The Zero Effect of Income Tax on the Timing of Birth: Some Evidence on French Data

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March 2021

Abstract

The present paper investigates the correlation between the French tax rebate triggered by the birth of a child and the probability to bring forward childbirth from late December to early January. Using administrative tax data from 2010 to 2016, we precisely simulate the corresponding tax rebate for households in which a child was born from mid-December to mid-January. Contrary to prior research, we did not find clear evidence of a significant link between the tax rebate brought about by a supplementary dependent child on the tax return and the probability of a December birth. Either the amount of the incentive may not be large enough or households may not correctly anticipate the corresponding tax rebate. Nevertheless, a small learning effect is present. According to our results, a significant correlation between the tax rebate and the probability of having a child in December is only observed among the wealthiest half of households that also benefit from a relatively large tax rebate. However, this seems to be due to a spurious correlation. Instead, our results reflect the willingness of parents to avoid childbirth on a public holiday.

Keywords: fertility, income taxation, birth, fiscal incentive.

JEL Classification: D1, H24, H31, J13,

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1. Introduction

The objective of this article is to empirically assess whether the income tax reduction triggered by the birth of a child encourages French parents to accelerate the birth of their child in December rather than in January. Regardless of the birth month, the tax rebate is applied to the entire calendar year instead of being prorated according to the birth month. Given this tax benefit, parents may wish to have their child in December rather than in January of the following year in order to bring forward by a year the benefit of the tax rebate. For instance, for a couple expecting their first child, the maximal tax reduction was €1,512 in 2016, representing on average around 40% of the initial income tax in our sample. This is an important public health issue, because shifting the delivery date, even by a few days, can affect the development of children (Schulkind and Shapiro, 2014).

We closely follow the approach initiated by Dickert-Colin and Chandra (1999) and later used by Schulkind and Shapiro (2014) and Lalumnia, Sallee, and Turner (2015) to measure the correlation between tax rebates and the probability of having a child in late December rather than in early January. We have access to a sample of French tax returns from 2010 to 2016, which were recently made available to researchers (Costemalle, 2017). It is therefore possible to accurately measure the tax rebate triggered by an additional dependent child on the tax return, as administrative data is less subject to misreporting than survey data.

Prior research has found a significant link between child-related income effects and the probability of a December birth. Drawing on US data, Dickert-Colin and Chandra (1999) estimated that a $1,000 rise in the tax rebate was associated with a 34.4 percentage point increase in the probability of having a child in the last week of December. More recently, Lalumnia et al. (2015) found a much smaller correlation with US data. According to their results, a $1,000 rise in the tax rebate corresponds approximately to a 1 percentage point increase in the probability of a December birth. Their results are line with the findings of Schulkind and Shapiro (2014), also based on US data. These authors estimated a 0.54 percentage point increase in the probability of a December birth for a $1,000 rise in tax benefits.[1]

In the same vein, Gans and Leigh (2009) estimated that in Australia, the AUD $3,000 bonus given to families with children born on or after July 1, 2004 led to a shift in more than 1,000 births from June to July 2004, even though the reform had only been announced a few weeks before its implementation. Neugart and Ohlsson (2013) explored the effects of a change in the German parental benefit system implemented as of January 1, 2007 when parental leave became much more advantageous for working parents with a child born from January 1, 2007, thus creating an incentive to postpone childbirth from late December to early

[1] Heim, Lurie, and Simon (2018) study the impact of the Affordable Care Act (ACA) on childbearing. Although they are not concerned with the timing of births in December and January, their results point to a modest income effect on childbearing in the US.

January 2007. Their estimates indicate that the reform caused a 5.4 percentage point increase in the probability of a January birth in 2007.

Contrary to prior research, we do not find clear evidence of a significant link between the French tax rebate stemming from a supplementary dependent child on the tax return and the probability of a December birth. Indeed, the amount of the incentive may not be large enough. Nevertheless, on average, December parents benefit from a larger tax rebate than January parents in our data. It is also possible that households do not correctly calculate or anticipate the corresponding tax rebate. Our results indicate a small learning effect, though not always significant. According to our estimates, a significant correlation between the tax rebate and the probability of a December birth is only observed among the wealthiest half of households that also benefit from a relatively large tax rebate. However, this seems to be due to a spurious correlation. Our results rather reflect the desire of parents to avoid giving birth on a public holiday.

This paper is structured as follows. Section 2 describes the empirical strategy. Data and sample selection are presented in Section 3. Section 4 discusses the results of the estimation. Several robustness checks follow in Section 5, and finally, Section 6 concludes the paper.

2. Empirical strategy

Our goal is to determine whether parents advance January births to December to gain immediate tax benefits. Parents may want to bring forward the birth of their child from early January of year *t+1* to late December of year *t* so as to benefit from the tax rebate of year *t* due to the inclusion of an additional child on their tax return. Following Dickert-Conlin and Chandra (1999) and Lalumnia et al. (2015), we calculate the household income tax rebate in year *t* caused by the addition of a dependent child to the tax return and test whether the probability of having a December child rather than a January child in the coming year is dependent on the tax rebate. Of course, it is unlikely that all parents can plan the exact date of birth of their children. However, it is sometimes possible to choose the date of labor induction and C-section.[2] Nevertheless, all else being equal, if this tax incentive is truly effective, the probability that a child is born in December instead of January will be related to the tax rebate.

Building on the work of Dickert-Conlin and Chandra (1999) and Lalumnia et al. (2015), we use the set of births taking place within a given bandwidth of days around the New Year to estimate the regression model:

[2] Regarding childbirth in France, the onset of labor was spontaneous in 68.6% of cases in 2016 and 66.9% of cases in 2010 (see "Enquête nationale périnatale Rapport 2016", INSERM and DREES). The rate of labor induction was 22% in 2016 and 22.1% in 2010, respectively. In 2016, 20.4% of births were delivered by C-section (21.1% in 2010). Medical interventions such as labor induction and C-section vary little from one region to another, although labor induction is slightly more frequent in Paris region (25.6% in 2016). The proportion of births by C-section varies greatly with the gestational age or birth weight of the child. However, the data at our disposal do not include this information. We also lack information on the type of delivery.

$$DecBirth_i = \alpha + \beta TaxRebate_i + \gamma X_i + u_i, \ (1)$$

where $DecBirth$ is a dummy variable equal to 1 if the birth takes place in December (December parents) and otherwise 0 (January parents). $TaxRebate$ is the reduction in income tax liability from an additional child included in the tax return, and X is a vector of controls. The household (or tax unit) in this sample of size N is denoted by i, taking on values 1 to N. $TaxRebate_i$ is calculated as the difference between household *i*'s tax liability with and without an additional dependent child.

We also estimate the alternative specification:

$$DecBirth_i = \alpha + \beta_1 \mathbf{1}_{[0<TaxRebate_i<s,\, R_i \leq r]} + \beta_2 \mathbf{1}_{[0<TaxRebate_i<s,\, R_i > r]} + \beta_3 \mathbf{1}_{[s<TaxRebate_i,\, R_i \leq r]} + \beta_4 \mathbf{1}_{[s<TaxRebate_i,\, R_i > r]} + \gamma X_i + u_i, \ (2)$$

where R_i is the household's i taxable income, and s and r two threshold values equal to the sample median values of the tax rebate and taxable income, respectively. The reference situation is that of a household without tax incentives to have a December birth ($TaxRebate_i = 0$). This specification allows us to account for a possible nonlinear effect of the tax rebate on the probability of being December parents. This also allows us to identify the separate effects of income and tax rebate on the timing of birth when these two covariates are correlated.

As mentioned by LaLumia, Sallee, and Turner (2015), income may be correlated with birth timing for non-tax reasons as "higher income parents may also have greater nonpecuniary reasons for timing birth such as holiday convenience effects" (LaLumia et al. (2015), p. 269). Parents may also want to have a child in December rather than in January because of the school-eligibility cutoff dates that correspond to the calendar year in France (Dickert-Conlin and Elder, 2010). They may therefore not want to delay school entry by a year in order to avoid paying an extra year of means-tested childcare costs.

To benefit from the immediate tax benefits, parents have two possibilities. After conception, they may try to advance delivery by a few days for a child due in early January. Before conception, they may try to plan the conception to have the child before the end of December. As conception is not an exact science, it is important to account for the window of a few days around New Year's Eve, which is large enough to capture these two behaviors from the data. We therefore consider 15 nested samples of households. The first and smallest one includes parents who had a child on December 31 or January 1. The second includes parents who had a child in the last 2 days of December or the first 2 days of January. We then keep expanding the sample window around the New Year up to the largest sample, which includes parents who had a child in the last 15 days of December or the first 15 days of January.

In France, children do not give rise to a child tax credit, as in several other countries. The only adjustment to tax liability for family size and children is through the family quotient ("quotient familial") scheme.

Married or civil union[3] couples represent a single tax unit (along with all their dependent children), and all their income is jointly taxed. Formally, for a tax unit i, the progressive tax schedule $t()$ is applied to an equivalent income $y_i/s(k_i)$, which is the taxable income of that unit, y_i, deflated by an equivalence scale. The total tax liability of this unit is then calculated as $T_i = s(k_i) \cdot t(\frac{y_i}{s(k_i)})$. The equivalence scale $s(k_i)$ depends on the number of dependent children attached to this unit, k_i. This scale includes a number of adult equivalents, or "fiscal shares", calculated as 2 for married or civil union partners plus 0.5 for the first and second child attached to the unit, and 1 for each additional child. Hence, for a married couple i, the explicit scale is $s(0) = 2$, $s(1) = 2.5$, $s(2) = 3$ and $s(k_i) = k_i + 1$ for $k_i \geq 3$.

An increase in the number of fiscal shares can sufficiently reduce the family quotient so that a lower tax bracket is considered to compute the tax liability, with lower marginal tax rates thus being used. Therefore, as the progressive tax schedule is applied to the equivalent income and not to the taxable income, the family quotient scheme tends to lower the impact of progressive income taxation. To limit this effect, the application of the family quotient does not reduce tax liability above a certain threshold.[4]

Fig. 1 illustrates the effect of the family quotient on tax rebates for parents who have an additional child in December. Three cases are considered here, depending on the number of children already born (0, 1, or 2). All curves exhibit the same pattern. First, an additional dependent child extends the range of taxable income for which the household does not pay income tax. This situation corresponds graphically to the first positive slope. The tax rebate is then constant within the intervals of taxable income where the increase in the number of fiscal shares does not reduce the number of tax brackets used to calculate the tax liability. At the next taxable income interval, an additional dependent child lowers the impact of progressive income taxation; in other words, fewer tax brackets and corresponding marginal rates are used. The tax rebate increases again as a function of taxable income. This corresponds graphically to the second positive slope. Finally, the tax rebate is capped at the threshold for highest taxable incomes.

As can be seen from Fig. 1, the marginal effect of a birth depends on the number of children already born in the family for certain ranges of taxable income. For parents who already pay income tax, the birth of an additional child usually leads to a greater tax rebate if they already have two children. For instance, for parents with a taxable income of €40,000, the tax reduction will be €679 if they already have one child and €1,358 if they already have two. For certain amounts of taxable income, the tax rebate is zero. This reflects situations in which households are not liable to pay tax.

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[3] Civil union or civil solidarity pact ("pacte civil de solidarité") is a contractual form of cohabitation between two adults who cannot or do not want to marry. Note that civil unions and marriages are subject to the same tax rules in France. For the sake of simplicity, we refer to couples who are married or in a civil union as "married couples" throughout this paper.

[4] With one dependent child, this threshold was equal to €2,336 in 2010 and 2011, €2,000 in 2012, €1,500 in 2013, €1,508 in 2014, €1,510 in 2015, and €1,512 in 2016.

Fig. 1 Tax rebates caused by an additional dependent child according to taxable income

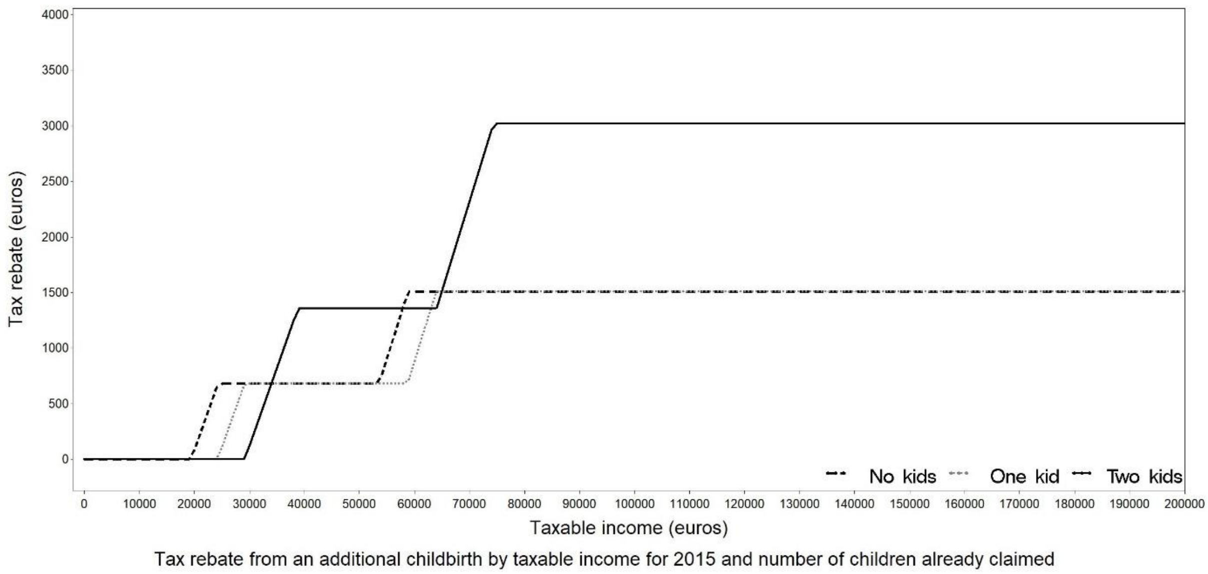
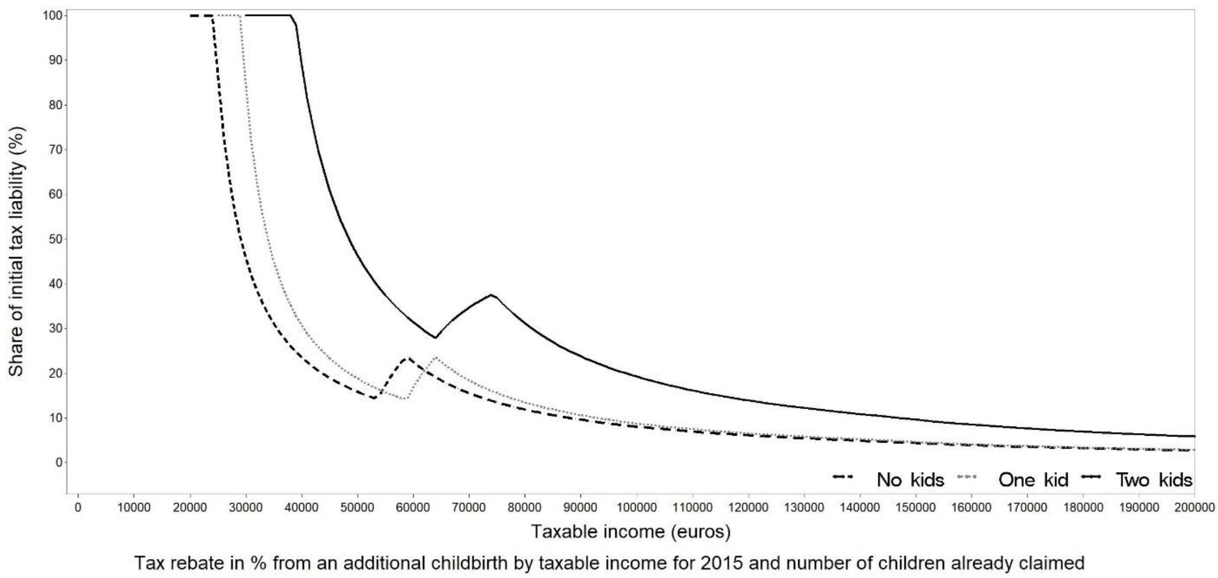


Fig. 2 presents the different tax rebates expressed as shares of the initial tax liability (that is, without accounting for the marginal birth). For low-income households, tax rebates can represent a substantial share of their initial tax liability.[5]

Fig. 2 Tax rebates caused by an additional dependent child according to taxable income as shares of tax liability



[5] Taxpayers who are eligible to pay low levels of income tax can benefit from supplemental tax relief to alleviate the impact of entering the progressive income tax scale. This additional tax benefit makes the effect of the family quotient on tax savings less clear to analyze. We refer the reader to Fig. 3 in the Appendix for a graphical overview of the tax rebate caused by an additional dependent child with the inclusion of supplemental tax relief. The additional tax relief is taken into account in the simulation of the tax rebate used to estimate the different models.

3. Data and sample selection

We use an administrative dataset, the Echantillon Démographique Permanent (EDP), which combines different civil registers (birth, death, and marriage registers as well as electoral registers), tax returns, pay slips, and census information for all persons born in France on one of the first four days of April, July, or October or between 2 and 5 January. These persons are known as the so-called "EDP individuals." Data are also collected for all persons living in the same dwelling as an EDP individual. The EDP therefore corresponds to a sample by day of birth, which represents 4% (16/365) of all possible days of birth for people born in France. We suppose that the selected birth days are sufficiently spread across the year (from January to October) so as not to call into question our results. The dataset includes 7 years of tax returns from 2010 to 2016. For each year, we select households with a "married couple" (married or in a civil union) comprising a woman and a man who live with their biological children born either between December 17 and December 31 of that year or between January 1 and January 15 of the following year

3.1 Identifying December and January parents

First, because of the complex tax rules in the case of dependent adults, we use the tax returns to select married couples who only report dependents under 18 years of age. Second, to avoid complications in the calculation of the number of "fiscal shares" due to parents with joint child custody, we select households who report having sole custody of the children on their tax return. Depending on the year, these initial selection criteria lead us to retain a number of households ranging from 318,351 to 360,932.[6]

Third, our strategy to identify the effect of income tax on the timing of birth is based on the calculation of a tax differential depending on whether the child is born in December of year *t* or January of year *t+1*. It is therefore important to ensure that households have the same husband and wife over years *t* and *t+1*. We therefore only select households meeting this criterion. Depending on the year, this leaves us between 272,250 and 310,944 households.

Fourth, as the tax returns do not include the date of birth of the children, we use the civil registers to select households in which a child was born during the year, either in the first 15 days of January (1-15) or the last 15 days of December (17-31). For all "EDP individuals" in the administrative dataset, regardless of whether they belong to our samples of selected households, the civil registers list between 2,489 and 2,924 children born each year in these time intervals. For all children born in this range from 2010 to 2016 and linked to an EDP individual included in our selected samples of married couples, their parents' dates of birth indicated on the birth certificate are matched with the dates of birth of both spouses found on their tax return. In this manner, we select households who live with their biological newborn children. As

[6] Around 42% of married couples in the original dataset report dependent children under 18 years of age on their tax return. Very few report children born during the course of the year as well as children aged 18 years and older.

can be seen from Table 1 below, more births take place in late December than in early January. The percentage of December parents increases as the sample window shrinks from December 17-January 15 to December 31-January 1, perhaps because of births scheduled to avoid childbirth on a public holiday or to benefit from the tax rebate.

Table 1 Number of December and January parents within the 15-day window around the New Year

No. of days around the New Year	Sample size	No. of December parents	No. of January parents	% of December parents
1 day	817	439	378	53.73
2 days	1,713	904	809	52.77
3 days	2,607	1,374	1,233	52.70
4 days	3,628	1,899	1,729	52.34
5 days	4,576	2,400	2,176	52.45
6 days	5,503	2,856	2,647	51.90
7 days	6,296	3,205	3,091	50.91
8 days	7,160	3,644	3,516	50.90
9 days	7,983	4,039	3,944	50.60
10 days	8,878	4,480	4,398	50.46
11 days	9,775	4,957	4,818	50.71
12 days	10,739	5,462	5,277	50.86
13 days	11,709	5,985	5,724	51.11
14 days	12,621	6,463	6,158	51.21
15 days	13,546	6,952	6,594	51.32

Source: EDP data.

Descriptive statistics of the sociodemographic characteristics for our largest sample of 13,546 households with children born within 15 days of the New Year are provided in Table 2.[7] For 37% of parents of that sample, the newborn child is the only dependent child, while 39% have one other dependent child and 25% have at least two other dependent children. On average, the father is 3 years older than the mother (34.09 vs 31.03 years). More than 90% of fathers and 78% of mothers received a wage income during the year. About 21% of households live in rural areas and 20% in the Paris region. Overall, 78% of parents are of French nationality.

To compare the distributions of the sociodemographic variables between December and January parents, we compute conventional t-statistics for equal means, normalized differences, and differences in the logarithms of the standard deviations. Following Imbens and Rubin (2015), normalized differences are defined as $\Delta_{DJ} = (\bar{X}_D - \bar{X}_J)/\sqrt{\frac{S_D^2+S_J^2}{2}}$, where $\bar{X}_D$ and $\bar{X}_J$ denote the sample averages of the covariate values

[7] For want of space, we do not report the 14 other tables. We rather emphasize in the text the differences that may emerge in the largest sample.

for the December parent group and the January parent group, respectively. Let S_D^2 and S_J^2 denote the corresponding sample variances of the covariate values for the two groups. Despite the lack of an established convention, the normalized difference becomes large if it exceeds 0.2. Unlike t-statistics, normalized differences are not sensitive to sample size. The difference in the logarithms of the two group standard deviations is $\Gamma_{DJ} = \ln(s_D) - \ln(s_J)$.

Across all sociodemographic characteristics, the maximum (absolute) value of the normalized difference in variable means is 0.03. The maximum value of the difference in the logarithms of the standard deviations is also very small, being 0.04. All these summary statistics indicate that the balance in the distributions of the sociodemographic characteristics observed between December and January parents is excellent. In terms of these observed sociodemographic variables, being December or January parents seems to be randomly assigned. We observe similar results for the other samples. However, some differences sometimes emerge in relation to the place of residence. Parents with a child born on December 31 or January 1 are more likely not to have other dependent children (around 41%). Further, 80% of mothers in this sample received a wage income when the child was born on December 31 compared to 74% when the child was born on January 1. This is the largest gap across all samples.[8]

[8] The other tables are available upon request.

Table 2 Descriptive statistics for sociodemographic characteristics (largest sample)

	All parents	December parents	January parents	t-stat	Δ_{DJ}	Γ_{DJ}
Only dependent kid	0.37	0.37	0.36	1.34	0.02	0.01
	(0.48)	(0.48)	(0.48)	(0.18)		
Another dependent kid	0.39	0.38	0.39	-0.84	-0.01	-0.00
	(0.49)	(0.49)	(0.49)	(0.40)		
Two other dep. kids	0.18	0.18	0.18	-0.09	-0.00	-0.00
	(0.38)	(0.38)	(0.38)	(0.92)		
More than two dep. kids	0.07	0.07	0.07	-0.78	-0.01	-0.02
	(0.26)	(0.25)	(0.26)	(0.43)		
Age (father)	34.09	34.11	34.06	0.49	0.01	-0.02
	(5.76)	(5.71)	(5.81)	(0.63)		
Age (mother)	31.03	31.03	31.02	0.09	0.00	-0.02
	(4.54)	(4.49)	(4.59)	(0.92)		
Father has wage>0	0.91	0.91	0.90	1.54	0.03	-0.04
	(0.29)	(0.28)	(0.29)	(0.12)		
Mother has wage>0	0.78	0.78	0.77	1.74	0.03	-0.01
	(0.42)	(0.41)	(0.42)	(0.08)		
French nationality	0.78	0.78	0.78	0.61	0.01	-0.01
	(0.42)	(0.42)	(0.41)	(0.54)		
Rural area	0.21	0.21	0.21	-0.85	-0.01	-0.01
	(0.41)	(0.41)	(0.41)	(0.39)		
Urban area 1	0.11	0.11	0.11	0.87	0.01	0.02
	(0.31)	(0.32)	(0.31)	(0.38)		
Urban area 2	0.10	0.10	0.10	-0.25	-0.00	-0.01
	(0.30)	(0.30)	(0.30)	(0.80)		
Urban area 3	0.11	0.12	0.11	1.69	0.03	0.04
	(0.32)	(0.32)	(0.31)	(0.09)		
Urban area 4	0.26	0.26	0.26	-0.61	-0.01	-0.01
	(0.44)	(0.44)	(0.44)	(0.54)		
Paris region	0.20	0.20	0.21	-0.28	-0.00	-0.00
	(0.40)	(0.40)	(0.40)	(0.78)		
No. of observations	13,546	6,952	6,594			

Source: EDP data.

Notes: Urban area 1: between 5,000 and 9,999 inhabitants. Urban area 2: between 10,000 and 49,999 inhabitants. Urban area 3: between 50,000 and 199,999 inhabitants. Urban area 4: between 200,000 and 1,999,999 inhabitants. In the t-statistic column, the number in parenthesis is the p-value for the test statistic. Otherwise, the numbers in parenthesis are standard deviations.

3.2 Estimating tax rebates

The data taken from the EDP are perfectly reliable given the administrative nature of the data source. They can therefore be used to calculate the amount of income tax paid by each household based on household income levels and demographic characteristics. The EDP contains detailed information on individual incomes that we use in the tax liability calculation, which includes the income of employed and self-employed workers, pension income, unemployment benefits, and various types of capital income. All income variables are adjusted for inflation and reported in 2015 euros.[9]

For December parents of year t, we compute for year t the difference in tax liability between the tax calculated with the newborn child and the tax calculated with the counterfactual number of "fiscal shares" without the child. For January parents of year $t+1$, we compute for year t the difference in tax liability between the tax calculated with the counterfactual number of "fiscal shares" that includes an additional dependent child and the tax calculated with the real number of "fiscal shares" that does not include them.[10]

Summary statistics for our largest sample of 13,546 households are provided in Table 4. On average, January parents have a slightly lower taxable income (€42,543 vs €44,311) and a slightly lower family quotient (€13,118 vs €13,670 with an additional dependent child and €16,264 vs €16,952 without), which in turn leads to a slightly lower tax liability with an additional dependent child (€2,534 vs €2,836) or without (€3,166 vs €3,496). Having an additional dependent child reduces quite substantially the percentage of households that pay income tax for both December parents (from 70% to 62%) and January parents (from 68% to 61%). January parents have slightly lower tax rebates compared with December parents (€632 vs €659). On average, tax rebates account for 40% of the initial tax liability and represent 1% of household taxable income for both December and January parents. Although the t-statistics for equal means associated with taxable income and tax liability variables are significantly different from 0 at the conventional levels, all corresponding normalized differences are very modest. Household taxable income values and tax liability values are less dispersed for January parents, which translate into small differences in the logarithms of the standard deviations. Building on Imbens and Rubin (2015), we also investigate the fraction of December (January) parents who have income variable values that are in the tails of the distribution of the income variable values for January (December) parents. We compute $\pi_D^{0.05} = \left(1 - F_D\left(F_J^{-1}(0.975)\right)\right) + F_D\left(F_J^{-1}(0.025)\right)$ and $\pi_J^{0.05} = \left(1 - F_J(F_D^{-1}(0.975))\right) + F_J(F_D^{-1}(0.025))$, where F_D and F_J are the cumulative distribution functions of the covariate in the December and January

[9] For this purpose, we use the consumer price index provided by the French National Institute of Statistics (index base 100 in 2015).

[10] The progressive income tax schedule $t()$ used to simulate tax liability is presented in Table 3 in the Appendix. As can be seen, $t()$ may evolve slightly from one year to another in terms of both the tax brackets and the marginal tax rates.

parent groups, respectively. As can be seen from the last two columns of Table 4, the overlap measures $\pi_D^{0.05}$ and $\pi_J^{0.05}$ suggest that large proportions of both December and January parents with income variable values are inside the central 0.95 part of the distribution of the other group.

When considering only parents who had a child on December 31 or January 1, the discrepancy in taxable income between December and January parents is more pronounced, the normalized difference being equal to 0.17. The gap in the tax rebate translates into a t-statistic equal to 2.64 and a normalized difference equal to 0.19 (€673 on average for December parents vs €557 on average for January parents).[11]

Table 4 Descriptive statistics for income variables (largest sample)

	All parents	December parents	January parents	t-stat	Δ_{DJ}	Γ_{DJ}	$\pi_D^{0.05}$	$\pi_J^{0.05}$
Taxable income	43,450	44,311	42,543	3.04	0.05	0.07	0.05	0.05
	(33,7852)	(35,038)	(32,533)	(0.00)				
Family quotient no extra birth	16,617	16,952	16,264	2.91	0.05	0.04	0.05	0.05
	(13,763)	(14,043)	(13,453)	(0.00)				
Family quotient extra birth	13,402	13,670	13,118	2.91	0.05	0.05	0.05	0.05
	(11,064)	(11,340)	(10,759)	(0.00)				
Tax liability no extra birth	3,335	3,496	3,166	2.02	0.03	0.07	0.03	0.02
	(9,507)	(9,838)	(9,142)	(0.04)				
Tax liability extra birth	2,689	2,836	2,534	1.91	0.03	0.07	0.03	0.02
	(9,206)	(9,536)	(8,843)	(0.06)				
Tax liability>0 no extra birth	0.69	0.70	0.68	2.26	0.04	-0.02		
	(0.46)	(0.46)	(0.47)	(0.02)				
Tax liability>0 extra birth	0.61	0.62	0.61	1.48	0.03	-0.01		
	(0.49)	(0.49)	(0.49)	(0.14)				
Tax rebate	646	659	632	2.43	0.04	0.02	0.02	0.02
	(670)	(675)	(665)	(0.02)				
Tax rebate (% of tax liability)	0.40	0.40	0.40	-1.14	-0.02	-0.00	0.03	0.02
	(0.28)	(0.28)	(0.28)	(0.25)				
Tax rebate (% of taxable income)	0.01	0.01	0.01	1.41	0.02	-0.02	0.02	0.03
	(0.01)	(0.01)	(0.01)	(0.16)				
No. of observations	13,546	6,952	6,594					

Source: EDP data and author's calculation.
Notes: In the t-stat column, the number in parenthesis is the p-value for the test statistic. Otherwise, numbers in parenthesis are standard deviations.

In our data, the tax rebate clearly increases with the taxable income (Table 5), which creates a correlation between these two variables.

[11] The related tables are available upon request.

Table 5 Average tax rebate per taxable income decile (largest sample)

Taxable income decile	Average Tax rebate	Standard deviation
Decile1	0	0
Decile 2	9.56	39.13
Decile 3	101.57	229.15
Decile 4	324.17	326.09
Decile 5	600.72	354.14
Decile 6	758.41	299.35
Decile 7	791.51	261.93
Decile 8	822.67	394.40
Decile 9	1095.75	466.21
Decile 10	1934.45	717.83

Source: EDP and author's calculation. Sample with births taking place within 15 days around the New Year.

4. Results

Estimation of the regression model (1)

We estimate three different specifications of the regression model (1). The most parsimonious specification only includes time dummies and the tax rebate from a December birth to explain the probability of having a child in December. The second includes the tax rebate, time dummies, and taxable income as an additional regressor. The last specification includes the previous covariates as well as other controls that may influence the timing of birth such as age, the number of dependent children already born, nationality, being an employee or not, and living in rural or urban areas.[12] Table 6 summarizes the results. For each sample and each specification, we present the estimated parameter $\hat{\beta}$ associated with the tax rebate in the regression (1).

Considering the estimates of the most parsimonious specification (left panel of Table 6), a positive and significant correlation appears between the tax rebate and the probability of having a child on December 31. According to the estimate, a €1,000 rise in the tax rebate leads to 7.5 percentage point increase in the probability of having a child on the last day of December instead of January 1. The correlation then decreases sharply as the bandwidth of days accounted for increases. For instance, a €1,000 rise in the tax

[12] Parents' education level is not included in the EDP but can be obtained from the census. Since the census is not conducted annually for the entire population, not all households present in the EDP in a given year are included in the census of that particular year. Therefore, the samples are reduced in this case by at least one third. We estimated the regression models (1) and (2) on these smaller samples. On the whole, the results are consistent with those obtained from the baseline samples, indicating that parents' education level does not have any significant effect on the probability of a December birth. These results are available upon request.

rebate leads to 2.6 percentage point increase in the probability of being December parents in the last 3 days of December, with this effect being significant only at the 10 percent level.

We now turn to the results that correspond to the 7-day window around the New Year used by Dickert-Colin and Chandra (1999) and Lalumnia et al. (2015) to predict a December birth. Our point estimate is much smaller than that of Dickert-Colin and Chandra (1999) who report a 0.344 marginal effect of a $1,000 rise in the tax rebate. It is close in magnitude to the small estimates reported by Lalumnia et al. (2015), which vary from 0.0098 to 0.0168 depending on the specification used. In our case, the effect is not significantly different from 0 at conventional levels. For the three largest bandwidths around the New Year (13, 14, and 15 days), we find a significant correlation between the tax rebate and the probability of being December parents. Compared to the 7-day window, the estimates are larger and more precisely estimated (sample size effect).

Overall, well after conception, parents might be able to bring forward a birth expected in early January to the last very few days of December. They could also plan their conception in order to have a child in December. However, they may fail if they aim for the last week of December and instead have a child in January. They may succeed if they aim for the entire month of December and manage to have a child in the last 2 weeks of December.

However, the significant correlation between the probability of a December birth and the tax rebate associated with an additional child vanishes when we control for taxable income in the regression (middle panel of Table 6). Due to the strong correlation between tax rebate and taxable income in our data, the estimated standard error of the coefficient related to tax rebate increases. In some cases, we even observe a change of sign of the estimate (from positive to negative). Adding other control variables does not lead to greater precision (right panel of Table 6), because almost all the covariates (except living in a non-rural area) have a non-significant effect on the probability of a December birth.[13] For all the estimated specifications, the goodness of fit is very low, the coefficient of determination being almost 0. We now turn to the estimation of the regression model (2) that allows for the possible nonlinear effect of the tax rebate and accounts for the correlation between tax rebate and taxable income.

[13] This is not surprising given the short time window used in our analysis to assess the births and the fact that the distributions of sociodemographic variables are well balanced between December and January parents. Therefore, our results differ from those of Buckles and Hungerman (2013) and Clarke et al. (2019), who find a significant effect of socioeconomic characteristics on the timing of birth on a monthly or quarterly basis.

Table 6 Estimating the correlation between tax rebate in €1,000s and December birth (regression model (1))

	Specification (1)			Specification (2)			Specification (2)		
# of days	$\hat{\beta}$	p-value	R^2	$\hat{\beta}$	p-value	R^2	$\hat{\beta}$	p-value	R^2
1 day	0.075 (0.027)	0.006	0.	0.052 (0.044)	0.236	0.0	0.040 (0.047)	0.400	0.02
2 days	0.038 (0.019)	0.050	0.	0.030 (0.029)	0.301	0.0	0.025 (0.031)	0.420	0.02
3 days	0.026 (0.015)	0.088	0.	0.021 (0.023)	0.356	0.0	0.022 (0.024)	0.357	0.01
4 days	0.017 (0.012)	0.175	0.	0.013 (0.019)	0.511	0.0	0.013 (0.020)	0.526	0.00
5 days	0.008 (0.011)	0.482	0.	-0.005 (0.014)	0.738	0.0	-0.006 (0.015)	0.718	0.00
6 days	0.013 (0.010)	0.189	0.	-0.008 (0.013)	0.552	0.0	-0.008 (0.014)	0.557	0.00
7 days	0.009 (0.009)	0.331	0.	-0.008 (0.012)	0.511	0.0	-0.009 (0.013)	0.511	0.00
8 days	0.009 (0.009)	0.300	0.	-0.010 (0.011)	0.404	0.0	-0.011 (0.012)	0.383	0.00
9 days	0.006 (0.008)	0.508	0.	-0.011 (0.011)	0.331	0.0	-0.013 (0.012)	0.281	0.00
10 days	0.007 (0.008)	0.362	0.	-0.009 (0.010)	0.369	0.0	-0.010 (0.011)	0.384	0.00
11 days	0.009 (0.008)	0.231	0.	-0.008 (0.010)	0.433	0.0	-0.007 (0.011)	0.532	0.00
12 days	0.010 (0.007)	0.159	0.	-0.002 (0.010)	0.831	0.0	-0.001 (0.011)	0.905	0.00
13 days	0.015 (0.007)	0.035	0.	0.001 (0.010)	0.894	0.0	0.000 (0.010)	0.982	0.00
14 days	0.017 (0.007)	0.011	0.	0.004 (0.010)	0.672	0.0	0.003 (0.010)	0.745	0.00
15 days	0.016 (0.006)	0.015	0.	0.004 (0.009)	0.690	0.0	0.003 (0.010)	0.791	0.00

Notes: Linear probability model regressions with standard errors are robust to heteroscedasticity of unknown form. Standard errors are in parentheses. For want of space, only p-values are reported without the corresponding t-statistics. The included controls (not shown) are the following: six dummies for year (specification 1); six dummies for year as well as household taxable income (specification 2); six dummies for year as well as household taxable income, husband's age, wife's age, one dummy for the presence of another dependent child on the tax return, one dummy for the presence of at least two other dependent children on the tax return, one dummy for household French nationality, two dummies for being an employee (one for each spouse), two dummies for being self-employed (one for each spouse), and five dummies for the household's place of residence (specification 3). Marginal effects from Probit models give almost identical results.

Estimation of regression model (2)

Two specifications are estimated here. As in the previous case, the first specification only uses time dummies as control variables. The second includes all covariates found in the third specification of the regression model (1) except for taxable income. Table 7 summarizes the main findings for the most parsimonious specification. At the 5 percent level, the tax savings associated with an additional dependent child on the tax return have a positive and significant effect on the probability of a December birth but only for parents with tax rebate and taxable income values that are higher than the sample median. In other words, large tax rebates are positively correlated with the probability of a December birth but only for parents with a taxable income above the median value. We find a similar pattern regardless of the number of days around the New Year, although the strongest estimated effect is for children born on December 31. All else being equal, for parents with a tax rebate and taxable income higher than the sample median values, the probability of having a child on December 31 increases by 0.126 points compared to parents with no tax incentives ($TaxRebate_i = 0$). By comparison, the increase is 0.033 points for parents with a child born during the last 15 days of December. The estimation of the regression model (2) including all the control variables gives similar results (Table 8). As most control variables have no effect on the probability of a December birth, the estimates are less precisely estimated. For the two specifications, the goodness of fit remains very low.[14]

Overall, the tax savings associated with an additional dependent child do not appear to be a major explanatory factor for the probability of a December birth. The financial incentive may be insufficient in this respect. It is also possible that parents may have difficulty understanding the effect of a supplementary dependent child on their tax liability. Nevertheless, the positive correlation between tax savings and the probability of a December birth observed for relatively well-off households may be due to non-tax reasons. These two issues are explored in the next section.

[14] We also estimated the regression model (2) with other threshold values for s and r. The results are similar. Because of the strong correlation between tax rebate and taxable income, the value intervals for these two variables must be large enough so that their intersections contain a sufficient number of observations.

Table 7 Estimating the correlation between tax rebate and December birth (regression model (2), specification 1)

	$\mathbf{1}_{[0<TaxRebate<s,R\leq r]}$		$\mathbf{1}_{[0<taxRebate<s,R>r]}$		$\mathbf{1}_{[s<taxRebate,R\leq r]}$		$\mathbf{1}_{[s<TaxRebate,R>r]}$		
# of days	$\hat{\beta}_1$	p-value	$\hat{\beta}_2$	p-value	$\hat{\beta}_3$	p-value	$\hat{\beta}_4$	p-value	R^2
1 day	0.074	0.170	0.108	0.119	0.048	0.466	0.126	0.008	0.0
	(0.054)		(0.069)		(0.066)		(0.047)		
2 days	0.030	0.405	0.026	0.581	0.012	0.793	0.086	0.008	0.0
	(0.036)		(0.047)		(0.045)		(0.032)		
3 days	0.001	0.962	0.007	0.841	-0.040	0.282	0.071	0.007	0.0
	(0.029)		(0.036)		(0.037)		(0.027)		
4 days	0.001	0.953	0.025	0.420	-0.023	0.467	0.060	0.008	0.0
	(0.024)		(0.031)		(0.032)		(0.022)		
5 days	0.025	0.247	0.028	0.314	-0.034	0.228	0.046	0.024	0.0
	(0.022)		(0.027)		(0.029)		(0.020)		
6 days	0.012	0.527	0.040	0.052	-0.004	0.888	0.053	0.004	0.0
	(0.020)		(0.021)		(0.026)		(0.018)		
7 days	0.011	0.563	0.030	0.205	-0.017	0.488	0.044	0.011	0.0
	(0.018)		(0.023)		(0.024)		(0.017)		
8 days	0.005	0.786	0.024	0.274	-0.004	0.872	0.040	0.013	0.0
	(0.017)		(0.022)		(0.023)		(0.016)		
9 days	0.008	0.612	0.017	0.410	-0.010	0.631	0.033	0.031	0.0
	(0.016)		(0.021)		(0.021)		(0.015)		
10 days	0.007	0.637	0.022	0.278	-0.007	0.744	0.031	0.035	0.0
	(0.015)		0.020		(0.020)		0.014		
11 days	0.006	0.683	0.014	0.471	-0.005	0.778	0.031	0.024	0.0
	(0.015)		(0.019)		(0.019)		(0.014)		
12 days	0.007	0.603	0.019	0.293	-0.008	0.685	0.031	0.018	0.0
	(0.014)		(0.018)		(0.019)		(0.013)		
13 days	0.012	0.377	0.024	0.163	0.003	0.867	0.034	0.007	0.0
	(0.013)		(0.017)		(0.018)		(0.013)		
14 days	0.013	0.316	0.026	0.111	0.003	0.876	0.035	0.004	0.0
	(0.013)		(0.017)		(0.017)		(0.012)		
15 days	0.014	0.253	0.022	0.179	0.005	0.779	0.033	0.005	0.0
	(0.012)		(0.016)		(0.016)		(0.012)		

Notes: Linear probability model regressions with standard errors robust to heteroscedasticity of unknown form. Standard errors in parenthesis. To save on space, just p-values are reported but-not corresponding t-statistics. Control included but not shown are: six dummies for year. Marginal effects from Probit models give almost identical results.

Table 8 Estimating the correlation between tax rebate and December birth (regression model (2), specification 2)

	$\mathbf{1}_{[0<TaxRebate<s,R\leq r]}$		$\mathbf{1}_{[0<taxRebate<s,R>r]}$		$\mathbf{1}_{[s<taxRebate,R\leq r]}$		$\mathbf{1}_{[s<TaxRebate,R>r]}$		
# of days	$\hat{\beta}_1$	p-	$\hat{\beta}_2$	p-value	$\hat{\beta}_3$	p-	$\hat{\beta}_4$	p-value	R^2
1 day	0.077	0.221	0.113	0.160	0.053	0.476	0.110	0.068	0.021
	(0.063)		(0.080)		(0.074)		(0.060)		
2 days	0.033	0.433	0.033	0.548	0.009	0.863	0.088	0.082	0.023
	(0.042)		(0.055)		(0.051)		(0.051)		
3 days	0.021	0.541	0.032	0.449	-0.024	0.570	0.086	0.009	0.016
	(0.034)		(0.042)		(0.042)		(0.033)		
4 days	0.016	0.585	0.045	0.218	-0.009	0.808	0.072	0.011	0.011
	(0.029)		(0.037)		(0.035)		(0.028)		
5 days	0.041	0.115	0.050	0.124	-0.018	0.570	0.061	0.015	0.010
	(0.026)		(0.032)		(0.032)		(0.025)		
6 days	0.021	0.376	0.055	0.064	0.006	0.842	0.064	0.005	0.008
	(0.023)		(0.029)		(0.029)		(0.023)		
7 days	0.018	0.424	0.043	0.121	-0.009	0.739	0.055	0.011	0.007
	(0.022)		(0.028)		(0.027)		(0.021)		
8 days	0.012	0.554	0.037	0.156	0.003	0.909	0.049	0.015	0.005
	(0.021)		(0.026)		(0.025)		(0.020)		
9 days	0.014	0.482	0.028	0.255	-0.005	0.819	0.039	0.040	0.004
	(0.020)		(0.025)		(0.024)		(0.019)		
10 days	0.014	0.449	0.039	0.093	-0.001	0.977	0.040	0.029	0.003
	(0.019)		(0.023)		(0.023)		(0.018)		
11 days	0.013	0.475	0.027	0.230	0.000	0.992	0.042	0.016	0.003
	(0.018)		(0.022)		(0.022)		(0.017)		
12 days	0.015	0.386	0.032	0.137	-0.001	0.956	0.041	0.012	0.002
	(0.017)		(0.021)		(0.021)		(0.016)		
13 days	0.010	0.516	0.026	0.201	0.001	0.944	0.035	0.026	0.002
	(0.016)		(0.020)		(0.020)		(0.016)		
14 days	0.011	0.474	0.028	0.155	0.001	0.952	0.035	0.019	0.002
	(0.015)		(0.020)		(0.019)		(0.015)		
15 days	0.010	0.505	0.020	0.282	0.001	0.969	0.032	0.030	0.002
	(0.015)		(0.019)		(0.018)		(0.015)		

Notes: Linear probability model regressions with standard errors robust to heteroscedasticity of unknown form. To save on space, just p-values are reported but-not corresponding t-statistics. Control included but not shown are: six dummies for year, as well as husband's age, wife's age, one dummy for the presence of another dependent child on the tax return, one dummy for the presence of at least two other dependent children on the tax return, one dummy for household French nationality, two dummies for being an employee (one for each spouse), two dummies for being self-employed (one for each spouse), and five dummies for household's place of residence (specification 2). Marginal effects from Probit models give almost identical results.

5. Robustness checks

Parents may not properly understand the variation in tax liability due to the addition of a child on their tax return. To question this assumption, we proceed as follows. We re-estimate the regression models (1) and (2) with the subsample of households who already have at least one dependent child on their tax return. If a learning effect comes into play, then these households would be more likely to correctly anticipate the future tax rebate. Fig. 4 and Fig. 5 summarize the results for the most and least parsimonious specifications of the regression model (1), respectively. To simplify the comparison, we also report in Fig. 4 and Fig. 5 the estimates already provided in Table 6. Our results indicate a greater sensitivity of December birth to tax savings for parents who already have dependent children but only if their newborn child is born on December 31 and not on January 1.. However, the difference in magnitude is small, and all 95% confidence intervals overlap.

Fig. 4 Estimating the correlation between tax rebate and December birth in light of a possible learning effect (regression model (1), specification 1)

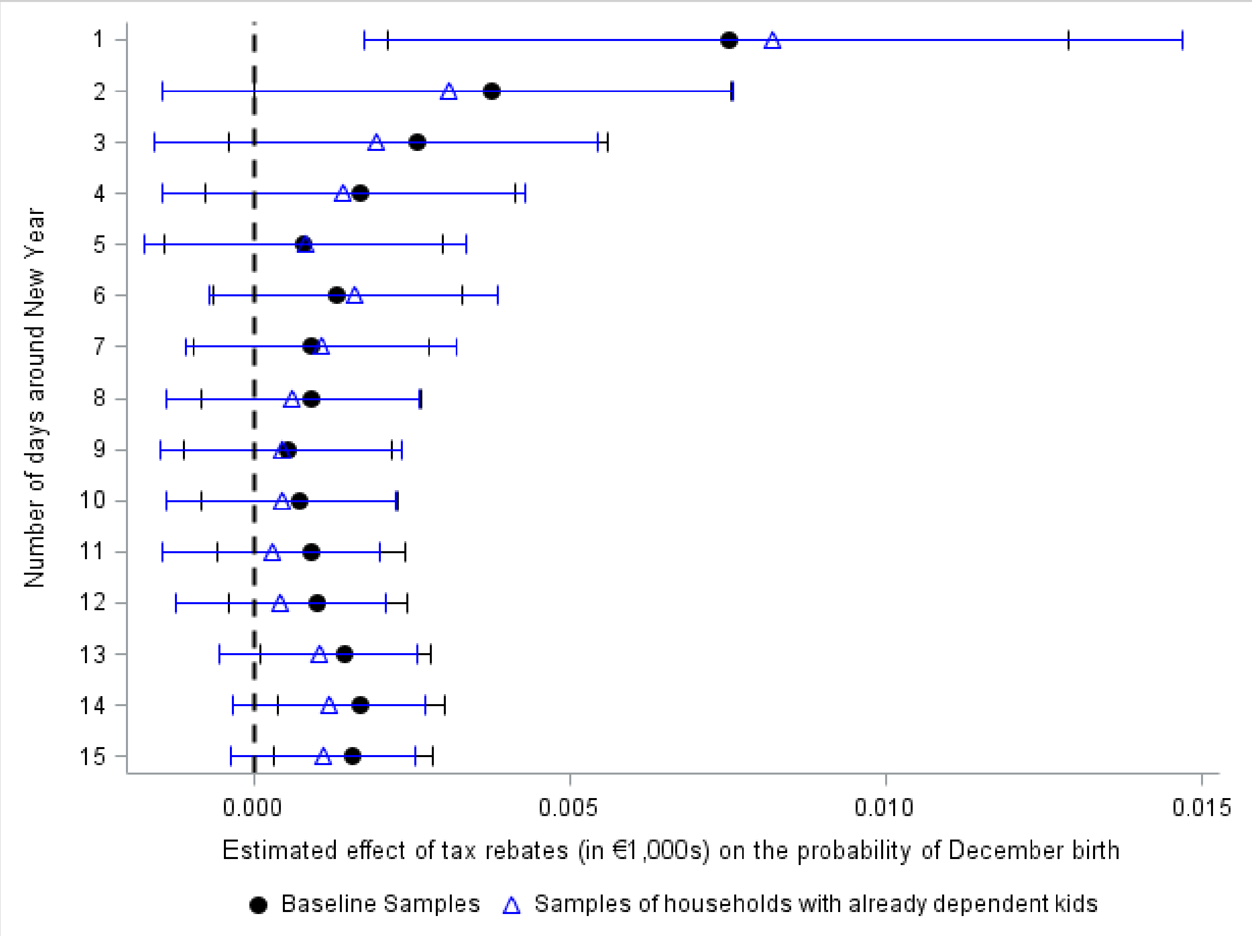
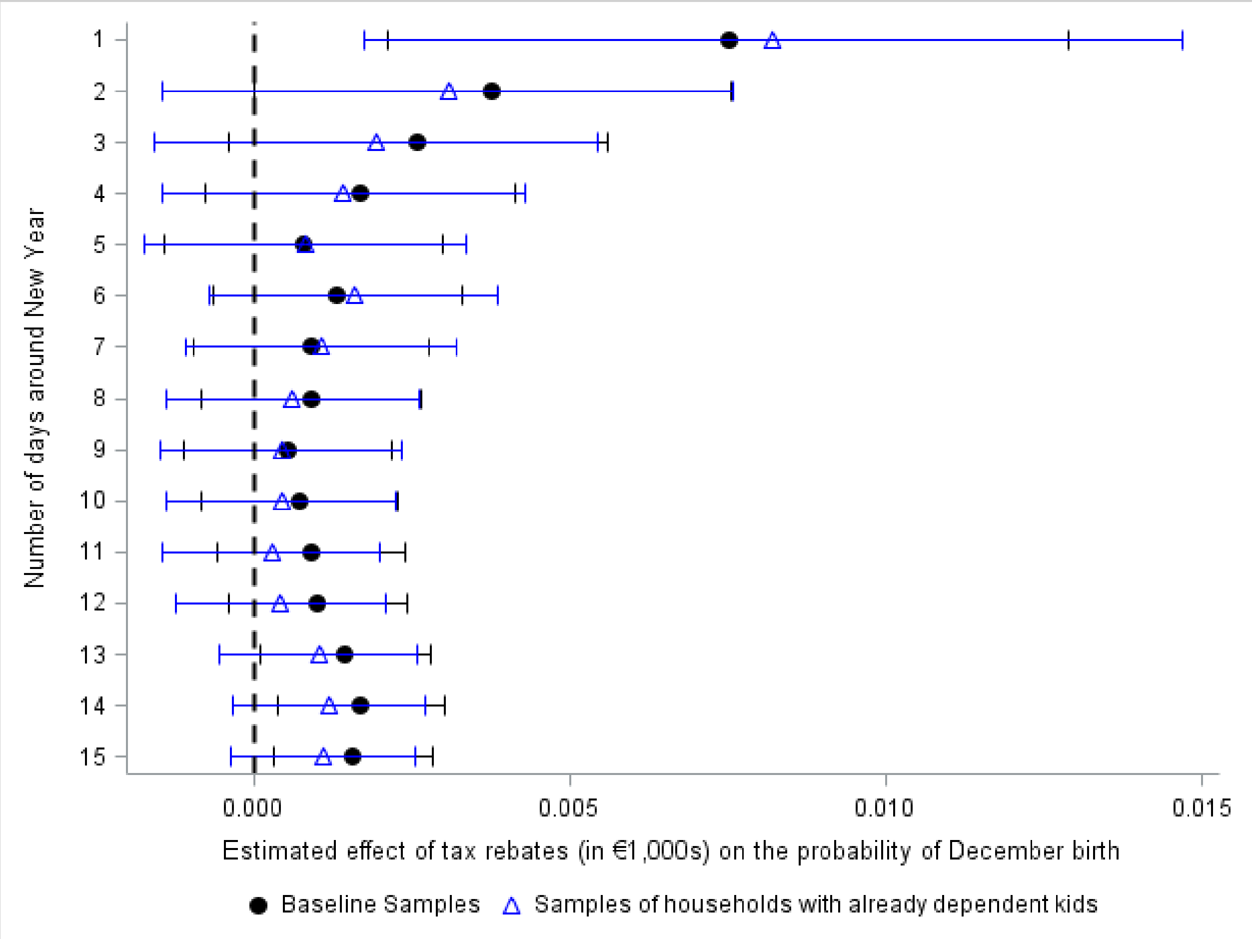


Fig. 5 Estimating the correlation between tax rebate and December birth in light of a possible learning effect (regression model (1), specification 2)



Tables 9 and 10 report the estimates for the two specifications of regression model (2). According to the results, there appears to be a learning effect for parents with taxable incomes below the median value, with the point estimates corresponding to $\hat{\beta}_1$ and $\hat{\beta}_3$ in Tables 9 and 10 being larger than their counterparts in Tables 7 and 8. As already mentioned, this could point to a greater sensitivity to tax savings for this specific group of parents. However, many coefficients are not significant at the conventional levels, which may be due to the smaller sample size.

Table 9 Estimating the correlation between tax rebate and December birth in light of a possible learning effect (regression model (2), specification 1)

	$\mathbf{1}_{[0<TaxRebate<s,R\leq r]}$		$\mathbf{1}_{[0<taxRebate<s,R>r]}$		$\mathbf{1}_{[s<taxRebate,R\leq r]}$		$\mathbf{1}_{[s<TaxRebate,R>r]}$		
# of days	$\hat{\beta}_1$	p-value	$\hat{\beta}_2$	p-value	$\hat{\beta}_3$	p-value	$\hat{\beta}_4$	p-value	R^2
1 day	0.080	0.243	0.126	0.153	0.111	0.208	0.146	0.018	0.020
(*N*=484)	(0.068)		(0.088)		(0.088		(0.062)		
2 days	0.038	0.399	0.009	0.876	0.086	0.143	0.062	0.130	0.011
(*N*=1,057)	(0.045)		0.061		(0.059		(0.041)		
3 days	0.005	0.891	0.020	0.664	0.039	0.418	0.036	0.281	0.009
(*N*=1,622)	(0.036)		(0.047)		(0.048		(0.034)		
4 days	0.011	0.711	0.028	0.491	0.059	0.142	0.041	0.149	0.008
(*N*=2,272)	(0.030)		(0.040)		(0.040		(0.028)		
5 days	0.042	0.116	0.024	0.523	0.044	0.234	0.037	0.136	0.007
(*N*=1,885)	(0.027)		(0.038)		(0.037		(0.025)		
6 days	0.030	0.213	0.026	0.419	0.058	0.081	0.055	0.014	0.006
(*N*=3,502)	(0.024)		(0.032)		(0.033		(0.023)		
7 days	0.034	0.136	0.020	0.517	0.044	0.149	0.040	0.057	0.005
(*N*=4,015)	(0.023)		(0.031)		(0.031		(0.021)		
8 days	0.024	0.261	0.005	0.864	0.043	0.140	0.030	0.132	0.004
(*N*=4,529)	(0.021)		(0.029)		(0.029		(0.020)		
9 days	0.027	0.187	-0.004	0.892	0.035	0.205	0.026	0.165	0.003
(*N*=5,039)	(0.020)		(0.027)		(0.027		(0.019)		
10 days	0.024	0.210	-0.006	0.811	0.031	0.237	0.021	0.233	0.002
(*N*=5,590)	(0.019)		(0.026)		(0.026		(0.018)		
11 days	0.016	0.379	-0.011	0.650	0.014	0.574	0.018	0.299	0.001
(*N*=6,161)	(0.018)		(0.025)		(0.025		(0.017)		
12 days	0.014	0.431	0.002	0.946	0.012	0.608	0.020	0.217	0.001
(*N*=6,792)	(0.017)		(0.023)		(0.024		(0.016)		
13 days	0.030	0.072	0.010	0.665	0.016	0.483	0.028	0.074	0.001
(*N*=7,412)	(0.017)		(0.022)		(0.023		(0.016)		
14 days	0.034	0.034	0.014	0.536	0.017	0.429	0.027	0.076	0.001
(*N*=8,002)	(0.016)		(0.022)		(0.022		(0.015)		
15 days	0.036	0.021	0.005	0.802	0.014	0.506	0.026	0.076	0.001
(*N*=8,592)	(0.015)		(0.021)		(0.021		(0.014)		

Notes: Linear probability model regressions with standard errors robust to heteroscedasticity of unknown form. For want of space, just p-values are reported but-not corresponding t-statistics. Control included but not shown are six dummies for year. Marginal effects from Probit models give almost identical results.

Table 10 Estimating the correlation between tax rebate and December birth in light of a possible learning effect (regression model (2), specification 2)

	$\mathbf{1}_{[0<TaxRebate<s,R\leq r]}$		$\mathbf{1}_{[0<taxRebate<s,R>r]}$		$\mathbf{1}_{[s<taxRebate,R\leq r]}$		$\mathbf{1}_{[s<TaxRebate,R>r]}$		
# of days	$\hat{\beta}_1$	p-value	$\hat{\beta}_2$	p-value	$\hat{\beta}_3$	p-value	$\hat{\beta}_4$	p-value	R^2
1 day	0.080	0.324	0.148	0.157	0.127	0.204	0.123	0.118	0.03
(N=484)	(0.081)		(0.105)		(0.100)		(0.079)		
2 days	0.033	0.534	0.010	0.886	0.078	0.218	0.053	0.295	0.03
(N=1,057)	(0.052)		(0.070)		(0.063)		(0.051)		
3 days	0.030	0.469	0.053	0.328	0.054	0.303	0.049	0.227	0.02
(N=1,622)	(0.041)		(0.054)		(0.052)		(0.041)		
4 days	0.026	0.474	0.050	0.290	0.073	0.099	0.050	0.146	0.01
(N=2,272)	(0.036)		(0.047)		(0.044)		(0.035)		
5 days	0.059	0.062	0.053	0.228	0.060	0.138	0.052	0.086	0.01
(N=1,885)	(0.032)		(0.044)		(0.040)		(0.030)		
6 days	0.039	0.172	0.046	0.221	0.068	0.060	0.066	0.018	0.01
(N=3,502)	(0.029)		(0.038)		(0.036)		(0.028)		
7 days	0.046	0.090	0.043	0.229	0.057	0.091	0.053	0.044	0.01
(N=4,015)	(0.027)		(0.036)		(0.034)		(0.026)		
8 days	0.040	0.122	0.029	0.385	0.056	0.076	0.043	0.081	0.00
(N=4,529)	(0.026)		(0.034)		(0.032)		(0.024)		
9 days	0.046	0.059	0.025	0.440	0.052	0.082	0.043	0.065	0.00
(N=5,039)	(0.024)		(0.032)		(0.030)		(0.023)		
10 days	0.042	0.065	0.021	0.490	0.048	0.092	0.039	0.074	0.00
(N=5,590)	(0.023)		(0.030)		(0.029)		(0.022)		
11 days	0.036	0.098	0.019	0.516	0.035	0.209	0.041	0.053	0.00
(N=6,161)	(0.022)		(0.029)		(0.028)		(0.021)		
12 days	0.031	0.131	0.027	0.318	0.031	0.245	0.038	0.054	0.00
(N=6,792)	(0.021)		(0.027)		(0.026)		(0.020)		
13 days	0.040	0.041	0.025	0.336	0.027	0.279	0.037	0.051	0.00
(N=7,412)	(0.020)		(0.026)		(0.025)		(0.019)		
14 days	0.045	0.018	0.029	0.248	0.029	0.226	0.036	0.052	0.00
(N=8,002)	(0.019)		(0.025)		(0.024)		(0.018)		
15 days	0.042	0.022	0.015	0.530	0.021	0.358	0.031	0.083	0.00
(N=8,592)	(0.018)		(0.024)		(0.023)		(0.018)		

Notes: Linear probability model regressions with standard errors robust to heteroscedasticity of unknown form. For want of space, just p-values are reported but-not corresponding t-statistics. Control included but not shown are: six dummies for year, as well as husband's age, wife's age, one dummy for the presence of at least two other dependent children on the tax return, one dummy for household French nationality, two dummies for being an employee (one for each spouse), two dummies for being self-employed (one for each spouse), and five dummies for household's place of residence (specification 2). Marginal effects from Probit models give almost identical results.

It is also possible that parents do not accurately calculate the reduction in tax liability associated with having an additional child on their tax return. Although taxpayers can easily simulate their tax liability online, they might use simplified heuristics. Following this idea, we re-estimate the different models by replacing the tax rebate with a pseudo tax rebate that is easier to calculate and does not account for the supplemental and maximum tax relief mechanisms. This simplified version of the tax rebate is easier to compute. We report the estimates for the second specification of regression model (2) in Table 11. The results are qualitatively identical. We find a significant correlation between tax rebate and the probability of a December birth but only for households with tax rebate and taxable income values higher than the median values. The use of this pseudo tax rebate does not allow us to better fit the probability of a December birth.

Table 11 Estimating the correlation between pseudo tax rebate and December birth (regression model (2), specification 2)

	$\mathbf{1}_{[0<TaxRebate<s,R\leq r]}$		$\mathbf{1}_{[0<taxRebate<s,R>r]}$		$\mathbf{1}_{[s<taxRebate,R\leq r]}$		$\mathbf{1}_{[s<TaxRebate,R>r]}$		
# of days	$\hat{\beta}_1$	p-	$\hat{\beta}_2$	p-	$\hat{\beta}_3$	p-	$\hat{\beta}_4$	p-value	R^2
1 day	0.059 (0.056)	0.291	0.053 (0.080)	0.502	-0.056 (0.083)	0.500	0.071 (0.057)	0.210	0.021
2 days	0.023 (0.038)	0.549	0.003 (0.059)	0.960	0.021 (0.056)	0.707	0.061 (0.037)	0.102	0.020
3 days	0.021 (0.030)	0.489	0.016 (0.046)	0.726	-0.016 (0.050)	0.749	0.061 (0.037)	0.102	0.013
4 days	0.010 (0.026)	0.713	0.043 (0.039)	0.275	0.011 (0.042)	0.785	0.042 (0.026)	0.108	0.010
5 days	0.016 (0.023)	0.474	0.037 (0.035)	0.287	0.023 (0.038)	0.551	0.042 (0.023)	0.072	0.008
6 days	0.008 (0.021)	0.720	0.046 (0.032)	0.146	0.037 (0.034)	0.283	0.046 (0.021)	0.029	0.007
7 days	0.000 (0.019)	0.985	0.037 (0.030)	0.215	0.031 (0.033)	0.340	0.046 (0.020)	0.019	0.006
8 days	0.011 (0.018)	0.541	0.047 (0.028)	0.094	0.045 (0.031)	0.144	0.045 (0.019)	0.016	0.005
9 days	-0.001 (0.017)	0.973	0.031 (0.027)	0.257	0.046 (0.029)	0.110	0.033 (0.018)	0.063	0.004
10 days	0.004 (0.016)	0.804	0.037 (0.026)	0.146	0.047 (0.027)	0.083	0.031 (0.017)	0.065	0.002
11 days	0.004 (0.016)	0.804	0.030 (0.024)	0.224	0.031 (0.026)	0.244	0.035 (0.016)	0.027	0.002
12 days	0.003 (0.015)	0.818	0.033 (0.023)	0.148	0.030 (0.025)	0.227	0.033 (0.015)	0.027	0.002
13 days	0.006 (0.014)	0.678	0.029 (0.022)	0.188	0.013 (0.023)	0.585	0.031 (0.014)	0.034	0.002
14 days	0.008 (0.014)	0.560	0.030 (0.021)	0.162	0.023 (0.023)	0.316	0.031 (0.014)	0.027	0.002
15 days	0.006 (0.013)	0.669	0.026 (0.021)	0.210	0.026 (0.022)	0.229	0.025 (0.013)	0.062	0.001

Notes: Linear probability model regressions with standard errors robust to heteroscedasticity of unknown form. For want of space, just p-values are reported but-not corresponding t-statistics. Control included but not shown are: six dummies for year, as well as husband's age, wife's age, one dummy for the presence of another dependent child on the tax return, one dummy for the presence of at least two other dependent children on the tax return, one dummy for household French nationality, two dummies for being an employee (one for each spouse), two dummies for being self-employed (one for each spouse), and five dummies for household's place of residence (specification 2). Marginal effects from Probit models give almost identical results.

Because of the correlation between household taxable income and tax rebate associated with an additional child, the effect of the tax rebate on the probability of a December birth for relatively well-off parents may partly reflect an income effect unrelated to tax savings. It may thus be easier for these parents to schedule the birth before the New Year in order to benefit from the best medical support when public and private hospitals are fully staffed. To disentangle these two effects, we build on the work of Lalumnia et al. (2015) by exploring the correlation between the tax rebate associated with an extra birth and the probability of giving birth before a public holiday other than the New Year such as Labor Day (May 1), All Saints' Day (November 1), and Christmas Day (December 25). Regardless of whether the child is born before or on one of these holidays, the tax rebate will be the same; the amount of the tax rebate thus has no effect on these probabilities. On the contrary, evidence of a significant correlation would indicate a spurious correlation between child-related tax savings and the timing of birth. We thus consider samples of births occurring within windows of several days around Labor Day, All Saints' Day, and Christmas Day, respectively. Table 12 summarizes the main findings for the regression model (2) with all the covariates included. For want of space, we only report the results obtained from the samples of births occurring between 1 and 4 days around the holiday. Overall, there is a significant correlation between the tax rebate and the probability of birth before the holiday. The point estimates corresponding to the probability of having a child on April 30 rather than May 1 are particularly large. For parents with tax rebate and taxable income values less than the median, the estimated probability of having a child on April 30 increases by 0.25 points compared to households with no tax incentives ($TaxRebate_i = 0$). The increase peaks at 0.30 points for parents with a tax rebate lower than the median value and a taxable income higher than the median value. Regardless of the holiday under consideration, the point estimates are smaller – and the corresponding effects are sometimes not significant at the conventional levels – for parents with tax rebate and taxable income values above the median. These results indicate that the tax savings associated with an additional dependent child do not only reflect a tax incentive but also reveal a desire to avoid having a child born on a public holiday. These findings are consistent with Almond et al. (2015), Levy et al. (2011), and Dickert-Colin and Elder (2011), who observe a decline in the number of births on Friday the 13th, Halloween, and weekends or holidays in the US. Similarly, Lo (2003) and Lin et al. (2006) document an increase or decrease in the number of C-sections performed in Taiwan on auspicious or inauspicious days, respectively.

Table 12 Estimating the correlation between the tax rebate and the probability of giving birth before Labor Day, All Saints' Day, and Christmas Day (regression model (2), specification 2)

	$\mathbf{1}_{[0<TaxRebate<s,R\leq r]}$		$\mathbf{1}_{[0<taxRebate<s,R>r]}$		$\mathbf{1}_{[s<taxRebate,R\leq r]}$		$\mathbf{1}_{[s<TaxRebate,R>r]}$		
	$\hat{\beta}_1$	p-value	$\hat{\beta}_2$	p-value	$\hat{\beta}_3$	p-value	$\hat{\beta}_4$	p-value	R^2
Labor Day									
1 day	0.250	0.000	0.304	0.000	0.228	0.000	0.105	0.032	0.045
(N=1,029)	(0.044)		(0.059)		(0.065)		(0.049)		
2 days	0.163	0.000	0.198	0.000	0.217	0.000	0.043	0.202	0.029
(N=2,148)	(0.031)		(0.041)		(0.042)		(0.034)		
3 days	0.139	0.000	0.204	0.000	0.208	0.000	0.035	0.204	0.026
(N=3,288)	(0.025)		(0.033)		(0.035)		(0.027)		
4 days	0.168	0.000	0.241	0.000	0.212	0.000	0.051	0.029	0.030
(N=4,371)	(0.022)		(0.029)		(0.030)		(0.024)		
All Saints' Day									
1 day	0.187	0.000	0.235	0.000	0.178	0.003	0.054	0.297	0.034
(N=968)	(0.048)		(0.059)		(0.061)		(0.052)		
2 days	0.155	0.000	0.253	0.000	0.176	0.000	0.076	0.032	0.028
(N=1,951)	(0.033)		(0.042)		(0.043)		(0.036)		
3 days	0.173	0.000	0.238	0.000	0.197	0.000	0.075	0.009	0.026
(N=2,989)	(0.026)		(0.034)		(0.036)		(0.028)		
4 days	0.180	0.000	0.214	0.000	0.190	0.000	0.054	0.027	0.025
(N=4,074)	(0.023)		(0.029)		(0.031)		(0.024)		
Christmas Day									
1 day	0.108	0.034	0.196	0.001	0.174	0.007	0.012	0.835	0.024
(N=911)	(0.051)		(0.060)		(0.065)		(0.056)		
2 days	0.156	0.000	0.187	0.000	0.136	0.002	0.069	0.062	0.019
(N=1,988)	(0.034)		(0.042)		(0.043)		(0.037)		
3 days	0.152	0.000	0.206	0.000	0.148	0.000	0.079	0.006	0.021
(N=3,107)	(0.027)		(0.034)		(0.035)		(0.029)		
4 days	0.162	0.000	0.205	0.000	0.146	0.000	0.067	0.006	0.021
(N=4,201)	(0.023)		(0.030)		(0.031)		(0.025)		

Notes: Linear probability model regressions with standard errors robust to heteroscedasticity of unknown form. For want of space, just p-values are reported but-not corresponding t-statistics. Control included but not shown are: six dummies for year, as well as husband's age, wife's age, one dummy for the presence of another dependent child on the tax return, one dummy for the presence of at least two other dependent children on the tax return, one dummy for household French nationality, two dummies for being an employee (one for each spouse), two dummies for being self-employed (one for each spouse), and five dummies for household's place of residence (specification 2). Marginal effects from Probit models give almost identical results.

6. Conclusion

In this paper, we empirically assess the correlation between income tax rebates triggered by the addition of a dependent child on the household's tax return and the timing of birth in France using a rich administrative dataset that combines birth certificates and tax returns. Unlike Dickert-Conlin and Chandra (1999) and Lalumnia et al. (2015) with US data, we find no clear evidence that French households bring forward the date of childbirth from early January to late December to benefit from child-related income tax reductions.

The size of the incentive, which averaged 40% of the initially payable taxes in our sample but only 1% of taxable income, may not be large enough to encourage parents to bring forward this benefit by a year. As parents benefit from the tax rebate at least until their child reaches the age of 18 years, they may not be sufficiently liquidity constrained or risk averse to anticipate this tax reduction by a year.

Even though parents may be aware of this tax incentive, they may want their children to be born in January instead of December in order for them to start school at an older age and thus not to be disadvantaged at school. As documented in the literature (e.g., Bedard and Dhuey, 2006; Black, Devereux, and Salvanes, 2011), children born in December are in the same class as pupils who are sometimes almost a year older, which appears not to be beneficial to learning. Furthermore, if the tax rebate from a supplementary dependent on the tax return is an extrinsic motivation to have children in December, this may be in conflict with the self-image also drives human behavior (see Ariely, Bracha and Meier, 2009), as accelerating childbirth for financial reasons may not provide a good self-image to others or to oneself.

According to our results, only the wealthiest half of households that also benefit from a relatively large tax rebate show a significant correlation between this fiscal incentive and the probability of having a child in December. However, this seems to be the result of a spurious correlation. It rather corresponds to the desire of parents not to give birth on a public holiday, as we also find a significant correlation between the tax rebate and the probability of giving birth on April 30 and October 31 rather than May 1 (Labor Day) and November 1 (All Saints' Day), respectively.

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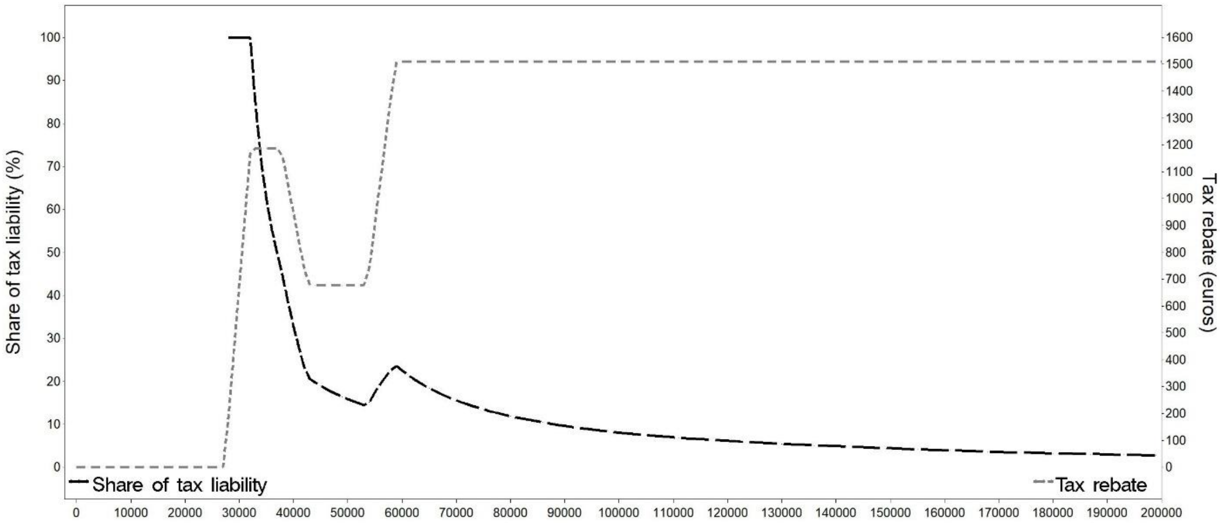
Appendix

Fig. 3 Tax rebate according to taxable income for the first dependent child, accounting for supplemental tax relief



Tax rebate by taxable income for 2015 when claiming a first dependent child

Table 3 Tax brackets and marginal tax rates used to simulate tax liability from 2010 to 2016

2010	Tax rate	0	0.055	0.14	0.3	0.41	
	Tax bracket	Up to €5,963	€5,964;€11,896	€11,897;€26,420	€26,421;€70,830	over €70,830	
2011	Tax rate	0	0.055	0.14	0.3	0.41	
	Tax bracket	Up to €5,963	€5,964;€11,896	€11,897;€26,420	€26,421;€70,830	over €70,830	
2012	Tax rate	0	0.055	0.14	0.3	0.41	0.45
	Tax bracket	Up to €5,963	€5,964;€11,896	€11,897;€26,420	€26,421;€70,830	€70,830;€150,000	over €150,000
2013	Tax rate	0	0.055	0.14	0.3	0.41	0.45
	Tax bracket	Up to €6,011	€6,012;€11,991	€11,991;€26,631	€26,632;€71,397	€71,398;€151,200	over €151,200
2014	Tax rate	0	0.14	0.3	0.41	0.45	
	Tax bracket	Up to €9,690	€9,690;€26,764	€26,765;€71,754	€71,755;€151,956	over €151,956	
2015	Tax rate	0	0.14	0.3	0.41	0.45	
	Tax bracket	Up to €9,700	€9,701;€26,791	€26,792;€71,826	€71,827;€152,108	over €152,108	
2016	Tax rate	0	0.14	0.3	0.41	0.45	
	Tax bracket	Up to €9,710	€9,711;€26,818	€26,819;€71,898	€71,899;€152,260	over €152,260	