ON LINE APPENDIX

When the baby cries at night.

Inelastic buyers in non-competitive markets

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A.1 Theoretical model

In this Appendix we illustrate in greater detail and with a simple model with closed form solution, how the theoretical analysis presented in Section 2 of the paper allows us to derive Remarks 1 and 2.

Two types of consumers $j \in \{A, B\}$ have the possibility to buy two goods $g \in \{H, D\}$ (respectively hygiene products and diapers or milk powder) from $S > 1$ shops, evenly distributed on a unitary circle. Any consumer, independently of her type, is identified by her position $x \in [0, 1]$ on the circle. Consumer of type j is interested in at most one unit of good g which gives her a utility v_g^j.

The two types of consumers differ on two respects. First, consumers A are not interested in product D, i.e. $v_D^A = 0$, whilst consumers B obtain a value v_D^B from it. The other good H is instead of interest for both consumers with values $v_H^A = v^A$ and $v_H^B = v^B$. Without loss of generality and to simplify the analysis we set $v_D^B = v^B$. Second, buying product g at price p from a shop that is d apart, the utility for a type j consumer is $v_g^j - \tau^j \times d - p$. At any period t there are N_t^j consumers of type j with a total of $N_t = N_t^A + N_t^B$ consumers.

A shop that sells a total amount Q of the two products incurs in a cost $C(Q) = cQ + \frac{\gamma}{2}Q^2$ where, without loss of generality, we have normalized to zero all costs that are specific to some products. We assume $c \geq 0$ and γ can be positive (negative) with increasing (decreasing) marginal costs. Shops do not price discriminate across types and the price of product g in shop i at time t is p_{igt}.

We first consider the case with at least two shops $S \geq 2$ and covered market. Let p_{i+1}, p_i be the prices of shop i and $i+1$ for a given product at a given time (to simplify notation we momentarily suppress the indexes g and t). Consumer of type j indifferent between shop i and shop $i+1$ is,

$$x_{i,i+1}^j = \frac{p_{i+1} - p_i}{2\tau^j} + \frac{1 + 2i}{2S}. \tag{A.1.1}$$

and the one indifferent between shop i and shop $i-1$ is

$$x_{i,i-1}^j = \frac{p_i - p_{i-1}}{2\tau^j} + \frac{2i - 1}{2S}. \tag{A.1.2}$$

The associated demand for shop i then is

$$Q_i^j(p_i, p) = (x_{i,i+1}^j - x_{i,i-1}^j)N_t^j = q_i^j(p_i, p)N_t^j. \tag{A.1.3}$$

where

$$q_i^j(p_i, p) = \frac{1}{S} + \frac{p - p_i}{\tau^j}$$

and p is the (symmetric) price of shop i's rivals (clearly $q_i^A(p_i, p) = 0$ when considering product D which is of no interest to consumers A). From these demand functions, the price elasticity is

$$\eta_i^j = -\frac{pS}{\tau^j + S(p - p_i)}$$

which is increasing in τ^j, i.e. the larger is τ^j the less elastic are consumers.

We can write shop i's profit as (reintroducing the three indexes i, g and t)

$$\pi_i = \sum_{j,g} p_{igt} Q_i^j (p_{igt}, p_{gt}) - C\left(Q_{it}\right)$$

with a total quantity

$$Q_{it} = Q_i^A(p_{iDt}, p_{Dt}) + Q_i^A(p_{iHt}, p_{Ht}) + Q_i^B(p_{iHt}, p_{Ht}).$$

Each shop i maximizes its profit at any t by optimally choosing the two prices p_{igt} for $g = D, H$. The associated first order condition is

$$\sum_j \left[q_i^j(p_{igt}, p_{gt}) + p_{igt} \frac{dq_i^j(p_{igt}, p_{gt})}{dp_{igt}} \right] N_t^j = C'(Q_{it}) \sum_j \frac{dq_i^j(p_{igt}, p_{gt})}{dp_i} N_t^j.$$

which, using symmetry among shops and the price p_{tg}, becomes, for product $g = H$,

$$\frac{N_t^A}{S} + \frac{N_t^B}{S} - p_{tH} \left(\frac{N_t^A}{\tau^A} + \frac{N_t^B}{\tau^B} \right) = -\left(c + \gamma Q_t\right) \left(\frac{N_t^A}{\tau^A} + \frac{N_t^B}{\tau^B} \right)$$

and, for product $g = D$,

$$\frac{N_t^B}{S} - p_{tD} \frac{N_t^B}{\tau^A} = -\left(c + \gamma Q_t\right) \frac{N_t^B}{\tau^A}.$$

The total quantity Q_t is now

$$Q_t = Q_i^A(p_{Dt}, p_{Dt}) + Q_i^A(p_{Ht}, p_{Ht}) + Q_i^B(p_{Ht}, p_{Ht}) = \frac{N_t^A}{S} + 2\frac{N_t^B}{S}. \tag{A.1.4}$$

Solving for the optimal prices we finally obtain

$$p_{Dt}^* = c + \gamma Q_t + \frac{\tau^B}{S}$$

and

$$p_{Ht}^* = c + \gamma Q_t + \frac{\bar{\tau}_t}{S}$$

where

$$\bar{\tau}_t \equiv N_t \left(\frac{N_t^A}{\tau^A} + \frac{N_t^B}{\tau^B} \right)^{-1} = \left(\frac{1}{\tau^A} - \frac{N_t^A}{N_t} \frac{\tau^A - \tau^B}{\tau^A \tau^B} \right)^{-1}$$

Now we can explicitely study the effect of changes in the population of consumers on prices. Note that when we consider a change of N_t that keeps the ratio $\frac{N_t^A}{N_t}$ constant, we must have $dN_t^A = \frac{N_t^A}{N_t} dN_t$ and when considering a change of N_t^A with constant N_t^B, it must $dN_t = dN_t^A$. We obtain the following comparative statics, where ξ is a non-negative constant,

		dp^*_{Dt}	dp^*_{Ht}	$d\left(p^*_{Ht} - p^*_{Dt}\right)$
$\left.\frac{\partial p^*_{gt}}{\partial N_t}\right\rvert_{\frac{N_t^B}{N_t}=\xi}$	$=$	$\gamma \frac{Q_t}{N_t}$	dp^*_{Dt}	0
$\left.\frac{\partial p^*_{gt}}{\partial N_t^B}\right\rvert_{N_t^A=\xi}$	$=$	$\frac{\gamma}{S}$	$dp^*_{Dt} + \frac{\bar{\tau}_t^2 N_t^B}{\tau^A \tau^B S N_t}\left(\tau^B - \tau^A\right)$	$\frac{\bar{\tau}_t^2 N_t^B}{\tau^A \tau^B S N_t}\left(\tau^B - \tau^A\right)$
$\left.\frac{\partial^2 p^*_{gt}}{\partial N_t^B \partial S}\right\rvert_{N_t^A=\xi}$	$=$	$-\frac{\gamma}{S^2}$	$dp^*_{Dt} - \frac{\bar{\tau}_t^2 N_t^B}{\tau^A \tau^B S^2 N_t}\left(\tau^B - \tau^A\right)$	$-\frac{\bar{\tau}_t^2 N_t^B}{\tau^A \tau^B S^2 N_t}\left(\tau^B - \tau^A\right)$
$\frac{\partial p^*_{gt}}{\partial S}$	$=$	$-\frac{\gamma Q_t + \tau^B}{S^2}$	$dp^*_{Dt} - \frac{\bar{\tau}_t N_t}{S^2 \tau^A}\left(\tau^B - \tau^A\right)$	$-\frac{\bar{\tau}_t N_t}{S^2 \tau^A}\left(\tau^B - \tau^A\right)$

(A.1.5)

The last column reports the differential effects on the two products D and H and how it depends on different price elasticities of the two groups of consumers.

Finally, since the empirical analysis relies in parts on small cities in which just a single shop may be available, we consider the case of monopolist, $S = 1$. Let p_g be the price for product g at a given time (suppressing the indexes i and t to simplify notation). Consumer j indifferent between buying and not buying good g is located at a distance d such that

$$v_g^j - d\tau^j - p_g = 0$$

and the demand for that good is thus,

$$Q_g^j(p_{gt}) = 2\frac{v_g^j - p_{gt}}{\tau^j} N_t^j.$$

From these demand functions, the price elasticity is

$$\eta_g^j = -\frac{p_{gt}}{v_g^j - p_{gt}}$$

which is increasing in v_g^j, i.e. the larger is v_g^j the less elastic are consumers.

The profit of the monopolist can be written as

$$\pi_m = \sum_{j,g} p_{gt} Q_g^j(p_{gt}) - C\left[Q_{tm}\right]$$

where

$$Q_{tm} = Q_D^A(p_{Dt}) + Q_H^A(p_{Ht}) + Q_H^B(p_{Ht}).$$

The optimal prices then satisfy the following conditions

$$\begin{aligned} p_{Ht} &= \frac{1}{2}\left(v + c + \gamma Q_{tm}\right) \\ p_{Dt} &= \frac{1}{2}\left(v + c + \gamma Q_{tm}\right) \end{aligned}$$

with

$$Q_{tm} = 2\frac{v - p_{Ht}}{\tau^A}N_t^A + 2\frac{v - p_{Ht}}{\tau^B}N_t^B + 2\frac{v - p_{Dt}}{\tau^A}N_t^B$$

Defining $\hat{\tau} \equiv N_t^A\tau^B + 2N_t^B\tau^A$, the prices can be written as

$$\begin{aligned} p_{Ht}^* &= \frac{c}{2} + \frac{1}{2}\left(v^A\frac{N_t^A}{N_t\tau^A} + v^B\frac{N_t^B}{N_t\tau^B}\right)\bar{\tau}_t + \frac{\gamma}{2}\frac{(v^A - c)N_t^A\tau^B + (v^B - c)2N_t^B\tau^A}{\tau^B\tau^A + \gamma\hat{\tau}}, \\ p_{Dt}^* &= \frac{c + v^B}{2} + \frac{\gamma}{2}\frac{(v^A - c)N_t^A\tau^B + (v^B - c)2N_t^B\tau^A}{\tau^B\tau^A + \gamma\hat{\tau}}. \end{aligned}$$

and the comparative statics is as follows,

		dp_{Dt}^*	dp_{Ht}^*	$d\left(p_{Ht}^* - p_{Dt}^*\right)$
$\left.\frac{\partial p_{gt}^*}{\partial N_t}\right\vert_{\frac{N_t^B}{N_t}=\xi}$	$=$	$\gamma\frac{\tau^B\tau^A Q_{tm}}{2\tau^B\tau^A+\gamma\hat{\tau}_t}$	dp_{Dt}^*	0
$\left.\frac{\partial p_{gt}^*}{\partial N_t^B}\right\vert_{N_t^A=\xi}$	$=$	$\gamma\tau^B\tau^A\frac{\tau^B(v^A-c)+2\gamma N_t^B(v^A-v^B)}{2(\tau^B\tau^A+\gamma\hat{\tau}_t)^2}$	$dp_{Dt}^* + \frac{\tau^B\tau^A N_t^B(v^B-v^A)}{2\tilde{\tau}_t^2}$	$\frac{\tau^B\tau^A N_t^B(v^B-v^A)}{2\tilde{\tau}_t^2}$

(A.1.6)

where $\tilde{\tau}_t \equiv N_t^A\tau^B + N_t^B\tau^A$. Also in this case the last column reports the differential effects on the two products D and H and how it depends on different price elasticities of the two groups of consumers.

A.2 Additional data information and results

Table A.2.1: Top items in the basket of hygiene products, diaper and milk

Name	Description	Price	Quantity
Top-5 by Sold Quantity: Hygiene			
Salviette Assorbello	Hygienic Towels	2.04	39.94
GP Baby Pasta all'Ossido di Zinco	Zinc-Oxyde Paste	4.91	23.3
Bluedermin Pasta BB 100ml	Diaper Change Ointment	5.83	17.21
Trudi Baby Care Salviettine	Hygienic Towels	2.07	16.53
GP Baby Detergente	Cleansing Cream	5.02	15.3
Top-5 by Price: Hygiene			
Soin de Fee 24-Hour Baby Cream 50ml	Barrier Cream	45	0.21
Vidermina 3 Soluzione 1000ml	Cleansing Cream	40.32	0.01
Buba Shampoo e Bagno	Shampoo and Bath Foam	37.61	0.04
Unilen Gel 15ml	Barrier Cream	36.06	0.11
Protezione Solare Bambini Vichy	Suntan Cream	30.9	0.02
Top-5 by Sold Quantity: Diaper			
Pampers Progressi 28pz	Diaper	9.95	80.47
Pampers Progressi mini 32pz	Diaper	10.47	50.20
Pampers Babydry mini 25pz	Diaper	5.70	44.70
Sempre Asciutto 2/5 kg 40pz	Diaper	4.45	51.16
Pampers Babydry 3/6 kg 32p	Diaper	10.62	14.62
Top-5 by Price: Diaper			
Popolini Onesiza 10pz	Washable Diaper	80.93	5.7
Kit Pannolino Amico small	Washable Diaper	19.42	3.8
Kit Base onesize superdry	Washable Diaper	41.25	1
Kit Base 3/6 kg superdry	Washable Diaper	46.81	1
Tortolini Torta Pannolino 3/6	Washable Diaper	53.15	4.5
Top-5 by Sold Quantity: Milk Powders			
Humana 1 slim premature baby	Milk Powder	3.39	336.27
Plasmon 1 primigiorni brik 458ml	Milk	2.71	328.47
Nidinia 1 500ml	Milk	2.77	199.51
Mellin 1 brick 500ml	Milk	2.71	188.40
Nipiol 1 485ml	Milk	1.37	166.32
Top-5 by Price: Milk Powders			
Nidinia confort 1 600gr 3p	Milk Powder	62.82	1
Blemil plus forte 16*500ml	Milk	51.78	1.33
Humana as 1 110gr	Milk Powder	39.78	7.94
Plasmon energy 12*485ml	Milk	37.16	1.3
Polilat 1 powder 800gr	Milk Powder	36.78	8.56

Notes: Our calculations based on the Pharma database. Prices are in Euros.

Figure A.2.1: An example of generalised discount offered in a pharmacy

Notes: This picture has been taken in a pharmacy by one of the authors.

Table A.2.2: Effect of the monthly number of newborns on the equilibrium price of hygiene products and diaper: all lags, all cities

	Hygiene	Diaper	Difference
Log Newborns (t)	0.020	0.002	-0.018
	(0.008)**	(0.006)	(0.012)
Log Newborns (t-1)	0.018	-0.002	-0.021
	(0.007)**	(0.006)	(0.010)**
Log Newborns (t-2)	0.017	-0.002	-0.018
	(0.008)**	(0.006)	(0.010)*
Log Newborns (t-3)	0.023	0.002	-0.020
	(0.009)***	(0.007)	(0.013)
Log Newborns (t-4)	0.026	0.004	-0.023
	(0.009)***	(0.008)	(0.014)
Log Newborns (t-5)	0.033	0.004	-0.029
	(0.010)***	(0.008)	(0.014)**
Log Newborns (t-6)	0.032	0.006	-0.026
	(0.007)***	(0.008)	(0.011)**
Log Newborns (t-7)	0.032	0.007	-0.025
	(0.007)***	(0.007)	(0.010)**
Log Newborns (t-8)	0.030	0.007	-0.023
	(0.007)***	(0.007)	(0.009)**
Log Newborns (t-9)	0.026	0 .001	-0.025
	(0.006)***	(0.009)	(0.010)**
Log Newborns (t-10)	0.018	-0.002	-0.0219
	(0.006)***	(0.008)	(0.009)**
Time effects	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes
Number of observations	125616	125616	125616
Number of cities	1548	1548	1548

Notes: OLS estimates of equation :

$$p_{cgt} = \sum_{\tau=0}^{23} \delta_{t-\tau} N_{c,t-\tau} + \sum_{\tau=0}^{23} \delta_{t-\tau}^{D} N_{c,t-\tau} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if g = diapers (or milk powders), c denotes cities, t months. p_{cgt} is the equilibrium (log) price index. N_{ct} is the log number of babies in month t. ψ_{cg} are city×product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To save on space only the first ten lags are reported (the remaining ones are not statistically significant). Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is ≈ 1.8 for the (log) number of newborns at different lags, 0.03 for the (log) price of hygiene product and 0.05 for the (log) price of diaper.

Table A.2.3: Effect of the monthly number of newborns on the equilibrium price of hygiene products and diaper: all lags,100% Pharma coverage

	Hygiene	Diaper	Difference
Log Newborns (t)	0.025	0.004	-0.021
	(0.006)***	(0.007)	(0.010)**
Log Newborns (t-1)	0.021	0.001	-0.020
	(0.006)***	(0.006)	(0.008)**
Log Newborns (t-2)	0.017	0.002	-0.015
	(0.007)**	(0.006)	(0.009)*
Log Newborns (t-3)	0.021	0.004	-0.016
	(0.007)***	(0.006)	(0.010)
Log Newborns (t-4)	0.023	0.006	-0.017
	(0.007)***	(0.008)	(0.012)
Log Newborns (t-5)	0.028	0.006	-0.022
	(0.008)***	(0.008)	(0.012)*
Log Newborns (t-6)	0.027	0.011	-0.016
	(0.007)***	(0.007)	(0.009)*
Log Newborns (t-7)	0.026	0.010	-0.016
	(0.007)***	(0.007)	(0.010)
Log Newborns (t-8)	0.024	0.008	-0.016
	(0.007)***	(0.006)	(0.009)*
Log Newborns (t-9)	0.018	0.002	-0.017
	(0.006)***	(0.008)	(0.010)
Log Newborns (t-10)	0.012	-0.004	-0.016
	(0.007)*	(0.007)	(0.010)*
Time effects	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes
Number of observations	51550	51550	51550
Number of cities	694	694	694

Notes: OLS estimates of equation :

$$p_{cgt} = \sum_{\tau=0}^{23} \delta_{t-\tau} N_{c,t-\tau} + \sum_{\tau=0}^{23} \delta^D_{t-\tau} N_{c,t-\tau} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if g = diapers (or milk powders), c denotes cities, t months. p_{cgt} is the equilibrium (log) price index. N_{ct} is the log number of babies in month t. ψ_{cg} are city$\times$product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To save on space only the first ten lags are reported (the remaining ones are not statistically significant). Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is $\approx$ 1.8 for the (log) number of newborns at different lags, 0.03 for the (log) price of hygiene product and 0.05 for the (log) price of diaper.

Table A.2.4: Effect of the monthly number of newborns on the equilibrium price of hygiene products and milk: all lags, all cities

	Hygiene	Milk	Difference
Log Newborns (t)	0.026	-0.012	-0.038
	(0.006)*	(0.006)	(0.007)***
Log Newborns (t-1)	0.009	0.008	-0.001
	(0.006)	(0.006)	(0.008)
Log Newborns (t-2)	0.006	0.005	-0.001
	(0.005)	(0.006)	(0.008)
Log Newborns (t-3)	0.010	0.007	-0.003
	(0.005)*	(0.006)	(0.008)
Log Newborns (t-4)	0.015	0.000	-0.015
	(0.005)***	(0.007)	(0.009)*
Log Newborns (t-5)	0.019	0.007	-0.013
	(0.006)***	(0.007)	(0.009)
Log Newborns (t-6)	0.025	0.005	-0.019
	(0.007)***	(0.007)	(0.009)**
Log Newborns (t-7)	0.026	0.008	-0.017
	(0.006)***	(0.007)	(0.009)*
Log Newborns (t-8)	0.023	0.011	-0.012
	(0.006)***	(0.007)	(0.009)
Log Newborns (t-9)	0.022	0 .001	-0.021
	(0.006)***	(0.008)	(0.009)**
Log Newborns (t-10)	0.016	-0.002	-0.014
	(0.006)***	(0.007)	(0.009)
Time effects	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes
Number of observations	117123	117123	117123
Number of cities	1548	1548	1548

Notes: OLS estimates of equation :

$$p_{cgt} = \sum_{\tau=0}^{23} \delta_{t-\tau} N_{c,t-\tau} + \sum_{\tau=0}^{23} \delta^{D}_{t-\tau} N_{c,t-\tau} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if g = diapers (or milk powders), c denotes cities, t months. p_{cgt} is the equilibrium (log) price index. N_{ct} is the log number of babies in month t. ψ_{cg} are city×product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To save on space only the first ten lags are reported (the remaining ones are not statistically significant). Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is ≈ 1.8 for the (log) number of newborns at different lags, 0.03 for the (log) price of hygiene product and 0.05 for the (log) price of milk powder.

Table A.2.5: Effect of the monthly number of newborns on the equilibrium price of hygiene products and milk: all lags, 100% Pharma coverage

	Hygiene	Milk	Difference
Log Newborns (t)	0.032	-0.016	-0.048
	(0.006)***	(0.007)	(0.009)***
Log Newborns (t-1)	0.015	0.001	-0.014
	(0.006)***	(0.007)	(0.009)
Log Newborns (t-2)	0.012	-0.004	-0.016
	(0.006)**	(0.008)	(0.010)*
Log Newborns (t-3)	0.014	-0.006	-0.020
	(0.006)**	(0.008)	(0.010)**
Log Newborns (t-4)	0.017	-0.014	-0.030
	(0.006)***	(0.008)	(0.010)***
Log Newborns (t-5)	0.020	-0.011	-0.032
	(0.006)***	(0.009)	(0.011)***
Log Newborns (t-6)	0.022	-0.012	-0.034
	(0.007)***	(0.009)	(0.011)***
Log Newborns (t-7)	0.022	-0.006	-0.029
	(0.006)***	(0.009)	(0.011)***
Log Newborns (t-8)	0.020	-0.007	-0.027
	(0.007)**	(0.009)	(0.011)**
Log Newborns (t-9)	0.017	-0.011	-0.028
	(0.007)**	(0.009)	(0.011)***
Log Newborns (t-10)	0.011	-0.013	-0.025
	(0.006)*	(0.009)	(0.011)**
Time effects	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes
Number of observations	48346	48346	48346
Number of cities	694	694	694

Notes: OLS estimates of equation :

$$p_{cgt} = \sum_{\tau=0}^{23} \delta_{t-\tau} N_{c,t-\tau} + \sum_{\tau=0}^{23} \delta^D_{t-\tau} N_{c,t-\tau} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if $g =$ diapers (or milk powders), c denotes cities, t months. p_{cgt} is the equilibrium (log) price index. N_{ct} is the log number of babies in month t. ψ_{cg} are city$\times$product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To save on space only the first ten lags are reported (the remaining ones are not statistically significant). Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is ≈ 1.8 for the (log) number of newborns at different lags, 0.03 for the (log) price of hygiene product and 0.05 for the (log) price of milk powder.

Table A.2.6: Effect of the future monthly number of newborns on the equilibrium price of hygiene products and diaper: all lags, all cities

	Hygiene	Diaper	Difference
Log Newborns (t+1)	0.011	0.004	-0.006
	(0.008)	(0.008)	(0.014)
Log Newborns (t+2)	0.010	0.004	-0.007
	(0.008)	(0.009)	(0.013)
Log Newborns (t+3)	0.011	-0.001	-0.012
	(0.008)	(0.009)	(0.013)
Log Newborns (t+4)	0.003	0.004	-0.001
	(0.008)	(0.010)	(0.014)
Log Newborns (t+5)	0.002	0.003	-0.001
	(0.008)	(0.009)	(0.012)
Log Newborns (t+6)	0.009	0.005	-0.005
	(0.009)	(0.009)	(0.014)
Log Newborns (t+7)	0.009	-0.004	-0.012
	(0.010)	(0.011)	(0.017)
Log Newborns (t+8)	0.011	-0.004	-0.015
	(0.010)	(0.010)	(0.016)
Log Newborns (t+9)	0.010	-0 .002	-0.012
	(0.011)	(0.010)	(0.017)
Log Newborns (t+10)	0.005	-0.010	-0.015
	(0.011)	(0.010)	(0.016)
Time effects	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes
Number of observations	60746	60746	60746
Number of cities	1221	1221	1221

Notes: OLS estimates of equation :

$$p_{cgt} = \sum_{\tau=1}^{23} \delta_{t+\tau} N_{c,t+\tau} + \sum_{\tau=1}^{23} \delta^D_{t+\tau} N_{c,t+\tau} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if $g =$ diapers (or milk powders), c denotes cities, t months. p_{cgt} is the equilibrium (log) price index. N_{ct} is the log of newborns in month t. ψ_{cg} are city×product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To save on space only the first ten coefficcients are reported (the remaining ones are not statistically significant). Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is ≈ 1.8 for the (log) number of newborns at different lags, 0.03 for the (log) price of hygiene product and 0.05 for the (log) price of diaper.

Table A.2.7: Effect of the future monthly number of newborns on the equilibrium price of hygiene products and milk: all lags, all cities

	Hygiene	Milk	Difference
Log Newborns (t+1)	0.002	0.021	0.019
	(0.006)	(0.011)*	(0.013)
Log Newborns (t+2)	-0.002	0.010	0.012
	(0.007)	(0.014)	(0.017)
Log Newborns (t+3)	-0.002	0.024	0.026
	(0.008)	(0.015)	(0.017)
Log Newborns (t+4)	-0.003	0.011	0.014
	(0.007)	(0.012)	(0.013)
Log Newborns (t+5)	-0.003	0.012	0.015
	(0.008)	(0.013)	(0.014)
Log Newborns (t+6)	0.005	0.010	0.005
	(0.008)	(0.013)	(0.014)
Log Newborns (t+7)	0.007	-0.006	-0.013
	(0.008)	(0.011)	(0.012)
Log Newborns (t+8)	0.007	-0.017	-0.024
	(0.009)	(0.010)	(0.013)*
Log Newborns (t+9)	0.010	-0.012	-0.022
	(0.009)	(0.013)	(0.017)
Log Newborns (t+10)	0.006	-0.026	-0.033
	(0.009)	(0.014)**	(0.015)**
Time effects	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes
Number of observations	51179	51179	51179
Number of cities	1221	1221	1221

Notes: OLS estimates of equation :

$$p_{cgt} = \sum_{\tau=1}^{23} \delta_{t+\tau} N_{c,t+\tau} + \sum_{\tau=1}^{23} \delta^{D}_{t+\tau} N_{c,t+\tau} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if $g =$ diapers (or milk powders), c denotes cities, t months. p_{cgt} is the equilibrium (log) price index. N_{ct} is the log of newborns in month t. ψ_{cg} are city×product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To save on space only the first ten coefficients are reported (the remaining ones are not statistically significant). Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is ≈ 1.8 for the (log) number of newborns at different lags, 0.03 for the (log) price of hygiene product and 0.05 for the (log) price of milk powder.

Table A.2.8: Effect of the monthly number of newborns on the equilibrium price: product-time fixed effect and city-time fixed effect

	Product-Time FE		City-Time FE	
Log Newborns (t,t-12)	0.419	0.419	0.421	0.321
	(0.071)***	(0.072)***	(0.075)***	(0.160)**
Log Newborns (t-13,t-24)	0.412	0.412	0.415	0.282
	(0.076)***	(0.078)***	(0.079)***	(0.188)*
Log Newborns (t,t-12) × Diapers	-0.295		-0.284	
	(0.071)***		(0.068)***	
Log Newborns (t-13,t-24) × Diapers	-0.383		-0.333	
	(0.086)***		(0.084)***	
Log Newborns (t,t-12) × Milk		-0.328		-0.197
		(0.086)***		(0.091)**
Log Newborns (t-13,t-24) × Milk		-0.416		-0.176
		(0.090)***		(0.134)
City-product effects	Yes	Yes	Yes	Yes
Product-time effects	Yes	Yes	No	No
City-time effects	No	No	Yes	Yes
Number of observations	125616	117212	125616	
Number of cities	1548	1548	1548	

Notes: Columns 1 and 2 report OLS estimates of equation:

$$p_{cgt} = \delta N^B_{ctr} + \lambda N^B_{cto} + \delta^D N^B_{ctr} D_g + \lambda^D N^B_{cto} D_g + \psi_{cg} + \mu_{gt} + \varepsilon_{cgt}$$

Columns 3 and 4 report OLS estimates of equation:

$$p_{cgt} = \delta N^B_{ctr} + \lambda N^B_{cto} + \delta^D N^B_{ctr} D_g + \lambda^D N^B_{cto} D_g + \psi_{cg} + \zeta_{ct} + \varepsilon_{cgt}$$

where $D_g = 1$ if $g =$ diapers (or milk powders), c denotes cities, t denotes months, r denotes the 12 months that include and precede t and o denotes the 12 months that include and precede $t - 12$. p_{cgt} is the (log) price index. N^B_{ctr} is the log of the total number of babies. ψ_{cg} are city×product fixed-effects; μ_{gt} are product-time fixed effects, and ζ_{ct} are city-time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable.

Table A.2.9: Effect of the monthly number of newborns on the equilibrium price: cities below and above the RDD threshold

	Cities below the RDD threshold			***Cities above the RDD threshold***		
	Hygiene	Diaper	Difference	Hygiene	Diaper	Difference
	(δ)	($\delta + \delta^D$)	(δ^D)	(δ)	($\delta + \delta^D$)	(δ^D)
Panel A: Hygiene versus Diaper						
Log Newborns (t,t-11)	0.568	-0.015	-0.583	0.186	-0.079	-0.265
	(0.141)***	(0.187)	(0.180)***	(0.237)	(0.222)	(0.226)
Log Newborns (t-12,t-23)	0.249	-0.381	-0.630	0.042	-0.366	-0.408
	(0.174)	(0.231)***	(0.270)***	(0.301)	(0.226)*	(0.274)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	10008	10008	10008	10128	10128	10128
Number of cities	136	136	136	136	136	136
	Hygiene	Milk	Difference	Hygiene	Milk	Difference
	(λ)	($\lambda + \lambda^D$)	(λ^D)	(λ)	($\lambda + \lambda^D$)	(λ^D)
Panel B: Hygiene versus Milk						
Log Newborns (t,t-11)	0.545	-0.165	-710	0.081	-0.303	-0.383
	(0.178)***	(0.182)	(0.251)***	(0.294)	(0.274)	(0.358)
Log Newborns (t-12,t-23)	-0.007	-0.392	-0.384	-0.111	-0.156	-0.046
	(0.197)	(0.189)**	(0.259)	(0.317)	(0.173)*	(0.319)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
City-product effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8891	8891	8891	8823	8823	8823
Number of cities	137	137	137	134	134	134

Notes: OLS estimates of equation 6 of the text, separately for the cities below or above the RDD maximum population threshold of 7500 inhabitants:

$$p_{cgt} = \delta N^B_{ctr} + \lambda N^B_{cto} + \delta^D N^B_{ctr} D_g + \lambda^D N^B_{cto} D_g + \psi_{cg} + \mu_t + \varepsilon_{cgt}$$

where all variables are in logs, $D_g = 1$ if $g =$ diapers (or milk powders), c denotes cities, t months, r the 12 months that include and precede t and o the 12 months that include and precede $t-12$. p_{cgt} is the equilibrium (log) price index. N^B_{ctr} is the log of the total number of babies that are born in city c during the 12 months that include and precede t (*recent* newborns), N^B_{cto} is the log of the total number of babies that are born in city c during the 12 months that include and precede $t-12$ (*older* newborns). ψ_{cg} are city×product fixed-effects, μ_t time fixed effects. Robust standard error, clustered at the city and time level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In the estimation we consider cities that are within a window of plus (the last three column) or minus (the first three columns) 2000 inhabitants from the threshold. Reported coefficients and standard errors have been standardized by the standard deviation of the correspondent variable. To evaluate the size of the estimates note that a standard deviation is ≈ 1.3 for the (log) number of newborns between t and t-12 and the (log) number of newborns between t-13 and t-24, 0.03 for the (log) price of hygiene product, 0.05 for the (log) price of diaper and 0.05 for the (log) price of milk powder.

Table A.2.10: Difference-in-Discontinuities Estimates of the effects of older newborns on prices - Hygiene products vs Diapers

	1st Ord. Poly ± 2000	1st Ord. Poly ± 2500	1st Ord. Poly ± 3000
Log Newborns (t-12,t-23)	0.784	0.533	0.527
	(0.342)**	(0.301)*	(0.254)**
Log Newborns (t-12,t-23) × Diaper Dummy	-0.902	-0.624	-0.954
	(0.473)*	(0.426)	(0.369)***
Log Newborns (t-12,t-23) × Threshhold Dummy	-0.921	-0.608	-0.846
	(0.546)*	(0.516)	(0.464)*
Log Newborns (t-12,t-23) × Diaper × Threshhold	0.421	-0.085	0.743
	(0.709)	(0.670)	(0.584)
Number of observations	20159	26135	31943
Number of cities	265	337	413
	2nd Ord. Poly ± 2500	**Local Linear CCT Bandwidth**	**Local 2nd Ord. CCT Bandwidth**
Log Newborns (t-12,t-23)	0.534	0.438	0.463
	(0.301)*	(0.197)**	(0.248)*
Log Newborns (t-12,t-23) × Diaper Dummy	-0.624	-0.715	-0.622
	(0.427)	(0.271)***	(0.388)
Log Newborns (t-12,t-23) × Threshhold Dummy	-0.609	-0.414	-0.704
	(0.517)	(0.329)	(0.421)*
Log Newborns (t-12,t-23) × Diaper × Threshhold	-0.092	0.299	0.003
	(0.674)	(0.389)	(0.614)
Number of observations	26135	20351	36047
Number of cities	337	301	392
	Mean Difference ± 1000	**% Pharma =100 ± 2500**	**With Controls ± 2500**
Log Newborns (t-12,t-23)	0.783	0.624	0.533
	(0.261)***	(0.261)***	(0.301)*
Log Newborns (t-12,t-23) × Diaper Dummy	-0.926	-0.803	-0.624
	(0.357)***	(0.553)	(0.426)
Log Newborns (t-12,t-23) × Threshhold Dummy	-0.490	-0.416	-0.608
	(0.398)	(0.643)	(0.516)
Log Newborns (t-12,t-23) × Diaper × Threshhold	0.423	-0.057	-0.085
	(0.529)	(0.885)	(0.670)
Number of observations	9816	11034	26135
Number of cities	257	158	337

Notes: Estimates of the effect of older newborns on prices based on equation (9) estimated on the sample of pharmacies and months in which both hygiene products and diapers are sold. The top and middle panels report results obtained with polynomials of different orders and with different bandwiths. CCT bandwiths are calculated following **?**. In the bottom panel, column 1 reports the mean difference in the number of pharmacies belonging to cities that are within a window of plus or minus 1000 inhabitants from the threshold; column 2 restricts the sample to cities in which Pharma has a 100% coverage with a polynomial of third degree and a window of plus or minus 2500 inhabitants; column 3 is based on a window of plus or minus 2500 inhabitants with a polynomial of third degree and includes as controls the average monthly number of newborns, a dummy taking value 1 if the city is in a urban area, a dummy taking value 1 if the city is in Northern Italy, and per capita disposable income at the city level. Robust standard errors clustered at the city and time levels in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2.11: Difference-in-Discontinuities Estimates of the effect of older newborns on prices - Hygiene products vs Milk powders

	1st Ord. Poly $\pm$ 2000	1st Ord. Poly $\pm$ 2500	1st Ord. Poly $\pm$ 3000
Log Newborns (t-12,t-23)	0.610	0.210	0.083
	(0.389)	(0.341)	(0.331)
Log Newborns (t-12,t-23) $\times$ Milk Dummy	-1.103	-0.786	-0.640
	(0.528)**	(0.465)*	(0.455)
Log Newborns (t-12,t-23) $\times$ Threshhold Dummy	-1.078	-0.633	-0.683
	(0.624)*	(0.570)	(0.558)
Log Newborns (t-12,t-23) $\times$ Milk $\times$ Threshhold	1.036	0.708	0.980
	(0.837)	(0.690)	(0.672)
Number of observations	17714	20340	23726
Number of cities	265	337	413
	2nd Ord. Poly $\pm$ 2500	**Local Linear CCT Bandwidth**	**Local 2nd Ord. CCT Bandwidth**
Log Newborns (t-12,t-23)	0.211	0.240	0.253
	(0.350)	(0.226)	(0.292)
Log Newborns (t-12,t-23) $\times$ Milk Dummy	-0.786	-0.614	-0.863
	(0.428)*	(0.309)**	(0.401)**
Log Newborns (t-12,t-23) $\times$ Threshhold Dummy	-0.636	-0.426	-0.781
	(0.604)	(0.368)	(0.486)
Log Newborns (t-12,t-23) $\times$ Milk $\times$ Threshhold	0.704	0.622	1.140
	(0.671)	(0.418)	(0.576)**
Number of observations	22656	18602	36821
Number of cities	337	304	384
	Mean Difference $\pm$ 1000	**% Pharma =100 $\pm$ 2500**	**With Controls $\pm$ 2500**
older Newborns	0.585	0.624	0.533
	(0.291)**	(0.361)*	(0.301)*
Log Newborns (t-12,t-23) $\times$ Milk Dummy	-0.703	-0.803	-0.624
	(0.422)*	(0.553)	(0.426)
Log Newborns (t-12,t-23) $\times$ Threshhold Dummy	-0.581	-0.416	-0.608
	(0.431)	(0.643)	(0.516)
Log Newborns (t-12,t-23) $\times$ Milk $\times$ Threshhold	0.501	-0.057	-0.085
	(0.533)	(0.885)	(0.670)
Number of observations	1547	9497	22656
Number of cities	–	158	337

Notes: Estimates of the effect of older newborns on prices based on equation (9) estimated on the sample of pharmacies and months in which both hygiene products and milk powders are sold. The top and middle panels report results obtained with polynomials of different orders and with different bandwiths. CCT bandwiths are calculated following **?**. In the bottom panel, column 1 reports the mean difference in the number of pharmacies belonging to cities that are within a window of plus or minus 1000 inhabitants from the threshold; column 2 restricts the sample to cities in which Pharma has a 100% coverage with a polynomial of third degree and a window of plus or minus 2500 inhabitants; column 3 is based on a window of plus or minus 2500 inhabitants with a polynomial of third degree and includes as controls the average monthly number of newborns, a dummy taking value 1 if the city is in a urban area, a dummy taking value 1 if the city is in Northern Italy, and per capita disposable income at the city level. Robust standard errors clustered at the city and time levels in parentheses. *** p<0.01, ** p<0.05, * p<0.1.