Mistrust and Long-term Impacts of Quality Shock

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Abstract

Taking China's dairy scandal in 2008 as a quasi-natural experiment, this paper shows that the domestic quality scandal pushed consumers to persistently substitute dairy products produced locally by oversea brands deemed as safer substitutes. To identify the scandal's effects on the dairy imports, we use an interacted difference-in-differences model, comparing imports of non-dairy and dairy products, before and after the revelation of the scandal, in varying proximity to dairy firms with contaminated products. We find that the import of dairy products increased by over 90 percent after the disclosure of the scandal and continued to grow in recent years with escalated mistrust of food safety. As imported dairy products are at least 40 percent more expensive than domestic brands, consumers bear welfare losses of 20 to 30 percent of baseline spending on dairy products. These estimates suggest that quality shocks, especially the ones in developing countries, could have a long-lasting effect on consumer product choices and development of local industries due to mistrust to local firms and government agencies.

JEL Classification: F10, F14, L15, L66, O10, O19

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1 Introduction

Quality shocks[1] could cause serious harm to consumers (Alsan and Wanamaker, 2017), tarnish a company's reputation (Bachmann et al., 2022), lead to major revenue and market-share losses (Freedman et al., 2012), and impose negative spillover on other firms selling similar products (Bai et al., 2022). Despite the potentially devastating impact of quality shocks, much less is known about its long-term effects on the relevant market outcomes, particularly on the mistrust of products affected by these incidents. Academic literature in the area has either experimentally investigated consumer reactions to hypothetical product crises (Ahluwalia et al., 2000; Dawar and Pillutla, 2000) or assessed the effects on outcomes measured in the short run (Bachmann et al., 2022; Bricongne et al., 2012). Few studies have considered the long-run impacts of actual quality scandals on consumer product choices and the development of the industries in question.

Moreover, existing studies have so far mainly focused on quality shocks in developed countries. With stringent quality and safety standards and regulations in these markets, quality scandals generally do not trigger systematic mistrusts of the safety of the products involved nor have permanent negative impacts on market outcomes. For example, in spite of the diesel emission scandal in 2015, consumers still highly value Volkswagen according to a survey conducted by Kellogg School of Management at Northwestern University (Hennessy, 2015). Volkswagen's namesake brands have solidly bounced back from the losses with a 5.2 percent rise in market share in the US by 2017. However, many developing economies have weak regulatory institutions with capacity deficits and lack of enforcement. As such, the malfeasance of individual firms could severely damage the group's reputation and cause widespread fear for the safety of the affected products, which in turn dampens overall demand and the growth of relevant industries. Hence, understanding the long-term impacts of quality shocks, especially in developing countries, is important for informing consumer product choices and development policies.

In this paper, we explore the long-run effect of quality shocks in the context of a large-scale scandal that affected the Chinese dairy industry in 2008. This scandal was the largest food scare in China. It involved domestically produced milk and infant formula, along with several other dairy products, being adulterated with the industrial chemical melamine, which could cause kidney stones and other urinary

[1]Quality shocks (or scandals) are discrete, well-publicized incidents wherein products are found to be defective or dangerous (Siomkos and Kurzbard, 1994).

problems in infants. An estimated 300,000 infant victims were identified, among which 54,000 were hospitalized due to kidney damage. Following the outbreak of the scandal, the Chinese government immediately recalled all melamine-laced dairy products and shut down the suppliers of the contaminated dairy products. By the end of 2008, according to an official statement, the incident had been fully addressed and that proper measures had been put in place to ensure the safety of the dairy products on the market.[2] Corroborating the official statement, no illegal additives, such as melamine, have been detected again in dairy products after 2008. Despite the quick resolution of the scandal, in the years following 2008, journalists, social scientists, and medical researchers have repeatedly pointed to this dairy scandal as a contributor to the lack of public trust in domestically produced dairy products, the staggered development of the local dairy industry, and the rising demand of dairy imports after 2008.[3]

Exploiting a variety of administrative and survey data, we show that this quality shock escalated the level of mistrust of food safety and pushed consumers to persistently substitute dairy products produced locally by those imported from OECD countries. To identify the scandal's causal effects on dairy imports, we adopt a difference-in-differences (DID) model to address potential estimation biases. Specifically, we use information on the Harmonized System (HS) product codes and importing firm's location from the Chinese Customs Database (2004-2013) to aggregate import value and quantity to the city-product-year level and use imports of non-dairy products as control group. Using the DID framework, we find that the average value of dairy imports grew by 91.0% after the scandal. The changes are mainly from the increases in import quantity, not in unit prices.

To generate testable estimates beyond those implied by the timing of the scandal in 2008, we use a location-based measure of proximity, geographic distance to the nearest dairy firm with melamine-laced products, as an additional treatment indicator. After the initial disclosure of the scandal, the Chinese government conducted three rounds of quality inspections and identified 51 firms across different cities with traces of melamine in their products[4]. Many studies indicate that individuals tend

[2]https://www.telegraph.co.uk/news/worldnews/3079146/China-claims-tainted-milk-scandal-is-over.html

[3]For example, when several areas in Hong Kong experienced a shortage in milk powder in early 2015, a number of observers conjectured that the 2008 dairy scandal had terrified Chinese parents who began mass buying milk powder from overseas, contributing to the shortages in Hong Kong (citation). Meanwhile, several recent survey studies show that consumer trust in domestically produced milk is still strongly negatively affected by the melamine scandal, even though it occurred more than 10 years ago (citation). In sum, the 2008 Chinese dairy scandal is an often-cited reason Chinese consumers remain wary of the safety of domestic dairy products and increase the demand for foreign alternatives.

[4]We conducted an extensive news search through LexisNexis to cross-validate the official inspection reports. See

to be more affected by an incident or scandal if they live in closer proximity to the incident site (Alsan and Wanamaker, 2017; Ang, 2021; Singer et al., 2006; Tabellini, 2008). Alternatively, people in closer geographic proximity may perceive themselves at higher risks of intaking contaminated dairy products and thus consequently purchase more imported dairy products as safer substitutes.

Following the literature, we merge the firm inspection data with the city-year-product level customs data (2003-2013) and test these hypotheses using an interacted DID framework that compare imports of non-dairy and dairy products, before and after the revelation of the scandal, for cities in varying proximity to dairy firms with melamine-adulterated products. Whenever feasible, we condition on a rich set of control variables such as a set of city characteristics as well as interactive city-year and industry-year fixed effects to control for time-invariant factors that influence outcomes in a given locale and for confounders that might have differently affected imports in each year. Our estimates imply that a one-standard deviation increase in geographic proximity to contaminated firms increases dairy impacts by 91.0% interactions per year

Next, we examine the long-term causal impact of the scandal on imports of dairy products using data on bilateral trade flows from the BACI-CEPII database for the period 2003-2020. As the finest level of geography observable in the CEPII database is a product's destination country, we aggregate import value and quantity to the product-year level and use the baseline DD design for analysis. We find that, from 2008 to 2020, the value of dairy imports increased by 156.2 percent relative to non-dairy imports, confirming the long-run, cumulative impacts of the scandal on the increase in imports of dairy products. In line with the short-run impacts, the changes are mostly from the increases in import quantity, not in unit prices.

We also conduct a back-of-the-envelope calculation to quantify the induced welfare changes we estimate above. We show that imported dairy products mostly come from OECD countries and are at least 40 percent more expensive than domestic brands, consumers bear welfare losses of 20 to 30 percent of baseline spending on dairy products.

We pursue a number of strategies to provide evidence that the effects we measure are indeed causal. First, coefficient estimates based on geographic proximity to contaminated dairy firms are not statistically significant in placebo tests that assume the scandal had been introduced 1, 2, 3 or 4 years earlier. Second, we employ an event study approach and show that the set of pre-2008 coefficients by geo-

Section 3 for more details.

graphic proximity are small in magnitude and statistically indistinguishable from zero, confirming that we are not capturing a generic, location-based growth trajectories in dairy imports. Third, we conduct the randomization inference procedure as suggested by Bertrand et al. (2004). We randomly assign the treatment status of imported products and estimate the interacted DID specification as placebo treatment effect. This procedure is repeated 1000 times to form a distribution of placebo treatment effects. The point estimates obtained in the main regressions are significant when compared to the distribution of placebo effects, corroborating the validity of the interacted DID approach. Fourth, our main results are robust after controlling the possible influences of other contemporaneous historical events, such as the global financial crisis in 2008, fertility policies, tariff rates, and domestic and global dairy outputs.

Finally, we investigate the potential mechanisms underlying the above longer-term effects of the scandal on dairy imports. Since consumers make purchase decisions based on their beliefs and perceptions of the products, we evaluate (1) whether the surge in dairy imports after the scandal is driven by escalated mistrust of local dairy brands (2) how information accuracy in media reports mediates the effects of the scandal. Specifically, we use survey data from the 2005, 2007, and 2013 waves of the Chinese General Social Survey (CGSS) on consumer confidence in food safety. When we interact post-scandal indicator with a measure of the distance of an individual from firms with melamine-laced dairy products, we find the same geographic gradient apparent in our results of imports of dairy products. This geographic gradient in mistrust is not present or opposite-signed in the respondents' answers to other mistrust questions such as their confidence in property, personal, traffic, and medical safety. Thus the effects we measure are specific to mistrust of food safety and to geographic proximity to dairy firms with melamine-laced products, not to a post-2008 condition affecting the level of mistrust overall. Besides, to study the role of information accuracy in media reports, we construct measures of consumers' knowledge of the scandal across different provinces in mainland China, using the number of household with an internet connection as well as search engine trend indices (Google and Baidu) for phrases that reflect a more accurate depiction of the scandal. We find that the increase in imports of dairy products are smaller in provinces where people appear to have better information about the parties directly involved in the scandal, reflected in more targeted internet search behavior.

Our findings contribute to the literature measuring the effects of mistrust on economic development and institutional outcomes. A number of studies demonstrate the impacts of mistrust on income

levels (Algan and Cahuc, 2010; Butler et al., 2016; **?**), government regulation (Aghion et al., 2010), financial behavior (Guiso et al., 2004), international trade and FDI (Guiso et al., 2009), labor market outcomes (Algan and Cahuc, 2009), political turnover (Nunn et al., 2018), and health behavior (Alsan and Wanamaker, 2017; Martinez-Bravo and Stegmann, 2017). Exploiting China's dairy scandal in 2008 as a quasi-natural experiment, we show that quality shocks, especially the ones in developing countries with weak regulatory institutions, could cause systematic mistrust and have a long-lasting effect on consumer product choices and development of local industries. Besides, recent works demonstrate that historical negative experiences could lead to lower levels of trust and a decrease in the demand for the affected goods and services (Alsan and Wanamaker, 2017; Martinez-Bravo and Stegmann, 2017; Lowes and Montero, 2021). For instance, xxx. In this project, we present evidence that, besides being an important demand constraint, mistrust generated by historical experiences could trigger an eventual switch to alternatives deemed safer.

Our paper also complements the literature on quality scandals and product recalls. Existing studies have either relied on laboratory experiments to examine consumer reactions to hypothetical product scandals (Ahluwalia et al., 2000; Dawar and Pillutla, 2000) or focused primarily on the effects on outcomes measured in the short run (Bachmann et al., 2022; Bricongne et al., 2012). Moreover, most works in the area have so far mainly focused on quality shocks in developed countries where, with strict quality standards and regulations, quality scandals generally do not have persistent negative impacts on market outcomes (Bai et al., 2022; Bachmann et al., 2022; Freedman et al., 2012). Using data covering a 13-year post-scandal period, this paper shows that quality shocks, especially the ones in developing countries with weak regulatory institutions, could have a long-lasting effect on consumer product choices and welfare implications.

The results of this paper also add to the literature on collective reputation. Empirical studies on this subject remain scarce and mainly have focused on the export performance of firms suffering from negative reputation spillovers (Bai, 2018; Zhao, 2018). For instance, Bai et al. (2022) document a large negative impact of the milk scandal on the export performance of the entire dairy sector in China. Bachmann et al. (2022) find large spillover effects a year after the Volkswagen scandal on US sales of other German cars. Exploiting a large-scale scandal that affected the Chinese dairy industry in 2008 as a natural experiment, this paper provides evidence on how quality scandals of domestic dairy firms trigger an overall increase in imports of dairy products. To the best of our knowledge, our study is

the first one to examine how tarnished group reputation of domestic producers push consumers to foreign brands of involved goods, especially the persistence of collective reputation damage. More work is called for to compare developing and developed countries as well as different market settings.

Our findings also contribute to the literature on firm reputation and quality provision in markets with information frictions (Banerjee and Duflo, 2000; Jin and Leslie, 2009; Macchiavello, 2010; Cabral and Hortacsu, 2010; Björkman-Nyqvist et al., 2013; Bardhan et al., 2013). Fewer studies have considered the effects of information frictions on international trade (Allen, 2014; Macchiavello and Morjaria, 2015; Startz, 2016; Atkin and Khandelwal, 2020). We expand on these two bodies of research by examining the role of group reputation in import figures. Our results demonstrate that stained collective reputation shifts demand away from domestic goods and hurt economic growth, especially in developing countries where local products are often considered as low in quality compared to imported ones.

The remainder of this study proceeds as follows. First, we provides background information on the 2008 scandal in section 2. Then, in Sections 3, we detail the data used. Next, in Section 4, we present our empirical strategy and main findings with the increase in total imports of dairy products driven by the scandal. Then, in Section 4.3, we consider how the magnitude of exposure to the scandal predicts the increase in imports. Section 6 examines how information accuracy mediates the effects of the scandal on the surge in dairy imports. Section 7 concludes.

2 Background

The 2008 Chinese milk scandal was the largest food scare in China. This scandal stemmed from malpractices of many upstream milk producers where milk was adulterated with the industrial chemical melamine. Melamine, commonly used in the manufacture of plastics, can cause kidney stones and other urinary problems in infants. The chemical was used to increase the nitrogen content of diluted milk, giving it the appearance of higher protein content in order to pass quality control testing. In this scandal, 300,000 affected children were identified with kidney stones and other kidney complications, among which 54,000 were hospitalized. The deaths of six babies were officially concluded to be related to the melamine-laced milk and infant formula.

The Sanlu Group, one of the largest dairy producers in China, was identified as the chief cul-

prit. But as the adulteration came from upstream milk producers, many more Chinese dairy firms became implicated. Meanwhile, besides infant formula, traces of melamine were found in numerous other dairy and dairy-related products, including milk, yogurt, cheese, baby food, and cake. Following the outbreak of the scandal, the Chinese government immediately pulled the melamine-laced dairy products from supermarket shelves and quickly shut down the suppliers of the contaminated dairy products. 700 tons of milk powder were recalled nationwide. In December 2008, the Chinese government issued an official statement that the incident had been fully addressed and that proper protocols had been put in place to ensure the safety of the dairy products on the market.

This scandal has several features that facilitate our empirical analysis. First, the milk contamination scandal occurred unexpectedly. Similar to other unexpected incidents or events, such as the 2007 toy recalls in the US (Freedman et al., 2012), consumers did not self-select to be in the scandal. Hence, this scandal serves as an excellent natural experiment to study how tarnished group reputation of domestic producers push consumers to substitute imported goods, especially in the long-term.

Second, this large-scale incident triggered nationwide fears over safety of dairy product. Despite the statement by the central government in December 2008, distrusting consumers cut back on consumption of dairy products. As shown in Figure 1, [add information about dairy consumption trends before 2008]. However, after the disclosure of the scandal, the average intake of dairy products decreased from 8.38 kilogram (18.47 pounds) in 2007 to 7.13 kilogram (15.71 pounds) in 2013. At the same time, China's dairy imports skyrocketed from 0.29 kilogram (0.64 pounds) per capita in 2007 to 1.32 kilogram (2.91 pounds) per capita in 2013. Over 99% of the imported dairy products come from OECD countries (Figure A6). This disparity in the growth rates of total dairy consumption and dairy imports allows us to capture the displacement of domestic dairy products by dairy imports.

Third, there is a wide geographical variation in the firms with melamine-laced products. As we will explain in greater detail in data section, some cities, such as Shanghai and Beijing, have dairy producers selling products containing melamine while some other cities, such as Heze and Shangqiu, report no firms with melamine-adulterated dairy products. These spatial disparities motivate certain choices in our empirical exercise. Specifically, employing geographic distance to the nearest dairy firm with melamine-laced products as a location-based proximity measure of treatment, we examine how the magnitude of potential exposure to the scandal predicts the increase in imports of dairy products across cities.

Figure 1: Event Study Graph: China's Dairy Consumption and Imports

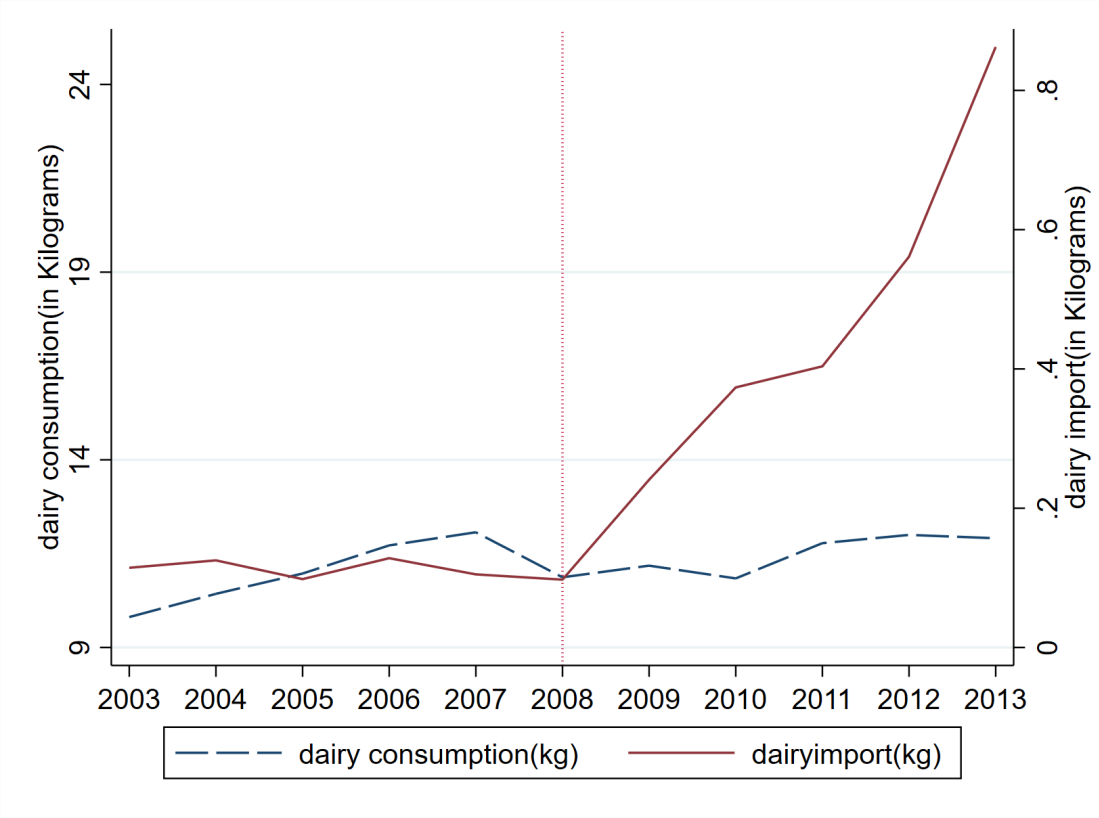

Figure 1 plots the per capita consumption and import of dairy products in China from 2003 to 2013. The vertical dotted line indicates 2008, the year before the scandal.

3 Data

In this section, we present the main features of the data sets used in this study. This paper first documents the short-run increase in imports of dairy products as a result of the disclosure of the scandal using the Chinese Customs Database (2003-2013), which was provided to us by the General Administration of Customs of China. It covers trade flows for the universe of China's exports and imports from January 1, 2003 to December 31, 2013. We focus on imports for this study. Each import transaction includes information on the importing firm's name, location, import value, import quantity, the HS eight-digit product code, the month and year of import, and the port in China from which the product is received. We compute unit prices for imported products by dividing the import value by the import quantity and aggregate the data to the HS six-digit city-product-year-level [5] for our main DID analysis[6].

We define the dairy products using the HS six-digit product codes[7]. Most dairy products fall under the HS two-digit code 04 with infant dairy products fall under 19 and milk protein products extracted from raw milk fall under 35. Table B1 in Appendix provides the full list of the HS six-digit codes and descriptions for dairy products.

To bolster a causal interpretation for our results, we also merge the city-product-year-level customs data with the list of inspections conducted by the Chinese government to examine imports of non-dairy and dairy products, before and after the revelation of the scandal, in varying proximity to dairy firms with melamine-laced products[8]. As discussed in the background section, the adulteration originated from upstream milk producers and caused contamination in a wide range of dairy products.

[5] As the Harmonized System is updated periodically, There are considerate variations in HS eight-digit codes, especially the last two digits, across different years. Thus, we could not directly link the same products imported in different years using the HS product codes. To overcome this coding discrepancy issue, we first aggregate the data to the HS six-digit product-year level and then match the HS six-digit product codes in each year to the 1996 version. We then collapse the import data to the year level to account for monthly seasonality in imports. Finally, to increase the statistical power and better capture the causal impacts of the scandal, we further aggregate the data to the city level based on the importing firm's location and use the city-product-year-level data in our main empirical analysis.

[6] Imported dairy products only include intermediate and consumption goods, not capital goods. For a better comparative analysis of dairy and non-dairy products, we match the HS six-digit product codes with the Broad Economic Categories (BEC), a three-digit classification developed by the United Nations Statistics Division to group goods according to their main end use, and keep only intermediate and consumption goods in the customs data.

[7] We define the dairy products using the unified HS 1996 six-digit product codes as detailed in footnote 2

[8] We know the exact location of the firms and aggregate the firm inspection date to the city level and merge with the city-product-year-level customs data using the names of the cities (this sentence needs revision). Using the merged data, we assess whether cities in closer geographic proximity to contaminated firms experience larger increases in dairy imports relative to non-dairy imports.

To better track contaminated products, the Chinese government conducted three rounds of melamine inspections following the revelation of the scandal. The first round targeted firms producing infant formula. Out of 109 firms inspected, 22 were found to have traces of melamine in their products. The second round targeted producers of milk powder. There were 290 milk powder producers nationwide in China in 2008. 154 producers (together making up over 70% of the market share) were randomly sampled and inspected. 20 were found to have tainted dairy products. The third round targeted producers of liquid milk. The government inspected 466 established dairy brands with large market shares of liquid milk and found that 9 plants of 3 major brands had traces of melamine in their products. Overall all, the second and third rounds of inspections covered most dairy producers in China. Table B2 in Appendix B lists the number of firms across cities that were found to have contaminated dairy products in the three rounds of government inspections.

Figure 2: Spatial Distribution of Polluted Companies

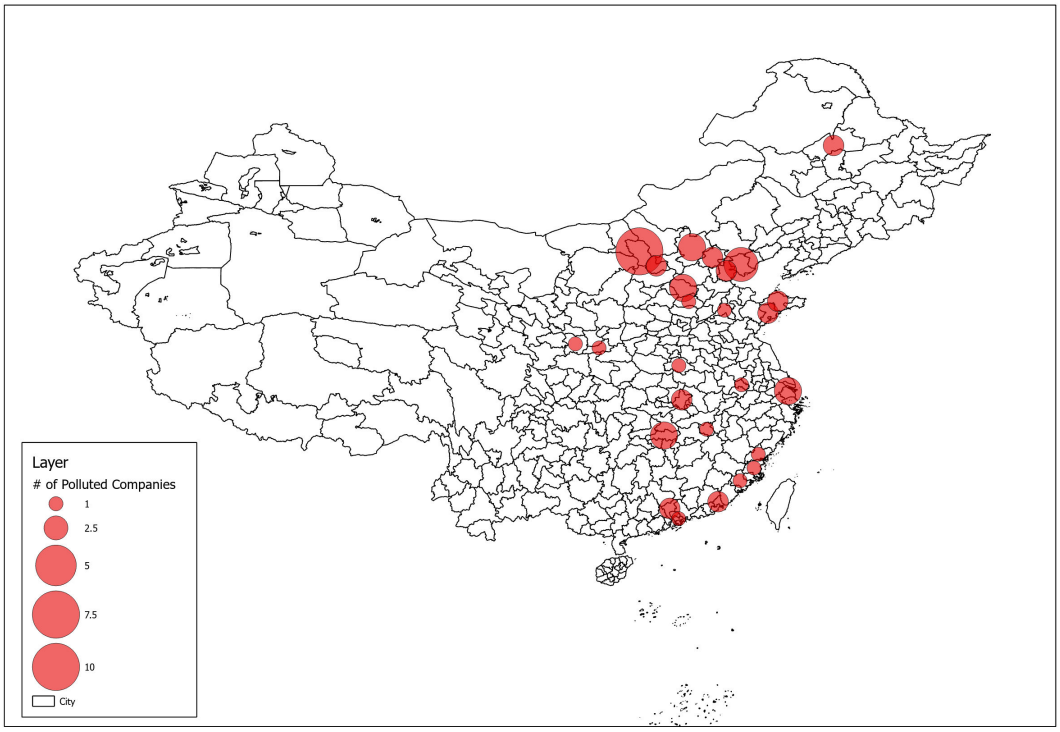

Figure 2 plots the distribution of contaminated companies.

For each round, the government released the list of products inspected at each firm and the inspection results. We obtained the inspection lists (at the firm-product level) from the GAQSIQ website. To

cross-validate the information in the official reports, we conducted an extensive news search through LexisNexis: all the media-reported cases of contamination that we found appeared in the official inspection lists.

We then use the BACI-CEPII International Trade Database (2003-2020), which covers bilateral trade flows of more than 200 countries from 2003 to 2020, to estimate the long-run effect of the scandal on imports of dairy products. We focus on imports to mainland China for this analysis. Each import transaction includes import value, import quantity, the HS 1996 six-digit product code[9], and the month and year of import. We compute unit prices for imported products by dividing the import value by the import quantity and aggregate the data to the product-year level for our long-run analysis in section 5.[10]

Figure 3 displays the annual values and quantities of imported dairy and non-dairy products from 2003 to 2013 in the Chinese Customs Database (panel A) and from 2003 to 2020 in the BACI-CEPII database (panel B). We focus first on panel A. During the pre-scandal period (2003-2007), the average values of dairy and non-dairy imports followed similar growth trends. Likewise, the annual quantities of imported dairy and non-dairy products show no heterogeneous preexisting time trends from 2003 to 2007. These parallel pre-trends motivate our choice of DID model as main empirical specification. After the revelation of the scandal, the value of dairy imports increased more than fourfold from 2008 to 2013 while the value of imported non-dairy products less than doubled over the same period. Correspondingly, the annual quantity of dairy imports increased more than 300 percent from 2008 to 2013 while the annual quantity of imported non-dairy products increased only 50 percent over the the same period. This divergence in the growth rates of dairy and non-dairy imports is consistent with displacement of domestic dairy products by the avalanche of dairy imports.

Table 1 presents product-level summary statistics in the aggregated customs data for dairy (panel A) and nondairy (panel B) products. Column 1 reports the average value and quantity of imported goods in the baseline period (2000–2007). Standard errors are included in the parentheses. Column 2 displays the average value and quantity of imported goods after the outbreak of the scandal (2008–20013). Column 3 calculates the difference in means between the pre- and post-scandal pe-

[9]The BACI database offers HS classification at the 1996 version. Thus we could directly link the same products imported in different years and define the dairy products using the HS 1996 six-digit product codes.

[10]As the finest level of geography observable in the BACI database is a product's destination country, we aggregate import value and quantity to the product-year level and use the baseline DD design for analysis.

riods (columns 1 and 2). In line with Figure 3, the mean value of imported dairy products is $14.5 million in the post-scandal period and systematically different from the mean value of dairy imports, $3.43 million, before the scandal. In contrast, the mean value of imported non-dairy products is $14.71 million in the post-scandal period and not systematically different from the mean value of non-dairy imports, $7.44 million, before the scandal.

Table 1: Summary Statistics: Dairy and Non-dairy Products

Dairy			
Variables	(1) Mean (2003-2007)	(2) Mean (2008-2013)	(3) Diff
Value(in Million Dollars)	31.0 (4.802)	167.0 (48.424)	136.0** (53.710)
Quantity(in Million KG)	15.9 (0.456)	42.8 (8.267)	26.9** (9.148)
YOY Value(%)	0.243 (0.0575)	0.420 (0.0770)	0.177 (0.106)
YOY Quantity(%)	0.0170 (0.0578)	0.315 (0.0980)	0.296** (0.131)
Non-dairy			
Variables	(1) Mean (2003-2007)	(2) Mean (2008-2013)	(3) Diff
Value(in Million Dollars)	113.7 (12.102)	240.1 (54.880)	126.4* (61.648)
Quantity(in Million KG)	218.4 (27.873)	327.2 (114.554)	108.8 (129.119)
YOY Value(%)	0.164 (0.0939)	0.2262 (0.165)	0.0980 (0.220)
YOY Quantity(%)	-0.00100 (0.180)	0.549 (0.449)	0.550 (0.579)

The sample is obtained from the customs database to identify dairy and non-dairy products. Panel A only includes dairy products, while panel B includes nondairy products. The unit of observation is collapsed to the product (HS six-digit) level. Columns 1 and 2 show the mean of selected variables in each subsample. The value variable represents the average import value, measured in millions of dollars; The quantity is the import quantity, in millions of tons; YOY value represents the year to year change in the average value of imported goods; The YOY quantity represents the change rate of the average import quantity. Columns 1-3 show the annual average value of relevant variables in 2003-2007, the annual average value of relevant variables in 2008-2013, and the difference in means between the pre- and post-scandal periods (columns 1 and 2)., respectively. Standard error are in parenthesis.

4 Empirical Strategy and Main Results

This section assesses the impact of the scandal on the increase in total imports of dairy products. Section 4.1 introduces our main empirical specification, a difference-in-differences (DID) model, as

Figure 3: Comparison of import trends between dairy and non-dairy products

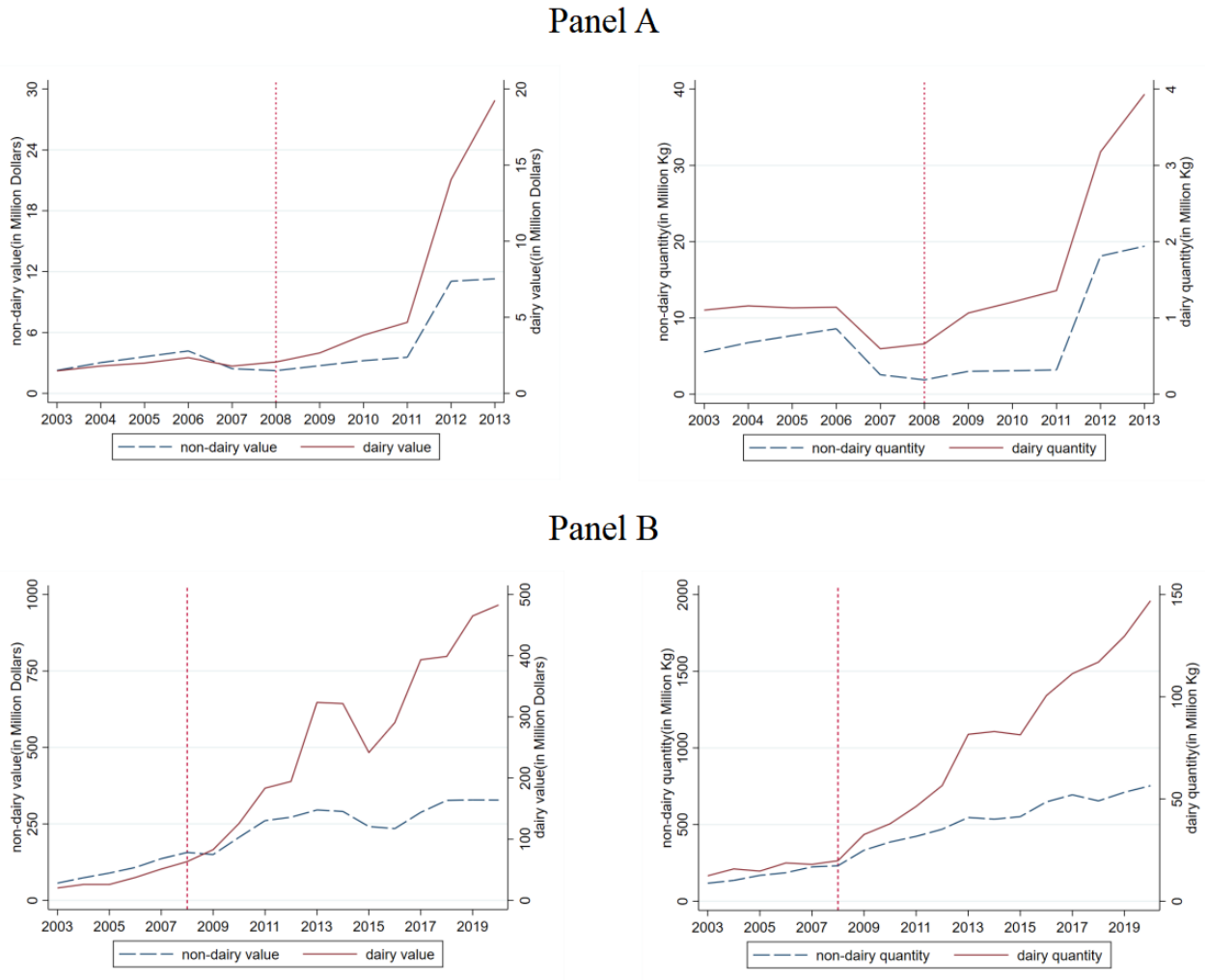

Figure 3 plots the import value of dairy and non dairy products in millions of US dollars, as well as the export quantity of dairy and non-dairy products in millions of kilograms. The vertical dashed line represents 2007, which is the year before the scandal occurred. Panel A is a sample from the customs database from 2003 to 2013, Panel B is a sample from the BACI-CEPII database from 2003 to 2020.

well as additional tests we perform that confirm the validity of our DID strategy. Section 4.2 presents the main results of the DID model using the customs data. We find that the average value of dairy imports grew by 91.0% in the next five years following the scandal. In decomposing the impacts of the scandal, we estimate that changes mainly came from the increases in import quantity, not in unit prices. Then, in Section 4.3 and Section 4.4, we consider how the magnitude of exposure to the scandal predicts the increase in imports using an interacted DID model. In section 4.5 and 4.6, we test the robustness of the DID estimation results.

4.1 Difference-in-Differences Specification

Equation 1 below presents our baseline DID model, which compares the value of dairy imports with the value of imports of other HS six-digit-level products before and after 2008, the year of the scandal:

$$\begin{aligned} ln(Value_{ijt}) =& \theta_0 + \theta_d(Dairy_i * Post_t) + \ Z_{jt} + \ X_{kt} + \gamma_i \\ &+ \mu_j + \delta_t + \epsilon_{ijt}, \end{aligned} \tag{1}$$

$ln(Value_{ijt})$ is the natural logarithm of the value of imports for product i in province j and year t; $Dairy_i$ is an indicator for dairy products; $Post_t$ is the post-scandal indicator; Z_{jt} represents the linear time trend of region j and year t; X_{kt} represents the linear time trend of industry k and year t; and γ_i, μ_j, and δ_t are product, province, and year fixed effects, respectively. We cluster standard errors two ways at the product (HS six-digit) and province-year level, allowing for arbitrary correlation in error terms over time for a given product and across products for a given province-year. This two-way clustering allows for persistent shocks over time within the import of the same product as well as for cross-sectional yearly shocks affecting the imports of all products to the same province.

The key assumption in DID estimation is a common-trends assumption: imports of dairy products would have followed the same time trend as imports of non-dairy products without the dairy scandal in 2008. While the counterfactual is certainly unobservable, we perform a series of robustness tests to support the common-trends assumption. First, in table B6 in Appendix B, we construct "placebo" measures and assume that the scandal had been introduced 1, 2, 3 or 4 years earlier. We then replicate the main regressions and find no effect of the scandal in the placebo settings, which indicates that imports of dairy- and non-dairy industries were parallel before the scandal and confirms the validity

of our DID approach. Second, in section 4.6, our estimates are robust to various empirical specifications that relax the classical DID assumption and allow differential growth trajectories for different products, addressing concerns that imports of different products may have different growth paths or that the scandal affected imports of different products differently (Gobillon and Magnac, 2016). Third, there may be some concern that our estimates are confounded by other concurrent policies and factors. To guard against this possibility, in section 4.5, we examine the possible influences of contemporaneous historical events, such as the global financial crisis in 2008, fertility policies, tariff rates, and domestic and global dairy outputs. The estimated coefficients on the scandal remain highly similar after considering the impacts of these factors. Fourth, to further control the effects of confounders changing over time, we use a synthetic control method to construct weighted combination of non-dairy products as control groups in appendix C (Abadie et al., 2010). The estimates produced with these synthesized controls are similar to those produced in our main specifications, lending further credence to the DID strategy.

4.2 Results: Difference-in-Differences

Table 2 presents estimates of the increase in total imports of dairy products driven by the scandal, using different control variables in each DID specification. The baseline specification in column 1 controls for city, year, and product fixed effects and shows an increase of 100.1% in the value of dairy imports after the scandal[11].As provincial factors such as median household income may affect imports, column 2 includes provincial GDP per capita and population as control variables besides province, year, and product fixed effects. The addition of these provincial characteristics has little impact on the estimated effect of the scandal. To address possible biases from time-varying provincial and product level variables, Columns 3 and 4 build on the specification in column 1 by adding province-year and industry-year fixed effects. Though smaller in magnitude, the effect of the scandal remain statistically and economically significant in our preferred specification in column 4: the value of dairy imports increased by 91.0% following the scandal.

After estimating the overall impact of the scandal on dairy imports, we decompose the effect of the scandal by estimating equation (1) on the natural logarithm of import quantity and, separately, on the

[11]Because most of the coefficients we estimates are large in magnitude, in what follows we compute elasticities using the mathematical formula: Elasticity = (e^{Coeff} - 1) /100, where Coeff is the estimated coefficient reported in the tables.

Table 2: Impact of the Scandal on the Overall Import of Dairy Products

	(1) log(Value)	(2) log(Value)	(3) log(Value)	(4) log(Value)
Post*Dairy	0.738***	0.764***	0.717***	0.647***
	(0.153)	(0.157)	(0.153)	(0.150)
Log(GDP)		-0.0530		
		(0.0972)		
Log(population)		0.0768		
		(0.146)		
R-squared	0.457	0.464	0.469	0.470
City	YES	YES	YES	YES
Year	YES	YES	YES	YES
Product	YES	YES	YES	YES
City-year			YES	YES
Industry-yea				YES
Observations	1,888,064	1,768,951	1,888,011	1,888,011

This table shows the regression results for Equation (1). The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The dependent variable is log annual import value for each product at the city level. The Post*Dairy is the interaction term of dairy products and post-scandal indicator (2008-2013). The baseline specification in Column 1 includes only year, city and product fixed effects. Column 3 and 4 build on this specification by adding city-year and industry-year fixed effects. Column 2 adds control variables at the city level on the basis of column 1, including log GDP and log population. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

natural logarithm of unit prices of imported products, using the preferred specification in column 4 of Table 2. The estimates are reported in Table 3. Column 1 replicates the regression in column 4 of table 2 as benchmark estimates. Column 2 examines the effects of the scandal on import quantity and finds similar results. Comparing the estimates of β_d in columns 1 and 2,we see that the increase in import value of dairy products mainly comes from the increase in quantity, after controlling for province, year, product, province-year, and product-year fixed effects.Column 3 examines the effects of the scandal on unit prices of imported dairy products. The coefficient of β_d is only -0.000954 and not statistically significant. While increased demand usually drives prices higher, one possible explanation for this zero or negligible effect on unit prices of imported dairy products is that dairy imports to China accounts for only a small fraction of the global dairy outputs. As such, the observed surge in the imported dairy products did not result in a significant increase in unit prices. Our evidence supports this explanation. According to Jin et al. (2019), in 2013 the average Chinese consumed 8.36kg (18.43 pound) of dairy products per year, which was less than one-fourth of the global average. Overall, these results indicate that the effect of the scandal on dairy imports comes almost entirely from the increase in quantity, not unit prices.

Table 3: Decomposition of the Impacts of the Scandal on Dairy Imports

	(1) log(Value)	(2) log(Quantity)	(3) log(Price)
Post*Dairy	0.647***	0.648***	-0.000954
	(0.150)	(0.174)	(0.0413)
R-squared	0.470	0.554	0.623
City	YES	YES	YES
Year	YES	YES	YES
Product	YES	YES	YES
City-year	YES	YES	YES
Industry-year	YES	YES	YES
Observations	1,888,011	1,888,011	1,888,011

This table shows the decomposition of the impact of the scandal on dairy imports using regression results for equation (1). The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1, 2 and 3 are the natural logarithm of import value, the natural logarithm of import quantity, and the natural logarithm of unit prices of imported products at the city level, respectively. The Post*Dairy is the interaction term of dairy products and post-scandal indicator. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Motivated by the findings in the previous section, we examine how persistent the effect of the scandal on dairy imports by interacting the product dummies in equation (1) with year dummies. Figure 4 plots the regression coefficients with 95% confidence intervals for three outcome variables: log value of imports, log quantity of imports, and log unit price of imports. Consistent with our results in Table 2 and Table 3, Figure 4 highlights a systematic and persistent increase in log value of imports and log quantity of imports after 2008, the year of the scandal. One important takeaway from Figure 4 is that the coefficients gradually increase from 2008 to 2013. This suggests that the effects of the scandal, while immediate, is accumulative in nature. The estimates of the scandal on log unit price, on the other hand, are small in magnitude and statistically insignificant. The relatively flat line on the left end of each graph (i.e., before 2008) also provides evidence for the parallel-trends assumption, supporting the validity of the DID strategy.

4.2.1 Heterogeneity

After estimating the overall impact of the scandal on dairy imports, we examine the heterogeneity of effects across different subgroups using the preferred specification in column 4 of Table 2. Table B4 presents the estimates of two separate regressions for consumption goods and intermediate goods. We find much larger effects of the scandal on consumption goods. Using shares of foreign capital as an proximity measure of connection to foreign dairy suppliers, Table B5 reports the results separately for

Figure 4: Effects Over Time: Import Value, Quantity, and Unit Prices

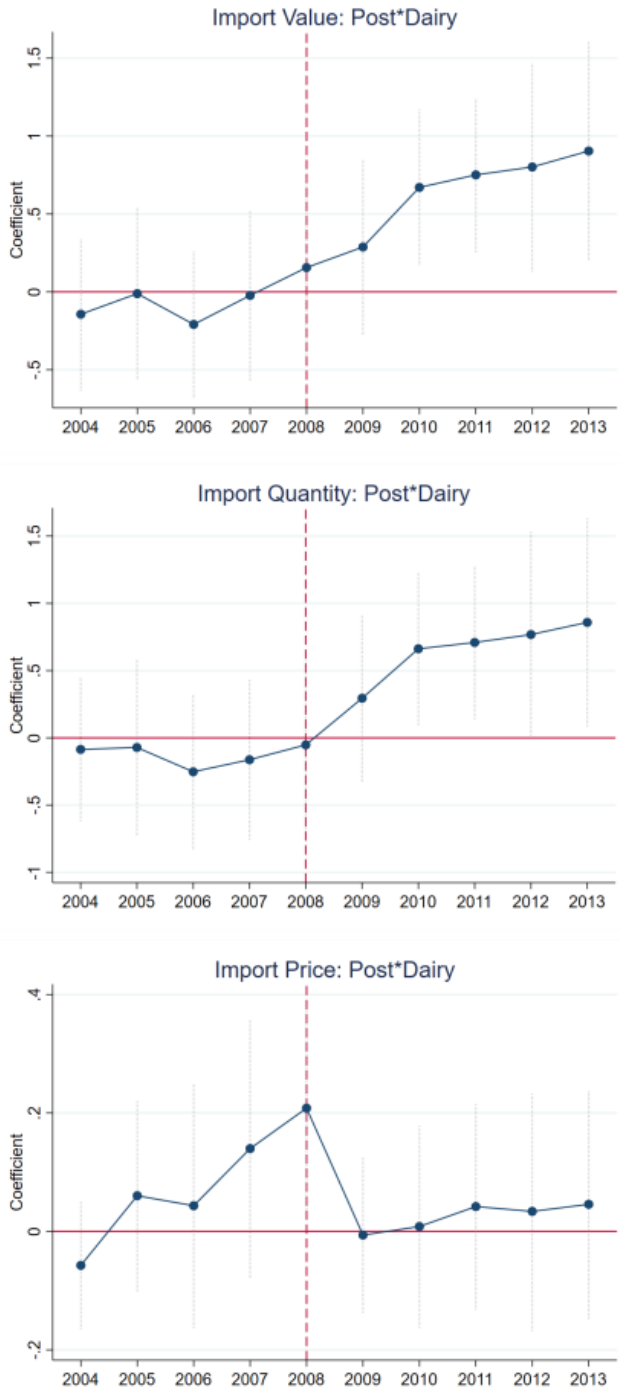

Figure 4 plots the regression coefficients of the dependent variables interacted with year dummies. All regressions include year, city, product, industry-year, and city-year fixed effects. The dotted lines plot the 95% confidence intervals, based on two-way clustered standard errors at the the product and province-year level.

firms with or without foreign capital. The effects are larger for firms with foreign capital.

4.3 Interacted Difference-in-Differences Estimates

Besides the overall impact of the scandal on dairy imports, we exploit variation in exposure to the scandal and employ linear geographic proximity to the nearest firms with tainted dairy products as an additional treatment indicator. This continuous proximity metric creates concentric circles of equal proximity to contaminated firms. In essence, we compare changes in imports of dairy products relative to nondairy products over time among cities that are close to contaminated firms to cities that are farther away. The plausibility of this strategy is boosted by two factors. First, geography may capture an identification or empathy response as discussed in the introduction. Second, this proximity metric may also reflect information contained in the signal if, for example, individuals at greater geographic distances believe that they are at lower risk of intaking contaminated dairy products.

In Figure 5, we plot the value of these coefficients by bin, as well as a (thin, dashed) line of best fit. Cities in close proximity to dairy firms with contaminated products saw an increase in relative log value and quantity of imports, and the effect declines with distance.

The geographic gradients documented in Figure 5 motivate a DID estimator which interacts differences over time and products with a continuous measure of proximity to the nearest firms with tainted dairy products. We denote this proximity measure P_s where s represents measurement at the city level. To facilitate interpretation of regression coefficients, geographic distance is transformed to proximity to contaminated dairy firms, in thousands of kilometers. The relevant estimating equation is as follows:

$$\begin{aligned} ln(Value_{ijt}) =& \theta_0 + \theta_{d1}(P_S * Dairy_i * Post_t) + \ Z_{jt} + \ X_{kt} + \gamma_i \\ &+ \mu_j + \delta_t + \epsilon_{ijt}, \end{aligned} \tag{2}$$

$ln(Value_{ijt})$ is the natural logarithm of the value of imports for product i in city j and year t; $Dairy_i$ is an indicator for dairy products; $Post_t$ is the post-scandal indicator; Z_{jt} represents the linear time trend of region j and year t; X_{kt} represents the linear time trend of industry k and year t; and γ_i, μ_j, and δ_t are product, city, and year fixed effects, respectively. We again cluster standard errors two ways at the product (HS six-digit) and city-year level, allowing for arbitrary correlation in error

Figure 5: Difference-in-Differences Coefficients and Geographic Gradients for Dairy Import

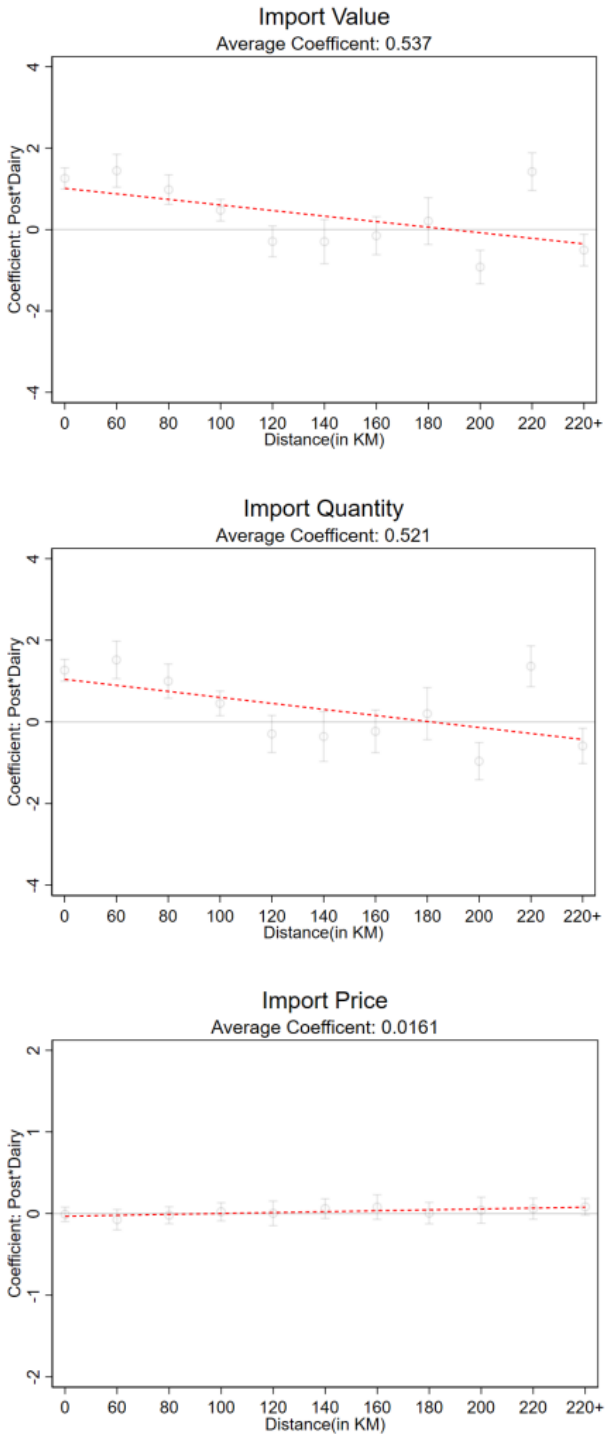

Figure 5 plots the level of dairy import under different distance gradients.

terms over time for a given product and across products for a given city-year.

The estimate of θ_{d1} coming from equation (2) reflects the effect of the scandal provided there are no other systematic shocks that affected imports of dairy products correlated with proximity to contaminated firms, but not due to the timing of the revelation of the scandal. By conditioning on the fixed effects and covariates described above, these estimates flexibly control for time-invariant geographic confounders as well as time-varying threats to identification such as rising consumer income that fuel more imports of all goods produced abroad for a lifestyle upgrade.

We present our interacted DID estimation results in section 4.4 and discuss their interpretations.

4.4 Main Estimates

Table 4 reports the main estimates from equation (2), using the same set of preferred year, city, product, city-year, product-year, and city-product fixed effects as in table 3. Column 1 examines the effects of the scandal on the log value of imported dairy products. In line with our hypotheses, cities experienced significant increases in dairy imports relative to nondairy imports in the years following 2008 as a function of their proximity to dairy firms with melamine-adulterated products. Specifically, a one standard deviation increase in proximity was associated with a 13.1 percentage point increase in the value of dairy imports. Column 2 examines the effects of the scandal on the log quantity of dairy imports and finds similar results. Comparing the estimates of β_{d1} in columns 1 and 2, the increase in quantity explains 97.2% of the increase in the value of dairy imports, consistent with evidence of the decomposition of the effect of the scandal in Table 3. Column 3 reports the effects of the scandal on unit prices of imported dairy products. In accordance with our results in Table 4, the value of coefficient β_{d1} is only 0.018 and statistically insignificant.

4.5 Robustness Tests

This section discusses several confounding factors that may also generate the increase of dairy imports after 2008 and presents additional robustness tests to confirm the validity of our interacted DID approach.

Non-dairy Food Products. As the largest food scare in China, this nationwide scandal may trigger increases in imports of nondairy food as well if frustrated consumers develop fears over safety of

Table 4: Differences in the Impact of Scandals

	(1) log(Value)	(2) log(Quantity)	(3) log(Value)
Post*Dairy*Firm	0.647***	0.629***	0.0180
	(0.156)	(0.181)	(0.0426)
City	YES	YES	YES
Year	YES	YES	YES
Product	YES	YES	YES
City-year	YES	YES	YES
Industry-year	YES	YES	YES
R-squared	0.475	0.556	0.625
Observations	1,792,122	1,792,122	1,792,122

In this table, we examined the regional spillover of the spread of scandal. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-3 at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1, 2 and 3 are the natural logarithm of import value, the natural logarithm of import quantity, and the natural logarithm of unit prices of imported products at the city level, respectively. The Post*Dairy*Firm is the interaction terms of Post*Dairy and weight of distance to contaminated dairy companies. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

domestic food products in general. If so, our main estimates may represent attenuated behavioral responses. To address this concern, we estimate our baseline specification after excluding non-dairy food products from the data. Alternatively, we include an interaction of the non-dairy food indicator with the post-scandal indicator in our main regression specification. Table 5 reports the results. Column 1 - 3 presents the effect of the scandal on the value of dairy imports, import quantity, and unit prices of imported products, respectively, excluding the non-dairy food products. Column 4 - 6 report the effect of the scandal on dairy imports, including the interaction of the non-dairy food dummy and the post-scandal indicator as control variable. The values of coefficient β_d are somewhat larger than those in Table 3 and statistically significant, confirming the existence of negative reputation spillover to other non-dairy food products. To the extent that the import of non-dairy food products increased as well after the scandal, our main estimates on dairy imports in Table 3 provide a lower bound of the collective reputation effect.

In addition, after the scandal, parents of infants and toddlers as well as parents-to-be may update their perceptions about the overall quality of baby products produced domestically and switch to foreign brands for other baby products, such as diapers and baby bottles. To evaluate the potential influence of this confounding factor, Column 1-3 of Table B7 in Appendix exclude the non-dairy baby products from our main specification. Column 4-6 additionally includes the interaction between the

non-dairy baby product dummy variable and the post-scandal indicator. The results show that the effects of the scandal on dairy imports remain highly similar after considering the possible spillover effects on non-dairy baby products.

Table 5: Robustness Check of the Product-City-Year Level Analysis: Elimination of the Non-dairy Food

	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	0.582***	0.479**	0.104***	0.581***	0.477**	0.104***
	(0.203)	(0.202)	(0.0387)	(0.202)	(0.201)	(0.0386)
Post*Food				-0.109	-0.285	0.176***
				(0.263)	(0.292)	(0.0648)
R-squared	0.474	0.556	0.619	0.470	0.554	0.623
city	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,814,972	1,814,972	1,814,972	1,888,011	1,888,011	1,888,011

This table examines the impact of the endogenous of the food industry on the basic regression. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We create a balanced panel at city-product (HS six-digit) and year level for outcomes in Column 1-6. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Column 1-3 exclude non-dairy food industries; Column 4-6 includes all industries, but adds the Post*Post. The Post*Food is the interaction terms of food industries and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Furthermore, there may be some concern that trade characteristics of food products may be inherently different from non-food products. As such, non-food imports may not be proper control groups. To address this potential confounder, We restrict our control group to include only non-dairy food products. Table B8 in Appendix show that the effects of the scandal on dairy imports remain highly similar after restricting the sample to only food products.

The 2008 Financial Crisis. The first important confounding event is the 2008 financial crisis which closely overlapped with the year of the scandal. During the global crisis of 2008-2009, the volume of international trade fell by more than 15 percent worldwide with China's overall imports declined by 11.2 percent. As dairy products account for only a small fraction of the total imports of China, the 2008 global financial crisis could have caused a larger decline in imports of non-dairy goods compared to dairy products, and therefore upwardly bias our estimates. Our empirical strategy to control for the

influence of the 2008 financial crisis follows that of (Bricongne et al., 2012), which studied the sources of the 2008–2009 trade collapse. Specifically, we construct a measure of country-specific supply shocks from the financial crisis using a foreign country's baseline export value share to China divided by the total value of yearly exports to China from the rest of the world. For an alternate measure, we calculate the country-specific reduction in exports to China using a foreign country's export value share to China from 2008 to 2009 divided by the total value of exports to China from the rest of the world during 2008-2009. Table 6 shows that our results are robust to including these supply shocks as additional controls.

Table 6: Robustness Check of the Product-City-Year Level Analysis: The 2008 Financial Crisis

	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	0.644***	0.634***	0.0108	0.648***	0.653***	-0.00564
	(0.151)	(0.175)	(0.0424)	(0.150)	(0.175)	(0.0420)
Post*Crisis1	-0.00747	-0.0413	0.0338			
	(0.0258)	(0.0323)	(0.0177)			
Post*Crisis2				-0.0334	-0.313*	0.280***
				(0.118)	(0.171)	(0.0938)
R-squared	0.470	0.554	0.623	0.470	0.554	0.623
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,888,011	1,888,011	1,888,011	1,888,011	1,888,011	1,888,011

This table tests the impact of the return of the base. This table examines the impact of the financial crisis on main regression specifications. The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Columns 1-3 adds the Post*Crisis1; Columns 4-6 adds the Post*Crisis2. The Post*Crisis1/2 is the interaction terms of financial crisis and post-scandal (2008-2013).The Crisis1/2 indicates whether the main import source of products is a country with financial crisis. The Crisis1 is measured by the countries or regions whose export volume of main import sources decreased by more than the median of the sample during 2008-2009; The Crisis2 is measured by whether the growth rate of exports from the main import sources is lower than the median of the sample countries or regions in 2008-2009. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Tariff. Another possible confounding factor is tariffs. Chinese tariffs on imports were reduced from an average of about 15 percent in 2000 to 9 percent after 2006. Reduction in tariffs could lower the price of imported products and hence enhance their competitiveness in domestic markets. In this view, we may erroneously attribute to the scandal an increase in imports of dairy products that

was in fact due to the lowered tariffs. To address this concern, we collect detailed information on tariff rates from the customers database and aggregate the data to the HS six-digit product-year level. Table 7 presents the estimates after controlling for tariff rates. Column 1 - 3 of Table 7 replicate the regressions in Table 3 as benchmark estimates. Column 4 - 6 report the effect of the scandal on the value of dairy imports, import quantity, and unit prices of imported products, respectively, including tariff rates as control variable. The results show that the effects of the scandal on dairy imports remain highly similar after considering the impacts of tariffs.

Table 7: Robustness Check of the Product-City-Year Level Analysis: Tariffs

	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	0.647***	0.648***	-0.000954	0.653***	0.647***	0.00600
	(0.150)	(0.174)	(0.0413)	(0.150)	(0.174)	(0.0418)
Log(tariff)				0.0494	-0.0759	0.125
				(0.0649)	(0.0700)	(0.0372)
R-squared	0.470	0.554	0.623	0.462	0.539	0.610
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,888,011	1,888,011	1,888,011	1,765,528	1,765,528	1,765,528

This table examines the impact of potential tariff changes on main regression specifications. The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction term of dairy products and post-scandal indicator. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Fertility Policies. The Chinese government imposed its one-child policy in 1979 to curb the growth of the population that, at that time, was reaching 972 million people[12]. After being firmly enforced for around 32 years, this nationwide fertility policy was relaxed in 2011. Starting November 2011, couples where both spouses are only children are allowed to have a second child. This policy change is likely to cause an increase in births and overall demand for dairy products, including dairy imports. Since our study covers trade flows for the universe of China's imports between 2003 and 2013, the volumes of imports in 2012 and 2013 were exposed to this change in fertility policy. To control for

[12]The policy most strictly applied to Han Chinese, but not to ethnic minorities around China. There were exceptions for rural farmers and certain situations, like when a first child was handicapped

the influence of potential rise in births, We restrict our sample to customs database during the period 2002 to 2011. Table 8 presents the results. Column 1 - 3 of Table 8 replicate the regressions in Table 3 for comparison purposes. Column 4 - 6 report the results of the main specification using the restricted sample. Although somewhat smaller in magnitude, our key estimates remain significant.

Table 8: Robustness Check of the Product-City-Year Level Analysis: Fertility Policy

	2003-2013			2003-2011		
	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log((Price)
Post*Dairy	0.647***	0.648***	-0.000954	0.565***	0.560***	0.00461
	(0.150)	(0.174)	(0.0413)	(0.138)	(0.161)	(0.0386)
R-squared	0.470	0.554	0.623	0.476	0.560	0.620
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,888,011	1,888,011	1,888,011	1,601,528	1,601,528	1,601,528

This table examines the impact of potential birth rate changes on the basic regression. The sample of Columns 1-3 includes the import data of dairy products at the city level in the China Customs database (2002-2013). The sample of Columns 4-6 includes the import data of dairy products at the city level in the China Customs database (2002-2011). We create a balanced panel at city-product (HS six-digit) and year level for outcomes in Column 1-6. The main specification in each column includes year, province, product, city-year, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Differential Time Trends. As trade characteristics of various products may be inherently different, dairy sector could have followed different growth trajectories from non-dairy sectors in the absence of the scandal, leading to biased estimates in our main specification. Meanwhile, within the dairy sector, different dairy products might have followed different time trends, exacerbating this bias issue. For instance, if the imports of some dairy products grew fast prior to the scandal, our estimates may be driven in part by the extrapolation of the pre-scandal boom of these dairy products. To address these concerns, we relax the parallel trends assumption and include a vector of product-specific linear time trends. Moreover, we exclude products that contributed over 99%, 95%, and 90%, respectively, of the average growth rate in imports between 2002 and 2007[13]. The estimated effects of the scandal are almost identical to our baseline specification, as shown in Table B9 in Appendix, suggesting that our

[13]Here we use customs data on imports at the HS six-digit product-year level

results are robust to empirical specifications that allow differential growth trajectories for different products and exclude products with unusually high growth rates.

Domestic and Global Dairy Outputs. Collective reputation represents a demand-side force, but supply-side factors may also have contributed to the observed effects of the scandal. Following the outbreak of the scandal and three rounds of quality inspections, the Chinese government immediately issued product recalls and shut down suppliers of contaminated dairy products, including Sanlu Group, one of the largest dairy firms in China. These massive actions could cause temporal decline of domestic dairy production and pushed consumers to substitute imported dairy products. Meanwhile, if there is a systemic increase in dairy production worldwide after 2008, dairy imports to every country, including China, might increase. To control for the influence of these supply-side forces, we collect data on domestic dairy outputs (measured as kilograms of dairy products produced each year in every province) from the China Statistical Yearbook and global dairy production (measured as kilograms of dairy products produced worldwide each year) from Ministry of Agriculture of China source. Table B10 and Table B11 in Appendix shows that our results are robust to including these potential supply shocks as additional controls.

4.6 Additional Robustness Checks

First, table B12 in Appendix B, we show that coefficient estimates based on geographic proximity to contaminated dairy firms are not statistically significant in placebo tests that assume the scandal had been introduced 1, 2, 3 or 4 years earlier. Second, we present the results of event study version of equation (2) in which we generate a coefficient for the interaction of proximity with post-scandal and dairy food indicators for every year. Figure 6 plots the regression coefficients with 95% confidence intervals for three outcome variables: log value of imports, log quantity of imports, and log unit price of imports. The set of pre-2008 θ_1 coefficients are statistically indistinguishable from zero, providing evidence that we are not capturing a generic, location-based growth trajectories in imports of dairy products. Besides, the set of post-2008 θ_1 coefficients are statistically significant and gradually increase from 2008 to 2013, highlighting a systematic and persistent increase in log value of imports and log quantity of imports after the disclosure of the scandal.

Third, we conduct the randomization inference procedure as suggested by Bertrand et al. (2004). Specifically, We randomly assign the treatment status of imported products and replicate the inter-

Figure 6: Effects Over Time of Distance: Import Value, Quantity, and Unit Prices

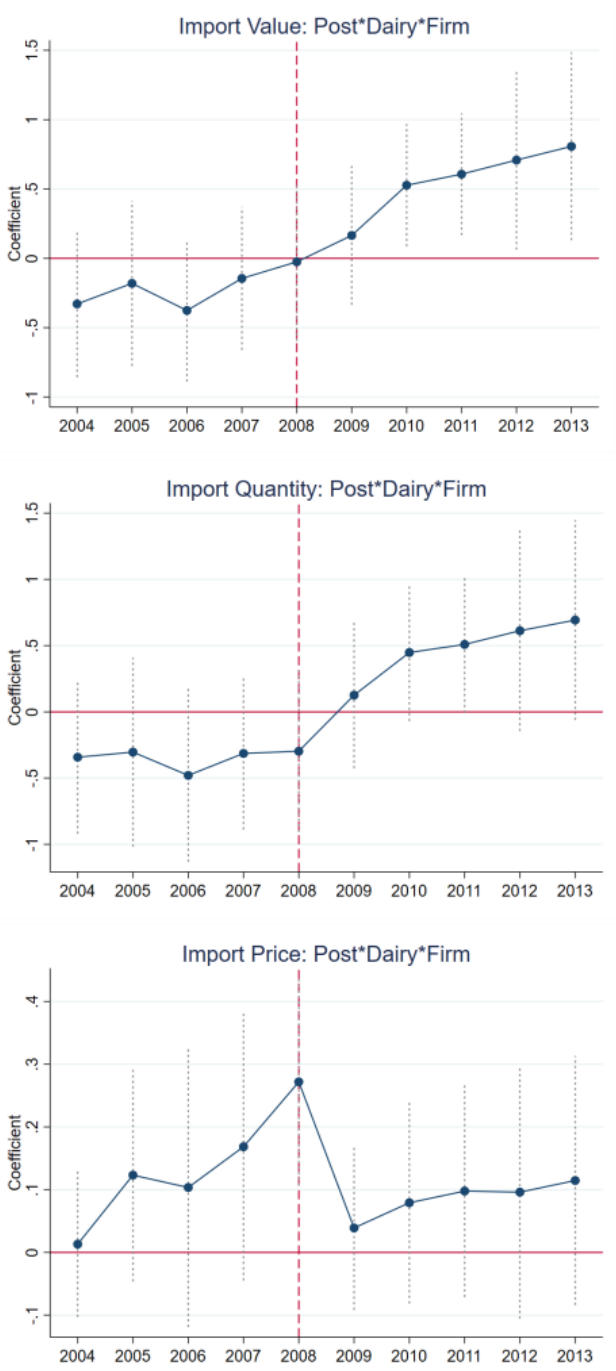

Figure 6 plots the regression coefficients of the dependent variables interacted with year dummies. All regressions include year, city, product, industry-year, and city-year fixed effects. The dotted lines plot the 95% confidence intervals, based on two-way clustered standard errors at the the product and province-year level.

acted DID specification as placebo tests. This procedure is repeated 200 times to form a distribution of placebo treatment effects. Figure A3 in Appendix A presents the distribution, in the probability density function form[14], of the estimated values of θ_1 in each of these tests when the outcome is log value of imports, log quantity of imports, and log unit price of imports. The vertical line indicates the estimated coefficients from Table 3 when the proximity measure is the true treatment distance to the nearest firm with melamine-laced dairy products. In the first two cases, the values of the estimates in Table 3 are greater (in absolute value) than 99% of placebo estimates, corroborating the validity of the interacted DID approach.

5 Long-Run Impacts of the Scandal

The persistent increase in imports of dairy products relative to that of nondairy products from 2008 to 2013 suggests that the scandal may have long-lasting impacts on dairy imports. To explore the long-run effects of the scandal, we use data on imports to mainland China from the BACI-CEPII international trade database (2003-2020). As the finest level of geography observable in the CEPII database is a product's destination country, we aggregate data to the product-year level[15] and estimate the baseline equation (1) using the preferred specification in column 4 of Table 2.

Table 9 reports the results. Column 1 examines the impact of the scandal on the natural logarithm of import value and estimates an increase of 156.3 percent in the value of dairy imports, relative to nondairy imports, from 2008 to 2020. Column 2 examines the effects of the scandal on the log quantity of dairy imports and shows that the quantity of dairy imports experienced an increase of 129.1% after the scandal. Comparing the estimates of θ_1 in Columns 1 and 2, the increase in quantity explains 82.6% of the increase in the value of dairy imports, mirroring the decomposition of the effect of the scandal in Table 3. Column 3 examines changes in unit prices of imported products and indicates an 11.9 percent increase in unit prices of dairy imports by 2020, which is significant at the 5% level. This differs from the estimated insignificant effects of the scandal on unit prices of imported dairy products in the short-run. One possible explanation for the differing effects is that dairy imports to China started to account for a substantial share of the global dairy outputs in recent years. According

[14]

[15] See section IIIC for more details.

Table 9: Decomposition of the Impacts of the Scandal on Dairy Imports: 2003-2020

	CEPII: 2003-2020			CUSTOM: 2003-2013		
	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	0.941***	0.829***	0.112**	0.850***	0.844***	0.00571
	(0.211)	(0.228)	(0.0466)	(0.243)	(0.263)	(0.0611)
R-squared	0.857	0.872	0.909	0.913	0.910	0.926
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	74,756	74,756	74,756	44,542	44,542	42,517

This table shows the decomposition of the impact of the scandal on dairy imports using regression results for equation (1). The sample data includes import trade data at the six digit code level of CPEII BACI from 2003 to 2020, and The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). We have created a balanced group for the results in columns 1-3 at the country product (HS six-digit) and year levels of CPEII BACI Dates, and have created a balanced group for the results in columns 4-6 at the country product (HS six-digit) and year levels of Costom Dates. The main specification in each column includes year, product, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the HS country level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the country level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the country level. The Post*Dairy is the interaction term of dairy products and post-scandal indicator. Standard Error Clustering to HS six-digit Level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

to , China has become the largest global dairy products importer since 2010. In 2019, Chinese dairy imports of $12.6 billion accounted for about a quarter of global dairy product imports. This compares to the United States and Russia, ranked second and third, with imports and shares of $2.6 billion (5.2 percent) and $2.4 billion (4.8 percent), respectively. As such, China's increasing import demand for dairy products eventually contributed to higher unit prices. In line with the short-run effects, in Figure B13, We find much larger effects of the scandal on consumption dairy products relative to intermediate dairy products by 2020.

We also replicate the event study as in Section 4.2 and 4.6 to examine how the effects of the scandal vary across different years. Figure 7 plots the regression coefficients with 95% confidence intervals for three outcome variables: log value of imports (panel A), log quantity of imports (panel B), and log unit price of imports (panel C). Figure 7 highlights a persistent increase in log value of imports and log quantity of dairy imports relative to nondairy imports after 2008. Estimates of θ_1 in panel A and B continued to grow in recent years and displayed little sign of decline, confirming the long-run, cumulative impacts of the scandal on the increase in imports of dairy products. Meanwhile, in line with Figure 4 and 6, the set of pre-2008 estimates of θ_1 are small and statistically insignificant, supporting the validity of the DID approach. Taken together, the results indicate that the scandal may

have large long-run effects on imports of dairy products. This provides causal evidence supporting the link between historical negative experiences and lower levels of trust in the safety of the affected goods and services found in the literature (citation).

5.1 Welfare Analysis

We also conduct a back-of-the-envelope calculation to quantify the induced welfare changes we estimate above. As shown in Figure A8, imported dairy products from OECD countries are at least 40 percent more expensive than domestic alternatives, consumers bear welfare losses of 20 to 30 percent of baseline spending on dairy products (Figure A9).

6 Escalated Mistrust of Domestic Dairy Products

As outlined in the introduction, a number of recent studies show that historical negative experiences could lead to lower levels of trust and a decrease in the demand for the affected goods and services (Alsan and Wanamaker, 2017; Martinez-Bravo and Stegmann, 2017; Lowes and Montero, 2021). Following the literature, we examine whether the behavioral responses we observe are driven by escalated mistrust of food safety. Our measure of consumer confidence in food safety comes from the CGSS, a repeated cross section extending from 2003 to the present. The earliest year questions were asked about food safety was 2005, when several questions were included. In particular, in the 2005, 2007, and 2013 waves of the survey, participants were asked about "how would you rate food safety on a 4-point likert scale (very unsafe, unsafe, somehow safe, and very safe). We construct a binary food-safety indicator that takes the value of 1 if individuals replied "very unsafe" or "unsafe" to the question and 0 otherwise. Using data from these three waves of survey, we exploit variation in exposure to the scandal and test whether individuals living closer to firms with tainted dairy products exhibit greater post-disclosure mistrust of food safety. In line with the interacted DID model in Sections 4.3 and 4.4, this continuous proximity metric creates concentric circles of equal proximity to contaminated firms. In Figure 8, we plot the value of these coefficients by bin, as well as a (thin, dashed) line of best fit. Provinces in close proximity to dairy firms with contaminated products saw an increase in mistrust of food safety, and the effect declines with distance.

we then estimate the equation as below for survey responses for individual i residing in province

Figure 7: Effects Over Time: Import Value, Quantity, and Unit Prices

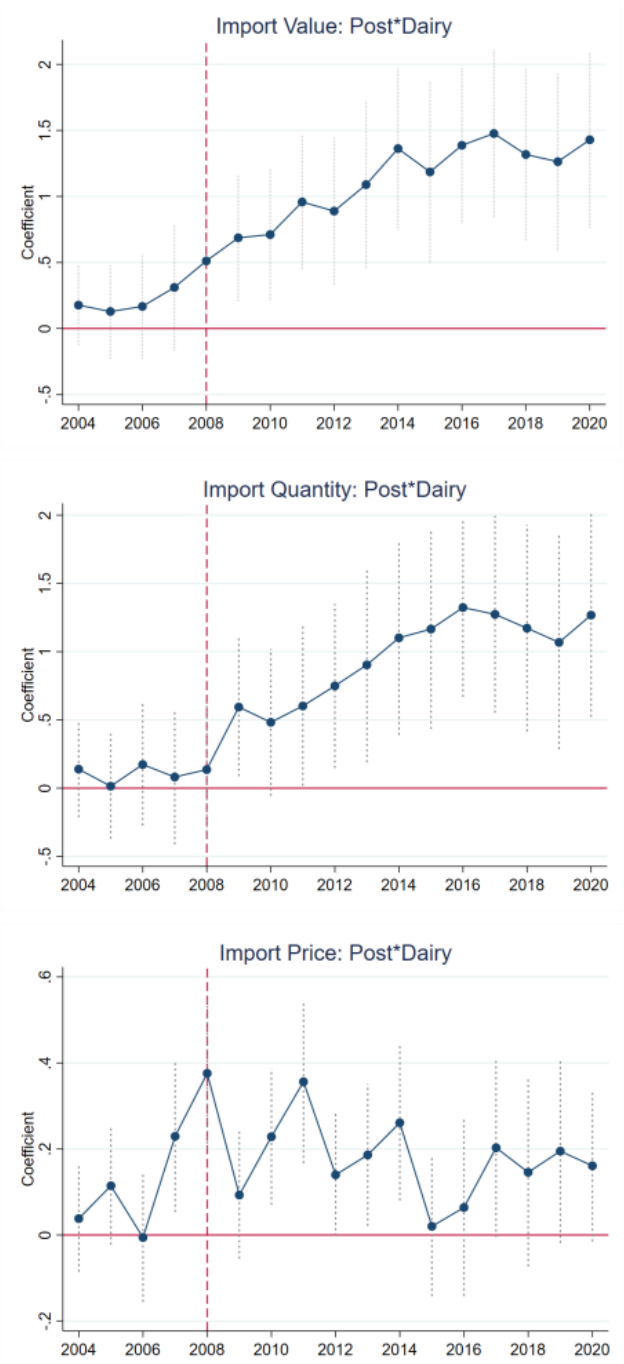

Figure 7 plots the regression coefficients of the dependent variables interacted with year dummies. All regressions include year, city, product, industry-year, and city-year fixed effects. The dotted lines plot the 95% confidence intervals, based on two-way clustered standard errors at the the product and province-year level.

Figure 8: Difference-in-Differences Coefficients and Geographic Gradients for Food Safety Mistrust

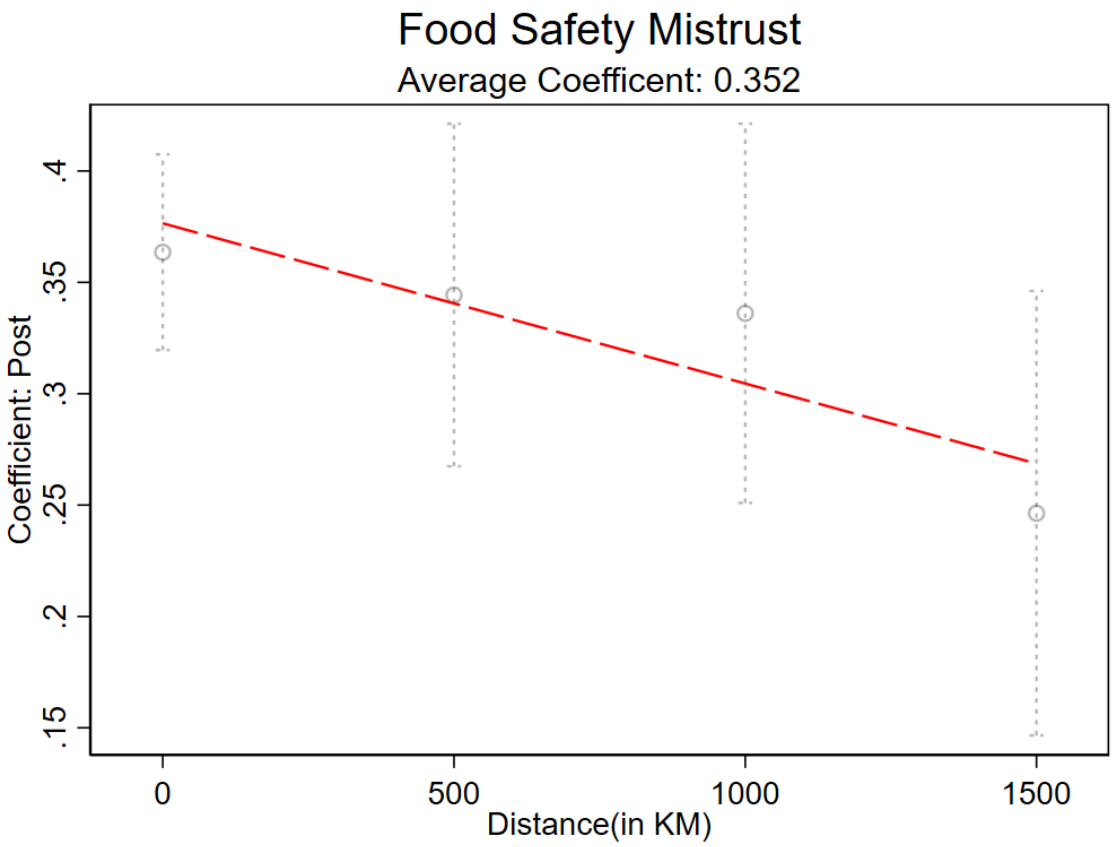

Figure 8 plots the level of personal mistrust of food safety under different distance gradients.

s:

$$Mistrust_{ist} = \theta_0 + \theta_1(P_S * Post_t) + X_{ist} + \mu_s + \delta_t + \epsilon_{ist}, \quad (3)$$

where P_S is proximity to dairy firms with contaminated products, μ_s represents a current province of residence fixed effect. Province fixed effects ensure that the estimated coefficient θ_1 captures the geographic gradient in mistrust of food safety net of province-specific attitudes common across all groups. δ_t denotes a year fixed effect. X_{ist} contains a rich set of individual characteristics, such as age, gender, income, and hukou status. The sample includes individuals at least 18 years of age at the time of the survey. Standard errors are clustered at the province-year level.

Table 10: The Impact of Scandal on People's Trust in Food Safety: Very Unsafe and Unsafe

	(1)	(2)	(3)	(4) Pre-2008	(5) Post-2008
Post*Distance	0.156***	0.133***	0.119**		
	(0.0487)	(0.0475)	(0.0491)		
Distance				0.163	0.0607***
				(0.116)	(0.0118)
Demographic			YES	YES	YES
Province		YES	YES	YES	YES
Year	YES	YES	YES	YES	YES
R-squared	0.0390	0.0734	0.111	0.0772	0.109
Observations	23,486	23,486	22,771	13,638	9,133

This table shows the impact of scandals on people's trust in food safety. The sample includes data from the CGSS database for 2006, 2008, and 2013. We created a mixed cross-sectional regression group for the results at the individual and year levels in columns 1-5. The main specifications include year and province fixed effects. Columns 1-3 represent the regression results for all year samples, columns 4 represent the regression results for only 2006 and 2008 samples, and columns 5 represent the regression results for only 2013 samples. Column 1 only includes year fixed effects, column 2 adds province fixed effects, and columns 3-6 further add control variables for demographic characteristics (gender, age, household income, census, political prospects, work). Post represents the virtual variable at the time of the scandal. Distance is the distance affected by the scandal, constructed by weighting the distance from the area to the nearest contaminated area. Post * Distance is the interaction term between Post and Distance. Standard Error Clustering to province-year Level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The results, contained in Table 10, demonstrate that people exhibit a strong, statistically significant geographic gradient in mistrust of food safety after the disclosure of the scandal in 2008. A one standard deviation increase in proximity to contaminated dairy firms is associated with a 14 percentage point increase in mistrust of food safety. Note that the coefficient θ_1 is small and statistically insignificant before 2008, indicating that it is not the case that people living closer to dairy firms with melamine-laced products are simply more concerned about food safety.

As a placebo outcome, we also examine respondents' answers to other mistrust questions including

their confidence in property, personal, traffic, medical, workplace, and privacy safety by estimating equation 3. The results are reported in Table 11. Note that the estimated values of θ_1 are either oppositely signed or statistically significant, providing evidence that we are not capturing a generic, location-based level of trust.

Table 11: Perform a Placebo Test Using a Fake Outcome

Panel A: After 2008						
	(1)	(2)	(3)	(4)	(5)	(6)
	Property	Personal	Traffic	Medical	Workplace	Privacy
Distance	0.0115	-0.0268***	-0.0429***	0.0145	0.0106	0.0755***
	(0.00730)	(0.0685)	(0.00804)	(0.0103)	(0.0935)	(0.0917)
R-squared	0.0239	0.0221	0.0351	0.0332	0.0332	0.123
Observations	9,293	9,244	9,191	9,017	8,876	8,528
Panel B: Before 2008						
	(1)	(2)	(3)	(4)	(5)	(6)
	Property	Personal	Traffic	Medical	Workplace	Privacy
Distance	-0.0652***	-0.168**	0.0800	0.0204	–0.124	0.405***
	(0.0146)	(0.0667)	(0.0553)	(0.113)	(0.0945)	(0.0180)
R-squared	0.0334	0.0370	0.0268	0.0493	0.0324	0.0784
Observations	13,839	13,830	13,729	13,382	13,419	12,860
Demographic	YES	YES	YES	YES	YES	YES
Province	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES

This table shows the impact of scandals on people's trust in other security issues. The sample includes data from the CGSS database for 2006, 2008, and 2013. We created a mixed cross-sectional regression group for the results at the individual and year levels in columns 1-6. The main specifications in each column include year, province fixed effects and control variables for demographic characteristics (gender, age, household income, census, political outlook, work). Panel A only includes data from 2013, while Panel B only includes samples from 2006 and 2008. The dependent variables in columns 1-6 are property safety distrust, personal safety distrust, traffic safety distrust, medical safety distrust, labor safety distrust, and privacy safety distrust. Distance is the distance affected by the scandal, constructed by weighting the distance from the region to the nearest contaminated area. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

6.1 Information Accuracy in Media Reports

Many studies have shown that the media influences a wide range of social and economic outcomes (Adda, 2007; Luong et al., 2019). Following the literature, we examine how detailed information on the involvement of different firms in the scandal in news reports mediate the displacement of domestic dairy consumption by imported dairy products. Specifically, we classify the merged customs-indices sample, explained in detail in section **??**, across different provinces into two groups based on the relative search intensity and run the main DID regressions for the two groups separately.

Table 12 presents the results using the same set of preferred year, province, product, product-year,

Table 12: Information Accuracy: Baidu Search Index and Google Search Index

Panel A: Baidu search index						
	HIGH			LOW		
	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log(Price)
Post*Dairy	0.608***	0.636***	-0.0279	0.949***	0.854***	0.0952
	(0.156)	(0.182)	(0.0398)	(0.294)	(0.332)	(0.0754)
R-squared	0.500	0.571	0.636	0.379	0.504	0.599
Observations	1,387,034	1,387,034	1,387,034	500,801	500,801	500,801
Panel B: Google search index						
	HIGH			LOW		
	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log(Price)
Post*Dairy	0.640***	0.658***	-0.0181	0.755***	0.665***	0.0893
	(0.166)	(0.192)	(0.0396)	(0.230)	(0.251)	(0.0739)
R-squared	0.492	0.567	0.631	0.396	0.514	0.606
Observations	1,450,983	1,450,983	1,450,983	436,856	436,856	436,856
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES

This table studies the impact of information acquisition on the external effects of scandal. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-6 of panels A and B at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. In panel A, the Baidu search index (2011-2013) of "Melamine" and "Sanlu Toxic Milk Powder" is used as the measurement system. The provinces with Baidu search index greater than the median are classified as information acquisition perfect group, and the rest are classified as information acquisition imperfect group. In panel B, the Google search index of "melamine" and "Sanlu Toxic Milk Powder" is used as the measurement system. The provinces with enough heat for related words are classified as the information acquisition perfect group, and the provinces without enough heat are classified as the information acquisition imperfect group. The dependent variables in columns 1, 2 and 3 are the log annual import value, log annual import quantity and log annual import unit price of each product at the city level, and the same is true for columns 4-6. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

province-year, and product-year fixed effects as in table 3. Panel A captures the magnitude of the increase in dairy imports for provinces with different search intensity of the two keywords using the Baidu Search Index. Panel B reports post-2008 changes in dairy imports across provinces using the Google Trend indices. We first look at panel A. Column 1 and 4 examine the effects of the scandal on the log value of imported dairy products for provinces with high and low search intensity of the two keywords, respectively. In line with our hypotheses, the coefficient of β_{d1} in Column 1 is 0.808, much smaller than the value of the coefficient of β_{d1}, 1.365, in Column 4. These finding confirm that people living in provinces with more accurate information about the contaminated firms reacted less to the scandal. Separately, columns 2 and 5 examine the effects of the scandal on the log quantity of dairy imports for provinces with high and low search intensity of the two keywords. Similar results are observed as in columns 1 and 4: provinces with less accurate information about the firms directly involved in the scandal had larger increases in dairy imports, indicating that people in these provinces could not easily distinguish innocent and contaminated firms. Columns 3 and 6 report the effects of the scandal on unit prices of imported dairy products. Comparing the estimates of β_{d1} in columns 1 to 6, we again see that the increase in quantity explains the majority of the increase in the value of dairy imports.

We then turn to panel B. In line with our expectations, provinces with relatively low search intensity of keywords that reflect a thorough depiction of the event experience larger increases in dairy imports. Altogether, the findings in panel A and B suggest that consumers in provinces with low search intensity of the two keywords are likely to have low information accuracy about the scandal and consequently could not easily distinguish innocent and contaminated firms. As a result, they substitute more for imported dairy products deemed safe.

7 Discussions and Conclusions

The 2008 Chinese milk scandal was the largest food safety incident in China. The scandal involved infant formula and numerous other dairy products from many Chinese dairy firms being adulterated with the industrial chemical melamine, which resulted in kidney stones and other kidney damage in infants. Exploiting this large-scale scandal as an natural experiment, this paper provides evidence on how quality scandals of domestic dairy firms cause collective reputation damage and trigger an

Figure 9: Baidu Search Index and Google Search Index Distribution Map

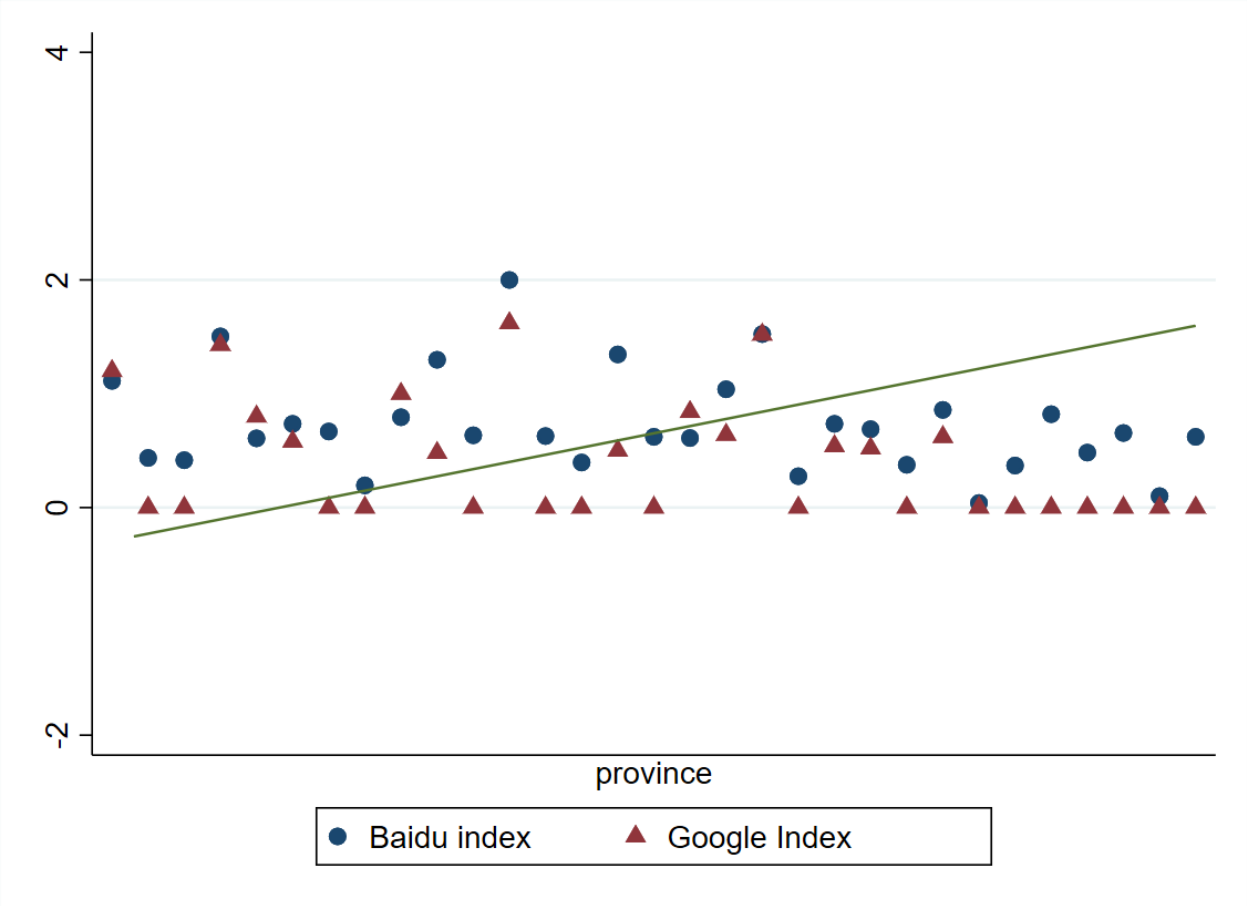

Figure 9 plots the distribution of Baidu search index (2011-2013) and Google search index (2008-2010), with a diagonal in the middle indicating the similarity between the Baidu search index and Google search index.

Table 13: Heterogeneity of Internet Development Level

	High Level			Low Level		
	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	0.591***	0.575**	0.0155	0.665***	0.694***	-0.0289
	(0.192)	(0.227)	(0.0502)	(0.188)	(0.205)	(0.0491)
R-squared	0.560	0.613	0.667	0.399	0.512	0.601
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	725,435	725,435	725,435	1,162,539	1,162,539	1,162,539

This table shows the reaction of internet development level. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-6 at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. Columns 1-3 are the regression results of the subsample of domestic enterprises, and columns 4-6 are the regression results of the subsample of foreign enterprises. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

overall increase in imports of dairy products as safe substitutes. Using a DID framework and detailed customs data, we find that the average value of dairy imports grew by 91.0% after the disclosure of the scandal and continued to grow in recent years. The changes are mainly from the increases in import quantity, not in unit prices. Our estimates are robust to various empirical specifications that relax the classical DID assumption and allow differential growth trajectories for different products. Leveraging on official quality inspection reports, we show that cities with larger potential exposures to contaminated dairy products substitute more to foreign brands.

The results of this paper elucidate the mechanisms underlying the home bias in trade. Our findings also contribute to the literature measuring the effects of mistrust on economic development and institutional outcomes. We also complements the literature on quality scandals and product recalls. In addition, the results of this paper add to the literature on collective reputation.

There are some possible limitations in this paper and we leave these issues for future studies. First, we do not have systematic data on the child victims of the scandal, mainly because the Chinese government does not release detailed geographic and demographic information of victim babies. As such, we could not directly use the number of child victims as a promoxity measure of potential exposure to

the contaminated dairy products. It would be interesting to obtain the detailed information on victim children and see how the number of identified child victims of the scandal predicts the increase in dairy imports across different cities. Second, we mainly capture public trust of domestic products as one mechanism underlying the home bias in trade. We hope that future studies can explore more potential channels that drive the home bias in trade in goods and services.

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Appendix A

Figure A1: Spatial Distribution of Infant Fatality Linked to the Dairy Scandal

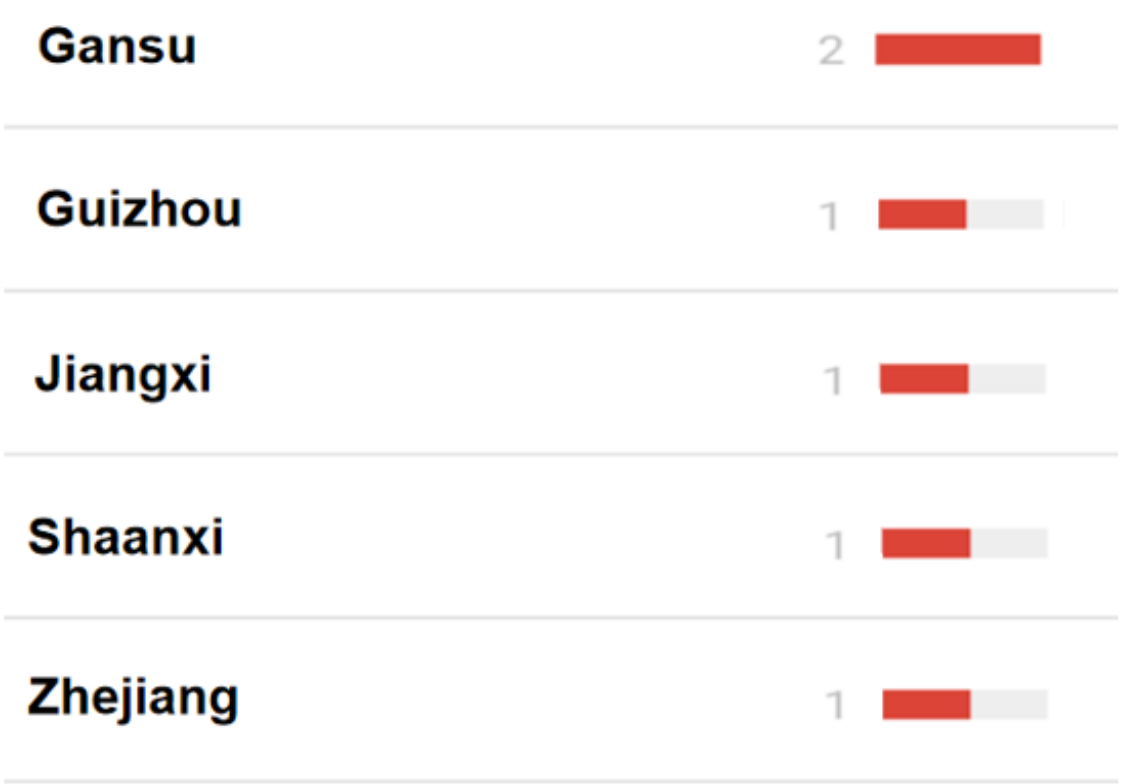

Figure A1 plots the infant deaths across different provinces linked to the melamine-laced dairy products. The pink areas indicate no infant deaths, and the red areas indicate infant deaths.

Figure A2: Examples of News Reports in Chinese New Media

蒙牛、伊利、雅士利等22家奶粉检出三聚氰胺(名单)

中国发展门户网　www.chinagate.com.cn　2008 年 09 月 16 日

字号: 大　中　小　　打印本文章　　写信给编辑

9月12日，北京一超市内原来摆放三鹿婴幼儿奶粉的柜子已经变空。当日，北京各大超市撤下所有三鹿问题奶粉。 中新社发 郑雄增 摄

中新社北京九月十六日电 (记者 刘长忠)中国国家质检总局十六日晚披露，最新专项检查显示，有二十二家企业六十九批次婴幼儿奶粉产品检出了三聚氰胺。供应北京奥运会、残奥会的乳制品均未检出三聚氰胺。

三鹿牌婴幼儿奶粉重大安全事故发生后，中国政府高度重视，作出重大部署。中国国家质检总局紧急在全国开展了婴幼儿配方奶粉三聚氰胺专项检查。

最新专项检查显示，中国目前共有一百七十五家婴幼儿奶粉生产企业，其中六十六家企业已停止生产婴幼儿奶粉。此次专项检查对其余一百零九家企业进行了排查，共检验了这些企业的四百九十一批次产品。

专项检查显示，有二十二家企业六十九批次产品检出了三聚氰胺：

1、石家庄三鹿集团股份有限公司生产的三鹿牌婴幼儿配方乳粉；

2、上海熊猫乳品有限公司生产的熊猫可宝牌婴幼儿配方乳粉；

3、青岛圣元乳业有限公司生产的圣元牌婴幼儿配方乳粉；

4、山西古城乳业集团有限公司生产的古城牌婴幼儿配方乳粉；

Figure A2 shows a Chinese news report on the results of the first round of melamine inspection by the Chinese government in 2008.

Figure A3: Random Trial Results: Randomized Treatment Group and Control Group

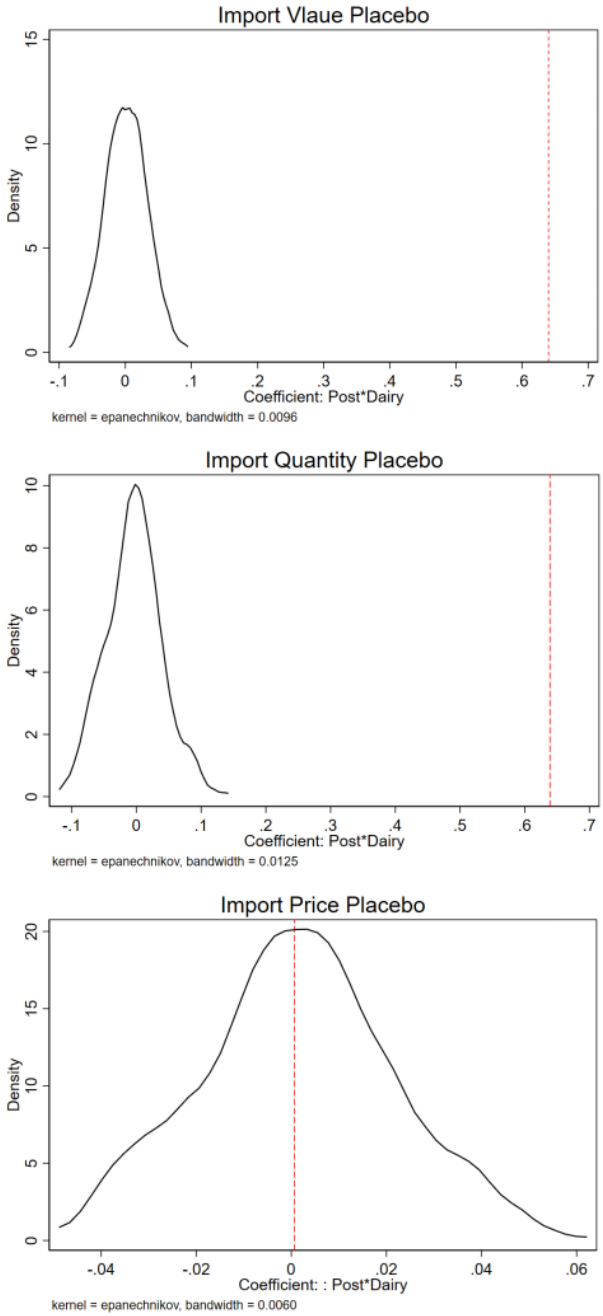

Figure A3 plots the kernel density plot of the Post*Dairy coefficient distribution of log value, log quantity, and log unit price regression results after randomly assigning the treatment group and control group.

Figure A4: Google Search Index across Provinces in China

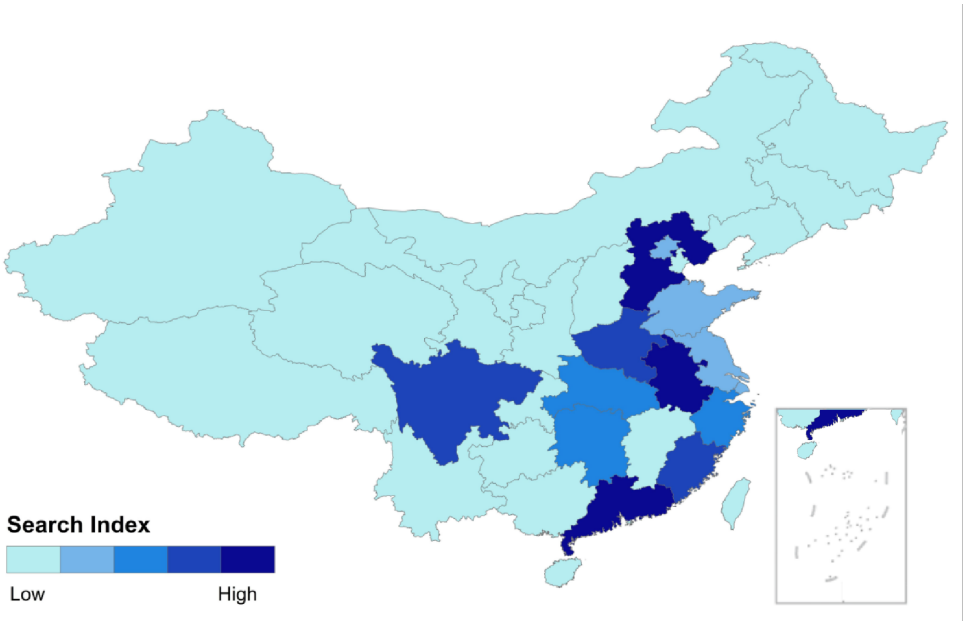

Figure A4 plots Google Trends search index for the term "Sanlu Toxic Milk" across provinces in China in 2008.

Figure A5: Baidu Search Index across Provinces in China

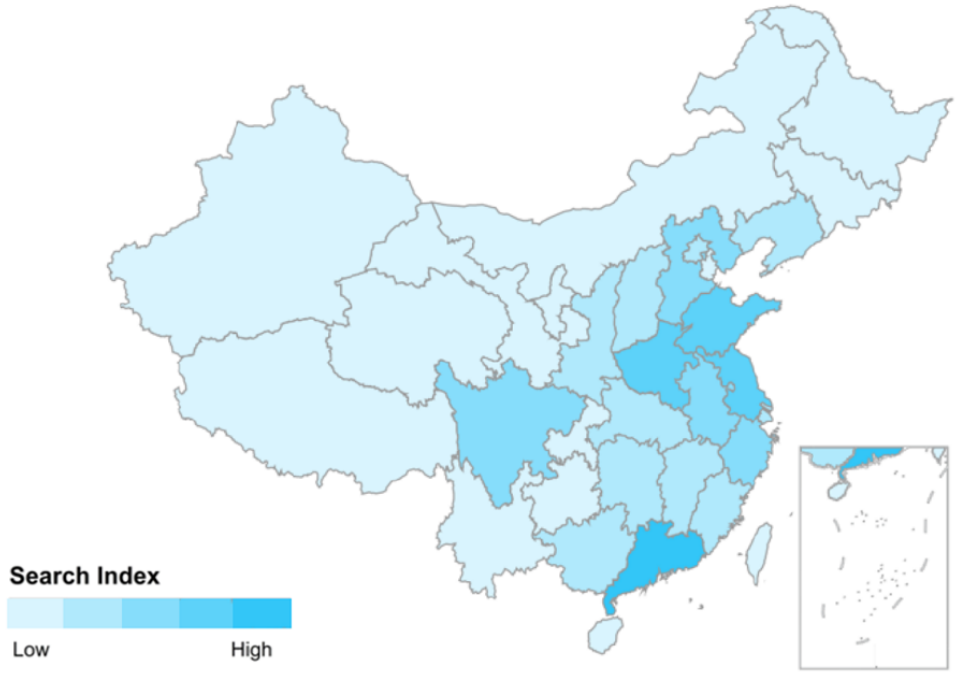

Figure A5 plots Baidu Search index for the term "Sanlu Toxic Milk" across provinces in China in 2008.

Appendix B

Table B1: HS Six-Digit Codebook for Dairy Products

HS1996	Product Description
040110	Unconcentrated milk and cream with fat content less than or equal to 1%
040120	Unconcentrated milk and cream with fat content greater than 1% and less than or equal to 6%
040130	Unconcentrated milk and cream containing more than 6% fat
040210	Solid milk and cream with fat content less than or equal to 1.5%
040221	Fat content more than1.5% sugar-free solid milk and cream
040229	Sweet solid milk and cream with fat content more than 1.5%
040291	Concentrated but unsweetened non-solid milk and cream
040299	Concentrated and sweetened non-solid milk and cream
040310	Yoghurt
040390	Buttermilk and other fermented or acidified milk and cream
040410	Other whey and modified whey
040490	Other products with natural milk not listed
040510	Butter
040520	Milk sauce
040590	Other fats and oils extracted from milk
040610	Fresh cheese (uncooked or uncured)
040620	Any of various grated or powdered cheeses
040630	Processed cheese
040640	Blue cheese and other cheese with texture produced by Penicillium loudi
040690	Other cheese
190110	Retail packaged formula for infants and young children
190190	Cereal, grain powder and other foods and dairy foods
350110	Casein
350220	Lactalbumin

The HS codes of dairy industry are mainly concentrated on products with two-digit codes of 04, 19 and 35. In order to further subdivide dairy products, this paper expands the dairy product category to the six-digit code level based on the two-digit code.

Table B2: Dairy Firms with Melamine-laced Products: City

City	year	Companies
Ningde	2008	1
Shanghai	2008	3
Yantai	2008	2
Xi'an	2008	1
Qingdao	2008	2
Hohhot	2008	6
Guangzhou	2008	2
Shenzhen	2008	1
Shuozhou	2008	2
Qiqihar	2008	2
Changsha	2008	3
Chaozhou	2008	2
Tianjin	2008	2
Baoji	2008	1
Nanchang	2008	1
Shijiazhuang	2008	3
Tangshan	2008	4
Xingtai	2008	1
Zhangjiakou	2008	3
Zhumadian	2008	1
Quanzhou	2008	1
Fuzhou	2008	1
Wuhan	2008	2
Beijing	2008	2
Ma'anshan	2008	1
Jinan	2008	1

This table lists the number of contaminated firms found in the three rounds of quality inspections conducted by the Chinese government in 2008.

Table B3: Dairy Firms with Melamine-laced Products: Province

province	year	companies
Anhui	2008	1
Beijing	2008	2
Fujian	2008	3
Guangdong	2008	6
Hebei	2008	11
Heilongjiang	2008	2
Henan	2008	1
Hubei	2008	2
Hunan	2008	3
Inner Mongolia	2008	6
Shaanxi	2008	2
Shandong	2008	5
Shanghai	2008	3
Shanxi	2008	2
Tianjin	2008	2

This table lists the number of contaminated firms found in the three rounds of quality inspections conducted by the Chinese government in 2008.

Figure A6: China's Dairy Products Import Source Countries

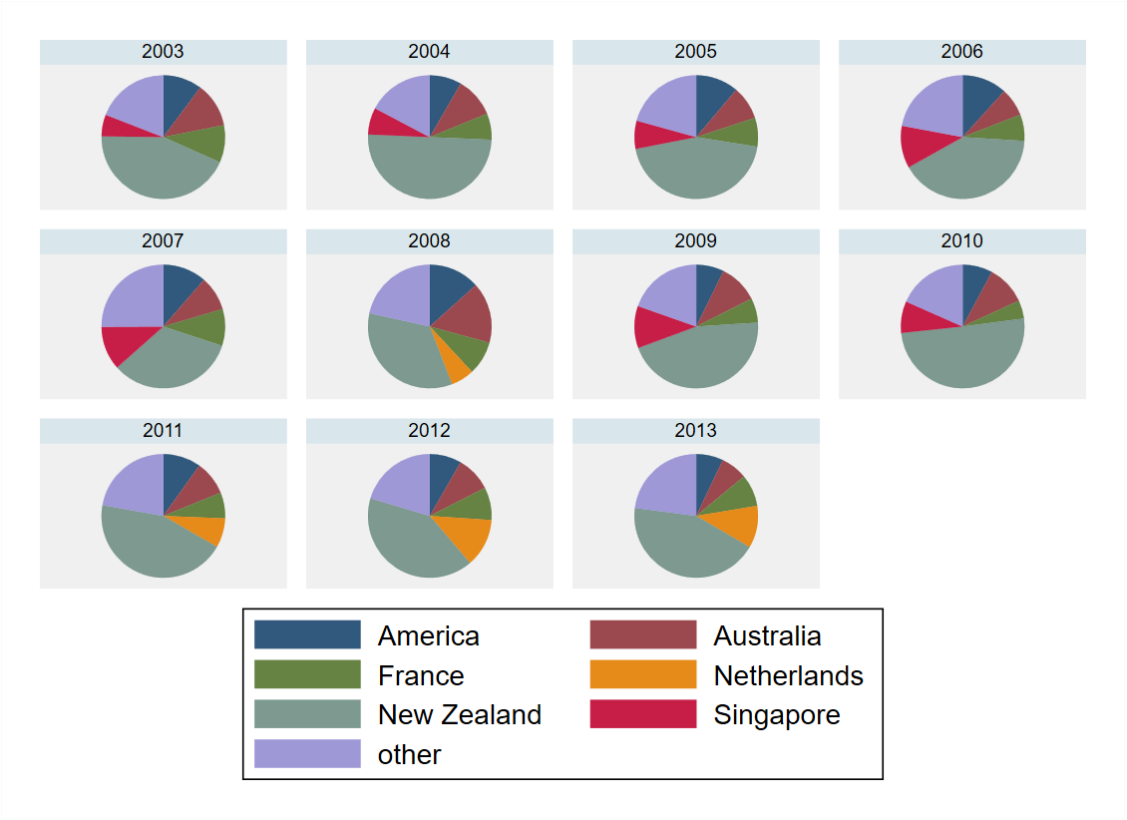

Figure A6 plots the top six source countries and their proportion of China's imported dairy products.

Table B4: Consumption Goods and Intermediate Goods

	Consumption goods			Intermediate goods		
	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log(Price)
Post*Dairy	0.691***	0.762***	-0.0713	0.503**	0.420**	0.0833
	(0.194)	(0.237)	(0.0550)	(0.210)	(0.218)	(0.0510)
R-squared	0.470	0.554	0.623	0.471	0.554	0.623
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,885,837	1,885,837	1,885,837	1,883,989	1,883,989	1,883,989

This table shows the reaction of Consumption goods and intermediate goods. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-6 at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. Columns 1-3 are the regression results of the subsample of Consumption goods, and columns 4-6 are the regression results of the subsample of intermediate goods. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B5: Heterogeneity of Domestic and Foreign Firms

	Firms without Foreign Capital			Firms with Foreign Capital		
	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log(Price)
Post*Dairy	0.606***	0.691***	-0.0850*	0.846***	0.759***	0.0869
	(0.154)	(0.173)	(0.0481)	(0.205)	(0.248)	(0.0546)
R-squared	0.446	0.560	0.630	0.449	0.529	0.606
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,080,493	1,080,493	1,080,493	1,517,755	1,517,755	1,517,755

This table shows the reaction of domestic and foreign enterprises to the impact of the scandal. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-6 at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. Columns 1-3 are the regression results of the subsample of domestic enterprises, and columns 4-6 are the regression results of the subsample of foreign enterprises. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B6: Placebo Tests on Pre-scandal Parallel Trends

Panel A: Import-Value				
	(1)	(2)	(3)	(4)
	2004	2005	2006	2007
	log(Value)	log(Value)	log(Value)	log(Value)
Post*Placebo	-0.110	-0.0233	-0.0600	0.0552
	(0.208)	(0.199)	(0.181)	(0.219)
R-squared	0.459	0.459	0.459	0.459
Panel B: Import-Quantity				
	(1)	(2)	(3)	(4)
	2004	2005	2006	2007
	log(Quantity)	log(Quantity)	log(Quantity)	Log(Quantitye)
Post*Placebo	-0.175	-0.146	-0.163	-0.0790
	(0.238)	(0.229)	(0.217)	(0.235)
R-squared	0.552	0.552	0.552	0.552
Panel C: Import-Price				
	(1)	(2)	(3)	(4)
	2004	2005	2006	2007
	log(Price)	log(Price)	log(Price)	Log(Price)
Post*Placebo	0.0651	0.123	0.103	0.134
	(0.0795)	(0.0877)	(0.0921)	(0.0841)
R-squared	0.629	0.629	0.629	0.629
City	YES	YES	YES	YES
Year	YES	YES	YES	YES
Product	YES	YES	YES	YES
City-year	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES
Observations	773,838	773,838	773,838	773,838

This table shows the results of parallel pre-trend estimations. The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1, 2 and 3 are the natural logarithm of import value, the natural logarithm of import quantity, and the natural logarithm of unit prices of imported products at the city level, respectively. The Post*Placebo is the interaction terms of dairy products and year dummy. In columns 1-4, the placebo variable indicates whether it belongs to 2004/2005/2006/2007 and later years. Standard errors are two-way clustered at the product (HS six-digit) and province-year level. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Table B7: Robustness Check of the Product-City-Year Level Analysis: Elimination of Other Baby Products

	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	0.647***	0.648***	-0.000956	0.647***	0.648***	-0.000950
	(0.150)	(0.174)	(0.0410)	(0.150)	(0.174)	(0.0413)
Post*Other				0.504***	0.254	0.250
				(0.148)	(0.190)	(0.102)
R-squared	0.470	0.554	0.623	0.470	0.554	0.623
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,884,479	1,884,479	1,884,479	1,888,011	1,888,011	1,888,011

This table examines the impact of the endogenous of the other baby products on the basic regression. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We create a balanced panel at city-product (HS six-digit) and year level for outcomes in Column 1-6. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Columns 1-3 do not include other baby products; Columns 4-6 include all products, but Post*Other is added.The Post*Othert is the interaction terms of the other baby products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B8: The Control Group Only Includes the Food Industry

	(1) log(Value)	(2) log(Quantity)	(3) log(Price)
Post*Dairy	0.546***	0.592***	-0.0458
	(0.176)	(0.210)	(0.0515)
R-squared	0.460	0.486	0.534
City	YES	YES	YES
Year	YES	YES	YES
Product	YES	YES	YES
City-year	YES	YES	YES
Industry-year	YES	YES	YES
Observations	78,183	78,183	78,183

This table shows the decomposition of the impact of the scandal on dairy imports using regression results for equation (1). The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013), and the control group only includes the food industry. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1, 2 and 3 are the natural logarithm of import value, the natural logarithm of import quantity, and the natural logarithm of unit prices of imported products at the city level, respectively. The Post*Dairy is the interaction term of dairy products and post-scandal indicator. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B9: Robustness Check of the Product-City-Year Level Analysis: Removal of Products with Spikes of Growth Prior to the Scandal

Panel A: Import Value			
	(1)	(2)	(3)
	Cut off 1%	Cut off 5%	Cut off 10%
	log(Value)	log(Value)	log(Value)
Post*Dairy	0.650***	0.663***	0.638***
	(0.150)	(0.150)	(0.149)
R-squared	0.470	0.472	0.475
Panel B: Import Quantity			
	(1)	(2)	(3)
	Cut off 1%	Cut off 5%	Cut off 10%
	log(Quantity)	log(Quantity)	log(Quantity)
Post*Dairy	0.652***	0.675***	0.646***
	(0.174)	(0.175)	(0.174)
R-squared	0.554	0.555	0.557
Panel C: Import price			
	(1)	(2)	(3)
	Cut off 1%	Cut off 5%	Cut off 10%
	log(Price)	log(Price)	log(Price)
Post*Dairy	-0.00148	-0.0119	-0.00845
	(0.0414)	(0.0416)	(0.0419)
R-squared	0.623	0.623	0.622
City	YES	YES	YES
Year	YES	YES	YES
Product	YES	YES	YES
City-year	YES	YES	YES
Industry-year	YES	YES	YES
Observations	1,886,314	1,868,364	1,827,418

This table shows the decomposition of the impact of the scandal on dairy imports using regression results for equation (1). The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The main specification in each column includes year, province, product, city-year, and industry-year fixed effects. The dependent variables in panel A, B, and C are the natural logarithm of import value, the natural logarithm of import quantity, and the natural logarithm of unit prices of imported products at the city level, respectively. Columns 1, 2 and 3 have censorized the sample by 1%, 5%, and 10%, respectively, according to the average growth rate of product imports in 2003-2007 based on the HS six-digit product codes. The Post*Dairy is the interaction term of dairy products and post-scandal indicator. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B10: Robustness Check of the Product-City-Year Level Analysis: Domestic Dairy Outputs

	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log(Price)
Post*Dairy	0.646***	0.646***	0.000189	0.635***	0.625***	0.00995
	(0.149)	(0.175)	(0.0411)	(0.156)	(0.181)	(0.0414)
China-Supply				-0.0465**	-0.0517**	0.00524
				(0.0219)	(0.0267)	(0.0159)
R-squared	0.459	0.545	0.614	0.465	0.548	0.616
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	1,888,064	1,888,064	1,888,064	1,754,402	1,754,402	1,754,402

This table examines the impact of the potential world dairy supply pattern on the basic regression using a different specification from Table 3.The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We create a balanced panel at city-product (HS six-digit) and year level for outcomes in Column 1-6. The baseline specification in each Column includes year, city, product fixed effects,and includes industry-specific linear time trends. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Relative to columns 1-3, columns 4-6 add The Chinese dairy supply as the control variable. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B11: Robustness Check of the Product-City-Year Level Analysis: Global Dairy Outputs

	(1)	(2)	(3)	(4)	(5)	(6)
	log(Value)	log(Quantity)	log(Price)	log(Value)	log(Quantity)	log(Price)
Post*Dairy	1.185***	0.753***	0.432***	0.731***	0.686***	0.0450
	(0.155)	(0.184)	(0.0481)	(0.150)	(0.184)	(0.0480)
Globe-Supply				4.650***	0.685***	3.965***
				(0.195)	(0.208)	(0.106)
R-squared	0.448	0.542	0.598	0.456	0.542	0.610
Product	YES	YES	YES	YES	YES	YES
City	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES
Observations	1,795,456	1,795,456	1,795,456	1,888,064	1,888,064	1,888,064

This table examines the impact of the potential world dairy supply pattern on the basic regression using a different specification from Table 3. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We create a balanced panel at city-product (HS six-digit) and year level for outcomes in Column 1-6. The baseline specification in each Column only includes city, product, industry fixed effects. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Relative to columns 1-3, columns 4-6 add The world dairy supply as the control variable. Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B12: Placebo Tests of Firm Distacne on Pre-scandal Parallel Trends

Panel A: Import-Value				
	(1)	(2)	(3)	(4)
	2004	2005	2006	2007
	log(Value)	log(Value)	log(Value)	log(Value)
Post*Placebo*Firm	-0.0284	0.0365	-0.00459	0.119
	(0.215)	(0.207)	(0.190)	(0.225)
R-squared	0.464	0.464	0.464	0.464
Panel B: Import-Quantity				
	(1)	(2)	(3)	(4)
	2004	2005	2006	2007
	log(Quantity)	log(Quantity)	log(Quantity)	Log(Quantitye)
Post*Placebo*Firm	-0.0929	-0.0697	-0.0856	0.0165
	(0.256)	(0.243)	(0.230)	(0.237)
R-squared	0.553	0.553	0.553	0.553
Panel C: Import-Price				
	(1)	(2)	(3)	(4)
	2004	2005	2006	2007
	log(Price)	log(Price)	log(Price)	Log(Price)
Post*Placebo*Firm	0.0645	0.106	0.0810	0.102
	(0.0873)	(0.0934)	(0.0990)	(0.0856)
R-squared	0.630	0.630	0.630	0.630
City	YES	YES	YES	YES
Year	YES	YES	YES	YES
Product	YES	YES	YES	YES
City-year	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES
Observations	741,945	741,945	741,945	741,945

This table shows parallel trends considering the distance from cities to polluting enterprises. The sample includes the import data of dairy and non-dairy products at the product-city-year-level in the China Customs database (2003-2013). The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. The dependent variables in columns 1, 2 and 3 are the natural logarithm of import value, the natural logarithm of import quantity, and the natural logarithm of unit prices of imported products at the city level, respectively. The Post*Placebo*Firm is the interaction terms of Post*Dairy and weight of distance to contaminated dairy companies. In columns 1-4, the placebo variable indicates whether it belongs to 2004/2005/2006/2007 and later years. Standard errors are two-way clustered at the product (HS six-digit) and province-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B13: Consumption Goods and Intermediate Goods: 2003-2020

	Consumption goods			Intermediate goods		
	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	1.020***	0.901***	0.119**	0.322	0.196	0.126
	(0.258)	(0.281)	(0.0558)	(0.236)	(0.224)	(0.119)
R-squared	0.857	0.872	0.909	0.857	0.872	0.909
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES
Observations	74,648	74,648	74,648	74,396	74,396	74,396

This table shows the reaction of Consumption goods and intermediate goods. The sample data includes import trade data at the six digit code level of CPEII BACI from 2003 to 2020. We have created a balanced group for the results in columns 1-6 at the country product (HS six-digit) and year levels. The main specification in each column includes year, product, and industry-year fixed effects. Columns 1-3 are the regression results of the subsample of Consumption goods, and columns 4-6 are the regression results of the subsample of intermediate goods. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the HS country level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the country level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the country level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2020). Standard Error Clustering to HS six-digit Level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B14: Differences In the Impact of Scandals: Infant or Non Infant Milk Powder Group

	Infant			Non-Infant		
	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy*Firm	1.029***	1.053***	-0.0241	0.630***	0.610***	0.0196
	(0.0892)	(0.108)	(0)	(0.159)	(0.185)	(0.0441)
R-squared	0.475	0.556	0.625	0.475	0.556	0.625
Observations	1,787,048	1,787,048	1,787,048	1,791,819	1,791,819	1,791,819
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES

This table shows the regression results for the infant milk powder and non infant milk powder groups. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-6 at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. Columns 1-3 are the regression results of the subsample of the infant milk powder, and columns 4-6 are the regression results of the subsample of the non infant milk powder. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy*Firm is the interaction terms of Post*Dairy and weight of distance to contaminated dairy companies (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure A7: Random Trial Results: Randomized Province Distance

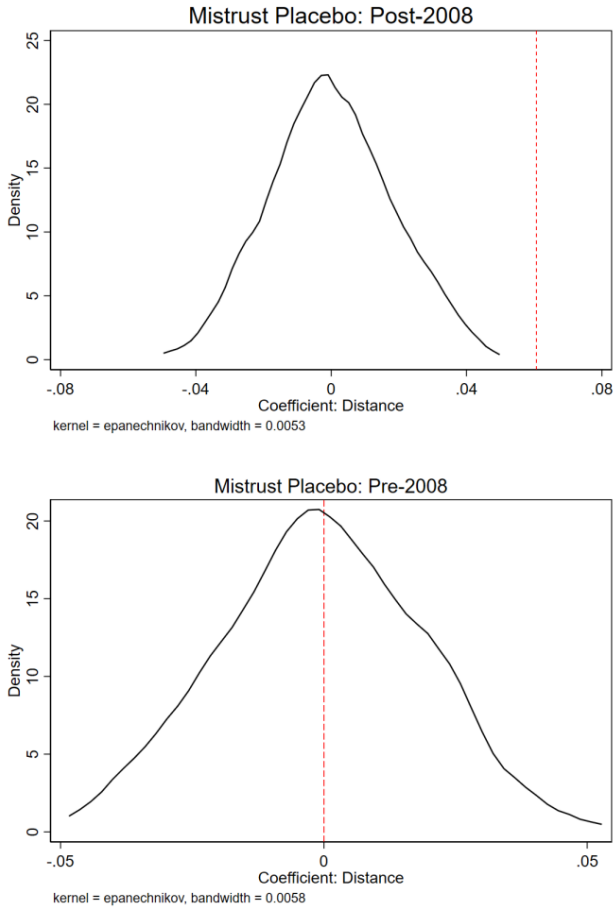

Figure A7 plots the kernel density plot of the Distance coefficient distribution of mistrust regression results after randomly assigning province distance.

Figure A8: The Prices of Imported and Exported Dairy Products in China

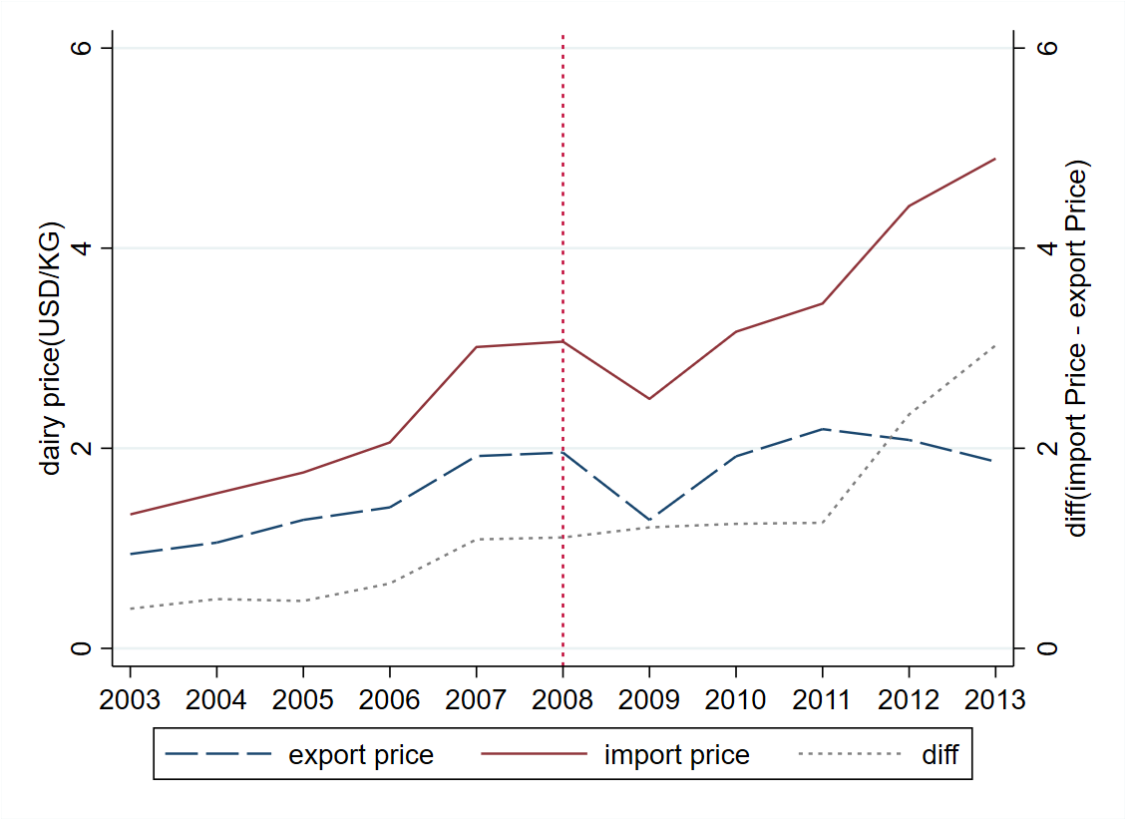

Figure A8 plots the price trends of China's dairy imports and exports from 2003 to 2013. The solid line represents the import price, the long dashed line represents the export price, and the dotted line represents the difference between the import price and the export price.

Figure A9: Resident Welfare Losses: Based on Customs Database

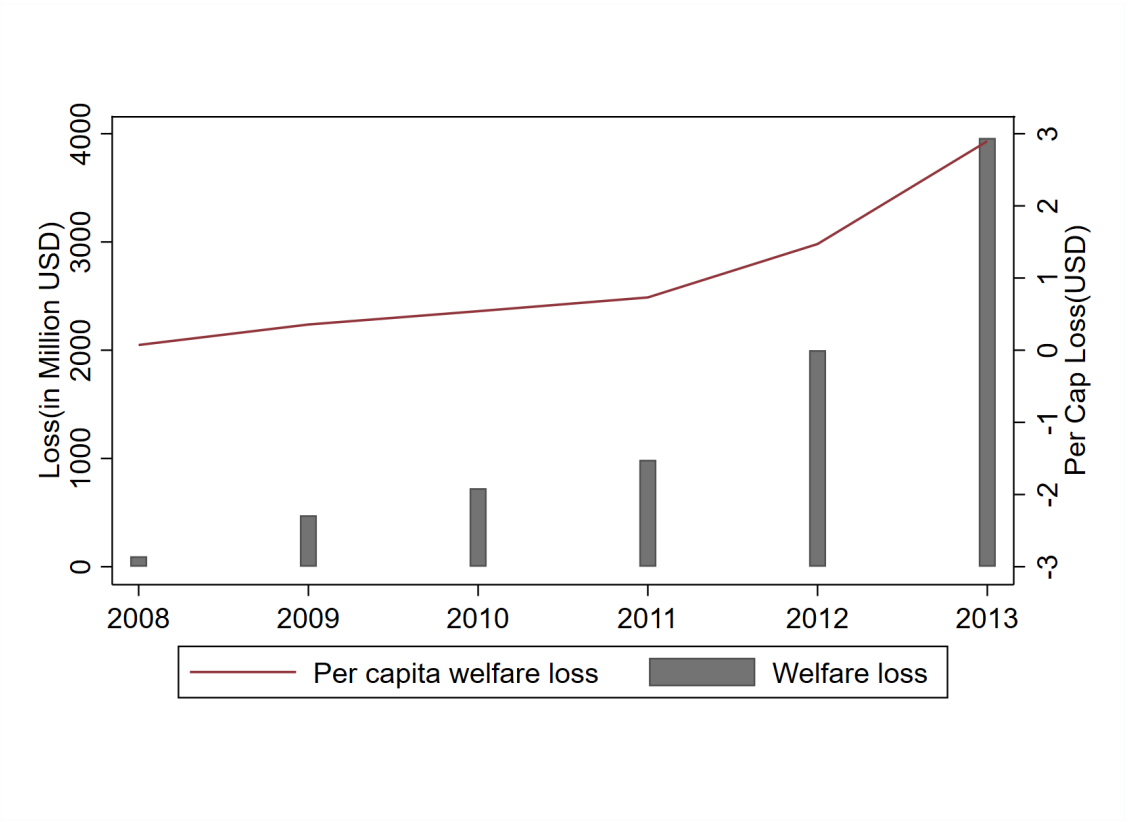

Figure A9 plots the welfare losses of Chinese residents in dairy consumption caused by the melamine incident, based on customs data. The bar chart represents the total loss of Chinese residents over the years, and the line chart chart represents the loss of per capita welfare in China over the years.

Figure A10: Resident Welfare Losses: Based on Synthetic Control

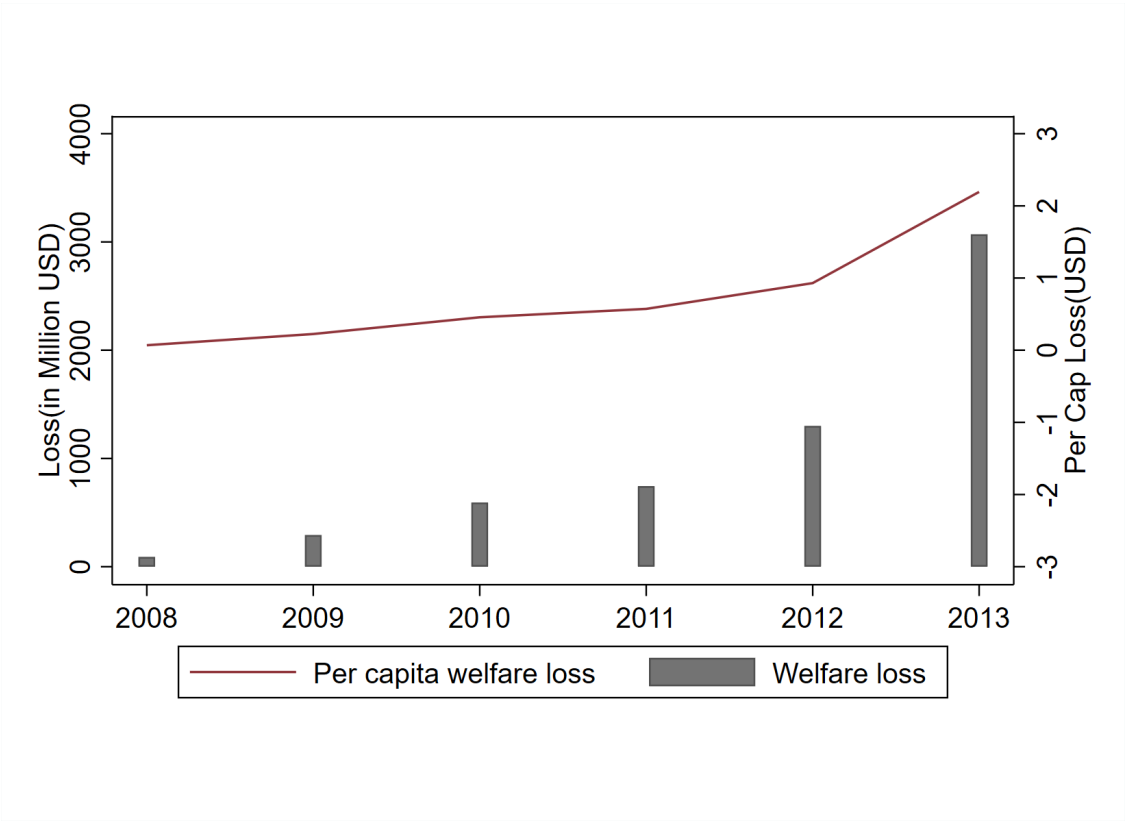

Figure A10 plots the welfare losses of Chinese residents in dairy consumption caused by the melamine incident, based on synthetic control. The bar chart represents the total loss of Chinese residents over the years, and the line chart chart represents the loss of per capita welfare in China over the years.

Figure A11: Resident Welfare Losses: Based on Baci Cepii Database

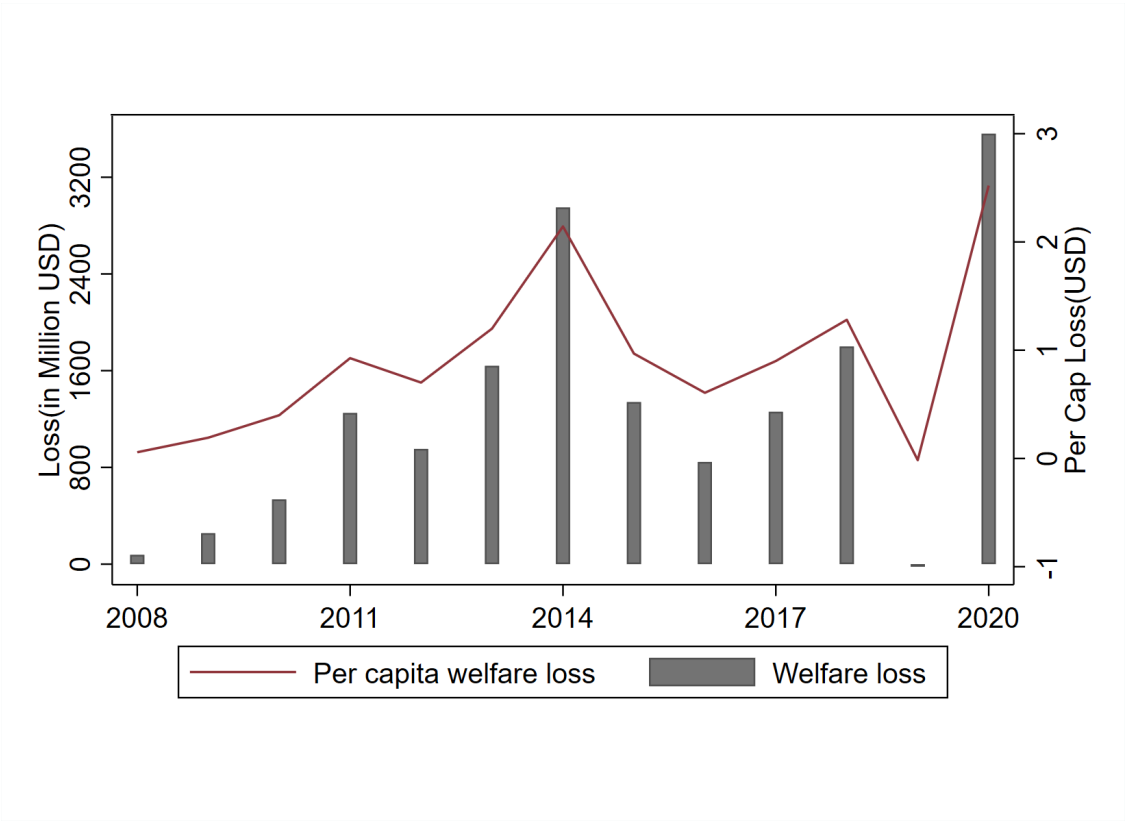

Figure A11 plots the welfare losses of Chinese residents in dairy consumption caused by the melamine incident, based on Baci Cepii Database. The bar chart represents the total loss of Chinese residents over the years, and the line chart chart represents the loss of per capita welfare in China over the years.

Figure A12: Event Study Graph: China's Dairy Consumption and Imports(2003-2020)

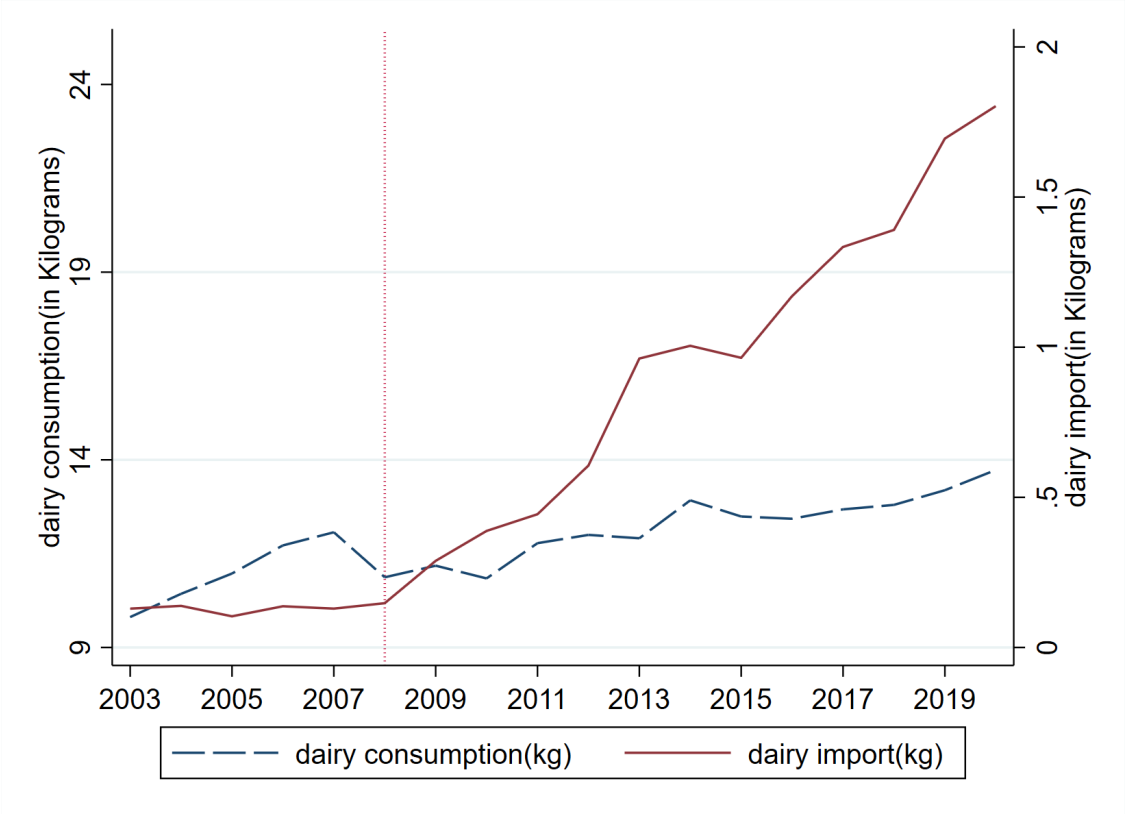

Figure A12 plots the per capita consumption and import of dairy products in China from 2003 to 2020. The vertical dotted line indicates 2008, the year before the scandal.

Table B15: The Processing Group of Infant or Non Infant Milk Powder

	Infant			Non-Infant		
	(1) log(Value)	(2) log(Quantity)	(3) log(Price)	(4) log(Value)	(5) log(Quantity)	(6) log(Price)
Post*Dairy	1.043***	1.132***	-0.0886	0.629***	0.627***	0.00271
	(0.0884)	(0.106)	(0)	(0.153)	(0.178)	(0.0425)
R-squared	0.470	0.554	0.623	0.470	0.554	0.623
Observations	1,882,693	1,882,693	1,882,693	1,887,696	1,887,696	1,887,696
City	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Product	YES	YES	YES	YES	YES	YES
City-year	YES	YES	YES	YES	YES	YES
Industry-year	YES	YES	YES	YES	YES	YES

This table shows the regression results for the infant milk powder and non infant milk powder groups. The sample includes the import data of dairy products at the city level in the China Customs database (2002-2013). We have created a balanced group for the results in columns 1-6 at the city product (HS six-digit) and year levels. The main specification in each column includes year, city, product, city-year, and industry-year fixed effects. Columns 1-3 are the regression results of the subsample of the infant milk powder, and columns 4-6 are the regression results of the subsample of the non infant milk powder. The dependent variables in columns 1 and 4 are the natural logarithm of import value at the city level. The dependent variables in columns 2 and 5 are the natural logarithm of import quantity at the city level. The dependent variables in columns 3 and 6 are the natural logarithm of unit prices of imported products at the city level. The Post*Dairy is the interaction terms of dairy products and post-scandal (2008-2013). Standard errors are two-way clustered at the product (HS six-digit) and city-year level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Synthetic Control Analysis

To further control the effects of confounders changing over time, we use a synthetic control method to construct a weighted combination of control units, non-dairy industries, that closely matches the time series of the dairy imports in the pre-period (Abadie et al., 2010). We estimate the impacts of the scandal as the difference between the value of dairy imports and the synthetic unit before and after the scandalSpecifically, we summarized the dairy product imports to the year-HS 2-digit code level to facilitate the use of the average value of the dairy industry in 2003-2007 and the tariff as the covariates. Specifically, 20 of the 24 HS6-digit dairy products belong to the HS 2-digit code "04" category, and only four belong to other HS 2-digit code categories. 83% of the HS 2-digit code "04" category are dairy products. Therefore, this paper deletes the import data of non-dairy products in the HS 2-digit code "04" category and summarizes the import of dairy products to the HS 2-digit code level. Then use the average value of the dairy industry from 2003 to 2007 and the tariff as the covariate to predict the composite control unit. The proportion of value consolation passing rate is 5/70, less than p=0.7, and the proportion of quantity placebo is 5/70, less than p=0.7, indicating that there is a significant difference between the two treatment groups and the synthetic control group. The price comfort regression was the same as the composite control analysis, and there was no significant difference between the treatment group and the composite control group.

Figure C1: Synthetic Control Analysis: Dairy Imports

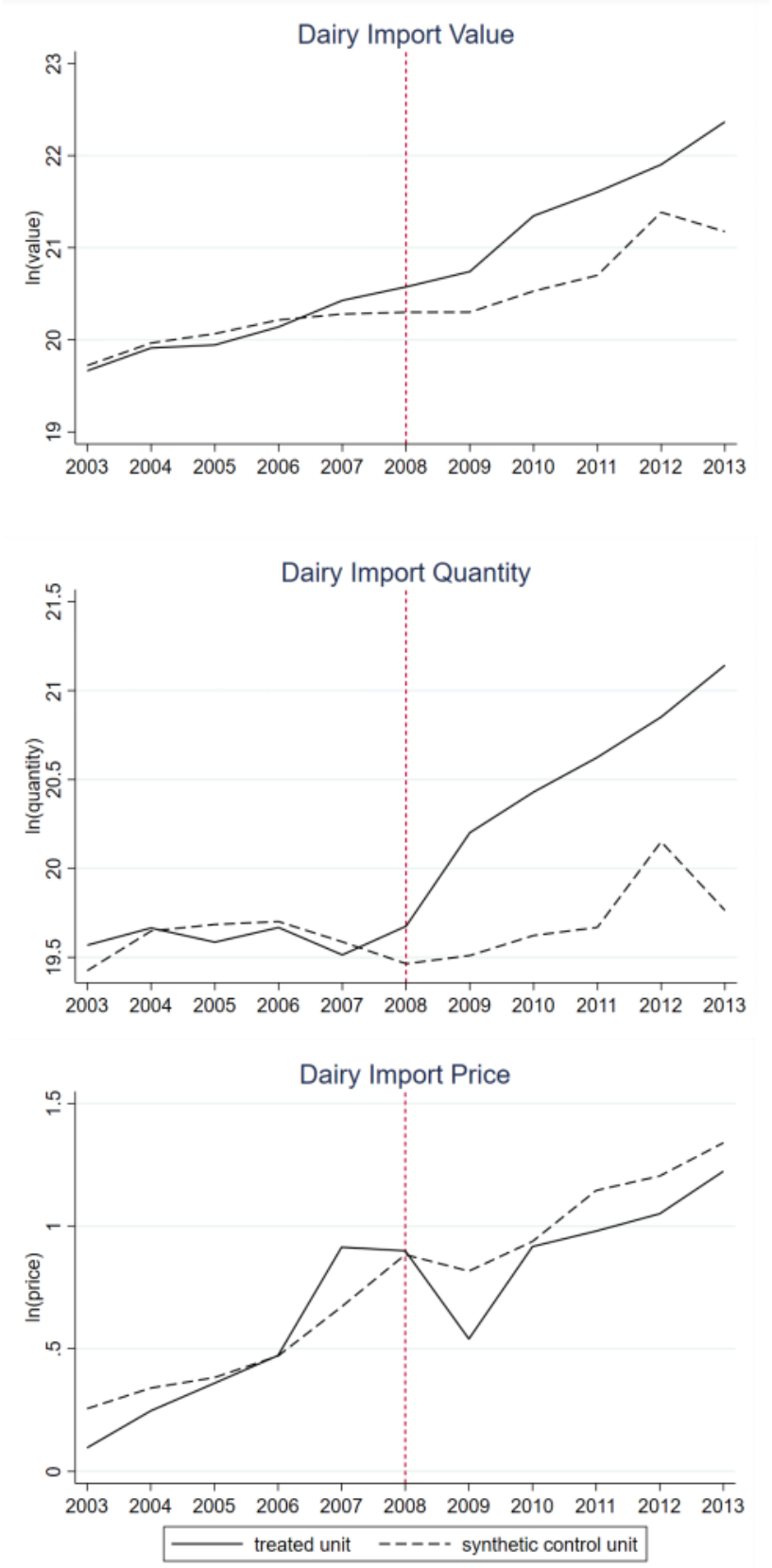

Figure C1 plots the natural logarithm of the value,quantity and price of imports for the Chinese dairy industry (solid line) and the synthetic control unit (dashed line). The vertical dotted line indicates year 2008, the first year of the scandal.

Figure C2: Difference: Treated and Synthetic Control

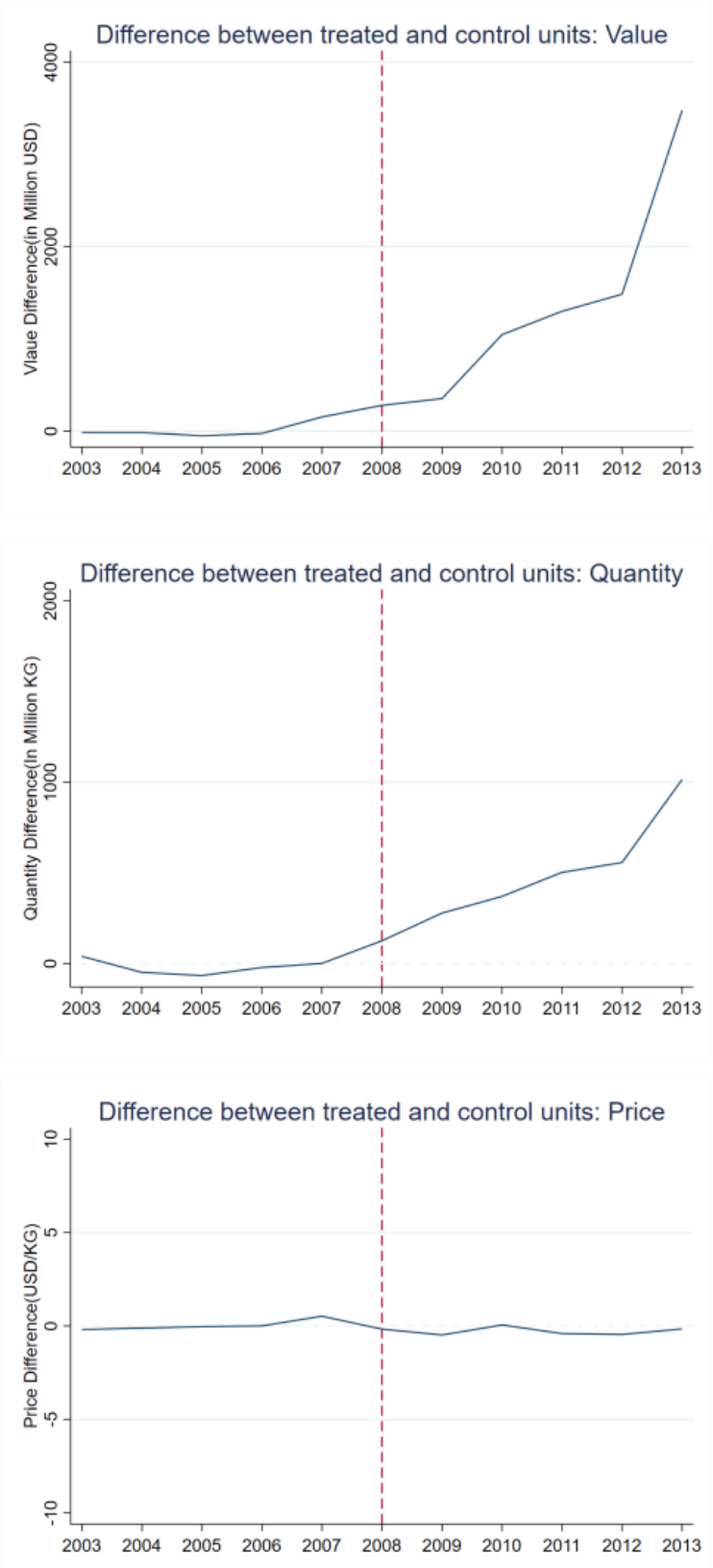

Figure C2 depicts the difference between the actual import of dairy products and the virtual data generated by synthetic control. This includes the difference in import amount, import quantity, and import unit price.

Figure C3: Synthetic Control Analysis: Dairy Imports, Placebo

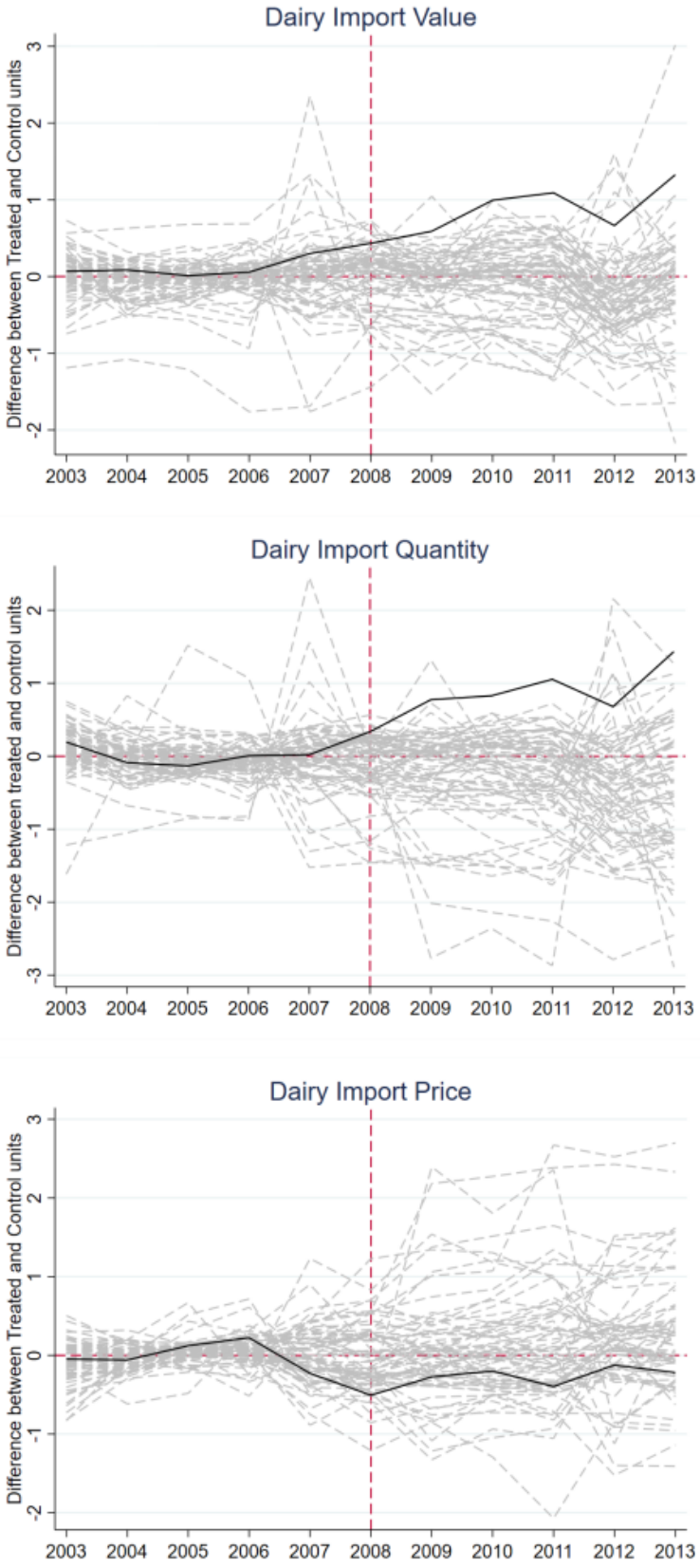

Figure C3 depicts the difference between dairy products and their respective comprehensive control units in terms of import value' logarithm, import quantity' logarithm and import price' logarithm. The black line indicates China's dairy imports. The vertical red line indicates 2008, the year of the scandal.