Twice the trouble: Twinning and the cost of voting

January 23, 2020

Abstract

Scholars have argued that becoming a parent impacts political behavior, including turnout. In this paper, we identify the effect on turnout of having an additional child conditional on the decision to become a parent. When parents have a child, nature sometimes assigns additional children through twinning. We argue that conditional on age of parents and birth cohort this as-if randomly assigns an extra child to some parents. With a large dataset of family composition and validated turnout for Danish voters, we find, consistent with additional children taking up parents' time and indirectly increasing the cost of voting, that having an additional child at the same time as another depresses turnout for both parents. Mothers' who had twins in their first parity are 1.6 to 3.0 percentage points less likely to vote across three elections. For fathers, turnout is only depressed by 0.7 to 1.4 percentage points.

KEYWORDS: Voter turnout, Political behavior, Causal inference, Political socialization.

Replication files are available in the JOP Data Archive on Dataverse (http://thedata.harvard.edu/dvn/dv/jop).

How does parenting affect political behavior and attitudes? Researchers have found that parents' attitudes and behaviors are shaped by the sex of their children and that parents become more likely to vote when their adolescent child comes of voting age (Oswald and Powdthavee 2010, Washington 2008, Glynn and Sen 2015, Dahlgaard 2018). But what is the effect of having children in itself? Using twin-births as a quasi-experiment, we take a focused look at how having an additional child at the same as another child affects voter turnout in elections. Conditional on age of the parents and the age of the parents' firstborn, we argue that it is as-if random if a first parity results in a twin-birth.

With rich administrative data from Denmark, we are able to determine the number of children parents have and their birth order. We find that twinning in the first parity leads to lower overall turnout rates over three elections from 2009 to 2014. The effects are substantive with point estimates for mothers who twinned in their first parity being between -1.6 and -3.0 percentage points across the three elections. Fathers are less affected and have point estimates from -0.7 to -1.4 percentage points with confidence intervals that mostly include zero. Instrumenting number of children with twinning in the first parity, we find that the effect of an additional child ranges from -3.3 to -6.0 percentage points for mothers and -1.5 to -2.7 percentage points for fathers. Our results are robust to a placebo test and to conditioning on pretreatment covariates, including previous turnout.

Parenting and voter turnout

The classic calculus of voting states that an increased cost of voting should reduce voter turnout (Downs 1957). Having children may not, in itself, increase the cost of voting, but it puts a significant strain on people's time (Bonke 2009). Since time is a limited resource, which voting consumes, any restraints on time should implicitly increase the cost of voting and, in turn, depress turnout. An additional child from twinning imposes such a constraint and we may, following this line of reasoning, expect turnout to be depressed as a result of twinning.

Alternatively, one could argue that parenting increases parents dependency on and

self-interest in public service provisions such as childcare and schools. Elections serve the purpose of selecting politicians to decide on policies concerning such areas. As the reliance on public service provision is higher when voters have more children, we might, following this argument, expect an additional child from twinning to increase turnout due to a higher perceived benefit from seeing one's preferred candidate win.[1]

Previous studies have assessed the effect of parenting on turnout. Jennings (1979) found mixed correlations between having school-aged children in the home and political participation, while other studies have found some or no direct relationship between parenthood and voting in regression models (Burns et al. 2001, Plutzer 2002, Wolfinger and Wolfinger 2008). We can learn a lot from these studies, but their mixed results could partly be due to the fact that they rely on controlling for factors that predicts both who becomes a parent and who votes. Aside from one, all the listed studies use cross-sectional data with its well-rehearsed limits for causal inference. The exception uses a panel dataset to look at the impact of parenting on growth in turnout for young adults (Plutzer 2002). We contribute with a causally identified effect of an additional child from twinning.

Data

Our turnout data are from the Danish 2009 and 2013 municipal elections and the Danish 2014 European Parliament election. Both types of elections are proportional and fairly salient, with turnout ranging from 56.3% to 71.9%. In the elections in question, validated turnout from the voter lists was linked to the civil registration numbers given to all permanent residents in Denmark. The collection of turnout relied on an opt-in from the municipalities. Therefore, the number of participating municipalities and voters for whom we have validated turnout varies between the elections. Forty-four out of 98 municipalities with almost 2.4 million voters participated in 2009. In 2013, all municipalities with a total of almost 4.4 million voters participated while 61 municipalities with more than 2.3

[1]In the preanalysis plan, we intended to explore the effect of twinning on turnout across elections with different degrees of self-interest. As we only study three elections, we depart from the plan on this point due to limited space and statistical power.

million voters participated in 2014.

Using civil registration numbers, we can also link turnout to administrative data on all Danes from Statistics Denmark. The data contain, among a variety of other information, date of birth and sex. The data also contains civil registration numbers of parents, which we use to link parents and their children. Since the date of birth is known for all children, the birth order is easily determined, and we can flag the firstborns, including firstborn twins. We define twins as two persons born within a week by the same mother. For children who have an identifier for their father but not their mother, we define twins as children who are born within seven days to the same father. We exclude parents whose firstborns turned 16 in the election year, as we expect the increased cost or any heightened self-interest of an additional child to pertain to parents with young children. For each election, we have validated turnout for 425,000 to 757,000 parents.

Research design

In general, neither the decision to have a child nor the number of children is random, which makes causal inference challenging. Besides the fact that older voters have had time to have more children, different kinds of people have a varying preference for whether or not they want children and how many children they want, which could correlate with turnout. Our identification strategy is to use twinning as a quasi-experiment. We argue that we can use this as-if random variation to identify the effect on parents' turnout of twinning in the first parity.[2] Twinning in the first parity has previously been used as an instrument to demonstrate an effect on labor market supply for women, while twinning in a subsequent parity has been used to estimate the effect on older siblings' education (Rosenzweig and Wolpin 1980, Black et al. 2005).[3] Our design will inform us about the effect of having an additional child at the same time as another, but we will not

[2]For simplicity, we refer to twinning as parities with more than one live-born child. Consequently, twin-births are pooled with the rare triplet, or even quadruplet, births.

[3]We also intended to use sex of the first two children as an instrument. This turned out to be underpowered, but we report the results in the supporting information.

learn about the effect of having additional children in general or of going from having no children to one child.

In general, comparing parents who have ever twinned to parents who have never twinned would be biased, as parents with a preference for or ability to have many children will experience more parities and consequently have more chances to twin (Rosenzweig and Wolpin 1980). If this correlate with predictors of turnout, comparing parents who have ever and never twinned is biased. Instead, we compare parents who twin in their first parity to parents who only have a single child in the first parity. Since all parents, regardless of preference for number of children, experience a first parity, we avoid the selection issue of parents having experienced multiple parities.

A second issue is that, in recent years, twinning has spiked in many countries, including Denmark (Pison et al. 2015). One factor driving the increase in twinning is that mothers age at birth is increasing and older mothers are more likely to twin. A second factor is the steep rise in parents who undergo medically assisted reproduction, which has significantly higher rates of twinning. To account for both the age of parents at birth and the birth cohort of the firstborn, we include fixed effects for age of the parents interacted with age of the firstborn child.

We estimate the effect on turnout of twinning for mothers and fathers separately. In both sets of models, we include fixed effects for the age of the parents (Pison et al. 2015). The age of fathers and mothers is correlated and if we do not use fixed effects to account for the mothers' age, fathers' age will be correlated with the propensity to twin. To create the fixed effects we partition the parents into 25 groups of four percentiles of their age-distribution measured in days. Second, within each parent age group, parents are divided into quartiles according to the age-distribution of their firstborns.[4] The procedure provides 100 groups of equal size but with a varying frequency of twin-births.

[4]In the preanalysis plan, we stated that we would create fixed-effects based on age in years of both parents and their children and collapse small groups. We changed to the approach described here as it creates equally sized group and avoids researcher discretion in deciding which groups to collapse.

We can make two assumptions for how twinning affects turnout: 1) *Only having an additional child in the first parity affects turnout.* 2) *All children equally affects turnout.* If assumption one is true, all children from the second or later parities should have no additional effect on turnout. Under that assumption, we just compare parents who twin in their first parity to parents who do not. It certainly seems plausible that the firstborns have a stronger effect on parents, but one might question if they alone affect turnout and put more faith in assumption two. Under the second assumption, twinning in the first parity is an ideal instrument for the number of children and we can use two-stage least-squares to get an estimate of the effect on turnout of additional children from twinning.

Results

In Table 1, we compare mothers/fathers who twinned in their first parity to mothers/-fathers who did not, conditional on age of the mother/father and child. Mothers who twinned in their first parity were 2.9 percentage points and 3.0 percentage points less likely to vote with 95% confidence intervals (CIs) of [-4.2; -1.6] and [-4.3; -1.7] in 2009 and 2014. In 2013, turnout for mothers who twinned in their first parity is depressed by 1.6 percentage points [-2.5, -0.8]. The effects are quite substantial and comparable to the gender gap between mothers' and fathers' baseline participation rates in Table 1. In the three elections, the point estimates of the effect of an additional child show that it depresses turnout by 5.5, 3.3, and 6.0 percentage points, respectively. The F-statistics for weak instruments is above 3,000 in all models.

For fathers, the effects are smaller. In 2009, fathers with twins as firstborns are 0.9 percentage points less likely to vote with a 95% CI of [-2.2, 0.5]. In 2013 the effect is just -0.7 percentage points [-1.6, 0.2] while it is slightly more negative in 2014, at -1.4 percentage points [-2.7, 0.0]. While all confidence intervals exclude zero for mothers, only the 2014 estimate for fathers marginally excludes zero.[5] Across all three elections, the best estimate is that, for fathers, twinning slightly depresses turnout, although the uncertainties around the estimates mostly are larger than the effects. The point estimates

[5]The upper bound of the confidence interval is negative to the fourth decimal point.

Table 1: Effect on turnout of twinning in first parity for mothers and fathers.

		Mothers	
Election:	**2009 Local**	**2013 Local**	**2014 European**
Twinning in	-0.029	-0.016	-0.030
first parity	(0.007)	(0.004)	(0.007)
No. of children (2sls)	-0.055	-0.033	-0.060
	(0.012)	(0.009)	(0.013)
$\text{Turnout}_{\textit{One child in first parity}}$	0.659	0.760	0.536
N	221,742	392,793	227,604
Share with twins	0.023	0.024	0.024
$\text{F}_{\textit{weak instrument}}$	3,687	5,822	3,525

		Fathers	
Election:	**2009 Local**	**2013 Local**	**2014 European**
Twinning in	-0.009	-0.007	-0.014
first parity	(0.007)	(0.005)	(0.007)
No. of children (2sls)	-0.017	-0.015	-0.027
	(0.013)	(0.009)	(0.013)
$\text{Turnout}_{\textit{One child in first parity}}$	0.644	0.734	0.545
N	203,466	364,540	209,651
Share with twins	0.024	0.025	0.025
$\text{F}_{\textit{weak instrument}}$	3,008	5,313	3,153

Std. errors in (). All models include fixed effects for *parent age* × *firstborn age*.

of the effect for fathers of an additional child caused by twinning suggests that it depresses turnout in the three elections by around 1.7, 1.5, and 2.7 percentage points, respectively.[6]

In the supporting information, we look at heterogeneous effects over the age of the firstborn child(ren). For parents with children below the age of 16, we find no clear variations in the effect on turnout conditional on the children's age. However, for parents with adult children aged 20 to 35, we find that there is no effect, suggesting that the effect disappears as parents no longer carry the daily burden of caring for a child or that the effect was different in earlier generations of parents.

[6]If we assume independence between fathers and mothers, the 95% CIs of the difference in the three elections are [0.001; 0.039], [-0.004; 0.022], and [-0.003; 0.035]. The assumption of independence is a conservative assumption, since the turnout of parents is likely to be correlated. Consequently, these CIs are probably too wide.

Placebo and robustness tests

A simple placebo test is to see if twinning predicts turning out in 2009 for parents who had their first child *after* that election. The models in Table 2 are similar to the reduced form model in Table 1, but they predict turnout in 2009 for parents who had their first child approximately 30 weeks after that election or later.[7] The last available data are from January 1, 2015. Consequently, only parents who were old enough to vote in 2009 and had their first children between mid-2010 and that day are included. To avoid over-fitting with the fixed effects, children's age is partitioned into only two groups within each of the parents' age groups and not to four as in the main models. The parents' age is partitioned into 20 groups instead of 25. From Table 2, we see that mothers and fathers were respectively 0.7 percentage points and 2.6 percentage points more likely to vote if they twinned later. If anything twinning predicts higher past voting, which indicates that if the main conclusions are biased, they underestimate the true effect on turnout.

Table 2: Predicting turnout in 2009 by twinning after 2009.

	Mothers	**Fathers**
Twinning in first parity	0.007	0.026
	(0.012)	(0.014)
$\text{Turnout}_{\textit{One child in first parity}}$	0.564	0.550
N	65,401	57,617
Share with twins	0.024	0.022

Std. errors in (). All models include fixed effects for *parent age* × *firstborn age*.

Another concern may be that twinning is correlated with parental outcomes above and beyond what we are able to pick up with our fixed effects (Farbmacher et al. 2018). In the supporting information, we show that although the fixed effects picks up most of the imbalance between parents who twin in their first parity and parents who do not, some imbalance persists in personal income, time spent in the hospital, and education. However, we also show that for the subset of our parents for whom we can control for pretreatment outcomes, including voting, the effect become more negative when we do so.[8] In line with the placebo test, the robustness test suggests that if anything the

[7]From circa 12 weeks into the pregnancy, most parents know if they are having twins.

[8]As Statistics Denmark has only given us access to data starting in 2007, we cannot

negative effect of twinning we estimate is actually biased towards zero.

Discussion

The paper contributes to the literature on how parenting shapes political behavior and attitudes (Jennings 1979, Burns et al. 2001, Plutzer 2002, Wolfinger and Wolfinger 2008). We have found that both mothers and fathers become less likely to vote by having an additional child at the same time as another due to twinning. We argue that the mechanism is that additional children place constraints on parents time arguably increasing the cost they suffer from using part of their day to vote. In the supporting information, we explore education, full time employment, personal income, and one health outcome as alternative mechanisms, but we find no support for any of them.

In the preanalysis plan, we did not specify any expectation that the effect would vary for mothers and fathers. However, previous studies have speculated that mothers would experience a stronger negative effect of children than fathers because mothers take on a larger responsibility as parents (Jennings 1979, Burns et al. 2001). Furthermore, mothers spend 50% more time than fathers on primary care for their children (Bonke 2009). The additional time an extra child requires place higher burdens on the mother, which should lead to twinning having a greater impact on the turnout of mothers than fathers.

We are left to speculate what the effect of transitioning to parenthood itself is. On the one hand, studies show that the marginal time Danish parents spend on a child is twice as high for a first child than for a second child (Bonke 2009). If time constraints depresses turnout, a negative effect of having an additional child at the same time as becoming a parent could come on top of a negative effect of becoming a parent. On the other hand, when people become parents they might start caring about the quality of child care and public schools, but they probably do not care twice as much if they become parents of two children at the same time. If twin parents care as much about public service provision as other parents, then we cannot rule out that for becoming a parent, any positive effect on turnout of increased self-interest induced by parenthood balances or is even larger than

control for pretreatment covariates for parents who had their first child earlier than that.

any negative effect of having less time to vote. If so, becoming a parent in itself may not depress turnout; we might only see an effect when a second child arrive at the same time.

Finally, as for any instrument variable design, our strategy captures only the effect for those who are affected by it (Angrist et al. 2010). In our case, already four to seven years after twinning, parents of twins only have about half an additional child as we show in the supporting information. Furthermore, we only learn about the effect of an additional child through twinning, which may be different from having additional children in general making it relevant to consider the external validity (Moffitt 2005).

We would argue that our effect estimates are lower bounds of the effect of an additional child in general. First, parents make future fertility decisions based on twinning. The parents with an initial preference for two or more children who chose to have additional children could be the parents who find it easiest to have children. If so, their turnout could be least depressed by children. Second, parents may choose to increase the span between the first and any future parity. Child spacing should correlate negatively with the time constraints from children, and in turn have a positive effect on turnout since young children are more time consuming (Bonke 2009). Both mechanisms suggests that the effect of additional children after twinning should be less negative than the effect of having an additional child in general. We cannot test this with our design, but leave it for future studies.

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Supporting information for: "Twice the trouble: Twinning and the cost of voting"

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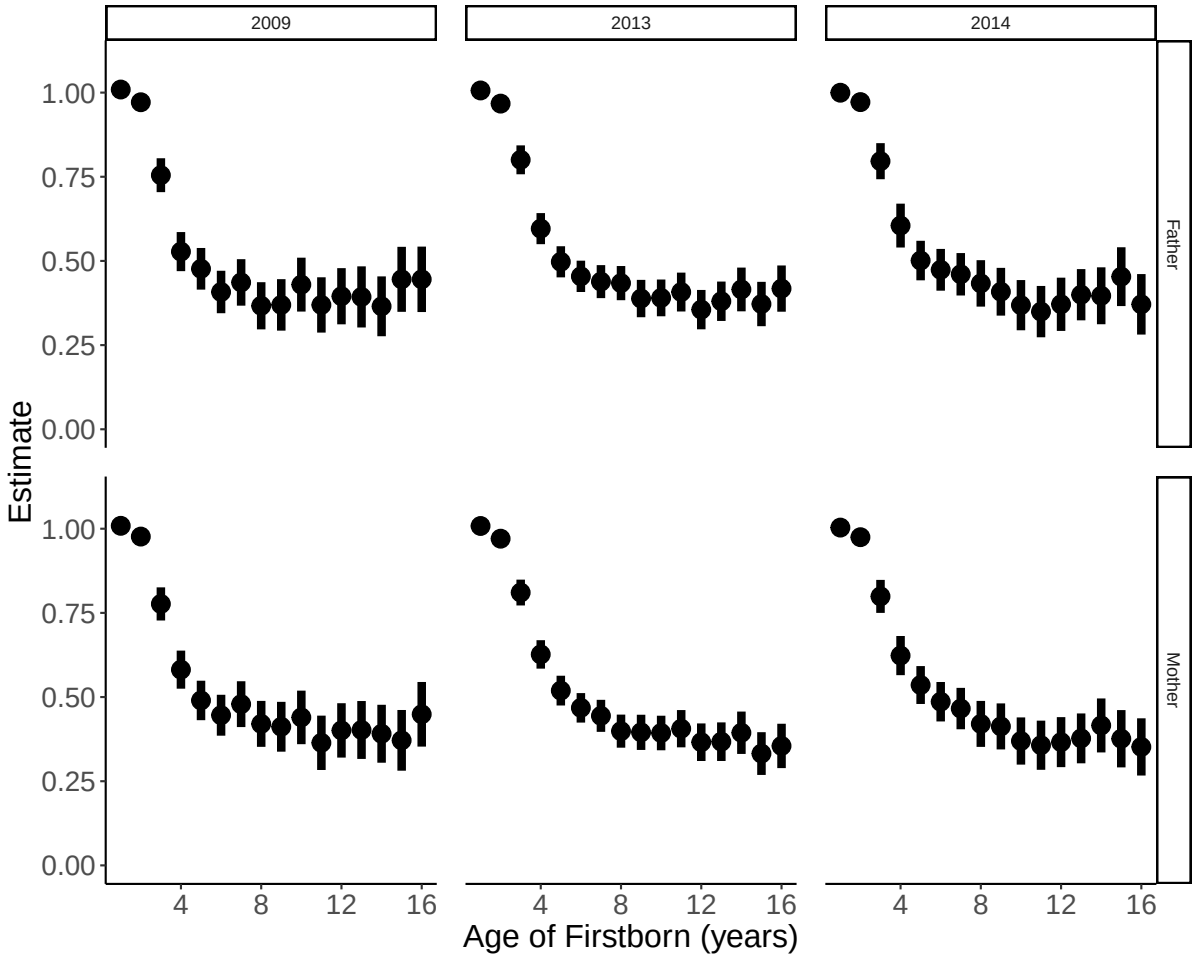
Contents

1 Effect of twinning on number of children across election years

Twinning obviously induces an immediate shock to the number of children but parents could mitigate it over time if they choose not to have additional children following the first shock. If all parents have a preference for more than one child, we could imagine that parents who twinned in a first parity, say, sixteen years ago have the same number of children as parents who did not twin. In Figure SI.1, we plot the effect twinning has on number of children across all three elections conditioned on how old the twins were at the election time. Unsurprisingly, for parents who twinned shortly before the election, there is a strong effect on number of children. We also see that the effect is smaller for older children, but even parents who twinned in their first parity twelve to fifteen years ago have around 0.4 additional children. Though, we do not estimate the effect per additional child, it is reassuring that twinning has a lasting, positive effect on number of children.

Figure SI.1: Effect of twinning on number of children across election years.



The figure shows point estimates with 95% CIs.

2 Balance on covariates conditional on age of parent and child

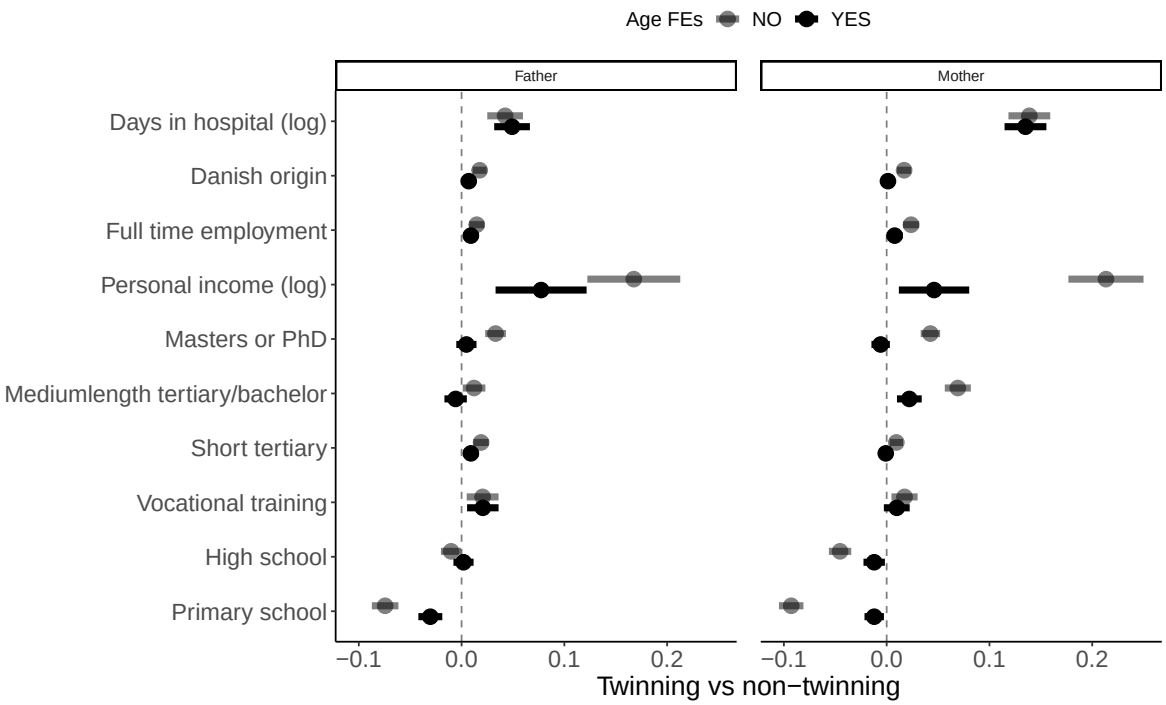
In the paper, we present the effect of twinning after we condition on age and cohort fixed effects. This is the approach that we specified in our preanalysis plan. We also show that when estimate turnout in 2009 for people who became parents of twins after this election compared to people who had one child only, those who twin were slightly more likely to vote in the election prior to their parity.

A recent paper, however, finds preexisting differences in outcomes for Swedish parents who twin and parents who do not (Farbmacher et al. 2018). This raises the question of the comparability between the two groups of parents that we study. For this paper, we only have access to data going back to 2005, which, for the majority of the parents we study, prohibits us from going back before they had twins to study pretreatment outcomes on variables that may be linked to both turnout and twinning such as education, income, country of origin, and maternal health.

Instead, we take a different approach to assessing the potential biases that may remain in our study. For each year from 2007 to 2014, the last year for which we have data, we explore if twinning in that year is predictive of outcomes one or two years before. We look at education, personal income, full time employment, being of Danish origin as defined by Statistics Denmark, and days spend in the hospital. For the days spend in hospital, we look at outcomes two years before. Parents who undergo medically assisted reproduction might spend some days in the hospital and they are also more likely to twin. By going back two years, we try to limit how much time people will have spent in the hospital due to circumstances related to their pregnancy.

In Figure SI.2, we show two sets of estimates. The gray-shaded estimates show the mean differences between parents who have twins as firstborns and parents who have only one child in the first parity without correcting for the age of the parent. We estimate the mean difference each year from 2007 to 2014 and present the weighted average in Figure SI.2. Therefore, the estimates are corrected for the children's cohort. The second

Figure SI.2: Covariate balance conditional on age and cohort 2007-2014.



The figure shows point estimates with 95% CIs.

set of estimates, in black, are the estimates were we include fixed effect for the parents in each year. The figure shows that there are large differences between the groups before conditioning on age fixed effects. Many of these differences disappear after controlling for age, but some remain although they are dramatically reduced in scale. One exception is 'Days in hospital', where the differences between parents are fairly stable even after conditioning on age. One possible explanation for this is that the additional time spend in the hospital is related to medically assisted reproduction or previous, failed pregnancies. As we describe above, we do go back two years to limit the potential impact of this, but this is not necessarily sufficient.

The results in SI.2 shows that some imbalances remain in pretreatment covariates even after we condition on cohort and parents' age. One response to this would be to include control variables for these outcomes in our models. For each election we study, we could control for income, time spend in hospital, education, and full time employment that year. However, we are reluctant to do so as it would require us to condition on posttreatment variables; outcomes that are directly affected by twinning,

but might also affect turnout. It is easy to imagine that time spend in the hospital, having full time employment, personal income, and even education could be affected by having an additional, unplanned child. Conditioning on posttreatment variables leads to well-known biases, and therefore we would be no better of by doing this (Montgomery et al. 2018).

Instead, we opt for another way to assess how much and in what direction the remaining imbalance may bias our results. Specifically, we look at the effect of twinning for everyone who had their first child between one month after the 2009 election and one month before the 2013 or 2014 election for whom we have turnout in both the 2009 and 2013 or 2014 election. For this subset of the parents in our study, we use three model specifications to look at the effect of twinning oon turnout in 2013 and 2014. In the first specification, we just use fixed effects for parents' and children's age. This is similar to what we do in the paper for the entire group of parents. In the second specification, we control for turnout in 2009. In the last specification, we also control for days in the hospital, being of Danish origin, having full time employment, personal income, and education all measured in 2007. Controlling for these outcomes may not be enough to rule out all omitted variables, but it should provide us an indication of the potential size and direction of the bias.

In table SI.1, we present all three model specification in both the 2013 and 2014 elections. The first specification is similar to what we present in the paper, but the point estimates differ because we use only parents for whom we observe turnout in 2009 and who had their first child between the 2009 election and the election under study. Compared to the results in the paper the point estimates all remain negative; they are still larger for mothers than for fathers; they are of comparable size; and they are estimated with less precision, because we study fewer observations.

What happens when we control for 2009 turnout? For both fathers and mothers in both elections, the point estimates changes a little and they become more negative. Conditioning on 2007 pretreatment covariates has the same impact: the effect estimates again become slightly more negative for both mothers and fathers in both elections. Due

to data limitations, we cannot repeat the analyses in SI.1 for all the parents for whom we have turnout data. However, we can say that if the results in SI.1 are representative of all parents, it suggests that any preexisting imbalances that we do not pick up with our fixed effects specification in the paper, will likely lead us to underestimate the negative impact of having an additional child from twinning. In other words, our estimate of the depressing effect on turnout may be a conservative estimate of the negative effect of having an additional child through twinning.

Table SI.1: Effect on turnout of twinning in first parity for mothers and fathers.

Mothers

Election:	**2013 Local**			**2014 European**		
Twinning in	-0.031	-0.036	-0.038	-0.018	-0.019	-0.022
first parity	(0.012)	(0.011)	(0.011)	(0.016)	(0.015)	(0.015)
	[-0.055; -0.008]	[-0.057; -0.014]	[-0.06; -0.017]	[-0.049; 0.013]	[-0.048; 0.011]	[-0.051; 0.008]
No. of children (2sls)	-0.037	-0.042	-0.045	-0.022	-0.023	-0.027
	(0.014)	(0.013)	(0.013)	(0.02)	(0.018)	(0.018)
	[-0.064; -0.009]	[-0.067; -0.016]	[-0.071; -0.02]	[-0.062; 0.017]	[-0.058; 0.012]	[-0.062; 0.008]
$\text{Turnout}_{\textit{One child in first parity}}$	0.721	0.721	0.721	0.548	0.548	0.548
N	55,356	55,356	55,356	40,761	40,761	40,761
Share with twins	0.025	0.025	0.025	0.024	0.024	0.024
$\text{F}_{\textit{weak instrument}}$	6,709	6,708	6,705	4,008	4,009	4,004
2009 turnout	NO	YES	YES	NO	YES	YES
2007 covariates	NO	NO	YES	NO	NO	YES

Fathers

Election:	**2013 Local**			**2014 European**		
Twinning in	-0.017	-0.024	-0.025	-0.004	-0.012	-0.014
first parity	(0.013)	(0.013)	(0.012)	(0.017)	(0.016)	(0.016)
	[-0.042; 0.009]	[-0.049; 0.002]	[-0.048; -0.001]	[-0.037; 0.029]	[-0.043; 0.020]	[-0.045; 0.018]
No. of children (2sls)	-0.020	-0.028	-0.030	-0.005	-0.015	-0.017
	(0.016)	(0.015)	(0.015)	(0.022)	(0.021)	(0.020)
	[-0.051; 0.012]	[-0.058; 0.001]	[-0.059; 0.000]	[-0.048; 0.038]	[-0.056; 0.026]	[-0.056; 0.022]
$\text{Turnout}_{\textit{One child in first parity}}$	0.703	0.703	0.703	0.561	0.561	0.561
N	48,823	48,823	48,823	35,894	35,894	35,894
Share with twins	0.024	0.024	0.024	0.023	0.023	0.023
$\text{F}_{\textit{weak instrument}}$	5,387	5,385	5,391	3,142	3,140	3,144
2009 turnout	NO	YES	YES	NO	YES	YES
2007 covariates	NO	NO	YES	NO	NO	YES

Std. errors in () and 95% CI in []. All models include fixed effects for *parent age* × *firstborn age*.

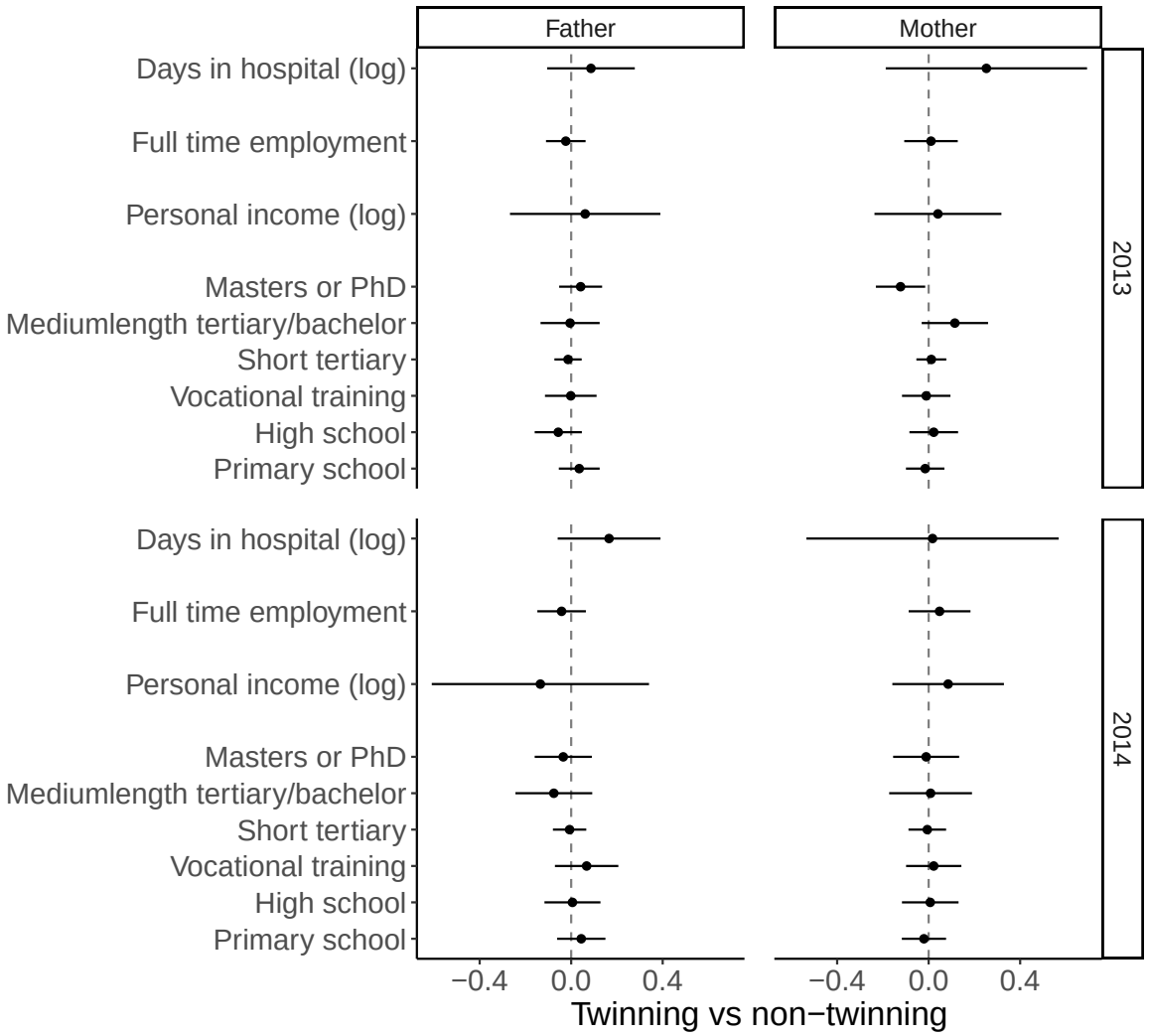
3 Potential mechanisms

In the section above, we looked at the effect for parents who had their first child after 2009 conditional on a set of covariates. Some of these covariates may also be potential mechanisms. Twinning could affect how much education parents have time to complete, whether parents take full time employment, and their personal income. Long term complications following a twin birth could also have a negative effect on maternal health. All of these outcomes could in turn affect turnout, which means that they could be competing mechanisms to an increased cost of voting; the mechanism we argue for in the paper.

As we discuss above, we are cautious about controlling for these posttreatment outcomes. We can, however, ask if any of them are affected by twinning. In Figure SI.3, we show the effect of twinning on time spend in the hospital, full time employment, personal income, and different educational categories for the parents in 2013 and 2014. As in Figure SI.1, we include only parents who had their first child after the 2009 election and for whom we have turnout in 2013 or 2014. That implies that in each election, we are looking at the same subset of voters in Figure SI.3 as we did in SI.1. As outcome measures, we use the variables measured at the end of the year prior to the election. We still use fixed effects for age of parents and cohort of the child. For each outcome, we also condition on each of the variables measured in 2007 as we saw in Figure SI.2 that the fixed effects did not capture all of the pretreatment imbalance in the outcomes.

The results in Figure SI.3 show that twinning does not seem to affect any of the potential mechanisms. Out of thirty-six 95% CIs only one excludes zero. Considering the fact that we are not adjusting for multiple comparisons, this is plausibly a fluke. The results in Figure SI.3 does not prove our proposed mechanism. They do, however, cast doubt on any of the variables included in the analysis as the mechanism. If these outcomes are on average unaffected by twinning, it seems implausible that any effect on them from twinning should be depressing turnout.

Figure SI.3: Effect of twinning on potential mechanisms.



The figure shows point estimates with 95% CIs. The models include fixed effects for parents' and childrens' age.

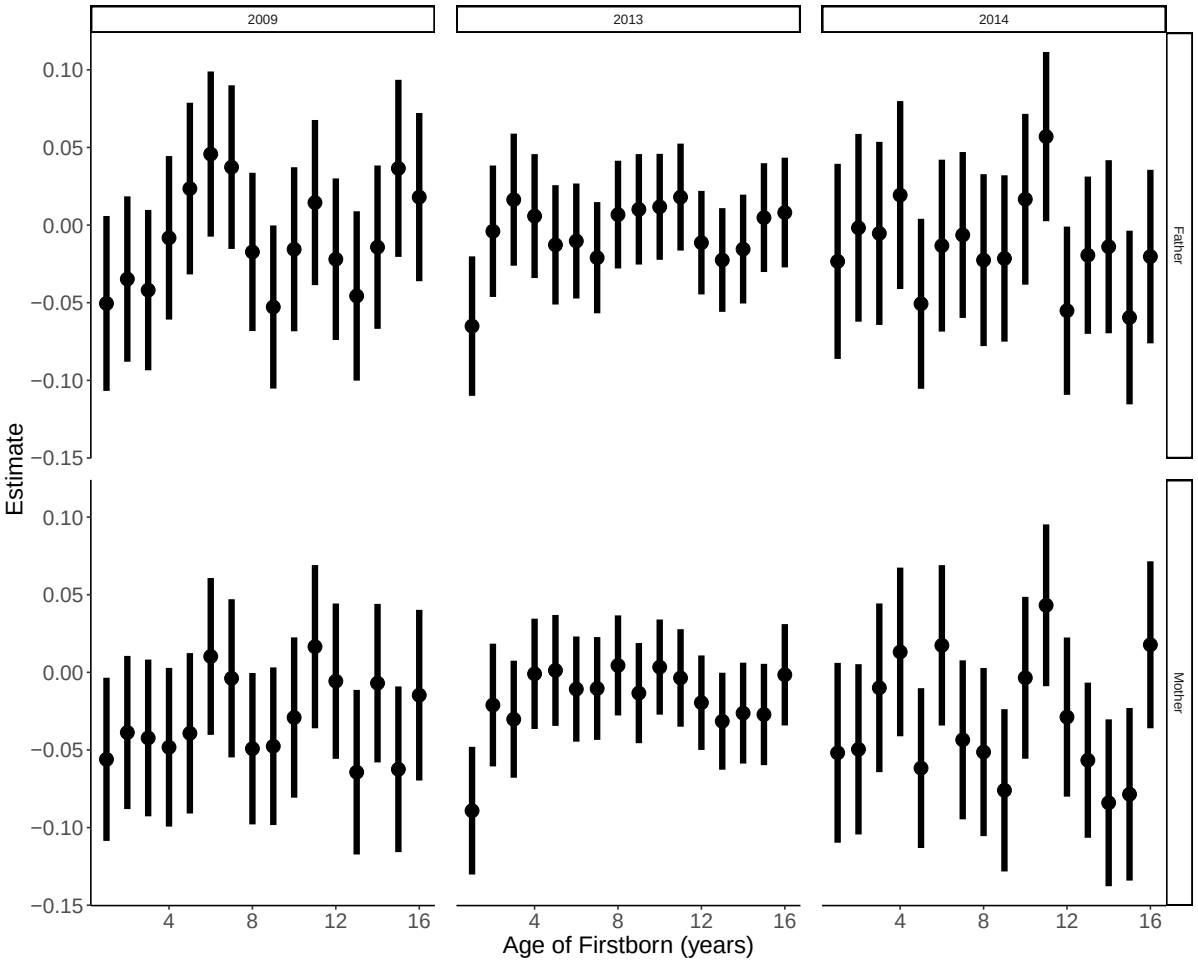
4 Comparing the effect over age of twins

If we believe that a time constraint is the mechanism underlying the negative effect on turnout of twinning, we could imagine that the constraint would fade over time if older children are less time consuming. On the other hand, children could take up the same amount of time regardless of their age or take up even more time as they age. This also suggests that the burden imposed by an additional child from twinning could belittle over time. If parents who do not twin catch up on the time they spend parenting, the effect should be strong among parents with young children and small if existing at all among parents with older children. In Figure SI.4, we explore if it is so. For each election, we plot the effect of twinning on turnout conditional on the firstborn child's age. Overall, there is no clear trend between age of the firstborn and the effect of twinning on turnout indicating that the effect does not vanish within the first sixteen years of the twins life.

There is no indication that parents who only have one child in the first parity catch up in the first 16 years. An alternative explanation for the lasting, negative effect of an additional child is that parents may fall into a habit of not voting (Meredith et al. 2009, Coppock and Green 2015). Because they spend so much time parenting, parents may lose touch with what is going on in politics, which could leave them disconnected in future elections. They may also experience non-voting and find that it did not have severe consequences for them, which could make them less motivated to vote in future elections. To explore is there is a lasting effect on turnout of twinning, we plot the effect on turnout of twinning for parents whose children were between 20 and 35 on Election Day in Figure SI.5. Arguably, when children reach this age, they discontinue to have an immediate effect on parents' turnout.

The results show that parents with older twins are not less likely to vote. Only in 2014 are mothers with twins aged 20 to 35 slightly less likely to vote, but this may just as well be a fluke, when we consider the full set of results. Does this mean that there is not a persistent negative effect of twinning? Not necessarily. It could be that parents are less likely to vote for some years and then gradually return to a "natural" level of voting. Another caveat is that, as an implication of what we saw in Figure SI.1, parents

Figure SI.4: Effect of twinning on turnout across election years conditional on age of firstborn.

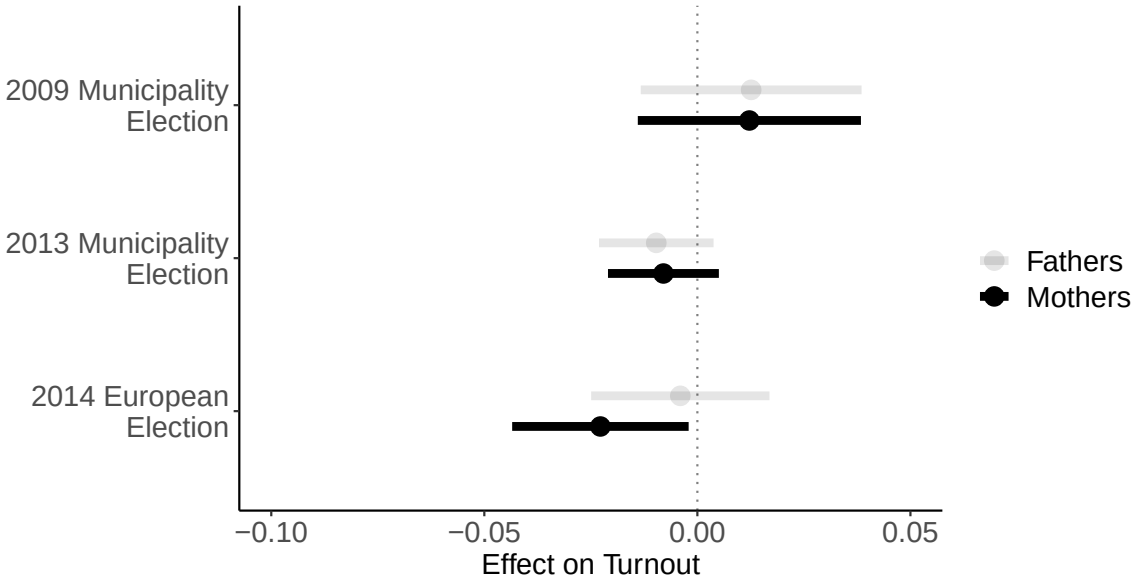


The figure shows point estimates with 95% CIs. The models include fixed effects for parents' and childrens' age.

who twin will have fewer children later on. That implies that the parents of twins aged 20 to 35 are *less* likely to have younger, possibly time consuming, children who may still live at home.[1]

[1]Another important caution concerning the heterogeneity across age of the children is that the differences in effects are not causally identified. For instance, we do not know if any (lack of) difference between the parents with the youngest and oldest children are caused by the children growing older, if they are generational differences, or if they express something else.

Figure SI.5: Effect of twinning on turnout across election years for parents with firstborns aged 20-35.



The figure shows point estimates with 95% CIs. The models include fixed effects for parents' and childrens' age.

5 The effect of having two first children of same sex

In the preanalysis plan, we intended to include a second instrument for the number of children that parents have. Specifically, we wanted to rely on the fact that when Danish parents have their first two children be of same sex, they are more likely to choose to have a third child, arguably because they have a preference for a mixed gender composition of their children (Statistics Denmark 2014). However, due to the instrument being too weak and also space limitations of the short paper format, we have moved these analyses for the Supporting Information.

Table SI.2: Effect on turnout of having two first children of same sex.

	Mothers		
	Turnout 2009 Local	**Turnout 2013 Local**	**Turnout 2014 European**
Two first children same sex	0.001	0.000	0.000
	(0.002)	(0.001)	(0.002)
	[-0.003; 0.004]	[-0.002; 0.003]	[-0.004; 0.004]
No. of children (2sls)	0.019	0.007	0.004
	(0.04)	(0.026)	(0.046)
	[-0.06; 0.097]	[-0.044; 0.059]	[-0.086; 0.094]
$\text{Turnout}_{\textit{two first children opposite sex}}$	0.709	0.803	0.579
N	234,072	462,449	255,678
$\text{F}_{\textit{weak instrument}}$	360.4	622.9	338.5
	Fathers		
	Turnout 2009 Local	**Turnout 2013 Local**	**Turnout 2014 European**
Two first children same sex	0.003	0.000	0.002
	(0.002)	(0.001)	(0.002)
	[-0.001; 0.007]	[-0.003; 0.002]	[-0.002; 0.006]
No. of children (2sls)	0.181	-0.005	0.181
	(0.131)	(0.088)	(0.197)
	[-0.077; 0.439]	[-0.178; 0.168]	[-0.205; 0.567]
$\text{Turnout}_{\textit{two first children opposite sex}}$	0.694	0.776	0.583
N	211,403	426,399	233,684
$\text{F}_{\textit{weak instrument}}$	34.7	58.1	18.3

Std. errors in () and 95% CI in []. All models include fixed effects for *parent age* × *firstborn age*.

In Table SI.2, we present two sets of results. First, we compare parents who had children of the same sex in their first two parities to parents who had children of mixed sex. Second, we use this as an instrument for the number of children that parents subsequently

have in a two-stage least-squares model. The results show that there is no meaningful difference between parents with same sex and mixed sex children. The reduced form estimates are all virtually zero and relatively precisely estimated due to the large number of parents. The effect of an additional child is close to zero in all cases, except for fathers in 2009 and 2014, where the point estimates in both elections are 18.1 percentage points.

However, the precision of the two-stage least-squares estimates reveals why we are skeptical of using the sex composition as an instrument. The standard errors blow up, because parents only become marginally more likely to have an additional child. In Figure SI.1 above, we showed that twinning has a large and lasting effect on the number of children that people choose to have. In Table SI.3, we show that having two children of the same sex has a much weaker impact on the number of children parents have.

Table SI.3: Effect on number of children of having two first children of same sex.

	Mothers		
	No. of children 2009 Local	**No. of children 2013 Local**	**No. of children 2014 European**
Two first children same sex	0.045	0.043	0.041
	(0.002)	(0.002)	(0.002)
	[0.041; 0.05]	[0.04; 0.047]	[0.037; 0.046]
No. of children$_{two\ first\ opp.\ sex}$	2.226	2.229	2.208
N	234,072	462,449	255,678

	Fathers		
	No. of children 2009 Local	**No. of children 2013 Local**	**No. of children 2014 European**
Two first children same sex	0.015	0.014	0.010
	(0.003)	(0.002)	(0.002)
	[0.010; 0.020]	[0.011; 0.018]	[0.006; 0.015]
No. of children$_{two\ first\ opp.\ sex}$	2.313	2.325	2.313
N	211,403	426,399	233,684

Std. errors in () and 95% CI in []. All models include fixed effects for *parent age* × *firstborn age*. The table show how many children parents have if their first two children are of opposite sex and how many additional children they have if the children are of mixed sex.

An alternative interpretation of the results in Table SI.2 is that the effect is null for the small subset of parents who have a third child, because their first two children were of the same sex. Although, the increase in the number of children is small, the number of parents in the analysis is large enough to identify a sizable effect, especially for mothers. If the null results are indeed driven by parents not being affected, a *post hoc*

speculation is that choosing to have an additional child after having two of the same sex is substantially different than having an additional child from twinning. When twinning the additional child is assigned simultaneously with one's first child, arguably putting an intense stress on parents time. The stress from a third child that parents' choose to have would arguably be less severe. Furthermore, parents may not choose the sex of their first two children, but they do choose if and when to have the third child. It could be the case that only the parents whose turnout is unaffected by an additional child choose to have a third child.

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Preanalysis plan for 'Twins, Self-interest, and Voting'

22 March 2016

In the canonical, rational model of voter turnout, voters choose to vote if their perceived reward or utility is positive (Riker and Ordeshook 1968). That is if the cost outweighs the benefit of seeing one's preferred alternative win times the probabiliy of casting the pivotal vote plus the sense of duty associated with voting. Formally, people vote if:

$$C < p * B + D$$

The purpose of this study is to use as-if random variation induced in the B-term to see if voting increases with B. Furthermore, the study is situated in a countrywide municipality election where the probability of casting the decisive vote varies. Therefore, the study aims to test if the exogenous variation in the B-term matters more in settings where the probabiliy of casting the pivotal vote is higher.

Research Design and data

The study utilize individual level turnout data from a countrywide study of voter turnout in the Danish municipality elections of 2009 and 2013, the 2014 European Parliament election. In 2009 and 2014 turnout data is available for only the approximately 60 percent of voters. Turnout for more than 99 percent of the voters is available for 2013.

The municipalities in Denmark are among the main welfare service providers with budgetary and service discretion over domains including though not limited to child care, public school, and elder care. Service

provision in child care and public schools are especially relevant among parents with young children and adolescents. In addition, the more children the higher stakes parents have in municipality politics. There are more children that benefit directly from the service provision, child care comes with user pay and thus impose a higher budget constraint with more children, and there are rebates for the second child, which varies, too. Therefore, it is to be expected that having children increases the potential benefit and that this increases with the number of children. Contrary, the European Parliament deals with matters that are not as closely linked with the everyday interests of especially parents and based on the classical framework there is no obvious reason to believe that parents should be more likely to turnout to vote in the European Parliament elections.

Obviously, a parent's stock of children is in general not random. Parents with several children are likely to diverge from parents with just one child on all sorts of characteristics that predict turnout. In general we would not learn about the impact of an additional child on turnout from a crossectional comparison between parents with varying counts of children. Even worse, would be to compare voters with and without children. In the article, I therefore rely on two sources of quasi-random variation in stock of children.

The first source of random variation comes from the incidence of twin-births.[1] When parents decide to have a child some parents will unexpectedly have twins, which increase their stock of children beyond expectation. Consequently, twin births induce some randomness in parents stock of children. Comparing parents who ever had twins to parents who never had twins would in general be biased, since there will be a correlation between taste for children and the likelihood of having twins (Rosenzweig and Wolpin 1980). Parents with a preference for many children will have higher parity. Figuratively, each parity is akin to drawing from a lot, and the more draws you make the higher the likelihood you will draw a twin birth. Thus, the instrument will be correlated with preferences if one makes the general comparison. However, twinning in the *first* parity should be exogenous to preferences under certain assumption that will be laid out below. Likewise, conditioned on twinning or not in the first parity, twinning in a second parity should be exogenous and so forth.[2]

[1] Throughout the document, I will somewhat inaccurately refer to multiple births as twin-births. To be clear, I plan to include all multiple births when identifying the shock caused from having an unexpected child. When I refer to this as twin-births it is only out of convenience.

[2] Since twinning occures relatively rare it would be greatly underpowered to estimate the effect of twinning in the second parity for those who twinned in the first. Therefore, in the prespecified models I describe below, I only consider the effect on parents who did not twin in the first parity.

Second, when parents decide to have a child nature randomly assigns its sex. In Denmark that means that 51 out of 100 child-births result in a son unconditional of the sex of any existing children the parents might have (Statistics Denmark 2014). However, Danish parents have a preference for a mixed sex composition of their children. If parents have two children of the same sex they are more likely to decide to have a third child arguably because they attach greater utility to a child of the opposite sex of their current children (Statistics Denmark 2014, Angrist and Evans (1998)). This mimicks a quasi-experiment similar to an encouragement design, where some parents are assigned two children of the same sex making them more likely to attempt to have a third child.

The increased likelihood of a third parity following two same-sex children is quite subtle. In Denmark 24 percent of parents with a mixed sex composition among their children had an additional child. Twenty-nine and 27 percent of parents with respectively two girls and two boys had an additional child. Likewise, twin births are relatively rare, even though Denmark with 22.4 of 1000 births being twin births in 2005 has one of the highest twinning rates in the world (Pison, Monden, and Smits 2015). One needs a large dataset to detect reliable effects. Lucklily, the turnout data to be used in this study includes voter turnout for a total of approximately 2.4 million voters in 2009, 4.4 million voters in 2013, 2.2 million voters in 2014. The data allows linking of parents to all their children. In the data it is straightforward to identify number of children, the age, birth order, and age of the children, and if children are twins. Matcing turnout to family composition allows for estimating the effect of randomly induced variations in the number of children in a household.

Expected effects

Given that every additional child adds to parents' self-interest in municipality politics, the quasi-random variation in number of children could increase the benefit of voting and lead to an increase in the probability of going to the poll. On the other hand, additional children puts an additional burden on the parents in terms of time spend caring for the children. This might change the trade-off parents face when deciding if they can set aside the time necessary to go to the poll. More children could increase the cost of voting by

increasing the value of time and thereby decrease the probability of voting occurring. Which mechanism is stronger is an empirical question that this study seek to address. Therefore, in the municipality elections where self-interest should increase with number of children, the effect could go in either direction. In the European Parliament elections it should be negative or zero as there is no additional self-interest from voting, and the cost of voting could be higher.

Regardless what effect is stronger in the municipality elections, the effect of the induced benefit should vary over electoral contexts. In closer elections I would expect a stronger effect of the induced benefit in close electoral contexts. To see why this is the case let us consider the calculus of voting once more. Only this time the equation is slightly rewritten such that voting occurs when the reward, R, associated with it is positive. The reward is a function of the cost, duty, benefit and probability of casting the pivotal vote:

$$R = p * B + D - C$$

now deriving with respect to B gives:

$$\frac{\partial R}{\partial B} = p$$

In other words, the marginal effect of B is a function of only p. Regardless, of the overall, mean effect of an additional effect being dominated by the cost or the potential gain of voting, the effect should be more positive or less negative in close electoral contexts. In other words, I expect a positive intaraction between closeness and the effect on an additional child on turning out to vote in the municipality elections. In the European Parliament elections the entire country is one constituency and therefore there is no variation in p. Even if there was, I would not expect an interaction as I expect that the impact of an additional child on B is zero in this context.

Estimation strategies

Data manipulation

The voting files include turnout from the elections in 2009, 2013, and 2014. The first two were municipality elections, 2014 was the election for the European Parliament. If the induced B-term is really driving the findings, we would expect there to only see an effect in 2009 and 2013. I only include 2014 in the analysis because I expect *not* to find an effect in this elections.

Crucially, though turnout data is not available for all voters in all years, information about the population, including age and parent-child links is available in all years. Knowing age and sex of every voters' children it becomes easy to get a full picture of every voters family including the birth order and sex of his or hers children. The first step of the data manipulation will be to create this picture. Twins will be defined as children of the same parent-dyad born less than a week a part.

If all parents only ever had children with the same person it would be straightforward to create a family-based analysis and allow for clustering at the family-level. This is complicated by parents who have children with multiple partners. One can imagine how a twin birth for one parent-dyad potentially affects how many children another parent-dyad with one member from the first dyad will have. Likewise, if a pair of parents have one child together and then go on to have their consecutive children with someone else, one of them could have the sex of their first two children match while the other could have children of different sex, which again would leave them with different propensities to have a third child.

One way to overcome the complications created by this would be to define a universe of parents who only ever had children with the same other. The downside of this is that you potentially lose a lot of data. Also, one risks sneaking in post-treatment bias since more children could create a stress on marriage and cause it to fall apart. Instead I overcome the hurdle by estimating separate models for mothers and fathers. For both mothers and fathers, I map the composition of their children and identify if there are twins, triplets or more as well as the sex and birth order of their children.

I believe the expected effect to travel through an increased benefit or self-interest. However, this benefit should have an "expiration" date, since the main issues, child care and public schooling, only applies to children up to a certain age. For the twin analysis, I will therefore restrict myself to parents with twins in their last year of mandatory educational enrollment. That is parents with twins born in or later than 1994 and 1998 for the 2009 and 2013 elections, repectively. For the election in 2014, the relevant cut-off years is also 1998. It is no error that there is a span fifteen years in 2009 and 2013 while the span is sixteen in 2014. The municipaly elections where held in November, while the 2014 election were in May. Since mandatory school enrollment ends the year one turns 16, the cutoff for 2009 and 2013 are really parents whose children turn 16 the year after the election. If I run the models for the parents who have twins in their second parity conditioned on the first parity resulting in a single birth, I will restrict to the same years or later for the second parity.

When using the sex of the two first-borns, I first deselect parents whose first-borns where twins to avoid overlap between the two sources of variation. It is a little more tricky to select an appropriate age cutoff for the children. Again, I would expect any results to be driven by parents of children under the age of sixteen. The question is at what age of the second-born child one should set the cutoff. If parents had two children of the same sex who are in their twenties it might increase the probability that they have a third child who is still below 16. There is no correct age cutoff, however for most parent ten years seems like a reasonable maximum timespan between a second and third child. Therefore, for the second part I restrict data to parents whose second-born was born in 1984 and 1988 or later for 2009 and 2013. For 2014 cutoff will be 1988. I could cut off parents who only had their second child less than nine months before the election. However, I will refrain from this because they could already be contemplating having a third child and thus experience and increased interest.

Model specifications

Twin-model

Since I will be analyzing a natural experiment, the baseline model will be a comparison between parents whose first succesful parity result in a twin birth and parents who ended up with a single-birth. However, making a simple differences-in-means comparison would most likely be biased. Age is a strong predictor for turnout. For mothers it is also correlated with the probability of twinning (Pison, Monden, and Smits 2015). Therefore simply comparing parents who have twins as first-borns to parents who did not would be biased as it would not take into account life-cycle variations or taste in timing of first-births that might correlate with turnout. E.g. parents with higher education might postpone parenthood. But they also turnout at very high rates. A second source of concern is that twinning rates have spiked markedly in recent years among other things due to an increased probibility of twinning following medically assisted reproduction (MAR). Therefore their might also be a generational bias that the simple approach misses. To simultaneously overcome both issues the main model will include fixed effects for the combination of the parent and child's birth years.

I am interested in knowing the effect of an additional child induced by twinning on the propensity to vote. Following Healy and Malhotra (2013), two assumptions can be made that arguably bracket the effect of twinning on turnout:

Assumption 1: All children equally affects turnout.

Assumption 2: Any effect on turnout is entirely due to the immideate shock of twinning.

If the latter assumption is true, we would expect all children born after the first parity to have no effect on turnout. Including fixed-effects for $j \times k$ combinations of year of birth of the parent and children, under assumption 2, the effect will be estimated as:

$$Turnout_i = \gamma_{j,k} + b * Twinning_i \tag{1}$$

To avoid overfitting parent-child age groups containing few parents will be collapsed to larger groups, preferably by collapsing over the age of the children.

Even though an argument can be made that the impact of the first-born child should be strongest, it still seems a fairly strong assumption that only the first-borns should have an effect. If on the other hand, we believe that parents are equally affected by all their children, the model should be:

$$Turnout_i = \gamma_{j,k} + b * Children_i \tag{2}$$

where *Children* is a count variable for the number of children a parent have. In general, this is not causally identified, since count of children is endogenous to turnout. However, since all children equally affect parents turnout under assumption 1 an ideal instrument for *Children* is twinning in the first parity. Therefore, I will estimate model (2) using two-stages least squares (2SLS) with twinning and child-parent birth year fixed effects in the first stage. If I run the models using twinning in the second parity as instrument, I will condition on the first parity resulting in a single birth.

Model for same-sex children

For the second instrument, the first two children being of same sex, I will only run a 2SLS model, since having a second child of the same sex does not immediately cause an exogenous shock to a parents number of children. The model will be similar to model (2), though the instrument will be having one's two oldest children being of the same sex. Though the concerns motivating fixed effects does not apply for the new instrument, I will keep them using the year of birth of the second child and the year of birth of the parent. Since they should be predictive of the outcome, if nothing else they cloud reduce the root-mean-square error and lead to more precise statistical inferences. Also, since other research indicate that the sex of parents' children might have a subtle causal effect on their propensity to vote, I will run the models with and without indicator variables for the sex of each of the two first-born children.

Main models and extensions

Using the model specifications above I will run a series of different models. First, the baseline models will be run using data for each of the four elections, where I expect to see effects in 2009 and 2013 but not in 2014. There will be a large overlap of the data in the individual years, and therefore I will not try to pool results from 2009 and 2013 or something similar to augment the conclusions.

As specified above, the theory predicts benefits to matter more in a close context. Also, a main effect could be masked by a higher opportunity cost of voting associated with having more children. Therefore, the next step will be to interact closeness with number of children. These analyses can only be made for the municipalities since the 2014 election was a nation-wide elections with no variation in closeness. In the municipality elections, the first question is how to measure closeness in a context with proportional representation and multiple parties running in an absence of stable coalitions.[3] The mayor is by far the most powerful position in the municipality council and will typically be found among the largest parties. As a measure for competitiveness I therefore use the numeric distance for the margin in percentage points between the mayors parties votes and the second largest party (largest party if this is not the mayor's party). This is assigned at the municipality level, while the effect is an individual level effect. For the interaction effect I will therefore specify a hierarchical model, where the effect of the number of children on turnout is a municipality specific effect modelled as linearly dependent on the closeness of the election.

Robustness and placebo models

I plan to assess the robustness of the findings in at least three different ways. First, I will restrict the data to only voters with available turnout for 2013 and 2014 and run the models specified above with just these data. The main models rely on different data for each year and variation in what is expected to be subtle results could be at least amplified by random noise. If a positive result is similar when restricting to only cases with

[3]Municipality elections are infamous for backroom agreements made on the night of the election and the following days, parties abandoning agreements made before or even after the election, and politicians switching to other parties for political gains immideately after the election.

data available in 2013 and 2014 it should strengthen our belief in the finding.

Second, I will run the twin models for 2013 with only parents who had at least one child between the elections. An advantage of this approach is that the main twin model can be reinforced by including lagged turnout and an indicator if turnout is missing for 2009. While the main models will rely on the first parity or the second parity conditioned on the first, this model can rely on the first parity after the 2009 election, regardless how many children one have previously had. The reduced form model will be the same as model (1) and the 2SLS model will be similar to model (2) both with the addition of a control for turnout in the first election.

Finally, as a placebo measure, I will run the twin models for parents who had twins *after* the 2009 election using turnout data in 2009. Twinning after 2009 cannot affect turnout in 2009, which leads to an expectation of no effect in this model. Also, one could have a concern that twinning is related to some biological factors, and biological factors have been suggested as predictive of turnout (Cesarini, Johannesson, and Oskarsson 2014; Fowler and Dawes 2008). Finding no relationship between twinning after 2009 and turnout in 2009 should strengthen our belief in the natural experiment of twinning. In addition to the 2009 models, I will run the models with turnout in 2013 for parents who twin after 2013.

Across all models, I plan to model estimates with standard errors and 95 percent confidence intervals. I will not report p-values.

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