Local Earned Income Tax Credits and Infant Health

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Abstract: In 1998, Montgomery County, MD adopted a local earned income tax credit (EITC) program. We use US Vital Statistics data covering births in Maryland from 1995-2004 to examine whether the local EITC impacted birth weight and the probability of low birth weight in Montgomery County. Using DD and DDD strategies, we find that the Montgomery County EITC increased infant birth weight by 13-21 grams and decreased the probability of low birth weight by 9-14% among likely eligible mothers. These estimates suggest that the local credit has an additional impact on birth outcomes of similar magnitude to state EITC programs.

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The EITC is one of the largest programs for low income households, third only in size to Medicaid and the Supplemental Nutrition Assistance Program (SNAP) at the federal level (US Government Accountability Office 2017, Moffitt 2013). In 2015 the federal cost of the program was over $61 billion, just under the almost $67 billion spent on SNAP; Medicaid spending was more than five times greater at $330 billion (US Government Accountability Office 2017). Operated through the tax code by the Internal Revenue Service, the EITC is described as "a benefit for working people with low to moderate income"(Internal Revenue Service 2017c). This refundable federal tax credit varies from a low of $2 for households with no qualifying children to a maximum of $6,269 for households with three or more qualifying children (Internal Revenue Service 2017b). The program is targeted toward working families as the credit applies to each dollar of earnings up to the eligibility threshold (e.g. $50,198 for a married couple with two children in 2016) (Internal Revenue Service 2017b). In addition to the federal credit, 25 states and the District of Columbia have their own earned income tax credit and some county or local governments fund their own EITC program (Internal Revenue Service 2017d).

A substantial literature suggests that the EITC increases labor supply and reduces poverty, primarily by encouraging work among single parents.[1] A growing literature suggests that the EITC improves health outcomes including infant birth weight (Hoynes, Miller, and Simon 2015, Markowitz et al. , Strully, Rehkopf, and Xuan 2010) and that improvements are greater for states that have refundable EITC programs in addition to the federal credit (Markowitz et al.). However, there is little evidence regarding local or county EITC programs that can inform policy decisions. Of interest to local policy makers is whether layering a local

[1] See Nichols and Rothstein (2015, Hotz and Sholz (2001), Eissa and Hoynes (2005), and Hoynes and Patel (2017).

EITC on top of federal and state EITC programs is expected to generate similar impacts on outcomes.

We examine the impact of one county-level EITC program on birth outcomes using US Vital Statistics micro data covering the full set of births in Maryland from 1995-2004. We use the 1998 introduction of a local EITC in Montgomery County, Maryland, which doubles the refundable portion of the Maryland state EITC, to identify the effects of the program on the probability of low birth weight and the birth weight of a newborn infant. As described below, the EITC is targeted toward households with children. As a result, mothers having their first child are less likely to be eligible for the credit, and even if eligible, the credit is typically a fraction of that available to households with children. Thus, we define the local EITC eligible group as births to low income women in the treatment county (Montgomery County, MD) and in the eligible population (mothers having their second or greater child). This will allow us to describe control groups based on the county of birth and the birth parity of the newborn infant.

The structure of this local EITC provides several key advantages and opportunities from an estimation perspective. As noted above, we observe the implementation of this county-level program in our data and can compare pre and post-implementation outcomes for births to mothers who are in the eligible population in Montgomery County using births to mothers who are among the eligible population but are in other counties to adjust for underlying trends (difference-in-differences, or DD). One potential problem with this strategy is that observed differences in outcomes across counties could be driven by a Montgomery County-specific shock rather than the EITC implementation. Because of the structure of the credit, we can exploit the fact that the credit targets mothers with children and we can compare difference in trends for mothers with children to trends for new mothers without previous children (difference-in-difference-in-differences, or DDD). Estimates indicate that the local EITC increased birth weight by 13-21 grams and decreased the probability of low birth weight by 9-14%. These results are robust to alternative specifications of the treatment date as well as alternative samples. Using these results, local policymakers who are considering a local EITC that piggybacks on state and federal EITCs can expect to see positive birth impacts from the local program.

Montgomery County Working Families Income Supplement

The Earned Income Tax Credit (EITC) program was created in 1975 as a federal tax credit for low- to moderate-income working people. Since its passage, the EITC has gone through several expansions, and it is currently one of the largest income-support programs in the United States with federal spending of nearly $61 billion in tax year 2015, which is more than spending on the Child Tax Credit, and more than twice as much as spending on Temporary Assistance for Needy Families (TANF) (US Government Accountability Office 2017).

Eligibility for the EITC requires that the household have earned income and a maximum amount of investment income.[2] If a household (single or married) is eligible, the size of the credit generally depends on the household's earned income level, the number of qualifying children, and the filing status (single, head of household, or married filing jointly) of the recipient. Of importance to our empirical strategy below, the EITC provides minimal benefits to households with no children due to lower income thresholds and smaller benefit amounts. For example, the federal 2016 maximum allowable income for a married couple with no children was $20,430 ($10,380 in 2000) with a maximum benefit amount of $506 ($353 in 2000) whereas a married couple with two children earned benefits up to $50,198 ($31,152 in 2000) in income and a

[2] Eligibility requirements are explained in more detail here, https://www.irs.gov/uac/Newsroom/Earned-Income-Tax-Credit-Do-I-Qualify.

maximum credit of $5,572 ($3,888 in 2000) (Internal Revenue Service 2017a, Tax Policy Center 2017).

In states that have a state EITC, eligibility is typically structured in a parallel fashion to the federal program. In most states, the size of the credit is a percentage of the federal credit and this percentage is set by the state; in 2016 the state percentages ranged from 3.5 to 40 percent.[3] While the federal EITC is refundable, some states have structured their state EITC as a nonrefundable credit, but in 2016, of the 26 states (plus the District of Columbia) that had a state EITC, all but 3 states had a refundable credit.

The state of Maryland created its own nonrefundable tax credit in 1987 and it created a separate refundable tax credit in 1998. The refundable tax credit was initially set at 10% of the federal credit and it gradually increased to 26% of the federal credit by 2016.[4] In addition to the state EITC, Montgomery County created its own local EITC-type program, called the Working Families Income Supplement program, in 1998 which is designed to match the state refundable EITC at 100%. Home to just over 1 million people, Montgomery County is part of the Washington, DC metro area. It has the second highest per capita income among Maryland counties, a 71.4% adult labor force participation rate, and an estimated 6.9% of the population lives in poverty.[5]

Table 1 illustrates maximum credits at the federal, state, and county level for households with 2 children. The Maryland and Montgomery county refundable credits increased 76 percent

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[3] See the Tax Policy Center for more information about state EITCs: http://www.taxpolicycenter.org/briefing-book/how-do-state-earned-income-tax-credits-work.
[4] Maryland continues to have a non-refundable and a refundable sate EITC.
[5] https://visitmontgomery.com/county-info/facts-and-stats/; https://www.census.gov/quickfacts/fact/table/montgomerycountymaryland/PST045216

from tax year 1998 to tax year 2002 due to increases in the federal credit and increasing state matching percent.

Table 1: EITC in Maryland and Montgomery County

Tax Year	Maximum Federal EITC	MD EITC Refundable Rate	Maximum MD EITC (refundable)	Maximum Montgomery County Credit	Number of recipients	Average Montgomery County EITC ($2002)
1998	$3,756	10	$375.60	$375.60	12,322	$197.15
1999	$3,816	10	$381.60	$381.60	10,917	$249.82
2000	$3,888	15	$583.20	$583.20	14,122	$290.76
2001	$4,008	16	$641.28	$641.28	14,814	$321.57
2002	$4,140	16	$662.40	$662.40	18,074	$332.64

Maximum credits are for households with 2 children. Source: IRS, Tax Credits for Working Families, Tax Policy Center, Montgomery County Memorandum to Government Operations and Fiscal Policy Committee, April 17, 2014

Because not all families receive the maximum credit, Table 1 also provides a sense for the average size of actual credits claimed (in 2002 dollars) and the number of people impacted. For tax year 2002, the average Montgomery County credit received was about $330 covering just over 18,000 recipients. The average number of recipients increased about 46 percent from 1998 to 2002 and the average credit rose by 69 percent measured in 2002 dollars.

Infant Health

Early life health outcomes are important determinants of long-term health, education, and labor market outcomes. Low birth weight has significant long-term effects on self-reported health status as well as educational and labor market outcomes (Currie and Hyson (1999)). Preterm birth has been associated with increased rates of mortality in early childhood and young adulthood and greater risk of later adult chronic medical conditions such as hypertension, heart disease, and diabetes (Crump et al. (2011); Goldenberg and Culhane (2007)). In addition, many early health problems are often associated with infants of lower-income mothers (Kramer et al. (2000); Currie and Moretti (2007); Larson (2007)).

Given the long-term importance of health outcomes of infants, recent literature has examined the role that social safety net programs have in promoting infant health. For example, Figlio, Hammersma, and Roth (2009), use Florida birth certificate data for a subset of individuals who are marginally eligible and marginally ineligible for participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). They then use changes in documentation requirements as an instrument for WIC participation and find that WIC participation has no effect on mean birth weight, but it does reduce the probability of very low birth weight. Hoynes, Page and Stevens (2011) take advantage of the WIC "rollout" across counties during the 1970s. They compare infant health in counties that have recently adopted WIC with infant health in counties that have not adopted WIC and find that WIC participation is associated with higher average birth weights (18 to 29 grams) and lower likelihood of very low birth weights. Almond, Hoynes, and Schanzenbach (2011) examine the impact that participation in the Food Stamp program had on children as it was rolled out in the 1960s and 1970s and find that program participation is associated with higher birth weights.

In addition to nutrition assistance programs, researchers have examined whether other income-support programs, such as the EITC, have a positive effect on health. Baker (2008) looked at whether the 1993 expansion of the federal EITC had a positive impact on birth weight and find that the expansion increased birth weight 7 to 14 grams on average. Strully, Rehkopf, and Xuan (2010) find that births in states with a state EITC were 15 grams higher on average. Hoynes, Miller, and Simon (2015) use US Vital Statistics microdata and find that the expansion of EITC increased birth weights and decreased the likelihood of low birth weight. Markowitz et al. (2017) investigate the effects of state EITC expansions using vital statistics data in a difference-in-differences estimation finding small, but positive effects on birth outcomes.

Our paper extends the literature in a couple of important ways. First, we are the first paper to examine the impact of a local EITC-type program on infant health. At this time, there are very few local EITCs in the United States and any information about the effects of the program will help local policymakers decide whether to implement a program. Second, our research utilizes information about health outcomes before and after the implementation, across eligible and non-eligible populations, and across counties with and without the program, which allows for a DDD approach to identify program effects. Additionally, the previous literature has primarily examined the impact of changes from expansion of the program rather than the introduction.

Data

US Vital Statistics data are collected by the National Center for Health Statistics and are publicly available. The data provide demographic, health, and geographic data for all births in the United States. The demographic data include information on the date of birth, age of mother, education of mother, marital status of mother, and birth parity of the child. The health data include a variety of information about the health of the child at birth, including birth weight, weeks of gestation, prenatal care, Apgar score, and maternal health choices during pregnancy. The geographic location, including state and county, of residence of birth is also provided.

Dating back to 1985, the data provide information on all births in all states, but beginning in 2005, public use data does not include geographic detail. Of particular interest to our research, we have data with geographic information for a few years before and after implementation of the local EITC, which is important for the DD approach. We have collected the national data from 1995-2004, which means that state and county of birth and residence are publicly available. As a result, we have compiled a dataset of Maryland births with county information that will allow us to utilize the DD and DDD approaches to examine the impact of the EITC on infant health.

To identify births most likely affected by the local EITC, we note that the credit is targeted toward households with children. That is, mothers having their first child are far less likely to be eligible for the credit due to lower income eligibility thresholds and even if eligible, the credit is only a fraction of that available to households with children. The EITC is also targeted to households with low income. The Vital Statistics data do not provide income or information about whether the EITC was claimed. As a result, we restrict our analysis sample to mothers who are "likely EITC" recipients. We use previous literature to inform us on who will likely receive the credit. Following Hoynes, Miller, and Simon (2015), we define mothers as likely EITC recipients if the mother is single and has less than a high school education. Thus, in the spirit of an intent-to-treat approach, we define the local EITC eligible group as births to women in Montgomery County, MD, who are having their second or greater child and are likely EITC recipients.

An additional important consideration is the definition of the control counties. In our dataset, counties with a population under 100,000 are not uniquely identified. As a result, we define control counties to be the counties in Maryland that are given a unique identifier while Montgomery County is the treatment county.[6] Of the 168,845 births that occur in our sample

[6] Including Baltimore City, there are 24 counties in Maryland. The counties that are uniquely identified and that are part of our control counties include Anne Arundel, Baltimore (City and County), Carroll, Charles, Frederick, Harford, Howard, Prince George's, and Washington.

during the panel, 21,769 occur in counties without a unique identifier, so we keep 87.11% of the sample for our estimations.[7]

Our analysis examines birth outcomes before and after implementation of the Montgomery County EITC program. Thus, the timing of program payments in relation to birth date is important. As shown above, the Montgomery County EITC program was implemented in tax year 1998. Recipients of the Montgomery County EITC receive their checks in July of the next calendar year, so the first recipients of the program received their checks in July 1999. This income increase did not likely have an impact on births that occurred immediately after receipt of the credit because evidence shows that the third trimester is most important for birth weight determination (Almond, Hoynes, and Schanzenbach 2011). Thus, the first checks received in July 1999 should have had an effect on births to mothers who began their third trimester in July 1999 and after. As a result, we define the pre-treatment period as all births that occur through October 1999, and we define post-treatment as all births that occur from November 1999 through the end of the panel.[8]

Our primary variables of interest are birth outcomes.[9] Specifically, we focus on birth weight (in grams) and the probability of low birth weight which is defined as a birth where the weight is less than 2500 grams. The implementation of the county-level EITC represents a natural experiment where we expect treatment status to be independent of unobserved characteristics. We use the DD and DDD approaches to adjust for any underlying time trends at

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[7] We re-estimated the models described below using data from all counties; the results were unchanged and are not included in the manuscript.

[8] To eliminate potential problems with the timing of the implementation, we estimated the models below excluding births that occur from July 1999-December 1999 and results are unchanged.

[9] As is common in the literature (see Hoynes, Miller, and Simon (2015)), we restrict our sample to singleton births because of systematic weight differences that occur in multiple births.

the state and county level. In order to improve the precision of our estimates, we include other variables expected to be correlated with birth outcomes at the individual level including the mother's age, race, and education. Data also include information about the mother's behavior during pregnancy, including whether the mother smoked, consumed alcohol, or received prenatal care before the third trimester. We also include gender identity of the child as detailed on the birth certificate. Finally, we also control for county-level macroeconomic conditions with the monthly county unemployment rate. Summary statistics are provided separately for treatment county and treatment period in Table 2.

Table 2: Summary statistics of 2nd plus births by treatment county and time

	Mont. County=1 & Post-treatment=0 (Obs.=3,129)		Mont. County=1 & Post-treatment=1 (Obs.=4,337)		Mont. County=0 & Post-treatment=0 (Obs.=31,771)		Mont. County=0 & Post-treatment=1 (Obs.=37,585)	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Birth weight (grams)	3235.749	614.983	3270.075	563.285	3147.338	654.905	3162.127	633.652
Low birth weight	0.091	0.287	0.066	0.249	0.125	0.330	0.113	0.317
Mother's age	26.848	5.854	27.170	6.001	25.699	5.593	25.779	5.691
Mother middle school highest grade	0.173	0.378	0.217	0.412	0.053	0.224	0.075	0.263
Male child	0.501	0.500	0.504	0.500	0.503	0.500	0.510	0.500
Hispanic mother	0.380	0.485	0.520	0.500	0.041	0.199	0.099	0.299
Mother smoke during pregnancy	0.126	0.332	0.071	0.256	0.254	0.435	0.218	0.413
Mother alcohol use during pregnancy	0.024	0.154	0.010	0.098	0.033	0.179	0.018	0.133
Prenatal care before 3rd trimester	0.857	0.350	0.883	0.321	0.780	0.414	0.867	0.339
County unemployment rate	2.447	0.390	3.095	0.450	6.164	2.314	5.135	1.494

Statistics are for all 2plus births to mothers who are likely EITC recipients. Pre-treatment includes births from January 1995-October 1999. Post-treatment includes births from November 1999-December 2004. Source: National Center for Health Statistics (1995-2004).

As seen in Table 2, our sample includes 7,466 births in Montgomery County from 1995-2004 with 3,129 of the births occurring before the county credit. On average, birth weight in Montgomery County increased by 34.33 grams and the probability of low birth weight in Montgomery County fell by 2.5 percentage points after the local county credit was passed. In control counties, there were 69,356 births with 31,771 occurring before the Montgomery County credit. On average, birth weight in the control counties increased by 14.79 grams and the probability of low birth weight in the control counties fell by 1.2 percentage points after the Montgomery County credit was implemented.

Empirical Strategy

The earned income tax credit varies in our dataset along three dimensions: county of birth, year of birth, and birth parity. One possible strategy to examine the effect of the tax credit on birth outcomes would be to estimate a DD model that compares outcomes for 2nd plus births in Montgomery County to 2nd plus births in other Maryland counties for mothers who are likely EITC recipients.[10] This would involve an estimation of the following form:

$$y_{ict}=\alpha+\beta Montgomery*Post_{ct}+\delta X_i+\gamma Z_{ct}+\alpha_c+\lambda_t+\varepsilon_{ict} \qquad (1)$$

where y is a birth outcome of infant i in county c during year t. *Montgomery*Post* is a dummy variable equal to 1 if the infant is born to a mother who is a resident of Montgomery County and the birth occurs after October 1999. X and Z represent individual and county-year level controls, and the model also includes county (α) and year (λ) fixed effects. Finally, ε is the error term which is clustered at the county level.

Estimates of the β coefficient provide the DD estimate of the effect of the Montgomery EITC on birth outcomes. It is identified in this model by comparing the change in birth outcomes in Montgomery County before and after implementation of the program to the change in birth outcomes in the control counties among mothers who are having their second or greater child. This identification strategy depends on the assumption that birth outcome trends in Montgomery County would not have progressed differently relative to the control counties in the absence of the local EITC program.

[10] Results for all singleton births (first child or 2nd plus child) yield similar results.

Figures 1 and 2 below show the trends in birth outcomes for the sample of births in Montgomery County and in the control counties. As seen in both figures, birth outcomes followed a similar trend prior to October 1999 with birth weights higher and the probability of low birth weight lower in Montgomery County. This similar trend prior to the implementation of the program is important for the difference-in-difference analysis below. A more formal test of the parallel treatments is pursued below by altering the implementation date, but the graphical analysis provides an initial examination of the assumption.

After the implementation of the Montgomery County EITC, the change in trends is subtle as seen in both figures, but there is a slight difference across treatment counties. As seen in Figure 1, the average birth weight in Montgomery County increased by slightly over 34.3 grams while the average birth weight in control counties increases by 14.8 grams. This simple graphical analysis portrays a DD estimate of 19.5 grams. Similarly, as seen in Figure 2, the probability of low birth weight in Montgomery County fell by 2.4 percentage points after implementation of the EITC, and in the control counties the probability of low birth weight fell by only 1.1 percentage points after the implementation. This simple analysis indicates a DD estimate of a 1.3 percentage point reduction in the probability of low birth weight.

Figure 1: Birth weight (grams)

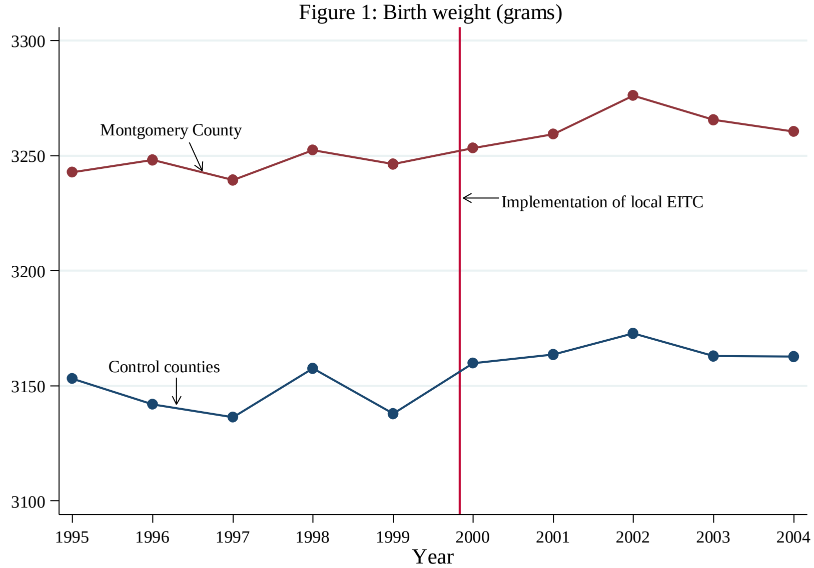
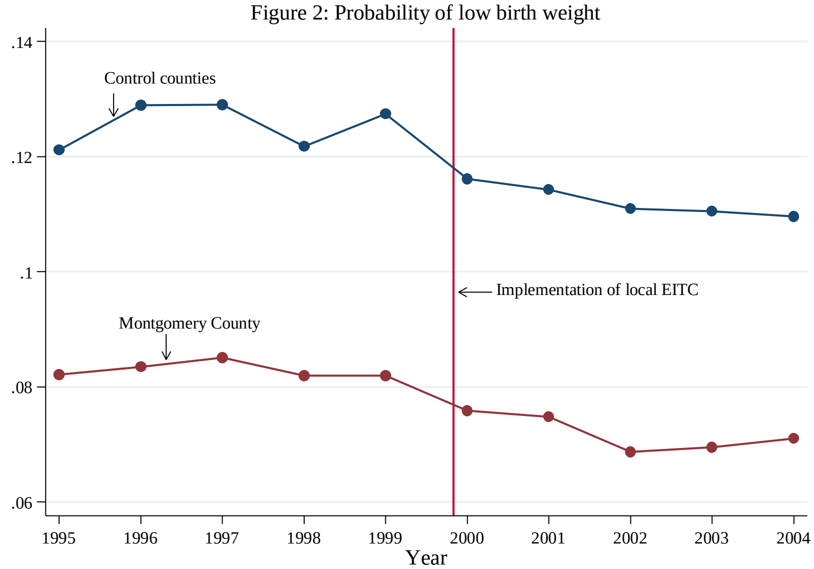


Figure 2: Probability of low birth weight



One potential problem with this DD method is that observed differences in outcomes across counties could be driven by a Montgomery County-specific shock rather than the EITC implementation. Because of the structure of the credit, we can exploit the fact that the credit targets families with children and compare differential trends for new mothers, in Montgomery

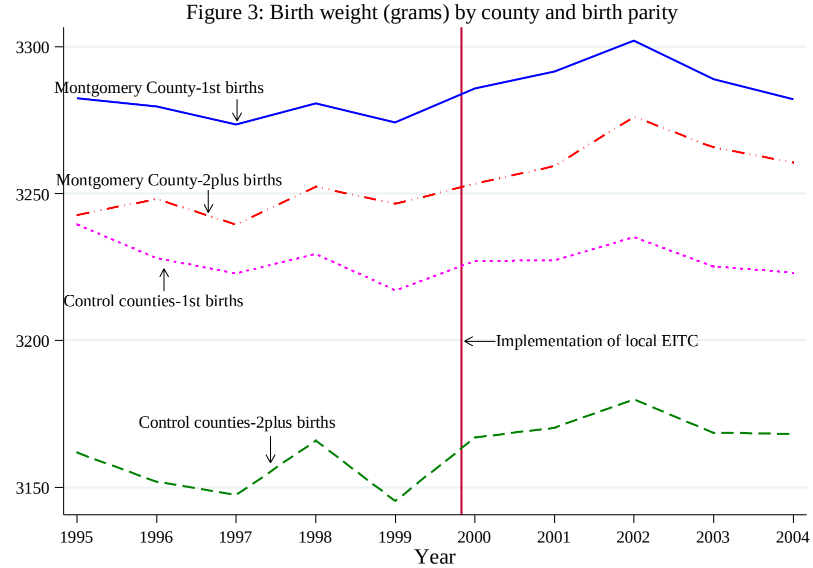
County and other counties, with trends for mothers who already have other children (DDD). This leads to an estimation of the form:

$$y_{iact} = \alpha + \beta Montgomery{*}Post{*}2plus_{iact} + \delta X_i + \gamma Z_{ct} + \alpha_c + \lambda_t + \eta_a + \varepsilon_{iact} \quad (2)$$

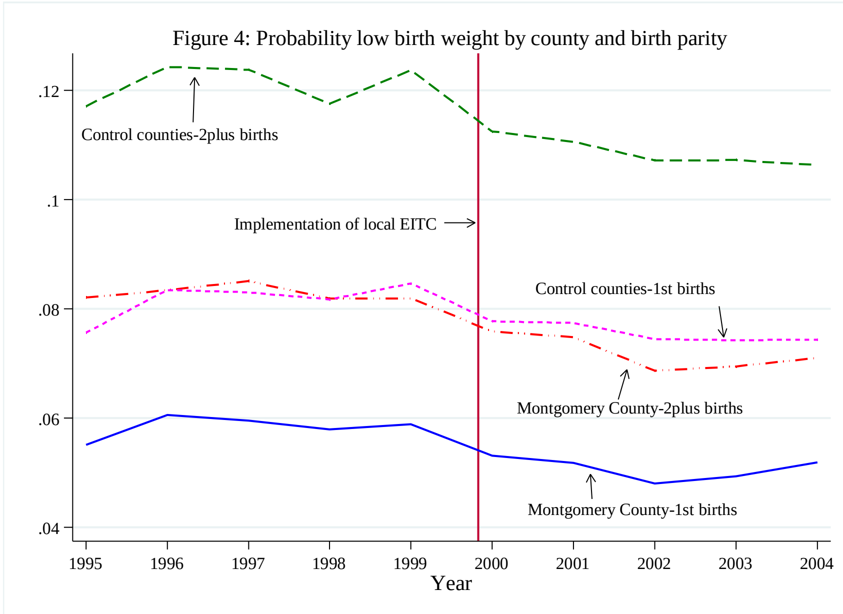
where y is a birth outcome of infant i from birth parity a in county c during year t. *Montgomery*Post*2plus* is a dummy variable equal to 1 if the infant is born to a mother who is a resident of Montgomery County, the infant is the second or greater child born to the mother, and the birth occurs after October 1999. X and Z represent individual and county-year level controls. The model also includes county (α), year (λ), and birth parity (η) fixed effects and two-way interactions between all of these. Finally, ε is the error term which is clustered at the county level.

The coefficient of interest is β, which is the DDD estimate of the effect of the Montgomery County EITC on birth outcomes. The DDD estimate compares the change in birth outcomes in Montgomery County before and after implementation of the program to the change in birth outcomes in the control counties among mothers who are having their second or greater child, and then compares this to the change in birth outcomes across counties for mothers who are having their first child. The identifying assumption in this model is that the relative trends across birth parity groups in Montgomery County would have progressed parallel to the relative trends across birth parity groups in the control counties in the absence of the local EITC program.

Figure 3: Birth weight (grams) by county and birth parity



Figures 3 and 4 present trends for birth outcomes across county, years, and birth parity. Figures 3 and 4 are similar to Figures 1 and 2 above, but Figures 3 and 4 provide trends for first births in Montgomery County and control counties. As displayed in Figure 3, the average birth weight among first births in Montgomery County increased by 8.8 grams between the pre and post-treatment periods, while first children born in control counties weighed 8.85 grams less on average after implementation of the local EITC. Following from this, the DD estimate for first births is 17.65 grams. The DDD estimate is calculated by subtracting the DD estimate for first births from the DD estimate for second plus births as calculated above (19.5 grams). Thus, the graphical DDD analysis shows that average birth weight increased 1.85 grams after implementation of the local EITC.



A similar analysis can be conducted for the probability of low birth weight, as graphed in Figure 4. The probability of low birth weight among first births in Montgomery County fell by 0.9 percentage points after implementation of the local EITC, while the probability of low birth weight among first children born in control counties fell by 0.2 percentage points. The DDD estimate then subtracts this first birth DD (0.7 percentage point reduction in the probability of low birth weight) from the second plus birth DD estimate as shown in Figure 2 (1.3 percentage point decline). As a result, the DDD estimate is that the local EITC caused a 0.6 percentage point decline in the probability of low birth weight in Montgomery County.

Results

Results for OLS estimations of equation (1) are presented in columns (1) and (2) of Table 3. Column (1) provides the DD estimate where birth weight is the birth outcome of interest and column (2) provides the DD estimate of the model where the birth outcome is the probability of low birth weight.[11] DDD estimates of equation (2) are shown in columns (3) and (4) for birth weight and the probability of low birth weight, respectively.

Table 3: Effect of Montomgery County EITC on birth outcomes of likely EITC recipients

	(1)	(2)	(3)	(4)
	DD		DDD	
	Birth weight (grams)	Prob. low birth weight	Birth weight (grams)	Prob. low birth weight
Montgomery*Post	20.471**	-0.016***		
	(8.291)	(0.004)		
Montgomery*Post*2plus			13.093**	-0.010***
			(5.203)	(0.003)
Mean of dependent variable	3165.1	11.5	3160.4	11.0
Sample	2plus births only	2plus births only	All birth parities	All birth parities
Observations	76,822	76,822	147,076	147,076

The table displays DD and DDD coefficient estimates with standard errors clustered at the county level. All models include county and year fixed effects as well as a full set of control variables as described in the text. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

As seen in columns (1) and (2), DD estimates indicate that the Montgomery County EITC increased birth weight by a statistically significant 20.5 grams (a 1 percent increase using the sample mean) and decreased the probability of low birth weight by a statistically significant 1.6 percentage points (a 14 percent decrease using the sample mean).[12] As described above, if the positive impact on birth outcomes is driven by a Montgomery County-specific shock, then the DD method does not identify the impact of the local EITC.

The DDD estimates are meant to address this concern and estimates of equation (2) are shown in columns (3) and (4). DDD estimates indicate that the Montgomery County EITC increased birth weight by a statistically significant 13.093 grams (about ½ of a percent increase

[11] A probit model was also estimated when the birth outcome is the probability of low birth weight. Results are similar so only the linear probability estimates are shown.

[12] Models were also estimated with county-specific linear trends to control for potentially different pre-treatment trends between Montgomery County and the control counties. Estimates are similar in magnitude and statistical significance so are not included.

using the sample mean) and decreased the probability of low birth weight by a statistically significant 1 percentage point (a 9 percent decrease using the sample mean).

An open question in the literature is whether local EITC impacts are equivalent to EITC payments at the state and federal level in terms of effects on birth outcomes. As the Montgomery County credit is a 100% match of the refundable state EITC one might expect our results to be similar to previous studies of state programs, and indeed this is the case. Our estimated effect of 13-21 grams is consistent with the Strully, Rehkopf, and Xuan (2010) estimate of a 16 gram increase and the Markowitz et al. (2017) estimate of a 9-27 gram increase for state EITC programs.

Our estimated decrease in the probability of low birth weight of 9-14% is also consistent with the Markowitz et al. estimate of a 4-11% decrease using a similar time period. Hoynes, Miller, and Simon (2015) find that a $1,000 increase in the EITC reduces the probability of low birth weight by 2-3% using older national data (1983-1999). As the Montgomery County EITC is about $333 on average (although this includes smaller amounts for childless households), we would expect about a 1% decline based on their estimates. Some of the difference in estimated magnitude might be due to the time period studied as Markowitz, et al. (2017) find larger effects using a later time period (1994-2006) similar to ours (1995-2004). Some of the difference might also be due to our focus on one state versus the previous research based on national data. Examining the effects within state might reduce data noise due to differences across states and regions.

Overall, the consistency of our results with the literature on state-level effects suggests that local policymakers can expect to see similar birth outcome effects for equivalent amounts of tax credit. In other words, the state and local effects seem to be additive and not diminished with a local EITC added to the federal and state credits.

Robustness

To assess the robustness of our results, we consider several alternative specifications. The first two specifications look for an impact of the Montgomery County EITC on samples of the population who should not be affected by implementation of the program. In addition, we consider two alternative specifications where we alter the date of implementation with the expectation that the false implementation date should not impact birth outcomes. In all of these robustness checks, we hypothesize that the local EITC should have no causal impact on differences in birth outcomes for children born to mothers in Montgomery County.

The first robustness check considers a sample of only the first births to Maryland mothers. As described above, the EITC is minimal for households with no children so we do not expect the implementation of the Montgomery County EITC to have a significant impact on first births in Montgomery County. Evidence that first births are affected by the Montgomery County EITC might be considered as evidence that there is a common shock to the county beyond the local EITC, in which case, DDD estimates might be more appropriate. To examine this, we consider a DD estimate of equation (1) where the sample includes only first births, and we continue to restrict our sample to only mothers who are likely EITC recipients.

Table 4 presents estimates of the DD estimates of equation (1) when considering only first births. Our DD estimates of first births indicate that the Montgomery County EITC increased birth weight of first births by a statistically significant 16.902 grams and had no statistically significant impact on the probability of low birth weight among first births. The statistical significance is unexpected, but it potentially indicates that the DD results above are influenced by a Montgomery County-specific shock other than the local EITC or that the smaller EITC payments to childless families did impact first time mothers. If so, this highlights the importance of the DDD estimates.

Table 4: DD estimates on first births

	(1)	(2)
	Birth weight	Prob. of low birth weight
Montgomery*Post	16.902***	-0.003
	(5.291)	(0.003)
Mean of dependent variable	3155.308	10.6
Sample	First births only	First births only
Observations	70,254	70,254

The table displays DD coefficient estimates with standard errors clustered at the county level. All models include county and year fixed effects as well as a full set of control variables as described in the text. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

The next robustness check alters our estimating sample to include only mothers who are not likely to be EITC recipients. This robustness checks mirrors the estimates shown in Table 3 but with a sample of mothers who are not likely to be EITC recipients (not single with at least a high school education). Columns (1) and (2) in Table 5 show DD estimates of equation (1) with this sample and columns (3) and (4) show DDD estimates of equation (2) with this new sample.

Table 5: Birth outcomes of not likely EITC recipients

	(1)	(2)	(3)	(4)
	DD		DDD	
	Birth weight (grams)	Prob. low birth weight	Birth weight (grams)	Prob. low birth weight
Montgomery*Post	0.318	0.0003		
	(3.574)	(0.0009)		
Montgomery*Post*2plus			-3.236	0.002
			(4.244)	(0.003)
Mean of dependent variable	3408.573	5.0	3364.459	5.9
Sample	2plus births only	2plus births only	All birth parities	All birth parities
Observations	277,723	277,723	465,713	465,713

The table displays DD and DDD coefficient estimates with standard errors clustered at the county level. All models include county and year fixed effects as well as a full set of control variables as described in the text. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

As seen in Table 5, the implementation of the Montgomery County EITC had no statistically significant impact on births to not likely EITC mothers in Montgomery County. Across all models with mothers who are not likely to be EITC recipients, DD and DDD coefficient estimates are not statistically significant.

As a final robustness check, we alter the measurement of the timing of the implementation of the local EITC. Specifically, we create one placebo date where post-implementation is defined as all births occurring after October 1997 (2 years before actual implementation) and another placebo date where post-implementation is defined as all births occurring after October 2001 (2 years after actual implementation). With the new placebo treatment dates, we hypothesize that there should be no causal relationship between the local EITC and differences in birth outcomes to mothers in Montgomery County. Table 6 provides DDD estimates of equation (2) with the placebo dates.[13] In all estimates, we find no causal impact of the implementation of the local EITC on birth outcomes.

[13] DD estimates of equation (1) with placebo dates were also estimated. Estimates show no causal impact of the local EITC but are not shown in Table 6.

Table 6: DDD with alternative treatment dates

	(1)	(2)	(3)	(4)
	Post defined as births after Oct. 1997		Post defined as births after Oct. 2001	
	Birth weight (grams)	Prob. low birth weight	Birth weight (grams)	Prob. low birth weight
Montgomery*Post*2plus	0.803	0.001	-7.705	0.001
	(7.853)	(0.003)	(6.907)	(0.004)
Mean of dependent variable	3160.4	11.0	3160.4	11.0
Sample	All birth parities	All birth parities	All birth parities	All birth parities
Observations	147,076	147,076	147,076	147,076

The table displays DDD coefficient estimates with standard errors clustered at the county level. All models include county and year fixed effects as well as a full set of control variables as described in the text. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

With the exception of birth weight for first-born children, our falsification tests show no effect of the Montgomery County EITC on birth outcomes. This gives us confidence that our identifying strategies are identifying the effects of the local EITC on birth outcomes to mothers who reside in Montgomery County.

Discussion

Using DD and DDD strategies to identify the causal effects of the Montgomery County EITC program, we find that the Montgomery County EITC increased birth weight by 13-21 grams and reduced the probability of low birth weight by 9-14% among likely EITC recipients. This result indicates that local EITC impacts are on par with EITC payments at the state and federal level in terms of effects on birth outcomes. The Montgomery County credit is a 100% match of the refundable state EITC and the estimated effects are similar to previous studies of state programs (Strully, Rehkopf, Xuan, 2010 and Markowitz et al, 2017).

Our estimated decrease in the probability of low birth weight of 9-14% is also consistent with the research on state EITCs (Markowitz et al. (2017) and Hoynes, Miller, and Simon

(2015). Overall, the consistency with the literature on state-level effects suggests that local policy makers can expect to see similar birth outcome effects for equivalent amounts of tax credit. In other words, the state and local effects seem to be additive and not diminished with a local EITC added to the federal and state credits. There is some evidence that the effect has increased over time, but further study is needed to determine the underlying reasons for the larger effect.

The effect of social safety net programs on birth outcomes is a growing area of research with much of the interest focused on state or federal programs. This research highlights the important role that local policymakers can play in improving health outcomes for local residents. Even when the local policy piggybacks on state and federal policies, the program can have additional benefits.

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