Breastfeeding and labor supply of new mothers: evidence from a baby formula hazard realization*

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Abstract

We use a product safety hazard realization in the baby formula market in Israel in 2003 as a plausible natural experiment to study the causal relationship between breastfeeding and new mothers' labor supply. We find that the likelihood of households with new mothers to consume baby formula decreased by about 15 percent, suggesting an increase in breastfeeding. In turn, first-time new mothers delayed their return to work. Specifically, analysis of administrative data covering the universe of births in the country shows that average months worked in the first six months after childbirth fell by about 4 percent. This effect is driven by new mothers from above-median income households. The results indicate that despite developments in technology and policy in recent decades, new mothers still trade off prolonged maternity leaves for the benefits of breastfeeding to their children. Since breastfeeding is a mothers' biological function, in the absence of sufficient consideration by policy makers, this channel of mothers' labor supply decisions may pose a barrier to gender equality.

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1 Introduction

Is breastfeeding a fundamental factor in new mothers' reduced labor supply?[1] The question of the causal relationship between gender roles, specifically, the role mothers play in infant feeding via breastfeeding, and their employment decisions, is key to understanding the relationship between motherhood and women's labor supply. While a vast literature examines women's choices with respect to children and careers,[2] current evidence on the causal relationship between breastfeeding and new mothers' labor supply is scant. Here, we leverage a large product safety hazard realization that occurred in the baby formula market in Israel in 2003 (Hereinafter: the "Remedia Event") to study this question. Our premise is that the Remedia Event caused a downward shift in new mothers' demand for baby formula, thereby increasing the tendency to breastfeed—their only available alternative for baby formula.

In the year 2003, Remedia, an Israeli company that distributed imported baby formula, began offering a new soy based formula, which was manufactured by the German company Humana.[3] In October 2003, several infants were hospitalized with symptoms of apathy and convulsions. The common cause of their illnesses, to be identified only a month later, in November 2003, was consuming the new formula. It was later discovered that the new formula contained insufficient quantity of vitamin B1, an essential vitamin for newborns, causing the death of four infants and various long-term motorial, neurological and cognitive damages to more than sixty others.[4] We use the Remedia Event as a plausibly natural experiment to analyze the causal relationship between new mothers' tendency to breastfeed and their labor supply.

We study the response of new mothers to the Remedia Event in two parts. In the first part, ideally, we would examine whether the Remedia Event led to an increase in the tendency to breastfeed. However, data on breastfeeding in the relevant period is unavailable.[5] Nonetheless, for new mothers, the only substitute to breastfeeding is baby formula. Therefore, we use data from the Israeli Household Expenditure Survey (or "IHES") in the years 2000-2007 to examine the likelihood to consume baby formula by households with

[1] A new mother is a woman who has recently given birth.

[2] Recent contributions, highlighting the life cycle career cost of children, include Bertrand et al. (2010), Adda et al. (2017) and Kleven et al. (2018).

[3] Soy based formula represents roughly 15% of the baby formula market in ages 0-1 and it is typically used for babies with allergies or babies with vegan nutrition. In Israel in 2003, this market segment was about 17,400 babies aged 0-1 out of the 145,000 babies born in 2003.

[4] 2,000-4,000 infants were exposed to the impaired formula to some extent (based on Remedia's market share of 37%, and about 4-7 months the impaired formula was in the market). As infants are typically introduced to solid foods in the age of about 6 months, roughly 1,000-2,000 infants were exclusively fed by the impaired formula, about 3-6% of them were inflicted (more than 60 infants). Over the years, more victims with less severe symptoms, including ADHD and limb pain, were diagnosed, and one more victim died.

[5] We are aware of one exception - two surveys of the Israeli Ministry of Health, in 1999 and in 2009. They provide some suggestive evidence for an increase in breastfeeding between 1999 and 2009.

new mothers. We take a differences-in-differences (or "DD") approach, comparing the likelihood to consume baby formula, the treatment group, with the likelihood to consume of a variety of other products before and after the Remedia Event. Using this approach, we find that the Remedia Event caused a decrease of about 15% in the likelihood of households with new mothers to consume baby formula. We complement this analysis by a synthetic control analysis of the data (Abadie et al. (2010)) and find a very similar effect, alleviating the concerns that the differences-in-differences results are driven by the choice of products in the comparison groups. As we noted, since this is a sample of households with new mothers, we interpret these results as supporting the view that the Remedia Event caused an increase in breastfeeding.

In the second part, we use administrative data from the National Insurance Institute of Israel, Israel's Social security (Hereinafter: "NII"), covering the universe of births in Israel in the period 2001-2004 for households where both spouses are employees. Using these data, we examine whether because of the Remedia Event new mothers extended their maternity leaves. We study first-time new mothers separately from experienced mothers—mothers with older children—because, as we explain below, we expect that the labor supply consequences of the Remedia Event would be stronger among first-time new mothers.

In order to draw causal inference, we compare the return to work decisions of new mothers that gave birth in the periods just before and just after the Remedia Event: November 03 - April 04 versus May 03 - October 03 and in the respective periods in the prior year, namely, November 02 - April 03 versus May 02 - October 02. We find that starting from the third month after childbirth, around which the mandatory maternity leave period ends along with the end of the eligibility period for maternity allowance, the Remedia Event decreased the likelihood to return to work among first-time new mothers. This effect gradually becomes small and it disappears by the ninth month after childbirth, when exclusive breastfeeding rates approach zero. Overall, the Remedia Event decreased the average of months worked within six and twelve months of childbirth by about 4 percent (0.08 months) and 2.2 percents (0.15 months), respectively. These results show that first-time new mothers responded to the Remedia Event by delaying their return to work after childbirth.

Next, we split the sample by household income to women from households with above- and below-median income. We find that the response is concentrated among new mothers from above-median income households. Within six and twelve months of childbirth, new mothers from households with above-median income work on average 7.6 (0.16 months) and 3.5 (0.25 months) percent less than they would have had the Remedia Event not occurred, respectively. The effect for mothers from households with below-median income is small and statistically insignificant.

A possible threat to our identification strategy is that labor market policy changes that occurred around the time of the Remedia Event, may have contributed to the trend break in maternity leaves around the Remedia Event. We are aware of two policy changes that took place in that period and could potentially have an effect on maternity leaves: one is a reduction in income guarantee allowance—a welfare payment typically made for individuals who are not in the labor force—and another is a gradual cut in child allowance that began in June 2003. Our results indicate, however, that the response to the Remedia Event, namely, the extended maternity leaves, was concentrated among first-time mothers from above-median income households. This group was least affected by these policy changes, which targeted low-income households and families with more than two children. Moreover, the goal of these policies was to strengthen the incentives to work, potentially discouraging new mothers from extending their maternity leaves. Hence, the threat that these policy changes pose to our analysis is that our results may be biased downwards, reflecting a lower bound of the actual effect of the Remedia Event on maternity leaves.

This study contributes to the understanding of the relationship between gender roles in child care, specifically infant feeding, and new mothers' employment decisions such as the timing of return to work after childbirth. From a historical perspective Albanesi and Olivetti (2016), relying on the decline over time of baby formula prices around the middle of the twentieth century, show that the diffusion of baby formula played a role in the remarkable increase in mothers' labor force participation between 1920 and 1960 by reducing their exclusivity in infant feeding. More generally, Albanesi and Olivetti (2016)'s study belongs to a strand of the literature suggesting a positive causal link between the declining child-bearing and child-rearing cost and the enormous rise in women's labor force participation in the course of the twentieth century through e.g. the invention and diffusion of the birth control pill, the infant formula and labor-saving household technologies, and advances in medical knowledge and obstetric practices, all alleviating the difficulties of reconciling work and motherhood (see Greenwood et al. (2005), Eckstein and Lifshitz (2011) and Bailey (2006)).

How should our results be interpreted in this context? It is often argued that, despite the technological improvement in infant feeding and the enormous rise in women's labor force participation in recent decades, work environment in both policy and structure, is still not supportive of women who wish to breastfeed.[6] However, we are unaware of any study that documents the causal relationship between breastfeeding and new mothers' labor supply.[7] Our results leverage the tragic and unique circumstances of the Remedia Event to show that breastfeeding decreases first-time new mothers' labor supply via

[6]Barriers to breastfeeding at the workplace include lack of nearby child care, rigid time schedules that do not allow for nursing breaks, lack of a location providing privacy for breast-pumping, and no facilities for refrigeration of pumped breastmilk (see Johnston and Esposito (2007) and AAP (1982)).

[7]For existing work on the association between return to work of new mothers and breastfeeding see Chatterji and Frick (2005) and Ryan et al. (2006).

prolonged maternity leaves.[8]

Establishing the link between breastfeeding and work is particularly important in light of the growing literature on the benefits of breastfeeding to the health, cognitive and non-cognitive skills of children.[9] Moreover, breastfeeding is a mothers' biological function, and as such, may pose a barrier to gender equality. Our results show that despite the changes in technology and policy, new mothers still trade off prolonged maternity leaves for the benefits of breastfeeding to their children. Recognizing this channel of mothers' labor supply decisions has important policy implications. For example, implementing policies that equalize fathers' rights for parental leave may fail to encourage mothers to return to work in the short run after childbirth if not accompanied by policies that are aimed to facilitate reconciling breastfeeding and work such as breastfeeding-friendly workplaces, child care at work, flexibility of working hours and work from home.

The analysis of the Remedia Event may also contribute to the understanding of the consequences of realizations of product safety hazards. Safety hazard realizations, often resulting in product recalls, in a wide array of industries, are increasingly common and appear to be an important factor in shaping the public's perception of product safety.[10] Early work on product recalls has focused on measuring potential losses to firm owners beyond the direct costs associated with destroying or repairing the defective goods (see Jarrell and Peltzman (1985); Hoffer et al. (1988)). More recently, Liu and Shankar (2015) find that in the car industry, product recalls affect brand preferences. In the context of the toy industry, Freedman et al. (2012) find a thirty percent industry-wide reduction in sales following a series of recalls. Ater and Yosef (2018) show that Volkswagen's emissions scandal caused a decrease in the number of used Volkswagen vehicles transactions and a decrease in the resale price of Volkswagen vehicles.

Several recent studies have examined the effects of food and health "scares". Anderberg et al. (2011) analyze the implications of an article in the British Medical Journal that mentioned possible serious side effects of a certain children's vaccination (MMR). They find that vaccination rates dropped by 10 percent, and did not fully recover even after the article was proven false-alarm. Schlenker and Villas-Boas (2009) and Adda (2007) report a drop in the demand for meat after the "mad-cow" crisis in the United States in the year 2003, and Chambers and Melkonyan (2013), find similar results in the UK. Studying the "mad-cow" crisis in France in 2000, Ferrer et al. (2016) develop a full demand model for the affected commodity and its substitutes and use it to recover consumers' preferences.

[8]For recent evidence on the consequences of prolonged maternity leaves, see e.g. Ruhm (1998), Schönberg and Ludsteck (2014) and Lalive et al. (2013).

[9]See e.g. Fitzsimons and Vera-Hernández (2014), Borra et al. (2012), Rothstein (2013) and Belfield and Kelly (2012).

[10]In the US, Johnson & Johnson's Tylenol crisis in 1982, Ford's (Bridgestone) tire failure in 2000 and the peanut butter related Salmonella Outbreak in 2009, are notable examples. In China, the 2008 "Melamine Incident" or Chinese milk scandal is another well known example (see Gossner et al. (2009)).

The foregoing study is the first, to the best of our knowledge, to examine the consequences of a realization of a product safety hazard through its interaction with the labor market. While the context we study is quite specific, the lesson to be learned is general: interactions with other markets, particularly the labor market, may represent a significant part of the overall economic consequences of safety hazard realizations. Namely, realizations of product safety hazards can cause an economy-wide "ripple effect" that arises through consumers' avoidance behavior and impacts other markets.

The remainder of the paper is structured as follows. Section 2 provides some background about the circumstances surrounding the Remedia Event and the baby formula market. In section 3 we analyze the impact of the Remedia Event on the likelihood of households with new mothers to consume baby formula. In section 4 we present the evidence on the impact of the Remedia Event on first-time new mothers' return to work after childbirth. Section 5 concludes.

2 Background

The baby formula market in Israel has been quite concentrated in the past few decades. Until 1999, Materna, a baby formula company that manufactures in Israel, had a market share of more than 50% of the baby formula market in the country. Consequently, Materna was declared a monopoly and the government implemented price control in the baby formula market. In that period there were two other main players in the baby formula market, Similac, a subsidiary of the international brand Promedico, and Remedia, an Israeli company, partly owned by Heinz, that distributed imported baby formula. By 1999, the market shares of the two smaller companies increased at the expense of Materna's market share. As a result, the price control was gradually removed until it was dropped completely in the beginning of 2001. In 2003, before the Remedia Event, Materna held 37% of the market, Remedia held 37% and Similac held 26%.[11]

The Remedia Event received considerable media coverage and public attention and resulted in civil and criminal proceedings of involved parties.[12] Figure 1 shows the stock price of Maabarot Ltd., Materna's mother company, around the Remedia Event. The figure shows that the value of the Maabarot stock increased by over 150% immediately after the Remedia Event. This figure illustrates that the Remedia Event was a very visible

[11]Information on annual market shares comes from the rating report summary of Maabarot products Ltd (2004), Materna's mother company which is a public company.

[12]In the criminal process Remedia chief technology officer was convicted of wrongful death and was sentenced to 15 months in prison. In the civil process, the company and the victims' families reached a financial settlement. Officials in the Israeli Health Ministry were sentenced to public service. In Germany, Humana officials were fired and the company was fined by the German authorities.

event in the baby formula market. Indeed, in December 2003, a month after the Remedia Event unraveled, Remedia's share in the baby formula market fell drastically from 37% to 5-7%, and effectively declined to zero by the end of 2005.

In order to show how baby formula prices behaved around the Remedia Event, we obtained from Israel's Central Bureau of Statistics (hereinafter: "CBS"), monthly store-level baby formula prices from a representative sample of 61 stores across the country.[13] Figure 2 depicts the log of the monthly average of (nominal) baby formula prices in the period 2000-2007.[14] Using a second vertical axis, we juxtapose the log price index of milk products in the country in the same period to provide a counter factual. In 2000-2001, the period of the gradual removal of the government price control in the baby formula market, prices of baby formula rose steadily relative to the milk products price index. Prices rose from about 32 NIS per unit in 2000 to roughly 34 NIS in the first months of of 2002. During 2002 and the first 10 months of 2003, prices stabilized and their level exhibited a similar trend to that of the milk products price index. At the end of 2003, just after the Remedia Event, there was an apparent sharp drop in baby formula prices. In the months subsequent to the Remedia Event, prices appear to remain at a low level relative to the milk products price index. Only towards the middle of 2006 price levels of baby formula return to their original levels prior to the Remedia Event.

To illustrate the effect of the Remedia Event on sales of baby formula we obtained data from Israel's antitrust authority on monthly units sold of Remedia's two competitors, Materna and Similac in the period 2003-2007.[15] We combine these data with the annual market shares of these companies to infer the quantities that were sold in the baby formula market around the Remedia Event.[16] Figure 3 summarizes this exercise. The figure shows the quarterly number of units (in thousands) of baby formula sold by the two companies. The vertical red line, located between the third and fourth quarter of 2003, indicates the timing of the Remedia Event. The horizontal dashed blue line approximates the average number of units (in thousands) sold in the entire baby formula market in the first three quarters of 2003. This number was calculated as the average of the actual quarterly number of units sold by Materna and Similac divided by their market share in 2003, which was 63%. The horizontal red dashed line represents the average number of units sold in the market in the first three quarters of each year in the period 2004-2006.[17] The

[13] CBS collects these data for internal use including the preparation of price indexes. CBS employees typically visit the same stores across the country and record prices of various products, including baby formula on a monthly basis.

[14] We use a simple average while the CBS typically assigns different weights to the observations in the preparation of price indexes.

[15] These data were collected by the antitrust authority as part of an examination of Materna's merger with Osem—a large public company in the Israeli food sector—in 2008.

[16] Information on annual market shares comes from the rating report summary of Maabarot products Ltd (2004), Materna's mother company which is a public company.

[17] We exclude the fourth quarter of each year to create a correspondence with the pre-Remedia Event period average and to account for the apparent seasonality in the number of unit sold in each quarter.

figure shows that the quantities sold by the two companies rose immediately after the Remedia Event by roughly 50%. This is consistent with the fact that Remedia's sales dropped to nearly nothing after the Remedia Event. However, the figure illustrates that in the periods after the Remedia Event, the total number of units sold in the baby formula market, which were the sum of units sold by the two remaining companies, decreased by about 15% relative to period before the Remedia Event, from roughly 3,200 to 2,700 units. This impression is consistent with the premise of this study. Namely, that the Remedia Event caused a downward shift in the demand for baby formula. In the next section we further investigate this issue.

3 The impact of the Remedia Event on the likelihood to consume baby formula

Ideally, we would like to evaluate directly the effect of the Remedia Event on breastfeeding. However, in practice, data on breastfeeding in Israel in the relevant time period is unavailable. Nonetheless, for new mothers with very young infants, the exclusive substitute for breastfeeding is baby formula. Therefore, we use the likelihood of households with new mothers to consume baby formula as a proxy for breastfeeding.

3.1 Data

We use repeated cross section data from the IHES in the period 2000-2007 to study the impact of the Remedia Event on the consumption of baby formula. Our sample includes 2,866 households with new mothers defined as women between ages 18-45 who are the head of the household or the spouse of the household's head and are at most one year after childbirth (i.e., their infants are in the ages 0-1).[18]

As part of the IHES, households collect, during a two-weeks period, receipts from their purchases. Based on the receipts, households fill a diary that records the amount they spent on each product they bought in that period; for example, how much a household spent on baby formula or milk during the two-weeks sampling period. Thus, these data contain a detailed record of the household-level expenditures in that two-weeks period at the single product level.

[18] A data limitation we face is that the age of infants is measured in whole years. Our notion of "exclusive" substitution between breastfeeding and baby formula is absolutely true only in the first months of the baby's life.

Table 1 provides the descriptive statistics of the sample. The average number of children in the pre and post Remedia Event period is similar, about 2.8. Average mothers' and fathers' years of schooling are a little higher in the post Remedia Event period. Household real income is similar in both periods, a little over 11,000 NIS (in real 2000 terms). The share of Ultra orthodox Jewish households is 2 percentage points higher and the share of non-Jewish households is 3 percentage points higher in the post period. While overall the samples seems quite well balanced across the pre and post Remedia Event periods, we account for differences that may arise due to compositional changes in the sample by controlling for these characteristics in the regression analysis below.

3.2 The likelihood to consume baby formula, a DD approach

In order to examine the effect of the Remedia Event on the likelihood to consume baby formula, we take a DD approach. We estimate the likelihood to consume baby formula, the treatment group, relative to the likelihood to consume other products, before and after the Remedia Event. The identification assumption underlying our empirical approach is that, absent the Remedia Event, the likelihood to consume baby formula would follow the same time trend as that of the various products in the comparison groups in the period 2000-2007. In the basic specification, we estimate a linear probability model of the form:

$$y_{ijt} = \alpha + \beta_1 \cdot Post + \beta_2 \cdot Treat + \beta_3 \cdot Post \cdot Treat + \epsilon_{ijt} \quad (1)$$

where y_{ijt} is a measure of consumption of product i by household j in year t. Specifically we use an indicator for purchasing a positive amount of a product.[19] $Treat$ is a dummy variable that equals 1 if the product i is baby formula and 0 otherwise. $Post$ is defined as the period 2004-2007.[20] The estimates of β_3, the main coefficient of interest, captures the change in the likelihood of households with new mothers to consume baby formula relative to their likelihood to consume other products. Additional specifications include year fixed effects, product fixed effects and household characteristics.[21]

We first provide graphical illustrations for the DD analysis. Panels (a)-(f) of Figure 4 depict the likelihood of households to consume baby formula versus six other products:

[19] To be precise, the indicator equals 1 if a household spent more the 3NIS on a product in the two-weeks period of the survey.

[20] Note that this definition is an artifact of the coarseness of the IHES data, which is measured in whole years. The Remedia Event took place in November 2003 and consumption of households that were surveyed in the end of 2003 may have been impacted too.

[21] The household characteristics we include are: household real income (in terms of the year 2000 NIS), mother's and father's years of schooling; and indicators for two specific populations who may have different characteristics from the rest of the Israeli population: non-Jews and Ultra-Orthodox Jews, that we define as Jews who attended religious post-secondary school: Kolel, Yeshiva, or Rabbis school.

diapers, salted cheese, eggs, yogurt, milk and white cheese. The impression from the figure is that relative to these six products, there appears to be a decline in the likelihood of households to consume baby formula. Granted, relative to some of the products, the divergence appears to begin in 2003. This is not surprising, however, given that the consumption in the last two months of 2003 was in fact affected by the Remedia Event. Nonetheless, the overall impression created by the figure is that while the consumption of most of these products appears to be quite stable over the entire period, baby formula consumption seem to decline after the Remedia Event.

We now turn to report the general DD estimation results. We analyze three sets of regressions each with a different comparison group of products: dairy, basic and bread & cereal.[22] Table 2 reports the results of this analysis. Column (1) reports the results of the DD analysis with the dairy products comparison group, showing a 11 percentage points decrease in the likelihood to consume baby formula. The results are robust to the inclusion of year and product fixed effects (column (2)) as well as household characteristics (column (3)). In columns (4)-(6) we repeat the analysis using the basic products comparison group and the results are similar, showing a 10 percentage point decrease in the likelihood to consume baby formula. With the bread and cereal comparison group, the effect is also a 10 percentage point decline in the likelihood to buy baby formula, as columns (7)-(9) of the table show. Therefore, given that baby formula was consumed by about 70% of the households in the sample in the period before the Remedia Event, the results in Table 2 indicate a decline of about 15% in the likelihood to consume baby formula among households with new mothers.

3.3 The likelihood to consume baby formula, a synthetic control analysis

In order to further validate these results we take an alternative approach. Following Abadie et al. (2010) we run a synthetic control analysis. We collapse the IHES data into product-by-year cells. Similarly to the DD analysis above, our aggregated outcome variable is the the share of households that consume a product in a given year and the treatment product is baby formula.

Figure 5 depicts the actual and synthetic annual share of households that consume baby formula.[23] As the figure shows, the share of households that consume baby formula

[22]The product composition of each group is as follows. Dairy: sweet cream, hard cheese, Processed cheese, Soft white cheese and Salted cheese; Basic products: white flour and other flour, eggs, milk, sugar, yougurt; bread & cereal: standard bread, various cereals, rice, cookies and biscuits, cornflakes and crispies.

[23]In section A.1 of the appendix we report the composition of the synthetic baby formula and describe the implementation of this approach in more detail.

in both the actual and synthetic groups was about 70% in the pre Remedia Event period and there appears to be a very good fit between the two groups. After the Remedia Event the two lines diverge. The share of households that consume baby formula declines relative to the synthetic baby formula group, opening a gap of about 10 percentage points between the two groups.

We next turn to assess the significance of these results following Abadie et al. (2010). To do so, we run a placebo analysis. We apply the same synthetic control analysis on every product in the sample, as if the product was treated by the Remedia Event instead of baby formula. This process generates a distribution of the estimated gaps between the actual likelihood to consume the product and its respective synthetic counterpart. This allows us to evaluate whether the effect of the Remedia Event on the likelihood to consume baby formula is unusually large relative to the effects estimated for the other products. The results of this exercise are reported in panel (a) of Figure 6. The grey lines represent the gaps associated with each of the placebo analyses. The black line denotes the gap estimated for baby formula. As the figure illustrates, the synthetic control method generates quite a good fit for consumption prior to the Remedia Event for the majority of products. The results we obtain for baby formula appear to be uncommon among other products, indicating that they reflect the effect of the Remedia Event on the consumption of baby formula. In order to more formally evaluate the implications of this test we depict the distribution of the ratio of post over pre Remedia Event period MSPE (the so-called MSPE ratio) of baby formula and the other products in panel (b) of Figure 6. The vertical dashed red line in the figure represents the 95^{th} percentile of MSPE ratio and the solid vertical red line marks the MSPE ratio of baby formula. The post MSPE of baby formula is about twenty times the MSPE of the pre period. Consistent with the impression of panel (a) of the figure, the MSPE ratio of baby formula is located to the right of the 95 percent line, indicating that the ratio is larger than more than 95 percent of the products, namely, the result is significant.

Overall, the results in this section suggest a decline in the share of households that consume baby formula in the order of 10 percentage points irrespective of the comparison group or the empirical method we apply. Thus, the results reflect roughly a 15% decline in the share of households with new mothers that consume baby formula.

4 The impact of the Remedia Event on maternity leaves

In the previous section we found that the Remedia Event caused a decrease in the likelihood of households with new mothers to consume baby formula, which we interpret as suggestive evidence for an increase in breastfeeding. In this section we turn to address the main question in this paper. We examine whether, by increasing the tendency to breastfeed, the Remedia Event caused a delay in the return of new mothers to work after childbirth. Namely, did new mothers extend their maternity leaves as a result of the Remedia Event?

4.1 Maternity leave policy in Israel

Several element Israel's labor laws and social safety net shaped the maternity leave policy in Israel in the relevant time period. Until May 2007, according to the Israeli Woman's Labor Law, an employee was entitled to a maternity leave of 12 weeks.[24] An employer was not allowed prevent an employee from taking maternity leave or fire her during the maternity leave or 45 days thereafter. Additionally, an employee was allowed return to work no less than 12 weeks after childbirth. Therefore, at the time, a rule of mandatory 12 weeks maternity leave after childbirth applied.[25]

The mandatory maternity leave is accompanied by Maternity allowance—a payment by the social security that substitutes the employee's labor income during maternity leave. In the relevant time period for this study, the Maternity allowance amount was calculated based on the average daily wage in the three months before the maternity leave, for a period of 12 weeks (84 days). To be eligible, a new mother was required to be employed during a qualifying period. Eligibility for the maximal allowance required work in 10 out of the 14 months prior to birth or 15 out of the 22 months prior to birth.[26] Therefore, for a woman with a qualifying work history, there was typically a twelve weeks paid mandatory maternity leave. Additionally, women with at least 24 months work history with the same employer could delay the return to work for another month for every 4 months of employment history up to a year.

[24] In May 2007 this period was extended to 14 weeks and in 2010 it was extended to 26 weeks as a default. However, a woman may shorten this period, to no less than 14 weeks.

[25] Since 2007, a couple could share the maternity leave. Husbands could take the last six weeks of the maternity leave. This required a written consent from the wife and her return to work while her husband is on leave.

[26] Partial maternity allowance for a period of 6 weeks existed for women who accrued 6 months of work in the 14 months prior to birth. All women were eligible for a birth grant that depended on the child's birth parity.

4.2 Data

Our analysis draws on administrative data from the NII. These data are collected by the NII from various sources (including the Tax Authority and the Ministry of Interior Affairs) for internal use. The data contain information about the universe of employees in the country including months of employment in every tax year, annual income and employers' industry and size. These data also contain demographic information such as country of origin, nationality, gender, date of birth and marital status. Importantly for the purpose of this study, the birth date of each child is also available, making it possible to link data about every childbirth in the relevant period with information about the mother's and father's employment history. Using these data we observe, for every childbirth in the relevant time period, the mother's months of employment around the birth. As we focus on the first months after childbirth, the period when the tradeoff between breastfeeding and employment potentially arises, we censor the employment data at 12 months after childbirth.[27]

The identification strategy that we employ, which we describe in detail below, compares the return to work decisions of new mothers that gave birth in the six months periods around the Remedia Event (the post period): November 03 - April 04 (the treatment group) versus May 03 - October 03 (the comparison group) and in the respective periods in the prior year (the pre period), namely, November 02 - April 03 versus May 02 - October 02. We create the final sample for the empirical analysis as follows. We start from the universe of all women who gave birth in these periods and were employed during the twelve months prior to giving birth, amounting to about 98,300 births. Since we are interested in the entire household's employment history and income, we restrict the initial sample to households with two employed spouses so that we can observe the entire household work history and income.[28] We observe both spouses' employment history for 76,194 households out of the initial sample. Of these households, we do not observe maternity leaves of 20,673 women. By and large, these are teachers for whom maternity leaves are not accurately reported in the data.[29] After we drop these women from the data, we are left with a final sample of of 55,521 new mothers from households with two employed spouses.

[27] Consistent with the typical recommendations of physicians (e.g., Gartner et al. (2005)), exclusive breastfeeding is uncommon after age six months (Li et al. (2002)). According to the Israeli ministry of health, exclusive breastfeeding rates in Israel are around 15% at the age of six months and approach zero at the age of eight months (Keinan-Boker et al. (2014)).

[28] We do not have data on individuals that are not employees, thus we are unable to distinguish between self-employed and those who do not work. Households with single mothers would also make an interesting group to examine. However, they comprise a small fraction households in our sample and we exclude them from the analysis.

[29] This group's maternity leave is coded as months of work and these women continue to receive their income from their employer, typically the ministry of education, and not by the NII.

There are several reasons to expect that the labor supply response of first-time mothers to the Remedia Event was stronger than that of experienced mothers. First, relative to experienced mothers, first-time mothers experience more stress and anxiety after childbirth (see Hung et al. (2011)) and that might have induced a larger increase in their tendency to breastfeed in response to the Remedia Event. Second, new mothers are more likely to breastfeed their first-born than they are their later-born children.[30] Finally, relative to experienced mothers, who may have already transitioned into child-friendly jobs, first-time mothers are more likely to have jobs that make it harder to combine work with breastfeeding.[31] Therefore, given these differences, we separate in our analysis first-time mothers from experienced mothers. Here, we report the results from the analysis of the first-time mothers group and in Section A.3 of the appendix, we report the corresponding estimates for experienced mothers. There are 19,918 births in the first-time mothers group.

Table 3 provides some descriptive statistics of the first-time mothers sample. Columns (1)-(2) of the table summarize the characteristics of the Comparison and Treatment groups in the post period (around the Remedia Event) and column (3) reports the difference between them; columns (4)-(6) summarize the characteristics of the Comparison and Treatment groups in the prior year (the pre period) and the difference between them and Columns (7) reports the differences-in-differences between the means of the four groups. Overall, the sample characteristics appear to be well aligned across the different groups. Characteristics like parents' ages and the shares of Jewish and native parents, are not statistically different across groups.

In order to create the monthly income variables for each individual, father or mother, we use their annual income in the tax year prior to the year of childbirth. We prefer the prior year information because the tax data is reported on an annual basis and so, using the income earned in the same tax year as the birth may rely on earnings that were generated after the birth and therefore would be less informative with respect to earning capacity. Suppose, for example, that after childbirth a woman returns to work only part-time. If we use that year's income, we would classify her as having a lower earning capacity than she actually has. Next, we divide the annual income by the number of months an individual worked during that tax year to create the monthly income per individual. This yields the nominal monthly income we report in the table. As the table indicates, there are no statistically significant differences in the (nominal) monthly income across groups. We create a real monthly income (denominated to year 2000 terms) variable by correcting for the inflation in the relevant tax year. Notably, while the nominal income is similar across groups, the differences-in-differences in the real monthly income of the husbands in the

[30]Buckles and Kolka (2014) finds that mothers are 15 percent less likely to breastfeed a second-born child; Lehmann et al. (2018) find similar results.

[31]Lalive et al. (2013) make a similar point and note that the pre-birth labor market history of first time mothers tends to be more informative about their earnings capacity than that of experienced mothers.

treatment group is larger by about 500 NIS. We note that this difference arises primarily because the different groups' incomes are calculated using earnings from different tax years. For example, a January 2004 birth, belonging to the treatment group, is matched with the parents' income in 2003. An October 2003 birth, from the comparison group, is matched with the parents' 2002 income. Since in 2003 inflation was in fact negative—roughly -2% and in 2002 the inflation rate was 6.5%, this procedure creates mechanical differences in real income. In a world with sticky wages, this suggests that the difference in income, at least in part, does not indicate an important selection issue, however, we control for real monthly income in the regression analysis below.

4.3 The impact of the Remedia Event on maternity leaves

In this section we lay out our analysis of the effect of the Remedia Event on maternity leaves. Before we turn to the formal analysis we provide some descriptive graphical evidence on maternity leaves of first-time mothers. Figure 7 depicts the likelihood to return to work within six months after childbirth of new first-time mothers by quarter of birth in the time period between the first quarter of 2001 and the third quarter of 2004, namely roughly three years before and one year after the Remedia Event (the blue solid line).[32] The vertical red line is located just before the fourth quarter of 2003 marks the timing of the Remedia Event. The figure illustrates that the likelihood to return to work tends to exhibit some seasonality with peaks in the second quarter of the calendar year. It also appears to be growing over time during the periods before the Remedia Event. In the first quarter of 2001, the likelihood to return to work within six months was 84% and in the first quarter of 2003 it rose to 89%.

Looking at the periods around the Remedia Event, there appears to be a break in the upward trend of the likelihood to return to work from maternity leave. This is best seen when looking at the actual rates of the return to work within six months and the predicted ones, depicted by the blue and red dashed lines, respectively.[33] After the Remedia Event, the likelihood to return to work appears to decline by about 0.03 percentage points, relative to its predicted values. In order to quantify the impression from the figure, we run the following regression using births from the entire period, namely, first quarter of 2001 - third quarter of 2004:

[32]The figure uses the same criteria we apply in the formal analysis of the"intensive margin" sample we describe below: first-time mothers of households where both spouses were employed and the mother returns to work within two years of birth.

[33]The red dashed line depicts the predicted values of the average probability to return to work within six months after childbirth from a regression with quarter-of-year dummies and a quarter of birth linear time trend using the pre Remedia Event period data. See section A.2 of the appendix for a full description of the creation of this figure.

$$y_{it} = \alpha + \beta_1 \cdot QOB_t + \sum_{i=1}^{4} \gamma_i \cdot Quarter + \beta_2 \cdot Post + \epsilon_{it} \quad (2)$$

where *Post* is a dummy variable that equals 1 if the birth occurred in the fourth quarter of 2003 or later. Table 4 reports the results from this regression. The table confirms the visual impression created by the figure, with an estimate of about 3 percentage points decrease in the likelihood to return to work for the post Remedia Event period.

In essence, our empirical strategy builds exactly on the impression that is portrayed by Figure 7, namely, that relative to the trend in maternity leaves in the periods before the Remedia Event, the apparent shift downwards in the likelihood to return to work can be attributed to the Remedia Event. In that respect, Figure 7 previews the main result of this paper: the Remedia Event caused an apparent decrease in the likelihood to return to work among new mothers.

In order to examine this impression further, we define births from the period between November and April of the subsequent year as belonging to the treatment group and births from the period between May and October as belonging to the comparison group. We analyze a model of the form:

$$y_{it} = \alpha + \beta_1 \cdot Treat + \beta_2 \cdot Post + \beta_3 \cdot Post \cdot Treat + \epsilon_{it} \quad (3)$$

where y_{it} is an outcome that describes maternity leaves such as an indicator for the return to work within n months after birth for a mother from household i that gave birth in month t. $Treat$ is an indicator variable that takes the value 1 if the birth belongs to the treatment group, namely it took place in the period November 03 - April 04 or November 02 - April 03, and zero otherwise. *Post* is an indicator that takes the value 1 if a birth took place in the period May 03 - April 04, the post period. The object of interest is β_3, the coefficient that captures the effect of being in the treatment group versus the comparison group in the post period, accounting for the difference in maternity leaves between the treatment and comparison group in the prior year. Hence, our identification strategy is based on the assumption that absent the Remedia Event the difference between the treatment and comparison groups would be similar to that in the prior year.

We note that mothers from the comparison group that gave birth in the periods just before the Remedia Event may have been affected by it too. Consider, for example, a woman who gave birth in October 2003, before the Remedia Event, and decided to exclusively use baby formula. For this woman the decision is irreversible - when the Remedia Event happened, the option of breastfeeding was no longer available for her. Therefore, it is plausible to include this woman in the comparison group. On the other

hand, consider a woman that gave birth at the same time, in October 2003, and decided to breastfeed for a few months. After the Remedia Event this woman may have decided to continue breastfeeding and to delay her return to work, yet, she is included in the comparison group. Therefore, our approach captures a lower bound of the impact of the Remedia Event in the sense that some of the woman in the comparison group may have also delayed their return to work in response to the Remedia Event.

One threat to our identification strategy is that labor market policy changes that occurred around the same time period, may have contributed to the trend break in maternity leaves around the Remedia Event. Two policy changes that took place in that period could potentially have an effect on maternity leaves. The first was a reduction in income guarantee allowance—a welfare payment typically made for individuals who are not in the labor force—that took effect in January 2003. In terms of its timing, this policy change happened long before the Remedia Event and it affected both the comparison and treatment group in our analysis. Additionally, the age group that was affected by the reform was the age group 46-54, which is not the population of households with women in fertility ages, 28 years old on average, we study here. Therefore, the reduction of income guarantee allowance is unlikely to pose a threat to our identification strategy. Additionally, in the analysis below, we stratify the sample by household income to examine if they are concentrated among a particular socioeconomic group.

The second policy change that occured around that period was a gradual cut in child allowance that began in June 2003.[34] Before the change, the child allowance depended on the birth order of the child. The child allowance for the fourth child for example was roughly 3 times larger than that allowance for the first child. The goal of the cut was to gradually (until the year 2009) reduce the excess payments to children of higher birth order and ultimately implement a policy of equal allowance to children of all birth orders. This cut primarily applied to families with 3 children or more. One concern with respect to this policy is that the decrease it caused to household income, assuming the leisure is a normal good, would cause, via an income effect, an increase in the household labor supply. One thing to note, however, is that this effect would arguably work against our hypothesis, which is that women would decrease their labor supply via prolonged maternity leaves. The second thing to note is that our the analysis looks at first-time new mothers. This group was almost unaffected by this change, which applies mostly to families with three children or more.

We now turn to the graphical analysis of the results. Figure 8 displays Kaplan Meyer survival curves for months in maternity leave. As we noted above, because we focus on breastfeeding, which is typically relevant in the first months after childbirth, we censored the functions at twelve months. Panel (a) of the figure shows the survival curves in the post

[34]Two smaller cuts were implemented in March and July of 2002.

period (around the Remedia Event): the red line depicts the November 03 - April 04 group (treatment) and the blue line shows the survival curve for the May 03 - October 03 group (comparison). By construction both groups begin with a likelihood of being on maternity leave of 1. Namely, all the women in the sample are on maternity leave in the first month after childbirth.[35] By the third month after childbirth, around which many women finish the eligibility period for maternity allowance and the mandatory maternity leave period ends, roughly half of the women return to work. At that point, a discernible gap between the treatment and comparison groups opens and the treatment group appears to be less likely to return to work. The gap persists for another few months, yet it narrows around the sixth month after childbirth and it closes around the ninth month after childbirth. Notably, this pattern, namely, the tightening of the gap between the curves around the sixth month after childbirth and its disappearance around the ninth month after childbirth is consistent with exclusive breastfeeding rates that, as we described above, tend to be quite high in the first months after childbirth but approach zero when the baby is eight months old. The difference between the two survival curves is statistically significant, with a p-value of 0.06 based on the log-rank test for equality of the two survival curves. Panel (b) of Figure 8 shows the survival curves for months in maternity leave of the treatment and comparison groups in the prior year (the pre period). As the figure shows, the two lines appear to coincide. Indeed, one cannot reject the null hypothesis that the two functions are equal with a p-value of 0.9.

Table 5 reports the DD regression estimates that map to the graphical illustration of Figure 8. Each line in the table represents a separate linear probability regression with the likelihood to return to work within 2-12 months as the outcome variables akin to Equation (3) above. Consistent with the graphical impression, except for month 2, the estimates in column (1) are all negative. In month 3, the treatment group in the post Remedia Event period is 2.9 percent (s.e. 0.0142) less likely to return to work, this gap closes gradually and by month 9 this gap is small and statistically insignificant (0.0098 percent (s.e. 0.0084)). Inclusion of household characteristics in the regressions, as shown in column (2), does not affect the results, indicating that differences in household characteristics are not driving these results.[36]

Our analysis focuses on breastfeeding, which is relevant in the short run after childbirth. We are therefore interested in the "intensive margin" response. Namely, the return to work of women who go on maternity leave and return to work afterwards as opposed to women who stop working altogether following childbirth. We therefore analyze a subsample where we add the additional data restriction that women return to work within

[35] As we noted above this is in fact mandatory that these women do not work just after childbirth.

[36] The household characteristics we include are: indicators for child gender, Jewish mother, Jewish father, mother Native Israeli, father Native Israeli, mother and father age and age squared, mother and father real monthly income and real monthly income squared.

two years of childbirth, which results in loosing 712 observations.[37] We then repeat the empirical analysis and report the results from this "intensive margin" sample in columns (3) and (4) of Table 5. The results are qualitatively similar, yet, as one might expect, they are more pronounced. As shown in column (3), in month 3, mothers who gave birth after the Remedia Event are 3.3 percent (s.e. 0.0144) less likely to return to work and by month 11 this gap becomes small and insignificant, 0.85 percent (s.e. 0.0060). Here too, household characteristics do not affect the results, as the results in column (4) show.

In order to quantify the cumulative effect of the delay in return to work we analyze the effect of the Remedia Event on the average months worked within six and twelve months after childbirth, again using the model in equation (3). The results are shown in Table 6. Panel (A) of the table reports the six months period results. As column (1) shows, following the Remedia Event, average months worked fell by 0.079 months (s.e. 0.036). Given that the baseline level of months worked within six months after childbirth is 2, the estimate implies a decrease of 4 percent in average months worked.[38] The results are not sensitive to the inclusion of household level characteristics, as column (2) indicates. The "intensive margin" sample results, reported in columns (3), are larger, with a decrease of 0.094 months (s.e. 0.035) in average months worked. With a baseline level of 2.09, this decrease reflects a 4.4 percent decrease in average months worked. Panel (B) of the table reports the effect of the Remedia Event on average months worked within 12 months after birth. The estimates for the full sample show a decrease of 0.146 months (s.e. 0.088) in average months worked (column (1)) reflecting a 2.2 percent decrease. Here too the results are robust to the inclusion of household characteristics (column (2)). The "intensive margin" sample estimates show a decrease of 0.19 months (s.e. 0.083) reflecting a 2.7 percent decrease in average months worked.[39]

Heterogeneity. It is often argued that high income individuals are less financially constrained when they make their labor supply decisions. Additionally, high income is commonly associated with better informed individuals. Therefore, we explore the relationship between household income and the effect of the Remedia Event with the conjecture that the response of new mothers from high-income households to the Remedia Event was stronger.

Before we report the results of the formal DD analysis, we illustrate, in Figure 9, the patterns of the likelihood to return to work within six months of childbirth. Essentially we repeat the analysis in Figure 7, breaking the sample in two, by household income. Panels

[37] I.e. we right truncate the data after two years.

[38] We calculated the baseline using the counter factual value of months worked for this group based on the estimates of the regression coefficients (we add-up the "constant", "post" and "treat" coefficients).

[39] We examine the validity of the results by conducting placebo analyses assuming that the (fictitious) Remedia Event occurred one year earlier. A detailed description of the placebo analysis is provided in section A.4 of the Appendix.

(a) and (b) of the figure show the likelihood to return to work of women from households with above- and below-median income, respectively. In both panels (a) and (b), there is an apparent break in the upward trend in the likelihood to return to work within six months, which is similar to the impression made by Figure 7. However, the effect is much more pronounced in the high-income group.

We now turn to examine this impression formally by repeating the analysis by household income. Figure 10 shows the Kaplan Meyer survival curves for months in maternity leave for the above-median income households. Panel (a) shows the survival functions of the treatment and comparison groups around the Remedia Event. The figure illustrates that in the third month after childbirth, there is a divergence between the red line, the treatment group, and the blue line, the comparison group. The gap between the two groups closes by the ninth months after birth. The p-value of the log-rank test is 0.01, indicating that the hypothesis that the two survival functions are equal can be rejected. Panel (b) displays the survival curves of the treatment and comparison groups in the prior year. The two survival functions appear to overlap and the log-rank test for equality between them cannot be rejected (p-value=0.69). Thus, in the above-median income households there appears to be a stark difference between maternity leaves in the treatment and comparison groups in the post-period around Remedia Event with no evidence for such a difference in the pre-period, the prior year. Figure 11 depicts the same survival curves for the below-median income households. In panel (a), around the Remedia Event, there appears to be a divergence between the treatment and comparison groups' survival curves around the third month after childbirth. However, it seems smaller than the gap in the above-median income households group. Indeed, the equality between the two functions cannot be rejected with a p-value of 0.62. The survival curves in panel (b) seem to overlap and the impression is confirmed by the result of the log rank test (p-value 0.81). Thus, the overall impression from this graphical illustration is that the impact of the Remedia Event on maternity leaves arises primarily among women from above-median income households.

Table 7 provides the corresponding monthly estimates. Column (1) shows the results for the above-median household income group, without and with household characteristics controls. The estimates corroborate the visual impression from Figure 10. A statistically significant gap of 4.8 percent (s.e. 0.021) opens in month 3 and it closes gradually in subsequent months. The result in unaffected by household characteristics controls (columns (2)). Column (3) displays the estimates for the below-median income household group. While the estimates are negative they are smaller than those in column (1) and they are not statistically significant. Here too, household characteristics have no effect on the estimates (column (4)). Overall, unsurprisingly the results reported in the table are consistent with the visual impression of Figures (10) and (11), demonstrating that the effect of the Remedia Event is concentrated among women from high-income households.

Table 8 provides estimates of the overall magnitude of the effect of the Remedia Event by household income. Column (1) shows that in the above-median income households, the effect of the Remedia Event on work within six months of birth was of 0.16 months (s.e. 0.053) decrease, reflecting a 7.6 percent decline in the average months worked in that period (again this result is not affected by household characteristics as shown in column (2)). The overall effect on work within six months on the below-median income households, reported in column (3), is small and statistically insignificant. Panel (b) of the table reports the estimates for work within twelve months of childbirth. The results are smaller as expected. The effect on the above-median group is a 0.25 (s.e. 0.122) months decrease, a decrease of 3.5 percents in work within twelve months of birth. The estimates for the below-median group remain statistically insignificant.

Summary. To recap, first-time new mothers, particularly those from above-median income households, extended their maternity leaves in response to the Remedia Event. Because the Remedia Event had a country-wide effect, our research design cannot rely on a concurrent comparison group and our causal inference is based on comparing the periods around the Remedia Event to the corresponding periods of the prior year. However, the analysis of maternity leaves of experienced mothers—mothers with older children—reported in Section A.3 of the Appendix, reveals that they do not exhibit a similar behavioral change following the Remedia Event. We view these results as providing additional support to our results, by providing counterfactual evidence by a group that was presumably less affected by the Remedia Event.

5 Conclusion

In this study we analyze the consequences of the Remedia Event, a realization of a product safety hazard in the baby formula market in Israel in 2003. We find that following the Remedia Event, the likelihood of households with new mothers to consume baby formula decreased by about 15%, indicating an increase in breastfeeding. In turn, first-time new mothers, particularly those from above income households, extended their maternity leaves and decreased the average months worked in the first year after childbirth by about 3.5%.

The results show that despite technological improvements and policy changes that help in reconciling breastfeeding and work and given the evidence about the benefits of breastfeeding, the comparative advantage of new mothers in infant feeding continues to play a key role in their employment decisions. While many gender roles are a product of norms and culture, breastfeeding is a mothers' biological function and as such, may require different policy tools to enhance gender equality.

With respect to product safety hazard realizations, another important insight from this study is that interactions with other markets, particularly the labor market, may represent a significant part of their consequences.

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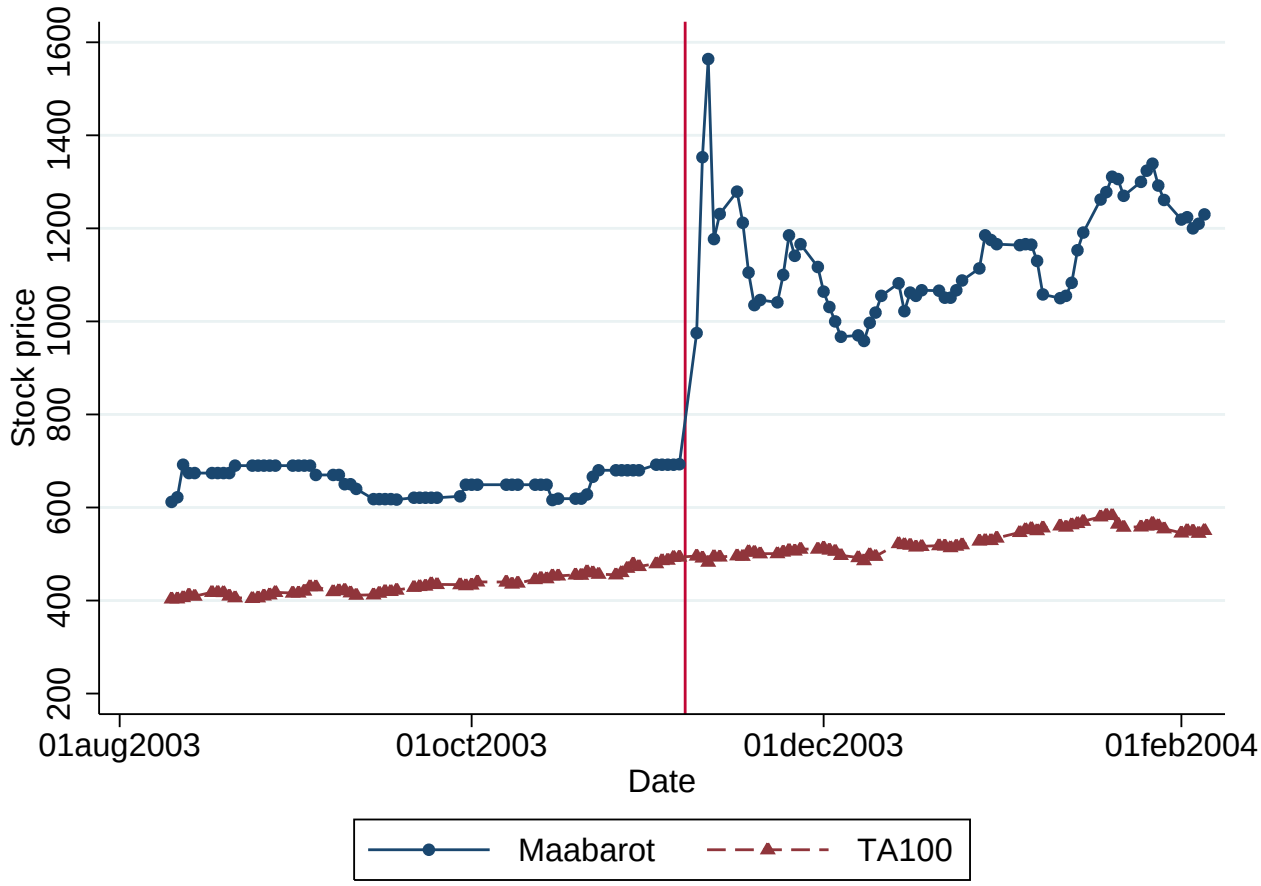
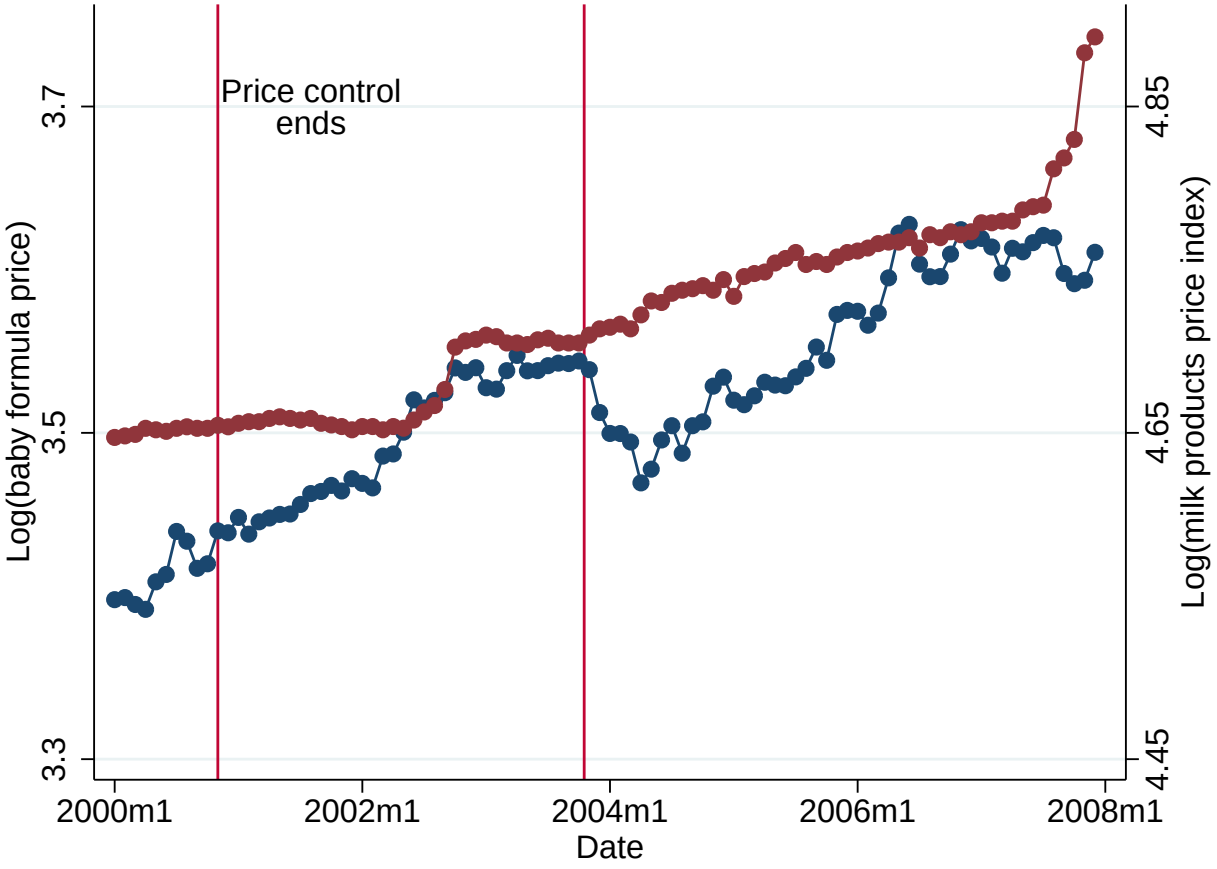
Figure 1: Market expectations around the Remedia Event



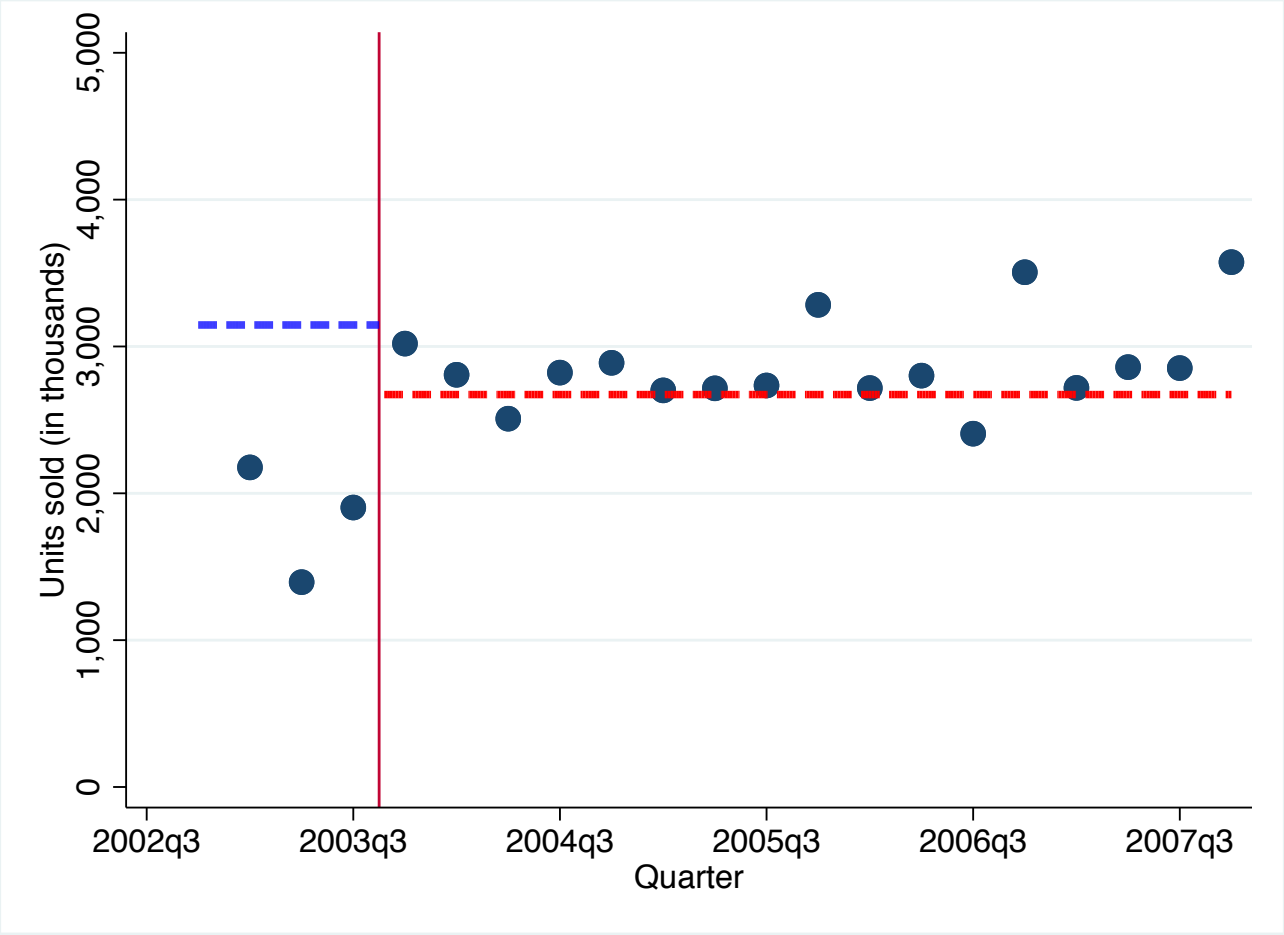
Note: The figure plots the stock price of Maabarot Ltd., Materna's mother company, and Tel-Aviv 100 index around the time of the Remedia Event.

Figure 2: Baby formula prices around the Remedia Event



Note: This figure plots the average of (nominal) monthly store-level baby formula prices from a representative sample of 61 stores across the country in the period 2000-2007, in natural log terms. The second vertical axis denotes the log price index of milk products.

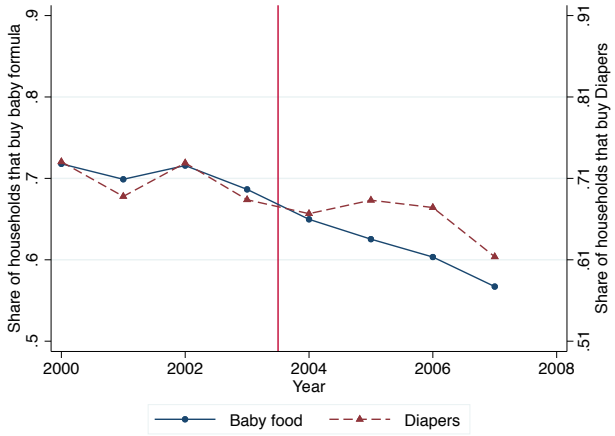
Figure 3: Units sold by Remedia's competitors around the Remedia Event



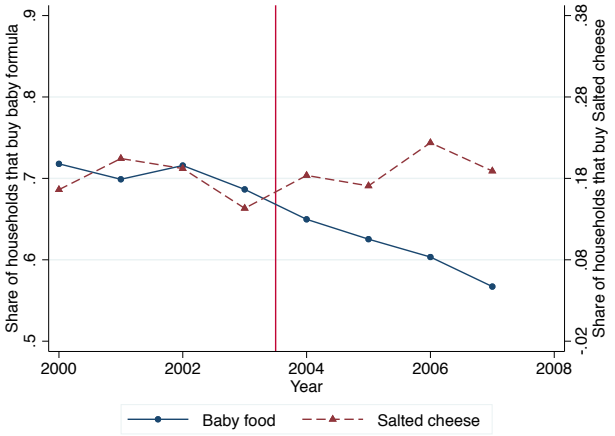
Note: This figure plots the quarterly total of baby formula units sold by Remedia's competitors, Materna and Similac. The vertical red line deontes the Remedia Event. The horizontal blue dashed line approximates total sales in the market in quarters 1-3 of 2003: the quarterly average number of units sold divided by the market share of Materna and Similac – 63%. The red dashed line represents average quarterly sales in the market in the first three quarters of each of the years following the Remedia Event - 2004-2006.

Figure 4: The likelihood to consume baby formula vs. other selected items

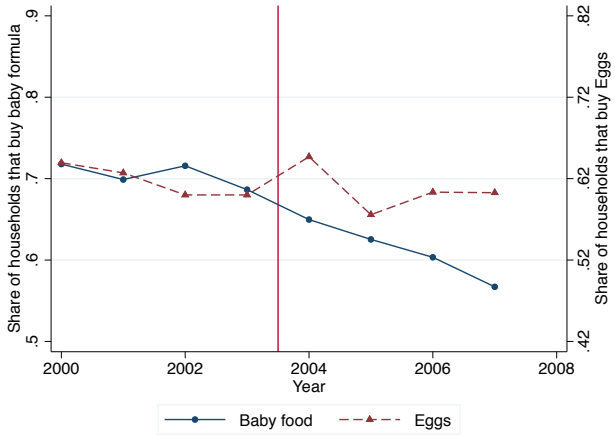
(a) Diapers



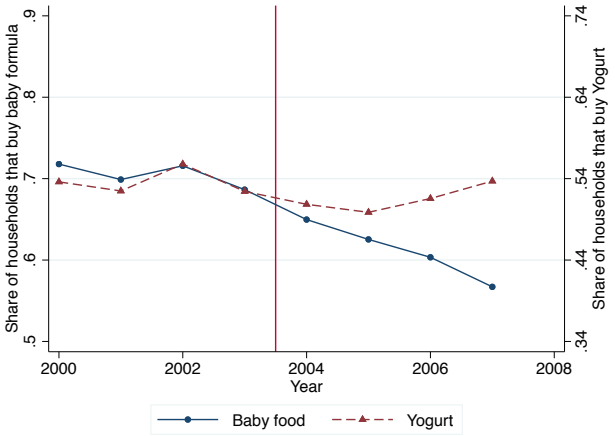
(b) Salted cheese



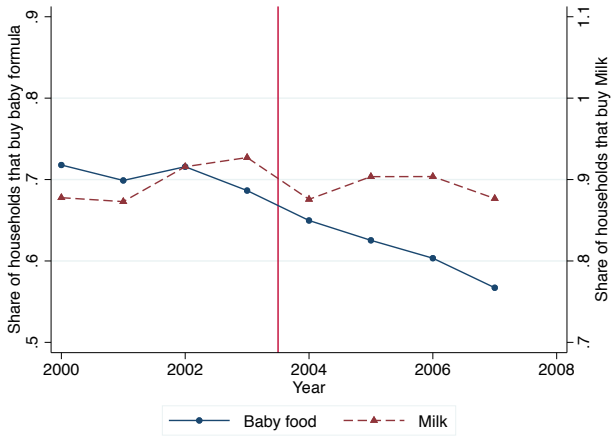
(c) Eggs



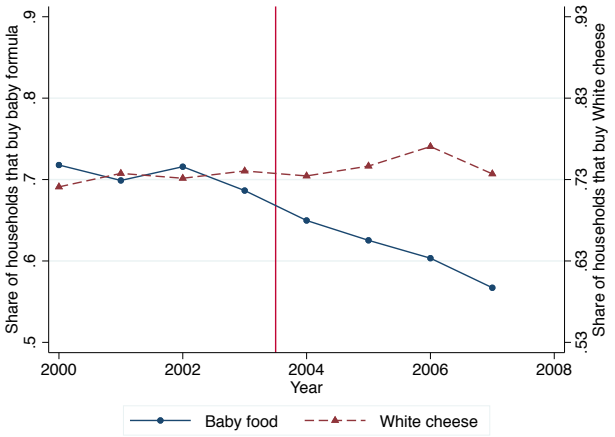
(d) Yogurt



(e) Milk

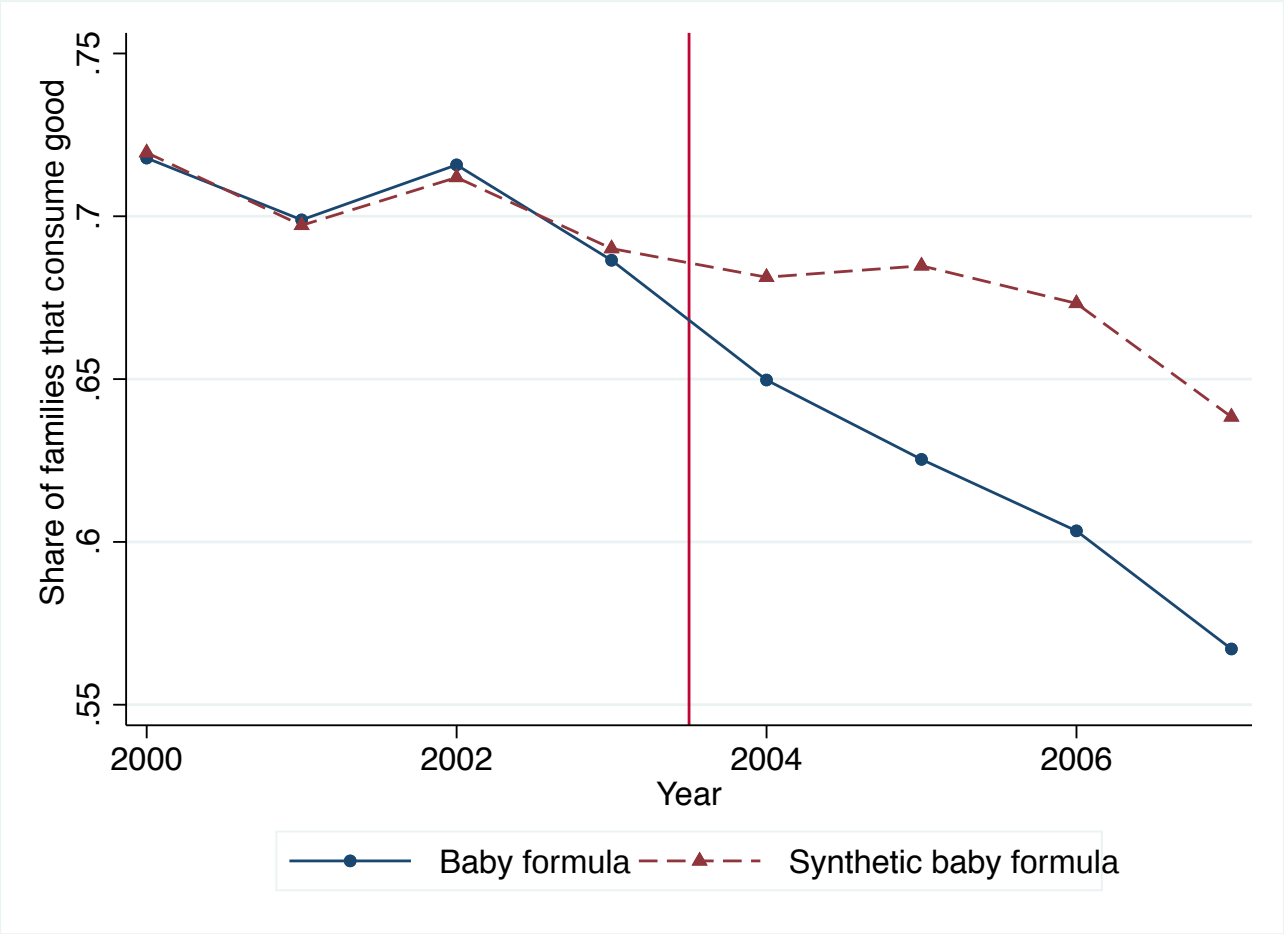


(f) White cheese



Note: Panels (a)-(f) of the figure plot the annual shares of households with new mothers and infants (ages 0-1) that consume baby formula versus several selected basic consumption products in the period 2000-2007.

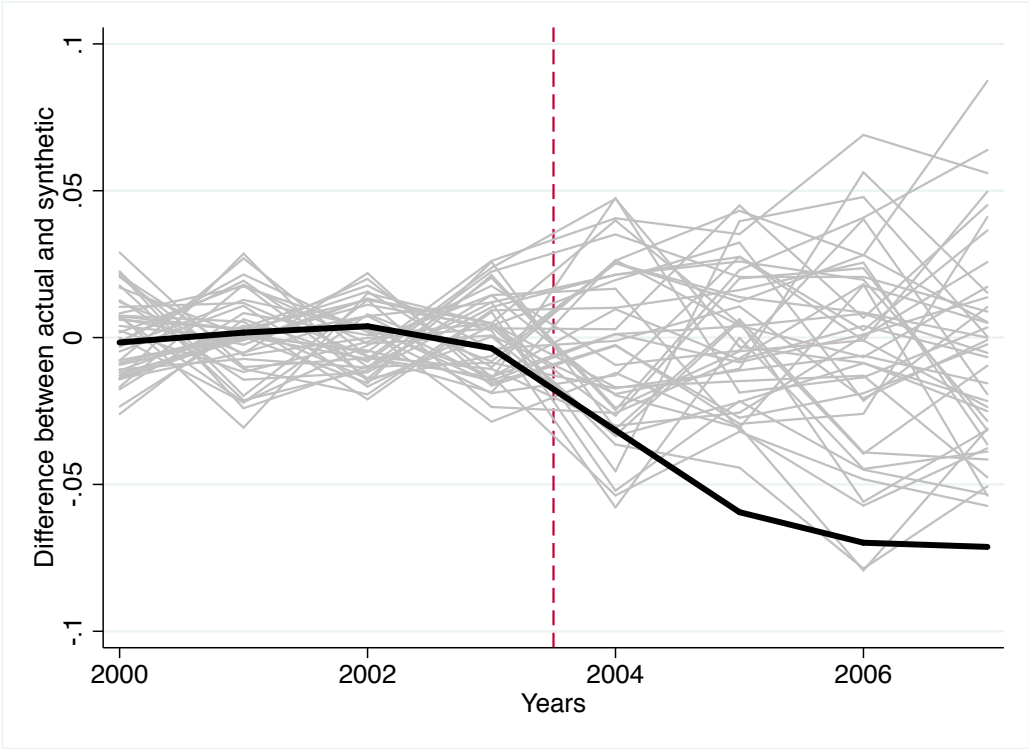
Figure 5: The impact of the Remedia Event on the likelihood to consume baby formula, synthetic control approach



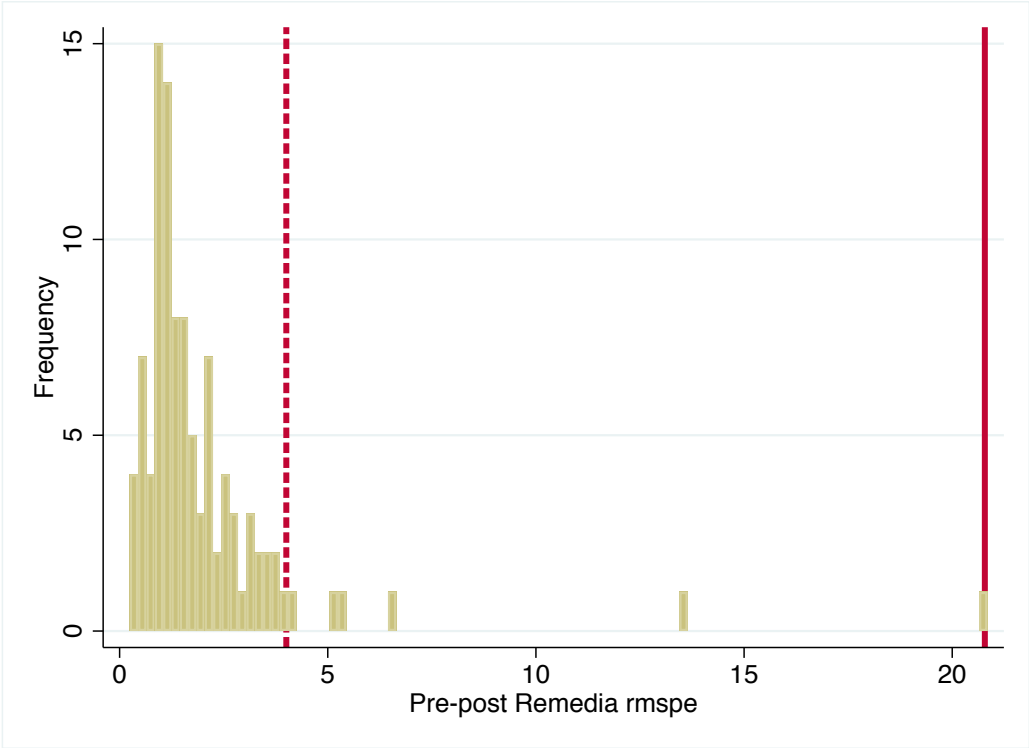
Note: The figure depicts the actual and synthetic annual shares of households that consume baby formula in the period 2000-2007. The red vertical line denotes the Remedia Event.

Figure 6: The impact of the Remedia Event on the likelihood of consuming baby formula, placebo analysis

(a) Difference between actual and synthetic, all products

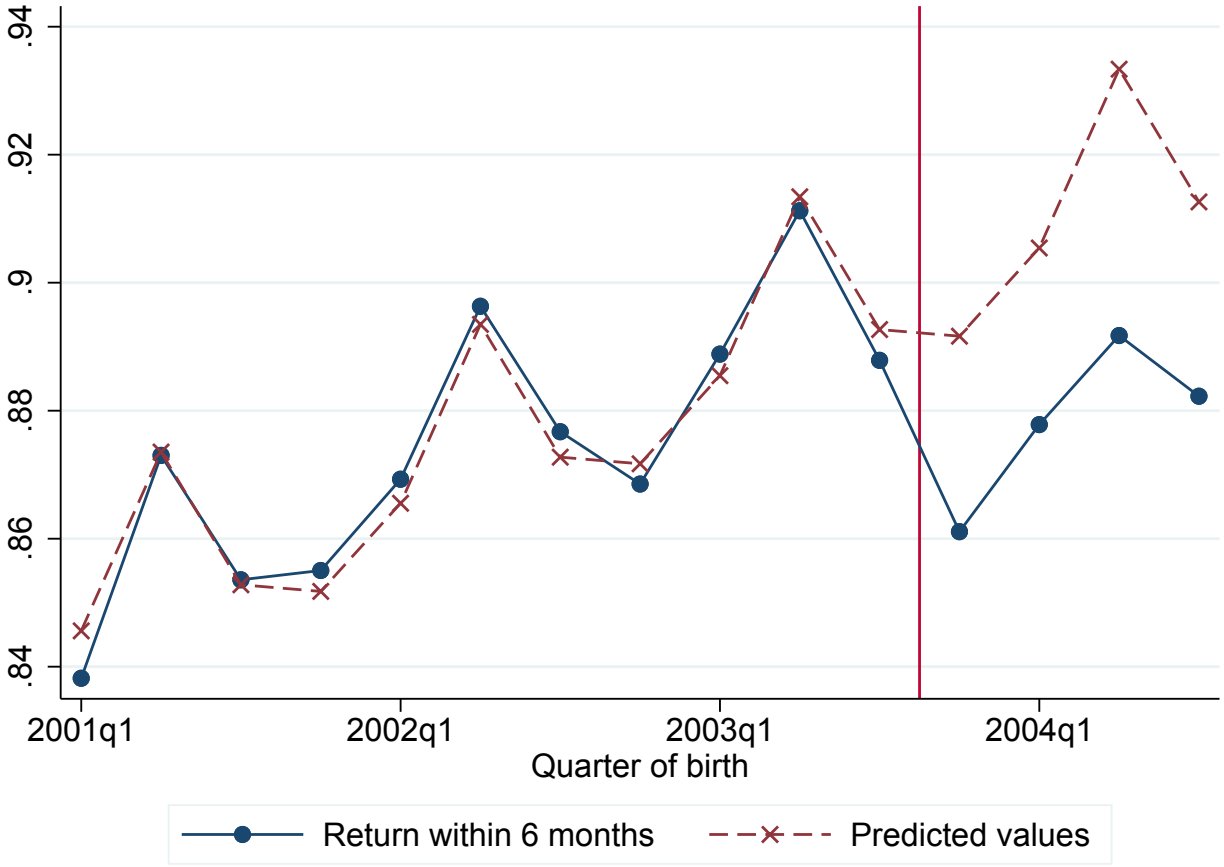


(b) Distribution of MSPE ratio, all products



Note: The figure reports the results of the synthetic control placebo analysis. Panel (a) reports the results of a synthetic control analysis on every product in the sample. Panel (b) depicts the MSPE ratios of baby formula and the other products. The vertical dashed red line represents the 95^{th} percentile of MSPE ratio and the solid vertical red line marks the MSPE ratio of baby formula.

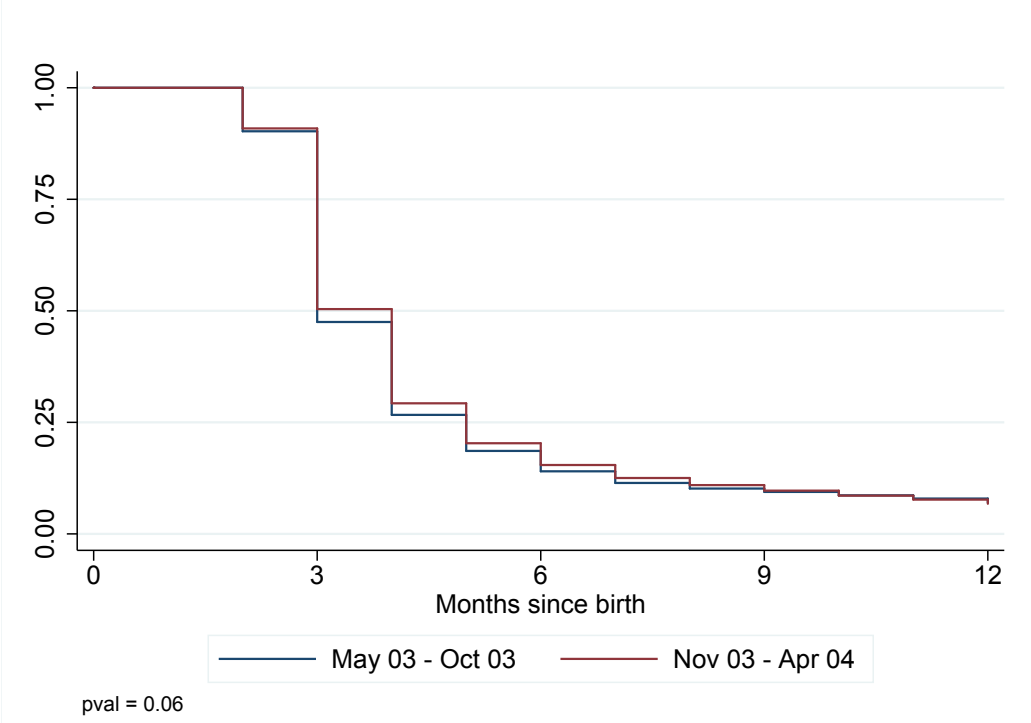
Figure 7: The impact of the Remedia Event on the likelihood of return to work within six months



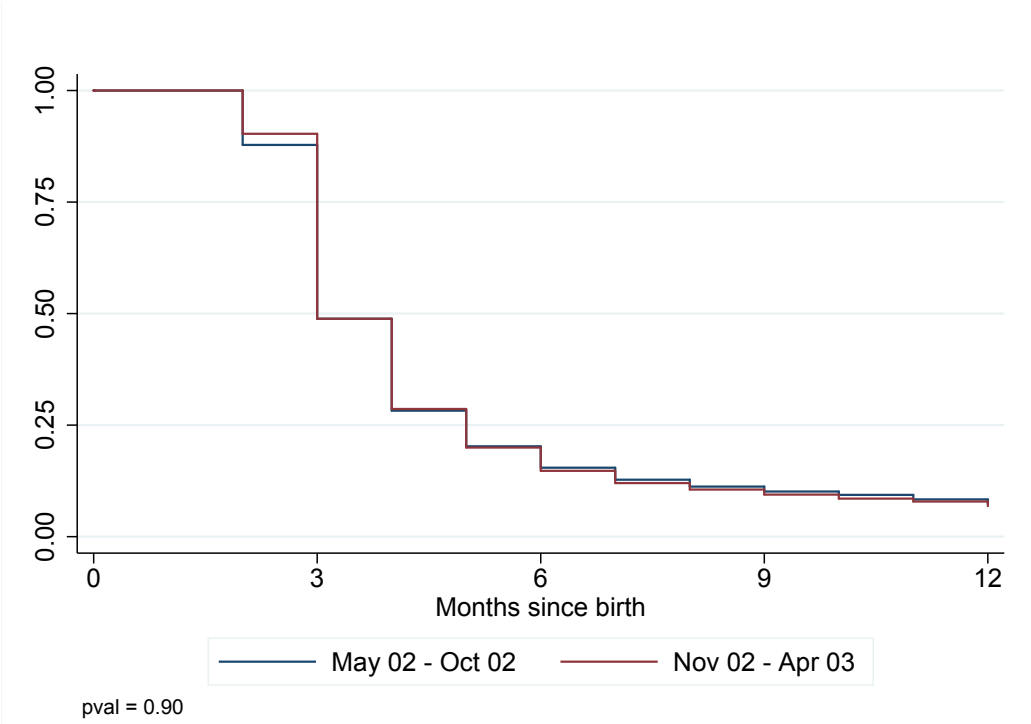
Note: The figure depicts the likelihood to return to work within six months after child birth. The vertical red line is located just before the fourth quarter of 2003 marks the timing of the Remedia Event. The red dashed line depicts the predicted values from a regression of the return to work within six months after childbirth on quarter-of-year dummies and a linear time trend of birth date using the pre Remedia Event Period data (See section A.2 of the appendix for full description).

Figure 8: The likelihood of being on maternity leave after childbirth

(a) Around the Remedia Event



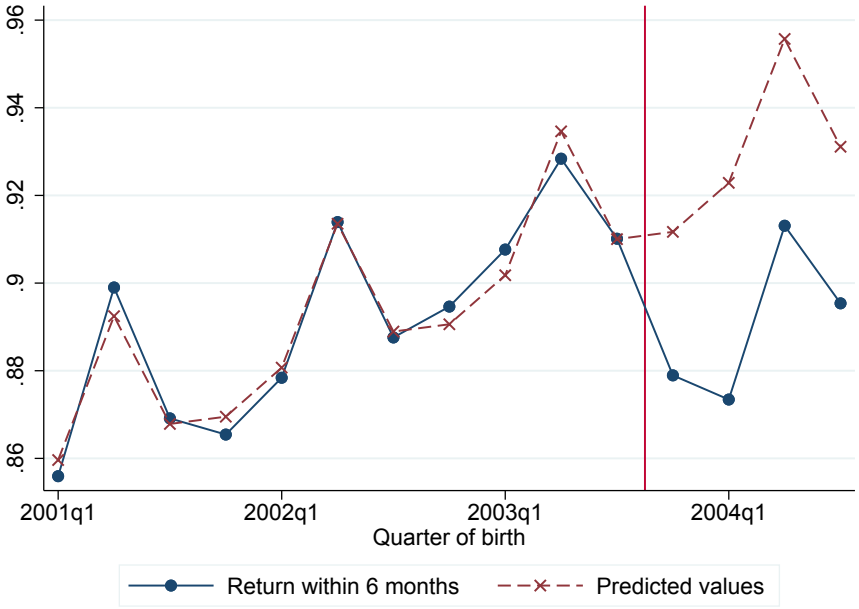
(b) Prior year



Note: Panels (a) and (b) of the figure depict the likelihood of being on maternity leave in the first twelve months after childbirth in the periods around the Remedia Event and the prior year, respectively.

Figure 9: The impact of the Remedia Event on the likelihood of return to work within six months, by household income

(a) Above median

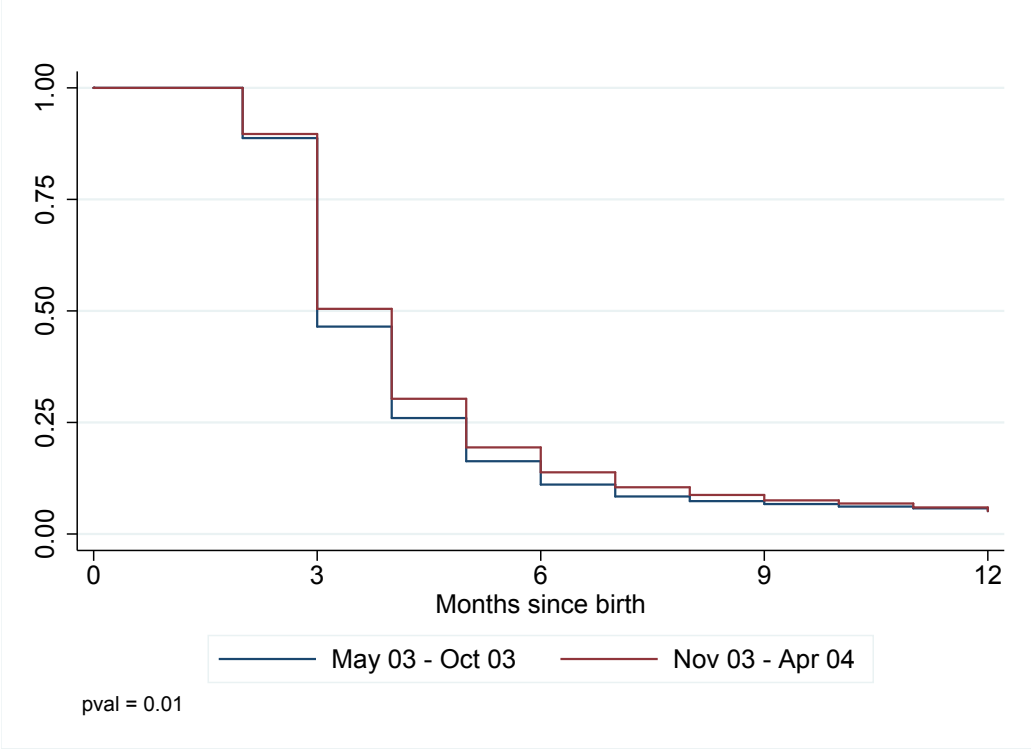


(b) Below median

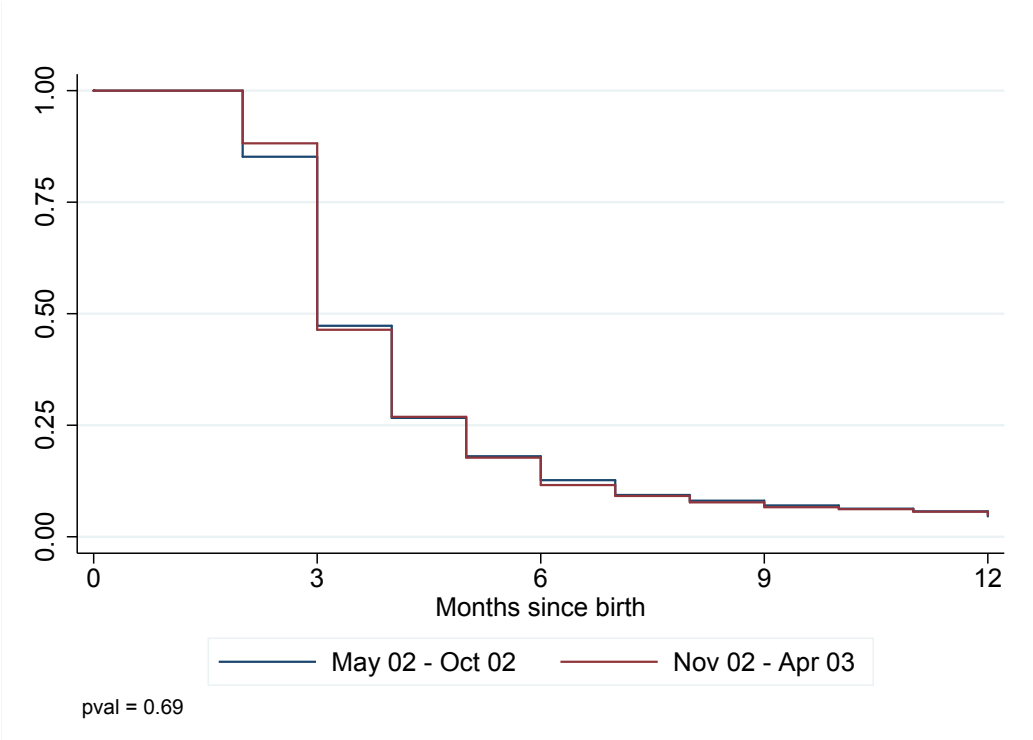
Note: Panels (a) and (b) of the figure depict the likelihood to return to work within six months after child birth of mothers from households with above- and below-median income. In both panels, the vertical red line is located just before the fourth quarter of 2003 marks the timing of the Remedia Event. The red dashed line depicts the predicted values from a regression of average likelihood to return to work as in Figure 7.

Figure 10: The likelihood of being on maternity leave after childbirth, above-median household income

(a) Around Remedia



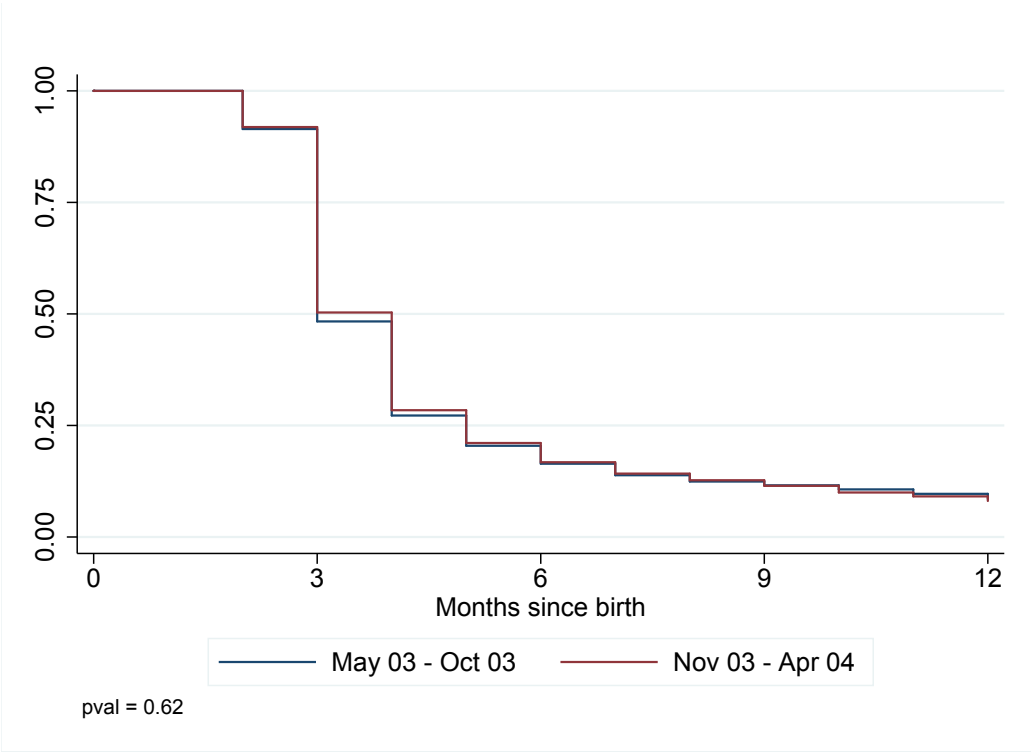
(b) Prior year



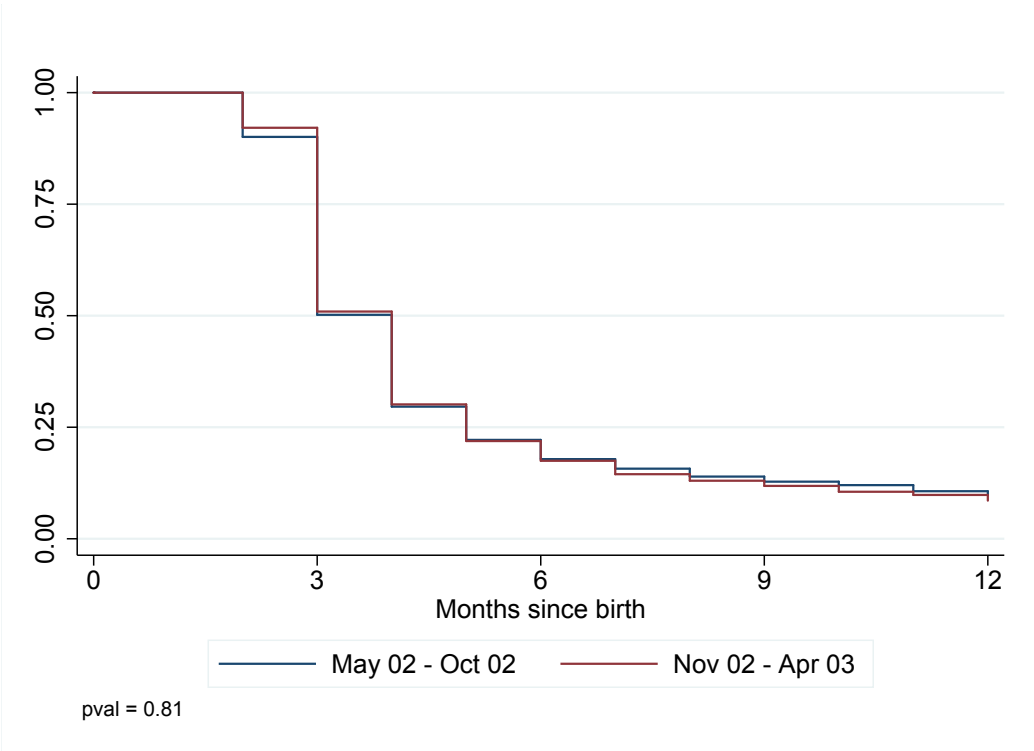
Note: Panels (a) and (b) of the figure depict, for women from to above-median income households, the likelihood of being on maternity leave in the first twelve months after childbirth in the periods around the Remedia Event and the prior year, respectively.

Figure 11: The likelihood of being on maternity leave after childbirth, below-median household income

(a) Around Remedia



(b) Prior year



Note: Panels (a) and (b) of the figure depict, for women from below-median income households, the likelihood of being on maternity leave in the first twelve months after childbirth in the periods around the Remedia Event and the prior year, respectively.

Table 1: Descripitive statistics, households with new mothers and infants aged 0-1 (IHES data)

	Pre Remedia (1)	Post Remedia (2)	Diff (3)
Children under 18	2.86	2.82	0.04
			(0.07)
Mother's years of schooling	13.27	13.55	-0.29
			(0.12)
Father's years of schooling	11.87	12.16	-0.29
			(0.25)
Household real income (2000 NIS)	11,340.82	11,171.39	169.43
			(341.71)
Share Ultra Orthodox Jews	0.14	0.16	-0.02
			(0.01)
Share Non-Jewish	0.20	0.23	-0.03
			(0.02)
Observations	1,431	1,435	

Note: This table provides descriptive statistics of the households in the IHES data pre- and post-Remedia period.

Table 2: The impact of the Remedia event on the likelihood to consume baby food, DD Estimates

	Dairy products			Basic products			Bread and cereal		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Remedia eventXBaby food	-0.107**	-0.107**	-0.107**	-0.098**	-0.098**	-0.098**	-0.102**	-0.102**	-0.102**
	(0.0186)	(0.0186)	(0.0186)	(0.0190)	(0.0190)	(0.0190)	(0.0193)	(0.0193)	(0.0193)
Year FEs	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Product FEs	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
HH Characteristics	No	No	Yes	No	No	Yes	No	No	Yes
Observations	17,196	17,196	17,196	20,062	20,062	20,062	17,196	17,196	17,196

Note: This table summarizes the DD estimates of Equation (1). The product categories are (1) Dairy products; (2) Basic products; (3) Bread & cereal. Standard errors are clustered at the household level. One or two asterisks indicate significance at 5% or 1%, respectively

Table 3: Descriptive statistics, first-time new mothers sample

	Post period: around Remedia			Pre period: prior year			DD
	Comp	Treat	Diff	Comp	Treat	Diff	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share male	0.50	0.50	-0.00	0.47	0.49	0.02	-0.02
	(0.50)	(0.50)	(0.01)	(0.50)	(0.50)	(0.01)	(0.01)
Wife's age at childbirth	27.88	28.14	0.26	27.82	27.90	0.08	0.18
	(3.55)	(3.48)	(0.07)	(3.60)	(3.50)	(0.07)	(0.10)
Share wife Jewish	0.94	0.95	0.01	0.92	0.92	-0.00	0.01
	(0.24)	(0.22)	(0.00)	(0.27)	(0.27)	(0.01)	(0.01)
Share wife native	0.83	0.82	-0.00	0.83	0.82	-0.00	-0.00
	(0.38)	(0.38)	(0.01)	(0.38)	(0.38)	(0.01)	(0.01)
Wife's monthly income - nominal	6,567.22	6,364.50	-202.72	6,549.99	6,385.46	-164.53	-38.20
	(4,074.23)	(3,967.99)	(81.56)	(4,392.01)	(4,232.47)	(85.47)	(118.12)
Wife's monthly income - real	6,256.32	5,930.20	-326.13	6,478.72	5,978.90	-499.83	173.70
	(3,878.72)	(3,696.78)	(76.86)	(4,344.22)	(3,962.99)	(82.38)	(112.65)
Husband's age at childbirth	30.48	30.62	0.14	30.43	30.47	0.04	0.10
	(4.15)	(4.01)	(0.08)	(4.26)	(4.11)	(0.08)	(0.12)
Share husband Jewish	0.94	0.95	0.01	0.92	0.92	-0.00	0.01
	(0.24)	(0.22)	(0.00)	(0.27)	(0.27)	(0.01)	(0.01)
Share husband native	0.83	0.83	0.00	0.83	0.84	0.00	0.00
	(0.37)	(0.37)	(0.01)	(0.37)	(0.37)	(0.01)	(0.01)
Husbands's monthly income - nominal	9,328.01	9,203.50	-124.51	9,566.24	9,222.69	-343.55	219.04
	(6,897.48)	(6,679.34)	(137.70)	(11,848.95)	(6,893.72)	(191.81)	(236.55)
Husband's monthly income - real	8,890.59	8,576.06	-314.54	9,462.15	8,635.48	-826.68	512.14
	(6,577.16)	(6,223.31)	(129.88)	(11,720.03)	(6,454.79)	(187.19)	(228.28)
Observations	4,961	4,773	9,734	5,060	5,124	10,184	19,918

Note: This table provides the descriptive statistics of the first-time new mothers sample.

Table 4: The likelihood to return to work within six months following the Remedia Event

	(1)	(2)
Post	-0.0323**	-0.0295**
	(0.0063)	(0.0063)
HH Characteristics	No	Yes
Observations	35,696	35,696

Note: This table provides the estimates of the analysis of the likelihood to return to work within six months after childbirth using the model in Equation (2).

Table 5: The impact of the Remedia Event on new mothers' return to work, DD Estimates per month

	Full sample		Intensive margin	
	(1)	(2)	(3)	(4)
Likelihood to return within:				
2 months	0.0185*	0.0177*	0.0186*	0.0178*
	(0.0086)	(0.0085)	(0.0089)	(0.0088)
3 months	-0.0290*	-0.0285*	-0.0333*	-0.0324*
	(0.0142)	(0.0140)	(0.0144)	(0.0143)
4 months	-0.0221	-0.0216	-0.0275*	-0.0264*
	(0.0128)	(0.0126)	(0.0126)	(0.0124)
5 months	-0.0201	-0.0204	-0.0259*	-0.0255*
	(0.0113)	(0.0111)	(0.0108)	(0.0106)
6 months	-0.0211*	-0.0222*	-0.0273**	-0.0277**
	(0.0101)	(0.0099)	(0.0093)	(0.0092)
7 months	-0.0187*	-0.0202*	-0.0250**	-0.0258**
	(0.0093)	(0.0091)	(0.0082)	(0.0081)
8 months	-0.0143	-0.0159	-0.0206**	-0.0214**
	(0.0088)	(0.0086)	(0.0076)	(0.0075)
9 months	-0.0098	-0.0113	-0.0160*	-0.0167*
	(0.0084)	(0.0082)	(0.0070)	(0.0070)
10 months	-0.0076	-0.0091	-0.0138*	-0.0145*
	(0.0080)	(0.0079)	(0.0065)	(0.0065)
11 months	-0.0024	-0.0038	-0.0085	-0.0090
	(0.0077)	(0.0075)	(0.0060)	(0.0060)
12 months	-0.0026	-0.0040	-0.0087	-0.0092
	(0.0072)	(0.0071)	(0.0053)	(0.0053)
HH Characteristics	No	Yes	No	Yes
Observations	19,918	19,918	19,206	19,206

Note: This table summarizes the DD estimates of the monthly likelihood to return to work as per Equation (3). Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.

Table 6: The impact of the Remedia Event on new mothers' return to work , DD Estimates

	Full Sample		Intensive margin	
	(1)	(2)	(3)	(4)
A. Months worked within six months of birth:				
Post X treat	-0.0787*	-0.0785*	-0.0942**	-0.0924**
	(0.0357)	(0.0347)	(0.0353)	(0.0345)
B. Months worked within twelve months of birth:				
Post X treat	-0.1458	-0.1564	-0.1940*	-0.1993*
	(0.0878)	(0.0849)	(0.0832)	(0.0810)
HH Characteristics	No	Yes	No	Yes
Observations	19,918	19,918	19,206	19,206

Note: This table summarizes the DD estimates of the average months worked as per Equation (3). Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.

Table 7: The impact of the Remedia Event on mothers' return to work , DD Estimates per month by household income

	Above median		Below median	
	(1)	(2)	(3)	(4)
Likelihood to return within:				
2 months	0.0209	0.0207	0.0161	0.0152
	(0.0136)	(0.0136)	(0.0108)	(0.0108)
3 months	-0.0487*	-0.0471*	-0.0127	-0.0155
	(0.0210)	(0.0206)	(0.0192)	(0.0190)
4 months	-0.0408*	-0.0400*	-0.0068	-0.0086
	(0.0187)	(0.0183)	(0.0174)	(0.0171)
5 months	-0.0342*	-0.0338*	-0.0088	-0.0116
	(0.0161)	(0.0157)	(0.0158)	(0.0155)
6 months	-0.0385**	-0.0382**	-0.0071	-0.0112
	(0.0138)	(0.0135)	(0.0145)	(0.0142)
7 months	-0.0227	-0.0224	-0.0160	-0.0204
	(0.0122)	(0.0120)	(0.0136)	(0.0133)
8 months	-0.0176	-0.0174	-0.0122	-0.0161
	(0.0114)	(0.0112)	(0.0129)	(0.0127)
9 months	-0.0123	-0.0120	-0.0083	-0.0119
	(0.0107)	(0.0105)	(0.0125)	(0.0122)
10 months	-0.0081	-0.0077	-0.0080	-0.0117
	(0.0103)	(0.0101)	(0.0119)	(0.0117)
11 months	-0.0029	-0.0025	-0.0026	-0.0060
	(0.0098)	(0.0096)	(0.0114)	(0.0113)
12 months	0.0031	0.0034	-0.0079	-0.0115
	(0.0091)	(0.0090)	(0.0108)	(0.0107)
HH Characteristics	No	Yes	No	Yes
Observations	9,085	9,085	10,833	10,833

Note: This table summarizes the DD estimates of the monthly likelihood to return to work as per Equation (3). Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.

Table 8: The impact of the Remedia Event on mothers' return to work , DD Estimates by income

	Above median		Below median	
	(1)	(2)	(3)	(4)
A. Months worked within six months of birth:				
Post X treat	-0.1583**	-0.1556**	-0.0140	-0.0238
	(0.0526)	(0.0507)	(0.0484)	(0.0474)
B. Months worked within twelve months of birth:				
Post X treat	-0.2505*	-0.2462*	-0.0646	-0.1145
	(0.1215)	(0.1165)	(0.1246)	(0.1212)
HH Characteristics	No	Yes	No	Yes
Observations	9,085	9,085	10,833	10,833

Note: This table summarizes the DD estimates of the average months worked as per Eq. (3), by household income. Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.

A Appendix

A.1 Synthetic control

We collapse the IHES data into year-by-product cells. To create a sensible counterfactual to baby formula (our outcome variable) in the pre-period (2000-2003 - the period before the Remedia Event), we construct a "synthetic" baby formula as a weighted combination of the comparison products. The combination of products is chosen to match the trajectory of baby formula in the pre-period in terms of outcome predictors. We use the average likelihood to consume baby formula during pre-period as well as characteristics of households that buy the product: average net household income per-capita and average father's likelihood to be highly-educated. The synthetic sample weights are reported in Table A.1. As the table shows the synthetic group is primarily comprised by dairy products (and a little bit cigarettes). As it is often noted, the exact results are sensitive to the exact choice of outcome predictions, however, they are qualitatively quite robust across different specifications, indicating a decrease in the likelihood to consume baby formula.

A.2 Graphical analysis of maternity leaves

Here we complement the description of the graphical analysis we show in Figure 7. To create the figure, we use the sample of all births in the time period between the first quarter of 2001 and the third quarter of 2004 that fall under the "intensive margin" sampling criterion we describe in the main text: first-time new mothers from households where both spouses were employed and where the mother returns to work within two years of childbirth (35,696 births). The blue connected line depicts the average likelihood to return to work within six months after childbirth. To draw the red dashed line we run the following regression keeping only births from the period before the Remedia event—first quarter of 2001- third quarter of 2003:

$$y_{it} = \alpha + \beta_1 \cdot QOB_t + \sum_{i=1}^{4} \gamma_i \cdot Quarter + \epsilon_{it} \tag{A1}$$

where y_{it} is the dummy for return to work within six months. The regression includes a linear time trend for quarter of birth (QOB_t) and quarter of year dummies ($Quarter_i$). Using the estimates from this regression we draw the predicted average quarterly values—the red dashed line.

A.3 The impact of the Remedia Event on maternity leaves of experienced new mothers

Here we report the results from the analysis of the effect of the Remedia Event on maternity leaves of experienced mothers. Table A.2 provides the descriptive statistics for this group. Figure A.1 and Table A.3 show the monthly return to work results. Table A.4 shows the results for average months worked within 6 and 12 months of childbirth. Over-

all, the estimates indicate that the Remedia Event did not create a statistically significant effect on maternity leaves of experienced new mothers.

A.4 Validity check - a placebo test

Here we report the results from a placebo test we conducted in order to validate our main results. We repeat the analysis we reported in Table 6 with data from the previous year. Namely, we assume that the (fictitious) Remedia Event—the post-period—shifted one year earlier and occurred in November 02 and that pre-period—one year prior to the (fictitious) Remedia Event—was November 01. The results are reported in Table A.5. As the table indicates the estimates are all statistically insignificant. The difference between the actual Remedia Event and the placebo is particularly stark in the "intensive margin" sample.

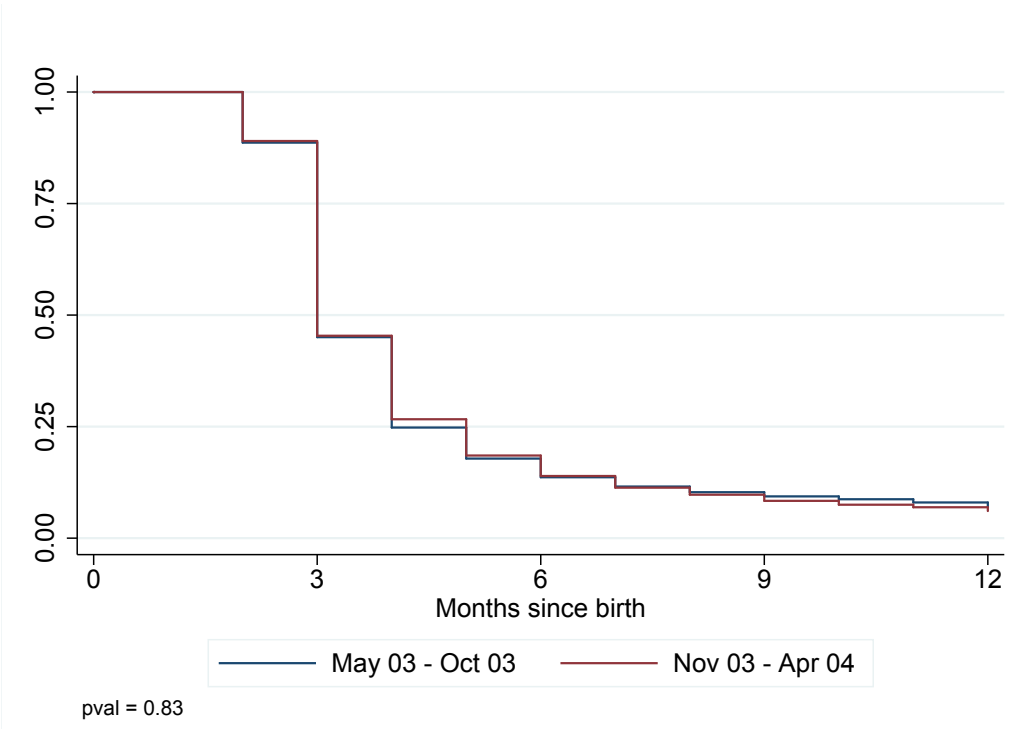
Table A.1: Synthetic control weights

Product name (1)	Weight (2)
Pasteurised milk	0.132
Milk and cheese delicacies	0.837
Cigarettes	0.031

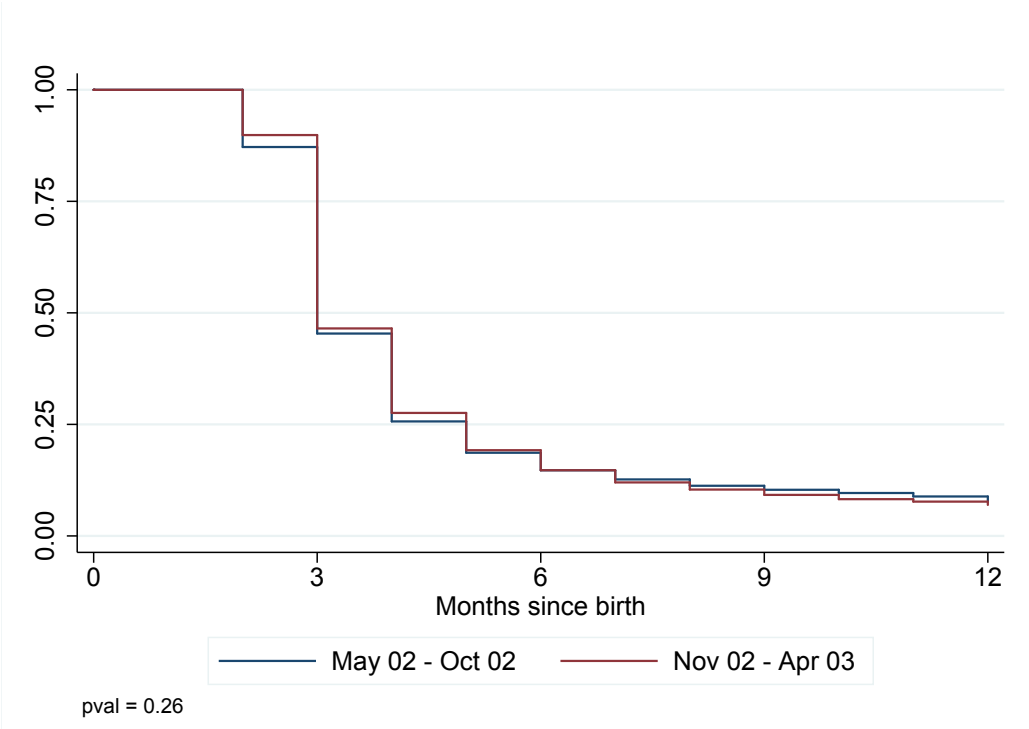
Note: This table provides the weights used to create the synthetic baby formula.

Figure A.1: The likelihood of being on maternity leave after childbirth, experienced new mothers

(a) Around Remedia



(b) Prior year



Note: Panels (a) and (b) of this figure depict the likelihood of experienced new mothers to be on maternity leave in the first twelve months after childbirth of around the Remedia Event and the prior year, respectively.

Table A.2: Descriptive statistics, experienced new mothers sample

	Around Remedia			Prior year			DD
	Pre	Post	Diff	Pre	Post	Diff	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share male	0.48	0.50	0.01	0.48	0.49	0.00	0.01
	(0.50)	(0.50)	(0.01)	(0.50)	(0.50)	(0.01)	(0.01)
Wife's age at childbirth	31.75	31.83	0.07	31.73	31.83	0.10	-0.02
	(4.35)	(4.29)	(0.06)	(4.24)	(4.28)	(0.06)	(0.09)
Share wife Jewish	0.92	0.92	0.00	0.92	0.92	-0.00	0.00
	(0.27)	(0.27)	(0.00)	(0.26)	(0.26)	(0.00)	(0.01)
Share wife native	0.80	0.79	-0.00	0.79	0.80	0.01	-0.01
	(0.40)	(0.41)	(0.01)	(0.41)	(0.40)	(0.01)	(0.01)
Wife's monthly income - nominal	6,509.10	6,373.53	-135.57	6,596.07	6,425.47	-170.60	35.03
	(4,840.05)	(4,476.84)	(69.96)	(5,526.55)	(4,573.87)	(75.88)	(103.36)
Wife's monthly income - real	6,203.56	5,940.06	-263.50	6,524.30	6,016.36	-507.94	244.44
	(4,606.59)	(4,171.77)	(65.95)	(5,466.42)	(4,282.65)	(73.41)	(98.88)
Husband's age at childbirth	34.68	34.81	0.13	34.61	34.71	0.10	0.03
	(5.02)	(5.04)	(0.08)	(4.89)	(4.98)	(0.07)	(0.11)
Share husband Jewish	0.92	0.92	0.00	0.92	0.92	0.00	0.00
	(0.27)	(0.27)	(0.00)	(0.27)	(0.26)	(0.00)	(0.01)
Share husband native	0.78	0.79	0.00	0.79	0.79	0.00	0.00
	(0.41)	(0.41)	(0.01)	(0.41)	(0.41)	(0.01)	(0.01)
Husbands's monthly income - nominal	10,993.84	10,862.86	-130.97	11,166.06	10,790.48	-375.58	244.61
	(9,265.91)	(12,371.33)	(163.67)	(10,024.67)	(8,600.43)	(139.75)	(215.87)
Husband's monthly income - real	10,481.52	10,124.17	-357.35	11,044.57	10,103.44	-941.13	583.78
	(8,815.11)	(11,515.27)	(153.58)	(9,915.60)	(8,052.83)	(135.08)	(205.22)
Observations	8,992	8,789	17,781	8,747	9,075	17,822	35,603

Note: This table provides the descriptive statistics of the experienced new mothers sample.

Table A.3: The impact of the Remedia Event on experienced new mothers' return to work, DD estimates per month

	Full sample		Intensive margin	
	(1)	(2)	(3)	(4)
Likelihood to return within:				
2 months	0.0233**	0.0226**	0.0242**	0.0234**
	(0.0067)	(0.0067)	(0.0070)	(0.0069)
3 months	0.0083	0.0069	0.0085	0.0072
	(0.0106)	(0.0104)	(0.0107)	(0.0106)
4 months	0.0004	-0.0005	0.0004	-0.0002
	(0.0093)	(0.0092)	(0.0091)	(0.0090)
5 months	-0.0011	-0.0022	-0.0013	-0.0019
	(0.0082)	(0.0081)	(0.0078)	(0.0077)
6 months	-0.0027	-0.0040	-0.0030	-0.0039
	(0.0074)	(0.0073)	(0.0068)	(0.0067)
7 months	-0.0042	-0.0055	-0.0045	-0.0054
	(0.0069)	(0.0068)	(0.0060)	(0.0060)
8 months	-0.0029	-0.0042	-0.0032	-0.0040
	(0.0065)	(0.0064)	(0.0055)	(0.0055)
9 months	-0.0015	-0.0027	-0.0018	-0.0025
	(0.0062)	(0.0061)	(0.0051)	(0.0050)
10 months	-0.0016	-0.0029	-0.0019	-0.0027
	(0.0059)	(0.0058)	(0.0047)	(0.0047)
11 months	-0.0008	-0.0020	-0.0011	-0.0018
	(0.0057)	(0.0056)	(0.0044)	(0.0044)
12 months	0.0024	0.0012	0.0022	0.0016
	(0.0054)	(0.0053)	(0.0039)	(0.0039)
HH Characteristics	No	Yes	No	Yes
Observations	19,918	19,918	34,296	34,296

Note: This table summarizes the DD estimates of the monthly likelihood to return to work as per Equation (3). Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.

Table A.4: The impact of the Remedia Event on experienced new mothers' return to work, DD Estimates

	Full Sample		Intensive margin	
	(1)	(2)	(3)	(4)
A. Months worked within six months of birth:				
Post X treat	0.0119	0.0074	0.0122	0.0078
	(0.0267)	(0.0261)	(0.0263)	(0.0257)
B. Months worked within twelve months of birth:				
Post X treat	-0.0199	-0.0371	-0.0222	-0.0387
	(0.0653)	(0.0636)	(0.0612)	(0.0599)
HH Characteristics	No	Yes	No	Yes
Observations	35,603	35,603	34,296	34,296

Note: This table summarizes the DD estimates of the average months worked as per Equation (3). Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.

Table A.5: The impact of the (Placebo) Remedia Event on mothers' return to work, DD Estimates

	Full Sample		Intensive margin	
	(1)	(2)	(3)	(4)
A. Months worked within six months of birth:				
Post X treat	-0.0667	-0.0413	-0.0554	-0.0348
	(0.0361)	(0.0357)	(0.0357)	(0.0354)
B. Months worked within twelve months of birth:				
Post X treat	-0.0918	-0.0199	-0.0487	0.0089
	(0.0899)	(0.0890)	(0.0852)	(0.0846)
HH Characteristics	No	Yes	No	Yes
Observations	19,867	19,867	19,059	19,059

Note: This table summarizes the DD estimates of the average months worked as per Equation (3). Standard errors are calculated using Huber-White heteroscedasticity correction. One or two asterisks indicate significance at 5% or 1%, respectively.