The Power of the Dutch Pill: The Short and Long Term Effects of Access to Birth Control

Olivier Marie* Esmée S. Zwiers†

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- EXTENDED ABSTRACT -

Fertility decisions have large long term effects on economic outcomes for both parents and children. The timing of selection into motherhood is particularly important for young women, as a birth can have large effects on her human capital accumulation. However, individual fertility and human capital investment decisions are likely endogenous which makes it hard to establish causality in this relationship. For this reason, economists have often turned to another mechanism that has a strong direct impact on the fertility decision: changes in birth control method availability. The most well-known and most studied of these is probably the legalization of abortion in the United States.[1] Another birth control technology that exogenously affected fertility decisions was the introduction of the contraceptive pill in the 1960s. For the US, the availability of the birth control Pill is shown to have very positive educational and labor market effects for women, as they were able to control and delay fertility at a much lower cost (Goldin and Katz, 2002; Bailey, 2006). One major issue with using the the introduction of the Pill in the US for causal interpretation is that its diffusion was quite slow and did not really constitute a strong exogenous shock. Also, the introduction of the Pill coincided with the legalization of induced abortion, and Myers (2017) argues that it is the legalization of induced abortion rather than the Pill that allowed women to delay motherhood.

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[1]See for instance: Gruber et al. (1999); Levine et al. (1999); Donohue III and Levitt (2001); Pop-Eleches (2006); Ananat et al. (2007, 2009); Donohue III and Levitt (2019); Hjalmarsson et al. (2019).

The introduction of the Pill in the late 1960s in the Netherlands had an almost immediate and very marked impact of fertility. The birth rate for women in fertile ages dropped by 25% in the five years following 1970: the point at which the Pill became widely available. Births to teenage mothers fell even more after 1970: by 45%. Schuyt and Taverne (2004) write that "an unasked, unexpected, and unplanned revolution took place... It was manifested in a spectacular drop of the birth-rate. Unexpectedly, family planning became feasible thanks to the introduction and rapid acceptance of new and reliable contraceptives. The most important of these was the contraceptive Pill" (page 207). The Pill became widely available in 1970 with the abolishing of the Morality Act that prevented the sales and promotion of contraceptives, another policy milestone is its inclusion in the National Health Service coverage in 1972.

The setting in the Netherlands provides substantial scope for exploiting the exogenous shock to birth control technology and study its impact on the fertility decision. First, when the Pill became widely available in 1970 it had a very large direct impact on fertility. Second, access to induced abortion cannot confound our results as it was only legalized in November 1984. Finally, we have access to rich administrative data that allows us to examine the impact of the Pill at the individual level, as opposed to the US papers that rely on state-level variation and outcomes. This implies that we cannot only study the impact of the contraceptive pill on mother's outcomes, but also the direct effect it had on their children. We are interested in the effects of the availability of the contraceptive Pill on short-run outcomes like the probability of becoming a young mother and the probability of entering a shotgun marriage. Moreover, as avoiding an ill-timed birth could allow women to invest more in their human capital, we examine long-run outcomes such as female educational and labor market outcomes. Finally, we study the intergenerational effects of parental selection caused by access to birth control.

By simply comparing outcomes before and after the repeal of the Morality Act we may not only capture the effect of the availability of the Pill, but also underlying societal changes that could have affected fertility and (potential) mother's outcomes. It is for this reason that we use a novel approach by relying on regional variation in religion that led to a differential adoption of the new birth control technology. More specifically, we argue that the take-up of the Pill is slower in more conservative municipalities and we proxy this by the share of votes for conservative religious parties who were against the repeal of the Morality Act in 1970. We combine this continuous measure for conservativeness with the timing of the repeal of the Morality Act in a continuous difference-

in-difference framework. Furthermore, we use the 1971 full count population census to identify municipalities in which individuals had access to a health professional (general practitioners and pharmacists) who act as 'gatekeeper' to the new technology. Given that we observe religion for all individuals, we can identify conservative health professionals. We use the proportion of conservative health professionals as a proxy for access to birth control: conditional on the conservativeness of an area, women may have had better or worse access to the contraceptive Pill based on their gatekeeper's convictions.

First, consistent with our hypothesis, we find much larger drops in the birth rate for more liberal municipalities relative to more conservative ones. Hence, the adoption of the contraceptive Pill is indeed related to differences in the conservativeness of areas. Second, we show that women in more liberal areas are less likely to become a young mother and are less likely to enter a shotgun marriage after the Pill became available. We find no effects of access to the contraceptive Pill on the number of children, which suggests that the Pill affected fertility mainly through motherhood delay. Furthermore we find that, conditional on the conservativeness of the municipality, women living in municipalities with a conservative health professional are more likely to become a young mother or to be in a shotgun marriage. Hence, our results suggest that conservative health professionals are less likely to adopt the new birth control technology, which is reflected by women's fertility outcomes.

We then examine the long-run effects of access to contraceptives on female outcomes. Our fertility results show that access to the Pill led to less ill-timed births. Does this also allow women to invest more in their human capital? For this analysis we are using a sample of women who were between the ages of 16 and 26 in 1970, and we are exploiting that the change in access to contraceptives was larger for minors (women aged below 21). We find that women in more liberal municipalities who had access to the Pill before age 21 are more likely to be childless before age 26 and 30, which allows them to invest in their education. In accordance with this, earlier access to the Pill led to a higher probability of graduating from higher education, and higher earnings in adulthood.

Finally, we examine the intergenerational effects of access to contraceptives. The Pill allowed women to avoid ill-timed births, does this selection out of motherhood affect the criminal behavior of the next generation? We find that children who are born in areas where the Pill was more widely available are not more likely to be arrested. However, conditional on being arrested they are more likely to commit more crimes and they start at a younger age. In our next steps we plan to examine a wider variety of child outcomes (e.g. labor market outcomes).

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The Power of the Dutch Pill: Birth control as crime control?

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Motivation

- Fertility decisions → economic outcomes
- Timing of motherhood: large effects on a woman's human capital accumulation.
  - But, fertility and human capital formation decisions endogenous.
- Family formation: marriage quality and stability affect parents' and children's outcomes.
  - But fertility and family formation endogenous.
- This paper: exogenous shock to birth control technology → The Pill

Related literature

- **Liberalized access to the Pill in the US**

  Goldin and Katz (2002), Bailey (2006), Pantano (2007), Ananat and Hungerman (2012), Bailey et al. (2012), Steingrimsdottir (2016), Myers (2017)

- **Liberalized access to abortion**

  Gruber et al. (1999), Joyce (2004, 2009); Foote and Goetz (2008), Ananat et al. (2007, 2009), Donohue and Levitt (2001, 2019), Pop-Eleches (2006), Hjalmarsson et al. (2019)

This paper

- Diffusion of the birth control Pill in the Netherlands.
  - Advantage 1: immediate impact on fertility.
  - Advantage 2: induced abortion $\rightarrow$ legalized in November 1984.
  - Advantage 3: great administrative data.
- Exploit 1970 law change that liberalized Pill access:
  $\rightarrow$ Available to minors ($<$ age 21) + reimbursed by health insurance (1971)
- Before Vs after identification enough? No!
  $\rightarrow$ Exploit local variation in religiosity that led to a differential access to new birth control.
- Rich outcomes from administrative data: children & mothers

What do we expect?

- **Short Run - Less ill-timed births**: e.g. less minor births, less shotgun marriages...
- **Long Run - Women**: avoid ill-timed birth → investing in human capital (education & work)
- **Intergenerational - Children**: many outcomes, here focus on crime - lively debate about parental selection & crime.
  - US → Donohue and Levitt (2001, 2019) → -50%
  - RO → Pop-Eleches (2006) → Hjalmarsson et al (2019) → No impact!
  - GE → Chevalier and Marie (2019) → -30%
  - NL → Marie and Zwiers → ???

Talk outline

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Institutional background

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Administrative microdata

Preliminary results

Conclusion & To do list

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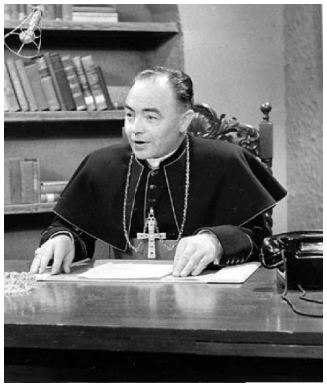
A short history of the **Dutch** Pill

- Pharmaceutical company Organon from Oss (Catholic southern region of NL) created oral contraceptive for women in **1957**: Lyndiol.
- Five years of discussions with Catholic experts before **Lyndiol** was brought on the Dutch market.
- **1962**: Lyndiol was introduced as a gynecological medicine, prevention of ovulation was considered undesired side-effect.
- "The Pill was mainly used in fertile marriages" (Bekkering, 1969)

Dutch view regarding contraceptives

- Organon did not want to market itself as a producer of contraceptives.
- Production of Lyndiol very secretive →
  - Organon worried about conservative backlash.
  - Nuns in charge of packaging (not as corruptible as 'normal' women).
- **Morality Act** (Zedelijkheidscode) introduced in 1911.
- Openly display, offer, or proclaim available any instrument that could prevent or interfere a pregnancy would lead to a:
  - Fine of 400 guilders (Euro 4.5k) or prison sentence of 2 months.
  - Minors: fine of 1200 guilders or prison sentence of 6 months.

Dutch view regarding contraceptives - **change**



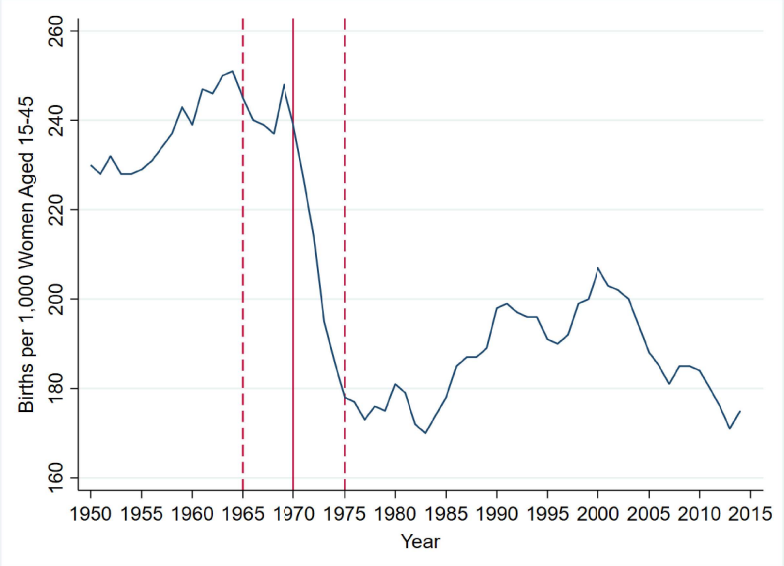
Bishop Bekkers (Catholic Bishop). National TV, 21 March 1963:

"*The size of the family is the moral question of a married couple, and no one - not even a priest - should interfere with their decisions.*"

Dutch view regarding contraceptives - **change**

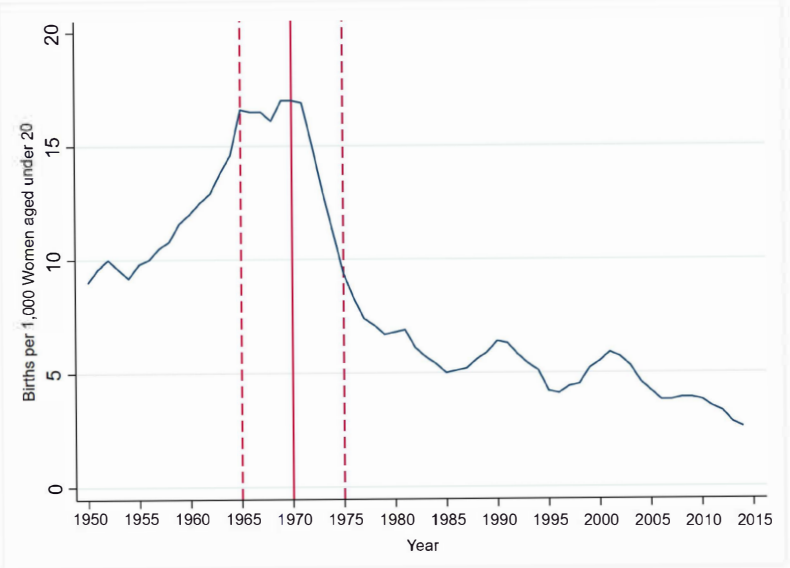
- **September 1966**: Cabinet Cals submitted bills to abolish the Morality Act.
- **November 1966**: Cabinet crisis (financial budget disagreements) $\rightarrow$ resignation of Cabinet Cals
- **February 1967**: New national parliamentary elections.
- **1969**: Bills were passed by parliament: Pill widely available.
- **1971**: the Pill covered in National Health insurance.

25% decline in the crude birth rate



Live births per 1000 women (aged 15-45), 1950-2015, the Netherlands.

45% decline for teenage pregnancies



Live births per 1000 women (aged under 20), 1950-2015, the Netherlands.

Birthyear first child, planned pregnancy?

	1966-1970	1971-1975	1976-1980	1981-1985	1986-1988
Clearly planned	**37.0%**	**69.5%**	80.3%	81.5%	92.7%
Sort of planned	18.5%	10.4%	7.3%	7.7%	1.6%
Not really plan.	16.7%	11.7%	6.4%	7.7%	3.3%
Not planned	**27.8%**	**8.4%**	6.0%	3.1%	2.4%
N	54	154	234	286	123

Notes: Source: Vennix (1990), survey initiated by Ministery of Health and executed by NISSO from 1986-1989.

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1st Difference - Before Vs After the Pill

- After 1970: Pill available for everyone $\rightarrow$ largest change in availability for minors (< 21).
- Caveat: other factors responsible for fertility decline after 1970?
  - **Induced abortion**: legalized in November 1984.
  - Resignation cabinet $\rightarrow$ **timing of repeal Morality Act unrelated to societal changes.**
  - If societal change, expect more gradual decline in birth rate..

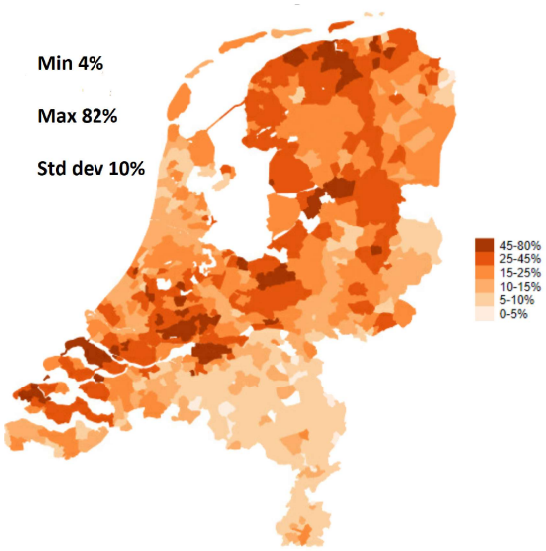
2nd Difference - Regional Variation in Access

- Religion important role in the acceptance of the Pill in NL.
- Adoption slower in more conservative Christian municipalities?
- Three parties voted against abolishing of Morality Act in 1969.
  - Reformed Political Party (*Staatkundig Gereformeerde Partij, SGP*) ▸ SGP today
  - Anti-Revolutionary Party (*Anti-Revolutionaire Partij, ARP*)
  - Farmers' party (*Boerenpartij*)

2nd Difference - Regional Variation in Access - **Data**

- Municipality level vote data national parliamentary elections in 1967. (www.kiesraad.nl: all election results in NL from 1848)
- Measure: share of votes for **parties that voted against** repeal.
- In 1967: compulsory turnout → 95%.
- Municipality level data on birth rate/demographics - 1960-1980. (Statistics Netherlands, statline.cbs.nl)
- Regional variation: **782 municipalities** ▸ Descriptives
  → Mean population: 16,667; Median population: 6,879.

Share ARP + Boeren + SGP The Dutch Bible Belt!



▸ 1967 Parliamentary Elections

Use of contraceptives by political belief

	CDA	PvdA	VVD	D66	Small right	Small left	None
Pill use	28.3%	36.6%	34.5%	31.6%	**15.4%**	32.3%	38.7%
IUD	10.6%	4.5%	14.3%	9.5%	3.8%	8.1%	6.5%
Condom	12.4%	8.2%	8.4%	8.4%	19.2%	17.2%	9.3%
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.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
No CC	19.0%	19.3%	12.6%	12.7%	**42.3%**	18.2%	20.2%
N	226	352	119	95	26	99	248

Notes: Source: Vennix (1990), survey initiated by Ministery of Health and executed by NISSO from 1986-1989.

Votes good measure for access to the Pill?

- 1971 full count Census:

	Prop. Very Conservative	Vote Against Pill (1967)	Vote Against Pill (1971)	N of Health Professionals	Prop. Very Cons. HPs
Prop Very Conservative	1.000				
Vote Against Pill (1967)	**0.840**	1.000			
Vote Against Pill (1971)	**0.867**	0.981	1.000		
N of Health Professionals	-0.168	-0.230	-0.243	1.000	
Prop. Very Cons. HPs	0.570	0.509	0.525	-0.033	1.000

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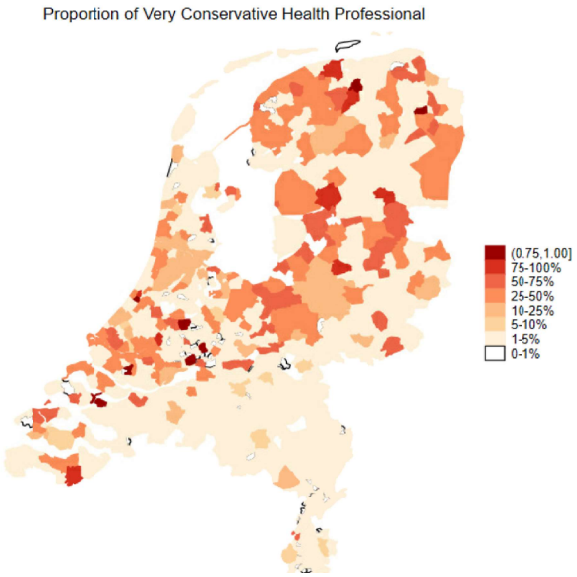
Votes good measure for access to the Pill?

- 1971 full count Census:

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Share of Very Conservative Health Professionals?

(Health Professionals = Pharmacists & GPs)

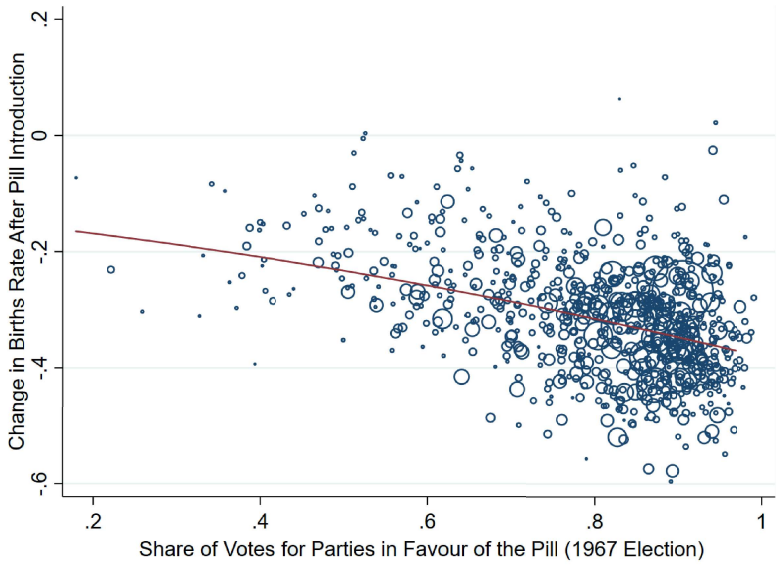


Empirical strategy Continuous DiD

$$\begin{aligned} CrudeBirthRate_{mt} &= \alpha_0 + \alpha_1 After1970_t \\ &+ \beta_1 After_t * ShareAgainstPill_m + \gamma_t + \delta_m + \varepsilon_{mt} \end{aligned} \tag{1}$$

- Continuous difference-in-difference where β_1 is coefficient of interest
- $CrudeBirthRate_{mt}$: N of births per 1000 women (municipality m, year t).
- $After1970_t$: equal to one after 1970 (Morality Act abolished).
- $After_t * ShareAgainstPill_m$: share of votes on parties that voted against abolishing the Morality Act * after 1970.
- γ_t: year fixed effects & δ_m: municipality fixed effects

Decline in BR Lower when Vote Share Against is Higher



Decline in BR Lower when Vote Share in Against is Higher

1 st. dev. Share Against Pill $= \pm$ 10%

	Births per 1000 women			
	1967 votes		1971 votes	
After1970*ShareAgainstPill	1.293***	1.286***	1.262***	1.274***
	(0.079)	(0.079)	(0.078)	(0.078)
After1970	-18.051***	-18.472***	-18.062***	-18.489***
	(0.179)	(0.210)	(0.179)	(0.210)
Year f.e.	Y	Y	Y	Y
Municipality f.e.	Y	Y	Y	Y
Excl. big 4		Y		Y
Mean dep. var $<$ 1970	44.652	44.720	44.652	44.720
N	16,422	16,338	16,422	16,338

Notes: Estimated by OLS. ShareAgainstPill is standardized with mean zero and st. dev one. Weighted by number of women in the municipality, 1960-1980 (21 years), 782 municipalities. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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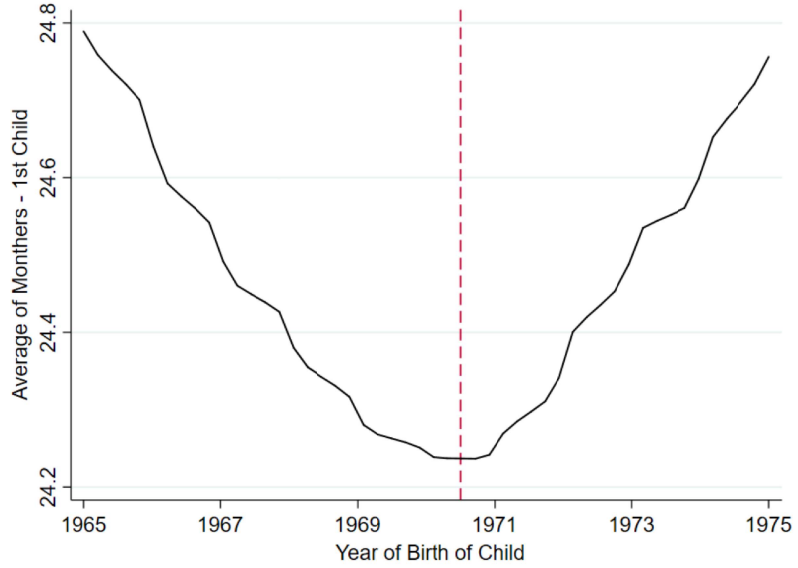
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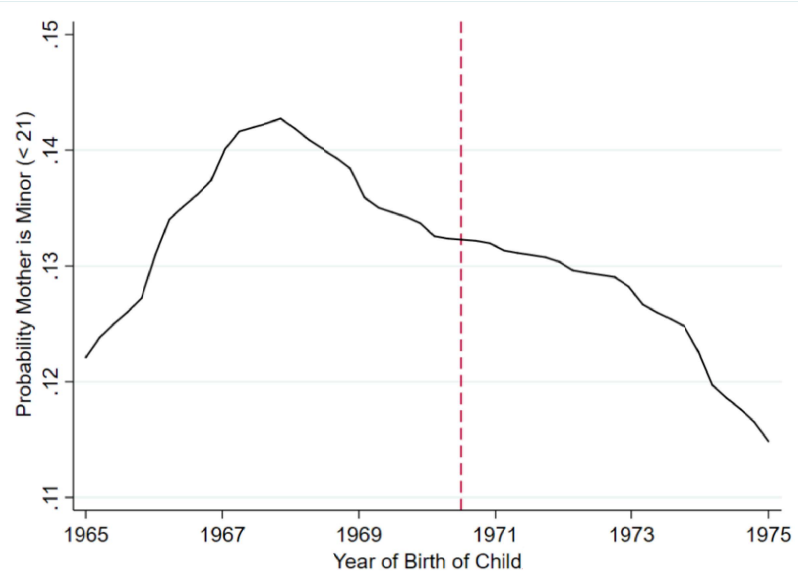
The Big Dutch Data: All Population Admin Records

- **Child/Mother sample**: born 1965-1975 (N = ±2.7 million).
  - Month/year of birth, place of birth, parent characteristics (age + marital state at birth).
- **Fertility outcomes:** age at birth; births to teenage/minor mothers ; in wedlock births, shotgun weddings, marital stability, number of children.
- **Crime outcomes:** Dutch police arrest data (1995-2015).
  - Ever arrested, number of arrests, type of offence, history: age at first arrest and criminal history.
- **Women sample**: women aged 16-25 in 1970 (±1 million).

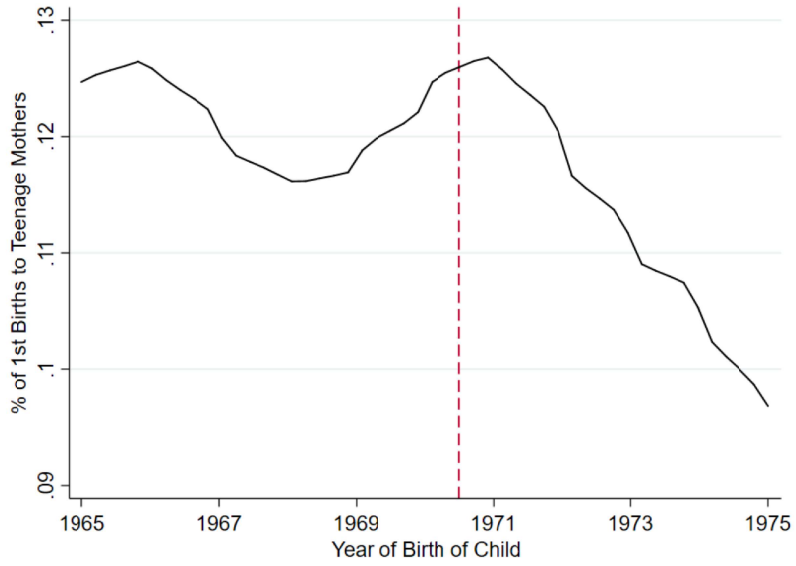
Mean Age of Mothers at 1st Birth



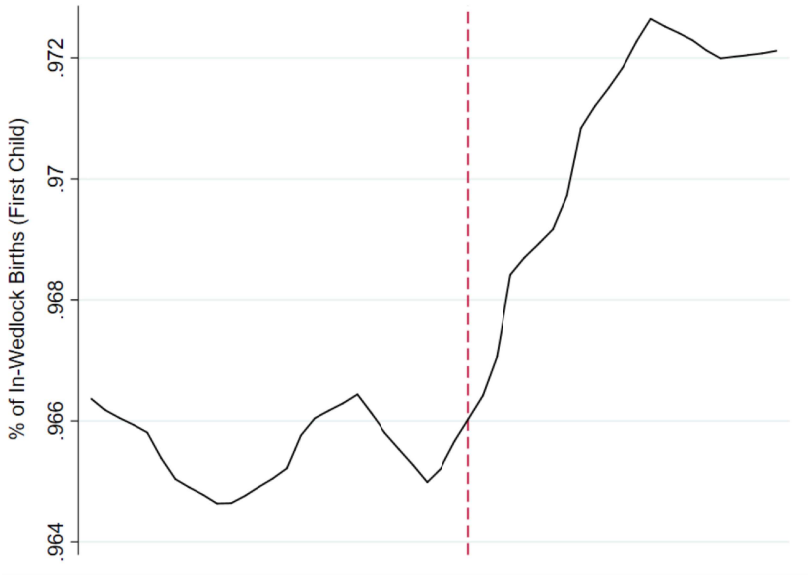
Probability of Mother $<$ 21 at 1st birth



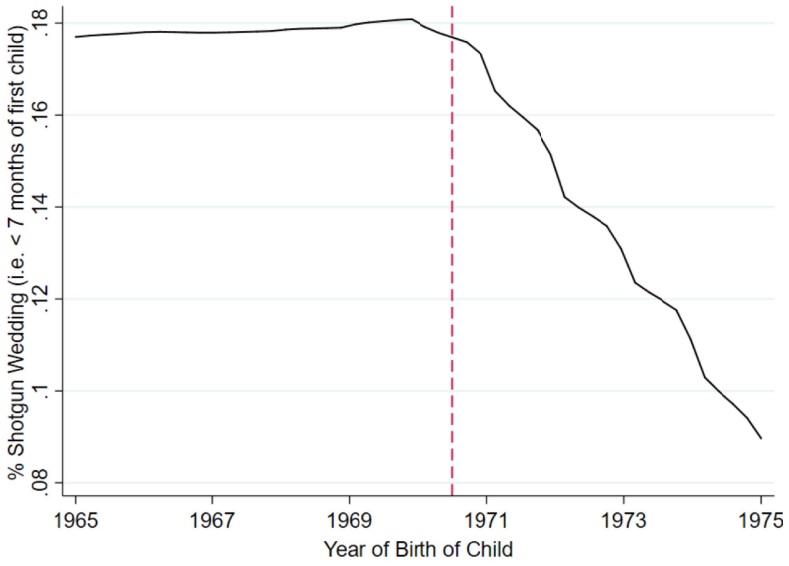
Proportion of Teenage Mothers at 1st Birth



Proportion of 1st Birth in Wedlock



Proportion of Shotgun Weddings



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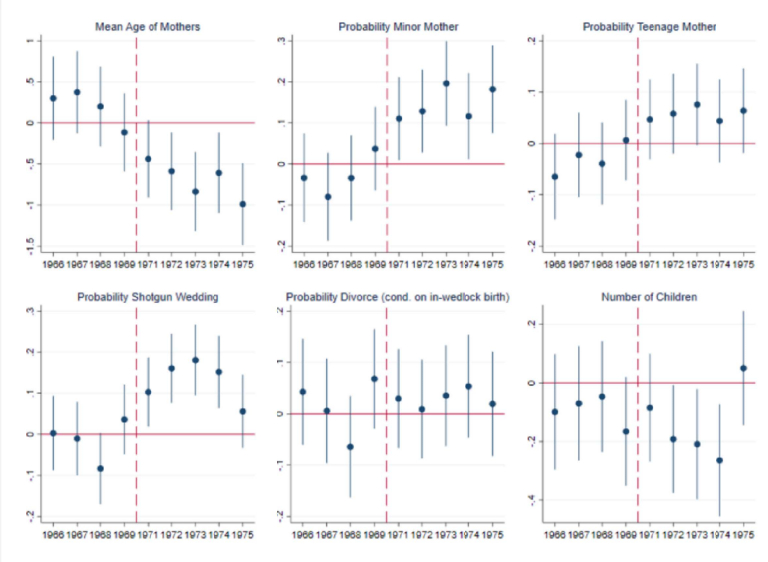
Conclusion & To do list

Continous DiD and Main Outcomes: Individual Level

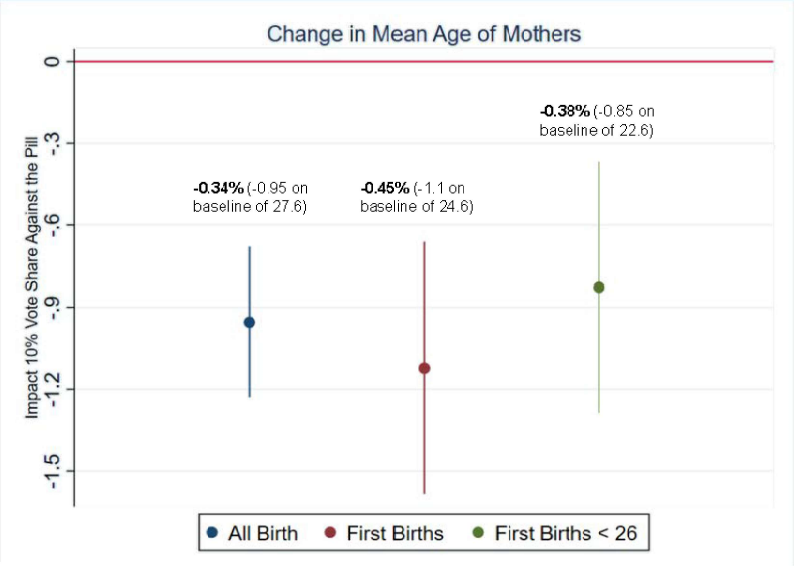
$$Outcome_{imt} = \alpha_0 + \beta_1 After_{it} * ShareAgainstPill_{im} + \alpha_1 After1970_{it} + YoB_{it} + MoB_{im} + \varepsilon_{imt} \quad (2)$$

- $Outcomes_{imt}$:
  - Mother's Fertility:
    - Mother's age at birth; Probability of birth < 21; Probability of birth < 19; Probability of shotgun wedding; Marital stability; Number of children
  - Child's Offending:
    - Probability of arrest (1995 to 2015); Age of 1st arrest (if arrest 1995-2015); Total number of arrests (if arrest 1995-2015)
- YoB_{it}: Year of Birth FEs; MoB_{im}: Municipality of Birth FEs
- Weighted by cohort size

Pre-trends?

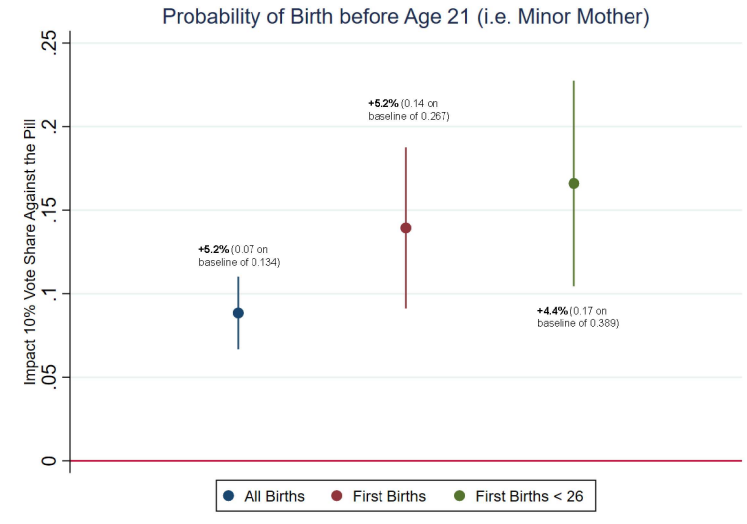


Fertility Results: Mean age at birth



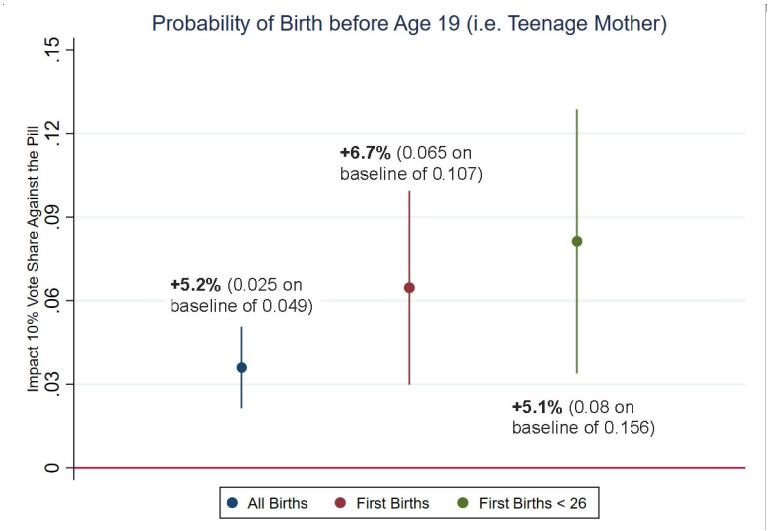
▸ Health Professionals & Share Against Percentiles

Fertility Results: Probability of birth < 21



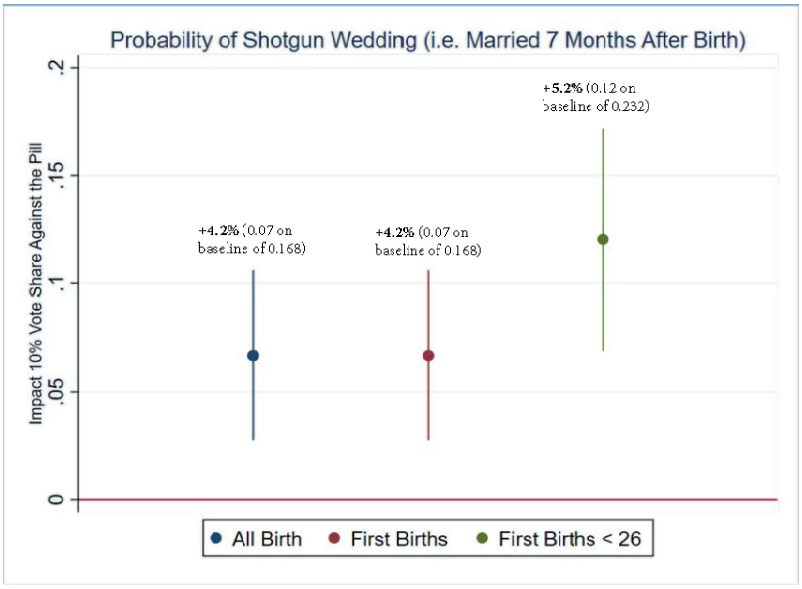
▸ Health Professionals & Share Against Percentiles

Fertility Results: Probability of birth < 19



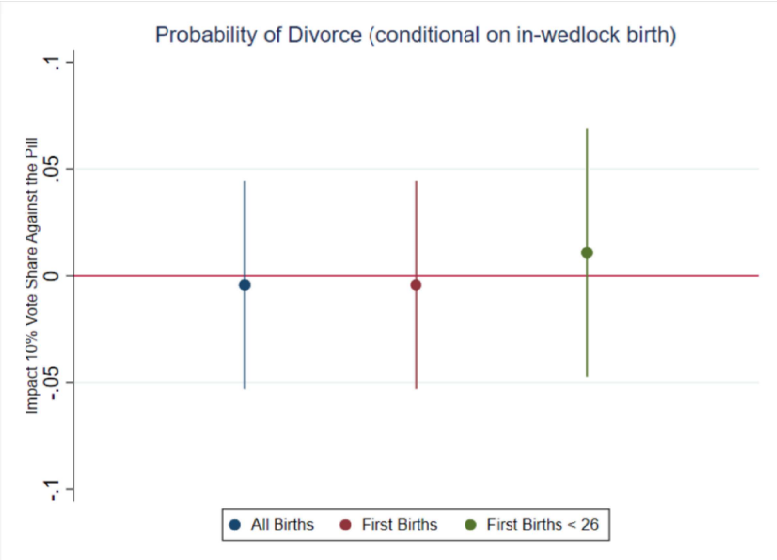
▸ Health Professionals & Share Against Percentiles

Fertility Results: Probability of shotgun wedding



▸ Health Professionals & Share Against Percentiles

Fertility Results: Marital stability



▸ Health Professionals & Share Against Percentiles

Fertility Results: Total number of kids



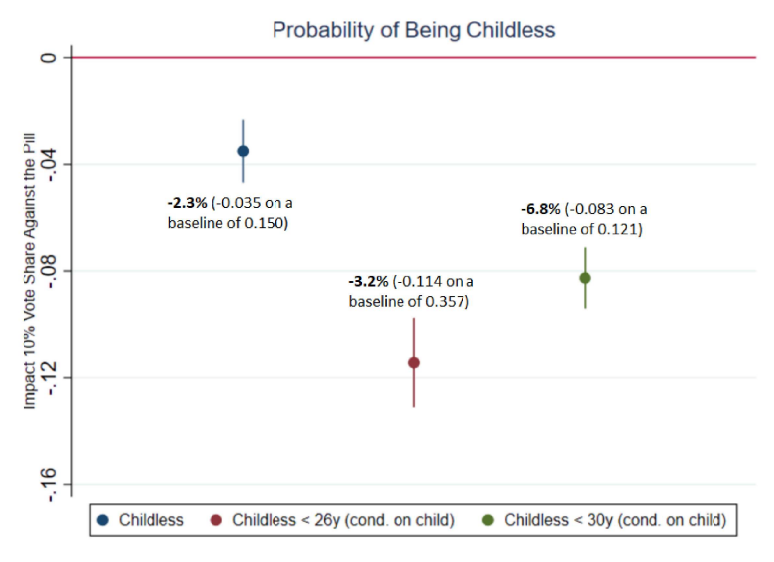
▸ Health Professionals & Share Against Percentiles

Continuous DiD and Women's outcomes

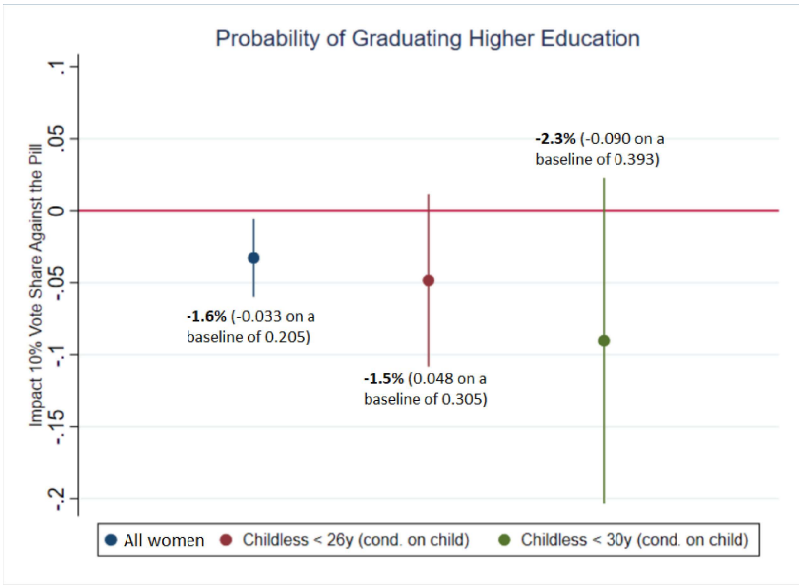
$$Outcome_{jmc} = \alpha_0 + \beta_1 Minor_{jc} * ShareAgainstPill_{jm} + \alpha_1 Minor_{jc} + YoB_{jc} + \varepsilon_{imt} \quad (3)$$

- Sample: women who were aged 16-26 in 1970 (N = ± 1 mln)
- Treatment: women is minor (< 21) in 1970.
- $Outcome_{jmc}$
  - Childless, Childless < 26y | a child, Childless < 30y | a child.
  - Education: Prob. of graduating from higher education.
    → Lower N: ± 270,000
  - Labor market outcomes: Prob. working/earnings at age 55.

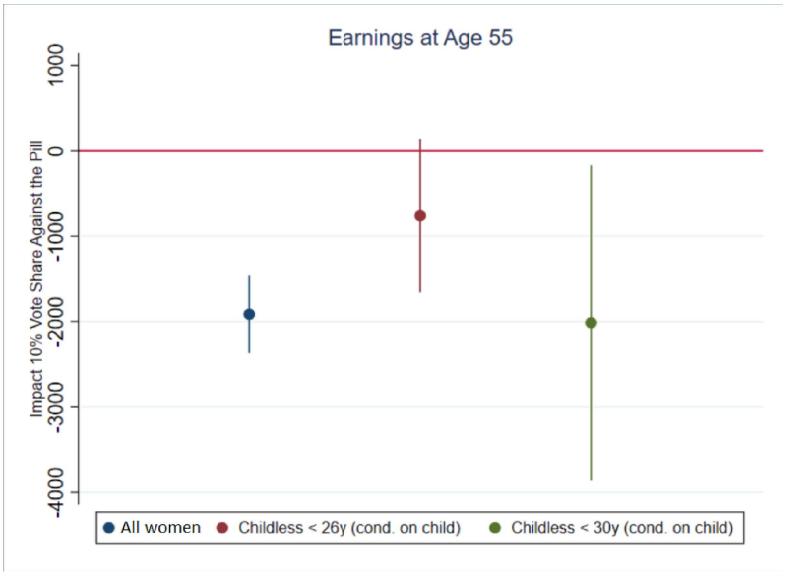
Women's outcomes: Childlessness



Women's outcomes: Finishing Higher Education



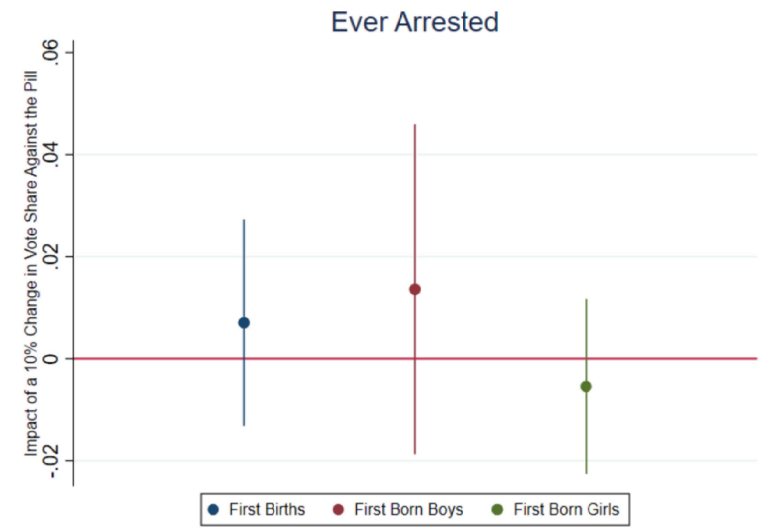
Women's outcomes: Earnings (including zeros)



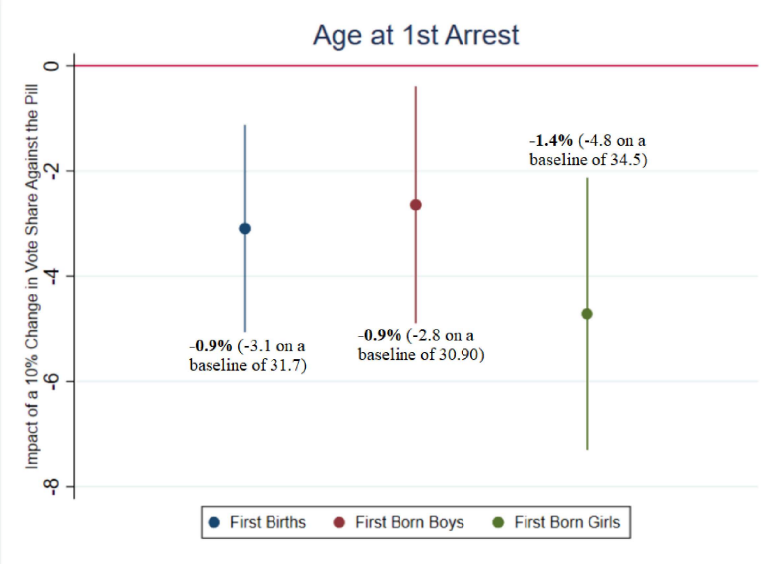
Crime outcomes

- HKS: registry of Police arrests from 1995-2011.
- Focus now: ever arrested, number of arrests, age at 1st arrest.
- Next:
  - Type of offense
  - Police data on suspects
  - Prison data

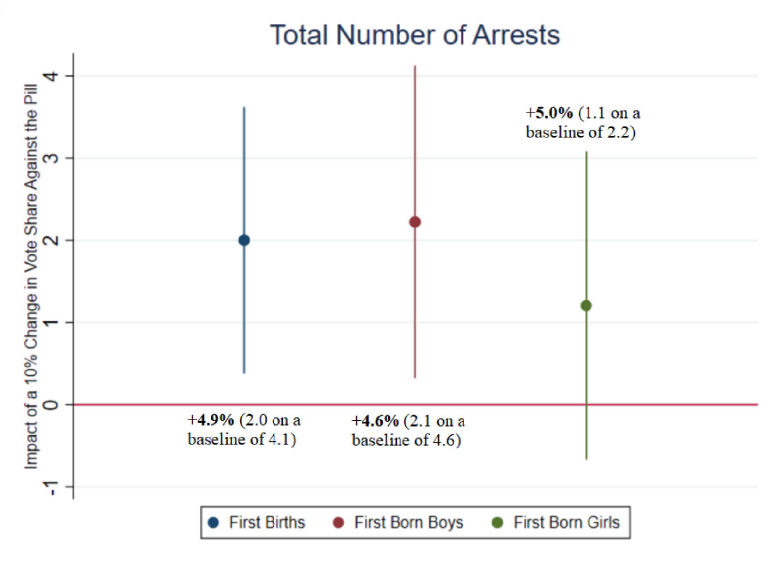
Crime Results: Probability of Any Arrest



Crime Results: Age at 1st Arrest



Crime Results: Total Number of Arrests



Conclusion

- The Birth Control Pill $\rightarrow$ drop in fertility in NL.
- Access to the Pill also led to less ill-timed births
  - less teenage pregnancies and less shotgun weddings.
  - motherhood delay rather than less kids.
- Delaying birth allowed women to invest in their education.
- Parental selection did affect criminal behavior of children:
  1. not more or less likely to be arrested...
  2. ...but if arrested they start younger and commit more crimes

To do list

1. More information on Pill usage:
   - Family Planning Survey (pill usage by municipality!)
   - Sales data from Organon
2. More information on access to the Pill:
   - Access to pharmacist/GP by municipality (distance?).
   - Fertility clinics across the Netherlands before 1970.
3. Do more with microdata:
   - Crime type and what effect at area level?
   - Quality of the mother's match (better measure than divorce?)
   - More on women's outcomes: Labor Force Survey ($\geq$ 1988).
   - More child outcomes (labor market/ (mental) health)

Thank you!

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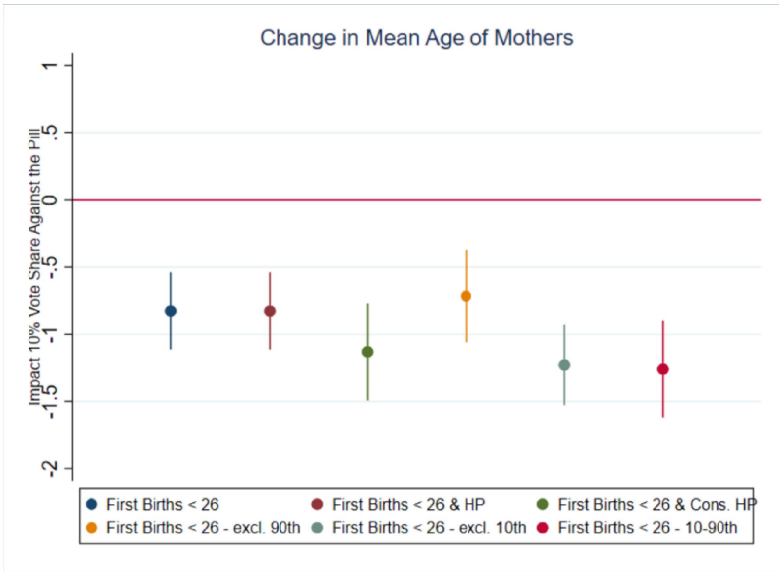
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Table 1: Descriptive statistics (raw) municipality level data

	Mean	St dev.	Median	Min	Max	N
Demographics in 1970						
Average Population	16,667.16	48,851.73	6,879.25	291.5	851,322.5	782
Births/1000 women	41.274	8.963	41.190	10.478	87.683	782
Demographics in 1970 **& 1967 vote share against $>$ median**						
Average Population	11,824.19	17,403.02	6444	291.5	170,088.5	391
Births/1000 women	43.385	9.134	42.10	20.281	87.683	391
Demographics in 1970 **& 1967 vote share against $\leq$ median)**						
Average Population	21,510.13	66,552.30	7,282	336.5	851,322.5	391
Births/1000 women	39.163	8.277	39.513	10.478	78.581	391
Voting data						
Share against 1967	0.163	0.097	0.156	0.032	0.821	782
Share against 1971	0.118	0.099	0. 101	0.016	0.766	782

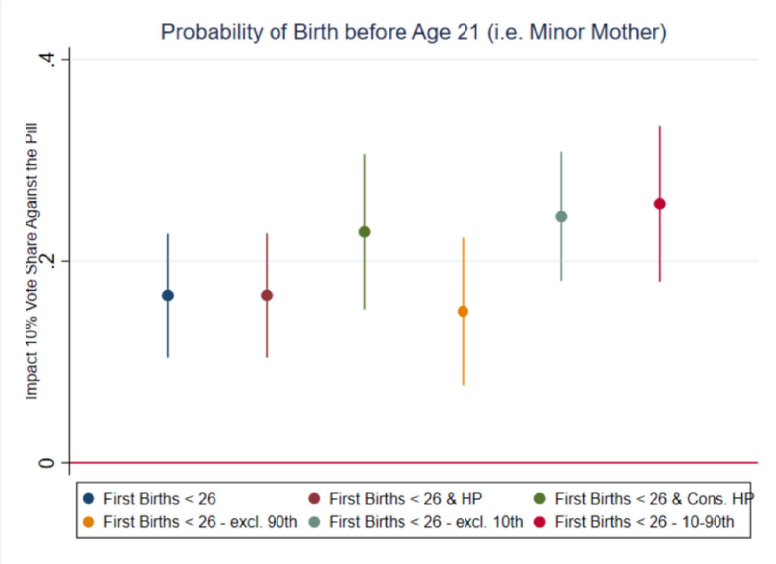
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Mother's age at First Birth



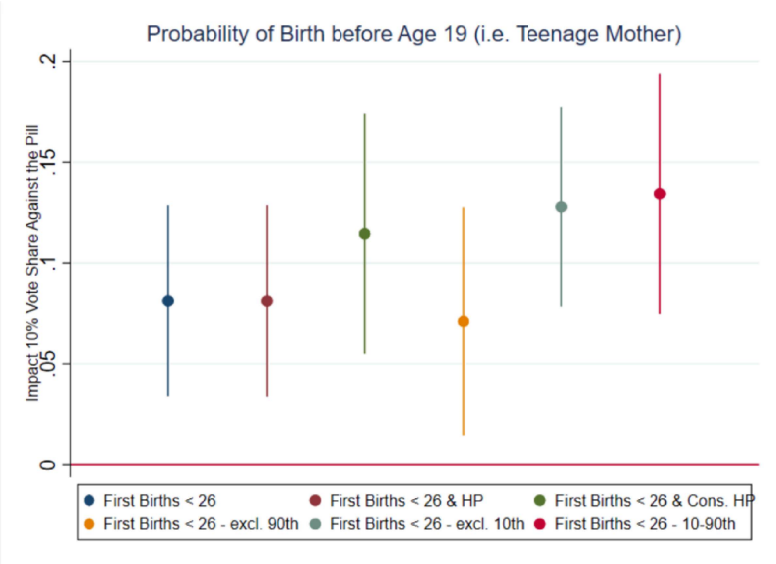
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Probability of birth < 21



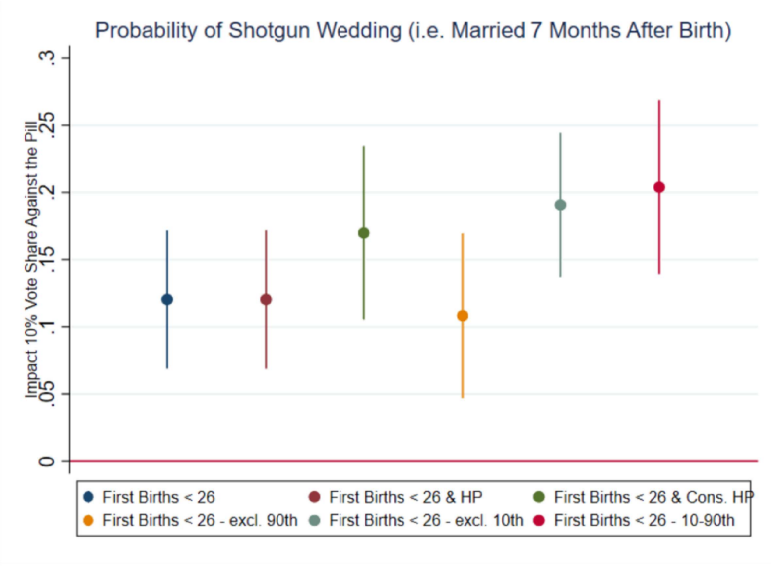
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Probability of Birth < 19



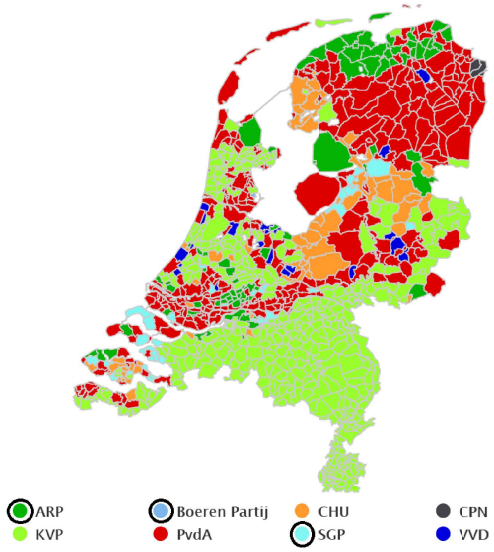
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Probability of Shotgun Wedding



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Area variation in votes: 1967 parliamentary elections



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