discontinue orders from the supplier subject to the recall and increase their reliance on alternative suppliers. In contrast, buyers that are vertically integrated with the suppliers of recalled products maintain their reliance on the same suppliers. We interpret these findings using a model of buyer-supplier relationships, in which firms with larger market sizes benefit more from vertical integration and find it optimal to maintain these integrated relationships in the face of adverse shocks.

JEL Codes: L14, F14, F23, F61

Keywords: Global supply chains; buyer-supplier relationships; firm boundary; vertical integration; recalls

*Comments welcome. Author contact: emek.m.basker@census.gov and fariha.kamal@census.gov. Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed. We thank Tanya Topka for providing background on the Consumer Product Safety Commission and the consumer product recall process, James Boohaker for invaluable and painstaking research assistance, Saku Aura, Cheryl Grim, J. Bradford Jensen, Pamela Medina-Quispe, Pham Hoang Van, Jon Williams, Nikolas Zolas, and seminar participants at the U.S. Census Bureau, American University, the 2018 Federal Statistical Research Data Center Conference, 2018 SEA, and 2018 Mid-Atlantic Trade Workshop for helpful comments and discussions.

1 Introduction

Relationships between individual buyers and sellers are key to facilitating trade. The pervasiveness of supply chains in the modern production landscape, both within and across national borders, provides greater impetus to understand the foundational links between individual firms. In this paper, we use a natural-experiment setting to explore the margins of adjustment for buyer-supplier relationships that experience exogenous negative shocks. We leverage a comprehensive dataset of recalls of imported consumer goods, linked to detailed information on both the U.S. buyer and the foreign supplier, and the vertical relationship between them. The recalls serve to identify exogenous shocks to buyer-seller relationships.

Central to our analysis is the role of the firm boundary. About half of total U.S. goods imports occur between affiliated firms (U.S. Census Bureau, 2017).¹ A large literature on multinational firms has examined the trading patterns of parents and affiliates, such as their volume and frequency.² However, we know much less about the longevity and stability of the individual relationships between affiliated firms. In this paper, we carefully distinguish between affiliated and non-affiliated relationships. We hypothesize that affiliated firms have stronger and more durable relationships than unaffiliated firms that trade. This hypothesized correlation reflects both selection effects (firms that expect their relationships to endure invest in affiliation) and causal effects (once the investment is sunk, there is a benefit of remaining in the affiliated relationship). Therefore, affiliated relationships may be expected to better withstand negative shocks than unaffiliated relationships. We test this hypothesis using difference-in-differences and triple-differences specifications on both the within- and

¹Title 19 U.S. Code §1401a(g) outlines seven different ways in which parties may be affiliated in a U.S. import transaction. The ownership-based definition, which we use in this paper, states firms are affiliated if either owns, controls, or holds voting power equivalent to six percent of the outstanding voting stock or shares of the other organization.

²For example, Harrison and McMillan (2011) estimate the labor-demand impact of offshoring on home-country employment; Ramondo, Rappoport, and Ruhl (2016) study patterns in foreign-affiliate sales to U.S. parents. See Antràs and Yeaple (2014) for a survey of the literature on multinational firms and the structure of international trade.

across-firm decisions to adjust supplier relationships.

To conceptualize the impact of recalls on buyer-supplier relationships, we posit a stylized model of a single firm’s decision problem over two periods. In this model, miscommunication and errors, which occur randomly, lead to product defects and trigger recalls. The firm’s decision to affiliate depends on its market size, and is uncorrelated with the probability of a recall. For some parameter values, the model delivers stark predictions: affiliated buyers continue to buy – at the same quantity and for the same expenditure – from their suppliers regardless of whether or not a recall occurs; whereas unaffiliated buyers maintain their purchasing relationships if and only if there is no recall. For other parameter values, the stark result is replaced by a more nuanced one, but for all parameter values, unaffiliated firms are less likely than affiliated firms to continue their relationship with the supplier of a recalled product, relative to their probabilities of continuation absent a recall.

Importantly, the recall announcement is only a symptom of the shock to the buyer-supplier relationship; the shock itself is the realization by the buyer that the product is defective and potentially harmful. The shock arises as a result of internal quality-control checks, consumer complaints, or an official notice that an investigation of the defect by a government agency is underway. It is this shock that can prompt the firm to switch suppliers or invest in improving its communication and quality-control systems.³

We then establish several empirical results. First, compared to control relationships, relationships that experience a recall experience an economically and statistically significant decrease in the probability of trade two years after the recall. Second, this effect is driven by unaffiliated relationships, and is long lasting: the value of trade between the unaffiliated

³Our interest in the shock to *firms*’ information sets distinguishes our paper from papers that analyze the impact of recalls through the lens of *consumer* response. Using the rash of recalls of toys produced in China in 2007, Freedman, Kearney, and Lederman (2012) find that toy sales in the U.S. drop for both manufacturers directly impacted by the recalls as well as manufacturers selling similar toys, which did not experience a recall themselves. Zhong (2018) also finds a negative effect of these recalls on aggregate imports of toys. Candelaria and Hale (2008), however, find that the aggregate effect of these recalls was relatively small. To the best of our knowledge, ours is the first paper to examine the impact of the underlying information shock directly on the relationships between buyers and their foreign suppliers.

buyer and supplier falls by approximately 50% after two years. In contrast, recalls of goods produced by affiliated firms do not, on average, cause a breach in buyer-supplier relationships. Consistent with our model, these findings suggest that intra-firm relationships are less fragile than relationships that cross firm boundaries. Third, the impact of the shock on the trading relationship begins several months before the public recall announcement, consistent with the announcement being a symptom, and not the cause, of the disruption. Finally, U.S. buyers not affiliated with the suppliers of recalled products are more likely to increase their reliance on *other* suppliers to source both the recalled and other products following the recall.

Our findings are consistent with the idea that intangible inputs in the production process, such as managerial oversight, can be communicated more easily within than across firm boundaries (Atalay, Hortaçsu, and Syverson, 2014). This idea can be illustrated by an anecdote. Mattel Inc., one of the world’s largest toy companies and a major importer of toys, was among the firms affected by a spate of toy recalls in 2007. These recalls disproportionately affected toy imports from China that were found to have used lead paint. The company argued that the recalled toys using lead paint were produced by a Chinese subcontractor with which Mattel communicated only through an intermediary, illustrating the potential for breakdown in communication across firm boundaries (Johnson, 2010).

Our paper makes contributions to two strands of literature. First, we contribute to the literature studying the propagation of idiosyncratic shocks in production networks. In a review of the literature on firm-to-firm connections in trade, Bernard and Moxnes (2018) emphasize the importance of understanding how shocks transmit from one firm to another in global supply chains. An emerging body of work analyzes large-scale shocks (such as natural disasters or infrastructure projects) that impact either the buyer or the seller and its propagation within supply chains. Barrot and Sauvagnat (2016), for example, find that a firm’s sales growth falls by 2–3 percentage points when a natural disaster affects a major supplier to that firm. Boehm, Flaaen, and Pandalai-Nayar (forthcoming) use data from the March 2011 Tohoku earthquake that disrupted production in Japan, including that of

Japanese multinational parent firms that supply key inputs to their foreign affiliates, and find that, on average, the firms' U.S. affiliates' output fell by almost the same magnitude as the reduction in imported inputs. Bernard, Moxnes, and Saito (forthcoming) study a positive shock, the 2004 introduction of a high-speed rail line in Japan, and find that it resulted in higher firm performance through the channel of improved matches with new suppliers. Our work differs from these papers on an important dimension: we study the impacts of a relationship-product-specific shock.⁴ Unlike prior studies, the shock due to product recalls do not represent a major long-term disruption to the operation of all suppliers or buyers within a defined geographic area. Hence, we are able to identify *relationship-level* adjustments.

Second, we contribute to the literature examining the value of trading relationships. Basker and Simcoe (2017) show that suppliers are willing to make investments in technology in order to maintain or establish trading relationships. Macchiavello and Morjaria (2015) exploit the 2008 outbreak of ethnic violence in Kenya to find that the older is the relationship between an individual Kenyan rose exporter and the foreign buyer, the more likely is the exporter to ensure delivery. Monarch and Schmidt-Eisenlohr (2017) also find that survival of and value traded within unaffiliated relationships increase as the relationships age. Our finding that affiliated relationships persist despite strain points to potential heterogeneity in the value of buyer-supplier relationships within and across the firm boundary.

The rest of the paper is organized as follows. Section 2 provides background on the recall process. Section 3 presents a stylized model to interpret our empirical setting. Section 4 describes our data sources and our procedure for merging them, identifying recalled shipments and affected relationships, and identifying appropriate control shipments and relationships. We lay out the empirical approach in Section 5 and present our results in Section 6. Section 7 concludes.

⁴We also focus on suppliers of final goods rather than intermediate-input suppliers.