A Why Bundle Scan and Abortion?

The easiest way to show why a bundled service makes sense is to model the provider's problem first and then show that both provider and buyer will be better off if a bundled service is offered. Take a provider with with cost, c_a, of providing an abortion, and cost, c_s, of providing a scan. These costs include expenses for equipment, labor, and possibly a premium for getting caught and prosecuted. The provider can either charge separately for the two services, in which case he will charge p_s for the scan and p_a for the abortion, or he can charge p_b for the bundle.

The provider's profit if he offers the two services separately, π_{sep}, to n buyers, who conceive girls with the probability $p(g)$, will be

$$\pi_{sep} = n(p_s - c_s) + p(g)n(p_a - c_a). \tag{1}$$

The first part is profit from the customers who want a scan and the second part is the profit from the fraction of the original customers who conceived a girl. If the provider instead offered the same n buyers a bundle service the profit, π_{bun}, would be

$$\pi_{bun} = np_b - nc_s - p(g)nc_a, \tag{2}$$

since all customers pays p_b, all customers get a scan at cost c_s, and the fraction $p(g)$ who conceived a girl would receive an abortion at cost c_a. A profit maximizing provider then picks bundled pricing if $\pi_{bun} > \pi_{sep}$, or

$$p_b > p_s + p(g)p_a. \tag{3}$$

Assume that buyers are risk averse and that the only motivation for getting a prenatal sex determination test is to abort female fetuses and that parents will abort the fetus if the test show a female fetus (I will relax the last assumptions below). Furthermore, to ease exposition assume that buyers can only spend money on two things: consumption c and prenatal sex determinations/abortions.

For a buyer facing separate services the expected utility is then

$$U = (1 - p(g))U(c - p_s) + p(g)U(c - p_s - p_a), \tag{4}$$

where the first part is the utility if the fetus is a boy and the buyers therefore only spend on the scan, which happens with probability $1 - p(g)$, and the second part is the utility if the fetus is a female and they therefore also has to pay for the abortion, which happens with probability $p(g)$. For a buyer facing a bundled service the utility is simply

$$U = U(c - p_b). \tag{5}$$

If follows from the standard assumptions about utility functions and the risk aversion assumption that

$$U(c - p_s - p(g)p_a) > (1 - p(g))U(c - p_s) + p(g)U(c - p_s - p_a). \tag{6}$$

In other words risk averse buyers prefer a sure thing—where they pay upfront—over the gamble that they either have a boy and pay only for the scanning or have a girl and pay for both the scan and the abortion. In fact, risk aversion implies that they are willing to pay *more* than the expected cost. In other words,

$$U(c - p_s - p(g)p_a - \delta) = (1 - p(g))U(c - p_s) + p(g)U(c - p_s - p_a), \tag{7}$$

where δ is a positive number that depends on the degree of risk aversion (the more risk averse the larger δ is).

The provider realizes that buyers are risk averse and therefore offer a bundle where the price is in the range

$$p_b \in [p_s + p(g)p_a; p_s + p(g)p_a + \delta]. \tag{8}$$

Hence, the optimal pricing scheme for both provider and buyer is bundled pricing, where you pay a flat fee and get the pre-natal sex determination and an abortion if needed.

I implicitly assumed that the provider is risk-neutral. The same result hold, however, if the provider is risk-averse as long as there are enough potential clients. In that case, the law of large numbers will ensure that the risk-neutral and risk-averse choices are the same for the provider—essentially there is no gamble if you see enough clients, $p(g)$ of them will present with a female fetus and $1-p(g)$ with a male fetus. In fact, it is possible for the provider to be *more* risk averse than the buyers and still prefer the bundled pricing scheme.

Now imagine a situation where there there is some uncertainty about whether a buyer will go through with the abortion after the prenatal sex determination. This can be represented by the probability ρ that a buyer who had a prenatal sex determination test that showed a female fetus will go through with the abortion. If parents know that there is probability $1-\rho$ that they will not go through with the abortion their utility is

$$U = (1-p(g))U(c-p_s) + p(g)U(c-p_s-\rho p_a), \tag{9}$$

where I have made the assumption that they are equally happy with a boy or a girl if they are in the $1-\rho$ portion of the population that have a prenatal sex determination which show a female fetus but do not go through with the abortion (obviously this cannot be the case because if they were there would be no point in having the prenatal sex determination, but if I can show that the bundle price arise here it would trivially hold if there were some lower utility associated with having a girl than a boy).

Because the buyers are still risk averse they would continue to prefer the "sure" thing over the gamble

$$U(c-p_s-p(g)\rho p_a) > p(b)U(c-p_s) + p(g)U(c-p_s-\rho p_a). \tag{10}$$

The provider still offers a bundle, but the price is now in the range

$$p_b \in [p_s + p(g)\rho p_a; p_s + p(g)\rho p_a + \delta], \tag{11}$$

where δ still depends on the degree of risk aversion.

If parents on the other hand initially believe that they will always go through with the abortion if the fetus is female but still have probability $1-\rho$ that they will not, they would be back to the original comparison of the utility.

$$U(c-p_s-p(g)p_a) > p(b)U(c-p_s)+p(g)U(c-p_s-p_a). \tag{12}$$

All that would do is *increase* the profit for the provider because the law of large numbers would tell them exactly how many would not go through with the abortion. In other words, they would offer the original bundled price because the buyers did not know that they will change their mind

$$p_b \in [p_s+p(g)p_a; p_s+p(g)p_a+\delta], \tag{13}$$

but the provider will have profit of

$$p_b-c_s-\rho c_a, \tag{14}$$

which is strictly larger than the profit in either of the other cases. Also, they do not need to know which buyers are more or less likely to use abortion, just that some fraction will not use their purchased abortion.

B Simulation Results for 20 Periods

Table B.1: Fertility and Percent Boys by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 1.0$) Cost of prenatal Sex Determination (p_s)									
	12		16		20		24		200	
Cost of children	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]
					Son Preference ($\alpha = 0.5$)					
k = 12	7.46	50.4	7.46	50.1	7.47	50.0	7.47	50.0	7.47	50.0
k = 14	5.40	52.0	5.40	50.5	5.40	50.3	5.41	50.2	5.43	50.0
k = 16	4.10	51.5	4.10	51.5	4.10	51.4	4.13	51.1	4.19	49.9
k = 18	3.13	54.0	3.13	54.0	3.13	54.0	3.14	53.7	3.25	50.0
k = 20	2.26	61.0	2.38	57.9	2.50	55.1	2.50	55.1	2.50	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.5	2.00	50.0
					Son Preference ($\alpha = 0.55$)					
k = 12	7.15	53.3	7.27	51.2	7.29	50.4	7.30	50.1	7.31	50.0
k = 14	5.21	55.3	5.22	54.0	5.30	52.9	5.37	51.0	5.42	50.0
k = 16	4.10	59.1	4.10	58.7	4.10	56.8	4.10	52.6	4.19	49.9
k = 18	3.13	69.0	3.13	57.5	3.13	54.0	3.13	54.0	3.32	50.0
k = 20	2.25	61.2	2.25	61.2	2.25	61.2	2.25	61.1	2.50	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.5	2.00	50.0
					Son Preference ($\alpha = 0.6$)					
k = 12	7.07	61.7	7.10	57.2	7.14	54.3	7.24	52.0	7.34	50.0
k = 14	5.20	65.2	5.05	63.3	5.05	60.6	5.06	56.3	5.26	50.0
k = 16	4.06	75.0	4.06	71.5	4.06	63.3	4.06	60.3	4.16	49.9
k = 18	3.13	70.0	3.13	69.9	3.13	69.7	3.13	69.0	3.32	50.0
k = 20	2.98	70.7	2.81	68.9	2.25	61.2	2.25	61.2	2.63	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.5	2.25	49.9
					Son Preference ($\alpha = 0.65$)					
k = 12	7.23	72.0	7.12	67.9	7.10	63.2	7.09	59.2	7.34	50.0
k = 14	5.38	80.8	5.05	77.4	5.05	72.8	5.05	67.6	5.27	50.0
k = 16	4.06	76.1	4.06	75.9	4.06	75.4	4.06	73.2	4.17	49.9
k = 18	3.77	75.2	3.13	70.0	3.13	70.0	3.13	69.9	3.32	50.0
k = 20	2.75	72.7	2.75	72.7	2.74	72.6	2.71	72.4	2.38	50.0
k = 22	2.00	99.8	2.00	99.1	2.00	95.1	2.00	74.1	2.25	49.9

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Percent boys is the percent boys of all births.

Table B.2: Fertility and Percent Boys by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 0.95$) Cost of prenatal Sex Determination (p_s)									
	12		16		20		24		200	
Cost of children	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]
	Son Preference ($\alpha = 0.5$)									
k = 12	7.46	50.0	7.47	50.0	7.47	50.0	7.47	50.0	7.47	50.0
k = 14	5.40	50.3	5.41	50.3	5.42	50.1	5.42	50.0	5.43	50.0
k = 16	4.10	51.5	4.13	51.1	4.16	50.7	4.16	50.7	4.19	49.9
k = 18	3.13	54.0	3.14	53.7	3.25	51.9	3.25	51.9	3.25	50.0
k = 20	2.50	55.1	2.50	55.1	2.50	55.1	2.50	55.0	2.50	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.4	2.00	61.0	2.00	50.0
	Son Preference ($\alpha = 0.55$)									
k = 12	7.30	50.8	7.30	50.3	7.30	50.0	7.30	50.0	7.31	50.0
k = 14	5.24	53.8	5.40	51.7	5.40	50.4	5.40	50.2	5.42	50.0
k = 16	4.10	58.9	4.10	52.6	4.10	51.5	4.11	51.3	4.19	49.9
k = 18	3.13	54.0	3.13	54.0	3.13	54.0	3.13	53.9	3.32	50.0
k = 20	2.25	61.2	2.25	61.2	2.27	60.8	2.50	55.1	2.50	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.5	2.00	50.0
	Son Preference ($\alpha = 0.6$)									
k = 12	7.09	56.9	7.19	52.4	7.30	50.5	7.33	50.1	7.34	50.0
k = 14	5.05	63.7	5.05	56.4	5.10	53.6	5.21	51.0	5.26	50.0
k = 16	4.06	69.1	4.06	59.2	4.06	58.8	4.06	55.3	4.16	49.9
k = 18	3.13	70.0	3.13	69.7	3.13	64.9	3.13	56.0	3.32	50.0
k = 20	2.50	65.1	2.25	61.2	2.25	61.2	2.25	61.2	2.63	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.5	2.25	49.9
	Son Preference ($\alpha = 0.65$)									
k = 12	7.07	67.6	7.08	60.9	7.13	54.8	7.26	51.4	7.34	50.0
k = 14	5.05	78.3	5.05	67.8	5.05	62.7	5.06	56.7	5.27	50.0
k = 16	4.06	76.0	4.06	75.4	4.06	69.7	4.06	63.3	4.17	49.9
k = 18	3.13	70.1	3.13	70.0	3.13	69.9	3.13	69.7	3.32	50.0
k = 20	2.75	72.7	2.74	72.6	2.64	71.6	2.00	62.5	2.38	50.0
k = 22	2.00	99.1	2.00	71.8	2.00	62.5	2.00	62.5	2.25	49.9

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Percent boys is the percent boys of all births.

Table B.3: Fertility and Percent Boys by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 0.9$) Cost of prenatal Sex Determination (p_s)									
	12		16		20		24		200	
Cost of children	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]
	Son Preference ($\alpha = 0.5$)									
k = 12	7.47	50.0	7.47	50.0	7.47	50.0	7.47	50.0	7.47	50.0
k = 14	5.42	50.1	5.43	50.0	5.43	50.0	5.43	50.0	5.43	50.0
k = 16	4.16	50.7	4.19	50.1	4.19	49.9	4.19	49.9	4.19	49.9
k = 18	3.25	51.9	3.25	51.4	3.25	50.0	3.25	50.0	3.25	50.0
k = 20	2.50	55.1	2.50	50.0	2.50	50.0	2.50	50.0	2.50	50.0
k = 22	2.01	62.2	2.00	50.0	2.00	50.0	2.00	50.0	2.00	50.0
	Son Preference ($\alpha = 0.55$)									
k = 12	7.30	50.0	7.31	50.0	7.31	50.0	7.31	50.0	7.31	50.0
k = 14	5.40	50.3	5.41	50.1	5.42	50.0	5.42	50.0	5.42	50.0
k = 16	4.10	51.4	4.16	50.7	4.19	50.1	4.19	49.9	4.19	49.9
k = 18	3.13	54.0	3.25	51.9	3.26	51.9	3.32	50.0	3.32	50.0
k = 20	2.50	55.1	2.50	55.1	2.50	55.0	2.50	50.0	2.50	50.0
k = 22	2.00	62.5	2.00	62.5	2.24	55.4	2.00	50.0	2.00	50.0
	Son Preference ($\alpha = 0.6$)									
k = 12	7.30	50.5	7.33	50.0	7.34	50.0	7.34	50.0	7.34	50.0
k = 14	5.24	52.3	5.24	50.3	5.25	50.1	5.26	50.0	5.26	50.0
k = 16	4.06	58.8	4.07	51.5	4.13	50.7	4.16	50.1	4.16	49.9
k = 18	3.13	54.0	3.13	54.0	3.25	51.9	3.26	51.9	3.32	50.0
k = 20	2.25	61.2	2.25	61.1	2.50	55.1	2.50	55.0	2.63	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.4	2.25	49.9
	Son Preference ($\alpha = 0.65$)									
k = 12	7.12	53.6	7.31	50.3	7.33	50.0	7.34	50.0	7.34	50.0
k = 14	5.05	63.2	5.21	52.6	5.24	50.3	5.26	50.0	5.27	50.0
k = 16	4.06	61.5	4.06	59.0	4.07	51.5	4.13	50.7	4.17	49.9
k = 18	3.13	70.0	3.13	68.3	3.13	54.0	3.16	53.5	3.32	50.0
k = 20	2.43	69.2	2.00	62.5	2.00	62.5	2.25	55.6	2.38	50.0
k = 22	2.00	62.5	2.00	62.5	2.00	62.5	2.00	62.5	2.25	49.9

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Percent boys is the percent boys of all births.

Table B.4: Fertility and Percent Boys by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 0.85$) Cost of prenatal Sex Determination (p_s) 12		16		20		24		200	
Cost of children	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]	Avg Fertility	Percent Boys[a]
					Son Preference ($\alpha = 0.5$)					
k = 12	7.46	50.0	7.46	50.0	7.46	50.0	7.46	50.0	7.46	50.0
k = 14	5.42	50.1	5.42	50.0	5.42	50.0	5.42	50.0	5.42	50.0
k = 16	4.16	50.7	4.18	50.0	4.18	50.0	4.18	50.0	4.18	50.0
k = 18	3.25	51.9	3.25	50.1	3.25	50.1	3.25	50.1	3.25	50.1
k = 20	2.50	54.9	2.50	50.0	2.50	50.0	2.50	50.0	2.50	50.0
k = 22	2.19	54.3	2.00	50.0	2.00	50.0	2.00	50.0	2.00	50.0
					Son Preference ($\alpha = 0.55$)					
k = 12	7.30	50.0	7.30	50.0	7.30	50.0	7.30	50.0	7.30	50.0
k = 14	5.40	50.2	5.41	50.0	5.41	50.0	5.41	50.0	5.41	50.0
k = 16	4.15	50.7	4.16	50.6	4.18	50.0	4.18	50.0	4.18	50.0
k = 18	3.14	53.8	3.25	51.9	3.31	50.1	3.31	50.1	3.31	50.1
k = 20	2.50	55.0	2.50	54.9	2.50	52.5	2.50	50.0	2.50	50.0
k = 22	2.00	62.4	2.00	62.1	2.00	50.0	2.00	50.0	2.00	50.0
					Son Preference ($\alpha = 0.6$)					
k = 12	7.33	50.1	7.33	50.0	7.33	50.0	7.33	50.0	7.33	50.0
k = 14	5.23	51.3	5.25	50.2	5.25	50.0	5.25	50.0	5.25	50.0
k = 16	4.06	52.3	4.12	50.7	4.14	50.5	4.15	50.0	4.15	50.0
k = 18	3.12	54.0	3.13	53.9	3.25	51.9	3.31	50.1	3.31	50.1
k = 20	2.25	61.0	2.31	59.4	2.50	54.9	2.51	54.3	2.62	50.0
k = 22	2.00	62.4	2.00	62.4	2.00	62.3	2.12	58.0	2.25	50.0
					Son Preference ($\alpha = 0.65$)					
k = 12	7.30	50.7	7.33	50.0	7.33	50.0	7.33	50.0	7.33	50.0
k = 14	5.06	55.0	5.23	50.6	5.25	50.1	5.26	50.0	5.26	50.0
k = 16	4.06	58.9	4.06	55.2	4.10	51.1	4.16	50.2	4.17	50.0
k = 18	3.12	69.7	3.13	57.1	3.13	53.9	3.25	51.8	3.31	50.1
k = 20	2.00	62.4	2.00	62.4	2.01	62.1	2.25	55.4	2.37	50.0
k = 22	2.00	62.4	2.00	62.4	2.00	62.4	2.00	62.3	2.25	50.0

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Percent boys is the percent boys of all births.

Table B.5: Abortions and Change in Abortion Use by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 1.0$) Cost of Prenatal Sex Determination (p_s) 12			16			20			24		
Cost of children	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]
						Son Preference ($\alpha = 0.5$)						
k = 12	6.0	0.1	22.3	1.4	0.0	28.2	0.6	0.0	49.1	0.2	0.0	48.2
k = 14	21.6	0.2	12.3	5.6	0.1	23.2	3.2	0.0	4.8	3.0	0.0	15.0
k = 16	12.7	0.1	0.2	12.6	0.1	1.0	12.2	0.1	6.4	9.5	0.2	40.1
k = 18	25.3	0.3	0.1	25.3	0.3	0.5	25.1	0.3	1.8	23.7	0.3	12.0
k = 20	49.6	0.5	3.2	37.8	0.6	40.1	25.3	0.3	0.1	25.3	0.3	0.2
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.3	0.5	0.1	50.1	0.5	0.4
						Son Preference ($\alpha = 0.55$)						
k = 12	47.0	0.6	21.7	18.1	0.3	37.6	6.5	0.1	47.3	1.3	0.0	29.1
k = 14	56.5	0.9	36.7	41.9	0.5	7.6	31.2	0.5	34.0	10.8	0.1	25.1
k = 16	75.2	0.8	0.8	72.1	0.7	4.0	56.4	0.7	19.4	22.1	0.3	22.7
k = 18	119.3	1.2	4.1	47.3	0.5	11.9	25.3	0.3	0.1	25.3	0.3	0.3
k = 20	50.4	0.5	0.0	50.4	0.5	0.1	50.3	0.5	0.2	50.2	0.5	0.9
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0
						Son Preference ($\alpha = 0.6$)						
k = 12	165.3	2.1	22.6	102.2	1.4	27.9	61.3	0.9	32.2	29.3	0.5	40.6
k = 14	158.7	1.6	1.0	135.6	1.4	4.8	108.0	1.3	15.4	64.1	0.8	19.1
k = 16	204.5	2.1	3.2	175.9	1.9	10.7	109.5	1.3	15.8	84.6	0.9	8.6
k = 18	126.0	1.2	0.1	125.4	1.2	0.5	123.9	1.2	1.3	119.4	1.2	4.0
k = 20	123.9	1.2	0.0	107.0	1.1	0.0	50.4	0.5	0.0	50.4	0.5	0.1
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0
						Son Preference ($\alpha = 0.65$)						
k = 12	319.6	3.8	15.6	256.2	3.3	21.9	188.1	2.5	26.3	131.1	1.6	17.7
k = 14	331.2	3.4	1.5	277.3	2.9	5.4	230.2	2.6	10.7	179.1	2.0	13.1
k = 16	213.6	2.1	0.2	212.2	2.1	0.7	208.2	2.1	2.0	190.3	2.0	6.6
k = 18	191.3	1.9	0.0	126.0	1.2	0.1	125.9	1.2	0.2	125.4	1.2	0.5
k = 20	126.0	1.2	0.0	125.7	1.2	0.0	124.9	1.2	0.0	122.3	1.2	0.0
k = 22	200.3	2.0	0.3	197.2	2.0	1.5	181.2	1.9	7.3	97.1	1.0	6.1

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Average number of spells per woman where scan has been used at least once.
[b] Percent of spells where prenatal scan was initially used but birth is the result of pregnancy without prenatal scan.

Table B.6: Abortions and Change in Abortion Use by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 0.95$) Cost of Prenatal Sex Determination (p_s) 12			16			20			24		
Cost of children	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]
							Son Preference ($\alpha = 0.5$)					
k = 12	0.9	0.0	8.3	0.4	0.0	7.7	0.2	0.0	48.2	0.0	0.0	.
k = 14	3.3	0.0	0.8	3.2	0.0	7.2	1.6	0.0	7.4	0.8	0.0	50.3
k = 16	12.6	0.1	1.0	9.6	0.2	39.9	6.3	0.1	1.9	6.0	0.1	7.0
k = 18	25.3	0.3	0.3	23.7	0.3	11.8	12.6	0.1	0.5	12.2	0.1	3.5
k = 20	25.3	0.3	0.0	25.3	0.3	0.1	25.3	0.3	0.2	24.9	0.3	1.8
k = 22	50.4	0.5	0.0	50.3	0.5	0.1	49.9	0.5	0.9	44.0	0.5	12.6
							Son Preference ($\alpha = 0.55$)					
k = 12	12.3	0.2	21.2	4.3	0.1	42.6	0.6	0.0	49.1	0.2	0.0	48.2
k = 14	40.5	0.5	11.8	18.8	0.2	20.7	4.8	0.1	41.2	2.8	0.0	24.3
k = 16	73.7	0.7	2.4	22.2	0.3	22.4	12.6	0.1	1.8	11.0	0.1	22.4
k = 18	25.3	0.3	0.0	25.3	0.3	0.1	25.3	0.3	0.5	24.9	0.3	3.3
k = 20	50.4	0.5	0.0	50.3	0.5	0.2	48.8	0.5	6.1	25.3	0.3	0.1
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.3	0.5	0.1
							Son Preference ($\alpha = 0.6$)					
k = 12	98.2	1.3	23.7	34.6	0.5	32.0	8.0	0.1	39.3	1.3	0.0	29.1
k = 14	139.2	1.4	3.3	65.2	0.8	19.4	36.8	0.5	20.7	10.8	0.1	25.1
k = 16	156.3	1.9	17.6	75.2	0.8	0.8	72.1	0.7	4.1	43.4	0.6	32.5
k = 18	125.7	1.2	0.3	123.9	1.2	1.4	93.6	1.1	18.2	37.7	0.6	40.2
k = 20	75.5	0.7	0.0	50.4	0.5	0.0	50.4	0.5	0.1	50.3	0.5	0.3
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0
							Son Preference ($\alpha = 0.65$)					
k = 12	248.9	2.8	10.0	155.2	2.0	24.1	69.0	0.8	19.1	21.0	0.3	26.7
k = 14	285.7	3.0	4.5	180.6	2.2	18.4	129.1	1.4	7.6	68.2	0.8	12.8
k = 16	213.0	2.1	0.4	208.3	2.1	2.0	161.3	1.8	12.1	108.9	1.3	16.2
k = 18	126.0	1.2	0.0	126.0	1.2	0.1	125.4	1.2	0.5	123.9	1.2	1.3
k = 20	125.9	1.2	0.0	124.9	1.2	0.0	114.9	1.1	0.0	50.4	0.5	0.0
k = 22	197.1	2.0	1.6	87.6	1.1	22.2	50.4	0.5	0.0	50.4	0.5	0.0

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Average number of spells per woman where scan has been used at least once.
[b] Percent of spells where prenatal scan was initially used but birth is the result of pregnancy without prenatal scan.

Table B.7: Abortions and Change in Abortion Use by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 0.9$) Cost of Prenatal Sex Determination (p_s) 12			16			20			24		
Cost of children	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]
	Son Preference ($\alpha = 0.5$)											
k = 12	0.4	0.0	5.0	0.1	0.0	55.7	0.0	0.0	.	0.0	0.0	.
k = 14	3.2	0.0	4.0	1.6	0.0	3.7	0.0	0.0	.	0.0	0.0	.
k = 16	6.4	0.1	0.2	6.4	0.1	1.0	2.4	0.0	25.8	0.0	0.0	.
k = 18	19.1	0.3	40.4	12.7	0.1	0.3	11.8	0.1	6.4	0.0	0.0	.
k = 20	25.3	0.3	0.0	25.3	0.3	0.2	22.0	0.3	12.5	0.0	0.0	.
k = 22	50.4	0.5	0.1	49.5	0.5	1.6	0.0	0.0	.	0.0	0.0	.
	Son Preference ($\alpha = 0.55$)											
k = 12	4.4	0.1	41.3	0.4	0.0	7.7	0.0	0.0	.	0.0	0.0	.
k = 14	21.6	0.2	12.3	3.2	0.0	4.4	1.6	0.0	7.4	0.0	0.0	.
k = 16	12.7	0.1	0.2	12.3	0.1	6.2	6.4	0.1	1.0	5.2	0.1	28.9
k = 18	25.3	0.3	0.1	25.2	0.3	0.9	12.7	0.1	0.3	12.5	0.1	1.7
k = 20	50.3	0.5	0.2	25.3	0.3	0.0	25.3	0.3	0.1	25.1	0.3	0.8
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.3	0.5	0.1	49.5	0.5	1.6
	Son Preference ($\alpha = 0.6$)											
k = 12	33.0	0.4	22.5	4.8	0.1	47.7	0.4	0.0	13.6	0.0	0.0	.
k = 14	43.9	0.4	1.7	26.1	0.3	11.2	4.8	0.1	41.2	1.6	0.0	7.4
k = 16	75.6	0.8	0.4	69.2	0.7	7.0	12.6	0.1	1.8	6.4	0.1	1.0
k = 18	124.8	1.2	0.9	25.3	0.3	0.1	25.3	0.3	0.3	24.9	0.3	3.3
k = 20	50.4	0.5	0.0	50.4	0.5	0.1	50.3	0.5	0.4	37.7	0.6	40.1
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.1
	Son Preference ($\alpha = 0.65$)											
k = 12	139.8	1.5	7.8	44.0	0.5	19.3	5.4	0.1	36.8	0.2	0.0	48.2
k = 14	144.2	1.4	0.7	120.3	1.3	11.4	39.1	0.5	14.0	5.9	0.1	14.2
k = 16	210.7	2.1	1.2	116.1	1.3	11.2	73.7	0.7	2.2	24.5	0.3	6.7
k = 18	126.0	1.2	0.0	125.7	1.2	0.3	119.4	1.2	4.0	44.1	0.6	22.6
k = 20	125.4	1.2	0.0	75.5	0.7	0.0	50.4	0.5	0.0	50.4	0.5	0.1
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Average number of spells per woman where scan has been used at least once.
[b] Percent of spells where prenatal scan was initially used but birth is the result of pregnancy without prenatal scan.

Table B.8: Abortions and Change in Abortion Use by Cost of Children and prenatal Sex Determination

	Discount rate ($d = 0.85$) Cost of Prenatal Sex Determination (p_s) 12			16			20			24		
Cost of children	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]	Abortions per 100 Women	Average Spells w. Scan[a]	Percent Change[b]
Son Preference ($\alpha = 0.5$)												
k = 12	0.2	0.0	16.0	0.0	0.0	.	0.0	0.0	.	0.0	0.0	.
k = 14	1.7	0.0	2.1	0.0	0.0	.	0.0	0.0	.	0.0	0.0	.
k = 16	6.4	0.1	0.7	1.6	0.0	51.2	0.0	0.0	.	0.0	0.0	.
k = 18	12.7	0.1	0.2	9.4	0.1	24.8	0.0	0.0	.	0.0	0.0	.
k = 20	25.3	0.3	0.1	0.0	0.0	.	0.0	0.0	.	0.0	0.0	.
k = 22	49.3	0.5	3.2	0.0	0.0	.	0.0	0.0	.	0.0	0.0	.
Son Preference ($\alpha = 0.55$)												
k = 12	0.4	0.0	5.8	0.0	0.0	.	0.0	0.0	.	0.0	0.0	.
k = 14	3.3	0.0	2.0	1.6	0.0	3.7	0.0	0.0	.	0.0	0.0	.
k = 16	12.3	0.1	6.2	6.4	0.1	1.3	1.6	0.0	51.2	0.0	0.0	.
k = 18	25.3	0.3	0.5	12.7	0.1	0.2	12.2	0.1	3.5	0.0	0.0	.
k = 20	25.3	0.3	0.0	25.3	0.3	0.1	24.9	0.3	1.8	0.0	0.0	.
k = 22	50.4	0.5	0.0	50.3	0.5	0.1	24.4	0.2	0.0	0.0	0.0	.
Son Preference ($\alpha = 0.6$)												
k = 12	7.0	0.1	13.3	0.4	0.0	13.6	0.0	0.0	.	0.0	0.0	.
k = 14	24.8	0.3	2.3	3.2	0.0	4.0	1.5	0.0	13.2	0.0	0.0	.
k = 16	72.0	0.7	4.3	12.5	0.1	3.5	6.3	0.1	2.4	1.6	0.0	51.2
k = 18	25.3	0.3	0.0	25.3	0.3	0.3	12.7	0.1	0.2	12.2	0.1	3.5
k = 20	50.4	0.5	0.0	50.2	0.5	0.9	25.3	0.3	0.1	25.2	0.3	0.5
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	49.8	0.5	1.8
Son Preference ($\alpha = 0.65$)												
k = 12	52.3	0.6	14.5	4.4	0.1	41.3	0.1	0.0	55.7	0.0	0.0	.
k = 14	134.3	1.4	7.0	27.3	0.3	6.2	3.1	0.0	14.2	0.8	0.0	50.3
k = 16	94.6	1.1	12.0	73.8	0.7	2.2	12.6	0.1	1.8	6.2	0.1	4.3
k = 18	126.0	1.2	0.1	114.7	1.2	6.8	25.3	0.3	0.2	22.2	0.3	22.4
k = 20	94.4	0.9	0.0	50.4	0.5	0.0	50.4	0.5	0.1	25.3	0.3	0.1
k = 22	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0	50.4	0.5	0.0

Note. Simulations based on 50,000 individuals, 20 periods, $I = 200$, and a probability of a son of 0.5.
[a] Average number of spells per woman where scan has been used at least once.
[b] Percent of spells where prenatal scan was initially used but birth is the result of pregnancy without prenatal scan.

C Recall Error and the Sex Ratio

Since the proposed method relies both on spacing between births and birth outcomes, the quality of the results depends on the reliability of the birth histories provided by the respondents. An important concern here is child mortality. A respondent may not provide information about deceased children because of the painful nature of the topic. Furthermore, the likelihood of reporting a deceased child may depend on sex of the child. Systematic recall error, where children of a specific sex are missed non-randomly, is especially problematic because it directly biases the sex ratios results.

NFHS enumerators probe for any missed births, although the method depends on the survey.[1] Probing catches many originally missed births but systematic recall error based on son preference may still be a problem. First, strong son preference lead to significantly higher mortality for girls than boys. Secondly, for children who died son preference makes it more likely that parents will remember boys than girls. Finally, in the absence of sex selective abortions, son preference lead parents to have the next birth sooner if the last child was a girl than if it was a boy. If this girl subsequently dies she is more likely to be missed because probing for missed births is only done for long intervals.[2]

To assess the extent of systematic recall error Table C.1 shows sex ratios of children recorded as first-born and second-born by year of birth together with tests for whether the observed sex ratio is significantly higher than the natural sex ratio. Births are combined into five-year cohorts to achieve sufficient power for a test of differences in sex ratios. Prenatal sex determination techniques did not become widely available until the mid-1980s and any significant deviation from the natural sex ratio before that time is therefore likely the result of recall error. Furthermore, births and deaths

[1] NFHS-1 probe for each calendar birth interval that is 4 or more years. NFHS-2 asked for stillbirths, spontaneous and induced abortions and also probed for each calendar birth interval 4 or more years. NFHS-3 did not directly use birth intervals, but asked whether were there any other live births between (name of previous birth) and (name), including any children who died after birth. It did ask for births before the birth listed as first birth.

[2] As an example, imagine a family whose first child is a girl. Because of son preference this girl is followed quickly by another child. If this child is also a girl the parents will quickly try for a third child. This can lead to three children in three years and if the middle child dies and is not listed the enumerators will not probe for missing births because the interval between the first and last child is only two years.

that took place longer ago may be more likely to be subject to recall error than more recent events. The three NFHS surveys make it possible to examine whether recall error increases with time by comparing sex ratios for births that took place during the same years but were surveyed at different times. Table C.1 therefore also shows tests for whether more recent surveys have a higher sex ratio for the cohort than older surveys.

The “first-born” sex ratios illustrate the systematic recall error problem well. According to the birth histories in NFHS-1 almost 55 percent of children born between 1960 and 1964 were boys. Given that this is more than two decades before sex selection techniques became available in India the most likely explanation for the skewed sex ratio is that some children listed as first-borns were not, in fact, the first children born in their families. Instead, for a substantial proportion of families the first-born was a girl who died and was skipped when enumerators asked about birth history.

As expected, the difference between the observed sex ratio and the natural sex ratio is less pronounced the closer to the survey date the cohort is. The observed sex ratio for children born just prior to the NFHS-1 survey and listed as first-born is 0.517, which is not statistically significant different from the natural sex ratio. The same general pattern holds for NFHS-2 and NFHS-3, with cohorts further away from the survey date more likely to have a sex ratio skewed male.

Second births show a pattern very similar to that for first births. An interesting difference is that there is evidence of a U-shaped relationship between time and sex ratio for second births. Cohorts furthest away from the survey year show the highest sex ratios, but declines to the natural sex ratio in the mid-1980s, and the sex ratio is then significantly higher again for more recent births. This is in line with the results in the paper that show that sex selective abortions take place on lower parity births as desired fertility declined.

Finally, across surveys the same cohort tends to show a higher sex ratio the more recent the survey (births in the cohort took place longer ago), especially for second-borns.[3] Despite this, few cohorts show significantly different sex ratios across surveys, most likely because of a lack of power.

[3] Births in the 1970-1974 cohort, for example, took place between 18 and 23 years ago for NFHS-1, between 24 and 29 years ago for NFHS-2, and between 31 and 36 years ago for NFHS-3.

Table C.1: Observed sex ratios by year of birth in five-year cohorts

	Listed as first-born				Listed as second-born			
	NFHS-1 1992-1993	NFHS-2 1998-1999	NFHS-3 2005-2006	Diff. test[a]	NFHS-1 1992-1993	NFHS-2 1998-1999	NFHS-3 2005-2006	Diff. test[a]
1960–1964	0.5473***	.	.		0.5172	.	.	
	(0.0004)	(.)	(.)		(0.4382)	(.)	(.)	
	[2,673]	[.]	[.]		[1,189]	[.]	[.]	
1965–1969	0.5274**	0.5538***	.	A	0.5327**	0.5244	.	
	(0.0306)	(0.0002)	(.)		(0.0124)	(0.3310)	(.)	
	[5,429]	[1,997]	[.]		[3,888]	[595]	[.]	
1970–1974	0.5354***	0.5341***	0.5411		0.5212	0.5313**	0.6160**	BC
	(0.0001)	(0.0019)	(0.1208)		(0.1497)	(0.0248)	(0.0143)	
	[7,763]	[5,546]	[523]		[6,249]	[3,499]	[125]	
1975–1979	0.5207	0.5151	0.5255*		0.5185	0.5262**	0.5384**	B
	(0.1258)	(0.4669)	(0.0920)		(0.2477)	(0.0340)	(0.0225)	
	[8,749]	[7,478]	[3,762]		[7,819]	[6,220]	[1,811]	
1980–1984	0.5210*	0.5244**	0.5280***		0.5236**	0.5236**	0.5249*	
	(0.0872)	(0.0273)	(0.0094)		(0.0361)	(0.0492)	(0.0628)	
	[11,147]	[9,709]	[7,718]		[9,950]	[8,478]	[5,532]	
1985–1989	0.5187	0.5132	0.5118		0.5157	0.5194	0.5165	
	(0.1916)	(0.6153)	(0.7091)		(0.4099)	(0.1695)	(0.3716)	
	[11,276]	[11,048]	[9,422]		[10,296]	[9,857]	[8,022]	
1990–1994	0.5174	0.5185	0.5183		0.5120	0.5166	0.5289***	BC
	(0.3263)	(0.2006)	(0.2207)		(0.6570)	(0.3430)	(0.0030)	
	[6,544]	[11,653]	[10,601]		[5,869]	[10,653]	[9,299]	
1995–1999	.	0.5222*	0.4980		.	0.5230*	0.5262**	
	(.)	(0.0788)	(0.9998)		(.)	(0.0664)	(0.0103)	
	[.]	[8,642]	[11,111]		[.]	[7,990]	[9,956]	
2000–2006	.	.	0.5135		.	.	0.5292***	
	(.)	(.)	(0.5978)		(.)	(.)	(0.0008)	
	[.]	[.]	[13,413]		[.]	[.]	[11,645]	

Note. Sample consists of Hindu women only. First number in cell is ratio of boys to girls. Second number in parentheses is p-value for the hypothesis that observed sex ratio is greater than 105/205 using a binomial probability test (bitest in Stata 13) with asterisks indicating significance as follows: * sign. at 10%; ** sign. at 5%; *** sign. at 1%. Third number in square brackets is number of observations.

[a] Test (prtest in Stata 13) whether recall error increases with time passed, which would manifest itself in a higher sex ratio for a more recent survey than an earlier for the same cohort. A: Cohort sex ratio significantly larger in NFHS-2 than NFHS-1 at the 10 percent level. B: Cohort sex ratio significantly larger in NFHS-3 than NFHS-1 at the 10 percent level. C: Cohort sex ratio significantly larger in NFHS-3 than NFHS-2 at the 10 percent level.

Using year of birth to analyze recall error is problematic because year of birth for a given parity is affected by recall error; for example, a second born child listed as first born will naturally be born later than the real first born child. Recorded year of marriage should, however, be affected neither by parental recall error nor use of sex selective abortions. Table C.2 therefore shows sex ratios of children recorded as first-born and second-born by year of parents' marriage, together with tests for whether the observed sex ratio is significantly higher than the natural sex ratio and whether more recent surveys show a higher sex ratio for the cohort than older surveys.

The basic recall error pattern remains with women married longer ago more likely to report that their first-born is a boy. If anything the pattern is more consistent when using year of marriage than year of birth. Before the introduction of sex selection there are only two instances across the two parities where the observed sex ratio is lower for women married longer ago than for women married closer to the survey date.[4] Similarly, comparing women married in the same five-year period across surveys shows that women married longer ago are more likely to report having a son.

The relationship between length of marriage and recall error can also seen in Figure C.1, which shows the observed sex ratio for children reported as first born as a function of duration of marriage at the time of the survey combining all three surveys. The solid line is the sex ratio of children reported as first born by the number of years between the survey and marriage, the dashed lines indicate the 95 percent confidence interval and the horizontal line the natural sex ratio (approximately 0.512). To ensure sufficient cell sizes the years are grouped in twos. In line with the results from Table C.2, the observed ratio of boys is increasingly above the expected value the longer ago the parents were married.[5]

The increasingly unequal sex ratio with increasing marriage duration suggests that a solution to the recall error problem is to drop observations for women who were married "too far" from the survey year. The main problem is establishing what the best cut-off point should be. As Table C.2 shows there are differences in recall error across the three surveys and between parities. One possibility is simply to drop all women married in cohorts where the observed sex ratio is substantially higher than the natural sex ratio, but even this is not straightforward. For "first" born

[4] For first-borns it is between 1970–1974 and 1975-1979 for NFHS-3 and for second-borns it is between 1975–1979 and 1980–1984 for NFHS-1.

[5] The graph for second births shows a similar pattern with the likelihood of the second child being a boy going up with increasing marriage duration. The graphs for the second births and the individual survey rounds are available upon request.

Table C.2: Observed sex ratios by year of parents' marriage in five-year cohorts

	Listed as first-born				Listed as second-born			
	NFHS-1 1992-1993	NFHS-2 1998-1999	NFHS-3 2005-2006	Diff. test[a]	NFHS-1 1992-1993	NFHS-2 1998-1999	NFHS-3 2005-2006	Diff. test[a]
1960–1964	0.5368***	.	.		0.5274**	.	.	
	(0.0002)	(.)	(.)		(0.0239)	(.)	(.)	
	[6,200]	[.]	[.]		[6,001]	[.]	[.]	
1965–1969	0.5333***	0.5450***	.		0.5277**	0.5401***	.	
	(0.0011)	(0.0000)	(.)		(0.0181)	(0.0005)	(.)	
	[6,707]	[4,268]	[.]		[6,449]	[4,142]	[.]	
1970–1974	0.5244**	0.5222	0.5271		0.5182	0.5235*	0.5384**	B
	(0.0386)	(0.1120)	(0.1372)		(0.2651)	(0.0805)	(0.0194)	
	[8,154]	[6,546]	[1,973]		[7,843]	[6,308]	[1,913]	
1975–1979	0.5272***	0.5202	0.5316***	C	0.5157	0.5183	0.5278**	B
	(0.0062)	(0.1477)	(0.0050)		(0.4208)	(0.2499)	(0.0242)	
	[9,829]	[8,644]	[5,798]		[9,295]	[8,294]	[5,608]	
1980–1984	0.5151	0.5142	0.5195		0.5198	0.5171	0.5187	
	(0.4616)	(0.5322)	(0.1877)		(0.1514)	(0.3178)	(0.2332)	
	[10,814]	[9,924]	[8,316]		[9,788]	[9,409]	[7,906]	
1985–1989	0.5176	0.5209*	0.5095		0.5131	0.5194	0.5267**	B
	(0.2753)	(0.0925)	(0.8425)		(0.5918)	(0.1651)	(0.0105)	
	[9,971]	[10,990]	[9,717]		[5,790]	[10,130]	[9,077]	
1990–1994	0.5180	0.5182	0.5125		0.4366	0.5191	0.5251**	AB
	(0.3836)	(0.2282)	(0.6692)		(0.9740)	(0.2097)	(0.0199)	
	[2,170]	[10,619]	[10,574]		[142]	[7,994]	[9,600]	
1995–1999	.	0.5243*	0.5017		.	0.5613***	0.5312***	
	(.)	(0.0845)	(0.9965)		(.)	(0.0015)	(0.0009)	
	[.]	[5,081]	[10,960]		[.]	[1,019]	[8,969]	
2000–2006	.	.	0.5169		.	.	0.5247	
	(.)	(.)	(0.3280)		(.)	(.)	(0.1243)	
	[.]	[.]	[9,210]		[.]	[.]	[3,316]	

Note. Sample consists of Hindu women only. First number in cell is ratio of boys to girls. Second number in parentheses is p-value for the hypothesis that observed sex ratio is greater than 105/205 using a binomial probability test (bitest in Stata 13) with asterisks indicating significance as follows: * sign. at 10%; ** sign. at 5%; *** sign. at 1%. Third number in square brackets is number of observations.

[a] Test (prtest in Stata 13) whether recall error increases with time passed, which would manifest itself in a higher sex ratio for a more recent survey than an earlier for the same cohort. A: Cohort sex ratio significantly larger in NFHS-2 than NFHS-1 at the 10 percent level. B: Cohort sex ratio significantly larger in NFHS-3 than NFHS-1 at the 10 percent level. C: Cohort sex ratio significantly larger in NFHS-3 than NFHS-2 at the 10 percent level.

this would imply dropping all women married before 1980, but for "second" born it would be imply dropping all married before 1970 for NFHS-1, before 1975 for NFHS-2, and before 1980 NFHS-3. Because of the differences between "first" and "second" born in the different surveys I

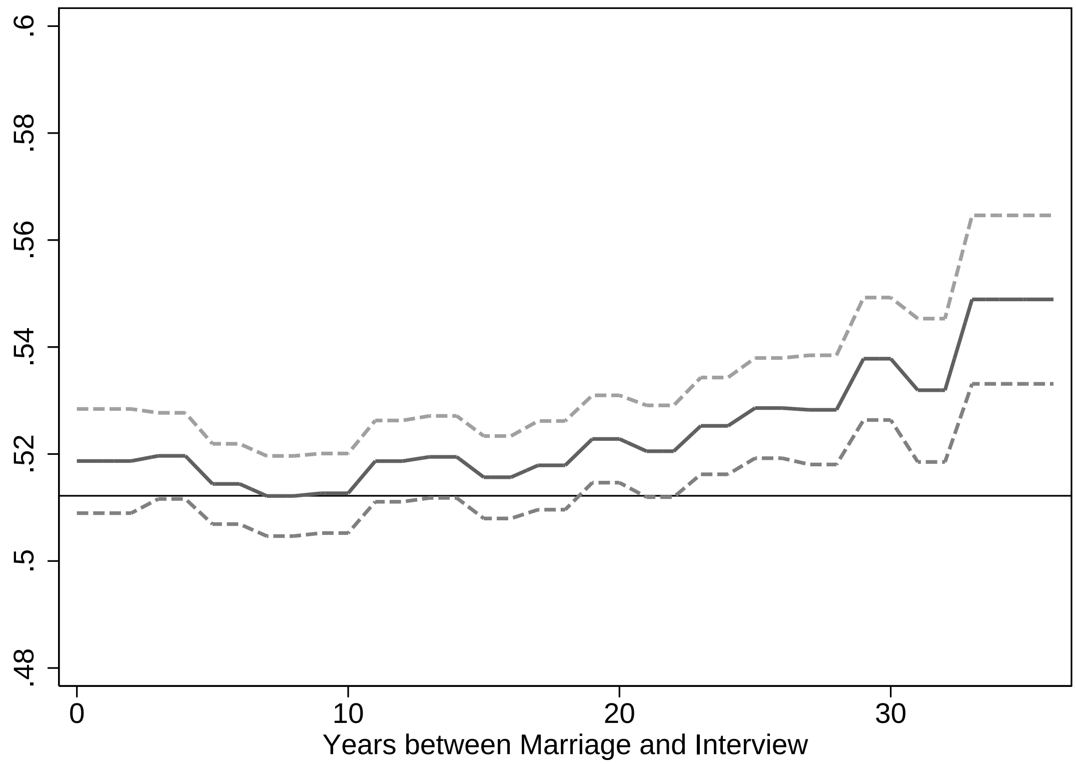


Figure C.1: Sex ratio of "first" births by duration of marriage

vary the cut-off point by survey round.

NFHS-3 is the most straightforward in that the implied cut-off point is the same for both first and second born. Based on Table C.2, women in NFHS-3 who were married 26 years or more before the survey date are dropped. For NFHS-1 and NFHS-2 the trade-off is between ensuring enough information and not bias the results unduly. Given that sex selective abortions are more likely in higher parity birth I base the cut-off point on the second births instead of the first births. Hence, for NFHS-1 women who were married 22 years or more before the survey date were dropped and for NFHS-2 women who were married 23 year or more before the survey date were dropped. The final sample consists of 146,096 women, with 332,951 parity one through four births.

C.1 Sensitivity of Results to Recall Error

The last three sections in this Appendix show results for the three education groups for three samples: the preferred sample used in the paper (Figures H.1 through H.21), a more restricted sample where only women married less than 19 years are included (Figures I.1 through I.15), and the sample of women dropped because of potential recall error bias, i.e. all women dropped from the data to reach the preferred sample (Figures J.1 through J.15). For the "dropped" sample it is only possible to estimate sex ratios for the period before sex-selective abortions became available. The period covered is different from the other two samples because the births for the sample takes place over a much longer period; the sample covers spells that begin between 1950 and 1984.

The different results for women with no education illustrates the potential problems with recall error. Figures H.1, I.1, and J.1 show the different results for women with no education across the three samples. The preferred and the restricted samples show almost identical results with the main difference that the restricted sample has wider confidence intervals because of the smaller sample size. The results from the dropped sample, on the other hand, show sex ratios that are statistically significantly above the natural sex ratio in many periods, which is consistent with recall error. Furthermore, the survival curves are substantially closer to being linear indicating that observed births took place further away from the time of marriage as expected if the couple had a girl first but counted a subsequent son as their first-born.

The second spell results demonstrate the trade-off inherent in dealing with recall error. While the results for women with no education are similar across the preferred and the restricted samples in rural areas (Figures H.5 and I.5), the results for urban women with no education in the restricted sample are much less stable and have substantially wider confidence intervals than the preferred sample (Figures H.4 and I.4). This happens because the restricted sample is down to less than 900 urban women, compared to close to 1,600 urban women in the preferred sample.

An interesting difference to this pattern is for the third spell for women with 8 or more years of education. This group shows no evidence on an unequal sex ratio for the "dropped" sample in either urban or rural areas (Figures J.14 and J.15). However, for the preferred sample there are consistently more boys than girls for urban women when the first two children are either two girls or one girl and one boy (Figure H.14). Furthermore, the sex ratios become even more unequal when restricting the sample to women married less than 19 years (Figure I.14), although the sample sizes also become substantially smaller. This is because spell periods are based on the starting year of the spell. Hence, some of the pregnancies in the 1972–1984 period will have been exposed to the availability of prenatal sex determination. For Figure H.14(a) 25 percent of observed births occur in 1986 or after, meaning that conception took place in the 1985–1994 period, while for Figure H.14(d) the number is 29 percent. Hence, it is possible that the unequal sex ratios observed are, indeed, evidence of sex-selective abortions.

D Potential for Reverse Causation in Education?

The data provides no direct way to tell whether a mother is currently in school or have returned to school. The questions in the survey simply ask whether the respondent has ever attended school, and if yes, what the highest level (standard) completed is. My best estimate of the age somebody left school is therefore their years of schooling completed plus 6 years for school starting age. Based on this, more than 75 percent exit school at age 16 or before, while 96 percent have stopped school by age 21.

It is possible to get a sense of whether women might return to school after giving birth using this information. To find the year when a woman would have completed school I take her birth year and add the estimated age at school completion. If the year the woman is estimated to have completed school is equal to or greater than the year of the first birth it is conceivable that the woman may have returned to school after giving birth. This ignores the possibility of grade repetitions, but if somebody needs to repeat grades it is unlikely that they will go on to secondary or higher education. Out of 146,096 women in the main sample only 2,615, or less than 2 percent, fall into this category. Furthermore, only 322 are possibly in school at the time of the second school. Among women who appear to return to school after their first child the sex ratio of their first birth is skewed somewhat more male than normal (54 percent boys), so their return may, indeed, be tied to the sex of their first child.

The estimates are conservative in the sense that it is possible to finish school first and then have the child later in the year. Using if the estimated end of schooling comes *after* the year the child is born the numbers fall to 1,234, or less than 1 percent, for the first birth and 162 for the second birth.

How much of a problem is this then? It is, indeed, possible that some women return to school after their first child, but it appears to be relatively uncommon. Furthermore, almost nobody are in school after their second child. Since there is little evidence of sex-selective abortions among first-born children the possibility of return to school should not affect the estimates.

Furthermore, I use 8 years of education as the cut-off point and hence only women who had their first child before age 14 would potentially be misclassified in terms of education group for their first birth. There are only 56 women who end up with 8 or more years of education but had their first birth at age 12 or 13. None are possibly misclassified for second birth or above, which is where sex-selective abortions become important. The upshot is that while it is possible that there might be some reverse causation of education and sex of children this should not affect the estimates.

E Sex Ratios at First Birth

I present a separate analysis of first spell births for three reasons. First, previous research claims that the largest number of missing girls is for first order births (Jha, Kumar, Vasa, Dhingra, Thiruchelvam and Moineddin, 2006). Secondly, there are substantially more first births than subsequent births, allowing for a precise estimation of the "natural" percentage boys born in India if there are no sex selection. Finally, the results provide an indication of whether first spell length is a good indicator for fecundity.

Figures H.1, H.2, and H.3 show the predicted percentage boys born by quarter from marriage to first birth and the associated survival functions for the lowest, middle, and highest education groups for representative women. For the first spell the representative woman is 16 years old at the beginning of the spell for the no education group, 17 years old for the middle education group, and 20 years old for the high education group. Each column represents a time period with the top panel showing urban results and the bottom panel rural results. The graphs also show the expected natural rate of boys, approximately 51.2 percent.[6]

The most interesting result is how close to the natural sex ratio the predicted percentage boys is for each group and for each period. As Figure H.1(d) shows, for rural women without education before 1985, who also represent the biggest group, the predicted sex ratios align almost perfectly with the expected sex ratio. For the other groups there is more volatility in the predicted percentage boys, but nowhere is it statistically significantly larger than 51.2 percent.[7] Furthermore, for quarters with more substantial deviations from the natural sex ratio, the predictions are generally based on few births. In other words, it appears that the probability of having a boy is exactly the same in India as it is in other places.

[6] For comparison, if 55 percent of children born in a given quarter were boys, approximately 14 percent of the female fetuses were aborted. Assume 105 boys per 100 girls born, the expected natural sex ratio. With b boys, $b\frac{100}{105}$ girls should be born. If g girls are observed the number of abortions is therefore $b\frac{100}{105} - g$ and the percent aborted female fetuses is $\frac{b\frac{100}{105}-g}{b\frac{100}{105}} \times 100$. With 55 percent boys we get $\frac{55\frac{100}{105}-45}{55\frac{100}{105}} \times 100 = 14.09$. The corresponding numbers for 60 percent and 65 percent boys are approximately 30 percent and 43 percent of the female fetuses aborted.

[7] The urban no education group for the 1972–1984 period show two quarters where the predicted percentage boys is just statistically significantly higher than 51.2 percent, but this is likely due to recall error not perfectly caught by the method above and the periods around those two quarters are below the natural percentage boys.

For the group most likely to use sex selection, highly educated, urban women in the 1995–2006 period, the predicted percentage boys is also almost perfectly aligned with the expected percentage boys, as shown in Figure H.3(c). Hence, there is no evidence that Hindus in India use sex selection on first births. This cast serious doubts on the data used by Jha et al. (2006) and their results, as also discussed by George (2006) and Bhat (2006).

For all education groups and for all periods more than ninety percent of women had their first child within 21 quarters of being married and the proportion is increasing in education. Furthermore, 70 to 85 percent of women will had their first child within ten quarters (2.5 years) of their marriage and the average time between marriage and first birth has become shorter over time. The most likely explanation for the reductions in duration and the increase in the number of women who have their first child before 21 quarters is improvements in health status. This is also consistent with the differences between education groups where more educated women are healthier and therefore more likely to conceive. There are two implications of this. First, it reinforces the need for estimating the models separately for different education levels. Secondly, it confirms that the first spell length can serve as a suitable proxy for fecundity and that Hindu women in India have their first birth very soon after marriage, even among highly educated, urban women.

F Comparing the Hazard and Simple Models

As detailed in the main paper, one of the main advantages of the hazard model approach is that it can be used to predict what completed fertility, number of abortions, and sex ratios will be once women are done with childbearing. This cannot be done with the simple model because it does not predict fertility progression, does not take into account censoring, and cannot capture if parents change their use of sex selection within a spell. We can, however, still compare differences in predicted sex ratios for *individual* parities.[8]

For each parity, the simple model is

$$Y_i = \gamma + \alpha' \mathbf{Z_i} + \beta' \mathbf{X}_i + \varepsilon_i, \tag{15}$$

where Y is a dummy variable that takes the value 1 if the child born is a boy and zero if it is a girl, and the vectors of explanatory variables, $\mathbf{Z}_i$ and $\mathbf{X}_i$, are the same as for the proposed method, except that $\mathbf{Z}_i$ obviously does not include the baseline hazard and that there are no time dependence.[9] I estimate this using a logit model, although a linear probability model leads to similar results. This model is estimated on all observed births for a given parity in the relevant period to ensure that the results are as close to the standard method of examining sex selection (see, for example, Retherford and Roy, 2003; Jha et al., 2006; Abrevaya, 2009).

I focus on those cases where there is evidence of sex-selective abortions: the spells from parity one to two and two to three for women with eight or more years of education.[10] Table F.1 shows the number of women who enter the second and third spells for the hazard model, the number of births, observed in the case of the simple model and predicted in the case of the hazard model, predicted percent boys, and the associated predicted sex ratio. It is possible for the number of births used for the simple model to be larger than the hazard models' predicted number of births

[8] The simple model uses only observed births and the predicted sex ratio is therefore simply what we observe for the relevant uncensored sample.

[9] To ease presentation, the indicator for parity number is not shown.

[10] The results for the spell from parity three to four are available on request. They are not presented because the number of educated women who end up with three births and the probability of having a fourth birth are small, which makes comparing the simple and hazard models with any precision difficult.

Table F.1: Comparison of Hazard and Simple Models for Women with 8 or More Years of Education

	Urban		Rural	
	Simple	Hazard	Simple	Hazard
	1985–1994 - Second Birth			
	1 girl			
Number of women[a]		4,869		3,105
Births[b]	3,848	3,926	2,417	2,795
Percentage boys	54.0	54.7	52.6	53.5
Sex ratio (boys per 100 girls)	117.4	120.7	110.9	115.1
	1985–1994 - Third Birth			
	2 girls			
Number of women[a]		1,654		982
Births[c]	1,034	1,092	682	853
Percentage boys	60.8	63.7	54.7	57.4
Sex ratio (boys per 100 girls)	155.3	175.3	120.7	134.6
	1995–2006 - Second Birth			
	1 girl			
Number of women[a]		3,774		2,823
Births[b]	3,031	2,704	2,489	2,407
Percentage boys	58.0	58.6	56.0	56.9
Sex ratio (boys per 100 girls)	138.1	141.3	127.1	132.2
	1995–2006 - Third Birth			
	2 girls			
Number of women[a]		1,000		863
Births[c]	695	600	690	661
Percentage boys	65.5	62.4	62.0	61.7
Sex ratio (boys per 100 girls)	189.6	166.0	163.4	161.0

Note. The simple models are estimated using logit on all births for a given parity that occurred during the relevant time period. The hazard models are estimated using all spells that began in the relevant time period. For the second birth the hazard model covers the period from beginning of spell to 6 years (24 quarters) after the birth of the first child. For the third birth it covers the period from beginning of spell to 7.25 years (29 quarters) after the birth of the second child for the period 1985–1994 and from beginning of spell to 5.75 years (23 quarters) after the birth of the second child for the period 1995–2006.
[a] Number of women in period who began the spell with given sex composition of prior child/children in the relevant period.
[b] For Logit model the number of women who are observed to have a second birth in the period. For hazard model the predicted number of second births that will occur between beginning of the spell and 6 years (24 quarters) after the birth of the first child.
[c] For Logit model the number of women who are observed to have a third birth in the period. For hazard model the predicted number of third births that will occur between beginning of the spell and 7.25 years (29 quarters) after the birth of the second child for the 1985–1994 period and between beginning of the spell and 5.75 years (23 quarters) after the birth of the second child for the 1995–2006 period.

because the simple model is based on all births that occurred in the period—independently of when the prior birth occurred—whereas the hazard model uses only spells that began in the period.

For the 1985–1994 period—which is when sex selection become available—the hazard model consistently predicts a higher sex ratio than the logit model. Furthermore, some of these differences are substantial. For urban women with 2 girls as their first two children, the hazard model predicts a sex ratio of 175 boys per 100 girls, whereas the simple method “only” predicts 155 boys per 100 girls. The difference is smaller in rural areas but still 14 boys per 100 girls higher for the hazard model than for the simple model. A similar, if less pronounced pattern, show up for the second birth, where the hazard model predict 3 and 5 boys more per 100 girls for urban and rural women.

For the latest period, 1995–2006, the hazard model still produces higher predicted sex ratios for second birth and the differences are of a similar magnitude to the 1985–1994 period. The predicted sex ratios for the third birth are, however, higher for the simple model than for the hazard model. This difference is substantially for urban women where the difference is 23 boys extra per 100 girls.

A possible explanation for these differences is that the simple model fails to capture the move towards lower fertility and the subsequent increase in the use of sex-selective abortions at earlier parities that occurred over the periods. The results also suggest that the take-up of sex selection occurred rapidly as the new methods became available and that this take-up is not fully captured by the simple model. More broadly, a possible interpretation of the differences is that the simple model will tend to underestimate when sex-selective abortions are initially spreading in use and overestimate when the spread of sex selection is slowing. This is most clearly seen for the third births for urban women where the hazard model show a *decline* is use of sex-selective abortions, consistent with the lower fertility as discussed in the main paper, while the simple model show a substantial increase.

G Migration

Table G.1: Migration by Beginning of Spell

	Years of Education								
	None			1–7 Years			8 or More Years		
	1972–1984	1985–1994	1995–2006	1972–1984	1985–1994	1995–2006	1972–1984	1985–1994	1995–2006
After marriage (%)									
Did not move	51.20	59.60	64.04	50.24	58.38	63.68	42.16	51.07	61.07
Within same type	39.76	32.69	27.99	34.85	29.94	25.95	41.38	34.69	27.35
Rural to urban	7.20	5.91	5.87	10.91	8.18	7.33	11.91	9.93	7.75
Urban to rural	1.85	1.80	2.10	4.00	3.49	3.04	4.55	4.30	3.83
After first birth (%)									
Did not move	80.66	86.63	88.78	75.16	82.93	88.32	66.60	76.85	86.33
Within same type	14.06	9.23	7.02	16.11	10.95	7.12	24.16	16.21	9.44
Rural to urban	4.25	3.28	3.23	6.39	4.33	3.36	6.63	4.97	3.04
Urban to rural	1.03	0.85	0.97	2.34	1.78	1.21	2.61	1.96	1.18
After second birth (%)									
Did not move	80.66	85.40	85.77	75.17	81.42	85.08	66.64	74.58	82.48
Within same type	14.08	10.12	8.91	16.15	11.93	9.33	24.08	17.59	11.84
Rural to urban	4.22	3.56	4.02	6.37	4.72	4.07	6.72	5.62	4.09
Urban to rural	1.04	0.93	1.30	2.32	1.94	1.51	2.56	2.20	1.58
After third birth (%)									
Did not move	80.76	84.22	84.47	75.19	81.01	82.24	68.55	75.25	82.54
Within same type	13.98	10.89	9.98	15.88	12.13	11.51	21.98	16.62	10.82
Rural to urban	4.25	3.91	4.28	6.57	4.93	4.74	7.02	5.89	4.98
Urban to rural	1.01	0.98	1.26	2.35	1.93	1.51	2.46	2.24	1.66

Note. "Within same type" indicates either a move from a rural area to another rural area, or a move from an urban area to another urban area.

H All Graphs using Main Sample

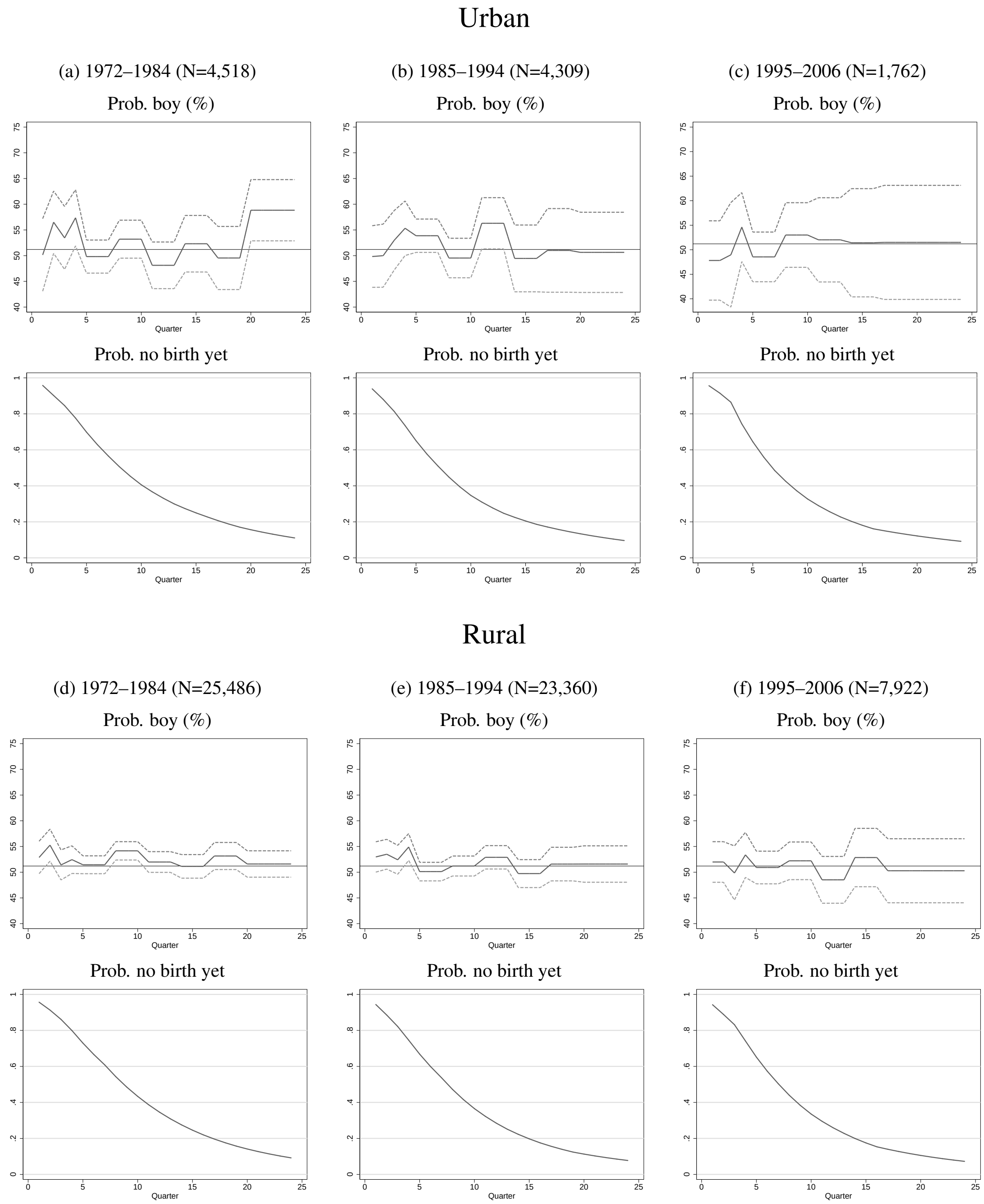


Figure H.1: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with no education by quarter (3 month period). Predictions based on age 16 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

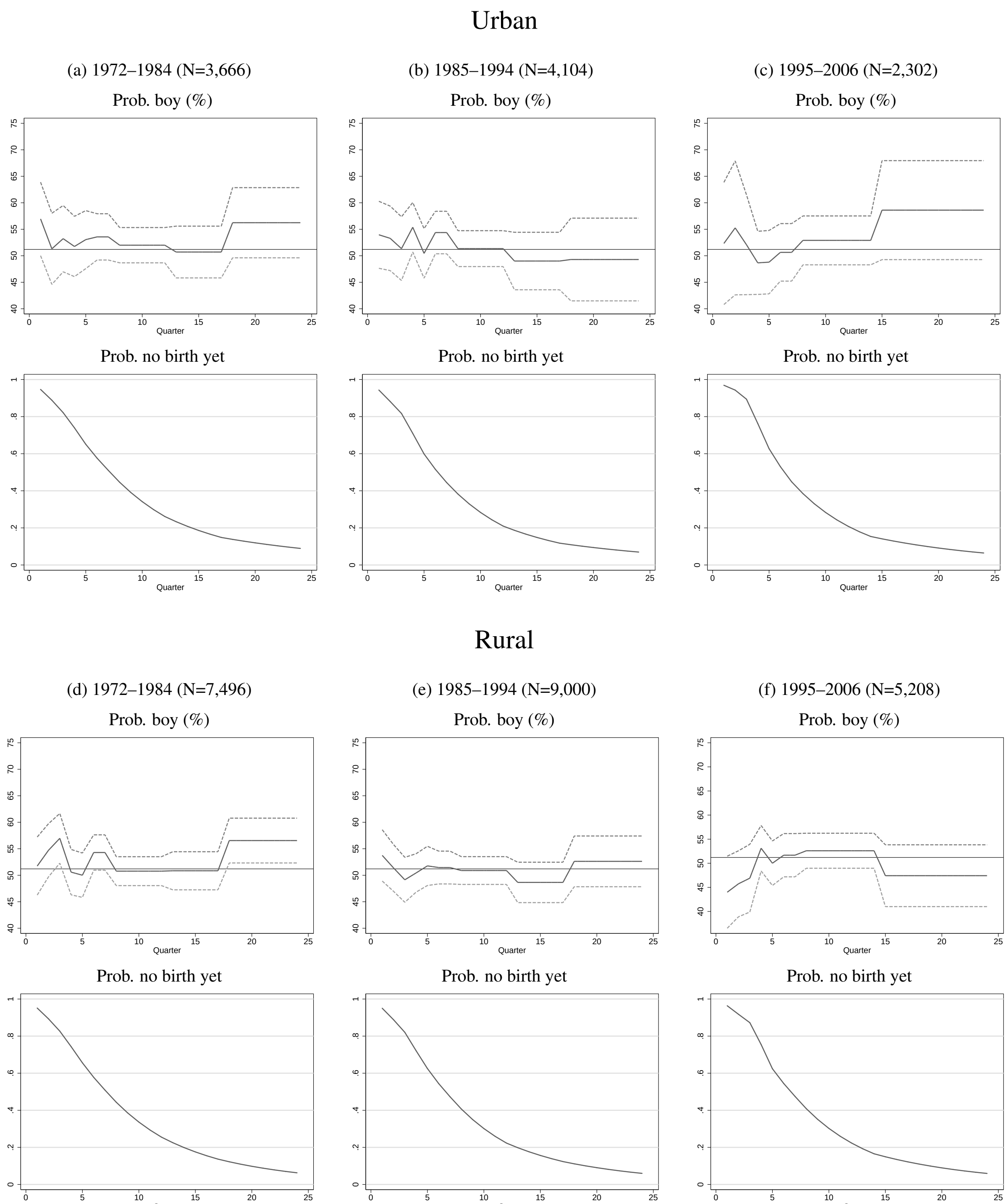


Figure H.2: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 17 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

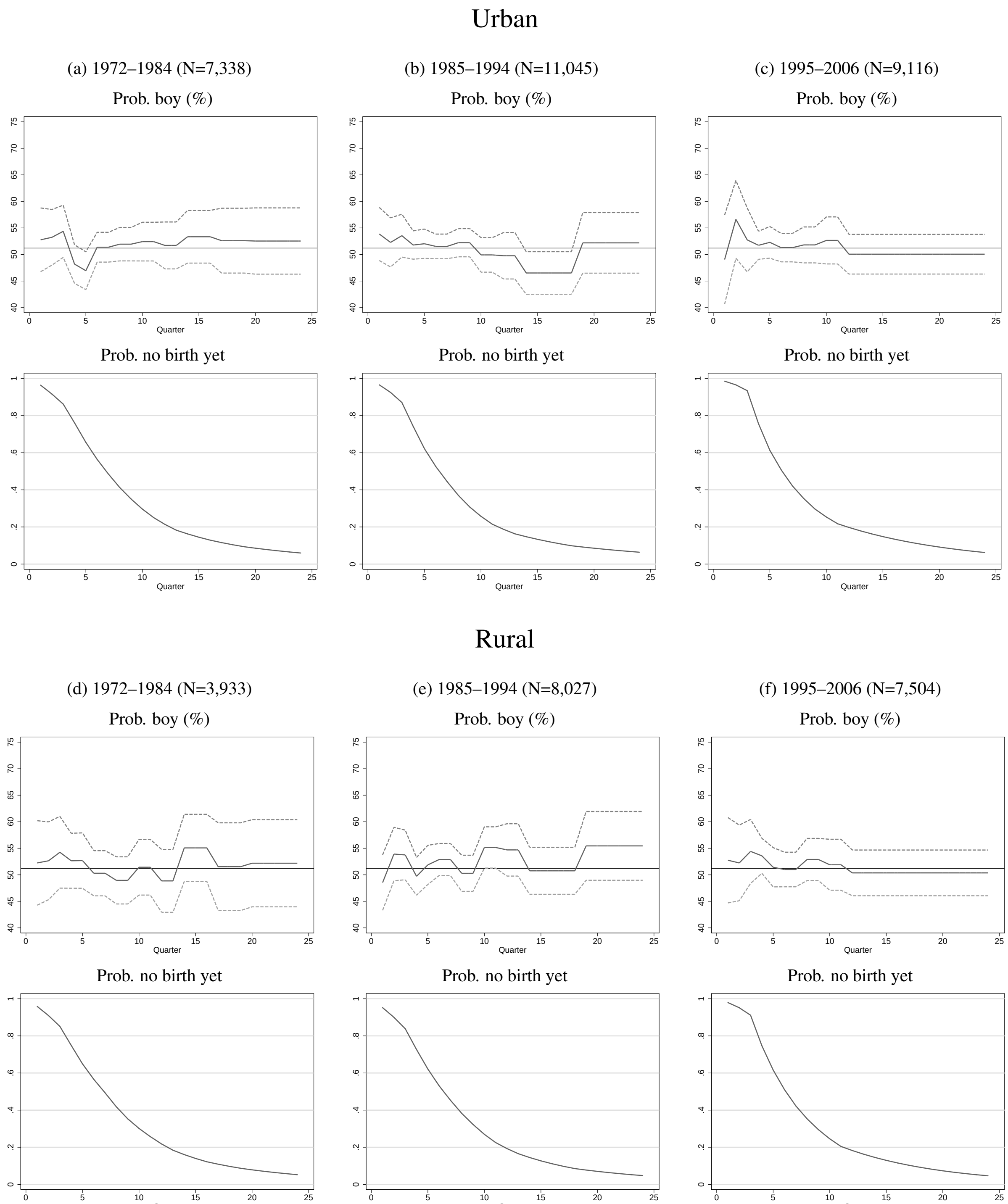


Figure H.3: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with 8 or more years of education by quarter (3 month period). Predictions based on age 20 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

H.1 Second Spell

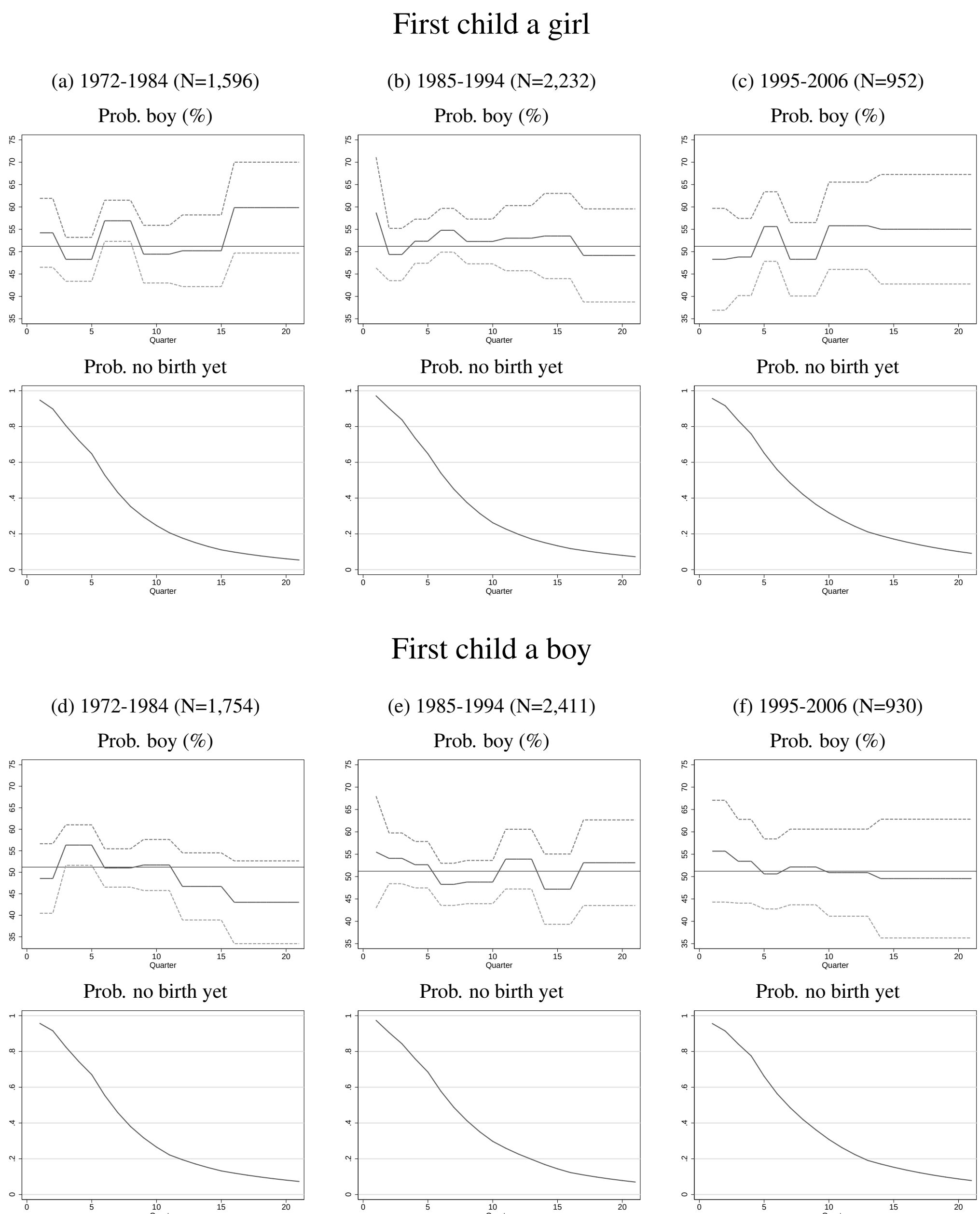


Figure H.4: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with no education by quarter (3 month period). Predictions based on age 18 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

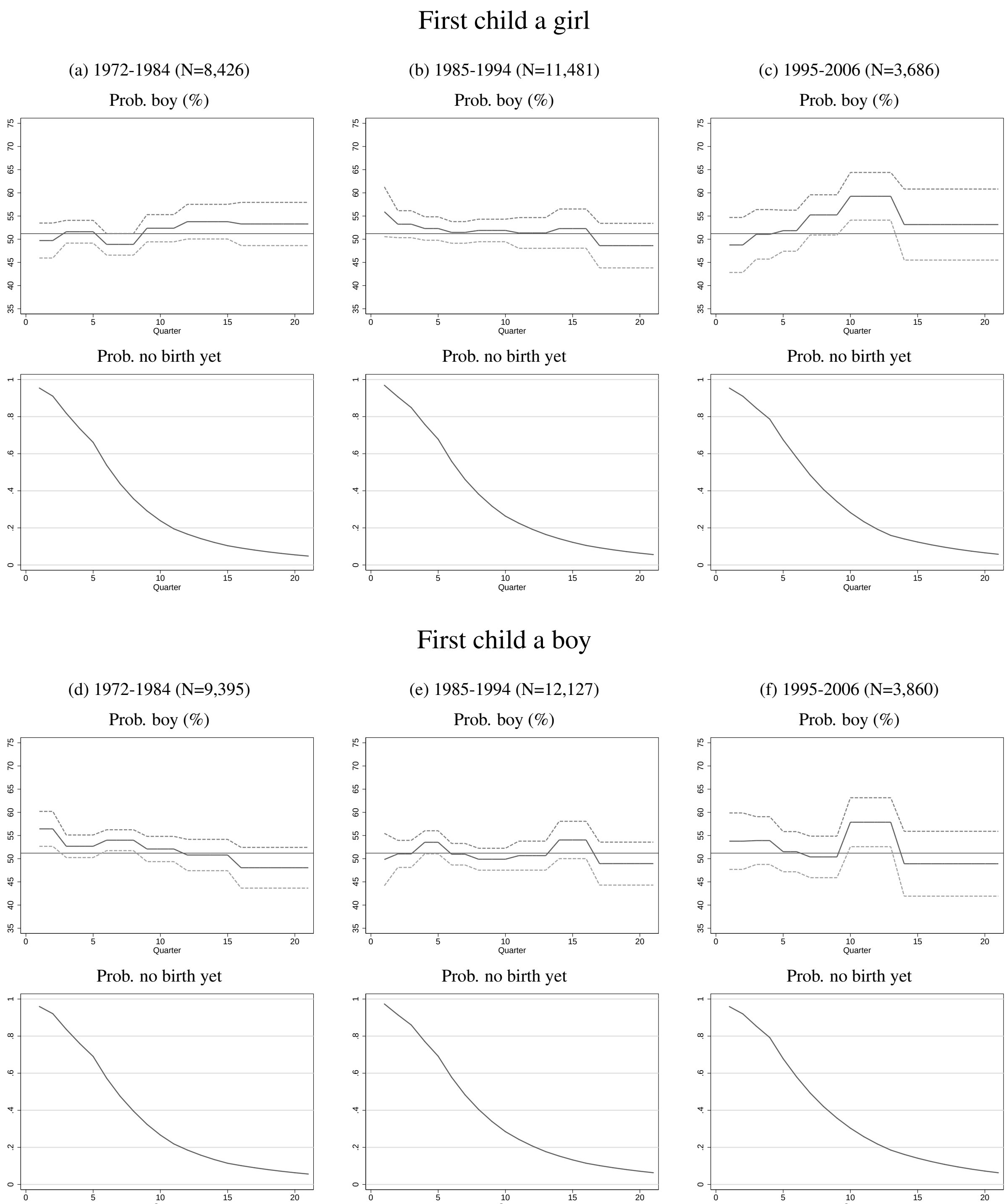


Figure H.5: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with no education by quarter (3 month period). Predictions based on age 18 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

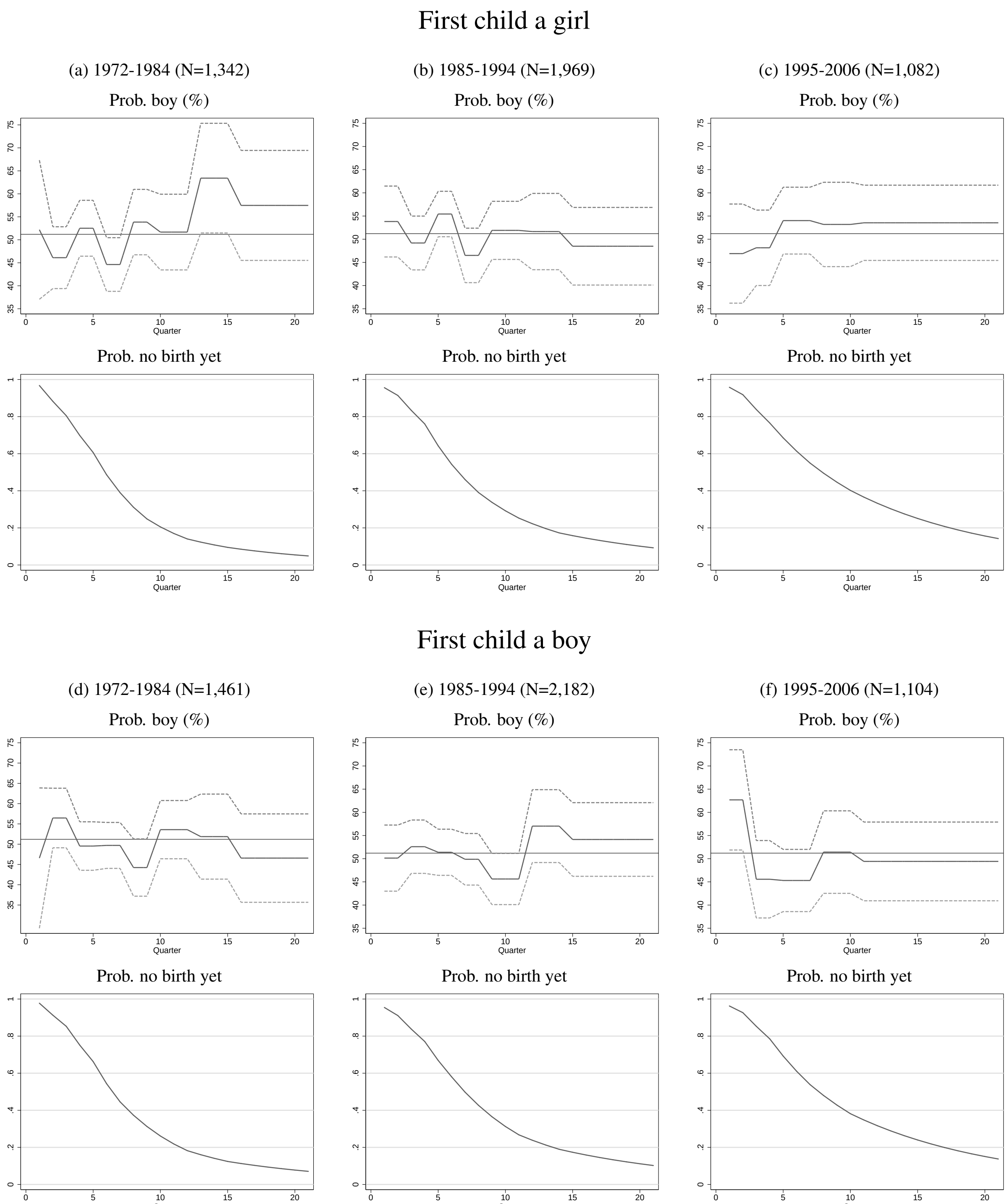


Figure H.6: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 19 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

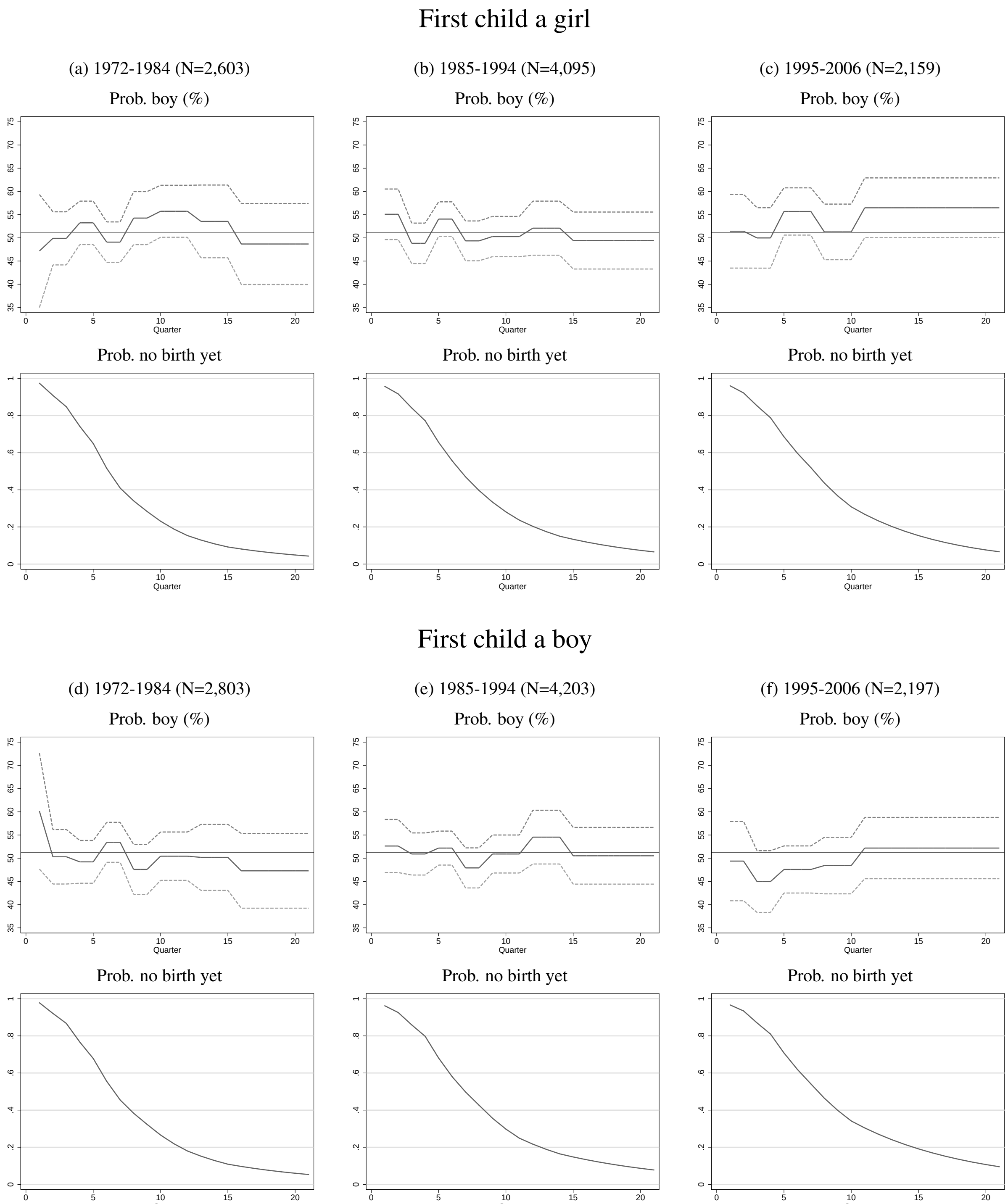


Figure H.7: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 19 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

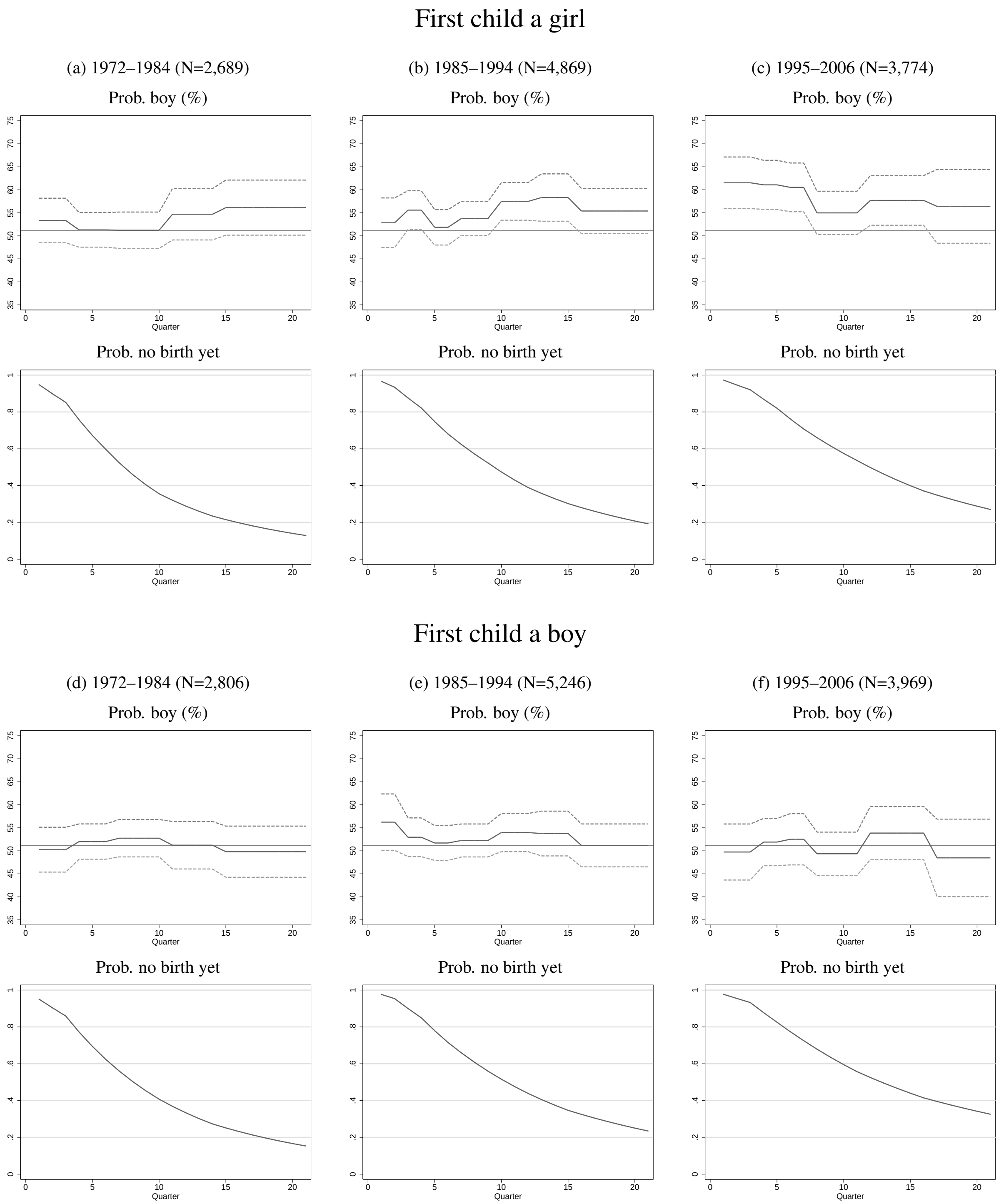


Figure H.8: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 22 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

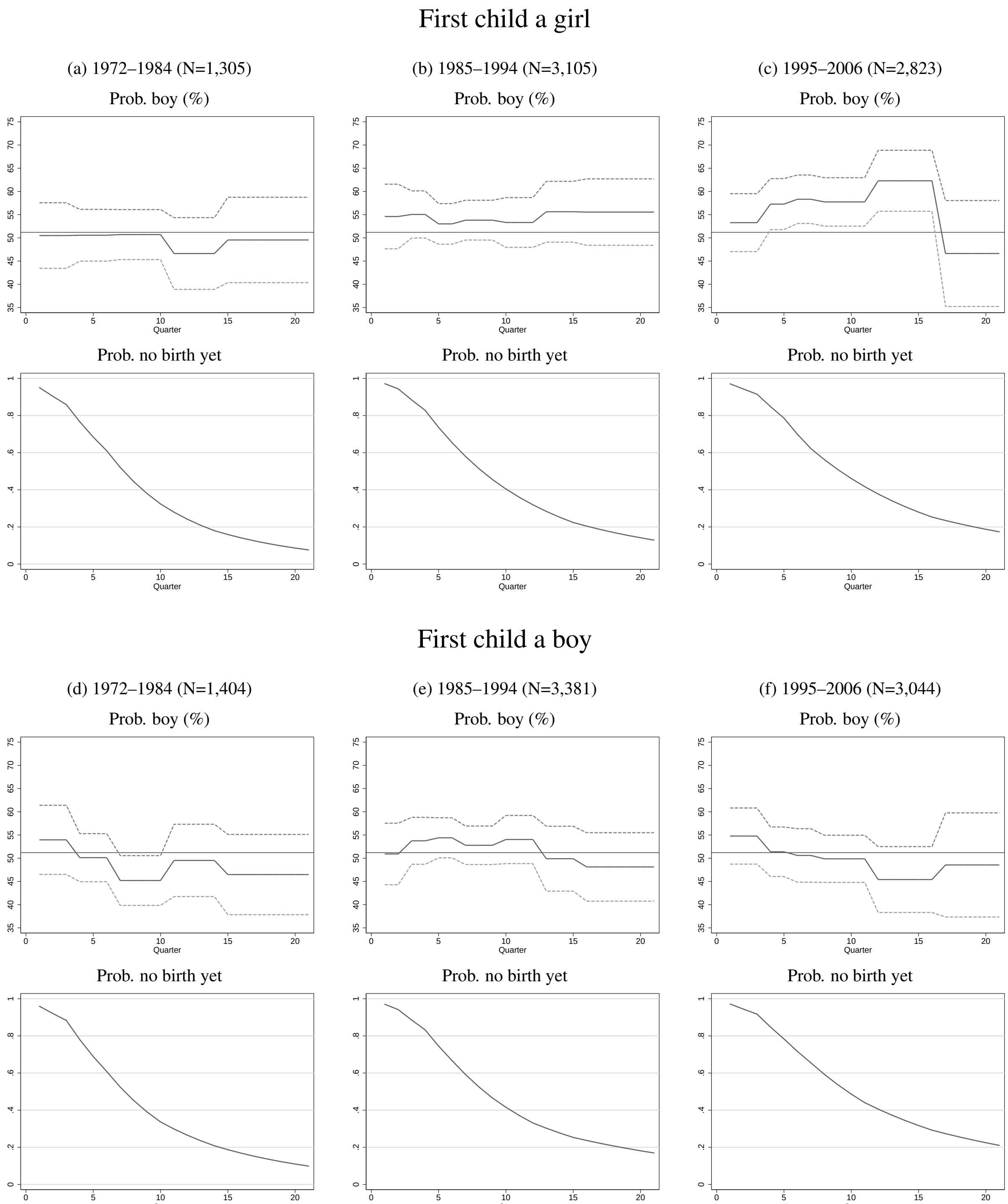


Figure H.9: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 22 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

H.2 Third Spell

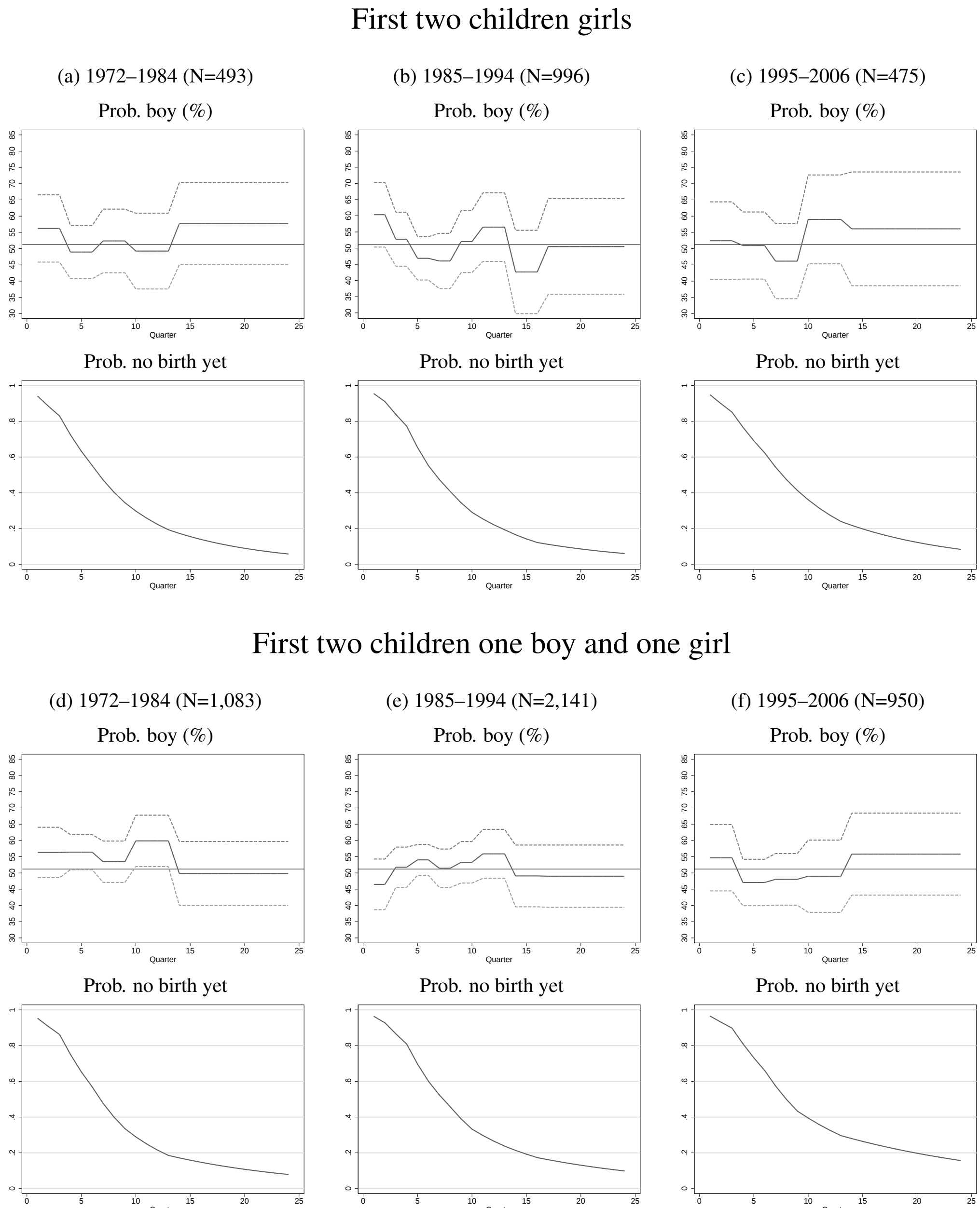


Figure H.10: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

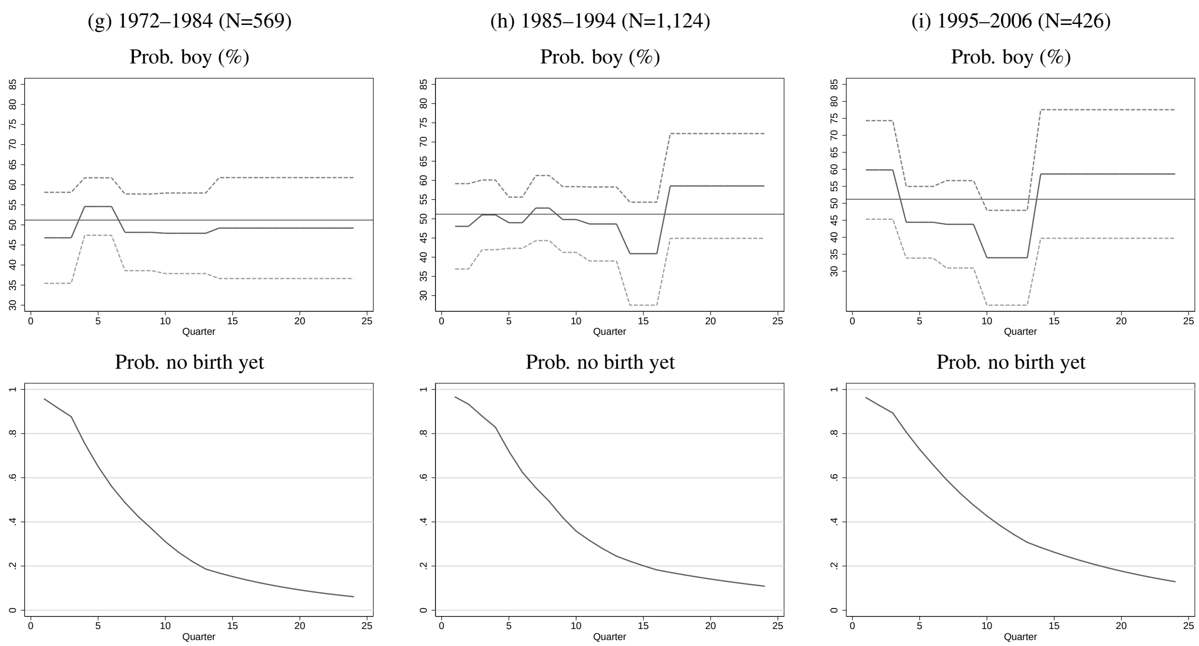
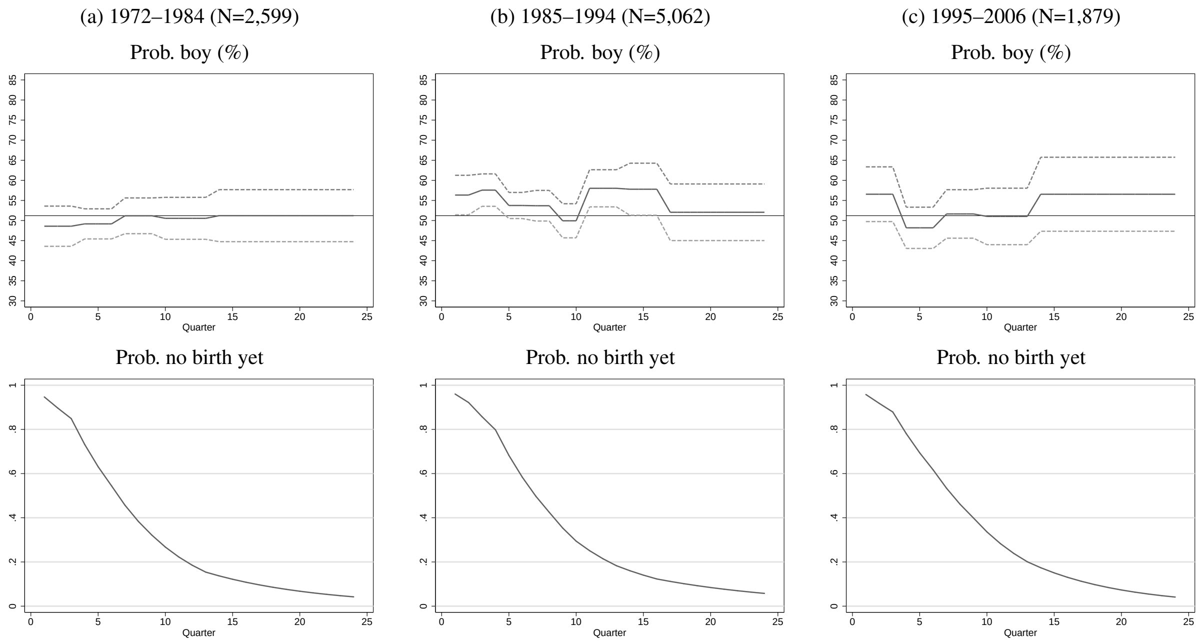


Figure H.10: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children girls



First two children one boy and one girl

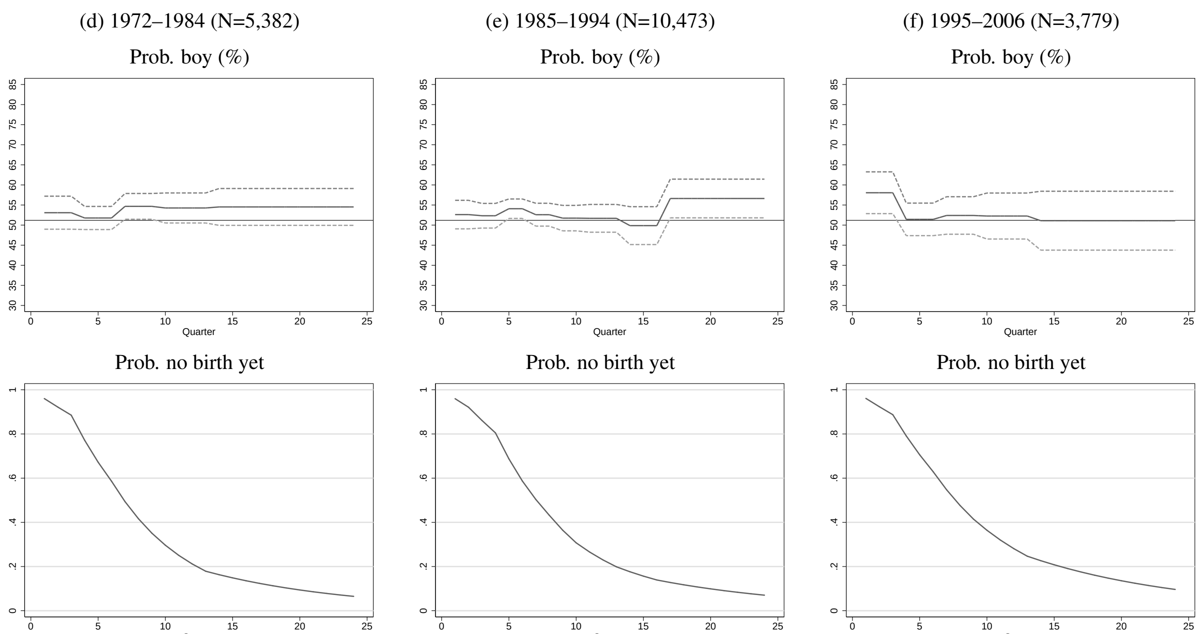


Figure H.11: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

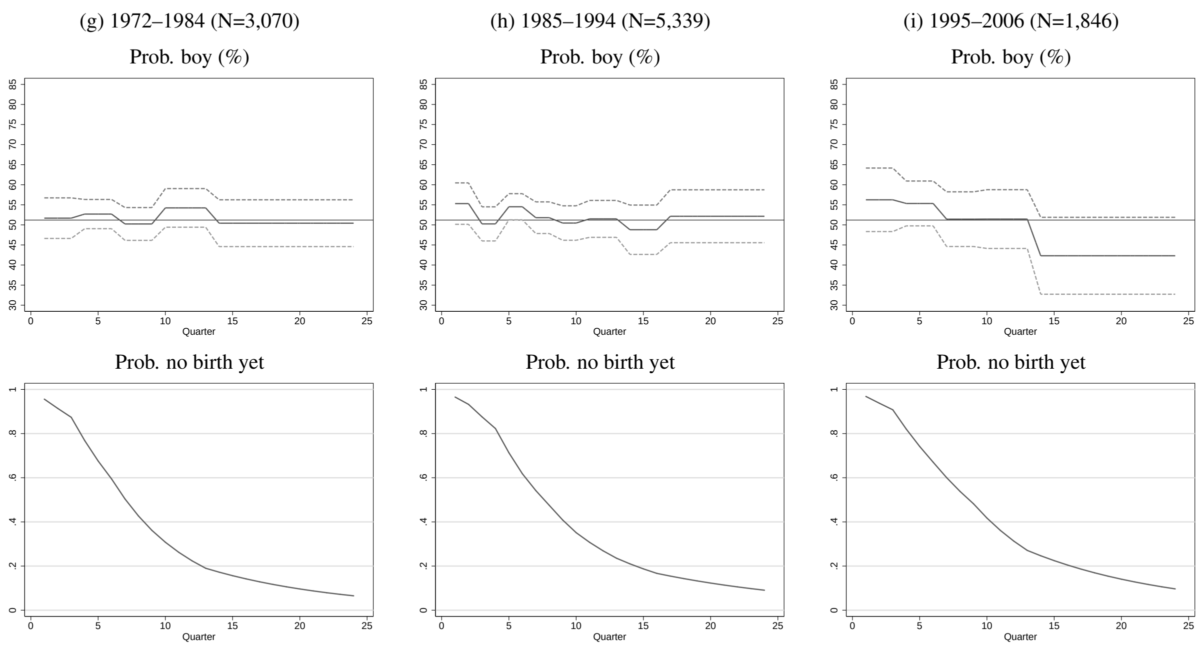


Figure H.11: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

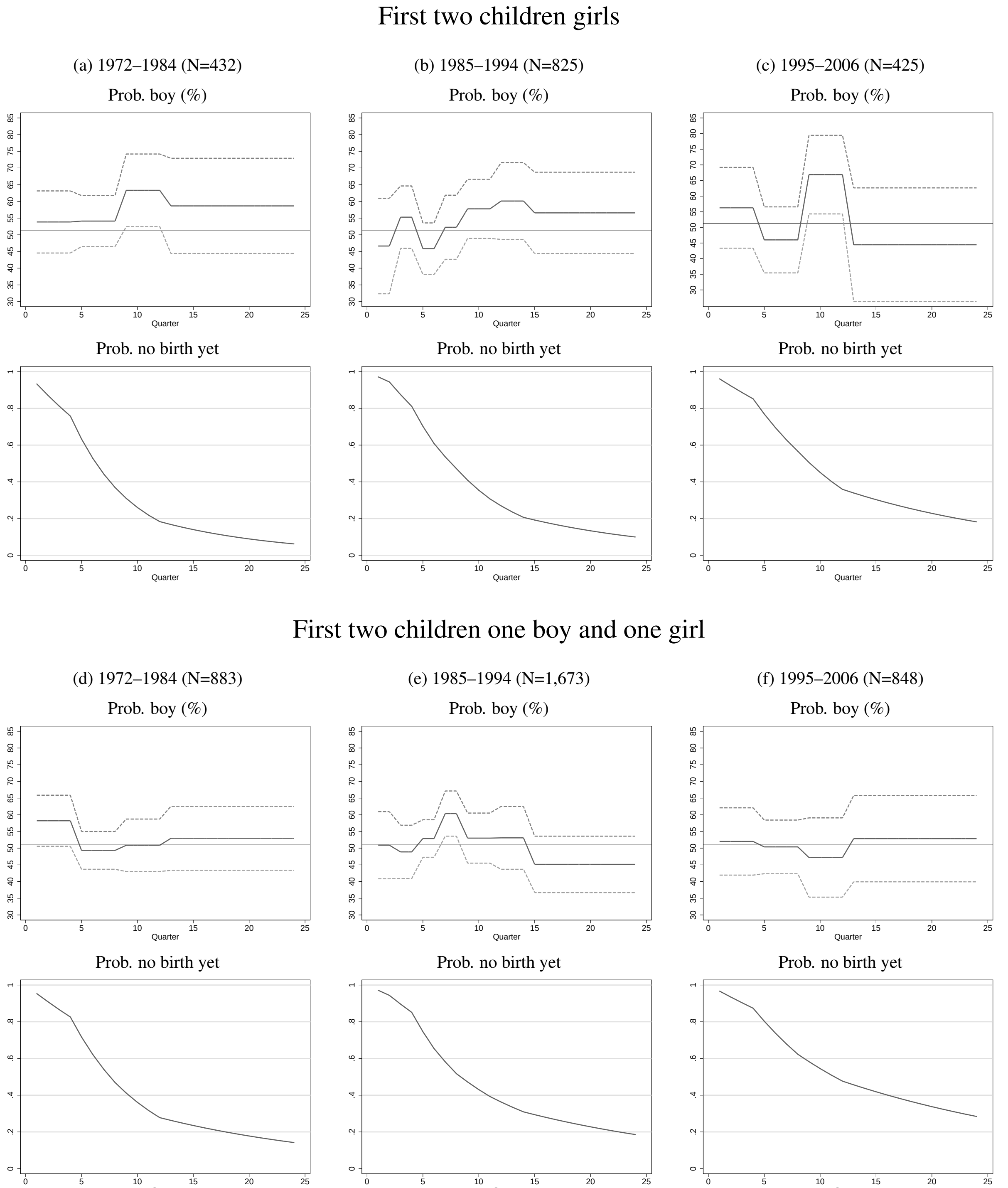


Figure H.12: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

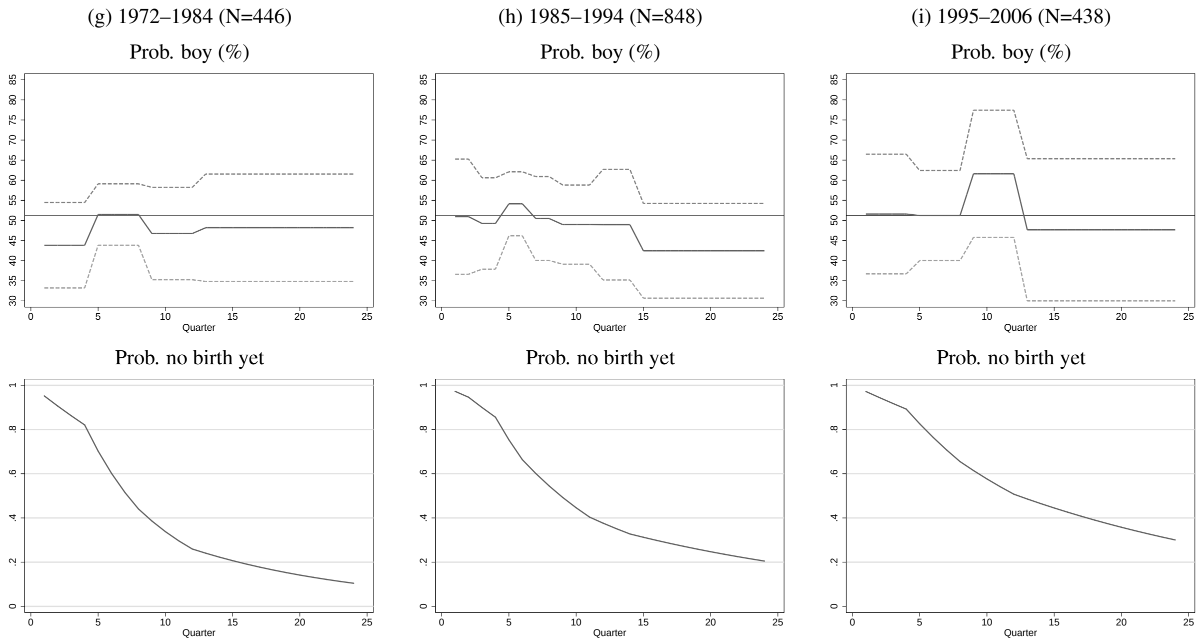
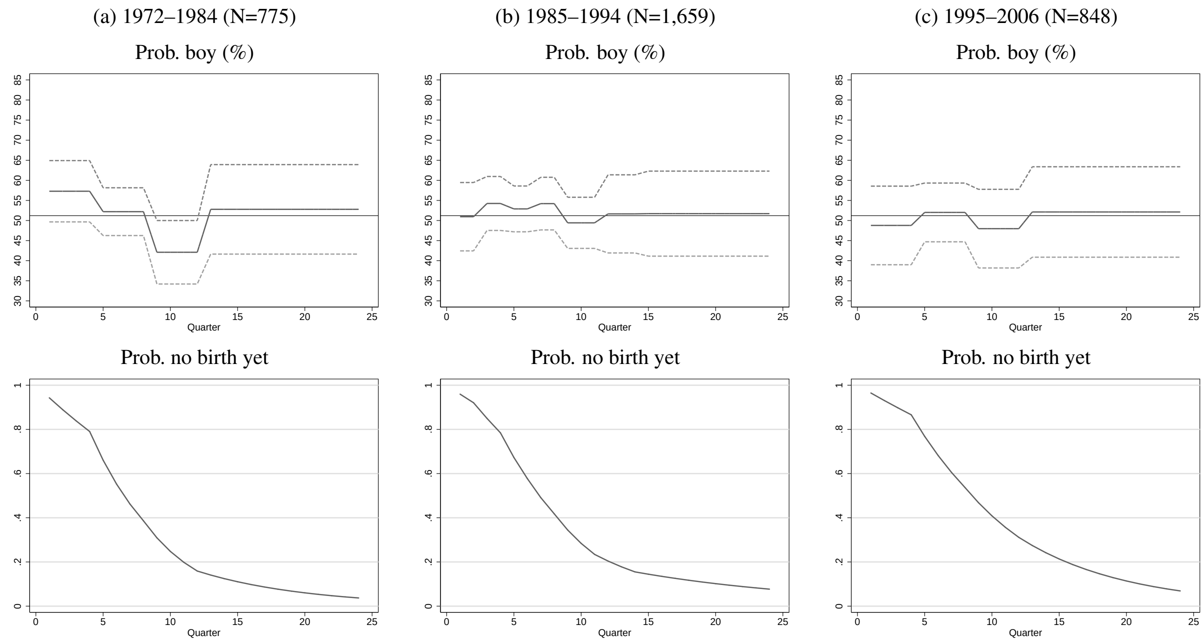


Figure H.12: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children girls



First two children one boy and one girl

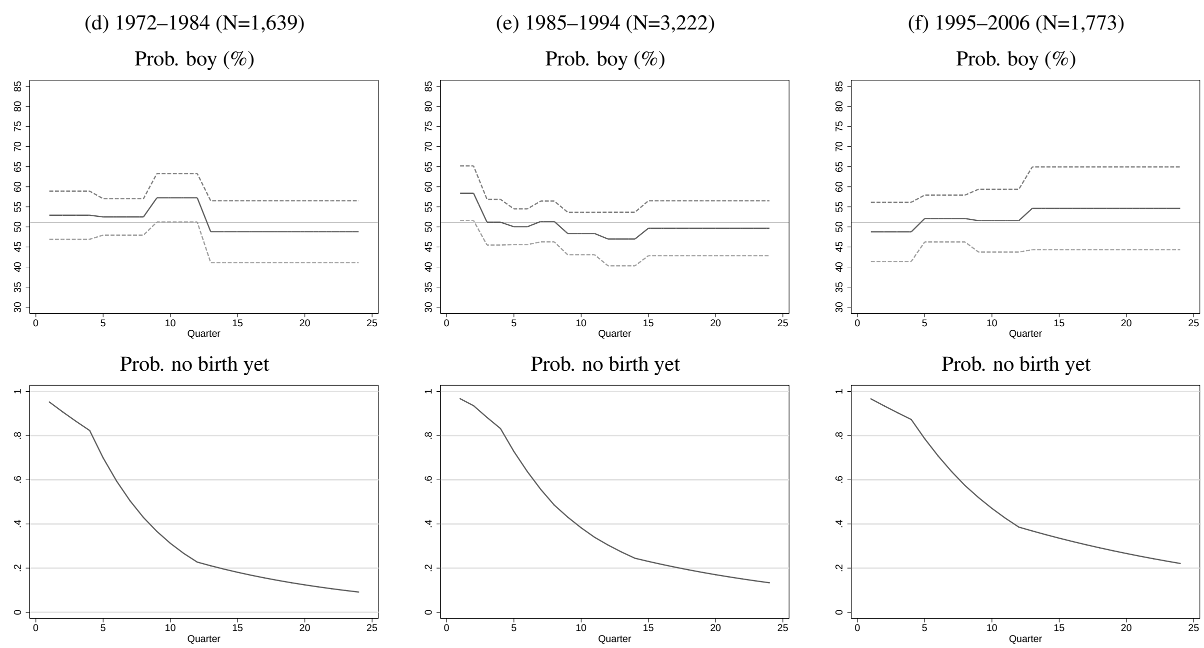


Figure H.13: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

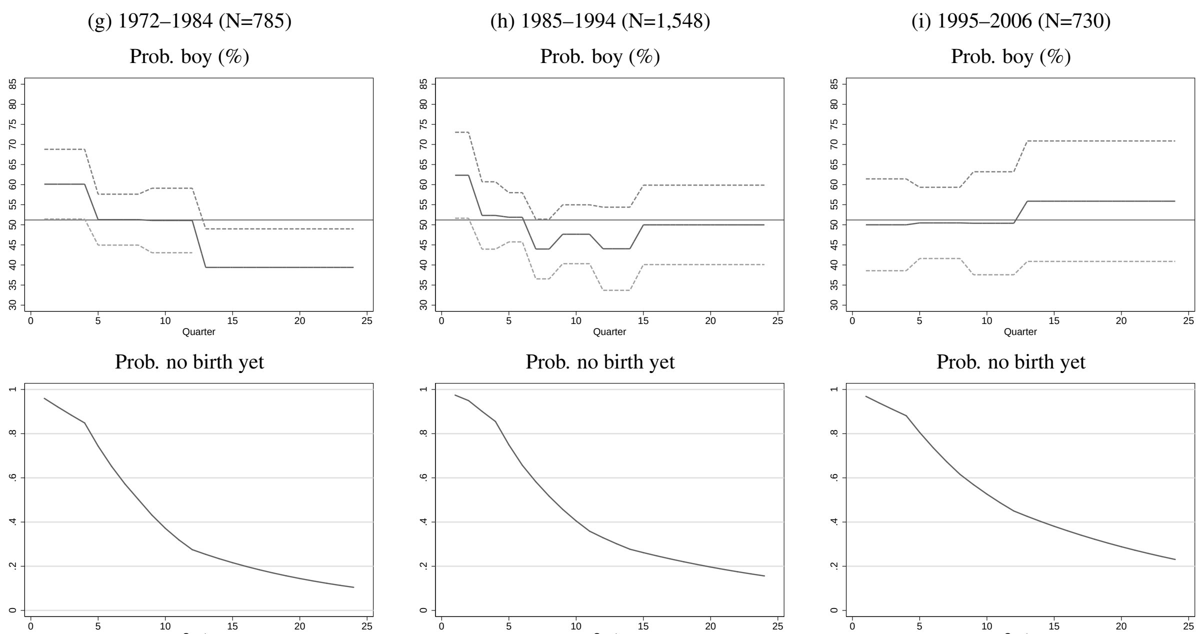


Figure H.13: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

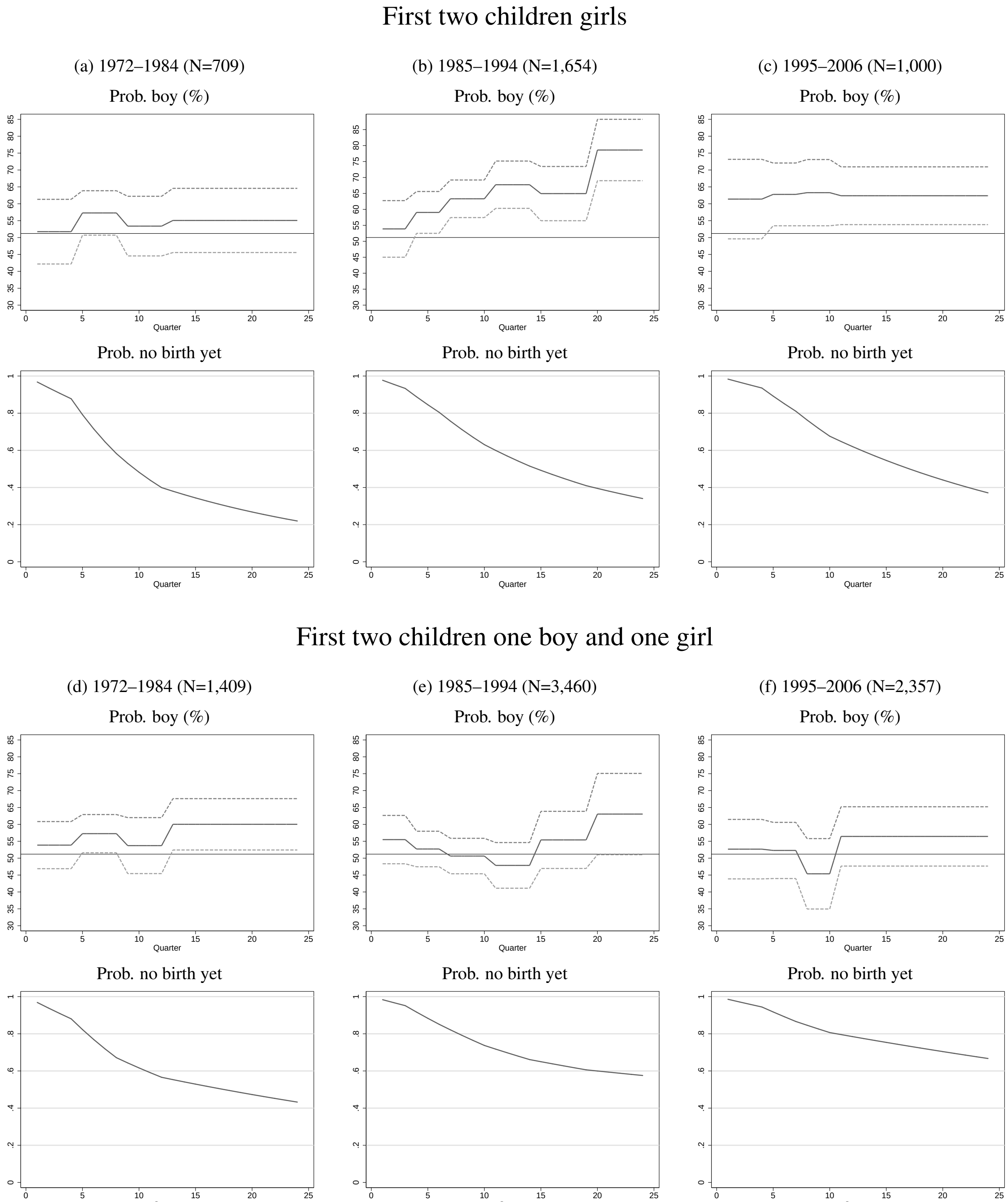


Figure H.14: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

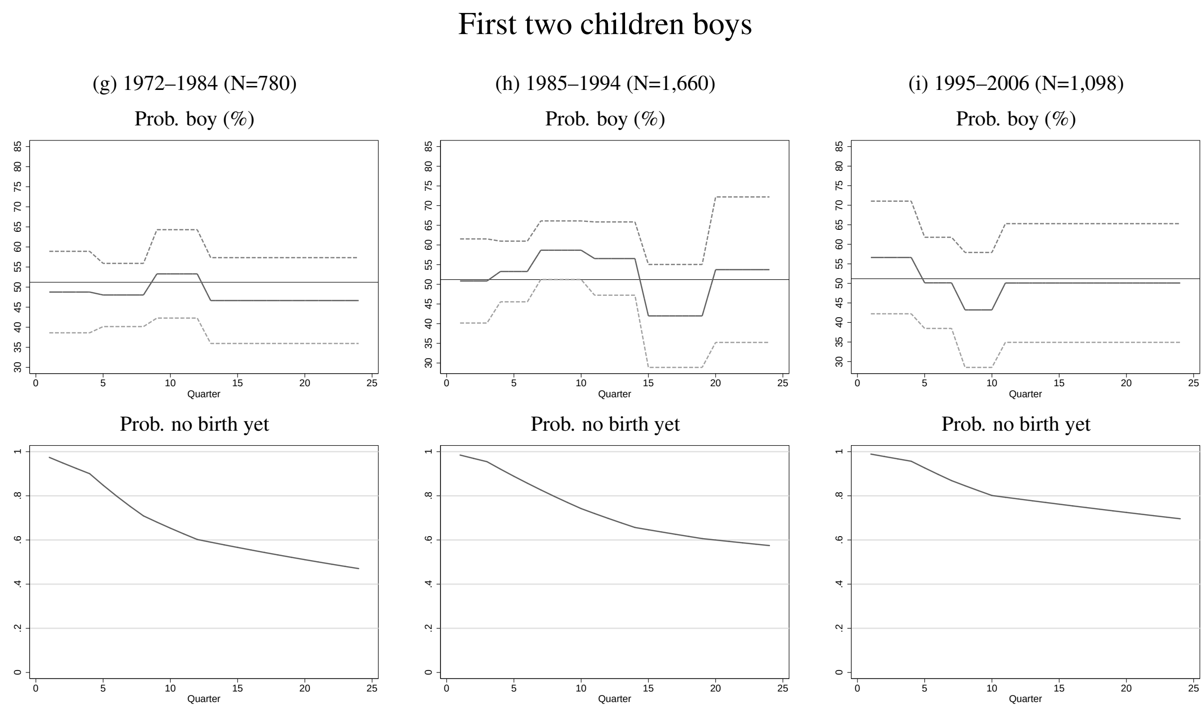


Figure H.14: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

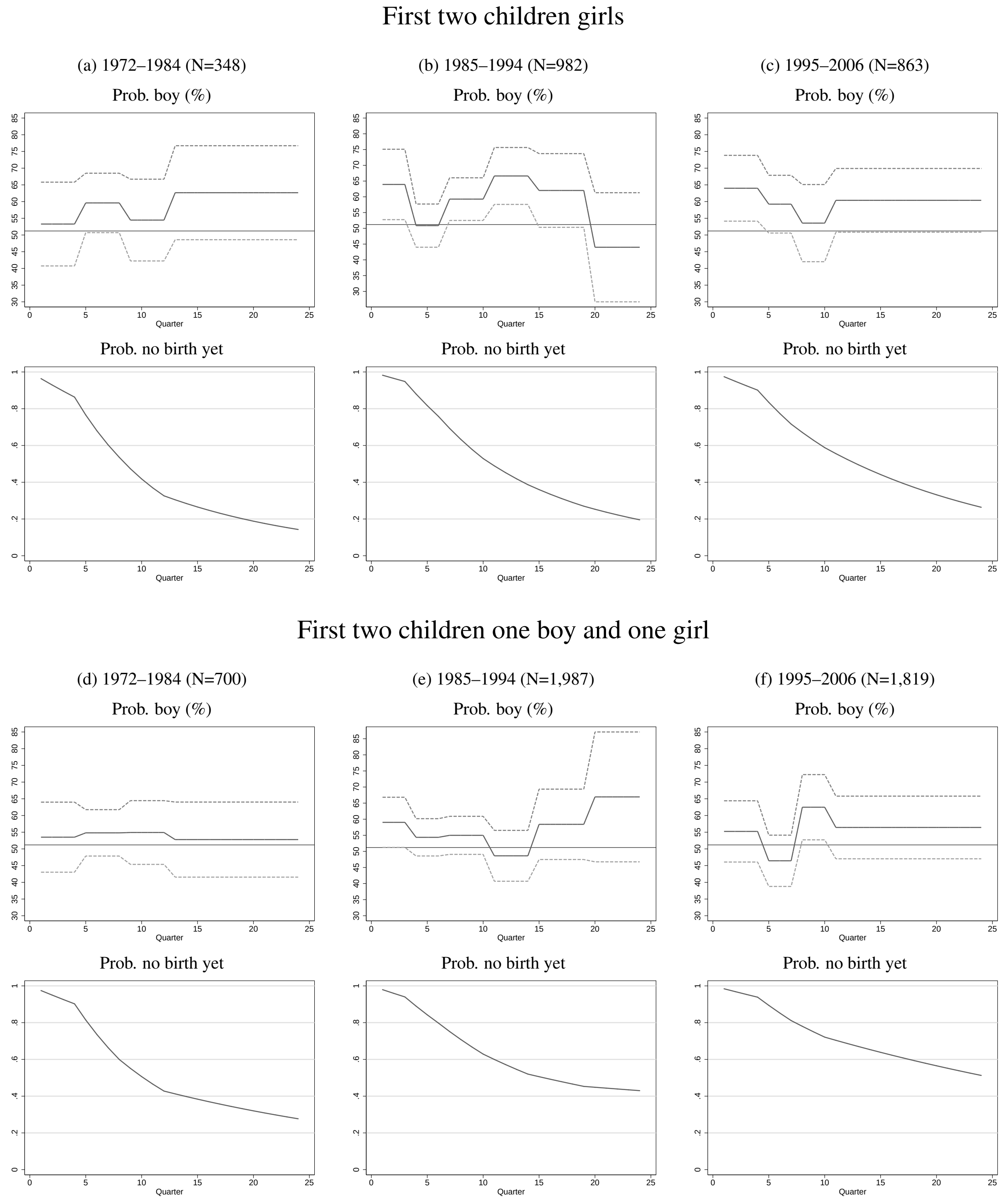


Figure H.15: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

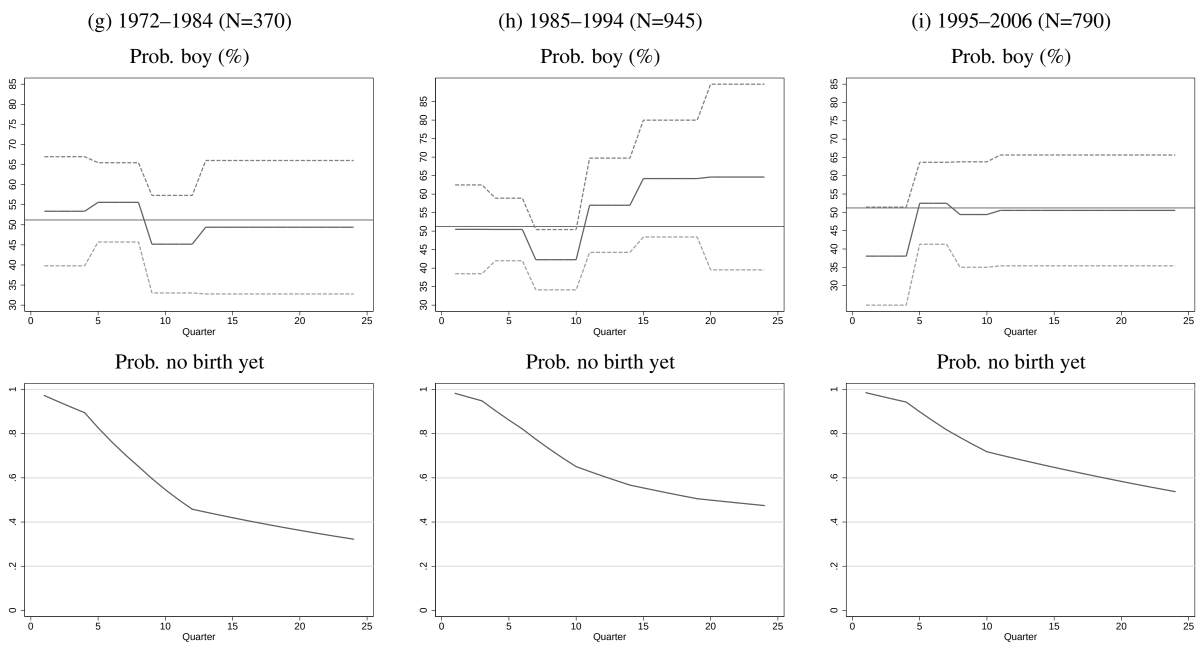
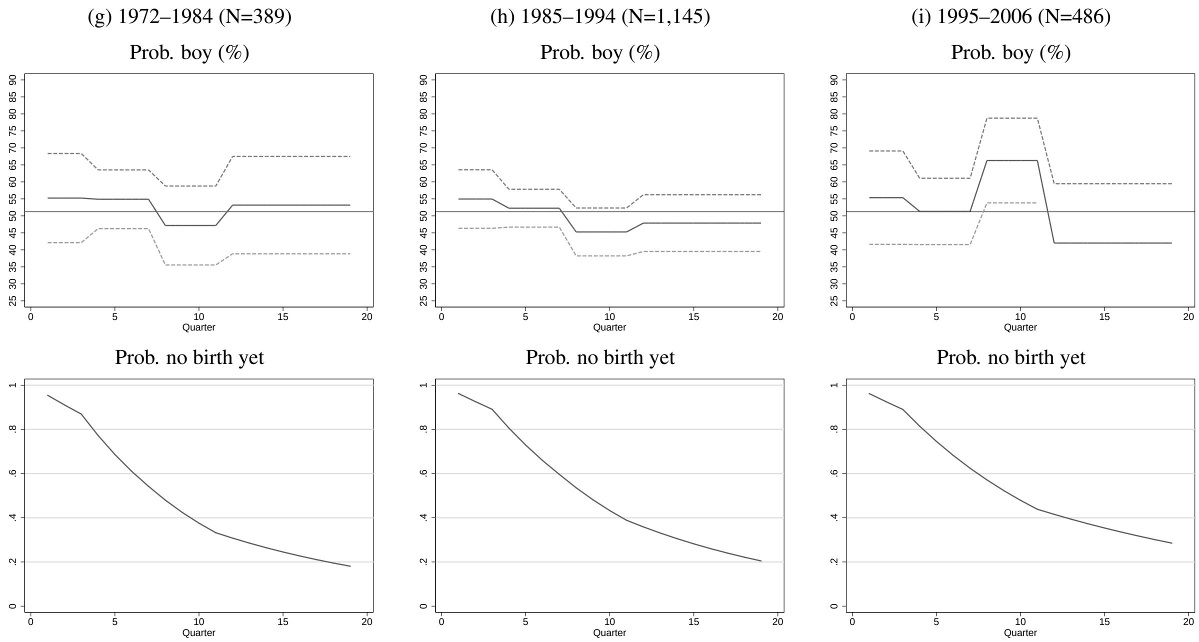


Figure H.15: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

H.3 Fourth Spell

Figure H.16: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children two boys and one girl



First three children three boys

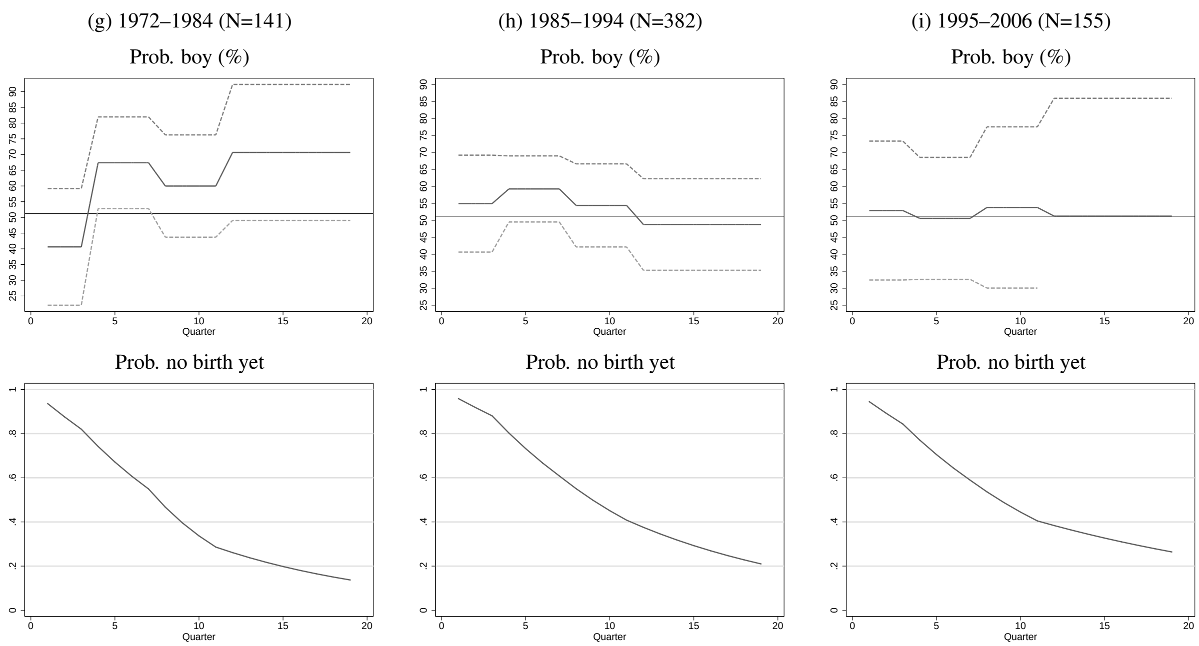


Figure H.16: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

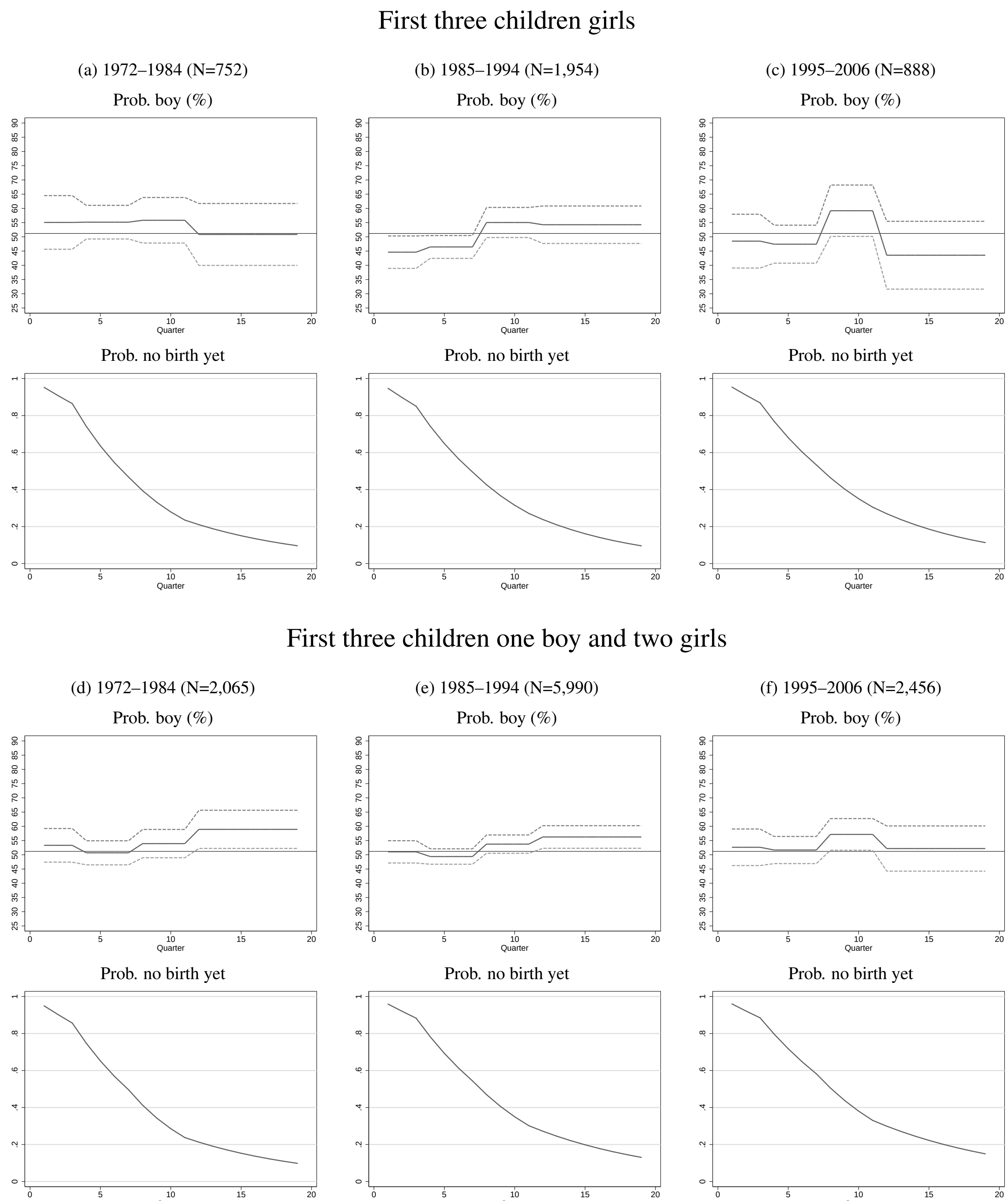
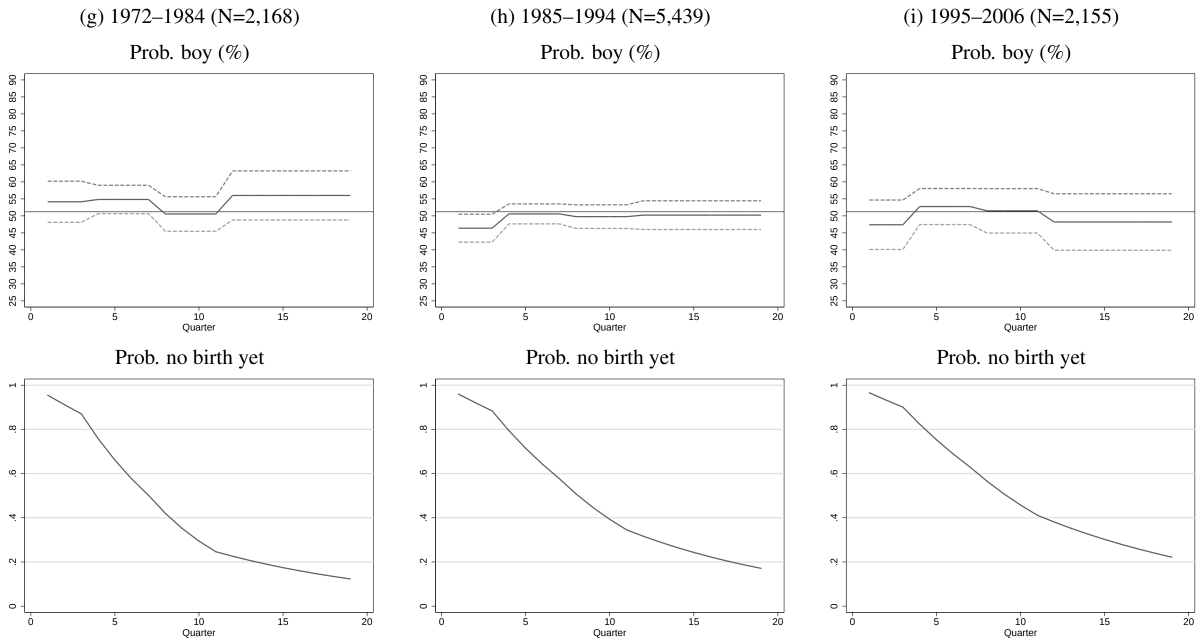


Figure H.17: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children two boys and one girl



First three children boys

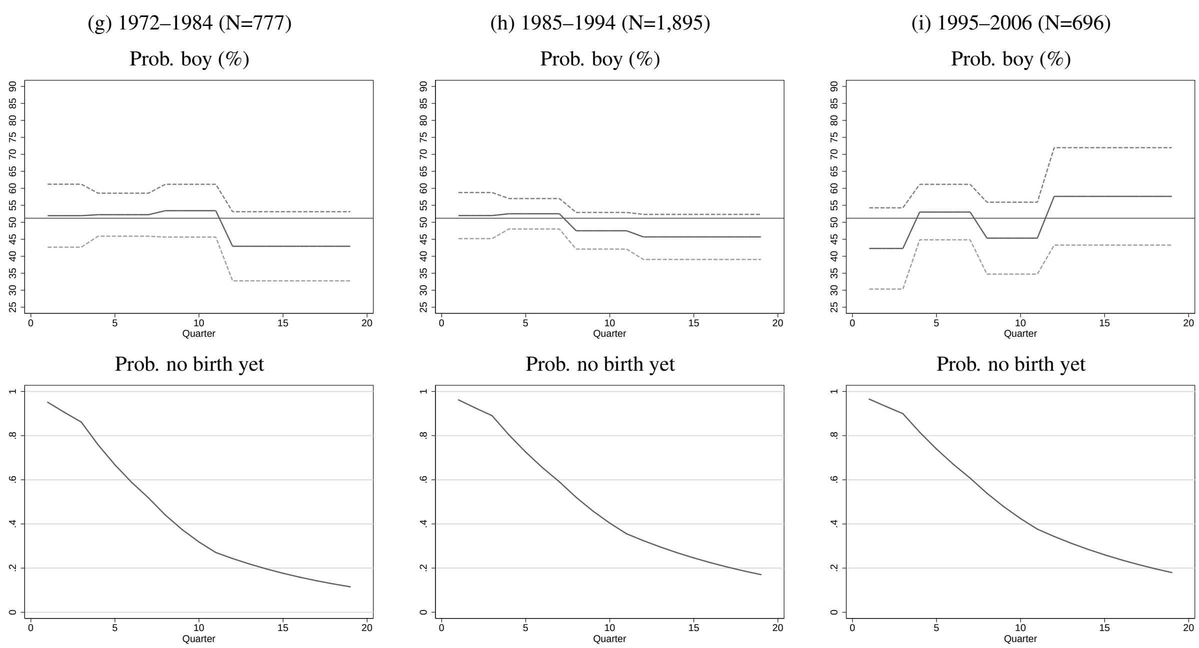
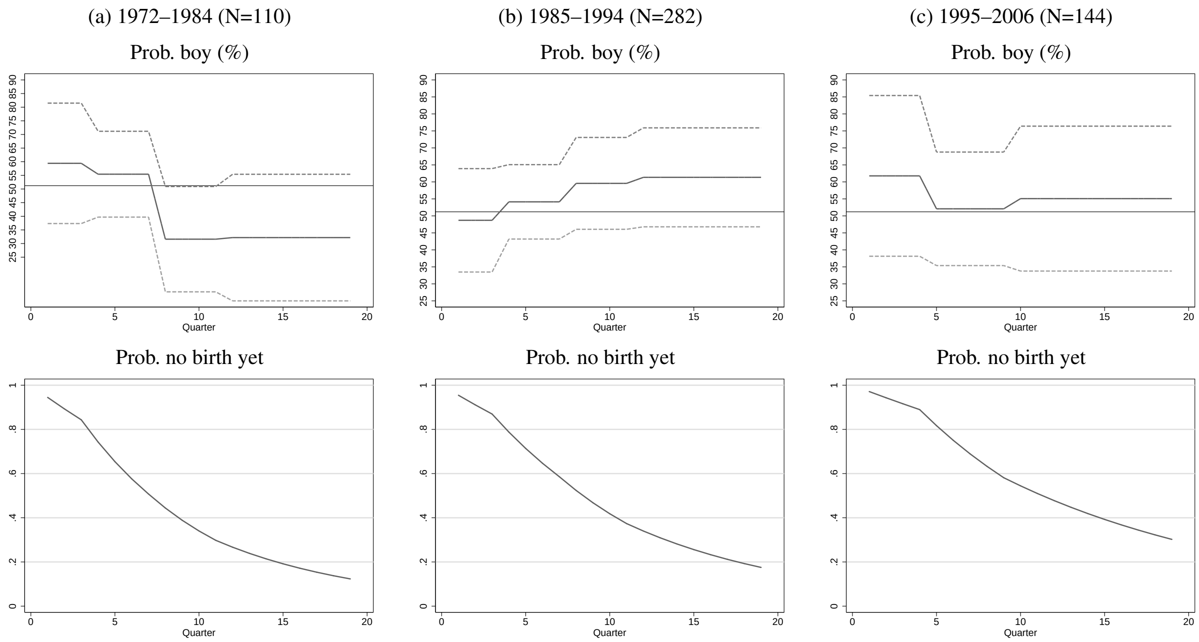


Figure H.17: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children girls



First three children one boy and two girls

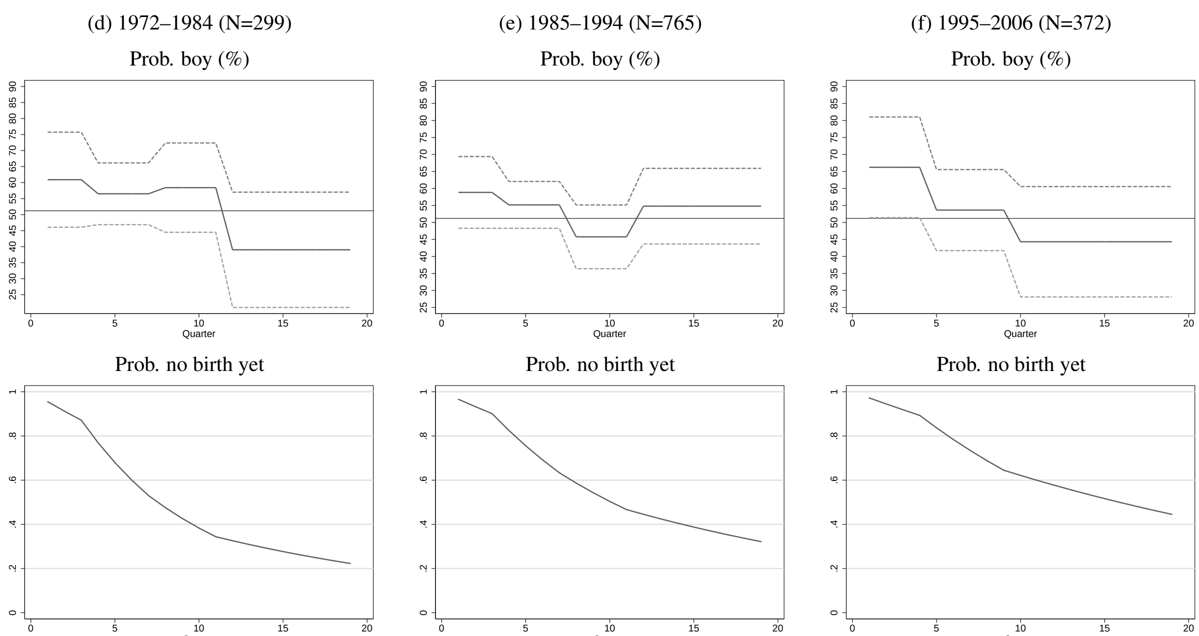
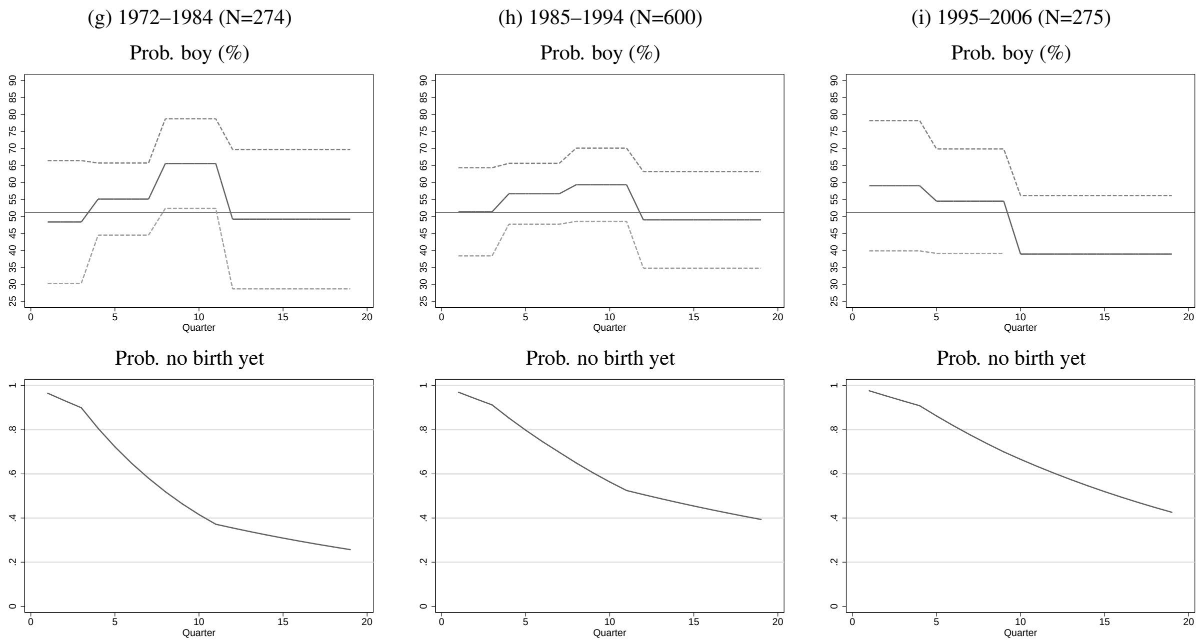


Figure H.18: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children two boys and one girl



First three children three boys

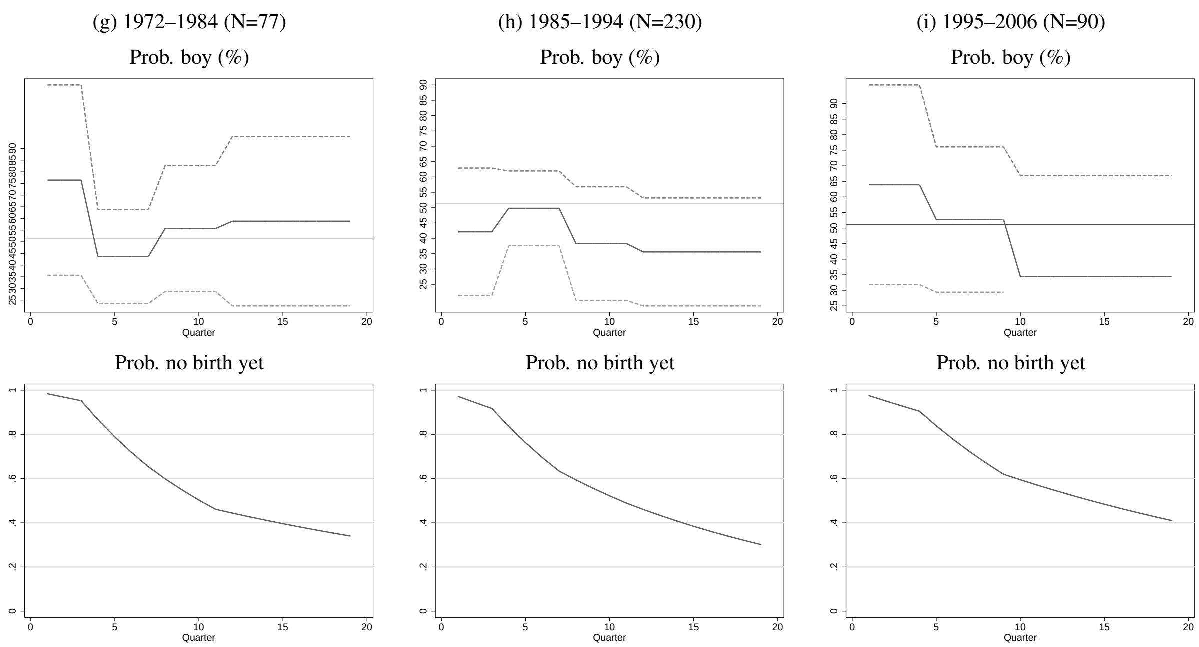


Figure H.18: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

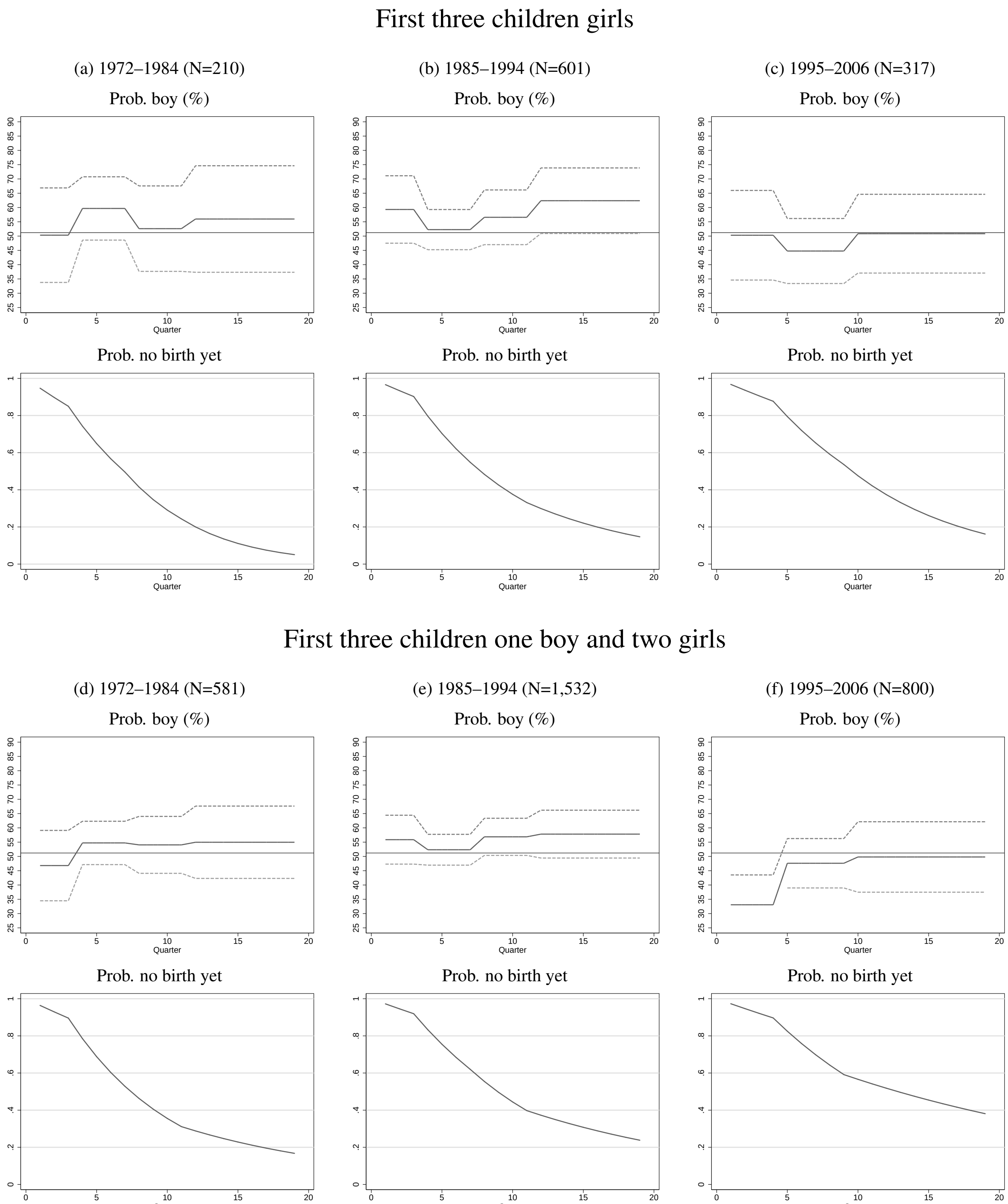


Figure H.19: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

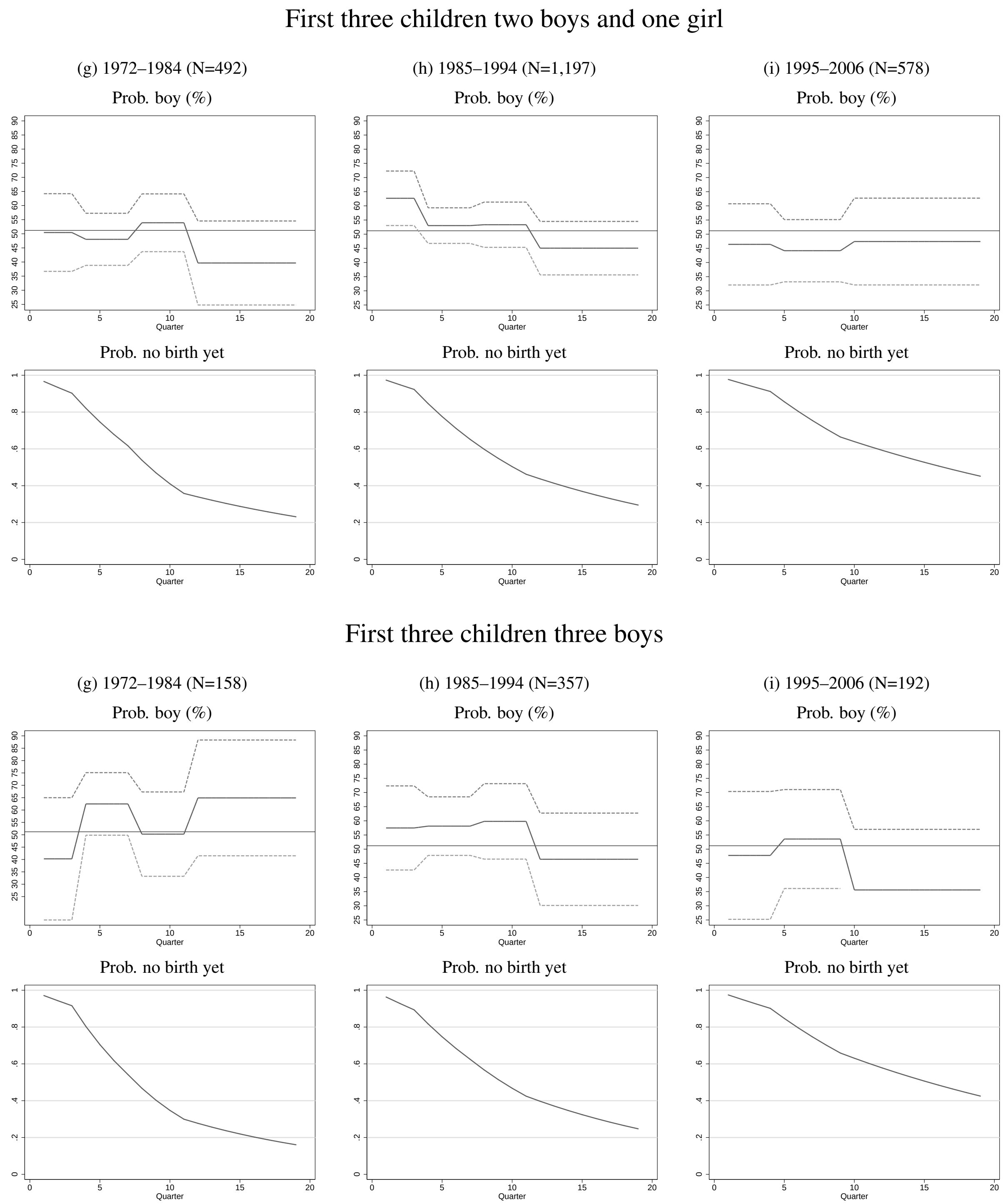


Figure H.19: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

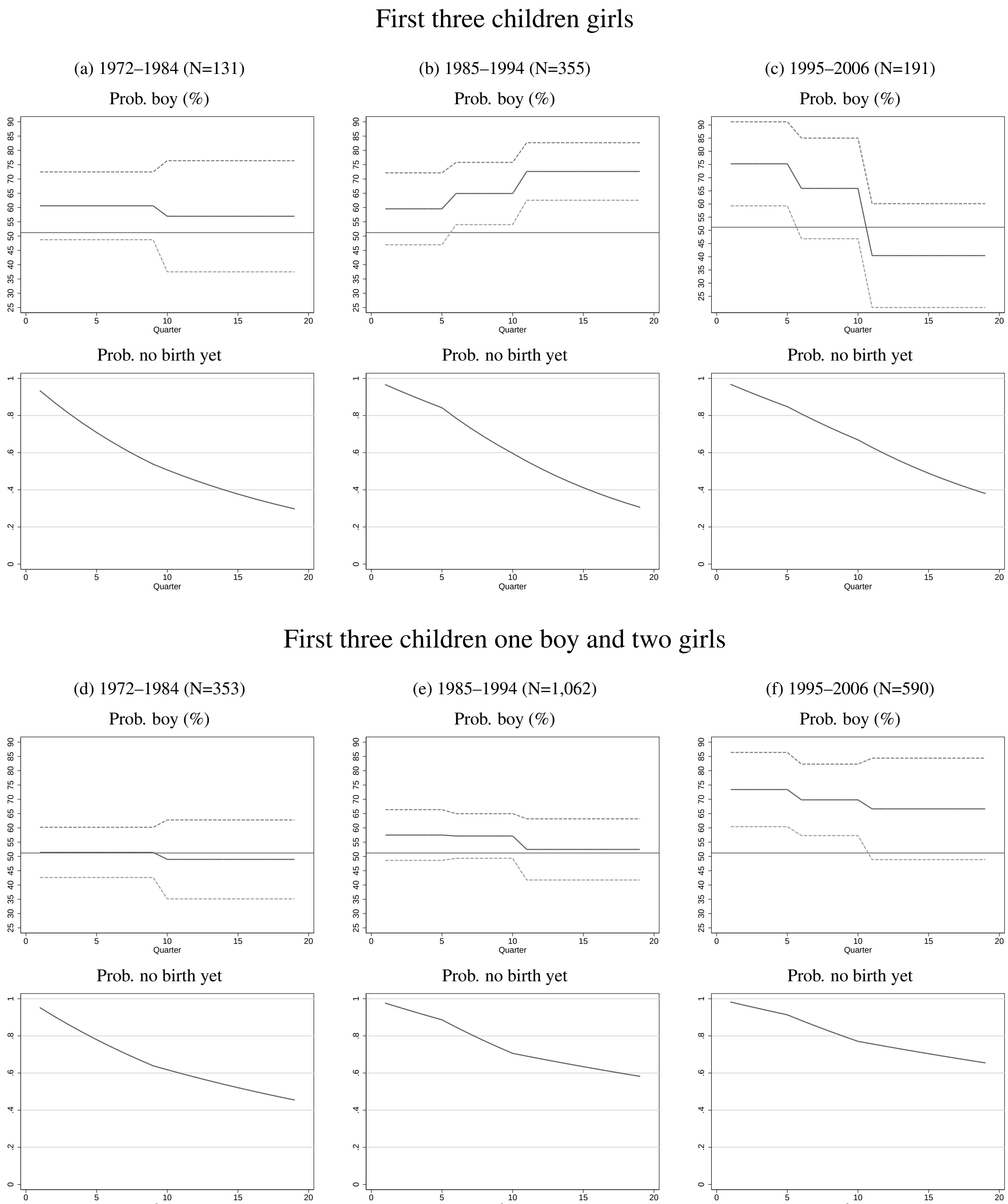
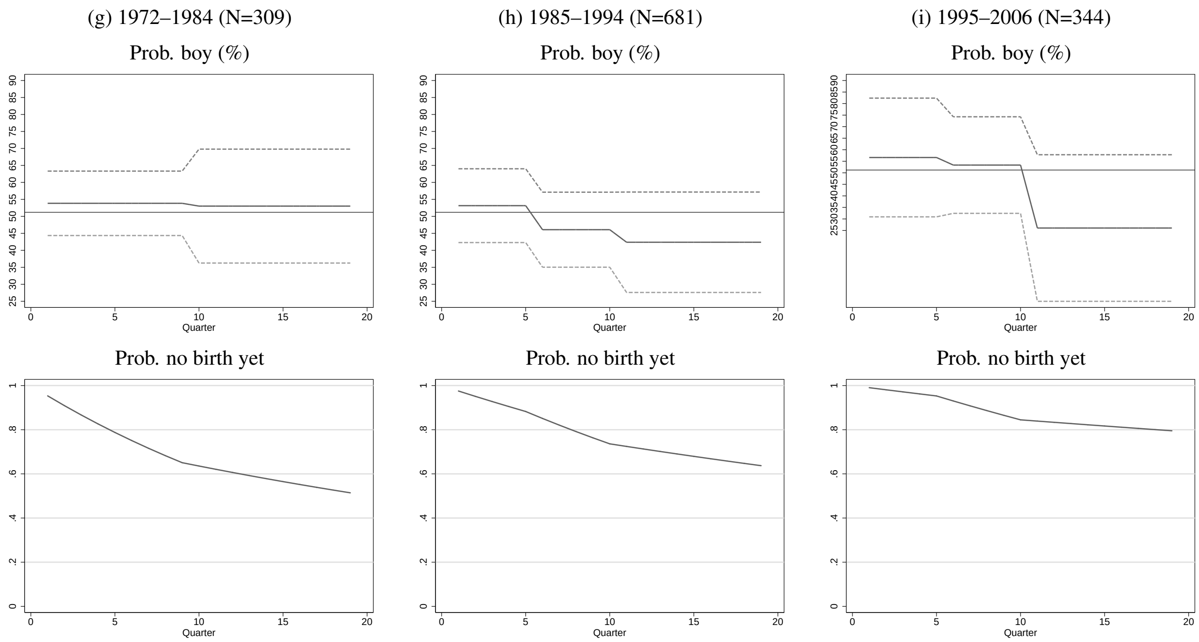


Figure H.20: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children two boys and one girl



First three children three boys

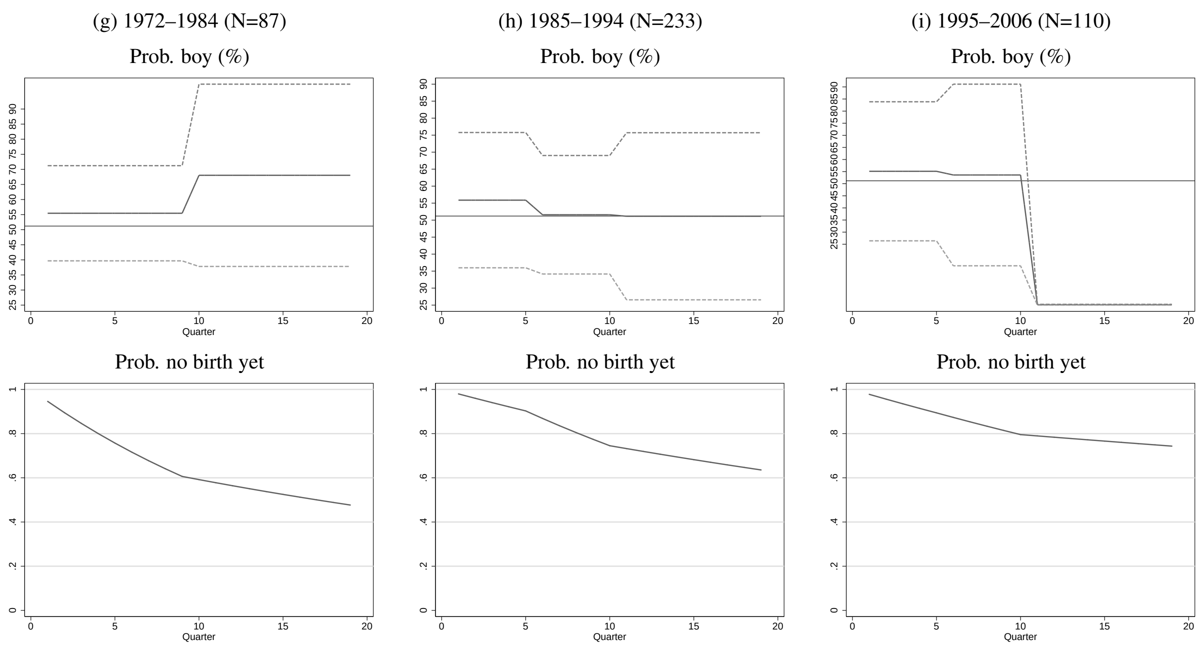
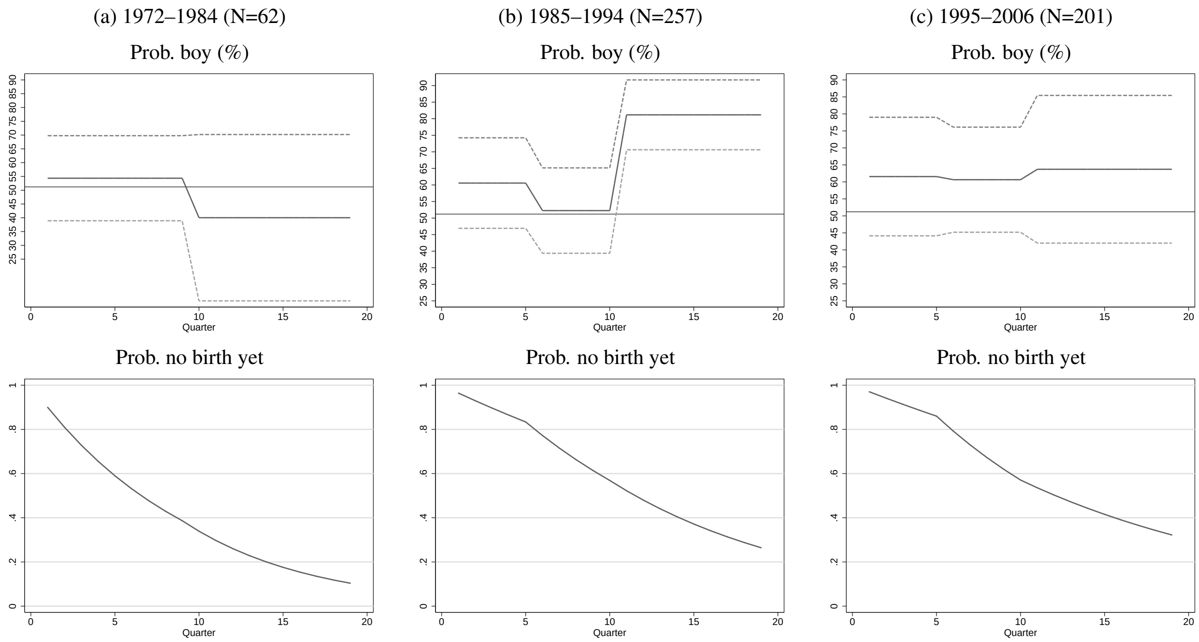


Figure H.20: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children girls



First three children one boy and two girls

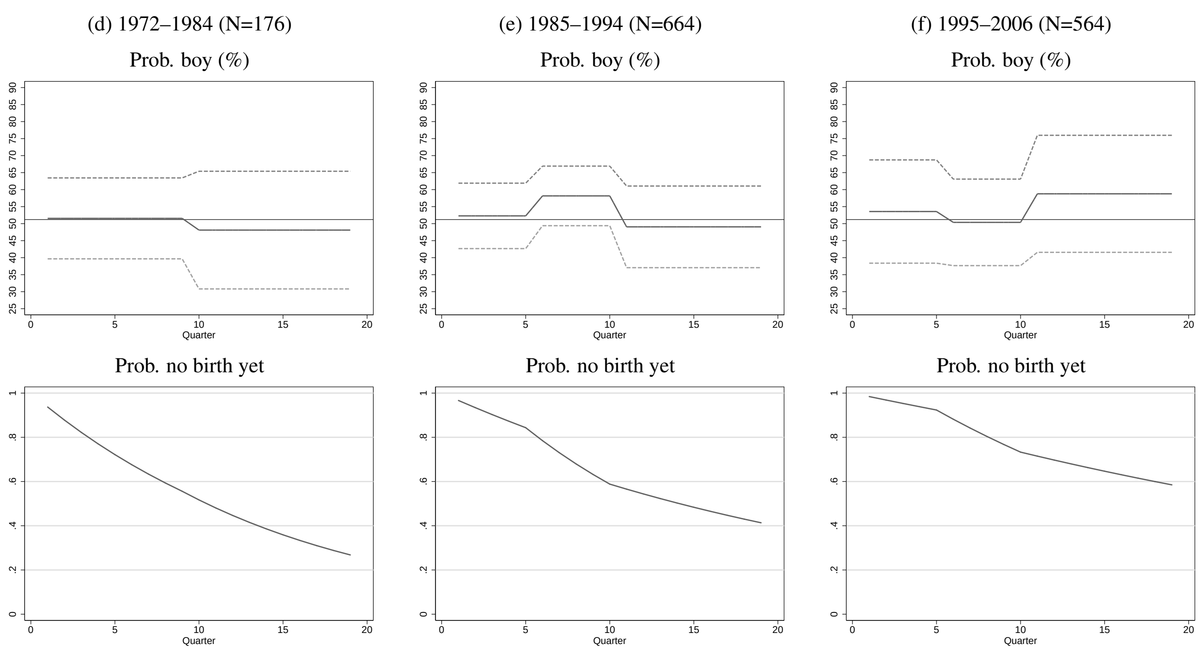
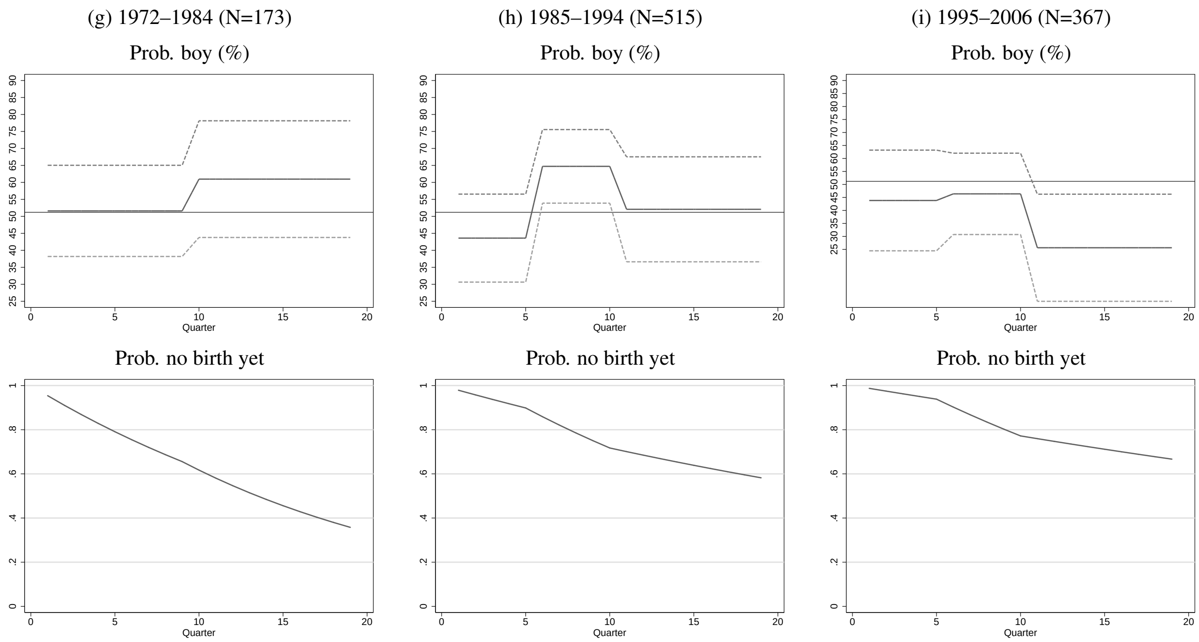


Figure H.21: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First three children two boys and one girl



First three children boys

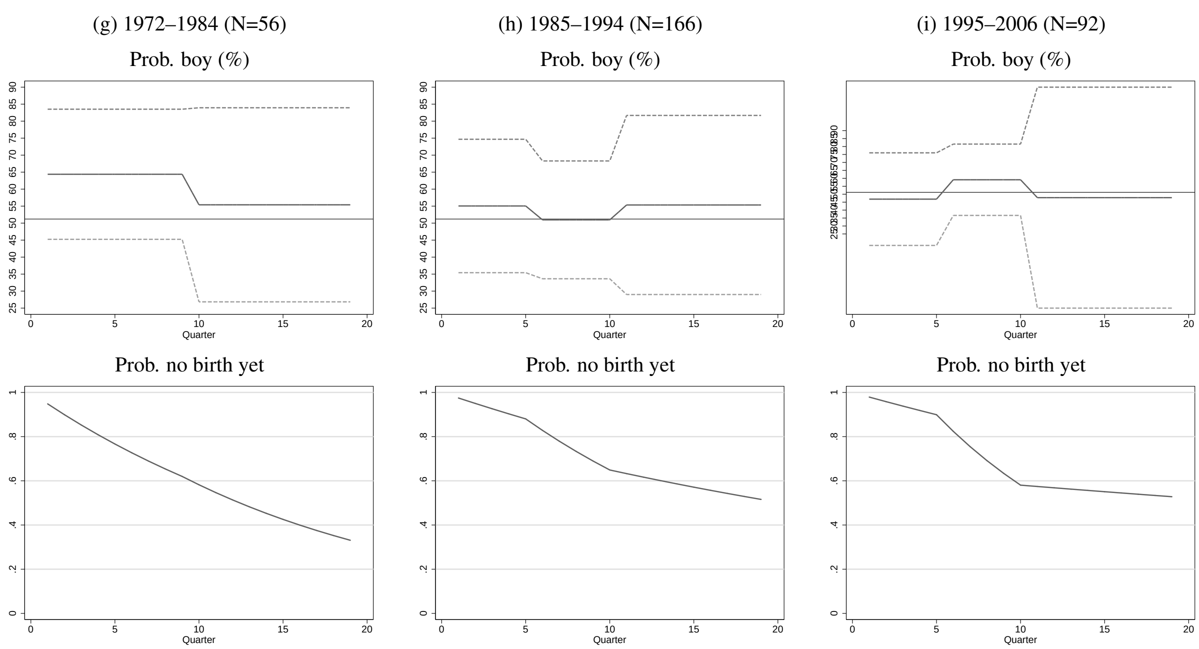


Figure H.21: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

I Graphs using Women Married less than 19 Years

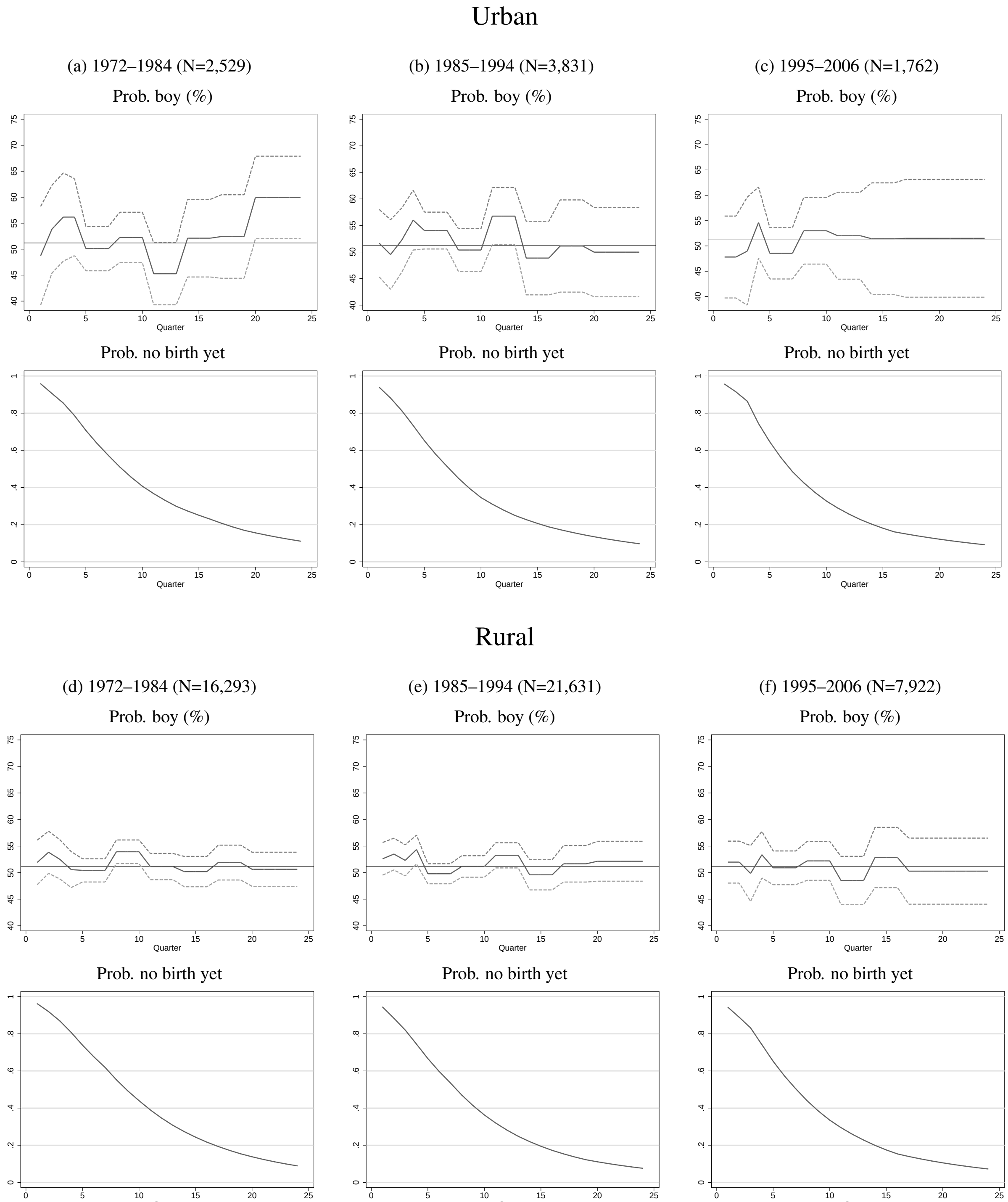


Figure I.1: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with no education by quarter (3 month period). Predictions based on age 16 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

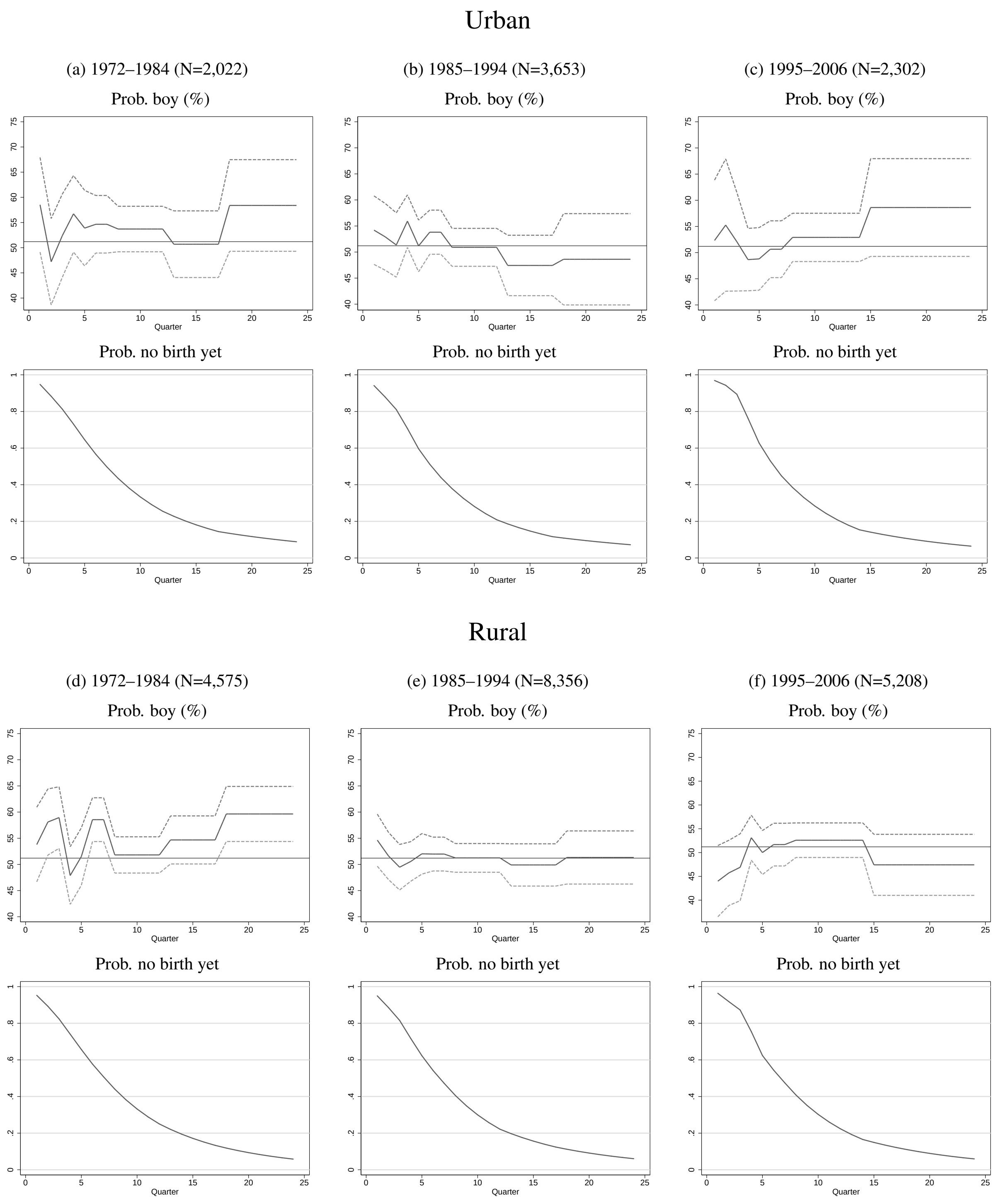


Figure I.2: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 17 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

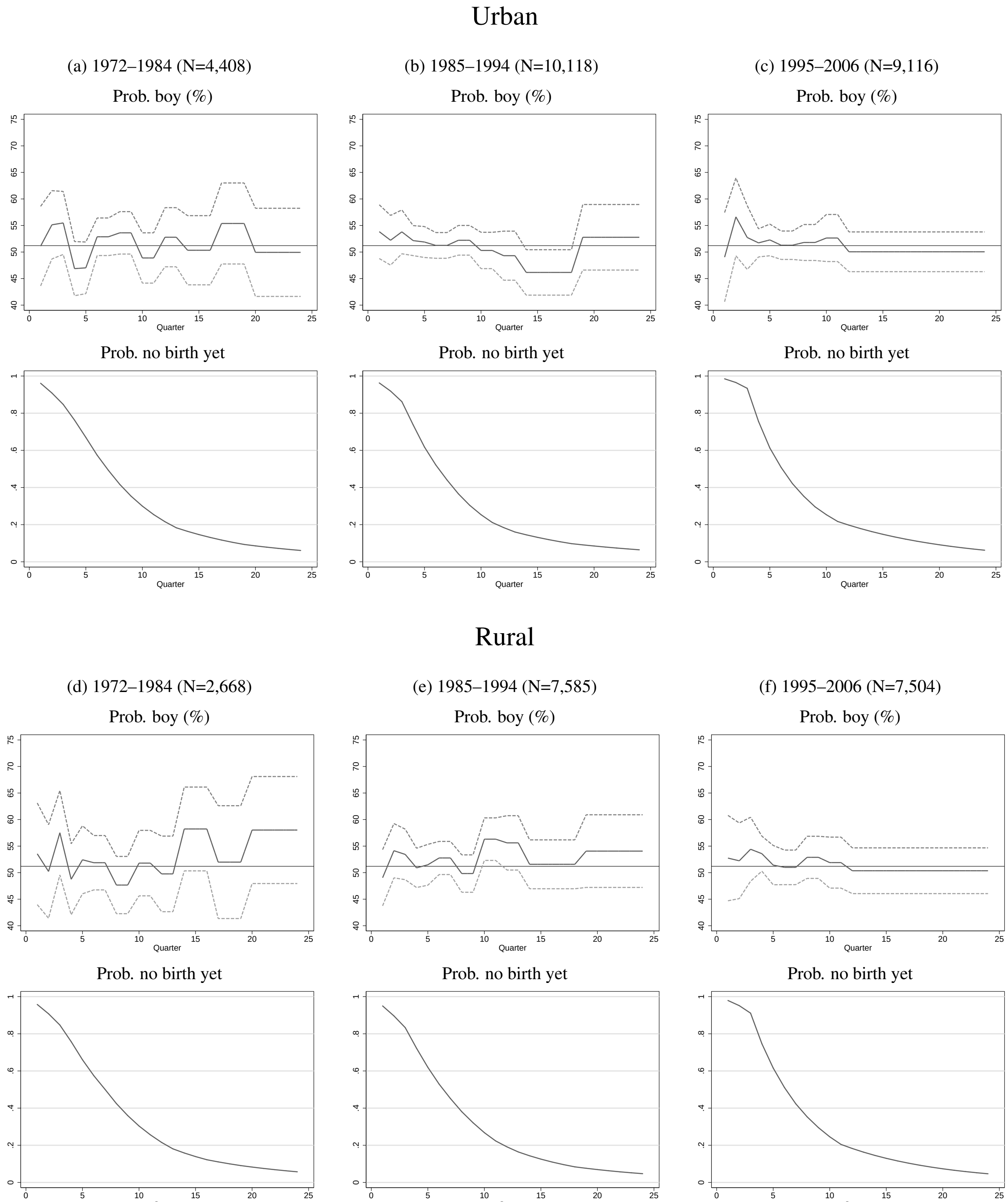


Figure I.3: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with 8 or more years of education by quarter (3 month period). Predictions based on age 20 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

I.1 Second Spell

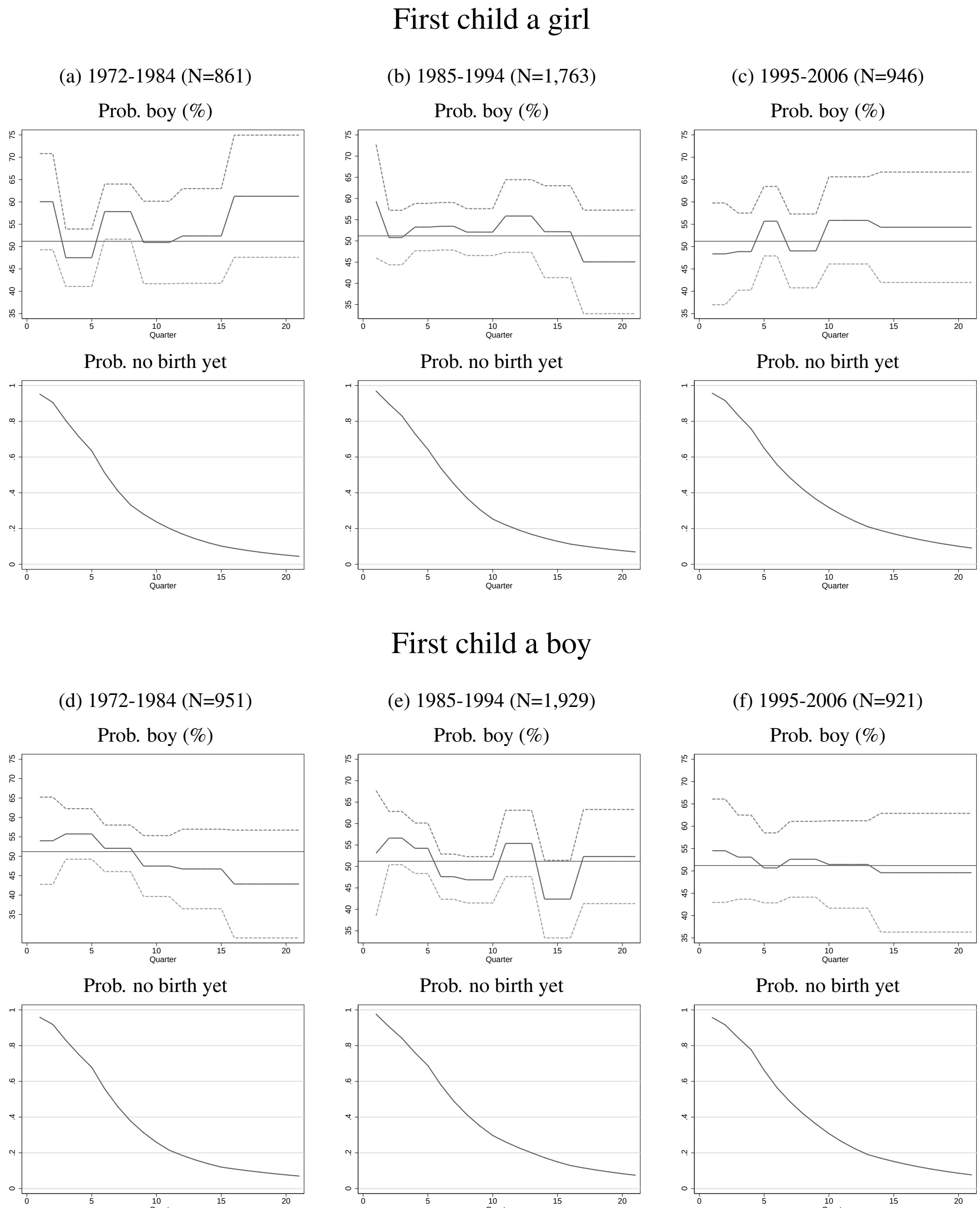


Figure I.4: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with no education by quarter (3 month period). Predictions based on age 18 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

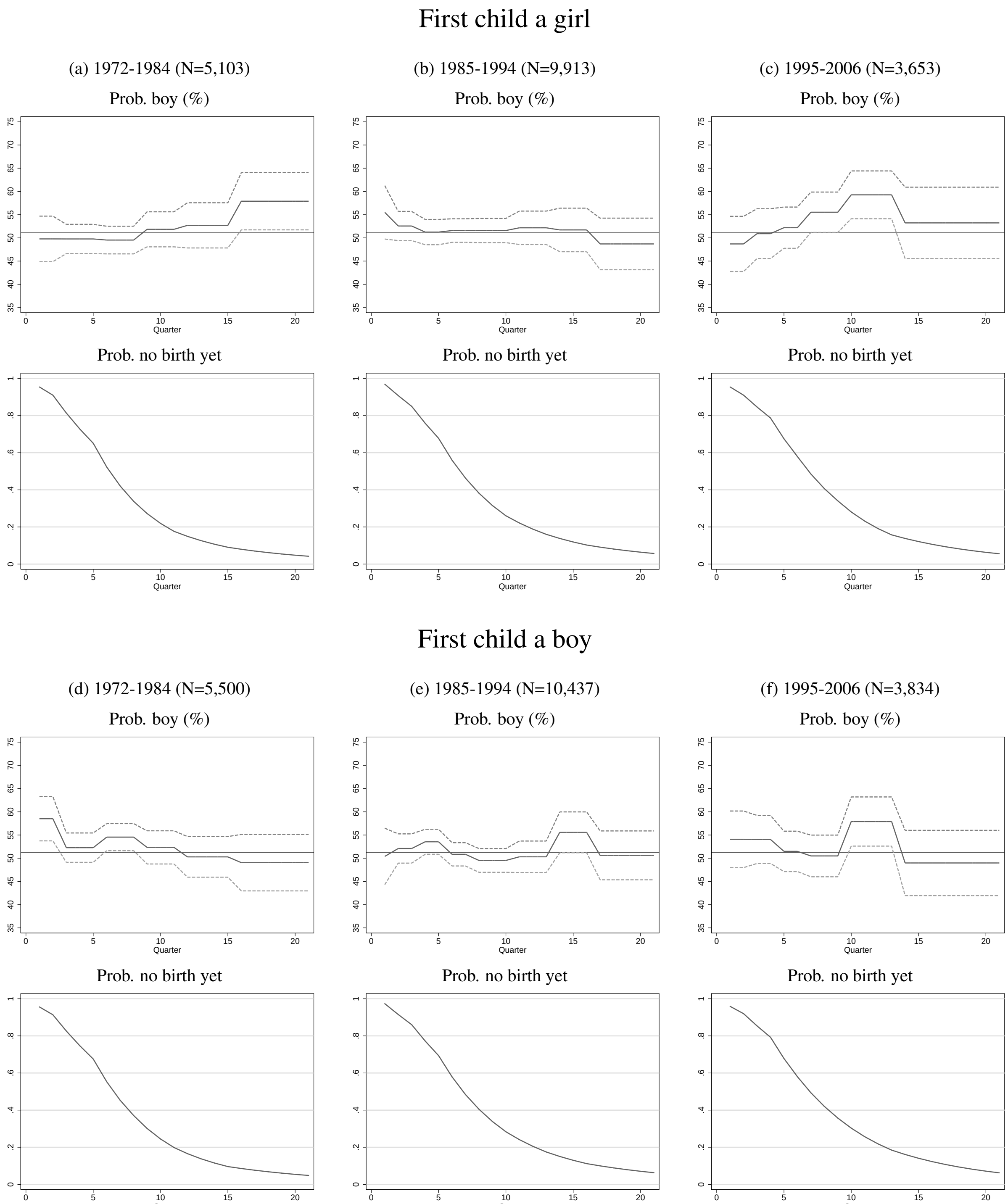


Figure I.5: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with no education by quarter (3 month period). Predictions based on age 18 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

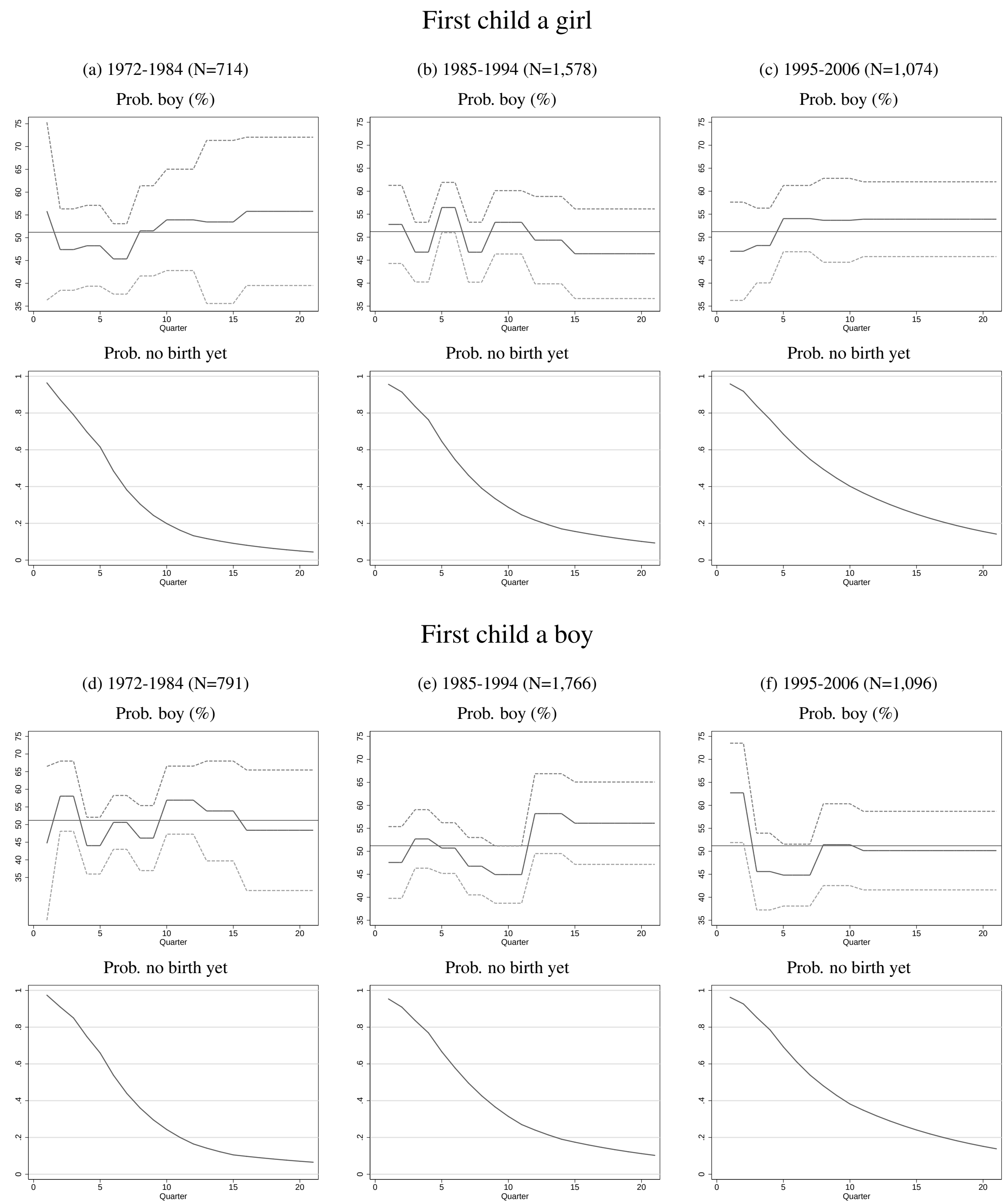


Figure I.6: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 19 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

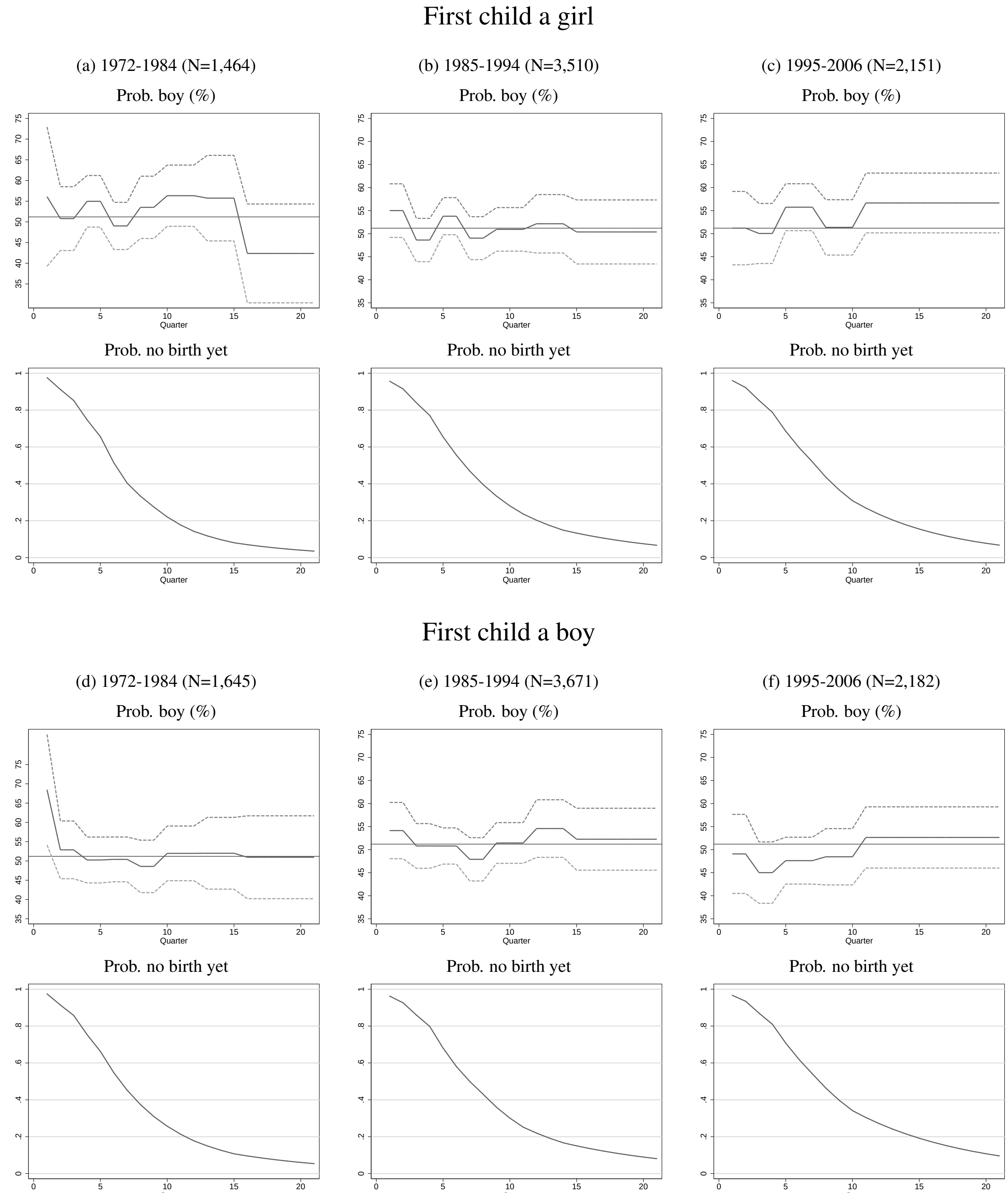
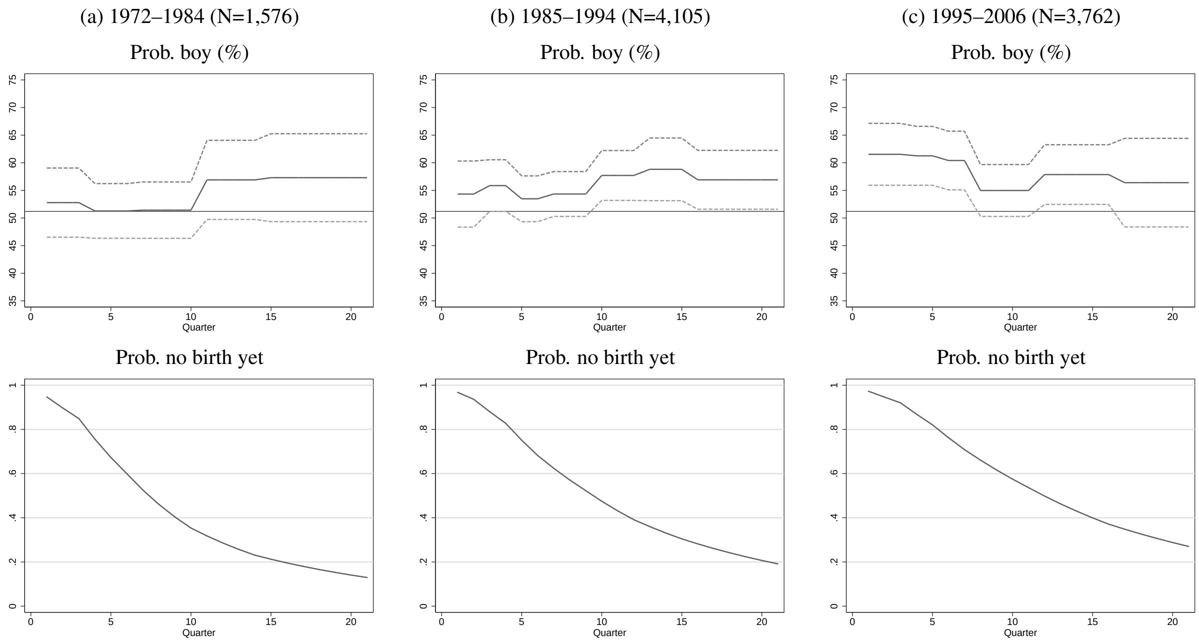


Figure I.7: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 19 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First child a girl



First child a boy

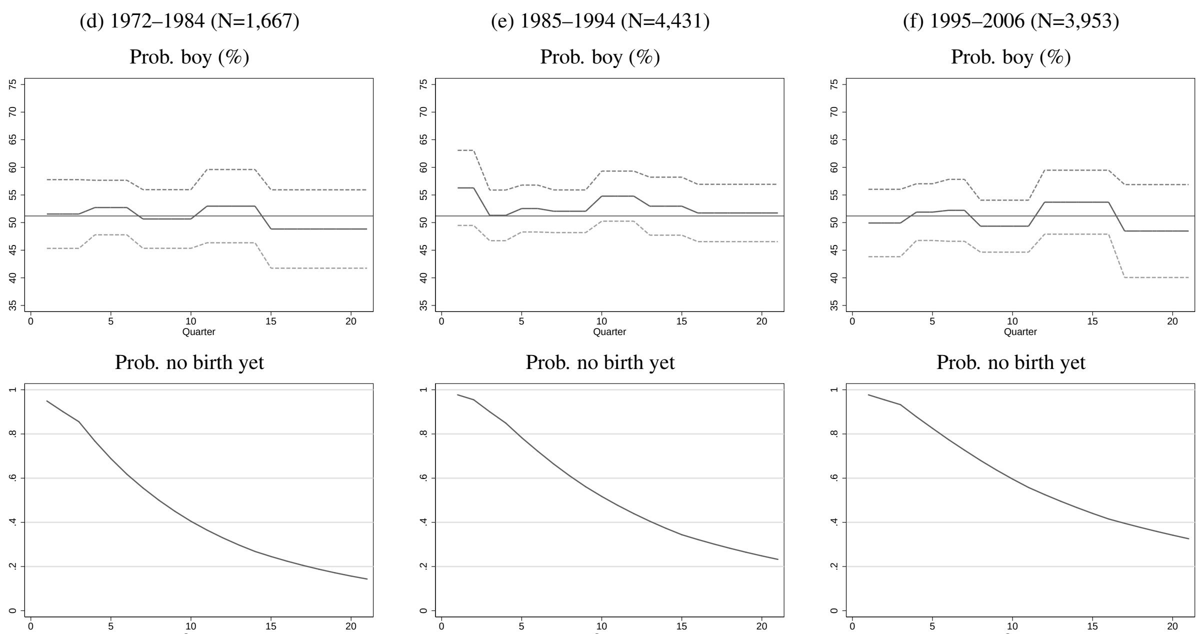


Figure I.8: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 22 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

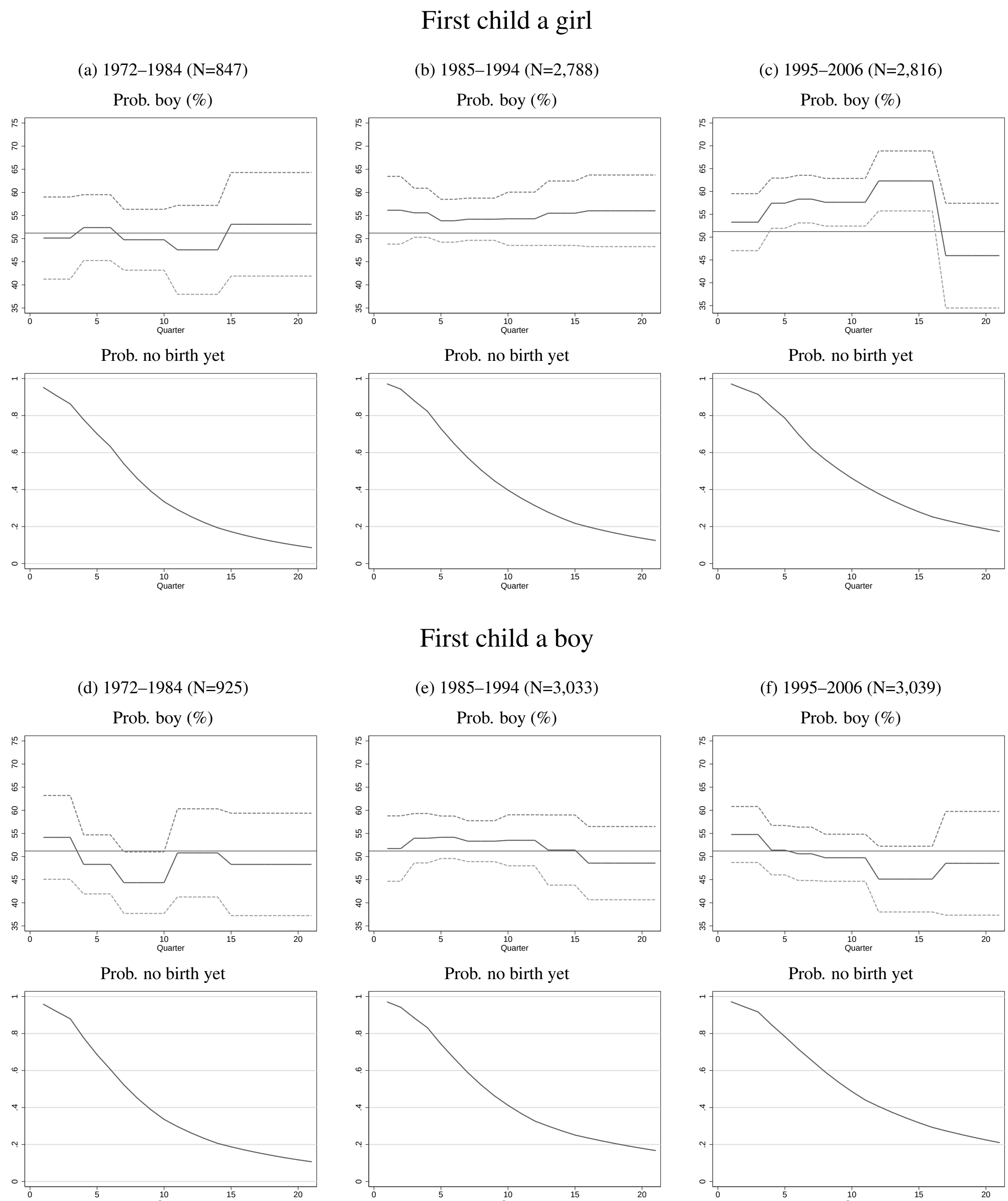


Figure I.9: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 22 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

I.2 Third Spell

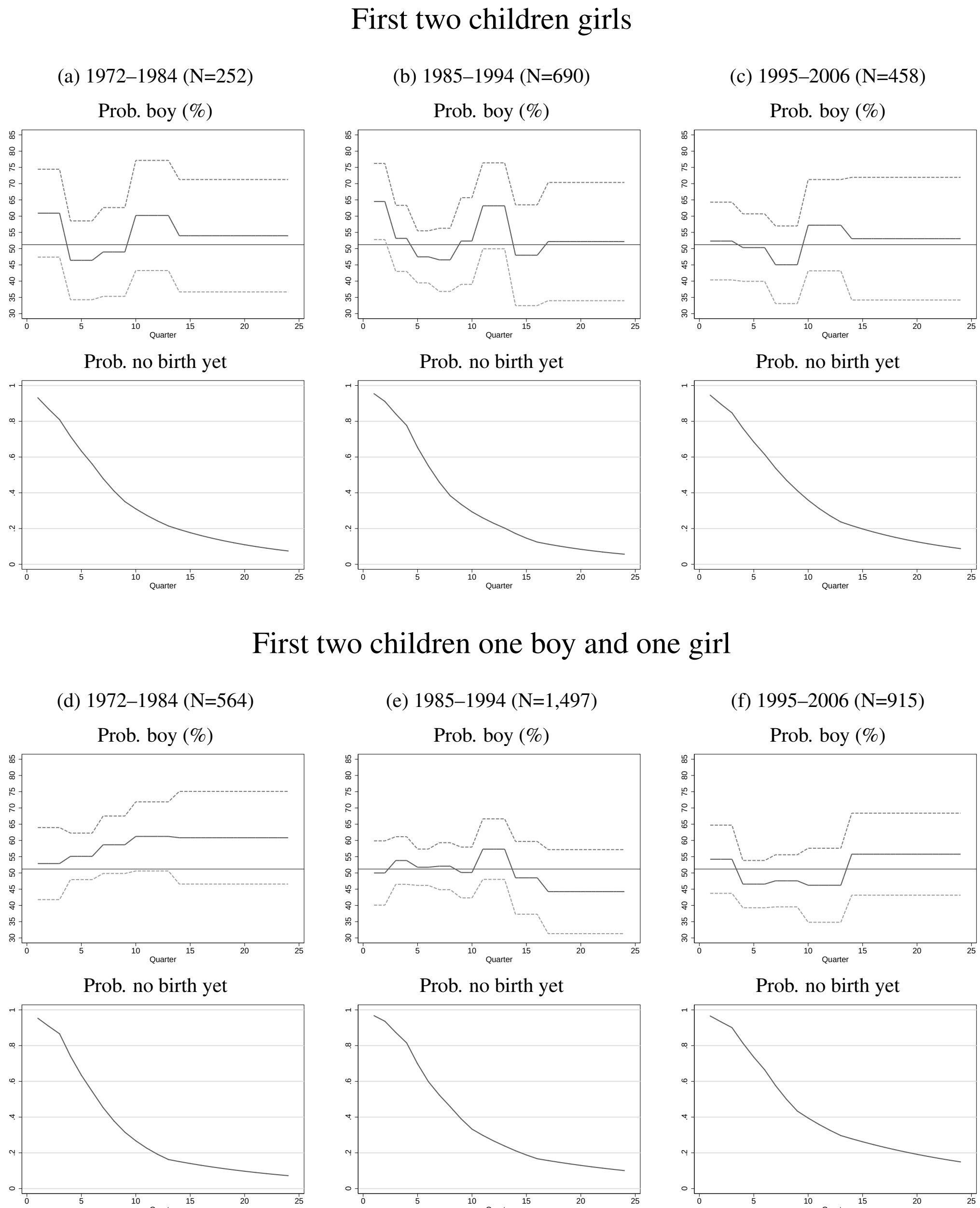


Figure I.10: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

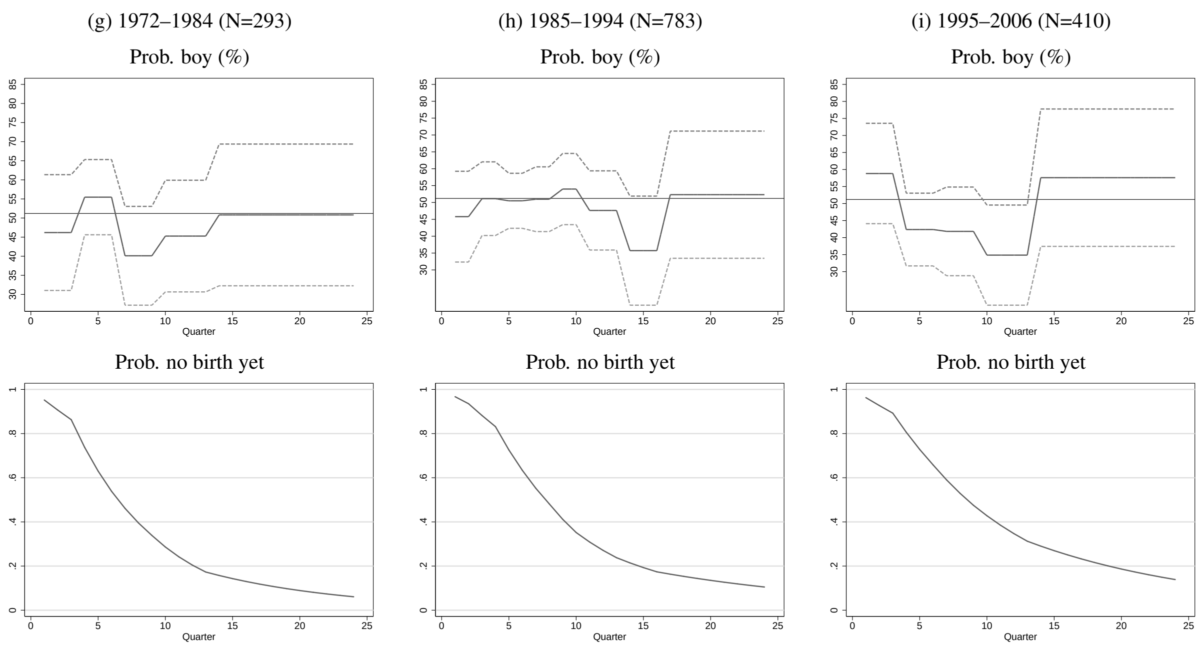


Figure I.10: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

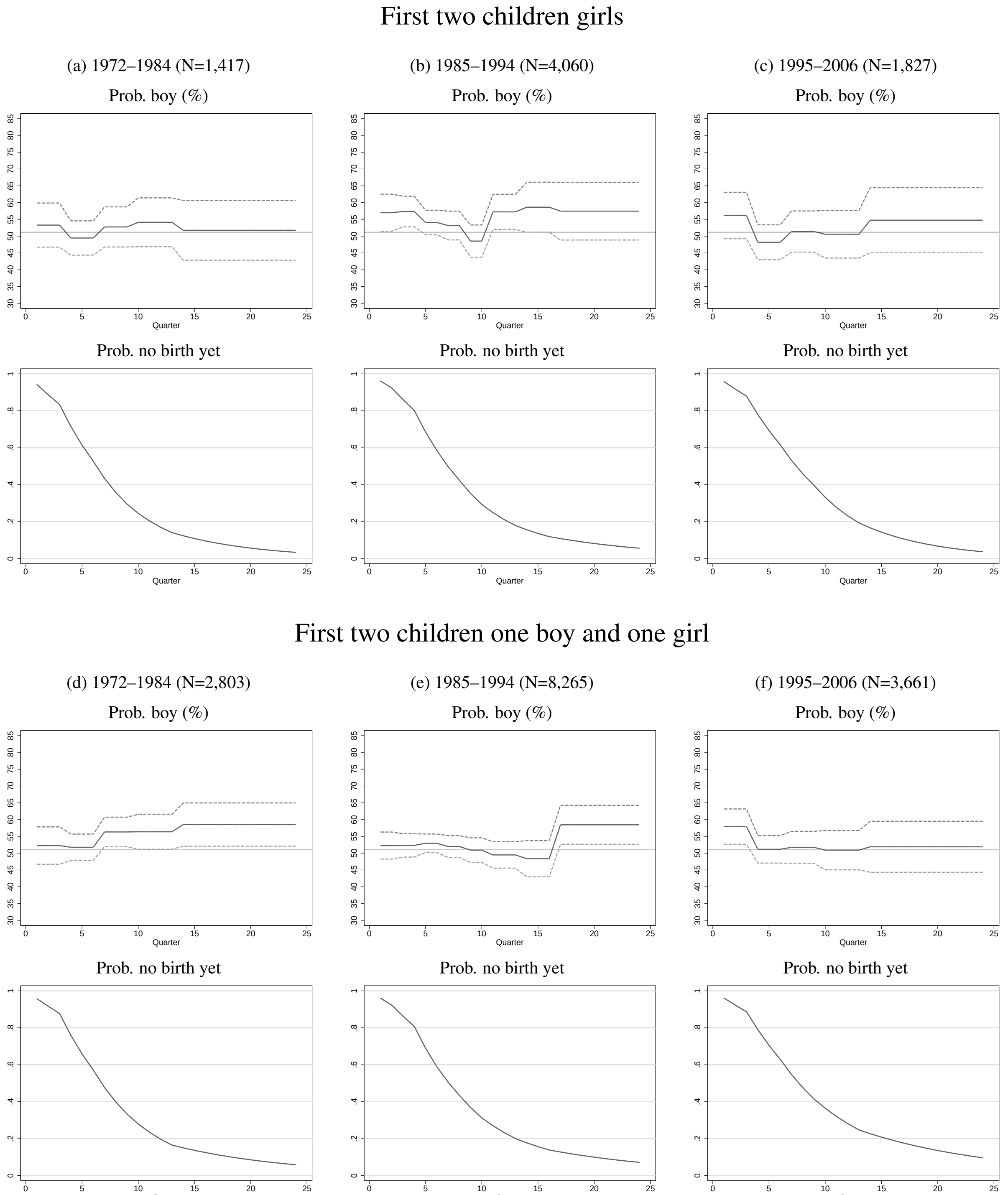


Figure I.11: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

First two children boys

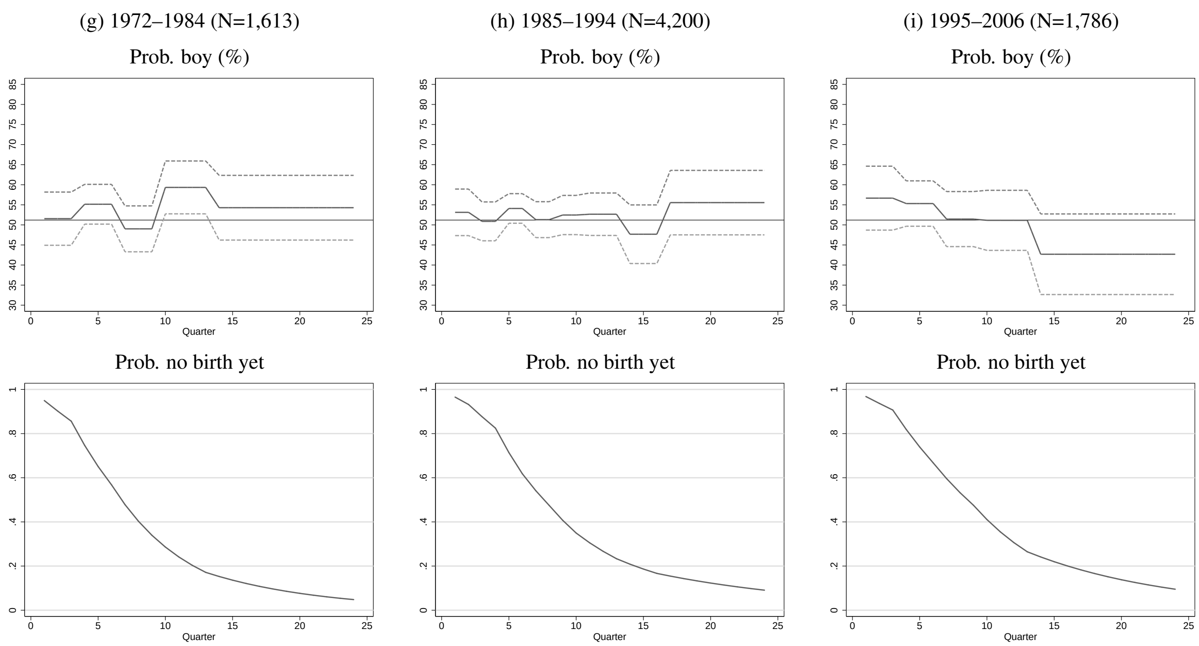


Figure I.11: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

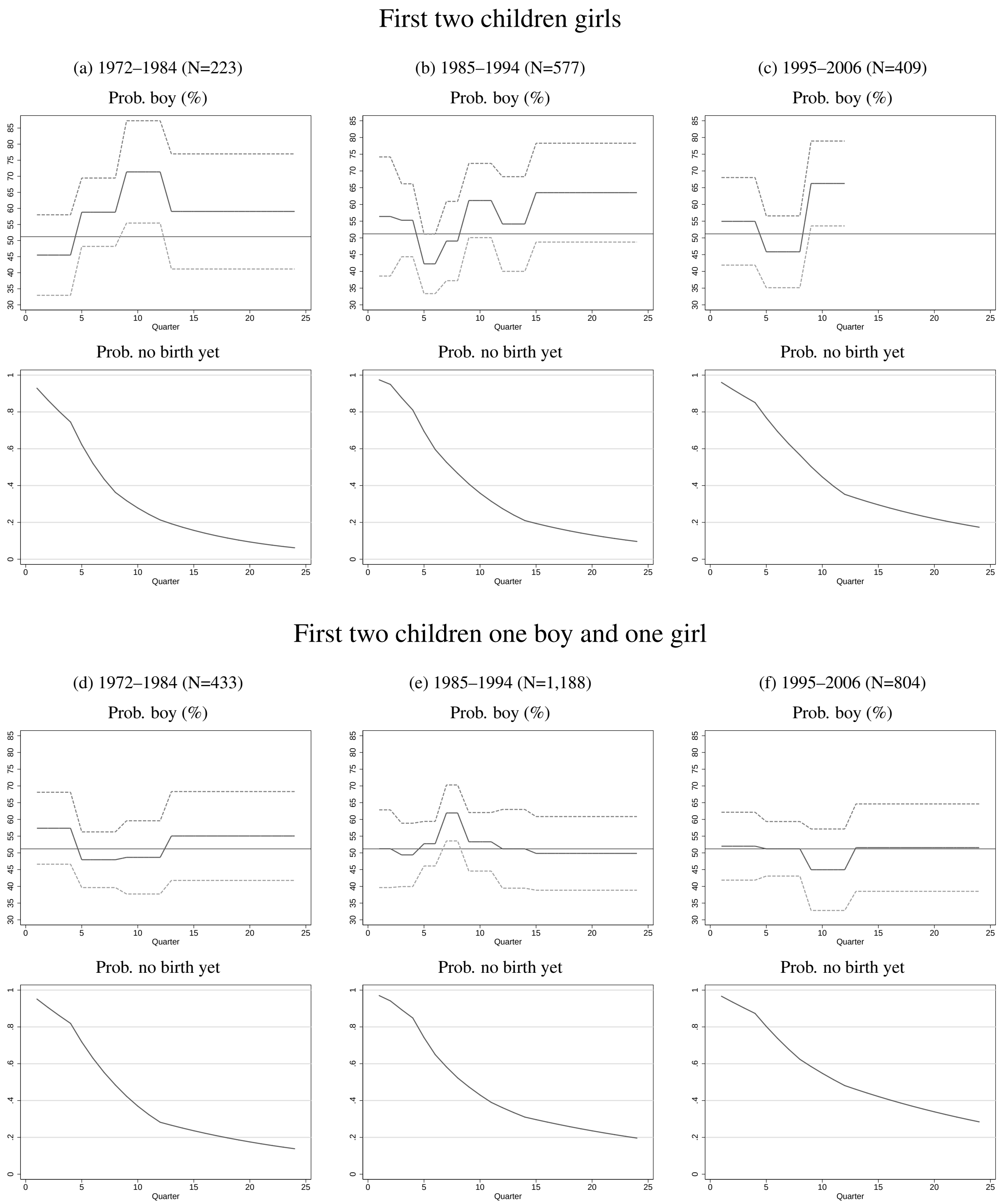


Figure I.12: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

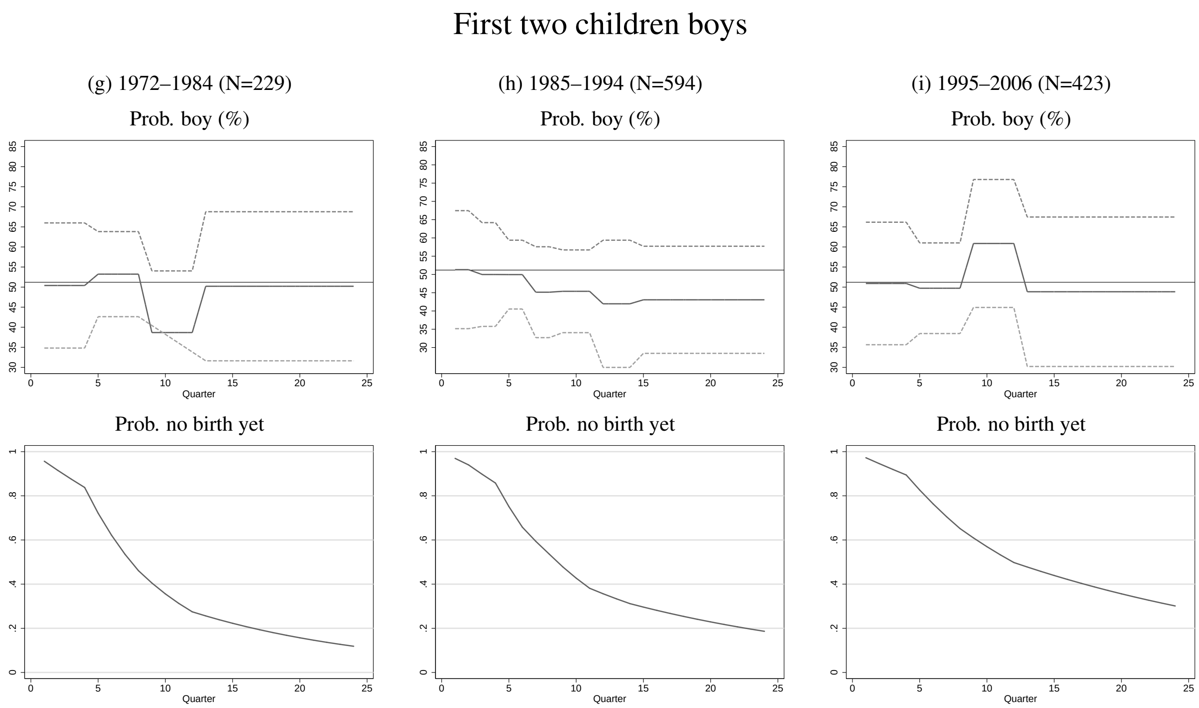


Figure I.12: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

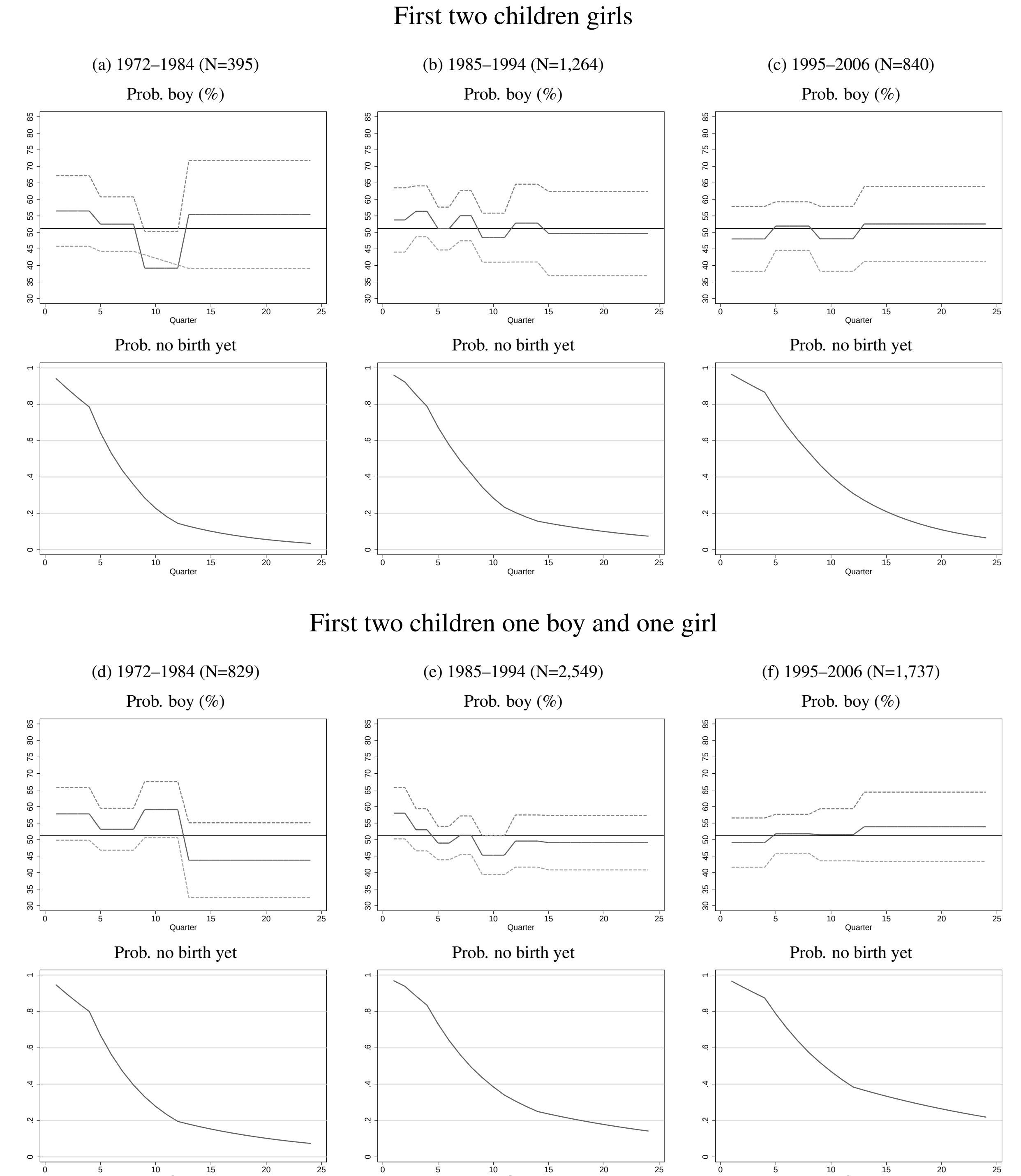


Figure I.13: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

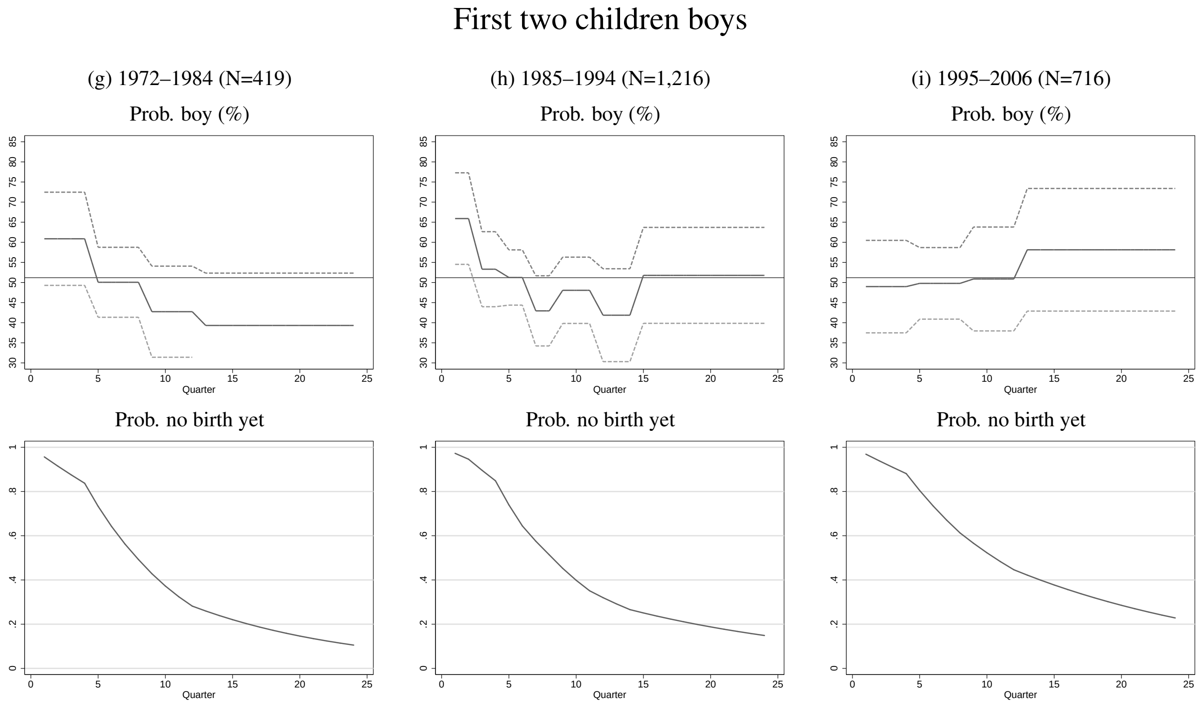


Figure I.13: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

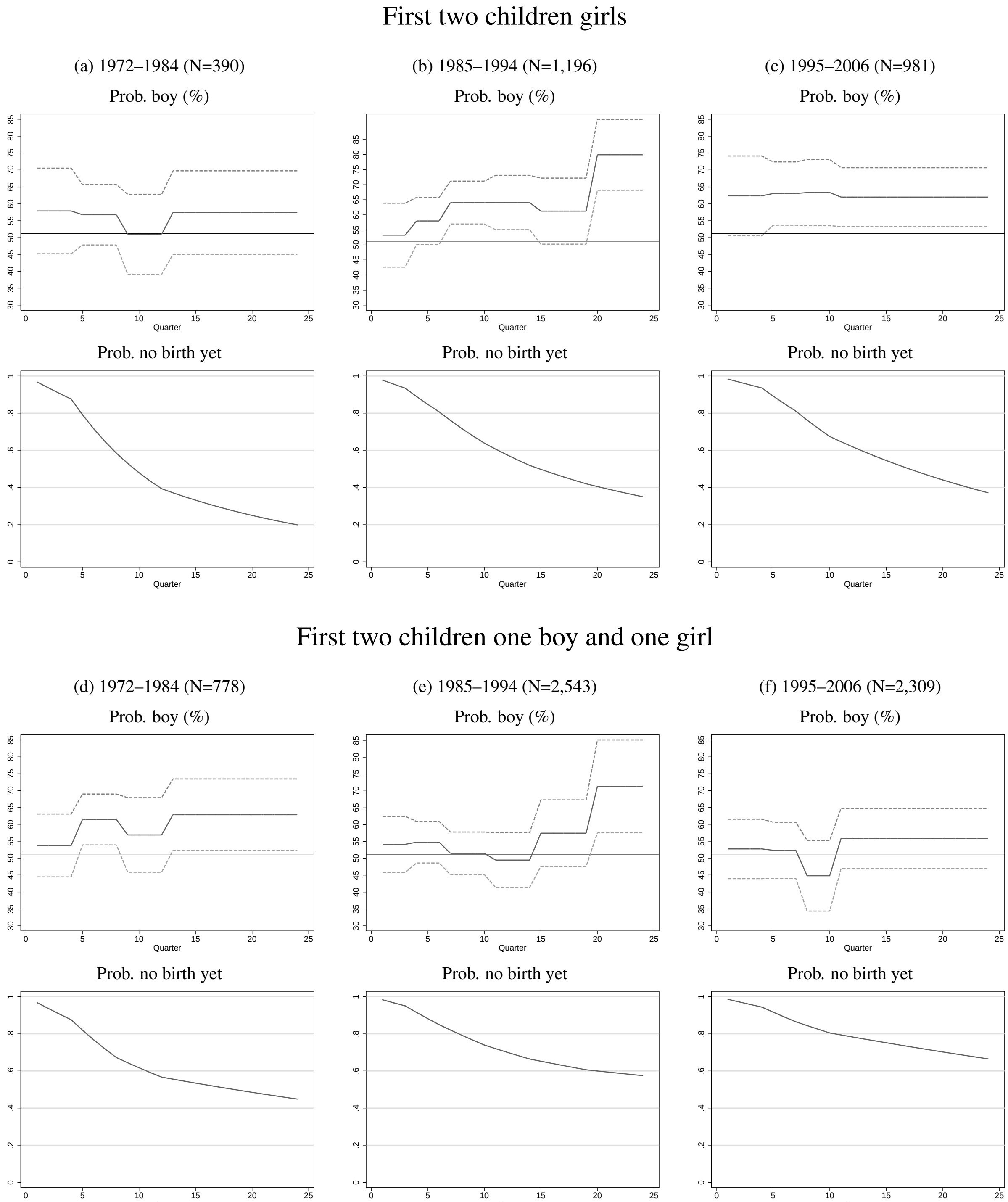


Figure I.14: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

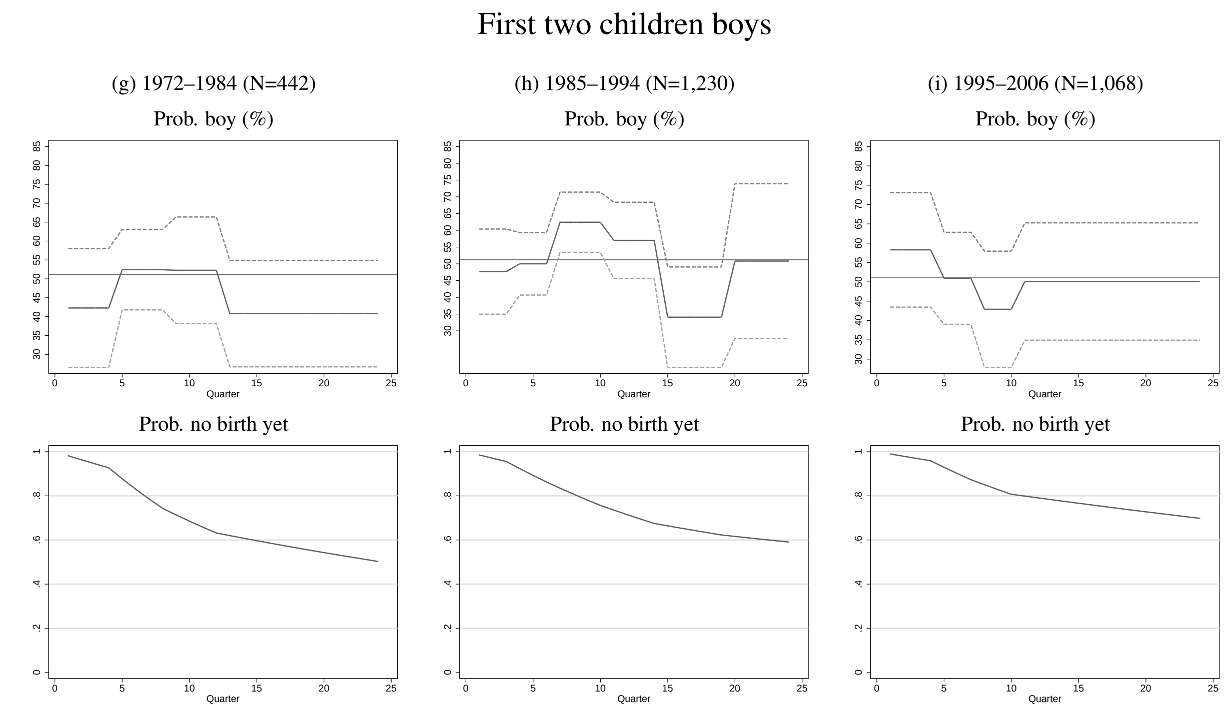


Figure I.14: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

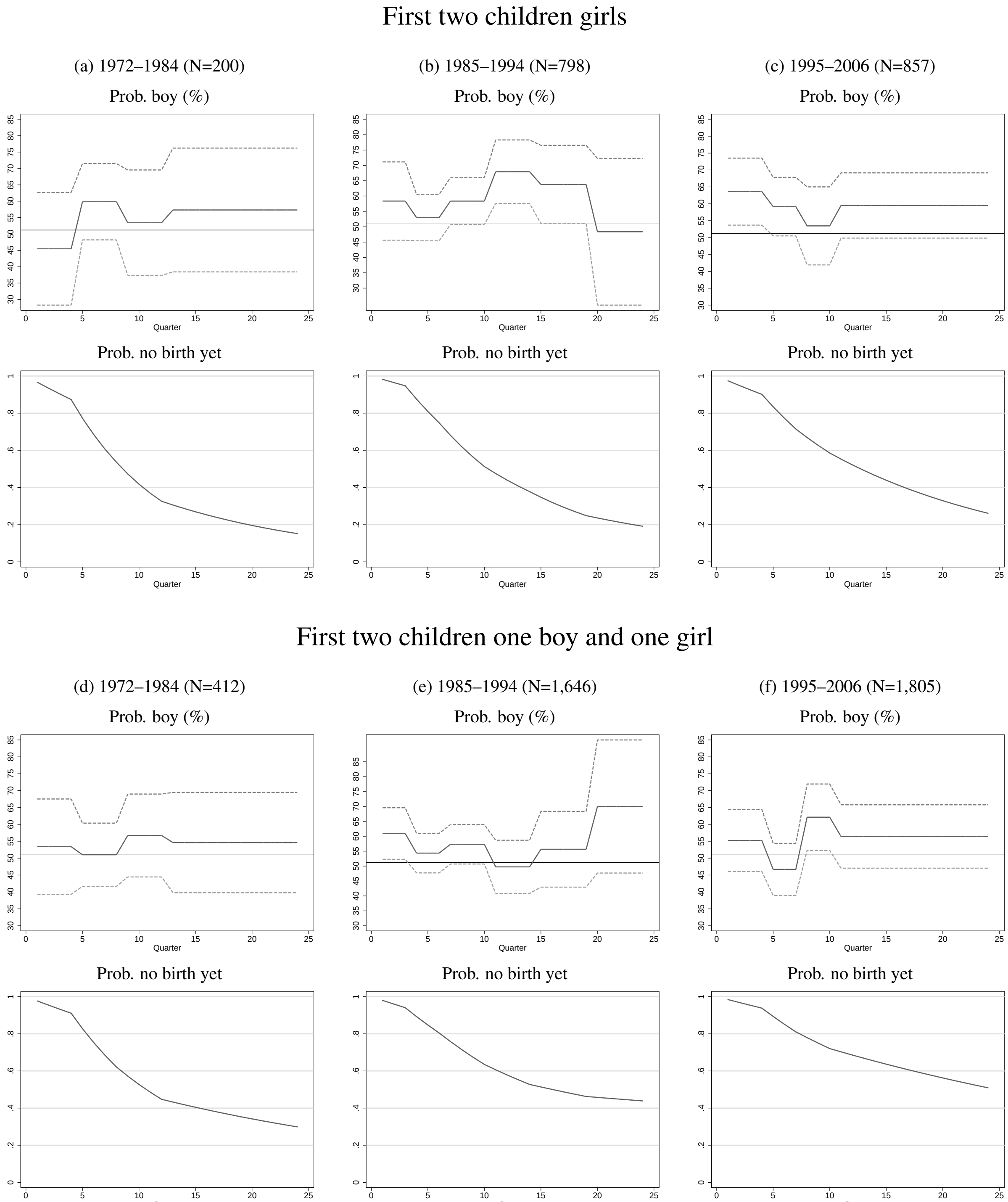


Figure I.15: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

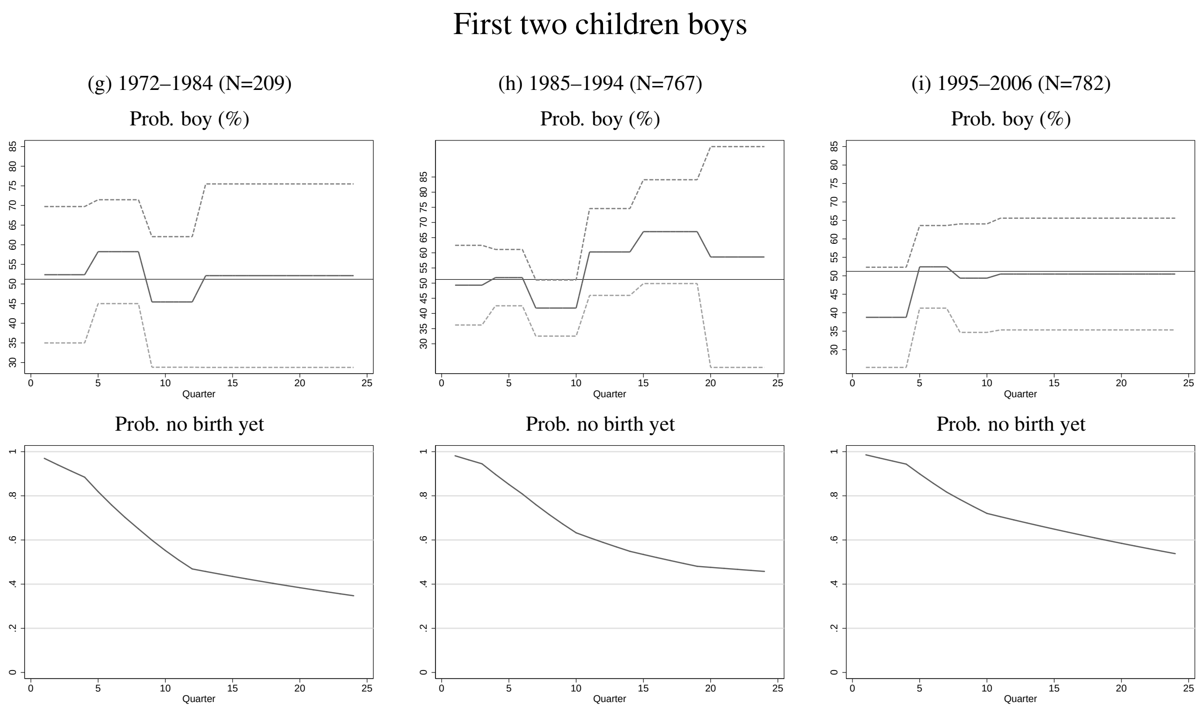


Figure I.15: (Continued) Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

J Graphs using Women Dropped Because of Recall Error

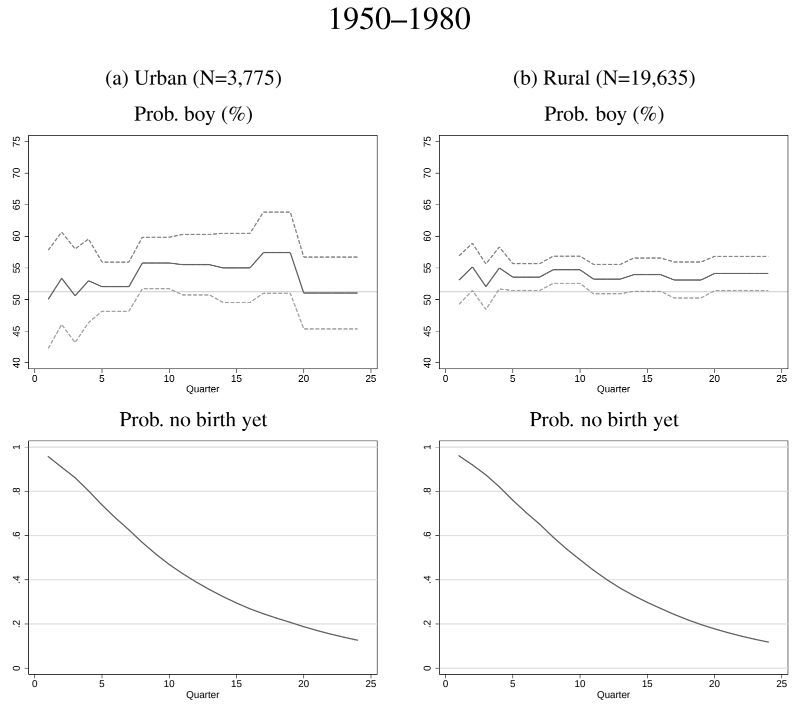


Figure J.1: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with no education by quarter (3 month period). Predictions based on age 16 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1954–1980

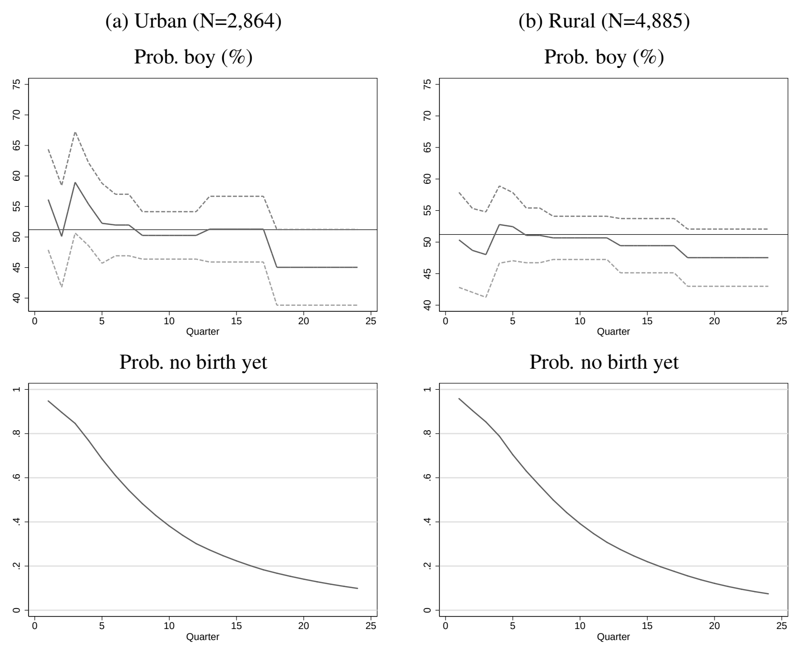


Figure J.2: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 17 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1955–1980

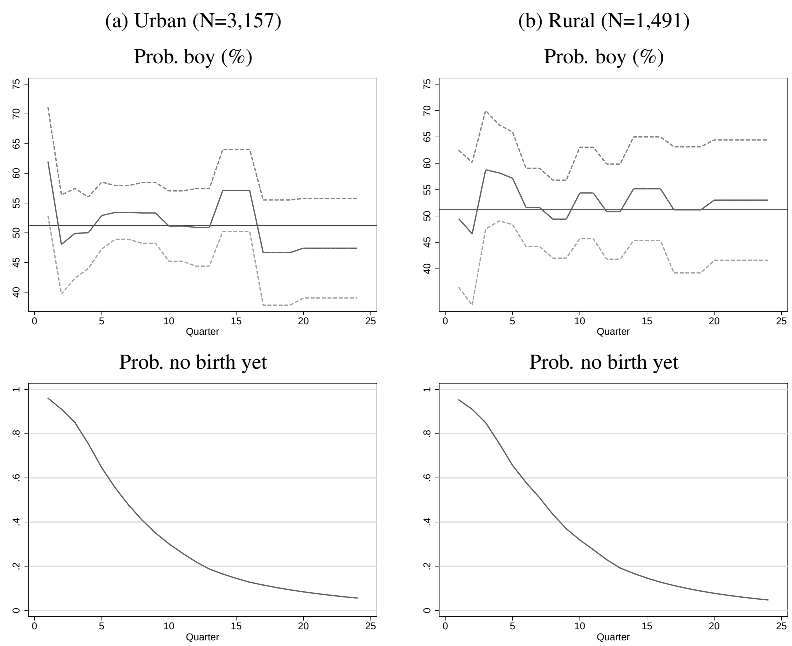


Figure J.3: Predicted probability of having a boy and probability of no birth yet from time of marriage for women with 8 or more years of education by quarter (3 month period). Predictions based on age 20 at marriage. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

J.1 Second Spell

1954–1984

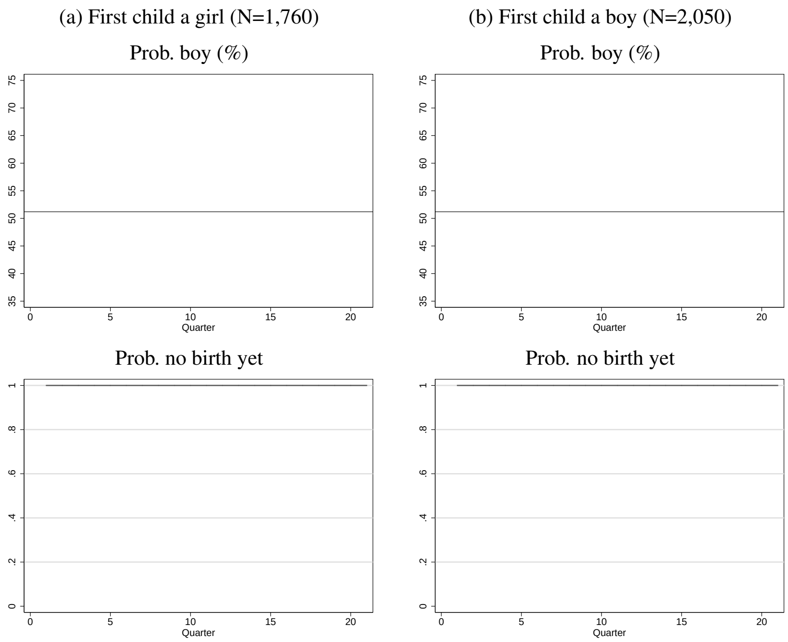


Figure J.4: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with no education by quarter (3 month period). Predictions based on age 18 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1954–1984

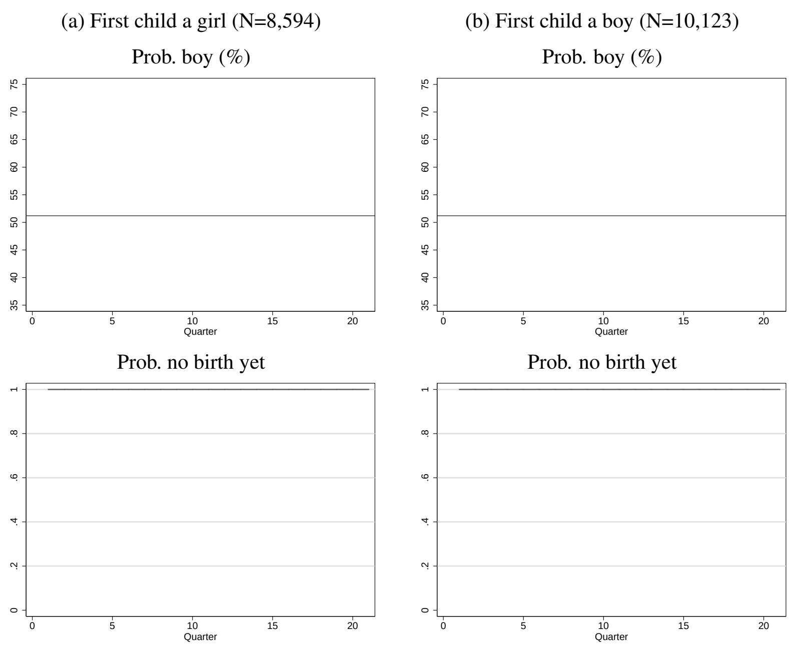


Figure J.5: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with no education by quarter (3 month period). Predictions based on age 18 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1955–1984

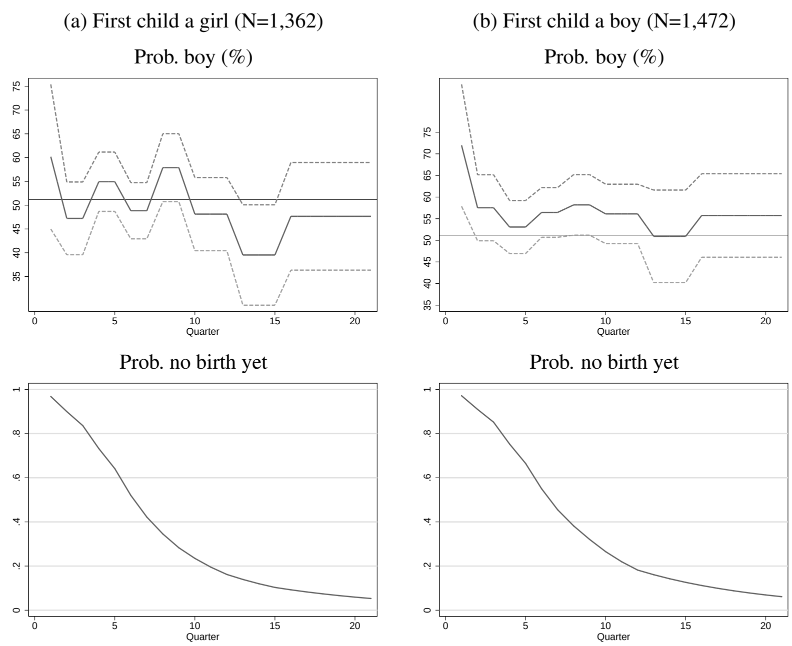


Figure J.6: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 19 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1955–1984

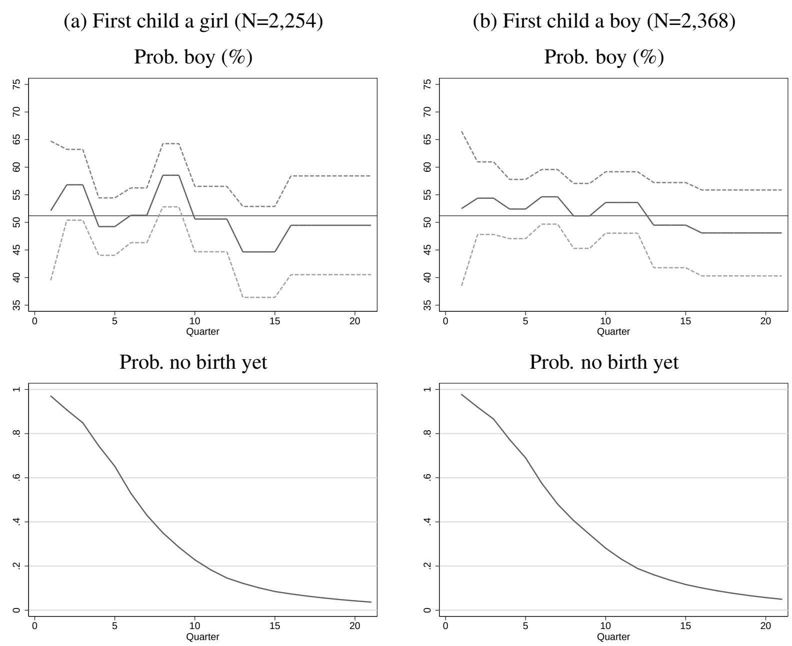


Figure J.7: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 19 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1957–1984

(a) First child a girl (N=1,498) (b) First child a boy (N=1,607)

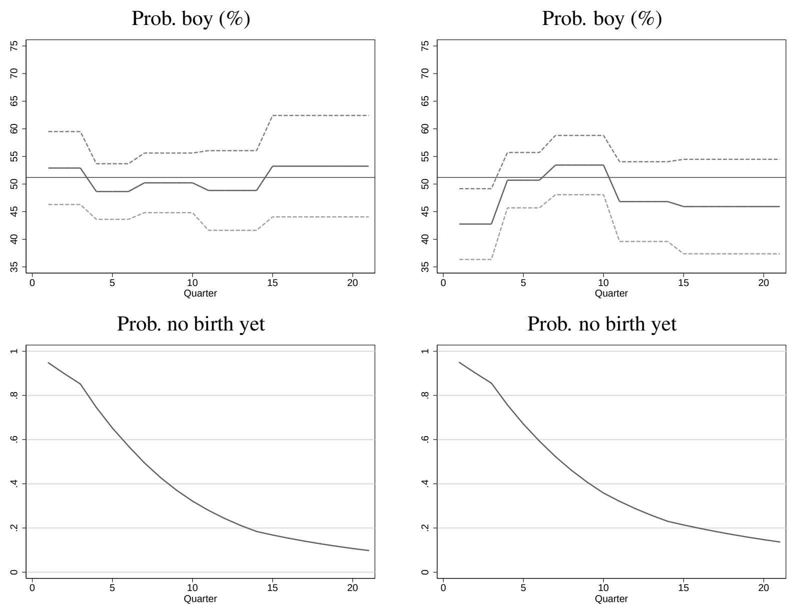


Figure J.8: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 22 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1957–1984

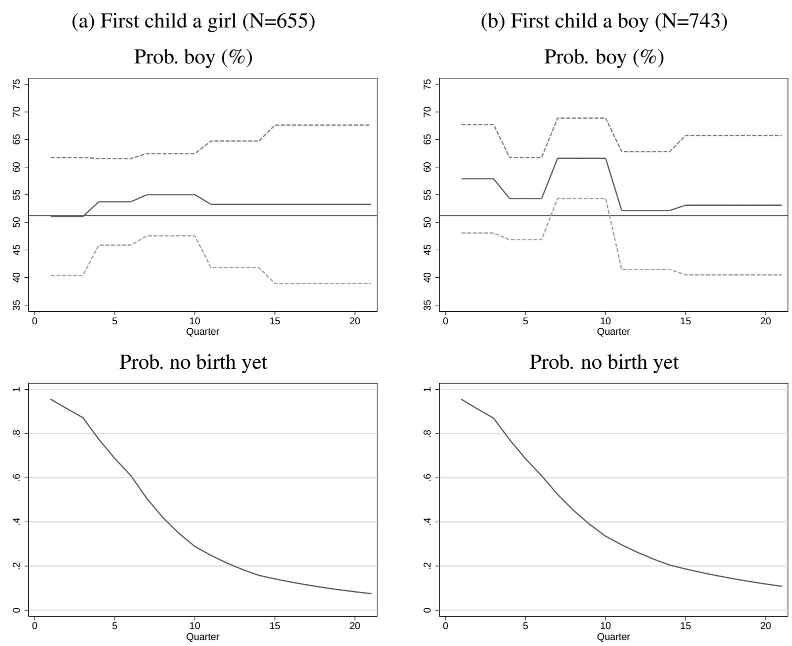


Figure J.9: Predicted probability of having a boy and probability of no birth yet from nine months after first birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 22 at first birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

J.2 Third Spell

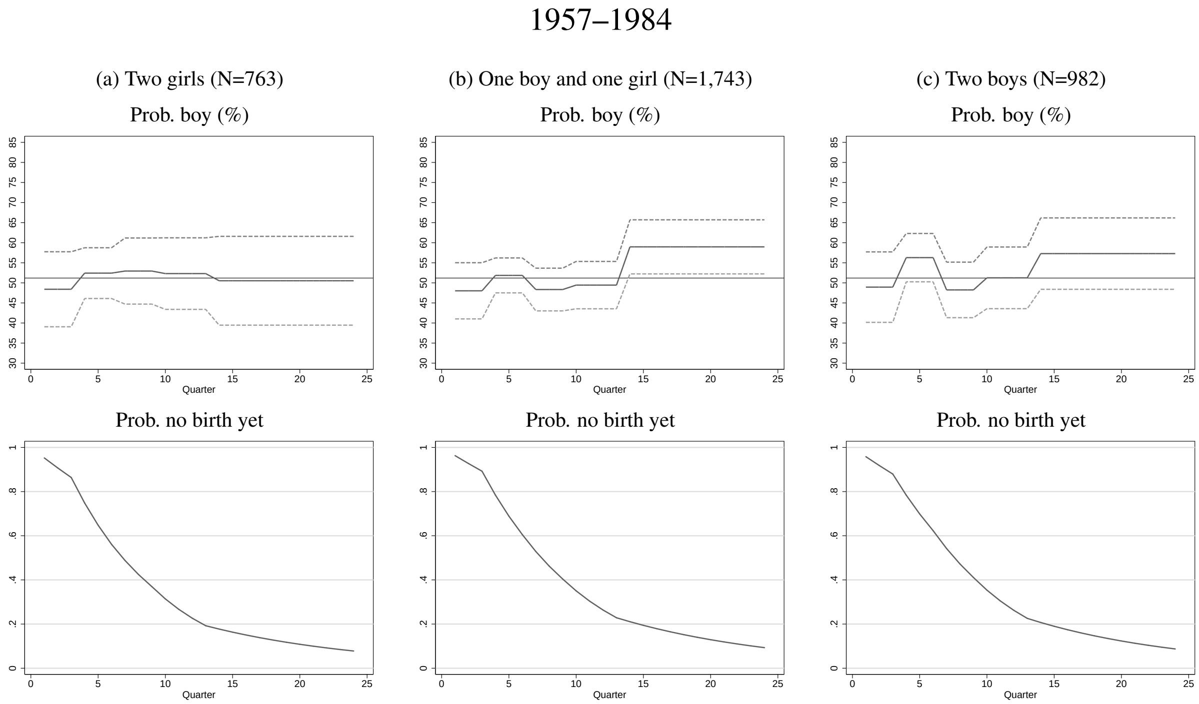


Figure J.10: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

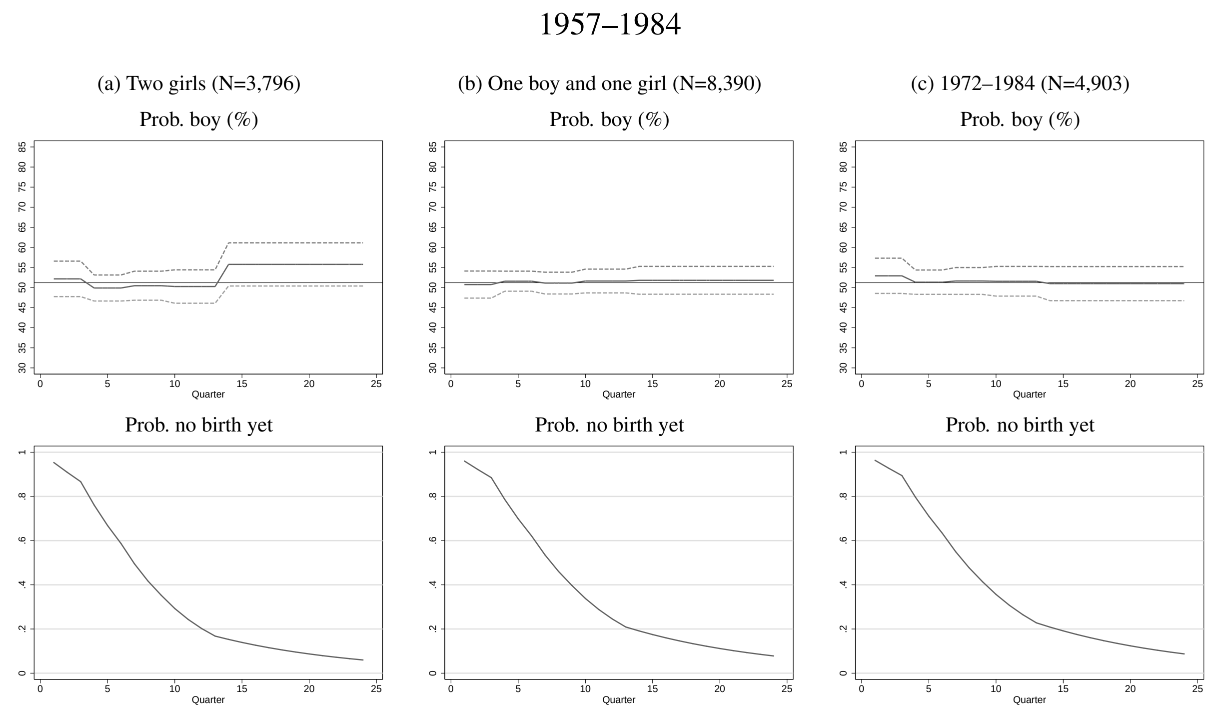


Figure J.11: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with no of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1958–1984

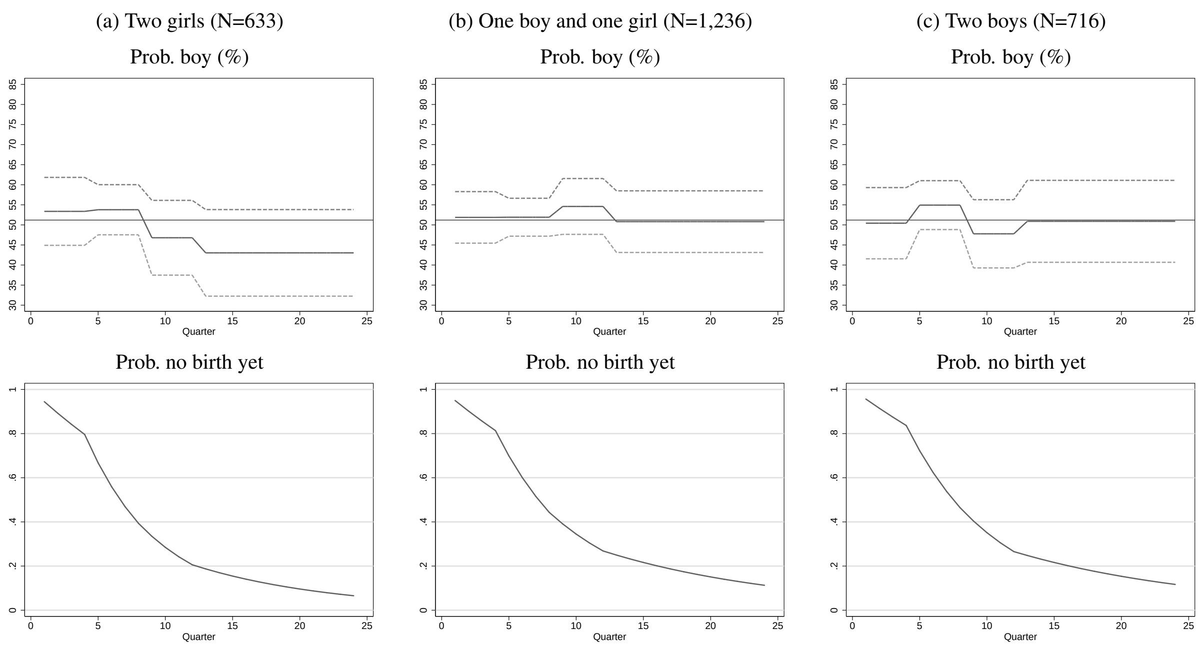


Figure J.12: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1958–1984

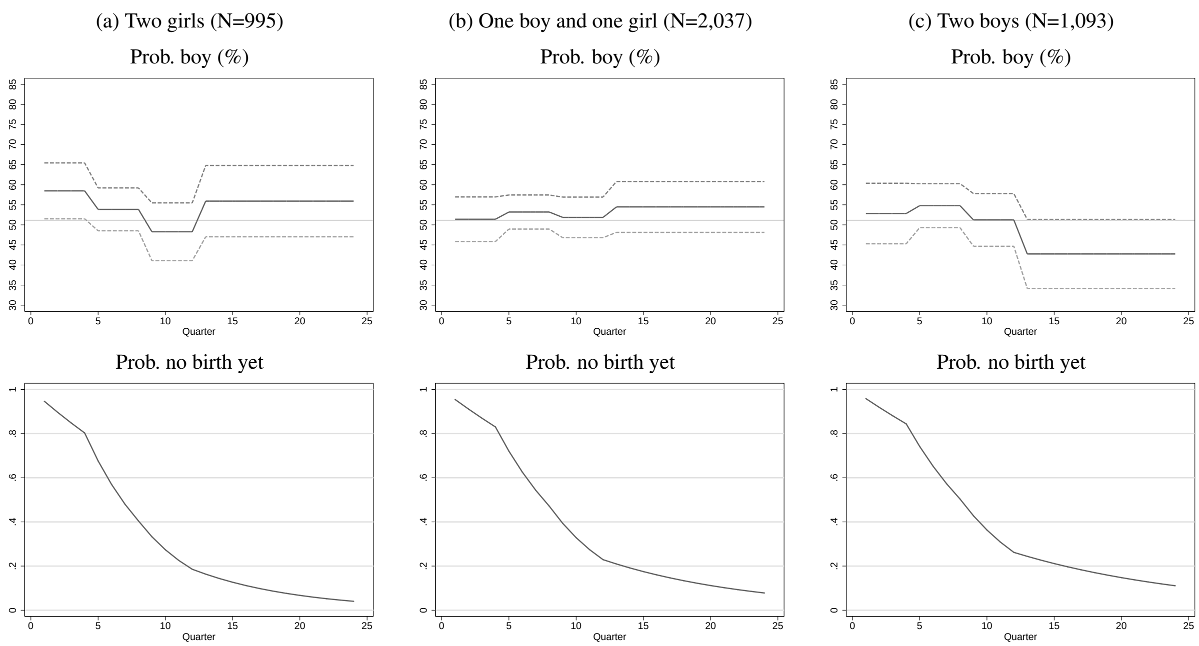


Figure J.13: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 1 to 7 years of education by quarter (3 month period). Predictions based on age 21 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

1960–1984

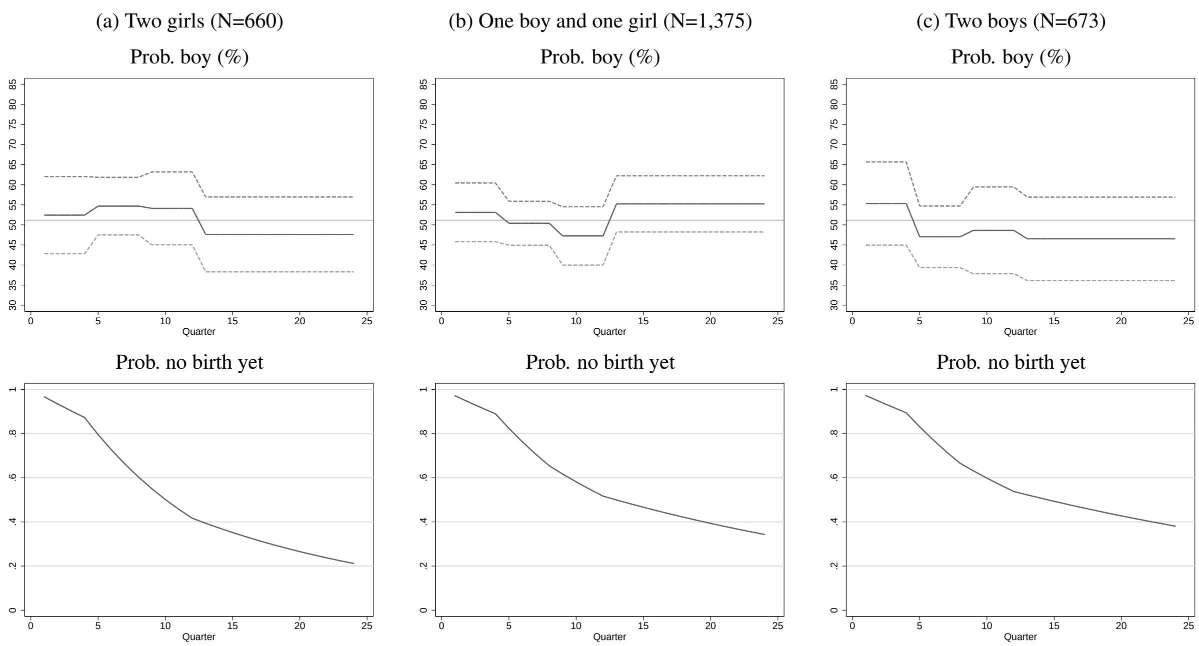


Figure J.14: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for urban women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

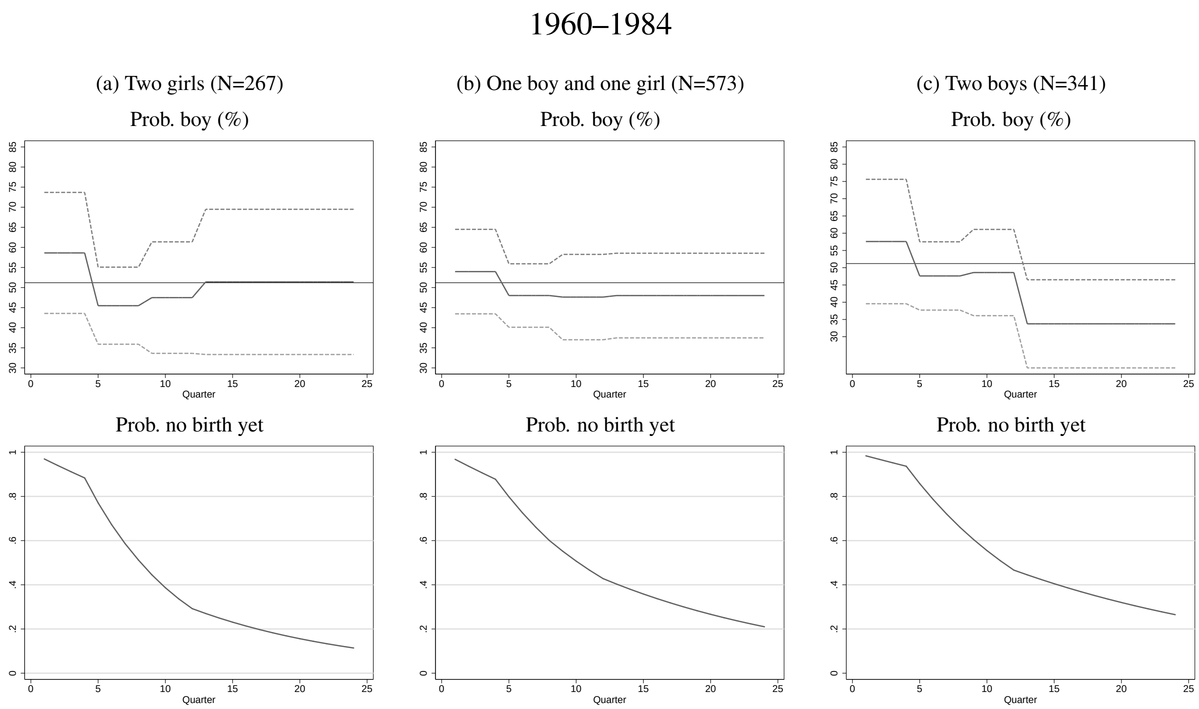


Figure J.15: Predicted probability of having a boy and probability of no birth yet from nine months after second birth for rural women with 8 or more years of education by quarter (3 month period). Predictions based on age 24 at second birth. Left column shows results prior to sex selection available, middle column before sex selection illegal and right column after sex selection illegal. N indicates the number of women in the relevant group in the underlying samples.

References

Abrevaya, Jason, “Are There Missing Girls in the United States? Evidence from Birth Data,” *American Economic Journal: Applied Economics*, 2009, *1* (2), 1–34.

Bhat, P N Mari, “Sex Ratio in India,” *Lancet*, 2006, *367* (9524), 1725–1726.

George, Sabu M, “Sex Ratio in India,” *Lancet*, 2006, *367* (9524), 1725.

Jha, Prabhat, Rajesh Kumar, Priya Vasa, Neeraj Dhingra, Deva Thiruchelvam, and Rahim Moineddin, “Low male-to-female [sic] sex ratio of children born in India: national survey of 1.1 million households,” *Lancet*, 2006, *367*, 211–218.

Retherford, Robert D and T K Roy, “Factors Affecting Sex-Selective Abortion in India and 17 Major States,” Technical Report, Mumbai, India 2003.