Online Appendix

"Patient Cost Sharing and Healthcare Utilization in Early Childhood: Evidence from a Regression Discontinuity Design"

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A Healthcare Utilization for Children under Age 4 in Taiwan

Table A1: Healthcare Utilization for Children Aged under 4 in Taiwan

	Age 0 to 1	Age 1 to 2	Age 2 to 3	Age 3 to 4
Total expenditure (NT$)	16,830	16,288	13,998	12,128
Outpatient expenditure (NT$)	9,187	12,120	11,303	10,159
Inpatient expenditure (NT$)	7,643	4,167	2,695	1,968
Number of outpatient visits	18.35	24.55	22.64	20.85
Number of inpatient admissions	0.27	0.26	0.18	0.14

Notes: This table displays healthcare utilization for children aged under 4 in Taiwan, using 2007-2008 claim data from the NHIRD. The numbers of outpatient visits include both regular outpatient visits and emergency room visits. 1 US$ is equal to 32.5 NT$ in 2006. All expenditures in our sample period are inflation-adjusted (in 2006 NT$).

B Healthcare Providers in Taiwan

In this section, we provide some general information about the major teaching hospitals, minor teaching hospitals, community hospitals and clinics in Taiwan. Based on criteria obtained from the Ministry of Health and Welfare, a major teaching hospital needs to have at least 500 acute-care beds, 22 departments and to have passed various teaching hospital accreditations. In addition, doctors in major teaching hospitals need to conduct medical research. Likewise, a minor teaching hospital needs to have at least 300 beds, seven departments and to have passed the teaching hospital accreditation. Both major and minor teaching hospitals take responsibility for training interns. A community hospital needs to have at least 20 beds. It also needs to provide general outpatient care, emergency care and inpatient care. A clinic will usually only provide regular outpatient care (primary care) and cannot provide inpatient care.

As shown in Table B1, in 2008, the numbers of major teaching hospitals, minor teaching hospitals, community hospitals and clinics were 23, 87, 440 and 22,053, respectively. In general, most of the major teaching hospitals are located in cities (urban areas), but almost every city and county has at least one minor teaching hospital. It is generally believed that major and minor teaching hospitals provide better care than community hospitals and clinics. For instance, in 2003, the percentages of doctors working in hospitals with a speciality (i.e. had received certificates in various specialities) were 78% for major teaching hospitals, 75% for minor teaching hospitals and 54% for community hospitals. In addition, average medical expenditure in teaching hospitals is generally much higher than in community hospitals and clinics.

Finally, like the NHI copayments, reimbursements made to hospitals are based on the NHI Fee Schedule. According to this schedule, all hospitals receive the same reimbursement for certain procedures and treatments, such as health checks. However, for some procedures and treatments, teaching hospitals receive higher reimbursements than community hospitals and clinics, since they usually accept patients with more serious conditions and provide a better quality of care. For example, when treating acute upper respiratory infections (ICD 9 code 465), the average reimbursement is 299 NT$ for teaching hospitals but just 278 NT$ for clinics and community hospitals.

Table B1: Distribution of Healthcare Providers in Taiwan

City/Counties	Major Teaching Hospital	Minor Teaching Hospital	Community Hospital	Clinic
Taipei City	7	7	22	2,970
Kaohsiung City	2	7	47	1,686
Taipei County	1	9	49	2,756
Ilan County	0	3	8	302
Taoyuan County	1	7	22	1,325
Hsinchu County	0	1	7	315
Miaoli County	0	2	14	353
Taichung County	0	7	27	1,284
Changhua County	1	4	29	991
Nantou County	0	2	8	412
Yunlin County	0	5	10	502
Chiayi County	0	2	2	261
Tainan County	1	3	17	764
Kaohsiung County	1	2	29	882
Pingtung County	0	5	20	626
Taitung County	0	1	5	152
Hualien County	1	2	6	273
Penghu County	0	0	3	82
Keelung City	0	2	5	275
Hsinchu City	0	2	6	380
Taichung City	3	3	23	1,736
Chiayi City	0	3	7	376
Tainan City	2	4	8	918
Kinmen County	0	0	1	32
Lienkiang County	0	0	1	6
Total	20	83	376	19,659

Notes: This table displays the spatial distribution of healthcare providers in Taiwan, using 2008 Health and Welfare statistics.

Table B2: Summary Statistics for Regular Outpatient Care: by provider

Providers	Major Teaching Hospital	Minor Teaching Hospital	Community Hospital	Clinic
Visit rate	22.23	30.19	20.62	468.70
Share of respiratory diseases	0.47	0.60	0.62	0.75
Share of digestive diseases	0.08	0.07	0.05	0.06
Share of skin diseases	0.04	0.04	0.03	0.04
Share of injury and poisoning	0.04	0.05	0.11	0.01
Share of mental disorders	0.06	0.04	0.03	0.00
Avg. expenditure (per visit)	999.56	744.80	594.73	407.54
	(7.51)	(4.04)	(3.10)	(0.14)
Avg. OOP expenses	113.07	90.45	83.61	76.35
	(0.09)	(0.06)	(0.07)	(0.01)
Share of OOP expenses	0.21	0.18	0.19	0.20
Avg. drug fee	180.24	127.08	80.12	49.80
Avg. treatment/examination fee	465.53	278.78	180.52	16.50
Avg. diagnosis fee	198.71	202.74	209.24	250.62
Avg. dispensing fee	43.17	45.93	41.45	14.29
Avg. drug days	6.67	5.09	3.70	3.10
Number of children-visit	82,871	112,552	76,901	1,747,580

Notes: Data are from the 2005-2008 NHIRD. The summary statistics are based on healthcare utilization occurring within 90 days before the 3^{rd} birthday. The visit rate is the number of visits per 10,000 person-days. Average expenditure and average OOP expenses are reported in New Taiwan Dollar (NT$), with 1 US$ equal to 32.5 NT$ in 2006. All expenditures in our sample period are inflation-adjusted (in 2006 NT$).

Table B3: Summary Statistics for Emergency Room Care: by provider

Providers	Major Teaching Hospital	Minor Teaching Hospital	Community Hospital	Clinic
Visit rate	5.76	8.44	1.95	0.15
Share of respiratory diseases	0.40	0.36	0.25	0.34
Share of digestive diseases	0.14	0.13	0.08	0.04
Share of skin diseases	0.02	0.02	0.02	0.03
Share of injury and poisoning	0.14	0.17	0.43	0.38
Avg. expenditure (per visit)	1788.66	1512.78	1616.23	1273.46
	(9.33)	(6.02)	(12.67)	(38.34)
Avg. OOP expenses (per visit)	223.55	194.66	183.96	134.73
	(0.31)	(0.26)	(0.51)	(1.56)
Share of OOP expenses	0.16	0.16	0.15	0.14
Avg. drug fee	120.41	83.57	51.36	16.41
Avg. treatment/examination fee	739.12	536.45	720.61	553.12
Avg. diagnosis fee	654.38	647.33	618.10	556.27
Avg. dispensing fee	52.74	51.43	44.58	15.25
Avg. drug day	3.51	2.67	2.25	2.47
Number of children-visit	21,480	31,451	7,268	576

Notes: Data are from the 2005-2008 NHIRD. The summary statistics are based on healthcare utilization occurring within 90 days before the 3^{rd} birthday. The visit rate is the number of visits per 10,000 person-days. Average expenditure and average OOP expenses are reported in New Taiwan Dollar (NT$), with 1 US$ is 32.5 NT$ in 2006. All expenditures/expenses in our sample period are inflation-adjusted (in 2006 NT$).

C Imputation of Registration Fee

We propose the following two-step procedure to "predict" the registration fees for each regular outpatient and emergency room visit. First, we use the "patient's self-reported answer" on the registration fee, from the 2005 Taiwan National Health Interview Survey (TNHIS), and combine the TNHIS's rich individual information to obtain the determinants of the registration fee.[56] In practice, we estimate the following regression:

$$RegFee_{ij} = \theta_0 + \theta_1 Age_i + \theta_2 Age_i^2 + \sum_{s=1}^{3} \theta_{4j} Level_{sj} + \sum_{k=1}^{24} \theta_{5k} County_{kj} + \upsilon_i$$

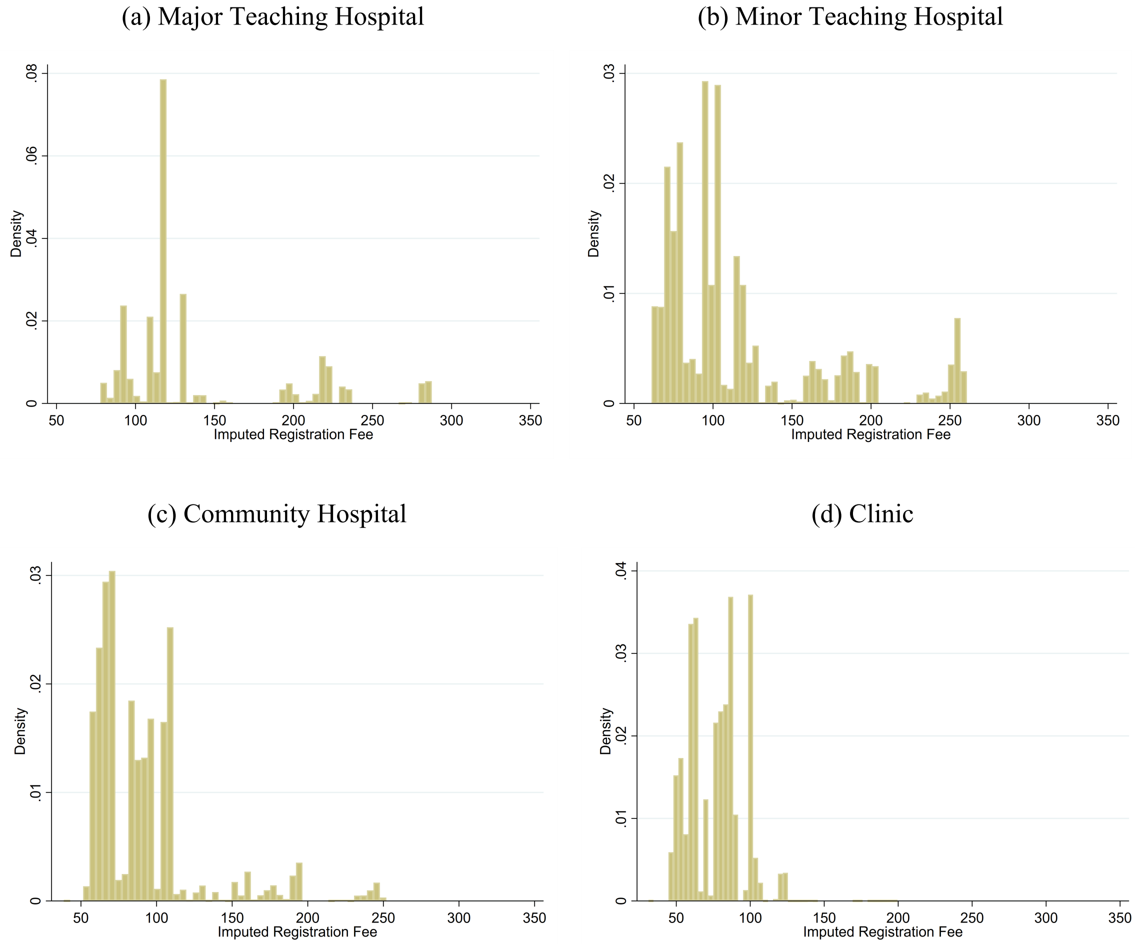
$RegFee_i$ is the registration fee that an individual i paid for his/her last visit j. Age_i is individual i's age. $Level_s$ is a set of dummies for the level of healthcare provider, using clinics as the reference group.[57] $County_k$ is a set of dummies for the county in which an individual lives.[58] Second, we utilize the above estimates and combine the corresponding variables in the NHIRD data to obtain a predicted value for the registration fee for each visit. by doing so, we allow much richer variation in registration fees, instead of a fixed-fee amount within each level of healthcare provider. Figure C1 displays the distribution of imputed registration fees for each type of healthcare provider. We also show the (predicted) average registration fees for the four types of healthcare provider in Table 1.

[56]The sample size for estimating the following regression is 4,419 (regular outpatient care) and 577 (emergency room care).

[57]There are four types of healthcare provider in Taiwan.

[58]There are 25 counties/cities in Taiwan. We use Taipei county as a reference group.

Figure C1: Distribution of the Imputed Registration Fee:
Outpatient Care



Notes: We pool NHI claims to have received outpatient care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. This figure displays the density of imputed registration fees for each type of healthcare provider, with 1 US$ is 32.5 NT$ in 2006. The imputed registration fee in our sample period is inflation-adjusted (in 2006 NT$).

D Sample Selection Process

Table D1: Sample Selection: Main Sample

Variables	(1) Original Sample	(2) Continuous Enrolment at age two and three	(3) Eliminating cost-sharing waiver
Male	0.52	0.52	0.52
Birth year:2003	0.51	0.51	0.51
Birth year:2004	0.49	0.49	0.49
1st birth	0.53	0.53	0.53
2nd birth	0.36	0.36	0.36
3rd birth	0.09	0.09	0.09
Number of siblings	1.88	1.88	1.87
Number of children	430,548	426,068	414,282

Notes: Column (1) presents the characteristics for original sample: all NHI enrollees who were born in 2003 and 2004 and had complete demographic information. Column (2) restricts the sample to enrollees who continuously register in the NHI at the ages 2 and 3. Column (3) eliminates observations with a cost-sharing waiver, such as children with catastrophic illness (e.g. cancer) or children from very low-income families, since these children do not experience any price change when turning 3.

Table D2: Sample Selection: Placebo Sample

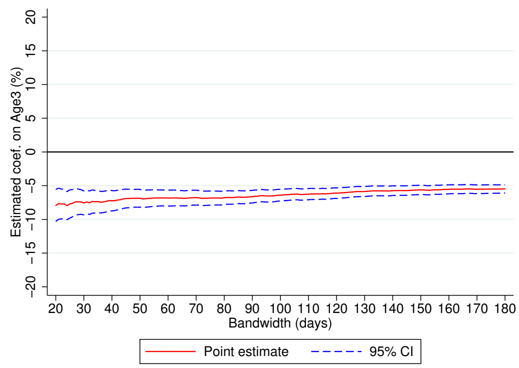
Variables	(1) Original Sample	(2) Continuous enrolment at age two and three	(3) Eliminating cost-sharing waiver
Male	0.52	0.52	0.52
Birth year:1995	0.33	0.33	0.34
Birth year:1996	0.33	0.33	0.33
Birth year:1996	0.34	0.34	0.33
1st birth	0.46	0.46	0.46
2nd birth	0.36	0.36	0.36
3rd birth	0.15	0.15	0.15
Number of siblings	2.11	2.12	2.11
Number of children	926,012	903,641	866,383

Notes: Column (1) presents the characteristics for the original sample: all NHI enrollees who were born in 1995, 1996 and 1997 and had complete demographic information. Column (2) restricts the sample to enrollees who continuously register in the NHI at ages 2 and 3. Column (3) eliminates observations with a cost-sharing waiver, such as children with catastrophic illness (e.g. cancer) or children from very low-income families, since they do not experience any price change when turning 3.

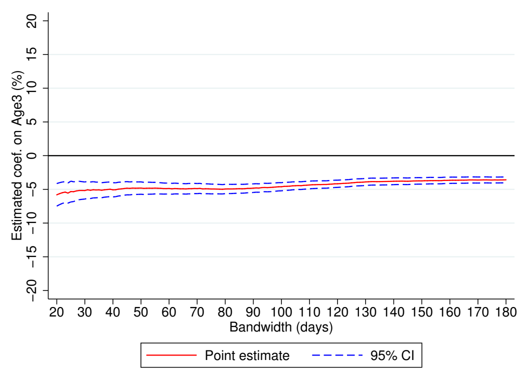
E Robustness Check for Bandwidth Choices

Figure E1: Robustness Check for Bandwidth Choices: Regular Outpatient Care

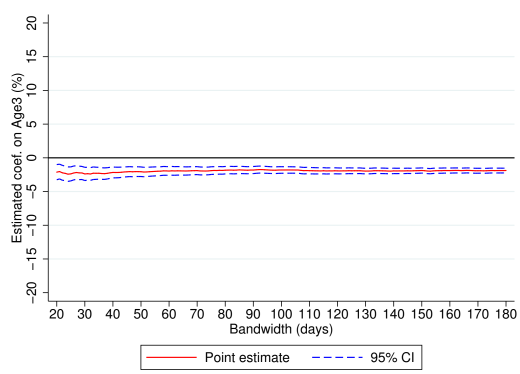
(a) Total expenditure



(b) Number of visits



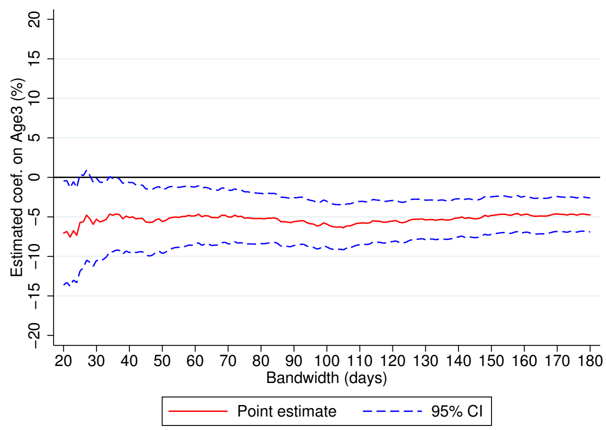
(c) Expenditure per visit



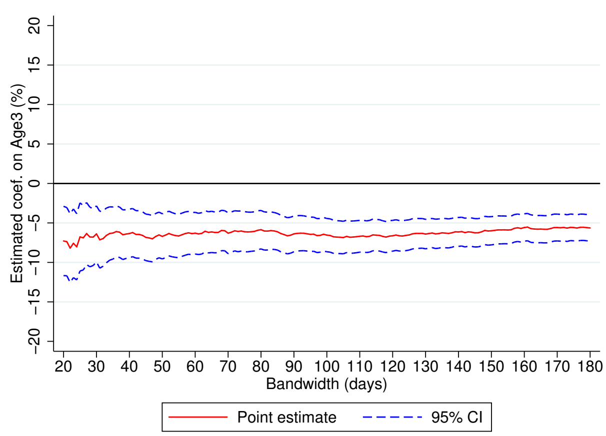
Notes: These figures display the estimated coefficients on $Age3$ (red line) in equation (2) and the corresponding 95% confidence interval (blue dash line) by different bandwidths. The dependent variables in the figures above are the log of total expenditure, the log of number of visits and the log of expenditure per visit for regular outpatient care.

Figure E2: Robustness Check for Bandwidth Choices: Emergency Room Care

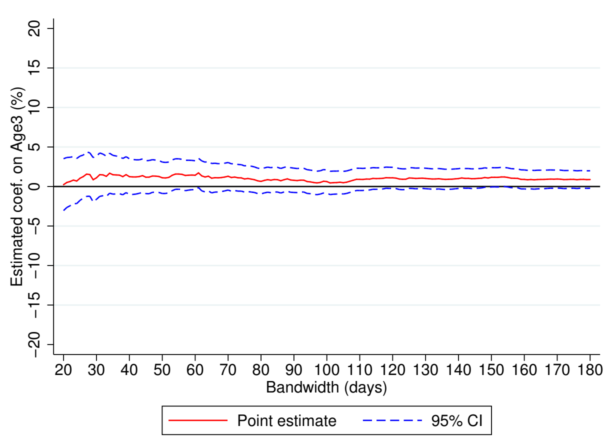
(a) Total expenditure



(b) Number of visits



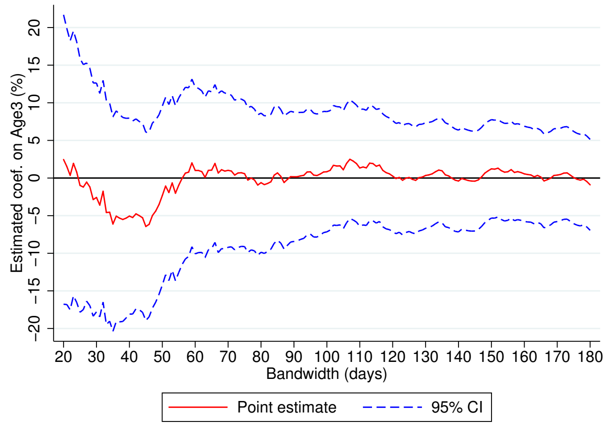
(c) Expenditure per visit



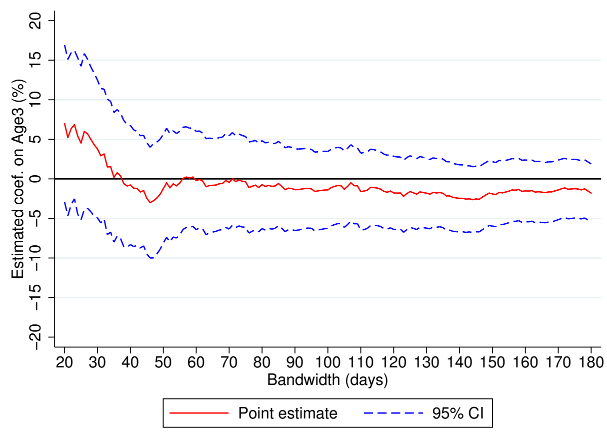
Notes: These figures display the estimated coefficients on $Age3$ (red line) in equation (2) and the corresponding 95% confidence interval (blue dash line) by different bandwidths. The dependent variables in these figures above are the log of total expenditure, the log of number of visits and the log of expenditure per visit for emergency room care.

Figure E3: Robustness Check for Bandwidth Choices: Inpatient Care

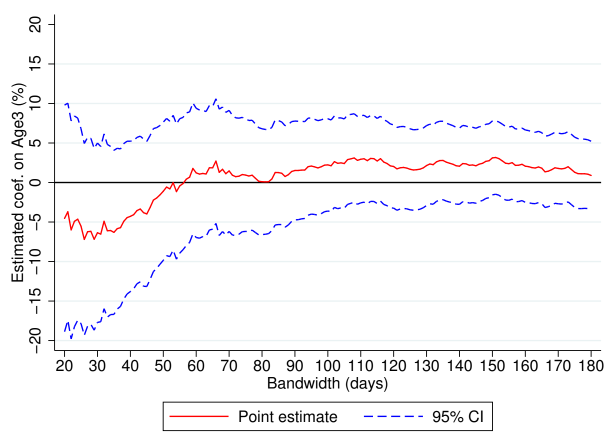
(a) Total expenditure



(b) Number of admissions



(c) Expenditure per admission



Notes: These figures display the estimated coefficients on $Age3$ (red line) in equation (2) and the corresponding 95% confidence interval (blue dash line) by different bandwidths. The dependent variables in these figures above are the log of total expenditure, the log of number of admissions and the log of expenditure per admission for inpatient care.

F Robustness Check for Empirical Specifications

Table F1: Robustness Check for Empirical Specifications: Regular Outpatient Care

	log(total expenditure)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	-6.83***	-6.63***	-6.11***	-5.63***	-5.46***	-7.06***
	(0.60)	(0.47)	(0.40)	(0.35)	(0.31)	(0.69)
2	-7.52***	-7.25***	-7.22***	-7.03***	-6.59***	
	(0.95)	(0.74)	(0.63)	(0.55)	(0.49)	
3	-8.44***	-7.55***	-7.42***	-7.49***	-7.52***	
	(1.37)	(1.05)	(0.89)	(0.77)	(0.70)	
	log(# of visits)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	-4.87***	-4.82***	-4.17***	-3.75***	-3.58***	-6.32***
	(0.41)	(0.32)	(0.27)	(0.24)	(0.22)	(1.15)
2	-5.19***	-5.11***	-5.38***	-5.06***	-4.64***	
	(0.68)	(0.52)	(0.44)	(0.39)	(0.34)	
3	-6.16***	-5.19***	-5.13***	-5.59***	-5.61***	
	(0.94)	(0.76)	(0.63)	(0.54)	(0.49)	
	log(expenditure/visit)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	-1.96***	-1.81***	-1.94***	-1.88***	-1.88***	-1.89***
	(0.33)	(0.27)	(0.22)	(0.19)	(0.18)	(0.27)
2	-2.33***	-2.13***	-1.83***	-1.96***	-1.95***	
	(0.49)	(0.40)	(0.34)	(0.31)	(0.28)	
3	-2.28***	-2.36***	-2.29***	-1.90***	-1.91***	
	(0.66)	(0.54)	(0.47)	(0.41)	(0.37)	

Notes: The estimated sample includes 414,282 children born in 2003 to 2004. We use 2005-2008 NHIRD data to find their healthcare utilization at around te age of 3. We collapse individual-level data into age cells and measure age in days. Rows 1 to 3 present the estimated coefficient on $Age3$, using different polynomial models within a given bandwidth. We use the following polynomial models. Row 1: see equation (2); Row 2: quadratic control for age, interacted with a dummy for age 3 and older; Row 3: cubic control for age, interacted with a dummy for age 3 and older. The last column displays the estimate based on a local linear regression, using a triangular kernel. We use the algorithm proposed by (Cattaneo et al., 2014) to select the corresponding bandwidth. The dependent variables are the log of total expenditure, the log of number of visits and the log of expenditure per visit, at each age in days. The estimated coefficients are multiplied by 100 to show the percentage change in the outcome. Robust standard errors are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table F2: Robustness Check for Empirical Specifications: Emergency Room Care

	log(total expenditure)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	-4.86***	-5.59***	-5.53***	-4.83***	-4.75***	-5.55***
	(1.84)	(1.53)	(1.32)	(1.21)	(1.09)	(1.51)
2	-6.08**	-4.66**	-5.67***	-6.34***	-5.72***	
	(2.68)	(2.24)	(1.92)	(1.77)	(1.61)	
3	-6.49*	-6.41**	-4.33*	-4.58**	-5.95***	
	(3.85)	(2.94)	(2.54)	(2.30)	(2.09)	
	log(# of visit)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	-6.29***	-6.38***	-6.62***	-5.99***	-5.63***	-6.32***
	(1.33)	(1.15)	(0.99)	(0.91)	(0.84)	(1.15)
2	-7.18***	-6.18***	-6.29***	-6.99***	-6.79***	
	(1.87)	(1.59)	(1.43)	(1.29)	(1.20)	
3	-7.26***	-7.72***	-6.33***	-5.99***	-6.84***	
	(2.56)	(2.12)	(1.76)	(1.63)	(1.53)	
	log(expenditure/visit)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	1.43	0.78	1.10	1.16*	0.88	0.95
	(0.92)	(0.78)	(0.68)	(0.62)	(0.56)	(0.68)
2	1.09	1.52	0.62	0.65	1.07	
	(1.37)	(1.15)	(0.99)	(0.89)	(0.81)	
3	0.76	1.31	2.00	1.41	0.90	
	(1.85)	(1.52)	(1.31)	(1.17)	(1.07)	

Notes: The estimated sample includes 414,282 children born in 2003 to 2004. We use 2005-2008 NHIRD data to find their healthcare utilization at around the age of 3. We collapse individual-level data into age cells and measure age in days. Rows 1 to 3 present the estimated coefficient on $Age3$, using different polynomial models within a given bandwidth. We use the following polynomial models. Row 1: see equation (2); Row 2: quadratic control for age, interacted with a dummy for age 3 and older; Row 3: cubic control for age, interacted with a dummy for age 3 and older. The last column displays the estimate based on a local linear regression, using a triangular kernel. We use the algorithm proposed by (Cattaneo et al., 2014) to select the corresponding bandwidth. The dependent variables are the log of total expenditure, the log of number of visits and the log of expenditure per visit, at each age in days. The estimated coefficients are multiplied by 100 to show the percentage change in the outcome. Robust standard errors are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table F3: Robustness Check for Empirical Specifications: Inpatient Care

	log(total expenditure)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	1.01	0.17	0.26	1.22	-0.91	0.34
	(5.60)	(4.35)	(3.74)	(3.32)	(3.07)	(3.93)
2	-7.82	-1.66	0.81	-1.06	2.16	
	(7.96)	(6.66)	(5.78)	(5.05)	(4.62)	
3	-0.88	-5.23	-6.21	0.30	-2.88	
	(10.57)	(8.48)	(7.41)	(6.84)	(6.25)	

	log(# of admissions)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	-0.21	-1.36	-1.77	-1.89	-1.80	-0.81
	(3.13)	(2.62)	(2.34)	(2.07)	(1.88)	(2.79)
2	0.43	0.72	0.29	-0.92	-1.07	
	(4.61)	(3.71)	(3.28)	(2.98)	(2.77)	
3	7.95	1.51	0.16	1.46	-0.35	
	(6.12)	(5.03)	(4.30)	(3.84)	(3.53)	

	log(expenditure/admission)					
Bandwidth(days)	60	90	120	150	180	CCT bandwidth
Polynominal						
1	1.22	1.52	2.03	3.12	0.89	0.82
	(4.13)	(3.17)	(2.67)	(2.38)	(2.20)	(3.34)
2	-8.25	-2.37	0.52	-0.13	3.23	
	(5.76)	(5.02)	(4.34)	(3.72)	(3.40)	
3	-8.83	-6.74	-6.37	-1.16	-2.53	
	(7.27)	(6.18)	(5.52)	(5.20)	(4.68)	

Notes: The estimated sample includes 414,282 children born in 2003 to 2004. We use 2005-2008 NHIRD data to find their healthcare utilization at around the age of 3. We collapse individual-level data into age cells and measure age in days. Rows 1 to 3 present the estimated coefficient on $Age3$, using different polynomial models within a given bandwidth. We use the following polynomial models. Row 1: see equation (2); Row 2: quadratic control for age, interacted with a dummy for age 3 and older; Row 3: cubic control for age, interacted with a dummy for age 3 and older. The last column displays the estimate based on a local linear regression, using a triangular kernel. We use the algorithm proposed by (Cattaneo et al., 2014) to select the corresponding bandwidth. The dependent variables are the log of total expenditure, the log of number of admissions and the log of expenditure per admission, at each age in days. The estimated coefficients are multiplied by 100 to show the percentage change in the outcome. Robust standard errors are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

G Donut RDD Analysis

Table G1: Donut RD for the Utilization of Regular Patient Care

	log(total expenditure)							
Size of Donut around 3^{rd} birthday	0	3	6	9	12	15	18	21
Age3	-6.63*** (0.47)	-6.42*** (0.41)	-6.45*** (0.43)	-6.30*** (0.45)	-6.08*** (0.47)	-6.11*** (0.49)	-6.21*** (0.54)	-6.06*** (0.61)
	log(# of visits)							
Size of Donut around 3^{rd} birthday	0	3	6	9	12	15	18	21
Age3	-4.82*** (0.32)	-4.62*** (0.25)	-4.62*** (0.25)	-4.65*** (0.26)	-4.62*** (0.27)	-4.71*** (0.31)	-4.78*** (0.34)	-4.85*** (0.37)

Notes: The estimated sample includes 414,282 children born in 2003 to 2004. We use 2005-2008 NHIRD data to find their healthcare utilization at around the age of 3. We collapse individual-level data into age cells and measure age in days. We conduct a "donut" RD (Barreca et al., 2011; Shigeoka, 2014) by systematically excluding outpatient expenditure and visits within 3-21 days before and after the 3^{rd} birthday. This table presents the estimated coefficient on $Age3$ in equation (2). The estimated coefficients are multiplied by 100 to show the percentage change in the outcome. Robust standard errors are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level and * significant at the 10 percent level.

Table G2: Donut RD for the Utilization of Emergency Room Care

	log(total expenditure)							
Size of Donut around 3^{rd} birthday	0	3	6	9	12	15	18	21
Age3	-5.59*** (1.53)	-5.17*** (1.67)	-5.24*** (1.74)	-5.24*** (1.94)	-5.03** (2.15)	-5.13** (2.43)	-6.78*** (2.53)	-7.47*** (2.73)
	log(# of visits)							
Size of Donut around 3^{rd} birthday	0	3	6	9	12	15	18	21
Age3	-6.38*** (1.15)	-6.04*** (1.25)	-6.09*** (1.35)	-6.04*** (1.49)	-5.81*** (1.65)	-5.80*** (1.89)	-6.95*** (1.92)	-7.02*** (2.06)

Notes: The estimated sample includes 414,282 children born in 2003 to 2004. We use 2005-2008 NHIRD data to acquire their healthcare utilization at around the age of 3. We collapse individual-level data into age cells and measure age in days. We conduct a "donut" RD (Barreca et al., 2011; Shigeoka, 2014) by systematically excluding outpatient expenditure and visits within 3-21 days before and after the 3^{rd} birthday. This table presents the estimated coefficient on $Age3$ in equation (2). The estimated coefficients are multiplied by 100 to show the percentage change in the outcome. Robust standard errors are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

H List of Ambulatory Care Sensitive Conditions (ACSC)

Table H1: List of Ambulatory Care Sensitive Conditions (ACSC)

Diagnosis	ICD 9 Code
Immunisation preventable conditions	033, 037, 045, 320.0, 390, 391
Grand mal status	345
Convulsions “A”	780.3
Severe ENT infections	382, 462, 463, 465, 472.1
Bacterial pneumonia	481, 482.2, 482.3, 482.9, 483, 485, 486
Asthma	493
Tuberculosis	011–018
Cellulitis	681, 682, 683, 686
Diabetes “A”	250.1, 250.2, 250.3
Diabetes “B”	250.8, 250.9
Diabetes “C”	250.0
Hypoglycaemia	251.2
Gastroenteritis	558.9
Kidney/urinary infection	590, 599.0, 599.9
Dehydration-volume depletion	276.5
Iron deficiency anaemia	280.1, 280.8, 280.9
Nutritional deficiencies	260, 261, 262, 268.0, 268.1

Notes: This table displays the diagnosis and the corresponding ICD 9 code for Ambulatory Care Sensitive Conditions (ACSCs) developed by the Agency for Healthcare Research and Quality (AHRQ) to study the type of outpatient care that may reduce the need for inpatient admissions. Thus, this outpatient care is usually considered a beneficial treatment (i.e. less moral hazard).

I List of Top 5 Diagnoses in Non-Deferrable Visits

Table I1: List of Top 5 Diagnoses in Non-Deferrable Visits

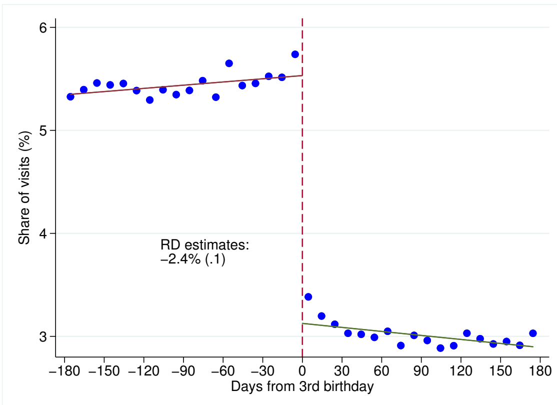
Diagnosis	ICD 9 Code	Share
Panel A: Regular Outpatient Care		
Tracheostomy complications	519	54.1%
Peritonsillar abscess	475	17.0%
Pneumonia And Influenza	480	12.7%
Relapsing fever	087	7.9%
Nasal polyps	471	3.7%
Panel B: Emergency Room Care		
Concussion	850	21.2%
Open wound of finger(s)	883	15.8%
Open wound of ocular adnexa	870	5.4%
Foreign body in mouth oesophagus and stomach	935	5.1%
Open wound to hand except finger(s) alone	882	4.6%

Notes: This table lists the top 5 diagnoses that are considered as non-deferrable conditions, and their corresponding ICD 9 codes. Inspired by Card et al. (2009), we identify the visits for non-deferrable conditions by using pre-reform (i.e. 2001) data and a set of three-digit ICD 9 diagnosis codes that have similar visit rates on weekdays and weekends. For instance, if a given diagnosis code has a similar emergency room visit rate on a weekend and on a weekday, then weekend visits should account for around 0.29 (2/7) of total visits for this specific diagnosis code. Therefore, we define the visits with diagnosis codes whose fraction of weekend visits is close to 0.29 as visits for non-deferrable conditions.

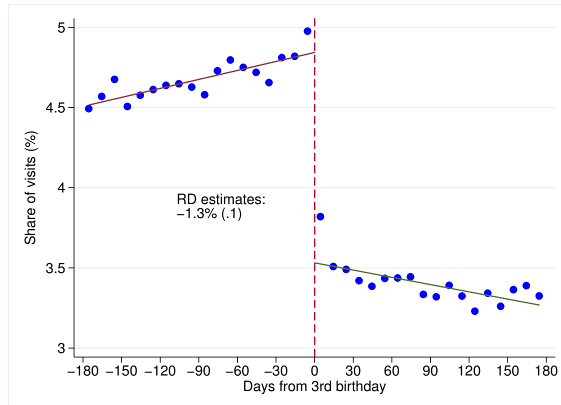
J Additional Results on Regular Outpatient Care

Figure J1: Provider Choice for Regular Outpatient Care before and after the 3^{rd} Birthday: Birthplace with Major Teaching Hospitals

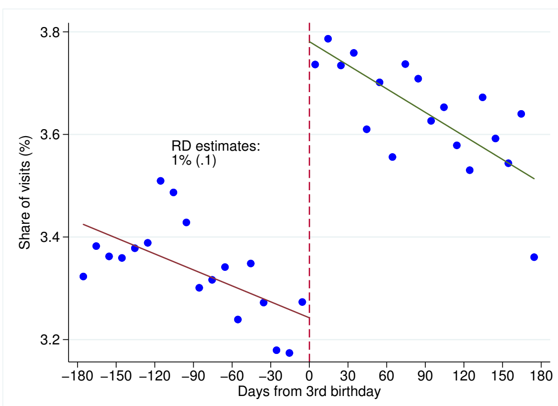
(a) Major Teaching Hospitals



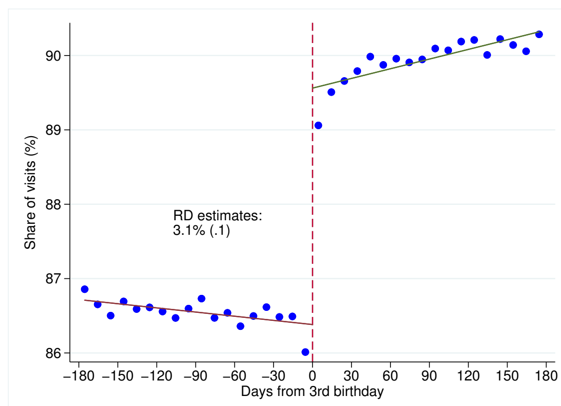
(b) Minor Teaching Hospitals



(c) Community Hospitals



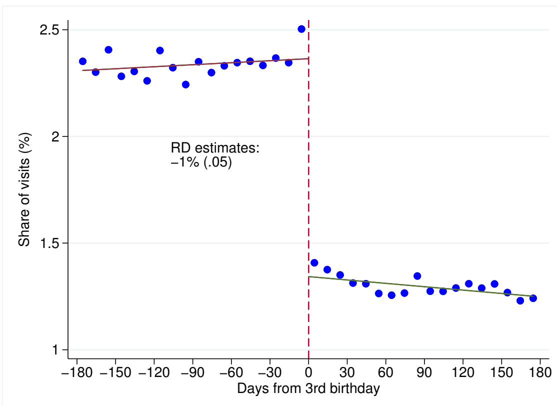
(d) Clinics



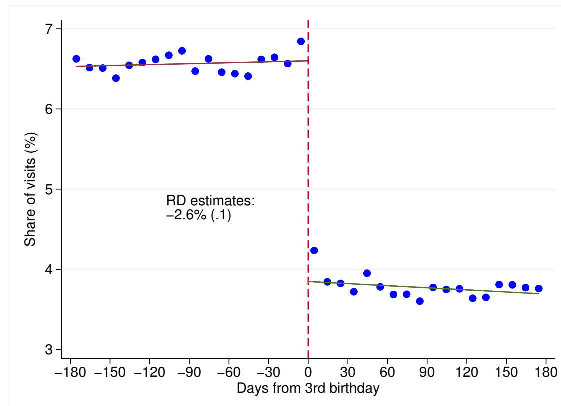
Notes: We pool NHI claims of regular outpatient care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable is the share of visits for each type of healthcare provider. We restrict the sample to those children born in a city/county with at least one major teaching hospital. The age at visit is measured in days. We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$. The RD estimates are based on the estimated coefficient on $Age3$ in equation (2), using a 90-day bandwidth. The standard errors of the RD estimates are presented in parentheses.

Figure J2: Provider Choice for Regular Outpatient Care before and after the 3^{rd} Birthday: Birthplace without Major Teaching Hospitals

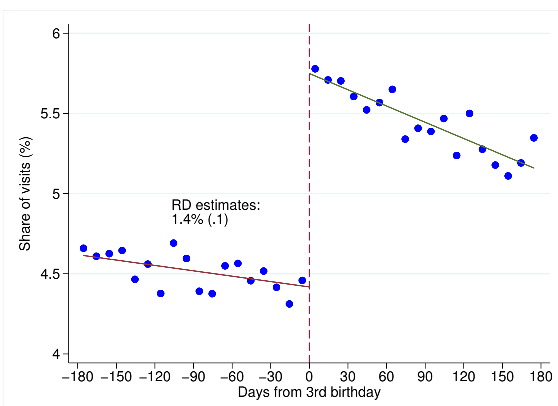
(a) Major Teaching Hospitals



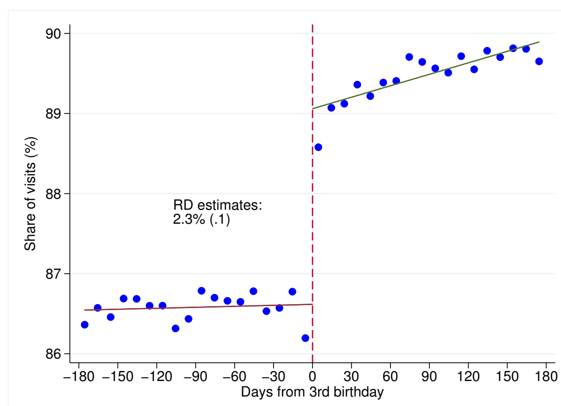
(b) Minor Teaching Hospitals



(c) Community Hospitals



(d) Clinics



Notes: We pool NHI claims of regular outpatient care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable is the share of visits for each type of healthcare provider. We restrict the sample to those children born in a city/county without any major teaching hospital. The age at visit is measured in days. We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$. The RD estimates are based on the estimated coefficient on $Age3$ in equation (2), using a 90-day bandwidth. The standard errors of the RD estimates are presented in parentheses.

K Details of the Construction of the Conditional Probability of a Shift in Healthcare Provider

Given the provider type for the last visit, we carry out the following steps to calculate the conditional transition probability of a shift in provider:

• Step 1: we order outpatient visits by visit date, to determine the provider type for both the last visit and the current visit.

• Step 2: based on the provider type for the last visit, we define the type of shift in provider for each visit. In our case, the last visit could be to either a high-intensity provider or a low-intensity provider. If the last visit was to a high-intensity provider, we have the following types of shift in provider: (1) from high- to high-intensity provider and (2) from high- to low-intensity provider. Similarly, if the previous visit was to a low-intensity provider, we can define the following types of shift in provider: (1) from low- to low-intensity provider and (2) from low- to high-intensity provider.

• Step 3: using the above definition, we calculate the number of visits for each type of shift at a given age (i.e. the age at the time of the current visit). N_h^h (N_l^h): the number of visits to high-intensity providers (low-intensity providers) when the last visit was to a high-intensity provider. N_l^l (N_h^l): the number of visits to low-intensity providers (high-intensity providers) when the last visit was to a low-intensity provider.

• Step 4: we also need to calculate the number of times the last visit was made to a high-intensity provider (N^h) or a low-intensity provider (N^l) at a given age, respectively:

$$N^h = N_h^h + N_l^h$$

$$N^l = N_l^l + N_h^l$$

These numbers serve as denominators of the conditional probability for each type of shift.

• Step 5: we combine the above information to get the conditional probability of each type of shift at a given age. For example, to obtain the conditional probability for moving from a high- to a low-intensity provider, we divide the number of visits where the patient has moved from a high- to a low-intensity provider (steps 2 & 3) by the number of previous visits to high-intensity providers (step 4):

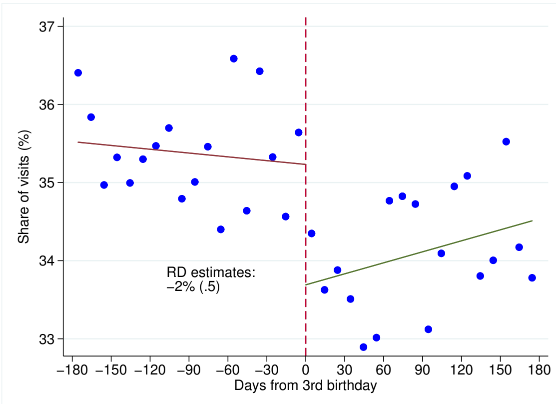
$$\text{Prob}(visit_t = low | visit_{t-1} = high) = \frac{N_l^h}{N_l^h + N_h^h}$$

For other types of shift, we use a similar logic to calculate the conditional probabilities.

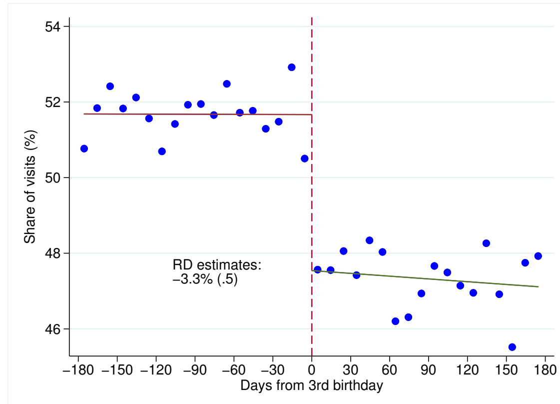
L Additional Results on Emergency Room Care

Figure L1: Provider Choice before and after the 3^{rd} Birthday: Emergency Room Care

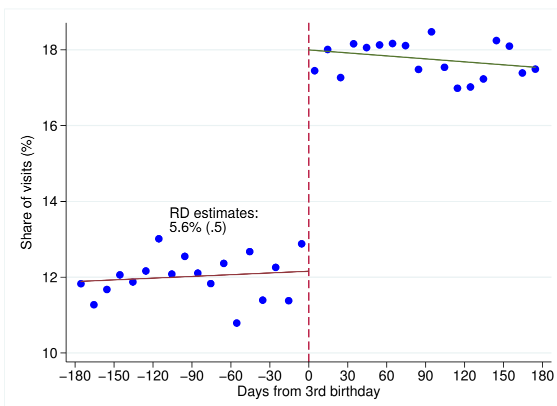
(a) Major Teaching Hospital



(b) Minor Teaching Hospital



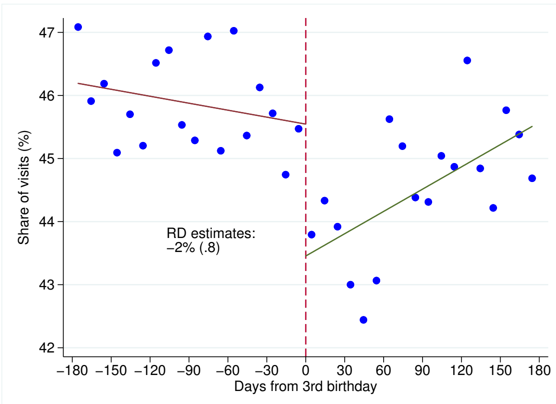
(c) Community Hospital



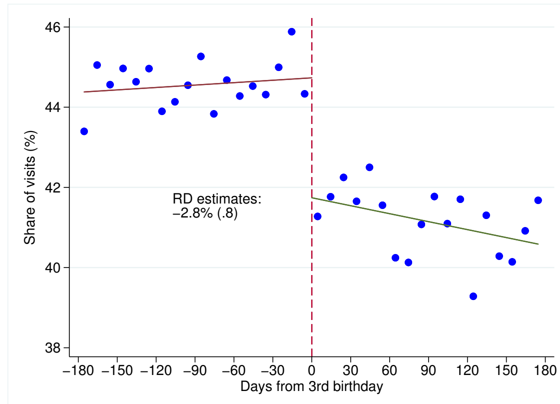
Notes: We pool NHI claims of emergency room care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable is the share of visits for each type of healthcare provider. The age at visit is measured in days. We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$. The RD estimates are based on the estimated coefficient on $Age3$ in equation (2), using a 90-day bandwidth. The standard errors of the RD estimates are presented in parentheses.

Figure L2: Provider Choice for Emergency Room Care before and after the 3^{rd} Birthday: Birthplace with Major Teaching Hospitals

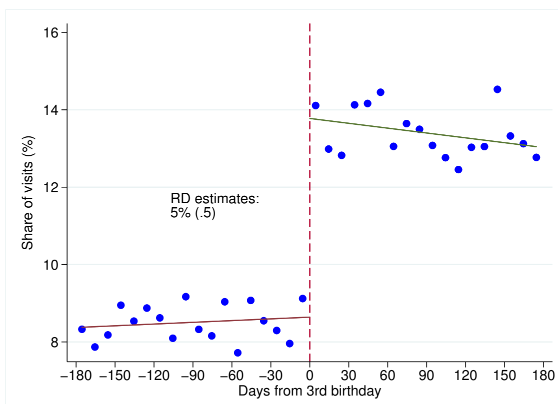
(a) Major Teaching Hospitals



(b) Minor Teaching Hospitals



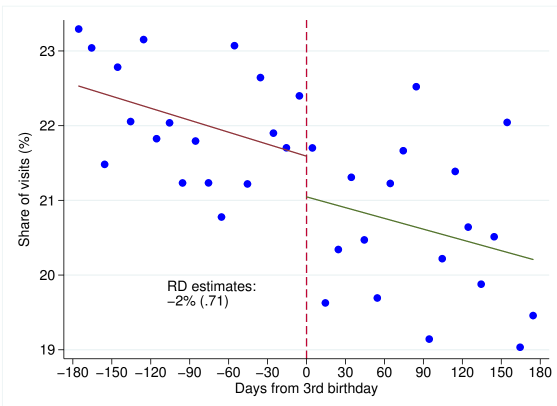
(c) Community Hospitals



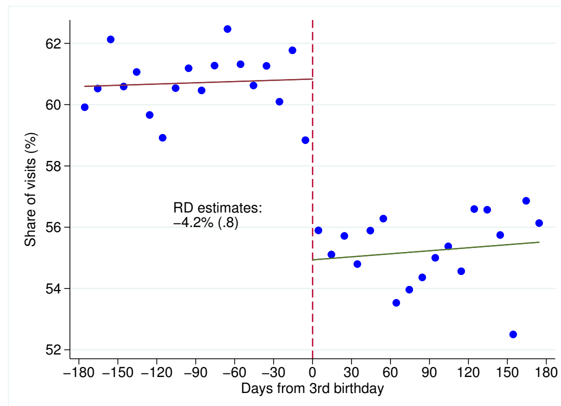
Notes: We pool NHI claims of emergency room care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable is the share of visits for each type of healthcare provider. We restrict the sample to those children born in a city/county with at least one major teaching hospital. The age at visit is measured in days. We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$. The RD estimates are based on the estimated coefficient on $Age3$ in equation (2), using a 90-day bandwidth. The standard errors of the RD estimates are presented in parentheses.

Figure L3: Provider Choice for Emergency Room Care before and after the 3^{rd} Birthday: Birthplace without Major Teaching Hospitals

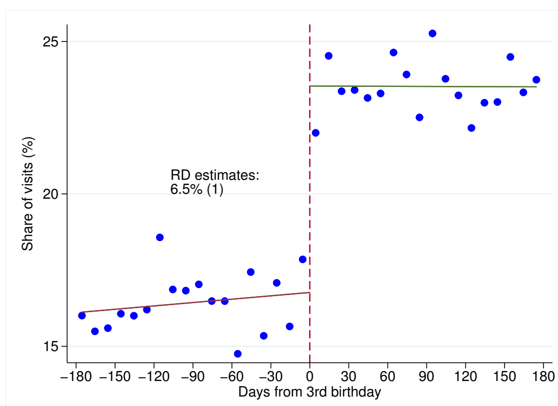
(a) Major Teaching Hospitals



(b) Minor Teaching Hospitals



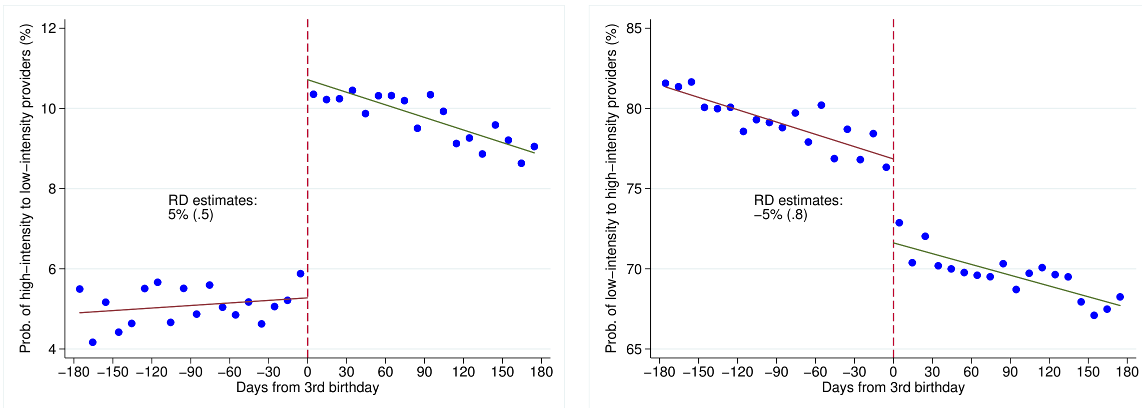
(c) Community Hospitals



Notes: We pool NHI claims of emergency room care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable is the share of visits for each type of healthcare provider. We restrict the sample to those children born in a city/county without any major teaching hospital. The age at visit is measured in days. We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$. The RD estimates are based on the estimated coefficient on $Age3$ in equation (2) using a 90-day bandwidth. The standard errors of the RD estimates are presented in parentheses.

Figure L4: Providers Switching before and after the 3^{rd} Birthday: Emergency Room Care

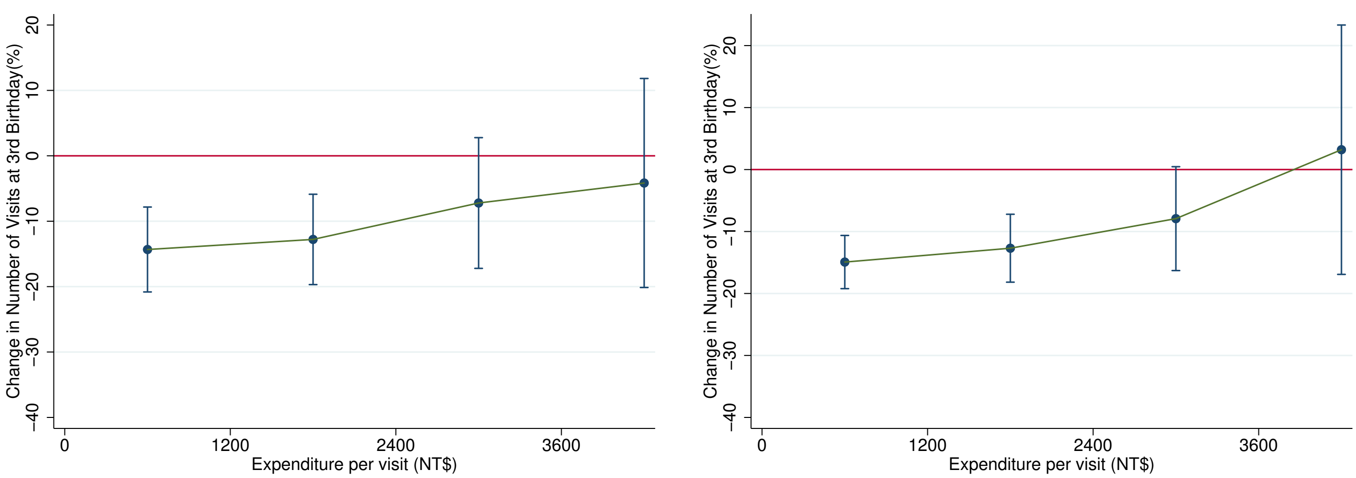
(a) Prob. of high-intensity to low-intensity providers (b) Prob. of low-intensity to high-intensity providers



Notes: We pool NHI claims of emergency room care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable in Figure L4a, namely conditional probability of current visit, is a low-intensity provider (i.e. community hospitals/clinics) given the last visit is a high-intensity provider (i.e. teaching hospital). The dependent variables in Figure L4b is conditional probability of current visit is high-intensity provider (i.e. teaching hospitals) given the last visit is low-intensity provider (i.e. community hospitals/clinics). We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$.

Figure L5: Utilization Responses at the 3^{rd} Birthday by Expenditure per Emergency Room Visit

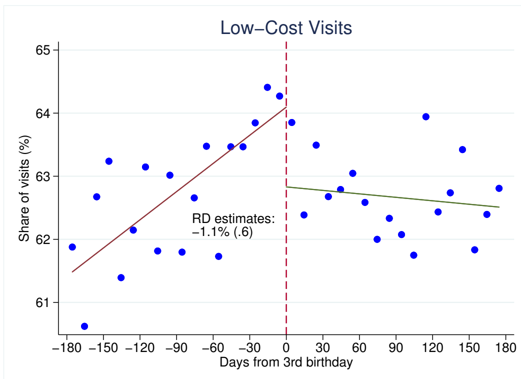
(a) Percent Change in Visits to Major Teaching Hospital (b) Percent Change in Visits to Minor Teaching Hospital



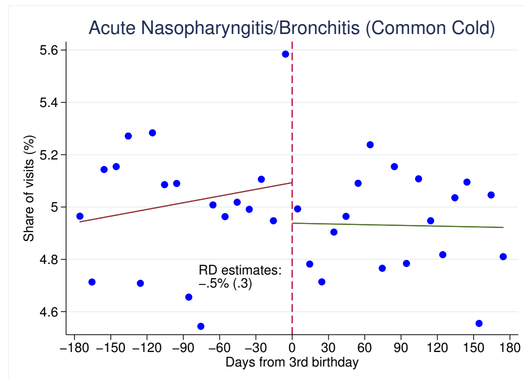
Notes: We pool NHI claims of emergency room care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. We estimate equation (2) separately by expenditure per regular outpatient visit: (1) 0-1,200 NT$; (2) 1,201-2,400 NT$; (3) 2,401-3,600 NT$; (4) above 3,601 NT$ for major teaching hospital visits (see Figures L5a) and minor teaching hospital visits (see Figures L5b). 1 US$ is 32.5 NT$ in 2006. All expenditures in our sample period are inflation-adjusted (in 2006 NT$). The dotted line in Figures L5a and L5b displays the estimated coefficients on $Age3$ in equation (2), using a 90-day bandwidth and the corresponding 95% confidence intervals.

Figure L6: Composition Change in Teaching Hospital Visits at the 3^{rd} Birthday: Emergency Room Care

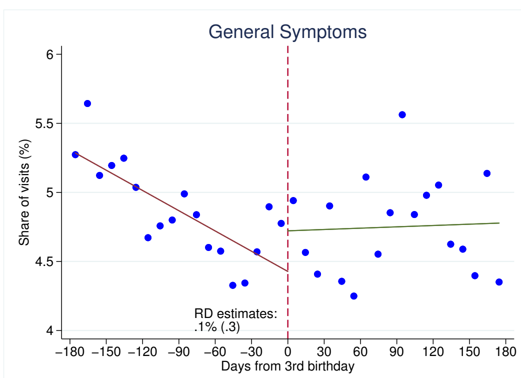
(a) Low-Cost Visits



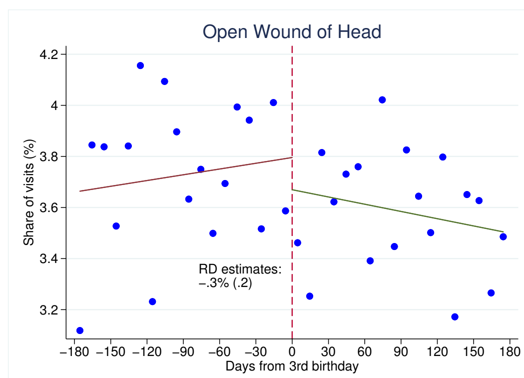
(b) Acute Nasopharyngitis/Bronchitis (Common Cold)



(c) General Symptoms



(d) Open Wound of Head



Notes: We pool NHI claims of emergency room care for the 2003-2004 birth cohort, using 2005-2008 NHIRD data. The dependent variable is the share of visits for selected diagnoses. The age at visit is measured in days. We plot the dependent variable within 180 days before and after the 3^{rd} birthday and group it every ten days as a bin from the 3^{rd} birthday. Thus, each dot represents the 10-day average of the dependent variable. The line is from fitting a linear regression on age variables fully interacted with $Age3$. The RD estimates are based on the estimated coefficient on $Age3$ in equation (2), using a 90-day bandwidth. The standard errors of the RD estimates are presented in parentheses.

M Examine Own-Price Elasticity

Table M1: List of Diagnosis Groups

No.	Diagnosis Groups	ICD 9
1	Intestinal Infectious Diseases	001-009
2	Tuberculosis	010-018
3	Other Bacterial Diseases	020-041
4	Viral Diseases	045-079
5	Rickettsiosis and Other Arthropod-borne Diseases	080-088
6	Venereal Diseases	090-099
7	Other Infectious and Parasitic Diseases and Late Effects of Infectious and Parasitic Diseases	100-139
8	Malignant Neoplasm of Lip, Oral Cavity, and Pharynx	140-149
9	Malignant Neoplasm of Digestive Organs and Peritoneum	150-159
10	Malignant Neoplasm of Respiratory and Intrathoracic Organs	160-165
11	Malignant Neoplasm of Bone, Connective Tissue, Skin, and Breast	170-175
12	Malignant Neoplasm of Genitourinary Organs	179-189
13	Malignant Neoplasm of Other and Unspecified Sites	190-199
14	Malignant Neoplasm of Lymphatic and Haematopoietic Tissue	200-208
15	Benign Neoplasm	210-229
16	Carcinoma in Situ	230-234
17	Other and Unspecified Neoplasm	235-239
18	Endocrine and Metabolic Diseases, Immunity Disorders	240-259 270-279
19	Nutritional Deficiencies	260-269
20	Diseases of Blood and Blood-forming Organs	280-289
21	Mental Disorders	290-319
22	Diseases of the Nervous System	320-359
23	Disorders of the Eye and Adnexa	360-379
24	Diseases of the Ear and Mastoid Process	380-389
25	Rheumatic Fever and Heart Disease	390-398
26	Hypertensive Disease	401-405
27	Ischemic Heart Disease	410-414
28	Diseases of Pulmonary Circulation and Other Forms of Heart Disease	415-429
29	Cerebrovascular Disease	430-438
30	Other Diseases of the Circulatory System	440-459
31	Diseases of the Upper Respiratory Tract	460-465, 470-478
32	Other Diseases of the Respiratory System	466, 480-519
33	Diseases of Oral Cavity, Salivary Glands, and Jaws	520-529
34	Diseases of Other Parts of the Digestive System	530-579
35	Diseases of Urinary System	580-599
36	Diseases of Male Genital Organs	600-608
37	Diseases of Female Genital Organs	610-629
38	Abortion	630-639
39	Direct Obstetric Causes	640-646
40	Indirect Obstetric Causes	647-648
41	Normal Delivery	650
42	Diseases of Skin and Subcutaneous Tissue	680-709
43	Diseases of the Musculoskeletal System and Connective Tissue	710-739
44	Congenital Anomalies	740-759
45	Certain Conditions Originating in the Perinatal Period	760-779
46	Signs, Symptoms, and Ill-defined Conditions	780-799
47	Fractures	800-829
48	Dislocations, Sprains, and Strains	830-848
49	Intracranial and Internal Injuries, Including Nerves	850-869 950-957
50	Open Wounds and Injury to Blood Vessels	870-904

Table M1: List of Diagnosis Groups (Continued)

No.	Diagnosis Groups	ICD 9
51	Effects of Foreign Body Entering through Orifice	930-939
52	Burns	940-949
53	Poisonings and Toxic Effects	960-989
54	Complications of Medical and Surgical Care	996-999
55	Other Injuries, Early Complications of Trauma	910-929, 958-959, 990-995
56	Late Effects of Injuries, of Poisonings, of Toxic Effects, and of Other External Causes	905-909

Note: This table displays 56 groups of diagnoses and their corresponding ICD 9 code based on the Basic Tabulations of Diagnoses.

Table M2: Examine Own-Price Elasticity

Variables	(1) OOP expense	(2) log(total expenditure)	(3) log(# of visits)	(4) log(expenditure/visit)	(5) elasticity
Dominated by Regular Outpatient Care					
Age3	71.37	-6.32***	-4.51***	-1.81***	-0.10
		(0.40)	(0.32)	(0.19)	
Dominated by Emergency Room Care					
Age3	285.41	-9.43***	-9.13***	-0.30	-0.11
		(3.38)	(2.64)	(1.99)	
Dominated by Inpatient Care					
Age3	1400.60	1.36	0.19	1.16	0.01
		(6.55)	(3.60)	(5.59)	

Notes: The estimated sample in the first and third rows includes 414,282 children born in 2003 to 2004. We use 2005-2008 NHIRD data to find their healthcare utilization at around the age of 3. We collapse the individual-level data into age cells and measure age in days. We select the diagnosis groups where regular outpatient care (emergency room care, inpatient care) accounts for the highest fraction of expenditure among the three types of healthcare services, to represent own-price elasticity for regular outpatient care (emergency room care, inpatient care). Column (1) displays the estimated change in OOP expenses (NT$) per visit at the age of 3. We estimate the change in out-of-pocket expenses per visit by assuming patients above the age of 3 (i.e. 90 days after their 3^{rd} birthday) made the same healthcare utilization decision (i.e. had the same number of visits and visited the same healthcare provider) as those immediately below the age of 3 did (i.e. 90 days before the 3^{rd} birthday). By doing so, the estimated change in out-of-pocket expenses per visit at the age of 3 is driven exclusively by expiration of the cost-sharing subsidy rather than an individual's choice. Columns (2)-(4) present the estimated coefficient on $Age3$ in equation (2), using a 90-day bandwidth (i.e. 180 observations). The dependent variables in all the regressions above are the log of total expenditure, the log of numbers of visits and the log of expenditure per visit, at each age in days. For columns (2) - (4), the estimated coefficients are multiplied by 100 to show the percentage change in the outcome. Column (5) displays the estimated price elasticity of total expenditure, using information from Columns (1) and (2), with 1 US$ equal to 32.5 NT$ in 2006. All expenditures in our sample period are inflation-adjusted (in 2006 NT$). Robust standard errors are in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level and * significant at the 10 percent level.

N Results for Children's Health

Thus far, our results imply that the cost-sharing subsidy significantly increases the utilization of outpatient care and causes patients to switch from low-intensity to high-intensity providers. Receiving more treatments could result in better health. However, we also find that the subsidy induces patients to visit high-intensity providers when they have minor illnesses. In addition, the subsidy has little impact on the utilization of inpatient care. Therefore, based on the results on utilization, it is unclear whether the cost-sharing subsidy really benefits children's health.

N.1 Impact on Contemporaneous Health

In this section, we examine the effect of the increase in the amount of cost-sharing at the age of 3 on contemporaneous (short-term) health outcomes. We first use mortality to measure children's health and utilize an RD design by comparing the mortality of children immediately before and after the age of 3.

Figure N1a displays the age profiles of the mortality rates per 10,000 person-months among children born in 2003-2004 and aged between 2 and 4, using 2005-2008 Cause of Death Registry data.[59] Since Cause of Death Registry data only provide information on people's birth month and death month, we measure the children's age at death in months. Thus, each dot represents the number of deaths per 10,000 person-months. We find that mortality does not exhibit significant discontinuity at the age of 3.[60] Our result suggests that increased cost-sharing at the age of 3 does not lead to higher mortality for the children just over 3 years old than for those just under 3 years old.[61]

In addition to the mortality rate, we examine the impact of cost-sharing on a less severe health outcome measure – the presence of complex health problems. Specifically, following Iizuka and Shigeoka (2018), we use the occurrence of pediatric complex chronic conditions (CCCs), devel-

[59] The Cause of Death Registry covers all deaths in Taiwan and uses ICD 9 codes to record their causes. We computed the mortality rate by dividing the total number of deaths at a particular age by the number of children born in 2003 and 2004, and then multiplying this figure by 10,000.

[60] The point estimate is -0.037, which is based on equation (2) using a 12-month bandwidth.

[61] Our estimates can rule out the notion that the expiration of the cost-sharing subsidy at the age of 3 increases the mortality rate by more than 0.047 per 10,000 person-months.

oped by Feudtner et al. (2000), to measure children's health status.[62] Notice that the presence of pediatric CCCs substantially increases children's one-year mortality rate. The diagnoses of CCCs and corresponding ICD 9 codes are listed in Table N1. For comparison with the mortality results in Figure N1a, Figure N1b displays the age profiles of the morbidity rate of pediatric CCCs (per 10,000 person-months) from 12 months before the 3^{rd} birthday to 12 months thereafter.[63] There is little evidence of any discontinuity in the morbidity rate of pediatric CCCs at the age of 3.[64] The above results might not be surprising, since our utilization results imply marginal patients may only reduce low-value visits in response to higher cost-sharing after the 3^{rd} birthday, which in turn might not affect their health status. More importantly, the health effect (if any) is probably hard to detect in the short term, since it will only gradually deteriorate the stock of health (Grossman, 1972).

N.2 Impact on Later-Life Health

In this section, we investigate whether the cost-sharing subsidy in early childhood has any effect on the health of children in later years. Our identification strategy exploits the fact that the length of the period for which a child is eligible for the cost-sharing subsidy is determined by his or her birth date. For example, individuals born before March 1, 1999, were ineligible for the subsidy (i.e. the control group). Thus, Figure N2a indicates that the number of days on which children in this group were eligible for the cost-sharing subsidy is zero. For those born between March 2, 1999, and March 1, 2002, however, the number of days on which they were eligible ranges between 1 and 1,096 days (i.e. the treatment group). Therefore, the number of eligible days is an increasing function of birth date for this group, as shown in Figure N2a.

Consistent with this observation, as seen in Figure N2b, the average OOP expenses per visit, and the birth date, exhibit a negative relationship for those born after March 1, 1999. Not surpris-

[62] The definition of a CCC is "Any medical condition that can be reasonably expected to last at least 12 months (unless death intervenes) and to involve either several different organ systems or one organ system severely enough to require speciality pediatric care and probably some period of hospitalization in a tertiary care center."

[63] Similarly, we computed the morbidity rate by dividing the total number of inpatient admissions with pediatric CCCs at a particular age by the number of enrollees born in 2003 and 2004, and then multiplying this figure by 10,000.

[64] The point estimate based on equation (2) and a 12-month bandwidth is -0.128, which is insignificantly different from zero.

ingly, healthcare expenditure and the number of outpatient visits for this cohort increase as their birth date becomes more recent, due to the cost-sharing subsidy. Figures N2c and N2d show the relationship between the birth date and outpatient expenditure, for all providers and at teaching hospitals, respectively. From these two figures, it is obvious that outpatient expenditure, either at all providers or just at teaching hospitals, becomes correlated more positively with the birth date for children born after March 1, 1999, implying that the cost-sharing subsidy induces the use of more healthcare for these children in their early life. In spite of this finding, there is no systematic relationship between birth date and the morbidity rate of pediatric CCCs when children are older. Figure N3 shows that there is almost no change in the slope of the relationship between children's later-life health and their birth date after March 1, 1999, as measured for various age groups (age 5-11, age 5-7, age 7-9 and age 9-11). Table N2 summarizes the statistics for the sample (i.e. treatment/control groups) and which were used to estimate the long/medium-term health effects.

To understand the statistical significance of the above findings, we estimate the following regression:

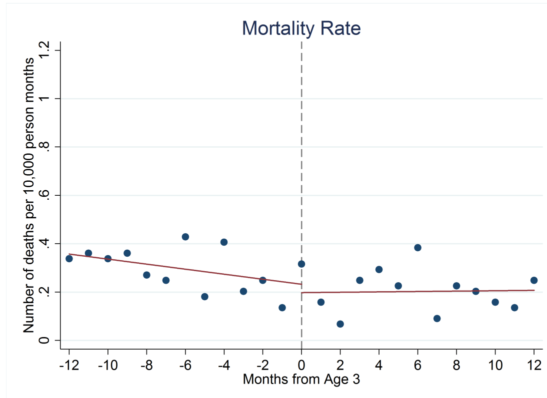
$$H_i = \kappa_0 + \kappa_1 After99_i + \kappa_2 Distance1999_i + \kappa_3 After99_i * Distance1999_i + \kappa_4 X_i + \varsigma_i \tag{N.1}$$

The H_i are the outcome variables, which can represent (1) the average OOP expenses per visit for individual i aged 2-3; (2) the outpatient expenditure across all providers for individual i aged 2-3; (3) outpatient expenditure at teaching hospitals for individual i aged 2-3; (4) the presence of pediatric CCCs, a dummy indicating that an individual i has at least one inpatient admission for a pediatric CCC, over various age groups (age 5-11, age 5-7, age 7-9, and age 9-11). $Distance1999_i$ denotes the number of days between individual i's birth date and March 1, 1999. $After99_i$ is a dummy indicating that individual i's birth date is later than March 1, 1999. The key variable is the interaction term between $After99_i$ and $Distance1999_i$. Its coefficient, κ_3, measures changes in the slopes of the relationships between the outcome variables and the child's birth date, for individuals born just before and those born just after March 1, 1999. As mentioned before, the length of eligibility for the cost-sharing subsidy, and the child's birth date, has a positive relationship for those children born after March 1, 1999. If there are no other confounding factors that might affect healthcare utilization or the health of children born around March 1, 1999, κ_3 will represent the causal effect of the cost-sharing subsidy on the outcome variables.

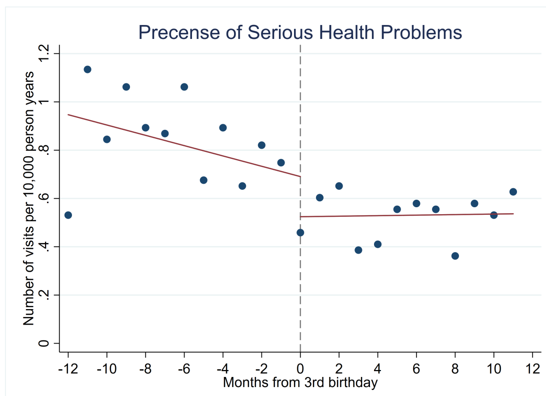
Table N3 reports the effect of the cost-sharing subsidy on healthcare utilization for children aged 2-3. The coefficients of $After99 * Distance1999$ (i.e. κ_3) suggest that the cost-sharing subsidy significantly reduces average OOP cost per visit, by 67.1 NT$. In addition, a one-year cost-sharing subsidy can increase outpatient expenditure during the ages 2-3 by 303.4 NT$ (i.e. by around 3%). Most increases in outpatient expenditure occur at teaching hospitals. A one-year cost-sharing subsidy can increase outpatient expenditure at teaching hospitals during the ages 2-3 by 322.4 NT$ (i.e. by around 17%). Nonetheless, this increase in healthcare use does not seem to contribute to children's health. Table N4 displays the effect of the cost-sharing subsidy on the occurrence of pediatric CCCs during the ages 5-11. In contrast to the results in Table N3, none of the estimated coefficients on $After99 * Distance1999$ (i.e. κ_3) is statistically significant. In sum, our findings imply that the cost-sharing subsidy has little impact on children's health later in life.

Figure N1: Mortality and Morbidity Rate before and after the 3^{rd} Birthday

(a) Mortality Rate



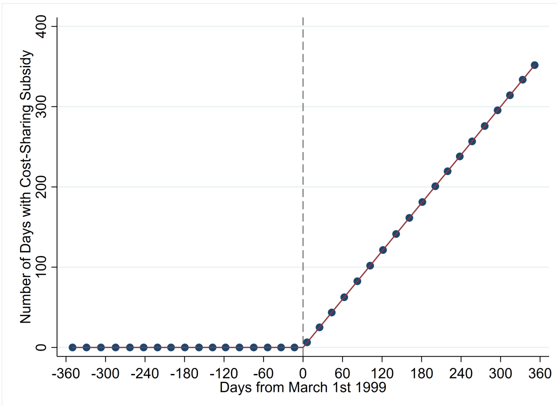
(b) Morbidity Rate of Paediatric Complex Chronic Conditions



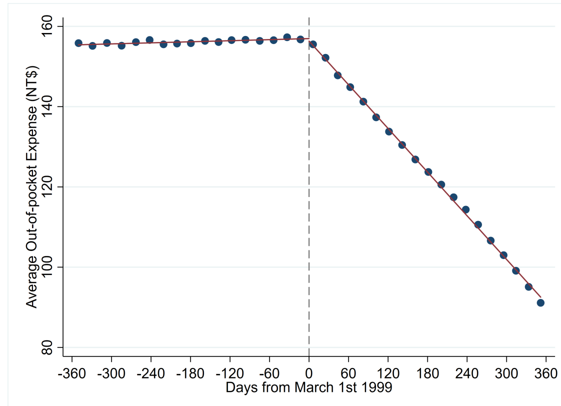
Notes: Figure N1a displays the age profiles of the mortality rate per 10,000 person months among children born in 2003-2004 and aged between 2 to 4, using 2005-2008 death registry data. Age at death is measured in months. Figure N1b displays the age profiles of morbidity rates per 10,000 persons months for pediatric complex chronic conditions (CCCs) from 12 months before the 3^{rd} birthday to 12 months thereafter. The diagnoses of CCCs and corresponding ICD 9 codes are listed in Table N1.

Figure N2: The Effect of the Cost-Sharing Subsidy on Healthcare Utilization During Age 2-3

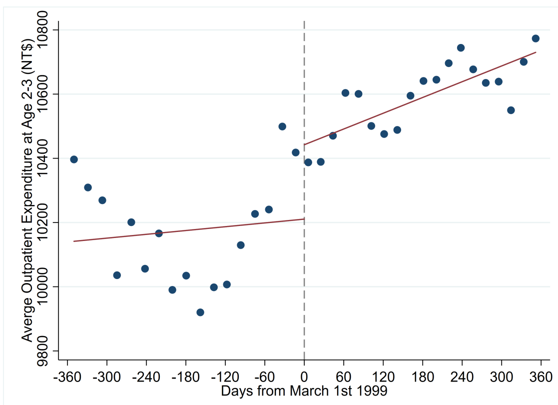
(a) Number of Days with the Cost-Sharing Subsidy



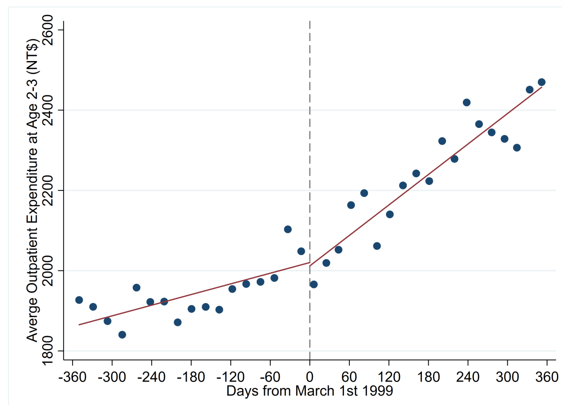
(b) Average Out-of-Pocket Expenses



(c) Outpatient Expenditure: All Providers



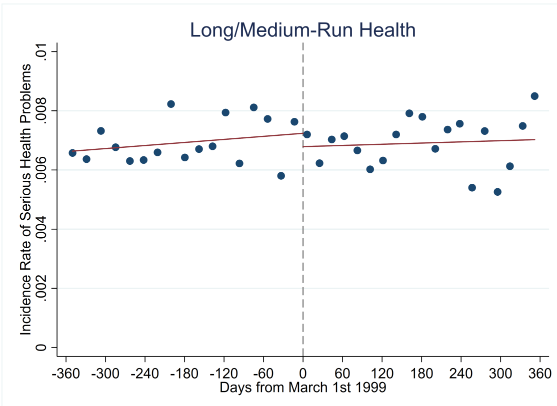
(d) Outpatient Expenditure: Teaching Hospitals



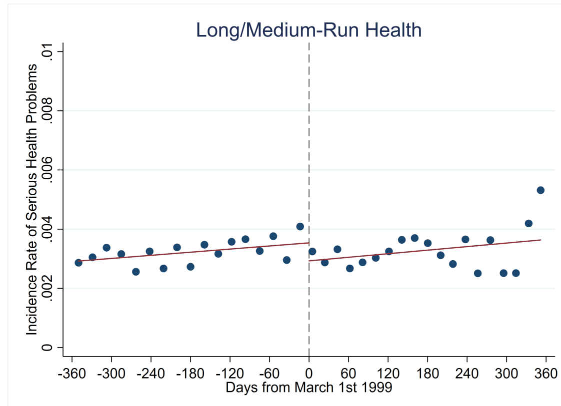
Notes: Figure N2a illustrates the relationship between the length of eligibility for the cost-sharing subsidy during ages 0 to 3 and the birth date. Figure N2b displays the relationship between average OOP expenses per visit during children's ages 2-3 and the birth date. Figure N2c displays the relationship between outpatient expenditure during children's ages 2-3 and their birth date. Figure N2d displays the relationship between outpatient expenditure for teaching hospitals during children's ages 2-3 and their birth date. Figures N2b to N2d are based on data from 2002-2004 NHIRD, where 1 US$ equals 32.5 NT$ in 2006. All expenditures/expenses in our sample period are inflation-adjusted (in 2006 NT$). Note that the horizon axis represents the days from March 1st, 1999, so zero means March 1st, 1999. We plot the dependent variables within 360 days before and after March 1st 1999 and group it every twenty days as a bin from March 1st, 1999. Thus, each dot represents the 20-day average of the dependent variables.

Figure N3: The Effect of the Cost-Sharing Subsidy on Morbidity Rate during Age 5-11

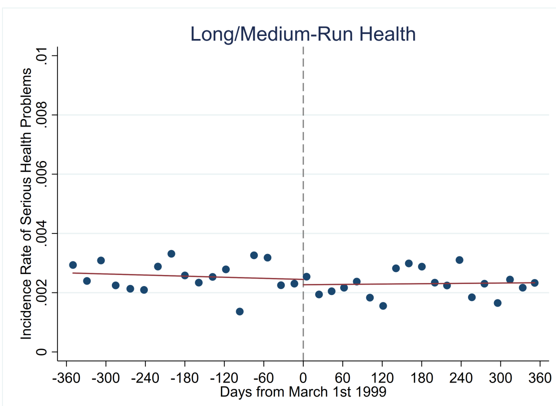
(a) Age 5-11



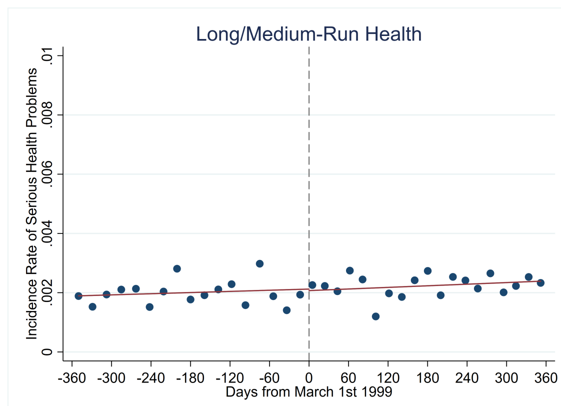
(b) Age 5-7



(c) Age 7-9



(d) Age 9-11



Notes: Figure N3 displays the relationship between the morbidity rate of pediatric CCCs over various age groups (age 5-11, age 5-7, age 7-9 and age 9-11), and the birth date, using claim data of inpatient care from the NHIRD. Note that the horizon axis represents days from March 1st, 1999, so zero means March 1st, 1999. We plot the dependent variables within 360 days before and after March 1st, 1999, and group it every twenty days as a bin from March 1st 1999. Thus, each dot represents the 20-day average of the dependent variables.

Table N1: List of CCCs

Diagnosis	ICD 9 Code
Brain and spinal cord malformations	740.0–742.9
Mental retardation	318.0–318.2
Central nervous system degeneration and disease	330.0–330.9, 334.0–334.2,335.0–335.9
Infantile cerebral palsy	343.0–343.9
Muscular dystrophies and myopathies	359.0–359.3
Heart and great vessel malformations	745.0–747.4
Cardiomyopathies	425.0–425.4, 429.1
Conduction disorders	426.0–427.4
Dysrhythmias	427.6–427.9
Respiratory malformations	748.0–748.9
Chronic respiratory disease	770.7
Cystic fibrosis	277.0
Congenital anomalies	753.0-753.9
Chronic renal failure	585
Congenital anomalies	750.3, 751.1–751.3,751.6–751.9
Chronic liver disease and cirrhosis	571.4–571.9
Inflammatory bowel disease	555.0–556.9
Sickle cell disease	282.5–282.6
Hereditary anaemias	282.0–282.4
Hereditary immunodeficiency	279.00–279.9, 288.1–288.2, 446.1
Acquired immunodeficiency	0420–0421
Amino acid metabolism	270.0–270.9
Carbohydrate metabolism	271.0–271.9
Lipid metabolism	272.0–272.9
Storage disorders	277.3, 277.5
Other metabolic disorders	275.0–275.3, 277.2, 277.4, 277.6, 277.8–277.9
Chromosomal anomalies	758.0–758.9
Bone and joint anomalies	259.4, 737.3, 756.0–756.5
Diaphragm and abdominal wall	553.3, 756.6–756.7
Other congenital anomalies	759.7–759.9
Malignant neoplasms	140.0–208.9, 235.0–239.9

Notes: This table displays the diagnoses and the corresponding ICD 9 code for pediatric complex chronic conditions (CCCs), developed by Feudtner et al. (2000) to measure children's health status. The definition of CCCs is "Any medical condition that can be reasonably expected to last at least 12 months (unless death intervenes) and to involve either several different organ systems or one organ system severely enough to require speciality pediatric care and probably some period of hospitalization in a tertiary care center."

Table N2: Summary Statistics for the Estimated Health Effects Sample

	Impact on Later Life Health	
	Born before March 1999	Born after March 1999
Panel A: Variables at Age 5-11		
Share of CCCs at age 5-11(%)	0.69	0.69
Panel B: Variables at Age 2-3		
Average OOP expenses per visit at 2-3	156.2	123.5
	(41.9)	(39.4)
Average outpatient expenditure at 2-3 (all providers)	10,175.5	10,590.9
	(7,290.2)	(7546.1)
Average outpatient expenditure at 2-3 (teaching hospitals)	1,941.4	2,241.42
	(4,609.5)	(5,018.9)
Number of children	236,689	257,578

Notes: We use enrollee data and claim data for outpatient care and inpatient care from NHIRD when the targeted cohort are ages 2-3 or 5-11. Furthermore, we restrict our sample to those born 360 days before and after March 1st, 1999. Average expenditure and average OOP expenses are reported in New Taiwan Dollar (NT$), with 1 US$ equating to 32.5 NT$ in 2006.

Table N3: The Effect of the Cost-Sharing Subsidy on Outpatient Utilization During Age 2-3

Dependent Variable:	Outpatient utilization During Age 2-3					
	OOP Expense		Outpatient Expenditure All Providers		Outpatient Expenditure Teaching Hospitals	
	(1)	(2)	(3)	(4)	(5)	(6)
After1999 ×Distance1999	-67.81***	-67.12***	226.5***	303.4***	300.2***	322.4***
	(0.380)	(0.333)	(74.26)	(73.55)	(48.64)	(48.28)
Covariates		√		√		√
Sample Size	494,267	494,267	494,267	494,267	494,267	494,267

Notes: This table reports the estimated coefficients on $After1999 \times Distance1999$ in the regression (N.1). The dependent variables are OOP expenses per visit for the ages 2-3, total outpatient expenditure for ages 2-3 and outpatient expenditure for teaching hospital visits during age 2-3. Covariates include gender, birth county, birth order and household income, with 1 US$ equalling 32.5 NT$ in 2006. All expenditures/expenses in our sample period are inflation-adjusted (in 2006 NT$). Standard errors are reported in parentheses and clustered at birth date. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table N4: The Effect of the Cost-Sharing Subsidy on Morbidity Rate for the ages of 5-11

Dependent Variable:	Morbidity Rate for the ages of 5-11							
	Age 5-11		Age 5-7		Age 7-9		Age 9-11	
	(1)	(2)	(3)	(4)	(5)	(6)	(5)	(6)
After1999 ×Distance1999	-0.0004	-0.0004	-0.0001	-0.0001	0.0002	0.0002	0.0001	0.0001
	(0.0008)	(0.0008)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Covariates		√		√		√		√
Sample Size	494,267	494,267	494,267	494,267	494,267	494,267	494,267	494,267

Notes: This table reports the estimated coefficients on $After1999 \times Distance1999$ in the regression (N.1). The dependent variables are the occurrence of serious health problems (CCCs) for the ages 5-11, 5-7, 7-9 and 9-11. Covariates include gender, birth county, birth order and household income for 2-3-year-olds. Standard errors are reported in parentheses and clustered at birth date. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

O A Sufficient Statistics Model for Evaluating Patient Cost-Sharing Policy

O.1 Model

In this model, we evaluate cost-sharing policy from the view of a social planner seeking to maximize social welfare as the following expected utility $W(p)$:

$$W(p) \;=\; (1-\lambda)U(y-P) + \lambda \mathrm{E}[U(y-P-s+m(p)(b-p))|sick]$$

Consider an individual with wealth y who pays premium P, in order to be eligible for national health insurance. He/she could fall sick with a probability λ and experience a negative health shock s, measured in monetary terms. In other words, with probability $1-\lambda$, an individual is healthy and receives utility $U(y-P)$. The magnitude of the health shock s is an individual's private information. In addition, the distribution of s follows $F(s)$, which has strictly positive density $f(s)$ and support with a lower bound s_l and an upper bound s_u. Medical treatment can alleviate the sickness by providing health benefits $b(s)$, but it does incur the social cost π. The benefit of the treatment depends on the health shock s. Under the NHI, an individual can receive medical treatment by paying only patient cost-sharing p (i.e. part of the treatment cost π, $p<\pi$). Therefore, his/her healthcare demand $m(p)$ depends on whether the health benefit b is greater than the individual's cost-sharing amount p:

$$m(p) = \begin{cases} 1, & \text{if } b(s) \geq p \\ 0, & \text{if } b(s) < p \end{cases}$$

If the health benefit of treatment, b, is greater than an individual's patient cost-sharing amount, p, he/she will seek medical treatment, i.e. $m(p)=1$, and will then receive utility $U(y-P-s+b-p)$. Otherwise, he/she will decide not to get medical treatment, $m(p)=0$, and will receive utility $U(y-P-s)$. Finally, we assume that the NHI must balance its budget: $P = M(p)\times(\pi-p)$, where $M(p)=E[m(p)]$ is the average healthcare demand (i.e. per capita aggregate healthcare demand) at a given cost-sharing. To understand how social welfare W changes when patient cost-sharing p increases, in section O.2, we first differentiate W with respect to p, given the NHI budget constraint. Then, we divide $\frac{\partial W}{\partial p}$ by the welfare change that occurs when income increases by 1 dollar, $\frac{\partial W}{\partial y}$, to convert changes in social welfare into a money metric form:

$$\frac{\partial W}{\partial p} / \frac{\partial W}{\partial y} = -\frac{\partial M(p)}{\partial p} \times (\pi - p) - I(p) \times M(p) \tag{O.1}$$

where $I(p) = \frac{E[U^{'}(C)|m=1]-E[U^{'}(C)]}{E[U^{'}(C)]}$ and $C = y - P - s + m(p)(b(s) - p)$, so that $I(p)$ represents the value of health insurance for those getting treatment. This formula suggests that the impact of an increase in patient cost-sharing on social welfare is driven by two key terms. The first term, $-\frac{\partial M(p)}{\partial p} \times (\pi - p)$, represents the welfare gain from raising patient cost-sharing, which occurs due to a reduction in the inefficient utilization of healthcare services (i.e. moral hazard), since the social cost of healthcare services is always higher than the patient's cost-sharing amount: $\pi > p$. Thus, we can measure this welfare gain by estimating the sensitivity of healthcare demand to the patient cost-sharing amount, $\frac{\partial M(p)}{\partial p}$. The second term (i.e. $-I(p) \times M(p)$) represents welfare loss due to raising patient cost-sharing, since a higher cost-sharing amount can reduce all patients' insurance value by decreasing their consumption when they fall sick.

O.2 Details of Derivation

Note that all notation has been defined in Section O.1. The social planner chooses the level of patient cost-sharing p to maximize social welfare, given the budget constraint $P = M(p) \times (\pi - p)$.

$$\begin{aligned} W(p) &= (1-\lambda)U(y-P) + \lambda \mathrm{E}[U(y-P-s+m(p)(b(s)-p))|sick] \\ &= (1-\lambda)U(y-P) + \lambda \left[\int_{s_l}^{s} U(y-P-s)dF(s) \right] \\ &\quad + \lambda \left[\int_{s}^{s_u} (U(y-P-s+m(p)(b(s)-p)))dF(s) \right] \end{aligned}$$

Differentiating $W(p)$ with respect to p subject to the budget constraint $P = M(p) \times (\pi - p)$

gives the following expression:

$$
\begin{aligned}
\frac{\partial W}{\partial p} &= -(1-\lambda)U^{'}(y-P)\frac{\partial P}{\partial p} - \lambda \mathrm{E}[\frac{\partial U(y-P-s+m(p)(b(s)-p))}{\partial P}\frac{\partial P}{\partial p}] \\
&\quad +\lambda \mathrm{E}[\frac{\partial U(y-P-s+m(p)(b(s)-p))}{\partial \delta}\frac{\partial \delta(p)}{\partial p}] \\
&\quad +\lambda \mathrm{E}[\frac{\partial U(y-P-s+m(p)(b(s)-p))}{\partial s}\frac{\partial s}{\partial p}]
\end{aligned} \tag{O.2}
$$

where $\delta(p) = m(p)(b(s)-p)$ and $C = y - P - s + m(p)(b(s)-p)$. We can express equation (O.2) as follows:

$$
\begin{aligned}
\frac{\partial W}{\partial p} &= -(1-\lambda)U^{'}(y-P)\frac{\partial P}{\partial p} - \lambda \mathrm{E}[U^{'}(C)\frac{\partial P}{\partial p}] \\
&\quad +\lambda \mathrm{E}[U^{'}(C)\frac{\partial \delta(p)}{\partial p}] \\
&\quad +\lambda \left\{ f(s)[U(y-P-s) - U(y-P-s+b(s)-p)]\frac{\partial s}{\partial p} \right\} \\
&= -\mathrm{E}[U^{'}(C)]\frac{\partial P}{\partial p} - \mathrm{E}[U^{'}(C)|m=1]M(p) \\
&\quad +\lambda \left\{ [U(y-P-s) - U(y-P-s+b(s)-p)]f(s)\frac{\partial s}{\partial p} \right\}
\end{aligned} \tag{O.3}
$$

We can now substitute $\frac{\partial P}{\partial p}$ and $-\lambda f(s)\frac{\partial s}{\partial p}$ in equation (O.3) with the following terms:

$$
\begin{aligned}
\frac{\partial P}{\partial p} &= \frac{\partial M(p)}{\partial p} \times (\pi - p) - M(p) \\
-\lambda f(s)\frac{\partial s}{\partial p} &= \frac{\partial M(p)}{\partial p}
\end{aligned}
$$

After rearranging equation (O.3), we can derive the following expression:

$$
\begin{aligned}
\frac{\partial W}{\partial p} &= -\mathrm{E}[U^{'}(C)][\frac{\partial M(p)}{\partial p}(\pi - p) - M(p)] - E[U^{'}(C)|m=1]M(p) \\
&= -\mathrm{E}[U^{'}(C)][\frac{\partial M(p)}{\partial p}(\pi - p)] - \left\{ E[U^{'}(C)|m=1] - \mathrm{E}[U^{'}(C)] \right\} M(p)
\end{aligned} \tag{O.4}
$$

Finally, we convert the change in social welfare into a money metric by normalizing the increase in welfare by the welfare gain from increasing income by 1, which yields

$$
\begin{aligned}
\partial W/\partial y &= (1-\lambda)U^{'}(y-P) + \lambda \mathrm{E}[U^{'}(C)] \\
&= \mathrm{E}[U^{'}(C)]
\end{aligned} \tag{O.5}
$$

Then, we combine equations (O.4) and (O.5) and get the formula in equation O.1:

$$\frac{\partial W}{\partial p} / \frac{\partial W}{\partial y} = -\frac{\partial M(p)}{\partial p} \times (\pi - p) - I(p) \times M(p)$$