The Fiscal Externalities of Charter Schools:

Evidence from North Carolina[*]

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Abstract

A significant criticism of the charter school movement is that funding for charter schools diverts money away from traditional public schools. As shown in prior work by Bifulco and Reback (2014) for two urban districts in New York, the magnitude of such adverse fiscal externalities depends in part on the nature of state and local funding policies. In this paper, we build on their approach to examine the fiscal effects of charter schools on both urban and non-urban school districts in North Carolina. We base our analysis on detailed balance sheet information for a sample of school districts that experienced substantial charter growth since the statewide cap on charters was raised in 2011. We find a large and negative fiscal impact in excess of $500 per traditional public school pupil in our one urban school district, which translates into an average fiscal cost of more than $3,500 for each student enrolled in charter schools. We estimate comparable to somewhat larger fiscal externalities per charter school pupil for two non-urban districts.

I.   Introduction

The expansion of charter schools over the past thirty years has raised a number of important questions in education policy. Considerable empirical research, for example, has examined the effectiveness of charter schools at increasing student learning (e.g. Abdulkadiroğlu 2011, Bifulco and Ladd 2006, Chabrier et al. 2016, Dobbie and Fryer 2013, Ladd et al. 2017a), how parents and students choose and value charter schools (e.g. Clotfelter et al. 2017, Ferreyra and Kosenok 2015, Walters 2014), and whether charter schools induce public schools to become more efficient or productive (e.g. Betts 2009, Buerger and Bifulco 2016, Imberman 2011, Ni 2009, Winters 2012, Terrier and Ridley 2017).[1] In contrast, despite public concern and anecdotal evidence about the potential for charter schools to have negative fiscal impacts on public school districts, only a few studies have sought to quantify the magnitude of such externalities. Bifulco and Reback (2014) report estimates for the urban districts of Albany and Buffalo, New York, but little to no work has examined how such impacts vary across smaller districts, both urban and non-urban, that are increasingly exposed to charter schools.[2]

In this paper, we examine the fiscal impacts of charter schools in one urban and five non-urban districts in North Carolina that have experienced significant charter entry since the 2011 removal of the statewide cap of 100 charter schools. As clarified by Bifulco and Reback (2014), charter schools generate negative fiscal externalities on public school districts to the degree that districts are unable to reduce spending in line with the revenue losses they experience as a result of charter schools without reducing services to the remaining public school students. The magnitude of the fiscal impact will depend on several factors, including the share of students lost to charters, the flexibility that districts have to adjust various components of their education budgets, as well as the types of students who enroll in charter schools. Because such factors differ across school districts, the fiscal impacts of charter schools may be more pronounced in some types of districts than for others. For example, non-urban school districts, which tend to be smaller and lower density, may have less latitude for adjusting their spending when they lose

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[1] See Epple et al. (2017) for a recent review of the literature. Recent work also examines the equity implications of how charter schools respond to funding (Singleton 2017).
[2] An exception is Lapp et al. (2017), who estimate fiscal impacts for six Pennsylvania school districts.

enrollments to charter schools than urban districts. Of policy interest is both the magnitude of the fiscal externalities from charter schools in different types of public school districts and the appropriate policy responses.

The school districts sampled for this study are drawn from North Carolina, a relatively large state with a population that exceeds ten million people. The state has 100 counties and 115 school districts. A few counties include more than one district, one of which is typically a city district. Our sample comprises one medium-sized urban school district (Durham County), which we include because it has a large and growing share of charter schooling, with charter school students now accounting for about 15 percent of enrollment.[3] The other five districts in our sample are less densely populated and have charter enrollment shares that range from about 3 percent up to 14 percent (compared to a statewide average of about 6 percent). Charter enrollment has grown rapidly recently in these non-urban school districts.

To highlight the key mechanisms through which charter schools may generate negative externalities for school districts, we begin by presenting a stylized formalization of our Net Fiscal Impact calculations. We then describe the sample of districts and the data we use to implement our calculations. The data combine information from the state on school funding programs and from expenditure reports detailed at the program code level for each school district for 2015-16. With these data, we build on the methodology of Bifulco and Reback (2014) by categorizing spending items as either fixed or variable costs in the short-run and estimating fiscal impacts under a range of scenarios.

Our results point to sizable negative fiscal externalities of charter schools in all six school districts. For Durham, under reasonable assumptions about its cost structure, we estimate a Net Fiscal Impact in excess of $500 per traditional public school (TPS) student, which creates a $16 million total burden. This value represents the magnitude of reductions in educational services for TPS students due to charter schools. Alternatively quantifying the externality as the fiscal cost to the district for each student enrolled in charter schools, this burden translates into an average impact of around $3,600 per

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[3] As of 2018, Durham is the 8th largest district in the state, with 34,172 students. The largest two districts in the state are Wake County with about 155,000 students and Charlotte-Mecklenburg with about 146,000 students.

charter school pupil in Durham. We find smaller, though sizable, Net Fiscal Impacts in the non-urban districts and considerable heterogeneity across them. For two of the non-urban districts in our sample, the fiscal costs per charter school pupil are comparable with or exceed the estimated magnitude of the externality in Durham.

This policy brief makes two primary contributions: First, we generalize the findings of Bifulco and Reback (2014) from two large cities in New York to a sample of school districts, including non-urban districts, in a different state. A second contribution is to then clarify the basic mechanisms that generate fiscal impacts, with attention to the contribution of the funding mechanisms in a state. Our findings are important for informing policy responses to ease the fiscal burden on public school districts, particularly as recent charter school expansion has impacted smaller, non-urban districts. Moreover, by benchmarking the fiscal impacts of charter schools, our findings contribute to understanding the net social value of charter schools, which may expand choice for some students while imposing costs on taxpayers and students who remain in district schools.

II.   Net Fiscal Impact

In this section, we describe our empirical approach to estimating the fiscal externalities of charter schools. We begin by presenting a stylized expression for the fiscal impact of charter schools that identifies key mechanisms and highlights the empirical ingredients necessary to generate estimates. A similar approach can be adapted for districts in other states, albeit with close attention to the specific funding mechanisms of each state.

To simplify the presentation, we first divide the costs of providing education in traditional public schools into those that are fixed in the short run and those that are variable. Variable costs, such as the cost of employing teachers, vary with student enrollment. Fixed costs, in contrast, are expenses that are less responsive (at least over the relevant horizon) to changes in enrollments. Examples of fixed costs include facility operations and maintenance, administration, and support staff, and services for students

with disabilities.[4] A second simplification for the purposes of our stylized model is that we include only two sources of revenue, namely per pupil state aid generated from state tax sources and per pupil local revenue generated from local county taxes, which are the major revenue sources for both traditional public and charter schools. In our subsequent empirical implementation, we include state-sourced revenues attached to students belonging to recognized categories of need, such as Limited English Proficiency, and federal sources of revenue.[5] For reasons we detail later, per pupil state aid differs significantly across districts in North Carolina. Local revenue per pupil, which is provided to school districts by the county in which the district is located (which, for most districts, covers the same area as the district) also differs across districts due to differences in county wealth and local preferences for education.

Each charter school in North Carolina receives funding directly from the state at the same average per pupil rate as the school district in which the charter student lives and also local revenue at the same per pupil rate as the regular public schools in the district. Thus, for each student who leaves a public school to attend a charter school, the school district in which the student lives must share local revenues with the charter school on a per pupil basis.[6] In the following exposition, we do not include district subscripts because we use the same stylized model to analyze each district separately. We let r_L represent this per-pupil amount of local revenue. We can therefore express a school district's total expenditure, which we denote by E, as the sum of fixed costs, total variable costs, and total payments to charter schools:

$$E = FC + VC * Q^P + r_L * Q^C$$

In this expression, Q^P and Q^C represent enrollments in traditional public schools and charter schools, respectively; FC denotes total fixed costs, and VC represents the per traditional public school pupil variable cost.

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[4] As we later elaborate, we relax this initial assumption that costs are either fully fixed or fully variable for our empirical implementation.

[5] In North Carolina, state revenue accounts for about 62% of the funding for local schools which is far higher than the national average of 46 percent; local revenue accounts for only 26%, far below the national average of 45%, and federal aid accounts for 12 percent, which is somewhat higher than the national average of 9% and reflects the state's relatively high poverty rate.

[6] Note that a school district in North Carolina must share local per pupil revenues with any charter that enrolls a student who resides in the district regardless of the charter's physical location.

To conceptualize the impact of charter schools, we need to consider what costs the district would have incurred had there been no charter schools in the district. To do so, we introduce some additional notation: Let 1 represent the value of a variable after charter schools open in the school district and let 0 represent the counterfactual without charter schools. Thus, $E(1)$, the total expenditure for a school district in the presence of charter schools, can be observed directly from the balance sheets of each of the North Carolina public school districts that constitute our data sample. Similarly, we also observe in the data enrollments in traditional public schools in the presence of charter schools, $Q^P(1)$.

We define the Net Fiscal Impact of charter schools, denoted NFI, as the dollar amount reduction in services per TPS pupil due to charter schools. This is given by the difference between the amount of spending per TPS pupil on variable inputs without charters, $VC(0)$, and the per TPS pupil amount after charter schools open, $VC(1)$:

$$NFI = VC(0) - VC(1)$$

Intuitively, the money that follows the students who leave traditional public schools to charters requires that a district reduce its variable spending per pupil (as the district cannot reduce its spending on fixed costs).[7] Such reductions represent a reduction in the educational services provided to students who remain in the district's public schools.

To formalize this intuition, we first make an additional assumption later relaxed in our empirical implementation: we assume that all charter school students leave public schools (as opposed to private schools or homeschooling). To compute $VC(0)$, we simply add total variable costs in the presence of charter schools to the total revenue lost to charters, namely, the sum of total state aid and local payments to charters. This amount represents the revenue available for spending on variable inputs in the absence of charter schools. We then divide that amount by TPS enrollment absent charter schools, $Q^P(0)$:

$$VC(0) = \frac{VC(1) * Q^P(1) + (r_S + r_L) * Q^C(1)}{Q^P(0)}$$

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[7] The district's total revenue and expenditure are held constant in this formulation. The Net Fiscal Impact can be equivalently conceptualized as the per pupil amount that total expenditure could be reduced in the absence of charter schools holding per pupil variable spending fixed.

In this equation, r_S represents the per pupil payment from the state while $Q^C(1)$ is the number of students enrolled in charters.

By applying our assumption that charter students would otherwise attend a public school (i.e. $Q^P(0) = Q^P(1) + Q^C(1)$), we can simplify the expression for Net Fiscal Impact as follows:

$$NFI = \left(r_S + r_L - VC(1)\right) * \frac{Q^C(1)}{Q^P(1) + Q^C(1)}$$

This expression, which consists of two multiplicative terms, highlights the key mechanisms that may drive negative fiscal externalities of charter schools. The second term of the expression, $Q^c(1)/(Q^P(1) + Q^C(1))$, reveals that Net Fiscal Impact is proportional to the fraction of all students served by charter schools. This highlights that the dollar value reduction in educational services for students that remain in TPS will be greater in districts for which charter enrollment comprises a larger share of schooling.

The first term of the expression, $r_S + r_L - VC(1)$, on the other hand, quantifies the magnitude of the fiscal externality: charter schools will impose a burden whenever the lost revenue per charter school pupil is greater than the variable costs per TPS pupil, $VC(1)$. Fiscal impact thus turns on a district's ability to reduce expenditures commensurate with revenue losses. A complementary way of understanding this first term of the expression is as the average fiscal impact *per charter school student*. This value can thus be understood as an estimate of the cost to the school district of a student enrolling in charter schools. Intuitively, Net Fiscal Impact is the total cost to the school district of charter school enrollment distributed across the students who remain in traditional public schools.

The fiscal cost to the school district of charter school enrollment, the first term of the expression, is likely to differ across school districts in important ways. For example, for districts that serve non-urban areas with fewer students and less density, fixed costs are likely to account for a greater share of expenditure and the districts are likely to have less flexibility to adjust spending.[8] As a result, the ability to reduce expenditures commensurate with revenues lost to

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[8] As we note in the empirical analysis, the rate of population growth may also be a factor. Stagnant and declining districts may have to close schools to adjust to charter expansion, whereas a district experiencing enrollment growth may be able to respond to the loss of students simply by scaling back its building of new schools. As a result, fixed costs may, in effect, be less fixed in growing than in declining areas.

charter enrollment is likely to be more limited for non-urban and rural school districts than for urban districts. These differences would be reflected quantitatively as a higher cost of charter school enrollment.[9] All else being equal, lost revenue due to charters will also be larger for districts that have greater per pupil local revenues or for those that receive greater per pupil state aid.

III.   Data and Implementation

As suggested in the preceding discussion, generating estimates of Net Fiscal Impact relies on combining data with assumptions regarding different elements that enter the calculation. In this section, we describe in detail the data we gathered and empirical implementation of the calculations for an illustrative sample of six North Carolina school districts.

a.   Data Sources and Descriptive Information

To understand quantitatively how the fiscal impact of charter schools differs for urban and non-urban school districts, we collected detailed expenditure data for six school districts in North Carolina. We use the medium-sized urban district of Durham to illustrate fiscal impacts of charters in an urban district. We chose Durham because its 15% share of charter school students exceeds that in all other North Carolina urban districts. We then use it as the point of comparison for the impacts of charters in five non-urban district which we selected as follows. We first identified all school districts with fewer than 100 students per square mile and more than two charter schools as of 2016-17. Using these criteria, we contacted Buncombe, Cabarrus, Guilford, Iredell-Statesville, and Union for detailed expenditure data. We also contacted three additional more rural districts with just two charter schools each (Granville, Orange, and Pitt). We included in our final sample the five districts from which we were able to obtain complete and usable expenditure records for the 2015-16 school year.[10] The characteristics of Durham and the

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[9] While not our primary focus in this paper, $VC(1)$ may also vary across districts due to differences in the composition of students that are in recognized need categories, such as children with disabilities, as serving these student populations requires specialized staff and support systems.

[10] All but one of these non-urban districts (Granville) responded to our inquiry for detailed expenditure records for the 2015-16 school year, but the data we received were incomplete or otherwise unusable for two of the districts (Guilford and Pitt).

five non-urban sample districts – Buncombe, Cabarrus, Iredell-Statesville, Orange, and Union – are shown in Table 1.[11]

As the table shows, in addition to being the most populated, Durham is the most urban of the counties with a density of 130 students per square mile. Charter schools also have the highest presence in Durham; 13 charter schools are located in Durham County and about 15% of students attend a charter school as opposed to a district public school. The remaining school districts in our sample have lower densities of students, indicative of less urbanization. In addition, with the exception of Union County's nearly 42,000 students, these districts also serve fewer students than Durham. Buncombe County schools, for example, serves over 24,000 traditional public school students, with a student density of just 41 per square mile, or about a third of the density of Durham.

The share of charter school enrollments differs significantly across the non-urban districts. Although Buncombe, Cabarrus, and Orange have charter shares that are near or exceed the national and or state averages of around 6% Iredell's charter enrollment share is quite large at 14%, while just 3% of students attend a charter school in Union. The table also presents the percentage growth in charter enrollment since 2013-14. On this score, the non-urban districts (save Union county) significantly exceed Durham's growth rate of 17% and, in the cases of Orange and Buncombe, have experienced nearly a doubling of charter school enrollment in the district in just two years. Charter enrollment grew 84% in Cabarrus, as well. As we discussed in the previous section, the size of the charter sector, which is growing rapidly for most of these non-urban districts (and faster than population growth), and size and density, which may influence the latitude for possible spending adjustments due to the need to assure classroom spaces in schools that are accessible to families, are likely to influence the magnitude of the fiscal externalities of charter schools.

The detailed annual expenditure data provided by each of our six school districts list expenditures by line item, which are categorized by fund and program code. This

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[11] Note that our sample of school districts includes two that have the same name as their respective counties but do not cover the whole county -- namely Cabarrus and Orange. Those two counties each include a city district – Kannapolis City and Chapel Hill-Carrboro, respectively – that are not in our sample but are included in the county population figures in Table 1.

level of detail is important for two reasons: First. as we elaborate below, building upon the prior work of Bifulco and Reback (2014), we use them to identify spending items that are fixed and those that may be adjusted with enrollment. Second, the detailed expenditure sheets list the amount of funding from local revenue sources sent by the school district to charter schools. We supplement these data with public information collected from the state of North Carolina regarding state allocations, district, and charter enrollments, such as the share of students who qualify for subsidized lunch.

b. Empirical Approach

Our empirical approach to estimating fiscal impacts of charter schools requires attention to three additional elements: (1) the share of students who enroll in charter schools who would otherwise have been in public schools as opposed to private or home schooling (abstracted from in our stylized exposition); (2) school funding formulas, which affect how much revenue is transferred to charters and as well as additional support for recognized categories of student need (including from the federal government); and (3) the structure of costs and their heterogeneity across school districts. We detail each component in this subsection in turn before discussing some limitations of our approach and presenting the findings.

i. The Demand for Charter Schooling

The fraction of students who enroll in charter schools who otherwise would have attended a public school in the district rather than a private school or home schooling. matters because the state aid for students switching to charters from private schools does not represent lost revenue to the district (though it does represent a cost to the state). To see this, note that in the extreme case in which all charter enrollees left private or home schooling, the district's enrollment and revenues from state aid would remain unchanged. In that scenario, charter enrollment creates lost revenue for the school district in North Carolina only via the sharing of per pupil local revenues.[12] Thus, to reflect the reality that

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[12] There would also be fiscal impacts, analogous to the analysis for students drawn from private schools or homeschooling, from students moving to the school district (from outside the district, including out of state) to attend a nearby charter school. As students can attend charter schools outside their district of residence in North Carolina, however, any incentive to residentially sort to access charter schools is lessened. Also, the empirical evidence from home prices suggests such incentives are overall weak (Brehm et al. 2017).

charter school students are drawn from a combination of district public schools and private schools or homeschooling, we generalize the expression for Net Fiscal Impact as follows:

$$NFI = \frac{\left(r_S - VC(1)\right) * \left(Q^P(0) - Q^P(1)\right) + r_L * Q^C(1)}{Q^P(0)}$$

where $Q^P(0) - Q^P(1)$ is the number of TPS students who left for charter schools (which need not equal $Q^C(1)$).[13]

To take this expression to the data, note that public school enrollment in the absence of charter schools, $Q^P(0)$, is a counterfactual object that is inherently unknown. As a result, we, like Bifulco and Reback (2014), must make assumptions regarding the fraction of charter students who leave public schools to produce empirical estimates. We therefore compute and report predicted fiscal impacts under three alternative scenarios for charter students who do not belong to a specific category of need recognized in funding formulas:

A. Drawn entirely from public schools
B. Drawn proportionately from public and private schools
C. Drawn disproportionately from private schools

In scenario C., the share of charter students drawn from public schools is the traditional public school share of all students, including students in private schools.[14] We regard as unrealistic and exclude the extreme case that charter students are drawn entirely from private schools.

ii. School Funding Formulas

Based on North Carolina statutes, charter schools receive the average per pupil allocation for the school district from the state for each student.[15] North Carolina's education funding system is based primarily on allocations of various types of positions,

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[13] Fiscal impact per charter school student with this generalization is total fiscal impact ($NFI * Q^P(0)$) divided by charter school enrollment.

[14] For illustration, if 70 students attend public schools, 20 charter schools, and 10 private schools, scenario C assumes that 70% of the charter school students (14 in total) switched from a public school. By contrast, in scenario B the share of charter students drawn from public schools is the public school share of enrollment in just charter and public schools (i.e. excluding private schools), that is, about 78% of charter students (about 16 total). Scenario A assumes that all 20 switched from a public school.

[15] The average is calculated excluding funding to the district for Children with Disabilities or who are Limited English Proficient, which charters separately qualify for.

not dollars, to each local district. This approach leads to variation in the per pupil dollar amount of per pupil state aid across districts in part because the state uses a state-wide salary schedules to cover the cost of the allocated positions and some districts are able to recruit more highly qualified teachers and other staff than other districts.[16] Per pupil state aid for the district, represented by r_S in the expression for Net Fiscal Impact, is publicly reported for each district by the state.[17] Additionally, the detailed balance sheet for each school district reports total local payments to charter schools, $r_L * Q^C(1)$.[18] Using state records for the enrollment of students who reside in each district attending charter schools to obtain $Q^C(1)$, we are able to calculate the per pupil amount, r_L.

However, our stylized presentation for Net Fiscal Impact abstracts from categories of recognized student need reflected in school funding formulas, including those linked to federal sources of revenue such as Title 1. At the state level, charter schools in North Carolina may qualify separately for Children with Disabilities and Limited English Proficient funding. Revenues that the school district would have received for qualified students follow those students to charter schools. To augment the formula for these categories, we therefore add lost revenue for the school district for charter enrollees that belong to these categories. The per qualified pupil amount of lost revenue for Children with Disabilities we take to be the per qualified pupil payment to charters in the district and for Limited English Proficient the per qualified pupil state aid to the district, which we collect from the state.[19] For the charter students who belong to these categories of need, we compute all of the estimates under the assumption that they are drawn entirely from traditional public schools. Districts also receive funding from federal sources, generally tied to students who are eligible for free or reduced price lunch, that may be lost when qualified students switch to charters. We thus build lost revenue

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[16] A district that is able to hire more experienced teachers (who command higher salaries according to the state schedule) thus receives more funding than a district that hires less experienced, and lower paid, teachers even if the districts are the same size and are allocated the same number of teachers. State funding per pupil is also greater for low-wealth and small districts.

[17] As North Carolina allocates much of its public school funding using position allotments, this allocation is not necessarily equal what the district would have received for the marginal student who switches to a charter school. r_S should instead be regarded as the average state aid per pupil lost to the district for students that attend charter schools.

[18] To be more precise, school districts must share current revenue other than capital appropriations (which are made at the county level) on an equal per pupil basis with charter schools.

[19] These are both approximations to the respective (nonlinear) funding formulas, which include caps on the qualified student population (for exceptional students) and base allocations on prior year enrollment as well (for Limited English Proficiency) in North Carolina.

from Title 1, Title VI, and the Child Nutrition into the estimates program using the reported line item amounts on the district balance sheets. However, in contrast with students who belong to either the Children with Disabilities or Limited English Proficiency categories, we assume that students eligible for free or reduced price lunches substitute between charters and private schools as in the three scenarios outlined in the prior subsection.

iii. The Structure of School District Costs

The determination of variable costs per pupil, $VC(1)$, requires assumptions about the structure of school district costs. We pursue two steps using the detailed expenditure records: First, we apply the categorization of the district expenditure sheet items as either "Fixed" or "Variable" used by Bifulco and Reback (2014) to estimate impacts in New York. This approach ensures comparability of the findings across the two states. "Fixed" items are those that must be supplied regardless of enrollment in the short-run, while "Variable" items correspond to categories where districts may be able to cut spending as students leave to attend charter schools. Table 2 displays the categorization that we use of select expense items on the district balance sheets. This categorization is broadly consistent with empirical results from the literature on school district economies of scale (Duncombe et al. 1995, Andrews et al. 2002) and patterns of expenditure adjustments by districts facing enrollment losses (Gigliotti and Sorensen 2017).

Classroom Teachers, displayed at the top of the table, is categorized as "Variable," indicating that districts can adjust spending on teachers in response to lower public school enrollments. In contrast, we classify the second item, Central Office Administration, as "Fixed." At least in the short-run, the district must incur costs for administrative services and personnel regardless of the number of students that a district serves. Other items categorized as "Fixed" represent services for at-risk, limited English proficient, and disabled or exceptional children. The categorization of these items as "Fixed" reflects two considerations: First, these spending items tend to have large fixed costs of supply, often in the form of specialized professionals or services, such as those needed to identify eligible students, that serve multiple sites. Second, enrollment of students belonging to these recognized categories of need in charter schools is

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significantly lower than in public schools, implying that charter expansion is unlikely to significantly reduce the demand for these services. In our sample, the average share of charter students who are categorized as limited English proficient is less than 1%, far below the 7% share of public school students.[20] The presence of fixed costs means that by reducing enrollments in traditional public schools, charter penetration is likely to raise average costs for the school district, which registers as a fiscal burden in our calculations. Thus, the distribution of each district's spending across these expense items will influence the magnitude of the Net Fiscal Impacts.

In the second step, we compute a range of predictions for Net Fiscal Impact given alternative assumptions regarding the adjustability of the "Variable" category items. This extension is important for two reasons: First, it allows for the possibility that non-urban districts, due to smaller scale and lower density, face a greater difficulty of adjustment than do urban districts over the same time horizon. Second, this extension allows for the possibility that variable costs may not be fully or perfectly adjustable even within the short-run. For example, while categorized as "Variable" in the first step, Transportation includes the fixed costs of hiring drivers, purchasing and maintaining equipment which may not be appreciably adjusted if enrollment declines are modest. Similarly, if each classroom in a school loses perhaps only a few students, limited adjustment may be possible in Classroom Teachers.

To achieve this end, we introduce an elasticity of spending with respect to enrollment to reflect the fact that the district may face some stickiness in its ability to reduce "Variable" expenses in line with enrollment declines. Our earlier expression for Net Fiscal Impact embeds an elasticity of 1 where for each percentage point reduction in public school enrollment, variable spending can also be cut by a percentage point. In contrast, if the elasticity of a spending category were 0.5, variable spending can be cut by only 0.5 percent in response to a 1 percent loss in enrollment. We compute Net Fiscal Impact under three elasticities for the "Variable" spending category: 1, 0.8, and 0.5. Note that an elasticity of 1 can be interpreted as "Fully Adjustable" in that it implies no

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[20] The share of exceptional or special education children in charter schools is also lower, though in lesser degree (9% in charters as opposed to 12% in public schools). Given evidence that students with more serious disabilities (Winters 2015) are relatively less represented among special education charter enrollees, this gap likely understates the difference.

stickiness in the adjustment of district spending on variable inputs in response to an outflow of students. The elasticities can be equivalently understood as the share of variable costs that can be fully cut back in response to such an outflow.

iv. Limitations

Our empirical approach and implementation is not without limitations. For one, the scenarios we have discussed so far do not allow for the possibility of any offsetting cost reductions that might arise from a reduced need to build new public school facilities, which we treat as "Fixed." For example, districts that are experiencing enrollment growth may be able to absorb some of the adverse fiscal impacts of charter schools by not adding new buildings or temporary classrooms. This consideration is particularly important for comparing our results, based on North Carolina districts that are growing over time in enrollments, with Bifulco and Reback's (2014) estimates for Buffalo and Albany, NY, where enrollments are declining. Hence, we extend the analysis to include impacts for an additional scenario that treats facilities and related spending (e.g. capital outlay, plant operations and maintenance) as variable with stickiness to adjustment rather than as fully fixed.[21]

Another limitation of our approach is that our estimates do not account for the possibility that charter schools may induce the district to spend its money more efficiently. Such efficiency effects could potentially arise from competitive incentives that induce the public school districts to cut wasteful spending or that cause the district to reallocate inputs to more productive uses, potentially biasing upwards our estimates of Net Fiscal Impact. The evidence regarding the competitive impacts of charter schools is mixed, however, and work that has examined efficiency directly finds little to weak evidence for such responses from districts (Buerger and Bifulco 2016, Ni 2009).[22]

Working in the other direction, our estimates likely do not account for all possible costs to districts of charter schools. For example, public school districts may have to

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[21] Administrative expenditures, consistent with estimates showing global economies of size (see Duncombe et al. 1995), remain fully fixed in this additional scenario.

[22] Although state aid to the district does not respond to charter enrollment in North Carolina, bias could also arise from responses that affect local revenues. In this case, the bias would lead us to underestimate the impacts if, as is plausible, charter school enrollment in a district and support for the local public schools are inversely related.

devote resources to activities such as monitoring payments to charter schools. Further, districts may incur costs from charters even in the longer-run that need not appear in terms of realized expenditures, such as the risk that charter schools in the district may close, which requires that the district be able to absorb those students into the public schools. These costs, which would contribute to negative fiscal impacts from charter schools, are not reflected in our estimates.

Finally, our estimates are partial in that they shed light only on the fiscal burden of charter schools. Such a burden is borne by students who remain in traditional public schools (in terms of reduced services) and/or by local taxpayers.[23] For evaluating the full social value of charter schools, a more complete analysis of benefits and costs would be required. That analysis would have to include any benefits from charter school expansion through greater choice for parents and children, as well as any additional costs in the form of, for example, greater racial or economic isolation (Ladd et al. 2017a and 2017b).

IV.   Results

In this section, we present our estimates of Net Fiscal Impact, which quantify the reduction in services per public school pupil due to charter schools. We first present the estimates for Durham before discussing the results for the five non-urban school districts in our sample.

a. Durham County

Table 3 presents estimates of Net Fiscal Impact for Durham under the various scenarios outlined in the prior discussion. The first column reports estimates given the assumption that the adjustable category spending items, as classified in Table 2, can be reduced 1 for 1 with reductions in enrollment. With the baseline categorization of spending categories as either fixed or adjustable in the short-run, Durham's variable cost per traditional public school pupil is around $6,468. Under scenario A, which assumes that all charter students exited public schools, we estimate a fiscal impact of $520 per traditional public school student. In other words, charter schools require that Durham

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[23] Note that, because they receive state aid, students drawn to charter schools from private and home schooling also represent a fiscal burden for state taxpayers that is additional to the burden borne (and that is implicit in our estimates) by local taxpayers.

must reduce services for each traditional public school student by about $500 or find other revenue sources to compensate. Under the more realistic scenarios that students are also drawn from private schools, the fiscal impacts are somewhat larger. This considerable Net Fiscal Impact stems from Durham's combination of a large charter enrollment share and local revenue stream that must be shared with charter schools. Given traditional public school enrollment of nearly 33,000 students in Durham, the total fiscal burden in this scenario translates into over $16 million dollars each year.

For comparison, these estimates, which are methodologically most similar to those reported by Bifulco and Reback (2014), are smaller than their estimated fiscal impacts of charter schools in the urban school districts of Albany ($883-$1,070) and Buffalo ($633-$744) for 2009-10. However, while smaller in magnitude, the Net Fiscal Impact we estimate for Durham is equivalent, if not larger, than Albany and Buffalo's in terms of the share of educational spending per pupil. Average current expenditures per pupil exceeded $18,000 in New York in 2009-10, as compared with around $8,000 in North Carolina. In addition, as it separates the magnitude of impact from the size of the charter sector (which is larger in Albany and Buffalo), the average fiscal impact (or cost) per charter school student is more illustrative for comparisons of charter school impacts across districts than the Net Fiscal Impact. For the same scenarios and elasticities as in Table 3, Table 4 reports estimates of this cost to Durham. Scenario A reports an estimated of $3,599 fiscal impact per charter school student under an elasticity of 1. This estimate is nearly identical with the corresponding numbers for Albany and Buffalo ($3,529 and $3,698, respectively).

The second and third columns of Table 3 present estimates in which there is stickiness to adjustments in variable costs for Durham. For example, in the second column, where variable costs can only be cut 8% for every 10% reduction in enrollment, our estimates of Net Fiscal Impact are about $700 per pupil for all scenarios. The corresponding estimates of fiscal impact per charter school student, reported in Table 4, are around $4,700. The third column, which models an additional stickiness in adjustment with a lower elasticity of 0.5, yields predictions of about $1,000 per traditional public school pupil in reduced services due to charter schools. In the column

labeled *, we present sensitivity estimates in which facilities spending is modeled as modestly adjustable (with an elasticity of 0.5), while variable costs are fully adjustable with an elasticity of 1. Even with these optimistic assumptions about how readily the district can adjust its spending to the growth of charters, particularly in the short run, we estimate that the fiscal burden of charter schools in Durham is over $400 per traditional public school pupil and that the cost per charter school pupil to Durham is over $2,700.

      b.   Non-Urban Districts

Table 5 presents the estimates of Net Fiscal Impact of charter schools for the five non-urban North Carolina school districts, while Table 6 reports estimates of fiscal impact per charter school pupil. We report the estimates only for scenario B, in which charter schools draw proportionately from public and private schools. As suggested by the pattern of results in Tables 3 and 4, the magnitudes of the estimates do not differ very much for alternative enrollment scenarios.

The results display consistently negative fiscal externalities of charter schools, with considerable heterogeneity in the magnitudes. For example, we estimate a Net Fiscal Impact of charter schools of $272 per traditional public school pupil based on an elasticity of 0.5 scenario for Buncombe County, which is about half the fiscal burden per pupil incurred by Durham from charter schools assuming full adjustability. Based on comparable assumptions, we estimate slightly smaller fiscal impacts in Cabarrus ($238) but even more modest ones in Union county ($177). In contrast, we estimate that the Net Fiscal Impact of charter schools on Iredell and Orange in the range of $200-$500 per traditional public school pupil given assumptions of 0.8 and 0.5 regarding the adjustability of fixed expenses for non-urban school districts. The corresponding estimates of the fiscal cost per charter school student are valuable for understanding the source of these impacts and comparing their magnitude with Durham. For Iredell, the relatively large Net Fiscal Impact reflect its large charter enrollment share, as the cost per charter school student, reported in Table 6, is estimated between $1,500-$3,300, less than the corresponding number for Durham. In contrast, for Orange, a relatively wealthy district whose residents are willing to spend more on local public schools (reflected by a considerable local revenue stream), the estimated fiscal impact per charter school pupil,

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from $4,000-$6,000, is comparable with or exceeds the estimated cost to Durham. The estimated cost per charter student to Union is similar in magnitude (although the low charter enrollment generates a modest Net Fiscal Impact overall in this case). In the sensitivity checks presented in row * of Tables 5 and 6, we allow facilities spending to be adjustable (with an elasticity of 0.5), while variable costs, in line with our preferred parameterization for non-urban districts, are somewhat costly to adjust (an elasticity of .8). In this scenario, the estimated Net Fiscal Impacts remain negative and sizable and the cost per charter pupil in the non-urban districts of Orange and Union remains comparable with Durham's.

V.   Conclusion

Recent policy momentum behind charter school expansion has generated renewed interest in understanding the various impacts of charter schools. Despite concerns by local policy makers, popular writing, and anecdotes that charter schools may have large negative fiscal impacts on public school districts, limited empirical work has sought to quantify such externalities and how they may vary across types of school districts.

Building on the approach taken by Bifulco and Reback (2014) for the New York cities of Albany and Buffalo, we examine the short-run fiscal impacts of charter schools for a sample of six North Carolina districts: Durham County and five non-urban districts that have experienced significant charter entry since 2011. Our results point to negative fiscal externalities of charter schools in all six school districts, with considerable heterogeneity in impacts across the non-urban districts. In the non-urban districts of Iredell and Orange, the Net Fiscal Impact – which quantifies the magnitude of potential service reductions for students who remain in traditional public schools – is sizable in magnitude, though smaller than the impact per traditional public school we estimate for Durham. For Iredell, this magnitude reflects a larger charter enrollment share. For Orange and Union, two non-urban districts with low overall charter enrollment, however, the average fiscal cost per student who enrolls in charter schools is comparable with or exceeds the magnitude of the externality in Durham. We estimate a cost per charter school student in those two districts of around $4,000 under reasonable assumptions

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about non-urban districts' ability to adjust spending, above the $3,600 estimated for Durham.

These negative fiscal externalities suggest the need for state-wide policies to ease the adverse fiscal impact of charter schools on traditional public schools. To the degree that such impacts of charter schools are temporary, one policy response would be for the state to provide transitional aid to smooth or mitigate revenue losses for school districts as local charters expand. Such a program has precedents in New York and Massachusetts, although in neither case does the magnitude of the aid offset the full negative fiscal impacts of charters. In Massachusetts, the aid is supplied over a six-year period (bigger in the first year) and further compensates districts for students drawn from private and home schooling (Schuster 2016). The appropriate period for transitional aid is likely to vary by district. The greater difficulty that non-urban districts face in adjusting to an influx of charter schools because of their lower density and smaller scale suggests, for example, that the relevant short-run period may be longer than for urban districts with flexibility to adjust programs across a greater number of classrooms and schools. Though charter school supporters may be likely to oppose such assistance, it is nonetheless difficult to argue against the logic that the state should bear the full costs of the charter schools it authorizes by including among those costs the negative externalities that charter schools impose on the local districts.

Temporary assistance, however, may not suffice if impacts are permanent and because public school districts continue to bear the full responsibility for assuring adequate schooling for all children in the district. The state of North Carolina is constitutionally required, for instance, to provide sufficient funding for all students in all local districts to receive a "sound, basic education." While our estimates do not speak directly to the size of longer-run efficiency costs, even in a scenario in which charter school enrollments are no longer growing as a share of total local enrollments, the existence of two sectors implies duplication of functions and services. For example, the district must continue to maintain a substantial central office operation, raising the cost per traditional public school student relative to what it would have been without the charter schools. Further, the presence of a charter sector in which schools may open or

close for various reasons – such as financial mismanagement, academic failure, changing goals, or changing parental preferences – generates uncertainty for district policymakers. This uncertainty makes it difficult for the district to plan and make efficient use of resources, requiring sufficient excess capacity to assure that all children will be served should charters shut down.

One policy response to these longer-run burdens would be for the district and the charter school operators to work together, perhaps through the mechanism of a formal compact. The purpose of the compact would be to create a more unified district-wide system designed to promote the public interest and to use resources efficiently. But evidence shows that the differing interests of traditional districts and individual charter school boards make it extremely difficult to establish viable compacts of this form (Ladd, forthcoming). The verdict on cross-sector compacts as a solution to the tension between public and private interests in an environment of self-governing schools and parental choice is still out. Although some cities have demonstrated successes in some specific policy areas (Whitmire 2015, Tuttle et al. 2016), many have found it difficult to make substantial progress in bringing the two sectors together (Education Counsel 2017).

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Tabl: School District Characteristics, 2015-16

	Durham	Buncombe	Cabarrus	Iredell	Orange	Union
County Population	306,212	256,088	201,590	172,916	141,796	226,606
Population growth	3.76%	2.44%	5.11%	3.59%	1.37%	3.87%
Density (students / sq. mi.)	130	41	95	43	23	68
TPS school enrollment	33,144	24,305	31,260	20,643	7,501	41,873
Charter enrollment share	15%	7%	6%	14%	6%	3%
Number of charters	13	5	3	4	2	1
Charter enrollment growth	17%	113%	84%	36%	94%	6%

Population refers to 2016 estimate of county Resident Population per the U.S. Census Bureau and population growth reports growth rate since 2014. Numerator of density is traditional public plus charter school enrollment in the district. Charter enrollment share is charter enrollment as a fraction of charter and traditional public school enrollment (i.e. excluding private school enrollment) in the district. Charter enrollment growth is percentage growth in enrollment in the district since 2013-14 school year.

Table 1: Categorization of Expense Items

Item	Variable or Fixed
Classroom Teachers	Variable
Central Office Administration	Fixed
Non-Instructional Support Staff	Variable
School Building Administration	Fixed
Instructional Support	Variable
Driver Training	Variable
Non-Contributing Employee Benefits	Variable
Professional Development Programs	Variable
Career-Technical Education	Variable
Teacher Assistants	Variable
Behavioral Support	Fixed
Academically Gifted Programs	Variable
Child & Family Support	Fixed
Limited English Programs	Fixed
Transportation	Variable

Classroom Materials & Equipment	Variable
Alternative Programs & Schools	Fixed
At-Risk Student Services	Fixed
State Textbooks	Variable
Facilities & Capital Outlay	Fixed

Table 2: Net Fiscal Impacts for Durham, 2015-16

Elasticity	1	0.8	0.5	*
Variable Costs / Pupil ($VC(1)$)	$6,468	$5,175	$3,234	$7,234
Scenario:				
A	$520	$710	$994	$409
B	$534	$706	$964	$432
C	$547	$703	$935	$445
State Aid / Pupil (r_S)	$5,039			
Local Payments / Pupil (r_L)	$3,271			
Charter Enrollment Share	15%			

Table presents estimates of Net Fiscal Impact for Durham in 2015-16. The columns each apply a different elasticity. Scenario A is all charter students left public schools; B is charters draw proportionately from public and private schools; C is charters draw disproportionately from private schools. Column * reports estimates for an elasticity of variable cost adjustment of 1, but facilities related expenses are adjustable with an elasticity of 0.5 instead of fixed.

Table 4: Fiscal Impact per Charter School Pupil for Durham, 2015-16

Elasticity	1	0.8	0.5	*
Scenario:				
A	$3,562	$4,856	$6,796	$2,795
B	$3,599	$4,757	$6,493	$2,912
C	$3,634	$4,663	$6,207	$3,023

Table presents estimates of Fiscal Impact per Charter School Pupil for Durham in 2015-16. The columns each apply a different elasticity. Scenario A is all charter students left public schools; B is charters draw proportionately from public and private schools; C is charters draw disproportionately from private schools. Column * reports estimates for an elasticity of variable cost adjustment of 1, but facilities related expenses are adjustable with an elasticity of 0.5 instead of fixed.

Table 5: Net Fiscal Impacts for Non-Urban Districts, 2015-16

	Buncombe	Cabarrus	Iredell	Orange	Union
Elasticity:					
1	$112	$74	$62	$169	$93
0.8	$176	$140	$225	$241	$126
0.5	$272	$238	$470	$349	$177
*	$107	$107	$176	$208	$108
State Aid / Pupil (r_S)	$4,899	$4,737	$4,787	$5,165	$4,848
Local Payments / Pupil (r_L)	$1,904	$1,412	$824	$4,200	$2,959
Charter Enrollment Share	7%	6%	14%	6%	3%

Table presents estimates of Net Fiscal Impact for 2015-16. The three predictions presented for each district correspond to scenario B in which charter schools draw proportionately from public and private schools. Column * reports estimates for an elasticity of variable cost adjustment of 0.8, but facilities related expenses are adjustable with an elasticity of 0.5 instead of fixed.

Table 6: Fiscal Impact per Charter School Pupil for Non-Urban Districts, 2015-16

	Buncombe	Cabarrus	Iredell	Orange	Union
Elasticity:					
1	$1,716	$1,192	$433	$2,943	$2,885
0.8	$2,696	$2,246	$1,580	$4,197	$3,936
0.5	$4,167	$3,827	$3,300	$6,078	$5,511
*	$1,641	$1,714	$1,237	$3,624	$3,373

Table presents estimates of Fiscal Impact per Charter School Pupil for 2015-16. The three predictions presented for each district correspond to scenario B in which charter schools draw proportionately from public and private schools. Column * reports estimates for an elasticity of variable cost adjustment of 0.8, but facilities related expenses are adjustable with an elasticity of 0.5 instead of fixed.