# Do Health Insurance Mandates Spillover to Education? Evidence from Michigan's Autism Insurance Mandate*

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**Abstract**

Social programs and mandates are usually studied in isolation but interaction effects could create spillovers to other public goods. We examine how health insurance coverage affects the education of students with Autism Spectrum Disorder (ASD) in the context of state-mandated private therapy coverage. Since Medicaid benefits under the mandate were far weaker than under private insurance, we proxy for Medicaid ineligibility and estimate effects via triple-differences. While we find little change in ASD identification, the mandate crowds-out special education services for students with ASD. A lack of short-run impact on achievement supports our interpretation of the service reductions as crowd-out.

KEYWORDS: Special Education, Health Insurance, Insurance Mandate

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# 1 Introduction

How policy decisions in one area spill over to other areas in which there are no direct policy connections is a core question in economics. These spillovers often are unintended by policymakers, but they can have large impacts on how individuals respond to policy changes and the resulting social welfare effects of those policies. The opportunity for these unintended spillovers is particularly large in the United States, where a large array of different government organizations at the federal, state and local levels enact separate policies that interact with one another in complex ways. These interactions mostly have been studied with respect to the social safety net in the US.[1] Little research has addressed spillovers in education, particularly with respect to the health care system.[2] This lack of research is surprising, since education and health together accounted for 25.2% of GDP in 2017. Health and education are strongly linked through their central role in the development of human capital, and there also are direct policy linkages through the special education system that services students with disabilities.

In this paper, we provide one of the first analyses of how health care policies spill over to the education sector by examining the effect of Michigan's autism insurance mandate on the educational services received by, and achievement outcomes of, students diagnosed with Autism Spectrum Disorder (ASD). While our analysis contains broad lessons for how health care policies affect educational services and outcomes, the specific focus on students with ASD also is of high importance.

ASD is one of the fastest-growing developmental disabilities in the United States. The ASD diagnosis rate among eight-year-olds increased from 6.7 per 1,000 students in 2000 to 16.8 per 1,000 in 2014.[3] Among students 3-21 years old, the rate of special education primary disability identifications with ASD rose from 0.2% in 2000 to 1.2% in 2015 (a 500% increase). The overall student disability rate declined slightly over this time period, from 13.3% to 13.2%.[4] A recent study using self-reports from 2016 found that among children aged 3 to 17, 2.8% were diagnosed

[1] See for example Elwell (2018), Ham and Shore-Sheppard (2005), Yelowitz (1995), Moffitt and Wolfe (1992), and Blank (1989). These studies all find evidence that changing one program affects participation in other programs.

[2] Recent work by Benson (2018) estimates the effect of special education participation on Supplemental Security Income receipt and shows strong evidence of interactions among these programs. There also is some research that shows how direct health interventions in public schools affects student health and educational achievement, but these studies do not identify spillover effects across programs or policy areas (e.g., Lovenheim, Reback and Wedenoja 2014; Reback and Cox 2018; Buckles and Hungerman 2018).

[3] Source: `https://www.cdc.gov/ncbddd/autism/data.html`.

[4] These tabulations are taken from the 2017 Digest of Education Statistics, Table 204.30. `https://nces.ed.gov/programs/digest/`

with ASD at some point (Xu et al. 2018). Students with an ASD diagnosis are growing in absolute terms (617,000 children in 2015) and are an increasing proportion of all students with disabilities (9.2% in 2015, up from 1.2% in 2000). Further, students with ASD are some of the most expensive students to teach. Children with ASD typically have substantial learning disabilities that require intensive therapy services throughout childhood as well as coordination between the health care system and the education system. These students cost schools $8,610 more than the average non-ASD student (Lavelle et al. 2014), while the cost to families varies dramatically by health insurance coverage but has been estimated to be as high as $47,000 per year in the US.[5]

Applied Behavioral Analysis (ABA) is the main therapy used to treat students with ASD. It is not a "cure" but has been shown to substantially improve symptoms through behavioral modification therapy (Peters-Scheffer, Didden, Korzilius, and Sturmey 2011; Dawson et al. 2010; Virués-Ortega 2010; Howlin, Magiati, and Charman 2009; Eldevik et al. 2009; Foxx 2008). It is most effective when implemented early in life (before age 4) and when done intensively, often for at least 20 hours per week. Because of the high cost of these therapies, schools and families often lack the resources to provide sufficient services to ASD students. ABA therapy typically is paid for through health insurance, but coverage of these services is uneven across health insurance plans both in terms of what is covered and the ages for which therapies are covered. Indeed, until recently ABA therapy was not covered by many private insurance plans because it was considered "experimental" and/or "educational."

The lack of coverage for ABA services in many private health insurance plans highlights that what ASD treatments students receive relies on the interaction between school-based services and the health insurance plan to which a family has access. The interaction of health insurance and school special education services is not unique to ASD, as these issues are present for all student disabilities.[6] Currently, there is very little understanding of how the health insurance and special education systems interact in the production of education services for students with disabilities. The need for expensive extra-curricular treatments that are unevenly covered by health insurance plans makes students diagnosed with ASD an informative group through

[5]Source: `https://www.special-learning.com/article/funding$_$overview`.

[6]Given the strong positive correlation between health and education and the central role both play in the development of human capital, health policy is likely to have an impact on education for non-disabled students as well. For example, Cohodes et al. (2012) show that Medicaid expansions led to higher educational attainment among affected cohorts.

which to study this interaction.

We provide the first analysis in the literature of how mandating private insurance coverage of ASD treatment services such as ABA affects special education diagnoses (including ASD), the educational services students with ASD receive, and the educational outcomes of students diagnosed with ASD. Beginning in October 2012, Michigan required that all private state-regulated insurance plans cover ASD treatment services through age 18. Self-insured plans, while not mandated to cover ASD therapy, were provided generous financial incentives to do so. Medicaid also provided coverage but only for children under age 6 due to a lack of funding.[7] The difference between the Medicaid and private insurance coverage forms the basis of our empirical strategy.

We use administrative data on all public K-12 students in the State of Michigan from the 2009-2010 to the 2014-2015 school years. The data are extremely rich and include not only traditional test scores, demographics, and schools attended but also specific disability diagnoses and the services students receive in school through their Individual Education Plans (IEPs). The data do not include information on the health insurance plan under which each student is covered, so we rely on the close overlap of Medicaid and free/reduced price lunch (FRPL) eligibility. Between 2008 and 2016, tabulations from the American Community Survey show that only 31% of FRPL-eligible students had private insurance coverage, while 89% of those not eligible for FRPL had private insurance.[8] We use this overlap to estimate intent-to-treat models that examine how outcomes among non-economically disadvantaged students (who are covered by the private insurance mandate) change when the mandate is enacted in 2012 relative to economically disadvantaged students (who are less likely to be covered by the private insurance mandate). To further increase the accuracy of our proxies for insurance coverage, we restrict our sample to students who are eligible for FRPL in all years that we observe them in grades 2 through 8 and those never observed during those grades with FRPL eligibility, conditional on being observed for at least two years. We use this sample because students who are persistently eligible for FRPL are the most disadvantaged (Michelmore and Dynarski 2017).

In a difference-in-difference setting, we first show that the mandate has no effect on the

[7] As of January, 2016, Michigan began covering all youth in Medicaid up to age 18. Our analysis thus ends prior to the Medicaid expansion to focus on the private insurance mandate.

[8] Note that insurance counts may exceed 100% as some people remain eligible for Medicaid while enrolled in private plans.

likelihood of receiving an ASD special education identification in grades 2 through 8.[9] This is interesting in its own right, as private insurance can cover diagnostic services. However, most medical diagnoses for ASD occur before the age of six (Fountain, King and Bearman 2011), which is likely why we find no effect on ASD identification.[10] The lack of an effect on overall ASD incidence supports a triple difference strategy when we examine education services and achievement. We estimate how outcomes among ASD students who are ineligible for free/reduced price lunch change relative to ASD students who are eligible and how this change relates to the change in outcomes among non-ASD students who are ineligible vs. eligible for free/reduced price lunch.

We find that the insurance mandate reduces the set of special education resources ASD students receive. Among ASD students who are never FRPL-eligible, the mandate causes a 6.8 percentage point (10.1%) reduction in enrollment in resource room (pull-out program) or cognitive impairment programs (self-contained classes for students with cognitive impairments), a 4.1 percentage point (31.8%) increase in no special education program enrollment, and a 1.3% decline in the time spent receiving specialized instruction. Furthermore, these ASD students are 2.3 percentage points (17.7%) less likely to receive access to an ASD-specific teacher consultant, though they are slightly (albeit insignificantly) more likely to receive any special education support services. Taken together, these measures indicate that the private insurance mandate led to lower special education resource provision for affected students in schools.

Our data do not allow us to observe the use of ASD therapy services outside of school. Such data would be useful in assessing the costs and benefits of this policy and whether our results indeed reflect crowd out of special education services rather than students not requiring as many services in school. To provide some evidence on whether the mandate generates crowd out versus reducing the need for in-school services, we examine student test scores that yield insight into the extent to which the mandate supports or detracts from student learning. There could be a negative effect if service crowd-out is more than 100% or if the privately provided services are of lower quality. Conversely, student learning may increase if overall services increase and/or

[9] Generally, free/reduced price lunch eligibility is more accurately measured in primary grades than secondary grades, which is one benefit of focusing on younger students.

[10] While medical diagnosis and identification of ASD for education purposes are similar, they are not the same. Some students may be diagnosed but not have an IEP or have a different primary identification. Alternatively, while it is extremely likely a child with an ASD identification also has a medical diagnosis, the latter is not a necessary condition for the former.

if the quality of services provided increases. Additionally, providing ABA outside of school may facilitate more inclusion of ASD students in general education classrooms, which some research suggests is productive for learning among students with disabilities (Ruijs and Peetsma 2009). The inability to observe privately provided services precludes a direct analysis of these mechanisms, but we are able to identify the net policy effect that shows how the policy impacts achievement. The achievement results thus provide suggestive evidence of the mechanisms at work.

We find little evidence of a net change in reading or math test scores. In our preferred model, the 95% confidence interval for math in standard deviation units is [-0.054,0.051] and in reading it is [-0.043,0.072]. We thus can rule out anything but modest-to-small changes in math and reading scores due to the mandate. This finding suggests either that crowd-out was complete (and thus total services did not change) or that any reduction in services is balanced by the effects of being in a more inclusive general education environment.

We also examine heterogeneous effects by gender, race, and grade level. Our results do not vary much across groups, but we do find that girls are more likely to be removed from resource/cognitive programs and more likely to be placed in no special education programs than are boys. Though service reductions are larger for girls, we find that both boys and girls with an ASD diagnosis experience declines in special services due to the mandate. Effects are similar for White and Asian versus Black and Hispanic students, but we lack power to estimate precise effects for the latter group. We also find that the effects only begin to appear in grade 2. This grade heterogeneity is sensible, as nearly all students in Kindergarten and many in grade 1 are 6 years old or younger and therefore receive increased private ASD services under the mandate regardless of their health insurance status. In terms of test scores, we find little evidence of heterogeneous treatment effects.

This paper contributes to several different strands of research. The first is the small literature the examines the effects of health care policies on student achievement. Most of the prior literature focuses on Medicaid (Cohodes et al. 2016; Levin and Schanzenbach 2009) or examines direct health interventions in schools (Lovenheim, Reback and Wedenoja 2014; Reback and Cox 2018; Buckles and Hungerman 2018). Our study is the first to identify causal effects of health

insurance coverage mandates on the educational services disabled students receive and their subsequent educational achievement.

The second literature to which we contribute is the crowd-out of public goods by private provision (Bergstrom, Blume, and Varian 1986). Crowd-out of public services from private provision has been documented in several contexts like Medicaid (Cutler and Gruber 1996; Gruber and Simon 2008), charitable donations (Payne 1998; Gruber 2007; Andreoni and Payne 2011), religion (Hungerman 2005), and school funding (Gordon 2004). To our knowledge, this is the first analysis to show that private health insurance mandates crowd out special education services in public schools. This is an important contribution because special education is by design at the intersection of publicly provided education and often privately provided health care. That changes to private insurance can affect the services that disabled students receive in public schools is a novel finding that has implications for health insurance policies and the funding and provision of special education services.

We also contribute to a growing body of work on policies surrounding ASD students. ASD is a very expensive disability to treat, with current estimates in the US indicating that it costs about $17,000 per year to treat a student with ASD through health care and special education services (Lavelle et al. 2014). There also is suggestive evidence that ASD leads to lower labor force attachment and earnings among parents (Cidav, Marcus, and Mandell 2012), although identifying causal estimates is difficult in this context. The lifetime cost of supporting a child with ASD, including potential labor force effects among parents, is between $1.4 and $2.4 million in the US (Buescher et al. 2014). A large literature has arisen that examines the causes of the rise in ASD (see e.g., Hansen, Schendel, and Parner 2015; Matson and Kozlowski 2011), but to date very little work has been done on what school or health policies can support the academic development of ASD students and how best to deliver services to them in a cost-effective manner.

Finally, we present direct estimates of the effect of the Michigan insurance mandate on special education services and academic outcomes. These mandates are growing in prevalence: 46 states (plus D.C.) currently have some form of regulation that requires ASD services to be covered by health insurance plans. However, the scope of what is covered and the ages of

children included in the regulations vary considerably across states.[11] The Michigan mandate is among the most expansive in terms of what must be covered and in terms of the ages of children included. Thus, our analysis is informative with respect to the potential for these types of policies to impact educational services and outcomes among students with ASD.

# 2 Background

## 2.1 Austism Spectrum Disorder and Therapy Options

Autism spectrum disorder (ASD) is a developmental disability that generates problems with social, emotional, and communication skills (Centers for Disease Control 2018). The categorization combines disorders that were previously viewed as distinct - Autism, Aspberger's Syndrome, Pervasive Developmental Disorder - Not Otherwise Specified - and are now considered by psychiatrists to be variations of the same spectrum of conditions. Children with ASD show many different symptoms and often exhibit some but not others. Common symptoms include difficulty with social interactions, delayed speech and inability to communicate verbally, repetitive behaviors, and stimming. These start to appear as early as 18 months of age, and diagnoses can be obtained as early as 24 months (Centers for Disease Control, 2018). Even so, diagnosis this early is uncommon. The median age of first diagnosis in the US as of 2012 was 4.2 years, and only 46% of children with ASD had a full evaluation prior to 3 years of age (Baio et al. 2018).

ASD is considered a lifelong disorder. While there is no cure, there are treatments that can help alleviate symptoms and improve the ability of individuals with ASD to perform well behaviorally, both in school and in society more broadly. Children with ASD usually receive a variety of therapeutic interventions. These often include occupational therapy, speech therapy, sensory integration therapy, and Applied Behavior Analysis (ABA) therapy.[12]

Applied Behavior Analysis (or Early Intensive Behavioral Intervention), which involves using positive reinforcement and repetitive application of behavioral situations where cause and effect

[11] Regulations for each state can be found at `http://www.ncsl.org/research/health/autism-and-insurance-coverage-state-laws.aspx`.

[12] While there is some research on how nutritional changes can help, these studies are largely observational or small sample experiments and show limited evidence of impacts on symptoms (Mari-Bauset et al. 2014)

are outlined, has become one of the most widely used strategies for addressing autism.[13] As noted above, there is substantial experimental and observational research that shows ABA to be effective at improving educational and behavioral outcomes for children. Further, providing intervention early on when the child is very young has been shown to be more effective than starting later (Zwaigenbaum et al. 2015; Dawson et al. 2010; Granpeesheh et al. 2009; Corsello 2005).

Data on the costs of these interventions are sparse, but the therapies are generally considered to be quite expensive. Total costs of treatment combined with opportunity costs (e.g. for lost work by a parent or caretaker) have ranged from $17,000 per year in the US to $44,000 in the UK and $68,000 in Sweden (Järbrink 2007; Knapp, Romeo, and Beecham 2009; Lavelle et al. 2014). Additionally, estimates of medical expenditures for individuals with ASD indicate they exceed those without ASD by $4,110 to $6,200 per year, 4 to 6 times larger than average (Shimabukuro, Grosse, and Rice 2008). Given these large costs, insurance coverage is potentially a very important factor in whether children receive treatment. Cost-benefit analyses have shown ABA interventions to be highly cost effective over the long run. Jacobson, Mulick, and Green (1998) find lifetime benefits for the individual of up to $1 million. Ganz (2007) estimates the lifetime social costs of untreated autism at $3.2 million as of 2003, though it is unclear how much this is mitigated by therapeutic treatment.

### 2.2 The Michigan Autism Insurance Mandate

Until recently, treatments for Autism Spectrum Disorder beyond therapies for co-morbidities like speech and occupational therapy were not commonly covered by health insurance. As a result, states started mandating coverage for ABA and related therapies. Today, 46 states and the District of Columbia have some coverage requirements for autism services. Even in these states, however, coverage can be limited. Affected children often have to go through a time consuming evaluation process where access may only be available in a few locations with long wait lists. Furthermore, coverage mandates do not extend to all health insurance plans. Since self-insured firms are covered under Federal law, states have little ability to mandate coverage in these cases.

[13] https://www.autismspeaks.org/applied-behavior-analysis-aba-0.

In 2012, the state of Michigan passed a law that expanded access to insurance coverage for children with ASD, with implementation starting in October, 2012. The law had three main pillars. First, for people covered under state regulated insurance plans, mainly employer sponsored plans for small or medium sized employers and individually purchased plans, the law mandated coverage for "evidence-based behavioral health treatment" - typically ABA, pharmaceuticals, psychiatric care, psychological care, and other therapies - from birth through 18 years of age for children with diagnosed ASD.[14] Coverage requirements are generous: the maximum annual benefit starts at $50,000 for children under six and decreases with age to a floor of $30,000 at age 18. Co-pays, deductibles, and co-insurance rates cannot exceed those required by the individual's insurance plan for physical illness.[15]

A difficulty often faced by states in ensuring widespread coverage of Autism insurance mandates is that only a subset of insurance plans are subject to state regulation. Self-insured plans, mostly used by large employers, are covered under Federal law and so are not typically subject to state mandates. As of 2011, 61% of Michiganders with employer-provided coverage were in self-insured plans (Fronstin 2012). Michigan addressed this gap via Public Act 101 of 2012, which set up a reimbursement fund for self-insured plans that provided benefits in line with those required for regulated insurance plans. Plans were permitted to request up to 100% of the claims from their beneficiaries for reimbursement.[16] While there are no data on how many self-insured firms provided coverage under this law, the very generous reimbursement likely led to high take-up. It is worth noting that the Autism Alliance of Michigan maintains a list of self-funded firms in Michigan that offer the insurance benefit, including many of largest employers in the state such as General Motors, Ford, Meijer, and Beaumont Health System, along with the state government and most major universities.[17]

Children not covered under employer-provided or individually-purchased insurance plans in Michigan are almost all covered under Medicaid, including those covered through the Children's Health Insurance Program (CHIP). In 2014, 58% of children aged 0 to 18 in Michigan were

[14]Diagnosis by a physician is required and insurance companies are permitted to require the evaluations be done through designated evaluation centers (Peters, Lausch, and Udow-Phillips 2014).

[15]Michigan Public Acts 99 and 100 of 2012.

[16]In FY2016, the fund ran out of money and hence claim processing has been suspended since then. While it is possible some firms have since removed their benefits due to the lack of reimbursement, since our data cover only through the 2015-16 school year and firms typically make insurance coverage decisions towards the end of the calendar year, this is unlikely to affect our results.

[17]A full list of self-insured employers with ASD benefit can be found at `https://autismallianceofmichigan.org/insurance-facts/`. Data on the largest employers in Michigan are from `https://www.zippia.com/advice/largest-companies-in-michigan/`.

covered by private insurance, while 39% were covered under Medicaid and only 3% were uninsured.[18] The Michigan reform provided insurance coverage for ASD to Medicaid beneficiaries as of April 2013, but the benefits were considerably less generous than the private insurance mandate, a key aspect of the reform for our identification strategy. In particular, while pharmacy, psychiatric, psychological, and co-morbid therapies like speech therapy were already covered prior to the reform, the only ASD-specific therapy added to coverage from the law is ABA. Other evidence based therapies are not covered. This itself is only a minor difference as most therapy for ASD is based on ABA. More importantly, underfunding of the Medicaid benefit led to coverage expiring once the child reaches an age of six.[19] Generally, ABA therapy continues beyond this age and many years of therapy are needed for benefits to emerge and be maintained. Further reducing the value of this benefit is that often children are diagnosed relatively close to the age cutoff. According to the most recent report available, the average age at first ASD diagnosis for Medicaid recipients across the US was 5.4 years in 2002 - 2004 (Mandell et al. 2010). This leaves virtually no time for therapy to have an effect before access is cut off. Even if age of diagnosis has improved, nationwide data regardless of insurance coverage showed that the median age of diagnosis in 2012 was 4.2 years, again leaving little time to garner substantial benefits from therapy prior to reaching six years of age (Christensen et al. 2016).

# 3 Data

## 3.1 Michigan Administrative K-12 Schooling Data

Our analysis relies on a student-level dataset provided by the Michigan Department of Education (MDE) and Center for Education Performance and Information (CEPI). The dataset contains administrative educational records on all students enrolled in pre-K through grade 8 in Michigan's public schools from the 2009-10 to 2014-15 school years. These records provide rich information on students' demographic characteristics, disabilities, special education programs and services, and achievement levels. Student demographic characteristics are reported by schools to MDE and include a student's race, gender, and eligibility for Limited English Pro-

[18] Kaiser Family Foundation estimates based on the Census Bureau's March Current Population Survey, 2014-2017.

[19] As of January 2016, due to requirements of the Affordable Care Act, the age limit was increased to 21. For this reason we focus our analysis on school years prior to 2015-2016.

ficiency (LEP) services. Our key demographic variable of interest is a students "economically disadvantaged" status, which we use as a proxy for measuring a student's insurance status. A student is defined as economically disadvantaged if she qualifies for free or reduced-price meals under the National School Lunch Program, is in a household that receives food (SNAP) or cash (TANF) assistance, is homeless, is a migrant, or is in foster care. Students' economic disadvantage statuses are updated annually to reflect changes in families' economic circumstances.[20] Typically a student who qualifies for any of the latter also qualifies for free/reduced price lunch, and so we interchangeably refer to this status as "economically disadvantaged" or FRPL.

For students with valid Individual Education Plans (IEPs), which is synonymous with qualifying for special education, we obtain additional information on a student's primary disability, as defined on her IEP, and special education resources provided to the student.[21] The special education resources variables are classified into three distinct categories: (1) a student's special education program, (2) a student's educational setting, and (3) the special education support services received by a student.

The program category contains the IEP-designated programs in which a student is enrolled. Programs are state-defined special education settings that must adhere to specific regulations. To be considered an ASD program, a classroom must not have more than 5 students and must be served by a state-endorsed teacher of students with ASD who has completed ASD-specific education and training. Therefore, not all schools or school districts offer all special education programs, and a student's program need not exactly correspond with her disability. For example, students with ASD are commonly enrolled in a "cognitive impairment" program, which has classrooms with up to 10 students and is designed to provide instruction to students with an array of learning disabilities. There are 14 specific types of special education programs in Michigan, and students can be enrolled in up to 3 of them. We focus on four categories that are the most relevant for ASD students: ASD-specific special education programs, cognitive impairment programs, resource programs - which usually involve access to a "resource room"

[20] One concern with this measure is that some schools qualify for the Community Eligibility Provision for free-lunch that allows all students in a school to qualify regardless of individual circumstances. However, Michigan still requires schools to collect family income information to determine individual FRPL eligibility for record keeping purposes. Only 0.3% of observations in our data are in school-years with 100% FRPL eligibility, indicating that CEP does not affect our classifications.

[21] Students may also receive services through the use of 504 plans which typically provide access for students who are not classified under conditions recognized via the Individuals with Disabilities Education Act (IDEA). Since autism is a category in IDEA and IEPs provide more legal protections and guarantees of educational (as opposed to simply disability related) services, most children with ASD are covered under IEPs. While we do not observe 504 plans directly, these students would have an ASD identification but no data on services, which accounts for 0.5% of students in our analysis sample with ASD.

with a special education specialist, and no program (e.g. in general education).

The educational setting category contains information on the primary educational setting where a student receives his education. Our data include eight different measures of the education setting: enrollment in a special education school, whether students are in a general education classroom more than 80% of the time, 40-79% of the time, or less than 40% of the time, whether students are ever in a general education classroom, and the proportion of the student's full-time equivalent (FTE) enrollment that is in a special education setting. Since the special education FTE rate is measured in the fall and spring, we use the average rate across the two semesters. For brevity, we focus our whether a student is enrolled in a separate special education school, whether she is enrolled in a general education classroom more than 80% of the time, and the percentage of FTE enrollment that is in a special education setting averaged across the year. We hypothesize ex-ante that these education settings are the most likely to be associated with changes in ASD-related school services, however we show estimates for our other measures in Online Appendix Table A-1.

The services category records any special education support services a student receives within an academic year. These services include therapies, such as speech, occupational, and physical therapy; work with school social workers and/or psychologists; special transportation to and from school; and assignment to teacher consultants who provide assistance to general education teachers. Teacher consultants in Michigan must have a master's degree in education or in a field related to special education as well as teaching experience in a special education classroom. Moreover, teacher consultants may be approved to work with special education students generally or may be approved to work with students with particular disabilities by meeting additional education and experience standards. There are 30 specific special education support service categories listed in the data, and up to 10 are recorded for a student. Our primary estimates examine ASD teaching consultants, language support, occupational therapy, and whether a student receives any support services. We focus on these support services because they are the most relevant for ASD student. In Online Appendix Table A-1, we also examine non-ASD teaching consultants, social workers, physical therapy, and transportation services to demonstrate that services that are less important for ASD students are unaffected by the insurance

mandate.

Finally, we obtain information on students' test-taking behavior and achievement on standardized math and reading exams. MDE reports the type of exams (standard or special education) students took in a given year, as well as any special education accommodations used. Test scores are recorded for students who take standard or particular types of special education exams. However, the special education exams assess different material and are scored on a different scale than the standard exams. Thus, we only consider test scores for students who take standard exams.[22] We further standardized the scaled scores for these exams across all students in the state within a grade level and school year.

Our main sample consists of students in grades 2-8 in school years 2009-2010 through 2014-2015. While as noted above we have data for more grades and years, students in kindergarten and grade 1 are excluded because it is likely that publicly insured students in these grades also received increased access to private services through the Medicaid benefit. Further, the 2015-2016 school year is dropped due to the Medicaid benefit becoming more generous in 2016. Table 1 presents means of all analysis variables for several subsamples of these students: all students, ASD students, non-ASD special education students, and non-special education students.[23] About 1% of the sample has an ASD identification; these students are more likely to be male and white than the sample overall and are less likely to be poor. ASD students also are less likely to be poor and more likely to be white and male than non-ASD special education students. Further, there are substantive differences in the programs, educational environments and support services received by ASD and non-ASD disabled students.

### 3.2 Measuring Insurance Status

One of the central data challenges in this analysis is the inability to measure student health insurance status. The insurance mandate was only binding for students covered under a private health insurance plan. In some cases children may be uninsured but this is very rare. According to the American Community Survey, 96% of individuals in Michigan under age 18 were covered

[22] As we discuss below, we do not find that the mandate changed the type of exam taken by students with ASD, allowing us to analyze the regular exams while avoiding sample selection concerns.

[23] The sample sizes of ASD students in the top and bottom panel do not match because a small number of students receive an ASD identification through a 504 plan but receive no special education services.

by insurance in 2012, the year Michigan passed the Autism mandate.[24] Thus, those students who do not have private insurance are almost certainly covered by Medicaid.

To proxy for private insurance coverage, we use a student's status as being economically disadvantaged, which is primarily based on free/reduced-price lunch (FRPL) eligibilty. The motivation for using this proxy is that the eligibility criteria for FRPL status overlaps closely with eligibility for public health insurance. In order to qualify for public health insurance, children must be in families that earn less than 200% of the Federal Poverty Line.[25] Eligibility for free or reduced price lunches in schools is set at 185% of the poverty line.

Table 2 shows health insurance status by free/reduced price lunch eligibility (top panel) and by family income as a percent of the federal poverty line (bottom panel) from the 2008-2016 American Community Survey among K-$8^{th}$ grade students in Michigan. The top panel shows health insurance coverage is near-universal and varies little by whether students are eligible for free/reduced price lunch. What does vary across these groups is what type of insurance students have. Almost 89% of ineligible students have private insurance, while 73% of eligible students receive Medicaid. While there is some overlap, FRPL eligibility is strongly correlated with whether students receive Medicaid.

FRPL status is a somewhat noisy proxy for family income. Research using from education records linked to tax data indicates that there is a wide range of family incomes among students in the same free/reduced price lunch category (Domina et al. 2018). The bottom panel of Table 2 shows that the poorest students, those whose families earn under 135% of the poverty line, are the most likely to be on Medicaid (81%). The percent on Medicaid declines with income, even in the eligible range. In order to strengthen the proxy we use for Medicaid eligibility, we use the fact that those who persistently receive free/reduced price lunch are the most disadvantaged students (Michelmore and Dynarski 2017). These students are likely to come from the bottom of the income distribution, and Table 2 indicates that they are unlikely to have private insurance. Conversely, higher income students who are above 250% of the poverty line are very likely to have private insurance. Hence, our main analysis sample is

[24] This is likely a lower bound of the child health insurance coverage rate because those who are eligible for Medicaid but who are not signed up would be signed up and receive treatment upon arrival at a hospital. They therefore are functionally covered by Medicaid even if they are not formally enrolled in the program.

[25] Federal Medicaid eligibility is stricter, at 133% of the Federal Poverty Line. The Michigan Child Health Insurance Program (MCHIP) extends public insurance eligibility up to 200% of the poverty line for Michigan residents.

comprised of those who receive free/reduced price lunch in every year of school enrollment and those who do not receive free/reduced price lunch in any year of school enrollment. Students who receive free/reduced price lunch in some years are excluded, as are students who are only observed for one year. For completeness, we show robustness checks that include the "sometimes free/reduced price lunch" students as well. The estimates that include these students are qualitatively similar but attenuated as expected because of the use of a weaker treatment proxy.

# 4 The Effect of the Autism Insurance Mandate on ASD and Special Education Incidence

## 4.1 Empirical Approach

Using data on students in grades 2-8 in Michigan from school years 2009-2014 as described in Section 3, we estimate difference-in-differences models that identify how the insurance mandate affected the likelihood that students were diagnosed with ASD or had any special education diagnosis. Our measure of special education is whether students have an individual education plan, and we designate a student as being diagnosed with ASD if the IEP lists ASD as the primary disability. Note that we only observe specific services, programs, and educational settings for students with IEPs. Further, for our main model we exclude any student who qualify for FRPL in some but not all years and conditions on students being observed in these grades for at least two years. We show results without this restriction that use the student's eligibility in a given year as the treatment indicator in the online appendix. Our difference-in-differences model for ASD identification is of the following form:

$$\begin{aligned} ASD_{igjt} = \quad & \beta_0 + \beta_1 NonPov_i + \beta_2 PostMandate_t \times NonPov_i \\ & + \beta_3 NonPov_i \times t + \mathbf{\Omega X_{it}} + \gamma_{gt} + \delta_j + \varepsilon_{igjt}, \end{aligned} \tag{1}$$

where $ASD_{igjt}$ is an indicator equal to 1 if student $i$ in grade $g$ and school district $j$ is identified as having ASD (or an alternative disability that generates an IEP in companion estimates) in year $t$, $NonPov$ is an indicator that equals 1 if the student never qualifies for free/reduced

price lunch in grades 2 through 8, and $PostMandate_t$ is an indicator that is equal to 1 in the 2012-2013 school year and beyond. The model includes district fixed effects ($\delta_j$) as well as grade-by-year fixed effects ($\gamma_{gt}$). We additionally control for a linear time trend interacted with non-poverty status to account for secular trends by poverty status. Finally, we include controls for whether a student is white, male, or limited English proficient ($\mathbf{X_{it}}$). Standard errors are clustered at the school district level since students in the same district experience similar education environments.

The coefficient of interest in equation (1) is $\beta_2$, which is the difference-in-differences estimate of how the ASD (or other disability) rate of non-poor children changes in 2012 relative to poor students. The core identifying assumption is that trends in special education diagnoses among students eligible for free/reduced price lunch are a valid counterfactual for trends among non-eligible children, conditional on the controls. This assumption can functionally be broken down into two pieces: 1) outcome trends between free/reduced price lunch eligible and ineligible children must be similar prior to 2012, and 2) there must be no shocks that occur in 2012 that disproportionately affect students by free/reduced price lunch status.

Using data prior to 2012, we generate direct evidence on whether there are pre-treatment relative trends. These figures are presented below in Section 4.2 and provide strong support for the assumption that ASD rates are trending similarly across free/reduced price lunch eligible and ineligible students prior to 2012. The second assumption of no correlated shocks is more difficult to examine in the data, as such shocks are by definition unobserved. Nonetheless, we are aware of no other state policy that was enacted during 2012 that would have disproportionately affected students across the SES distribution. The economy was recovering from the Great Recession, but this should be reflected in trends rather than a 2012-specific shock. The Affordable Care Act individual mandate came into effect in 2012. However, it was effective January 1 2012, while the ASD mandate went into effect in October 2012. Thus, any effects of the ACA mandate should be evident in the prior school year. We do not believe it is plausible that the ACA affected these students: the ACA was focused on uninsured adults rather than children. Health insurance coverage among children was nearly universal prior to 2012 due to Medicaid and CHIP, and Medicaid rules did not change in Michigan during this period.[26] To

[26]Michigan expanded Medicaid for adults under the ACA in April 2014, but this expansion did not affect eligibility among

the extent the mandate caused some parents of children who are free/reduced price lunch eligible to switch from Medicaid to private insurance to use the ASD service benefits, our estimates will understate the effect of the mandate.

### 4.2 Results

Table 3 presents estimates of $\beta_2$ from equation (1). Column (1) shows estimates using ASD diagnosis as the dependent variable, and the point estimate is small in magnitude and is not statistically different from zero at even the 10% level. The point estimate indicates that non-poor students experience a relative decline in ASD diagnoses of 0.00022 percentage points after 2012. This is 2.2% relative to the mean, and the 95% confidence interval rules out an ASD increase among this group of more than 2.1%. Thus, our estimates indicate that the mandate led to no change in ASD special education identification.

As discussed above, a core assumption underlying our approach is that there are no trends in disability diagnosis that differ across students who do and do not receive free/reduced price lunch. The top panel of Figure 1 presents event study estimates of equation (1), where $PostMandate_t \times NonPov_i$ is replaced with a set of interactions between $NonPov_i$ and year indicators.[27] The figure demonstrates that there is no systematic change in the likelihood of being diagnosed with ASD across the two groups prior to 2012. Furthermore, the year-to-year changes are extremely small, even relative to the low baseline mean of 1%. The figure also shows that there is little post-2012 change in the ASD diagnosis likelihood across the groups, which is consistent with estimates in Table 3.

Column (2) of Table 3 presents estimates for the incidence of all other non-ASD disabilities. The estimate is positive, not statistically significant, and is small in magnitude. Taken at face value, it suggests that non-ASD diagnoses increased by 0.00006 percentage points (0.05% relative to the mean) among free/reduced price lunch students relative to ineligible students post-2012. The bottom panel of Figure 1 presents event study estimates for non-ASD disability incidence. Similar to the ASD event study, there is little evidence of pre-2012 or post-2012 relative changes, though there is some noise in the pre-2012 estimates. Taken together, the

children.

[27] Note that we exclude the $NonPov_i \times t$ control because it is collinear with the $NonPov_i$ interacted with year variables.

panels of Figure 1 support the use of the free/reduced price lunch students as a control group in this analysis.

Although there is no aggregate change in non-ASD disability incidence, there could be changes in the composition of disabilities in this broad group. The remaining columns of Table 3 show effects on the incidence of specific non-ASD disabilities, and the findings suggest little effect on the composition of non-ASD diagnoses. The estimates are universally small, and only one is statistically significant at the 10% level. Taken together, the results from Panel A of Table 3 show that the Autism insurance mandate had no effect on the rate of ASD diagnoses nor on the composition of non-ASD special education diagnoses. Based on this evidence, in many of the estimates below we will use non-ASD disabled students as a control group,

Panel B of Table 3 shows estimates that exclude the linear time trend interacted with non-poverty status. Excluding this control leads there to be a statistically significant (at the 10% level) decline in ASD incidence of -0.00044. In addition, the composition of non-ASD diagnoses changes to include more students with emotional and other health disabilities and fewer students with speech and learning disabilities. These relative changes in the composition of the special education groups complicates our preferred triple difference analysis in which we compare changes in outcomes by poverty status among ASD versus non-ASD special education students when the mandate comes into effect. A comparison of Panel A and Panel B of Table 3 shows that these relative shifts in diagnoses are due to linear secular trends by poverty status. Event studies that exclude this control also demonstrate this point: the changes in disability incidence are mostly driven by secular trends that appear prior to 2012.[28] The linear non-poverty trend accounts for these secular trends. Importantly, we show below that the rest of our results and conclusions are robust to excluding the linear non-poverty time trend.

[28]These event study estimates are available from the authors upon request.

# 5 The Effect of the Autism Insurance Mandate on Educational Services and Test Scores

## 5.1 Empirical Approach

Motivated by the finding that the insurance mandate does not affect ASD incidence, we employ triple difference models that compare changes in outcomes among students with ASD by free/reduced price lunch status to changes in outcomes among non-ASD students by free/reduced price lunch status. Specifically, we estimate models of the following form:

$$\begin{aligned} Y_{igjt} &= \beta_0 + \beta_1 NonPov_i + \beta_2 ASD_{it} + \beta_3 NonPov_i \times t + \beta_4 PostMandate_t \times NonPov_i \\ &\quad + \beta_5 PostMandate_t \times ASD_{it} + \beta_6 NonPov_i \times ASD_{it} + \beta_7 PostMandate_t \times NonPov_i \times ASD_{it} \\ &\quad + \mathbf{\Omega X_{it}} + \gamma_{gt} + \delta_j + \varepsilon_{igjt}, \end{aligned} \tag{2}$$

where $Y_{igjt}$ is an outcome for student $i$ in grade $g$, school district $j$, and year $t$. All other variables are as previously defined. In all the models, the vector ($\mathbf{X_{it}}$) includes controls for whether a student is white, male, or limited English proficient. In models with test scores as the dependent variable, the vector also includes the lagged test score for the same subject. As with equation (1), standard errors are clustered at the school district level throughout.

The main variable of interest in equation (2) is $\beta_7$, which yields the triple difference estimate of the effect of the Michigan insurance mandate on student outcomes. The identification assumptions underlying this model are similar to those discussed above for equation (1). However, this model relaxes the common trends assumption somewhat: any differences in trends in outcomes across students who do and do not receive free/reduced price lunch must be similar for ASD and non-ASD students. Put differently, the non-ASD relative trends by free/reduced price lunch status need to be an accurate counterfactual for these trends among ASD students. Similar to the difference-in-differences model, there are two main sources of bias. The first is differential relative trends across treatment and control groups. In this case, ASD students who do and do not receive free/reduced price lunch would have to exhibit different relative trends to non-ASD students prior to 2012. We present graphical evidence below that such relative trends are not present. The second is contemporaneous and persistent shocks that differentially

impact ASD students who are not eligible for free/reduced price lunch. We know of no reason to suspect that these shocks exist, especially since the ASD incidence rate is not changing when the mandate comes into effect.

The plausibility of the identification assumptions rests heavily on the composition of the control group. When estimating impacts on programs, educational settings, and support services, the sample consists of all students with a disability (i.e., with an individual education plan). The control group thus is students with a non-ASD disability. Since only students with an IEP receive special education services, non-ASD disabled students are a natural control group. When we estimate effects on test scores, we are able to consider both non-ASD disabled and non-disabled students as potential comparison groups. One important issue is that Michigan changed the format and structure of achievement exams, particularly those taken by students with disabilities, in 2014-15. Given this change, we focus on non-disabled students as a comparison group, as disabled students may be more affected by test changes, though we report estimates for both. We also estimate event studies to see if any achievement effects in the triple difference models come differentially from 2014-15 and present results from models that exclude the 2014-2015 school year.

### 5.2 Results

One of the strengths of our data that is unique to our administrative education data and is not commonly available in other states is the detailed information on special education services. As discussed in Section 3.1, we consider three types of services: education programs, the educational setting, and special education support services. These categories are correlated with one another but imperfectly so. For example, the program in which one is enrolled can affect special education support services and the extent to which students are in a general education setting. However, students can receive support services even if they are not enrolled in special education programs and if they are in a general education setting. Examining these three categories of educational inputs thus paints a rich picture of how the ASD insurance mandate affects the type of education students with ASD receive.

Table 4 presents our baseline estimates for the main set of special education service outcomes

that are most associated with ASD. The special education program outcomes we examine are whether the student is in an ASD program (column 1), whether the student is in a resource or cognitive program (column 2) and whether the student is in no special program (column 3).[29] The program does not have to match the disability listed on the IEP, so students with ASD diagnoses can be in non-ASD focused programs. Each column of the table shows results from a separate regression, and the first row presents the triple difference coefficient of interest. Column (1) shows that the ASD mandate increases the likelihood that students are placed in an ASD program by 2.8 percentage points, which is 14.2% of the ASD-specific mean (shown at the bottom of the table). However, the estimate is not statistically significantly different from zero. Enrollment in resource and cognitive programs decline substantially, by 6.8 percentage points (10.1%), and this estimate is statistically significant at the 5% level. The likelihood a student is enrolled in no special education program increases by a statistically significant 4.1 percentage points, which is a 33.2% increase relative to the mean. This result is notable because these students have an ASD diagnosis, which is why 87% of them are enrolled in at least one of these special education programs. That the percentage of ASD students not in any special education program rises substantially suggests that the insurance mandate leads to lower intensity of special education interventions and less placement in self-contained special education classrooms. These results thus reflect crowding out of special education services offered by public schools from the private insurance mandate.

As discussed in Section 3.1, one of the main assumptions under which our estimates are identified is that relative trends among free/reduced price lunch and non-free-reduced price lunch students are similar for ASD and non-ASD disabled students prior to 2012. Online Appendix Figure A-1 presents evidence on the plausibility of this assumption by showing event study estimates of the mandate on program placement.[30] For no outcome do we see any evidence of differential pre-2012 trends, which supports our identification strategy. Furthermore, there is a clear decline in the likelihood of being in a cognitive or resource program after 2012 and an increase in the likelihood of being enrolled in no program. These figures match the results in Table 4 closely.

[29] The estimates for other programs are provided in Appendix Table 2 and show no effect.

[30] Specifically, we replace $PostMandate_t \times NonPov_i \times ASD_{it}$ with $NonPov_i \times ASD_{it}$ interacted with a set of year dummies in equation (2). Year 2011 is excluded, so all estimates are relative to that year.

Columns (4)-(6) of Table 4 present estimates of the effect of the mandate on students' educational settings. We focus on three outcomes: whether a student is placed in a special education school (column 4), whether the student is in a general education classroom more than 80% of the time (column 5), and the percentage of time students are in a special education classroom (column 5). The point estimates are small in magnitude and are not statistically significant at conventional levels. While not significant and small in magnitude, the estimates provide suggestive evidence of more inclusion. The likelihood of being in a special education school declines by 10.7% relative to the mean, general education classroom inclusion increases by 3.1%, and the FTE rate declines by 3.7%. These results are consistent with crowd-out of special education services due to the ASD insurance mandate.

Online Appendix Figure A-1 presents event study estimates for these outcomes. The event study models are less informative for these measures because education setting variables are only available beginning in 2010 and the FTE measures are only available beginning in 2011. Hence, we have fewer pre-treatment years for these outcomes with which to diagnose any selection on relative trends. Nonetheless, given the data available, the event study estimates support the validity of our empirical approach and match the findings in Table 4 closely.

Our final set of educational input measures – special education support services – are shown in columns (7)-(10) of Table 4. We focus on ASD teaching consultants (column 7), language support (column 8), occupational therapy (column 9), and whether students receive any support services (column 10). Column (7) shows that the insurance mandate reduced the likelihood that a student received an ASD teacher consultant by a 2.3 percentage points (17.7% relative to the mean) and this estimate is statistically significant at the 5% level. The point estimates for language and occupational therapy are close to zero and are not significant, though they are negative. While these results all are consistent with a crowd-out of special education services, we also find that the likelihood of receiving any special education support services increases by 1.6 percentage points, albeit the estimate is not statistically significant. Online Appendix Figure A-1 shows event studies for these outcomes and again supports the identification assumption of common relative trends in special education support services prior to 2012 between ASD and non-ASD disabled children.

The results presented thus far suggest that ASD students who are likely to have private insurance receive fewer special education services after the insurance mandate is passed. The effect of this change on student achievement is unclear. If the crowd-out we find is incomplete, overall service levels increase and students achievement is likely to increase. This is particularly the case if the quality of services provided by the private market are of higher quality. However, if crowd-out is full (or more than full) or if service quality declines, student achievement should decline.

In Table 5, we focus on two achievement measures: standardized math test scores and standardized reading test scores. Given Michigan changed their exam structures in 2014-2015, we exclude that year from the estimates, leaving us with two pre-mandate and two post-mandate years. An added complication when we analyze these outcomes is that it is unclear which control group is most appropriate. Rather than take a strong stand on any one control group, we show estimates using all non-ASD students as well as non-special education students and non-ASD special education students. The third group is the control group we have used thus far.

The first three columns of Table 5 show results for math scores and the second three show results for reading test scores, both of which are in standardized units. Across all columns, we find little evidence that academic achievement is affected by the private insurance mandate. One concern with the test score measures is that we can only measure test scores for students who take Michigan's traditional standardized exams. Special education exams do not assess the same material, are scored on a different scale, and experienced substantial changes over the time period. In Appendix Table A-3, we show there is no evidence that test-taking behavior was altered by the insurance mandate.

For math all of the estimates are quite small. The largest estimate is in column (2) and uses non-disabled students as the comparison group. Our preferred estimate uses the non-ASD special education students as the comparison group, and the 95% confidence interval for this estimate is [-0.054,0.051]. Thus, we can rule out at the 95% level that the mandate changes math scores by more than 5.4% of a standard deviation.

The point estimates for reading (columns 4-6) are somewhat larger than for math but are not statistically different from zero. In this case, the largest estimate is in column (4) using all

non-ASD as a comparison group. The 95% confidence interval for reading with our preferred control group (column 6) is [-0.043,0.072]. We thus can rule out anything larger than modest positive effects on test scores at the 95% level. Figure 2 shows event study estimates for math and reading using non-ASD special education students as the comparison group.[31] The figures do not show any evidence of differential pre-2012 trends that would bias our triple difference estimates, though we acknowledge that we are limited in this assessment by the need to control for prior achievement to only having two years of pre-mandate testing data.

Taken together, the results from Table 5 and Figure 2 indicate that academic achievement is likely unaffected and certainly does not increase substantially due to the private insurance mandate. This null result is an important finding given the changes in education services we document. Because we cannot observe services provided outside of school, we cannot determine whether our results indeed reflect crowd-out or just a reduced demand for services among students because they are getting better due to increased access to private services. That student achievement does not substantially increase suggests our findings are most consistent with a crowd-out story, which is our preferred interpretation of the results. Nonetheless, we caution that these achievement analyses are short term and so it is possible that cognitive improvements do not show up until more exposure time has elapsed.

### 5.3 Heterogeneous Treatment Effects and Robustness Checks

We examine several sources of heterogeneity: gender, race, and grade. Table 6 presents estimates of the effect of the mandate on ASD incidence for each of these different groups. We see no evidence of a change in diagnoses for boys or girls or for Whites & Asians vs. Black & Hispanic students. We do find a decline in the likelihood of being diagnosed with ASD in second grade, but that is the only estimate that is statistically significantly different from zero at even the 10% level. There is very little evidence that different groups experience a meaningful increase in ASD diagnosis, and there is no evidence of a positive shift along any dimension we examine.

We now turn to examine outcomes for these different groups. As shown in Table 1, 85% of those with an ASD diagnosis are boys. It thus is informative to examine effects separately

[31] Event studies for the other control groups are shown in Online Appendix Figures A-2 and A-3 and are very similar.

by gender. Table 7 shows triple difference estimates of educational service outcomes for boys (Panel A) and girls (Panel B). The direction of the estimates are similar for boys and girls, but the effects tend to be larger in absolute value for girls. Effects on resource/cognitive programs, no special education programs, and ASD teacher consultant are all larger for girls than for boys, but they are qualitatively similar across genders. Combined, the results show substantial crowd out effects on both genders that are somewhat larger for girls.

Panels C and D show effects of the mandate for Black and Hispanic as well as White and Asian students, respectively. The crowd-out effects are most evident for White and Asian students, who make up nearly 3/4 of the ASD population though as a result, the effects on Black and Hispanic students are quite noisy. The estimates for Whites and Asians mirror the overall results quite closely while the findings for Black and Hispanic students are qualitatively similar but imprecise, which limits our ability to draw strong conclusions for this group.

Table 8 shows effects by grade, including kindergarten and $1^{st}$. Kindergarten can be interpreted as a specification check, as ASD services for the vast majority of these students are covered by both private and Medicaid insurance plans after 2012. Furthermore, many first grade students are under age 6 and will not be affected by the mandate. The estimates in both of these grades are small, and no estimate in these grades is statistically significantly different from zero at even the 10% level. These estimates suggest that we are not picking up unobserved shocks or trends that differentially influence outcomes among non-poor ASD students.

The remaining estimates in the table test for heterogeneous treatment effects by grade for higher grades. ABA services can have differential effects by age, and the ability of schools to alter special education services also can differ for older versus younger students. Resource and cognitive program reductions are largest for students in grades 2-5 and start to fade after $4^{th}$ grade, though estimates never turn positive. The rate of non-participation in special education programs increases in all grades except 8 and consistent with resource/cognitive program effects, these are largest in the late elementary grades. Further, the reduction in the use of ASD teacher consultants is concentrated in early elementary grades. For the other outcomes, the estimates are generally small and statistically insignificant regardless of grade level. Thus, there is some evidence of crowd-out of special education services in all grades from 2-8, though they are

mostly concentrated in elementary rather than middle school.

We also examine test score effects along these dimensions of heterogeneity. Online Appendix Table A-4 shows reading and math score estimates by gender, race, and grade using non-special education students as the comparison group. There are no strong statistically significant patterns across groups, though for girls and black/Hispanic students the estimates are very imprecise due to there being relatively few incidences of ASD in these cases. Nonetheless, these results provide additional evidence that the crowd-out in education services we document generally do not lead to changes in test scores for ASD students.

We next estimate a series of robustness checks that assess the validity of several data limitations and identifying assumptions. First, we examine the importance of including the linear time trend interacted with non-poverty status. As discussed in Section 4, this control is necessary to account for secular trends in ASD and non-ASD special education incidence, particularly in the comparison group of non-ASD disabled. In Panel A of Table 9, we present triple difference results that exclude this control. The estimates are very similar to baseline, which suggests that this control has little effect on our special education service provision results despite the corrections it makes for changes in the disability category distribution amongst non-ASD disabled shown in Table 3. Panel A of Online Appendix Table A-5 shows a similar robustness check for math and reading test scores; the test score results are robust to excluding this control as well.

Panel B of Table 9 shows estimates using the full sample of students. Relative to our baseline sample, this sample adds those who sometimes receive free/reduced price lunch or are observed only once in the data and identifies treatment as being non-disadvantaged in a given year. The sample sizes increase, and the point estimates are attenuated relative to the main results as expected, since free/reduced price lunch receipt is a worse proxy for Medicaid eligibility among the sometimes-eligible students (Michelmore and Dynarski 2017; Domina et al. 2018). Nonetheless, the qualitative patterns do not change; the conclusion that the Autism insurance mandate led to crowd-out of education services is robust to including these students. Panel B of Online Appendix Table A-5 shows that we obtain similar results for math and reading test scores when we include these students as well.

In Panel C of Table 9 and Appendix Table A-5, we again use the full sample of students to

assess the robustness of the estimates to excluding the linear year trend interacted with non-poverty status in this sample. The results in both tables are extremely similar to those in Panel B and also to our baseline estimates. Together, the results in Table 9 and Appendix Table A-5 demonstrate that our results and conclusions are robust to the way in which we construct our analysis sample and to the use of linear time trends by non-poverty status.[32]

The results thus far have focused on a set of special education services and outcomes that are most closely associated with ASD. In Online Appendix Table A-2, we present estimates for other services in our data that are less likely to be affected by the Autism insurance mandate. If we find effects on many of these outcomes, it is suggestive of bias in our main results. Specifically, we examine enrollment in another special education program, two categories of general education participation, any general education participation, non-ASD teacher consultant use, social worker support services, physical therapy services, and transportation services. None of the point estimates in Table A-2 is statistically significant at even the 10% level, and each estimate is close to zero. There is no evidence that these other service measures are affected by the insurance mandate, which supports the validity of our main findings; the services that change are those that are most closely aligned with the needs of ASD students.

Finally, in Panel D of Online Appendix Table A-5, we show that our test score estimates are robust to including the 2014-15 testing year when Michigan changed to a new exam format that could have affected ASD versus non-ASD students differently. In general the estimates are similar with the exception of math relative to non-ASD sped students which becomes negative and marginally significant. More importantly, however, these results are consistent with our overall conclusion that any achievement gains, if they existed, were modest.

## 6 Conclusion

We present the first estimates in the literature of how a mandate that requires private insurance to cover ABA therapeutic services for children diagnosed with Autism Spectrum Disorder affects the special education services students receive in public schools, as well as their educational achievement as measured by test scores. While we study Michigan's mandate, passed in 2012,

[32]Online Appendix Table A-1 shows disability incidence estimates using the full sample of students both with and without time trends by non-poverty status. The estimates are very similar to those in Table 3.

46 states and D.C. currently have some form of coverage mandate for ASD students. The prevalence of these mandates makes them important to study, but our results also provide more general insight into how the effects of health policy spills over to education services and outcomes. The close connection between health and education in the production of human capital underscores the relevance of studying such policy spillovers more broadly.

Using administrative K-12 data on all $2^{nd}$ through $8^{th}$ grade students in the state of Michigan from 2009-2010 to 2014-2015 school year, we estimate how the insurance mandate affected a wide range of special education services as well as student test scores. The data do not contain information on private insurance coverage, so we use the strong overlap between economic disadvantage and Medicaid (the alternative to private insurance) to proxy for exposure to this mandate. Because we find no evidence that the incidence of ASD diagnoses is altered by the mandate, we estimate triple difference models that compare how services and outcomes change in 2012 among non-poor ASD students relative to poor ASD student and poor vs. non-poor differences among non-ASD students.

Our main findings indicate that the ASD coverage mandate led to sizable declines in the special education services students receive. ASD students who are not economically disadvantaged experienced declines in the likelihood of being placed in a resource or cognitive impairment special education program, in the likelihood of being placed in any special education program, and in the likelihood of being given an ASD teaching consultant. However, test scores did not change on average. Taken together, we argue the evidence is most consistent with a crowd-out story, where the private provision of ASD therapies reduces special education services in schools. This would generate the service reductions we document and would lead to no change in academic achievement, as we find.

Our results are important in showing that supply-side health policies focused on health insurance have spillover effects to the education system that likely were unintended by policymakers. The findings from this paper suggest that the crowd-out of special education services largely undoes the intent of policymakers to help provide more therapy services to autistic children. That these spillovers occur in this setting is suggestive that other health care policies, such as recommendations against teens taking anti-depressants or medical practices surrounding ADHD

disabilities, also may have effects on the services students receive in schools and their academic achievement. Further understanding these interactions between health policies and schools and how they affect students is a ripe area for future research.

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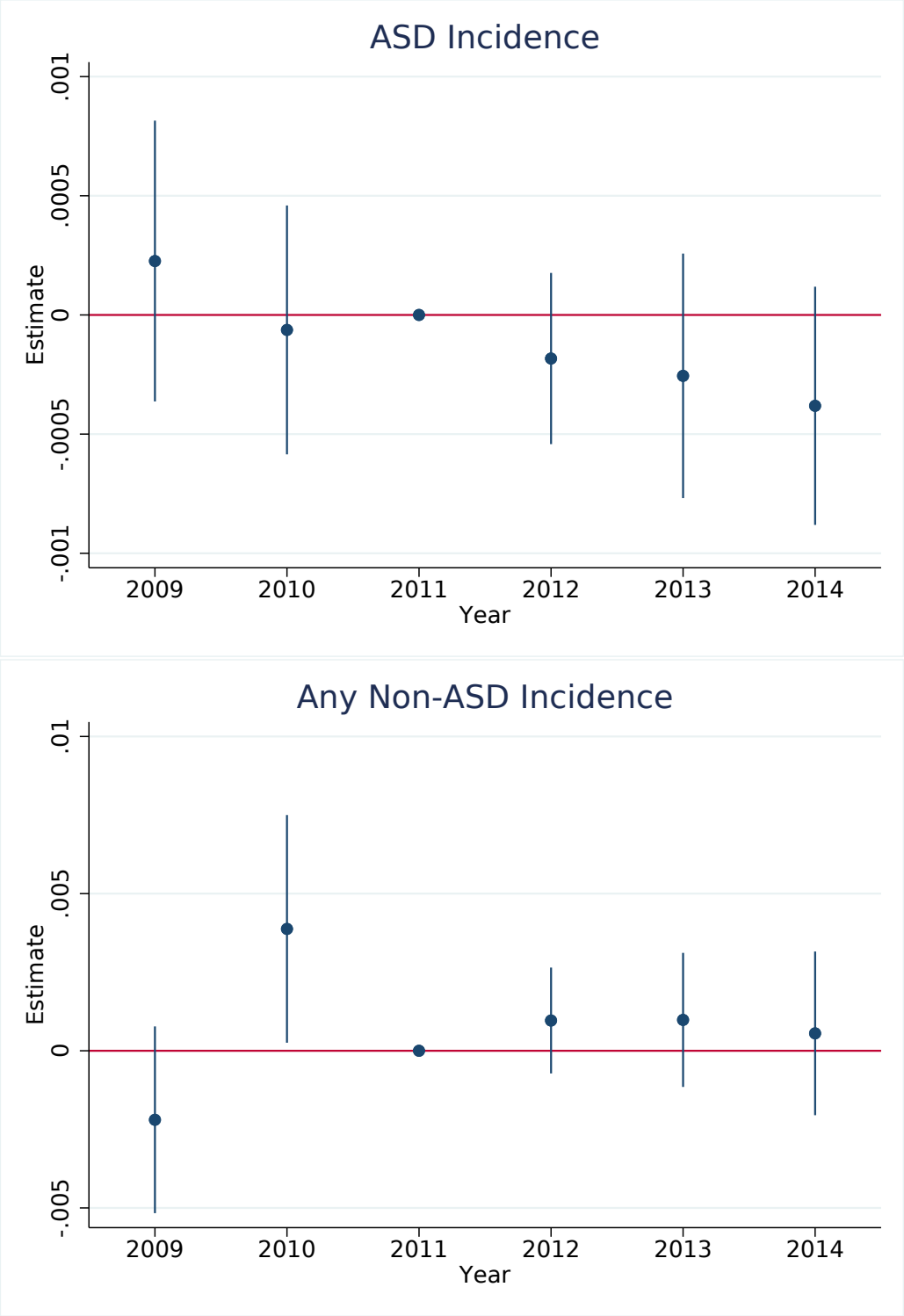
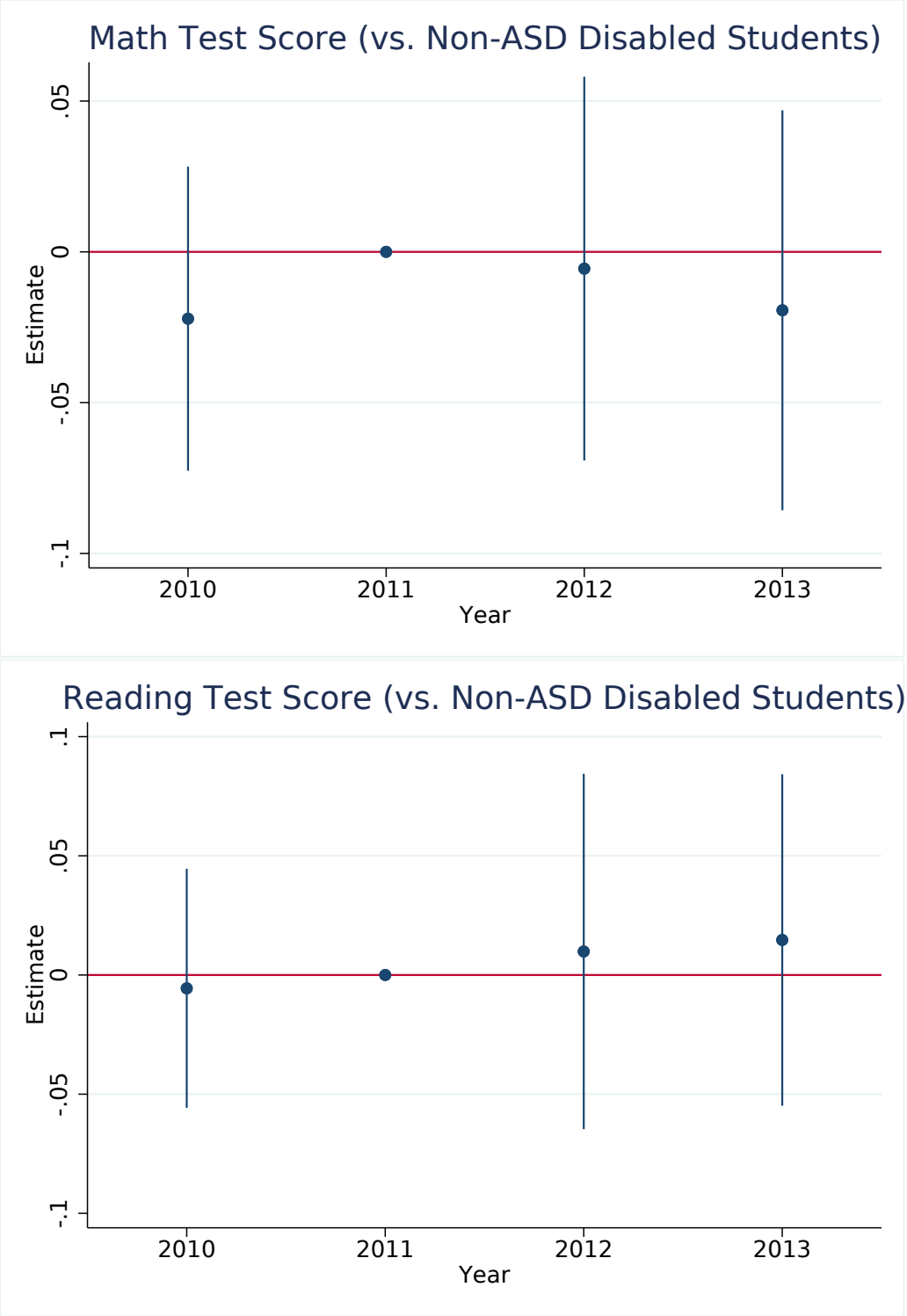
**Figure 1: ASD and Non-ASD Special Education Incidence Event Studies**




This figure plots event study estimates in which we replace $PostMandate_t \times NonPov_i$ with $NonPov_i$ interacted with a set of year dummies in equation (1). The $NonPov \times t$ control is excluded because of collinearity with the event study variables. Year 2011 is excluded, so all estimates are relative to that year. Each point represents the point estimate and the bars extending from each point show the 95% confidence interval that is calculated from standard errors that are clustered at the school district level.

**Figure 2: Test Scores Event Studies, using Non-ASD Special Education Control Group**




This figure plots event study estimates in which we replace $PostMandate_t \times NonPov_i \times ASD_{it}$ with $NonPov_i \times ASD_{it}$ interacted with a set of year dummies in equation (2). Year 2011 is excluded, so all estimates are relative to that year. Each point represents the point estimate and the bars extending from each point show the 95% confidence interval that is calculated from standard errors that are clustered at the school district level.

**Table 1: Descriptive Tabulations of Analysis Variables**

| Variable | All | ASD | Non-ASD Special Ed. | Non-Special Ed. |
|---|---|---|---|---|
| Demographics | | | | |
| White | 0.683 | 0.754 | 0.651 | 0.687 |
| Male | 0.513 | 0.858 | 0.644 | 0.489 |
| LEP | 0.055 | 0.030 | 0.053 | 0.055 |
| Poverty | 0.509 | 0.434 | 0.691 | 0.482 |
| Disability | | | | |
| ASD | 0.010 | | | |
| Any Non-ASD | 0.133 | | | |
| Cognitive | 0.011 | | | |
| Emotional | 0.009 | | | |
| Speech | 0.036 | | | |
| Learning Disability | 0.055 | | | |
| Other Health | 0.016 | | | |
| Observations | 3,854,234 | 38,803 | 506,432 | 3,308,999 |
| Special Education Program | | | | |
| ASD | | 0.197 | 0.001 | |
| Resource | | 0.551 | 0.611 | |
| Cognitive | | 0.119 | 0.090 | |
| Other | | 0.031 | 0.046 | |
| None | | 0.129 | 0.268 | |
| Education Setting | | | | |
| Special Ed. School | | 0.056 | 0.018 | |
| Gen. Ed. $> 80\%$ | | 0.455 | 0.594 | |
| Gen. Ed. 40-79% | | 0.149 | 0.143 | |
| Gen Ed. $< 40\%$ | | 0.207 | 0.074 | |
| Average FTE | | 0.353 | 0.194 | |
| Special Education Support Services | | | | |
| ASD Teaching Consultant | | 0.130 | 0.003 | |
| Non-ASD Teaching Consultant | | 0.091 | 0.074 | |
| Language | | 0.790 | 0.478 | |
| Social Worker | | 0.691 | 0.220 | |
| Occupational Therapy | | 0.401 | 0.085 | |
| Physical Therapy | | 0.031 | 0.027 | |
| Transportation | | 0.041 | 0.009 | |
| Other Service | | 0.042 | 0.023 | |
| Any Service | | 0.943 | 0.674 | |
| Observations | | 38,621 | 506,432 | |

Authors tabulations from data on students in grades 2-8 from the 2009-2010 to the 2014-2015 school years. The sample sizes for the ASD groups in the top and bottom panels differ slightly because a small number of students with an ASD diagnosis do not receive any special education services.

**Table 2: Overlap Between Free/Reduced Price Lunch and Medicaid, by Family Income**

| By Free/Reduced Price Lunch Status | | | |
|---|---|---|---|
| Free/Reduced Price Lunch Status | Percent Insured | Percent Medicaid | Percent Private Insurance |
| Eligible | 95.40% | 72.93% | 31.03% |
| Not Eligible | 97.54% | 12.86% | 88.53% |

| By Family Income as Percent of Poverty Line | | | |
|---|---|---|---|
| Family Income | Percent Insured | Percent Medicaid | Percent Private Insurance |
| $\leq$ 135% FPL | 95.63% | 81.05% | 22.50% |
| 135-185% FPL | 94.75% | 50.87% | 54.19% |
| 185-250% FPL | 95.95% | 29.13% | 74.53% |
| 250-350% FPL | 96.84% | 14.60% | 86.82% |
| $\geq$ 350% FPL | 98.57% | 5.16% | 95.29% |

Authors tabulations from the 2008-2016 American Community Survey among children who were in grades K-8 at Michigan public schools (N = 84,477). "FPL" stands for Federal Poverty Line. Note that insurance counts may exceed 100% as some people remain eligible for Medicaid while enrolled in private plans.

**Table 3: The Effect of the ASD Insurance Mandate on Disability Incidence**

Panel A: Including Linear Time Trend Interacted with Non-poor Status

| | Dependent Variable: | | | | | | |
|---|---|---|---|---|---|---|---|
| Independent Variable | ASD (1) | Non-ASD Disability (2) | Cognitive Disability (3) | Emotional Disability (4) | Speech Disability (5) | Learning Disability (6) | Other Health Disability (7) |
| Non-poor* | -0.00022 | 0.00006 | -0.00042 | 0.00054* | -0.00013 | 0.00018 | 0.00019 |
| Post-2012 | (0.00022) | (0.00099) | (0.00032) | (0.00030) | (0.00064) | (0.00071) | (0.00039) |

Panel B: Excluding Linear Time Trend Interacted with Non-poor Status

| | Dependent Variable: | | | | | | |
|---|---|---|---|---|---|---|---|
| Independent Variable | ASD (1) | Non-ASD Disability (2) | Cognitive Disability (3) | Emotional Disability (4) | Speech Disability (5) | Learning Disability (6) | Other Health Disability (7) |
| Non-poor* | -0.00044* | -0.00013 | -0.00005 | 0.00125*** | -0.00303*** | -0.00168 | 0.00345*** |
| Post-2012 | (0.00023) | (0.00011) | (0.00031) | (0.00031) | (0.00066) | (0.00123) | (0.00048) |
| Dep. Var. Mean | 0.010 | 0.133 | 0.011 | 0.009 | 0.036 | 0.055 | 0.016 |

Authors estimates of equation (1) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression; N=3,854,234. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch in all observed years of schooling. Students who are eligible for free/reduced price lunch in only some years of schooling are excluded from the regression. All regressions include controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Estimates in Panel A also control for a linear time trend interacted with non-poor status. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table 4: The Effect of the ASD Insurance Mandate on Special Education Services**

| | Dependent Variable: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent Variable | ASD Program (1) | Resource or Cognitive Program (2) | No Sped Program (3) | Special Ed School (4) | General Ed >80% (5) | Sped FTE Rate (6) | ASD Teacher Consultant (7) | Language Services (8) | Occupational Therapy Services (9) | Any Sped Services (10) |
| Non-poor*Post-2012*ASD | 0.028 | -0.068** | 0.041*** | -0.006 | 0.014 | -0.013 | -0.023** | -0.0004 | -0.017 | 0.016 |
| | (0.037) | (0.030) | (0.011) | (0.007) | (0.016) | (0.011) | (0.011) | (0.014) | (0.013) | (0.010) |
| Non-poor | -1.005 | -9.140*** | 13.480*** | 0.659 | 12.970 | -10.090*** | 1.702* | 12.860*** | 2.800** | 11.11** |
| | (0.762) | (3.217) | (3.289) | (1.425) | (4.448) | (2.546) | (0.881) | (3.253) | (2.591 ) | (4.54) |
| ASD | 0.224*** | 0.005 | -0.114*** | 0.023 | -0.168*** | 0.135*** | 0.119*** | 0.307*** | 0.273*** | 0.251*** |
| | (0.047) | (0.020) | (0.011) | (0.015) | (0.021) | (0.028) | (0.016) | (0.015) | (0.016) | (0.012) |
| Non-poor*Year | 0.0005 | 0.004*** | -0.007*** | -0.0003 | -0.006*** | 0.005*** | -0.0008* | -0.006*** | -0.001 | -0.006** |
| | (0.0004) | (0.002) | (0.002) | (0.0007) | (0.002) | (0.001) | (0.0004) | (0.002) | (0.001) | (0.002) |
| Non-poor*Post-2012 | -0.001 | -0.002 | 0.004 | 0.002 | -0.010** | 0.002 | 0.002 | -0.001 | 0.009** | 0.006 |
| | (0.002) | (0.005) | (0.005) | (0.002) | (0.005) | (0.003) | (0.001) | (0.005) | (0.004) | (0.006) |
| Non-poor*ASD | -0.057 | 0.149*** | -0.112*** | -0.014** | -0.026 | -0.006 | 0.039** | -0.071*** | 0.017 | -0.053*** |
| | (0.042) | (0.034) | (0.013) | (0.007) | (0.021) | (0.025) | (0.017) | (0.015) | (0.017) | (0.011) |
| Post-2012*ASD | -0.027 | 0.047 | -0.011 | -0.002 | -0.016 | 0.009 | -0.014 | 0.012 | 0.006 | -0.019* |
| | (0.040) | (0.033) | (0.009) | (0.010) | (0.015) | (0.011) | (0.011) | (0.014) | (0.013) | (0.010) |
| Observations | 545,053 | 545,053 | 545,053 | 455,751 | 455,751 | 332,372 | 545,053 | 545,053 | 545,053 | 545,053 |
| Dep. Var. Mean | 0.197 | 0.670 | 0.129 | 0.056 | 0.455 | 0.353 | 0.130 | 0.790 | 0.401 | 0.943 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2010-2011 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch in all observed years of schooling and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Dependent variable means are for the ASD sample. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table 5: The Effect of the ASD Insurance Mandate on Test Scores**

| | Math | | | Reading | | |
|---|---|---|---|---|---|---|
| Control Group: | All Non-ASD | Non-Sped | Non-ASD Sped | All Non-ASD | Non-Sped | Non-ASD Sped |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-poor*Post-2012*ASD | 0.0010 | 0.0137 | -0.0013 | 0.0291 | 0.0268 | 0.0143 |
| | (0.0264) | (0.0264) | (0.0269) | (0.0289) | (0.0291) | (0.0294) |
| Non-Poor | -21.08** | -24.26*** | -12.05 | -24.86*** | -26.46*** | -39.97** |
| | (8.627) | (9.025) | (13.15) | (8.331) | (8.073) | (15.50) |
| ASD | -0.0884*** | -0.1240*** | 0.1110*** | -0.0959*** | -0.1620*** | 0.1930*** |
| | (0.0162) | (0.0163) | (0.0177) | (0.0179) | (0.0184) | (0.0191) |
| Non-Poor*Year | 0.0106** | 0.0121*** | 0.0061 | 0.0125*** | 0.0133*** | 0.0200*** |
| | (0.0043) | (0.0045) | (0.0065) | (0.0041) | (0.0040) | (0.0077) |
| Non-Poor*Post | -0.0092 | -0.0142 | 0.0186 | -0.0276*** | -0.0260*** | -0.0286* |
| | (0.0098) | (0.0102) | (0.0138) | (0.00978) | (0.0095) | (0.0168) |
| Non-Poor*ASD | -0.0862*** | -0.0771*** | -0.0231 | -0.191*** | -0.174*** | -0.152*** |
| | (0.0178) | (0.0179) | (0.0204) | (0.0216) | (0.0220) | (0.0233) |
| Post*ASD | 0.0197 | 0.0183 | 0.0585*** | 0.0127 | 0.0208 | 0.0274 |
| | (0.0214) | (0.0215) | (0.0210) | (0.0236) | (0.0238) | (0.0239) |
| Lagged Achievement | 0.744*** | 0.737*** | 0.606*** | 0.649*** | 0.624*** | 0.570*** |
| | (0.0054) | (0.0050) | (0.0131) | (0.0024) | (0.0023) | (0.0091) |
| Observations | 1,754,971 | 1,579,046 | 185,814 | 1,749,290 | 1,578,937 | 180,172 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2013-2014 school years. 2014-2015 is excluded as Michigan changed from the Michigan Assessment of Educational Progress to the M-Step exam and restructured alternative examination options. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch in all observed years of schooling and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Dependent variable means are for the ASD sample. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table 6: Heterogeneous Effects of the ASD Insurance Mandate on ASD Incidence**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Panel A: By Gender, Race, and District Income | | | | | | | | | |
| Independent Variable | Girls (1) | Boys (2) | | White & Asian (3) | Black & Hispanic (4) | | | | |
| Non-poor* Post-2012 | 0.0000003 (0.00019) | -0.00043 (0.00038) | | -0.00030 (0.00025) | -0.00001 (0.00066) | | | | |
| Observations | 1,878,120 | 1,976,114 | | 3,272,013 | 582,221 | | | | |
| Panel B: By Grade | | | | | | | | | |
| Independent Variable | KG (1) | Grade 1 (2) | Grade 2 (3) | Grade 3 (4) | Grade 4 (5) | Grade 5 (6) | Grade 6 (7) | Grade 7 (8) | Grade 8 (9) |
| Non-poor*Post-2012 | -0.00018 (0.00090) | 0.00043 (0.00105) | -0.00194* (0.00102) | -0.00007 (0.00123) | 0.00003 (0.00113) | 0.00124 (0.00117) | 0.00112 (0.00109) | -0.00181 (0.00114) | 0.00030 (0.00119) |
| Observations | 594,630 | 545,212 | 526,440 | 520,105 | 524,539 | 538,197 | 559,531 | 588,427 | 503,930 |

Authors estimates of equation (1) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch. All regressions include the full set of controls listed in equation (2), including controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

## Table 7: The Effect of the ASD Insurance Mandate, by Gender and Race

Panel A: Boys

| Independent Variable | ASD Program (1) | Resource or Cognitive Program (2) | No Sped Program (3) | Special Ed School (4) | General Ed >80% (5) | Sped FTE Rate (6) | ASD Teacher Consultant (7) | Language Services (8) | Occupational Therapy Services (9) | Any Sped Services (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dependent Variable: | | | | | | | | | |
| Non-poor*Post-2012*ASD | 0.030 | -0.062** | 0.038** | -0.002 | -0.010* | -0.012 | -0.021* | -0.018 | -0.018 | 0.011 |
| | (0.036) | (0.030) | (0.012) | (0.007) | (0.006) | (0.010) | (0.011) | (0.014) | (0.013) | (0.010) |
| Observations | 359,165 | 359,165 | 359,165 | 300,256 | 300,256 | 218,809 | 359,165 | 359,165 | 359,165 | 359,165 |

Panel B: Girls

| Independent Variable | ASD Program (1) | Resource or Cognitive Program (2) | No Sped Program (3) | Special Ed School (4) | General Ed >80% (5) | Sped FTE Rate (6) | ASD Teacher Consultant (7) | Language Services (8) | Occupational Therapy Services (9) | Any Sped Services (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dependent Variable: | | | | | | | | | |
| Non-poor*Post-2012*ASD | 0.013 | -0.103** | 0.065*** | -0.020 | 0.021 | -0.019 | -0.031 | 0.037 | -0.011 | 0.038* |
| | (0.049) | (0.047) | (0.025) | (0.020) | (0.033) | (0.028) | (0.021) | (0.026) | (0.030) | (0.020) |
| Observations | 185,888 | 185,888 | 185,888 | 300,256 | 155,459 | 113,563 | 185,888 | 185,888 | 185,888 | 185,888 |

Panel C: Black & Hispanic

| Independent Variable | ASD Program (1) | Resource or Cognitive Program (2) | No Sped Program (3) | Special Ed School (4) | General Ed >80% (5) | Sped FTE Rate (6) | ASD Teacher Consultant (7) | Language Services (8) | Occupational Therapy Services (9) | Any Sped Services (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dependent Variable: | | | | | | | | | |
| Non-poor*Post-2012*ASD | 0.083 | -0.060 | -0.005 | -0.001 | 0.017 | 0.009 | -0.013 | 0.016 | -0.012 | -0.014 |
| | (0.090) | (0.078) | (0.035) | (0.018) | (0.051) | (0.029) | (0.025) | (0.033) | (0.046) | (0.030) |
| Observations | 82,393 | 82,393 | 82,393 | 58,337 | 58,337 | 29,426 | 82,393 | 82,393 | 82,393 | 82,393 |

Panel D: White & Asian

| Independent Variable | ASD Program (1) | Resource or Cognitive Program (2) | No Sped Program (3) | Special Ed School (4) | General Ed >80% (5) | Sped FTE Rate (6) | ASD Teacher Consultant (7) | Language Services (8) | Occupational Therapy Services (9) | Any Sped Services (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dependent Variable: | | | | | | | | | |
| Non-poor*Post-2012*ASD | -0.015 | -0.036** | 0.048*** | -0.010 | 0.026* | -0.015 | -0.016* | 0.016 | -0.021* | 0.009 |
| | (0.012) | (0.014) | (0.010) | (0.006) | (0.014) | (0.012) | (0.010) | (0.033) | (0.012) | (0.008) |
| Observations | 462,660 | 462,660 | 462,660 | 397,414 | 397,414 | 302,946 | 462,660 | 462,660 | 185,888 | 462,660 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression; N=707,376. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include the full set of controls listed in equation (2), including controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Dependent variable means are for the ASD sample. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table 8: The Effect of the ASD Insurance Mandate, by Grade**

| Grade | ASD Program (1) | Resource or Cognitive Program (2) | No Sped Program (3) | Special Ed School (4) | General Ed >80% (5) | Sped FTE Rate (6) | ASD Teacher Consultant (7) | Language Services (8) | Occupational Therapy Services (9) | Any Sped Services (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| KG | 0.003 | 0.012 | 0.005 | 0.004 | 0.012 | -0.004 | -0.006 | -0.016 | -0.016 | -0.013 |
| | (0.044) | (0.044) | (0.028) | (0.016) | (0.034) | (0.038) | (0.022) | (0.018) | (0.022) | (0.013) |
| 1 | 0.019 | -0.022 | -0.008 | -0.011 | -0.009 | 0.002 | -0.030 | 0.024 | -0.016 | 0.008 |
| | (0.044) | (0.041) | (0.027) | (0.016) | (0.034) | (0.030) | (0.025) | (0.021) | (0.022) | (0.016) |
| 2 | 0.026 | -0.068 | 0.040 | -0.027** | -0.015 | 0.013 | -0.048** | 0.017 | -0.016 | 0.024 |
| | (0.050) | (0.044) | (0.025) | (0.016) | (0.036) | (0.036) | (0.022) | (0.025) | (0.022) | (0.018) |
| 3 | 0.055 | -0.107** | 0.047* | 0.011 | -0.0006 | 0.004 | -0.041* | 0.006 | -0.016 | 0.019 |
| | (0.051) | (0.048) | (0.025) | (0.015) | (0.033) | (0.025) | (0.021) | (0.023) | (0.022) | (0.018) |
| 4 | 0.059 | -0.095** | 0.047** | -0.031* | -0.0006 | -0.009 | -0.002 | 0.010 | -0.016 | 0.030 |
| | (0.048) | (0.043) | (0.022) | (0.016) | (0.032) | (0.024) | (0.018) | (0.025) | (0.022) | (0.020) |
| 5 | 0.012 | -0.047 | 0.030 | -0.018 | 0.035 | 0.007 | -0.008 | -0.001 | -0.016 | -0.003 |
| | (0.040) | (0.039) | (0.020) | (0.013) | (0.032) | (0.026) | (0.018) | (0.025) | (0.022) | (0.017) |
| 6 | -0.004 | -0.033 | 0.045** | -0.006 | 0.042 | -0.033 | -0.011 | -0.028 | -0.016 | -0.002 |
| | (0.034) | (0.033) | (0.018) | (0.013) | (0.031) | (0.025) | (0.017) | (0.024) | (0.022) | (0.016) |
| 7 | 0.021 | -0.022 | 0.002 | -0.002 | 0.001 | -0.027 | -0.016 | -0.043 | -0.016 | 0.003 |
| | (0.043) | (0.041) | (0.019) | (0.013) | (0.033) | (0.025) | (0.020) | (0.028) | (0.022) | (0.018) |
| 8 | 0.023 | -0.009 | -0.004 | 0.007 | 0.023 | -0.034 | -0.023 | -0.041 | -0.016 | -0.024 |
| | (0.028) | (0.032 ) | (0.021) | (0.013) | (0.032) | (0.023) | (0.022) | (0.028) | (0.022) | (0.020) |

Authors estimates of equation (2) as described in the text using data on students in grades Kindergarten-8 from the 2009-2010 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each cell is a separate regression and shows the estimate of the coefficient on the triple interaction term of Non-poor*Post-2012*ASD. All regressions include the full set of controls listed in equation (2), including controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table 9: The Effect of the ASD Insurance Mandate – Robustness Checks**

Panel A: Excluding Linear Time Trend Interacted with Non-poor Status

| | Dependent Variable: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent Variable | ASD Program | Resource or Cognitive Program | No Sped Program | Special Ed School | General Ed <80% | Sped FTE Rate | ASD Teacher Consultant | Language Services | Occupational Therapy Services | Any Sped Services |
| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Non-poor*Post-2012*ASD | 0.029 | -0.069** | 0.041*** | -0.006 | 0.014 | -0.013 | -0.023** | -0.0002 | -0.017 | 0.017 |
| | (0.037) | (0.030) | (0.011) | (0.007) | (0.016) | (0.011) | (0.011) | (0.014) | (0.013) | (0.010) |
| Observations | 545,224 | 545,224 | 545,224 | 455,727 | 455,751 | 332,338 | 545,224 | 545,224 | 545,224 | 545,224 |
| Dep. Var. Mean | 0.197 | 0.670 | 0.129 | 0.056 | 0.455 | 0.353 | 0.130 | 0.790 | 0.401 | 0.943 |

Panel B: Including All Students Who Ever Receive Free/Reduced Price Lunch

| | Dependent Variable: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent Variable | ASD Program | Resource or Cognitive Program | No Sped Program | Special Ed School | General Ed >80% | Sped FTE Rate | ASD Teacher Consultant | Language Services | Occupational Therapy Services | Any Sped Services |
| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Non-poor*Post-2012*ASD | 0.019 | -0.045* | 0.026*** | -0.006 | 0.007 | -0.014* | -0.018* | 0.00004 | -0.008 | 0.009 |
| | (0.032) | (0.026) | (0.010) | (0.005) | (0.015) | (0.008) | (0.009) | (0.012) | (0.013) | (0.009) |
| Observations | 705,616 | 705,616 | 705,616 | 577,221 | 577,221 | 421,418 | 705,616 | 705,616 | 705,616 | 705,616 |
| Dep. Var. Mean | 0.200 | 0.672 | 0.125 | 0.056 | 0.444 | 0.359 | 0.129 | 0.784 | 0.395 | 0.940 |

Panel C: Including All Students Who Ever Receive Free/Reduced Price Lunch and Excluding Linear Time Trend Interacted with Non-poor Status

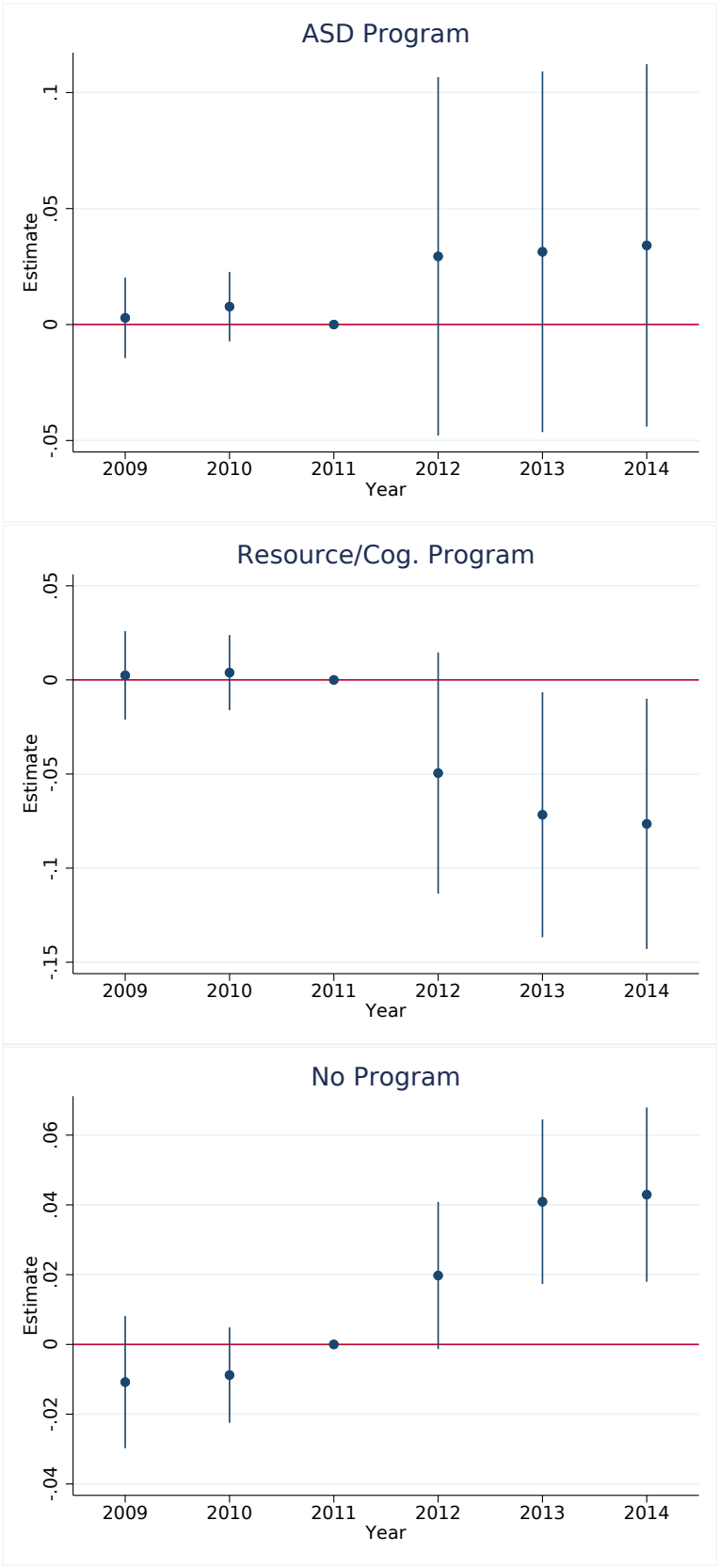
| | Dependent Variable: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent Variable | ASD Program | Resource or Cognitive Program | No Sped Program | Special Ed School | General Ed >80% | Sped FTE Rate | ASD Teacher Consultant | Language Services | Occupational Therapy Services | Any Sped Services |
| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Non-poor*Post-2012*ASD | 0.019 | -0.045* | 0.026*** | -0.006 | 0.007 | -0.014* | -0.018** | 0.0001 | -0.008 | 0.009 |
| | (0.032) | (0.026) | (0.010) | (0.005) | (0.015) | (0.008) | (0.009) | (0.012) | (0.013) | (0.009) |
| Observations | 705,616 | 705,616 | 705,616 | 577,221 | 577,221 | 421,418 | 705,616 | 705,616 | 705,616 | 705,616 |
| Dep. Var. Mean | 0.200 | 0.672 | 0.125 | 0.056 | 0.444 | 0.359 | 0.129 | 0.784 | 0.395 | 0.940 |

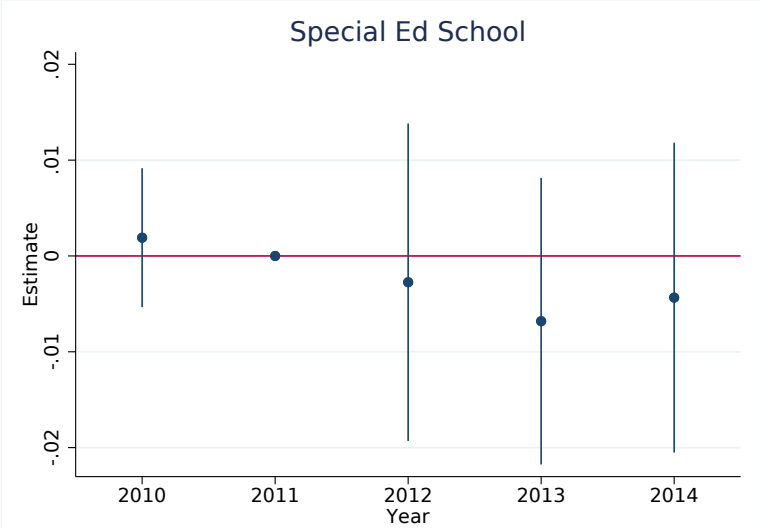
Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2010-2011 to the 2014-2015 school years. The sample in Panel A includes only students who are always or never eligible for free/reduced price lunch, while the sample in Panels B and C include all students. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include the full set of controls listed in equation (2), including whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. The estimates in Panels A and C exclude the linear time trend interacted with non-poor status. Dependent variable means are for the ASD sample. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

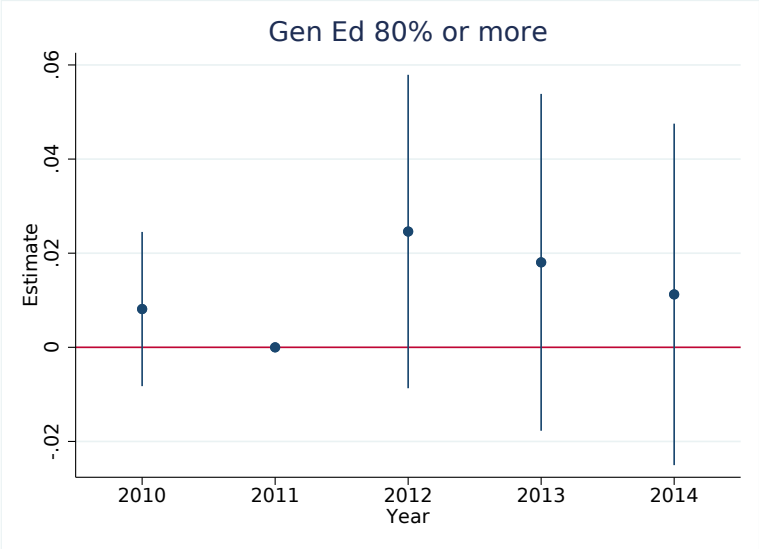
## 7 Online Appendix

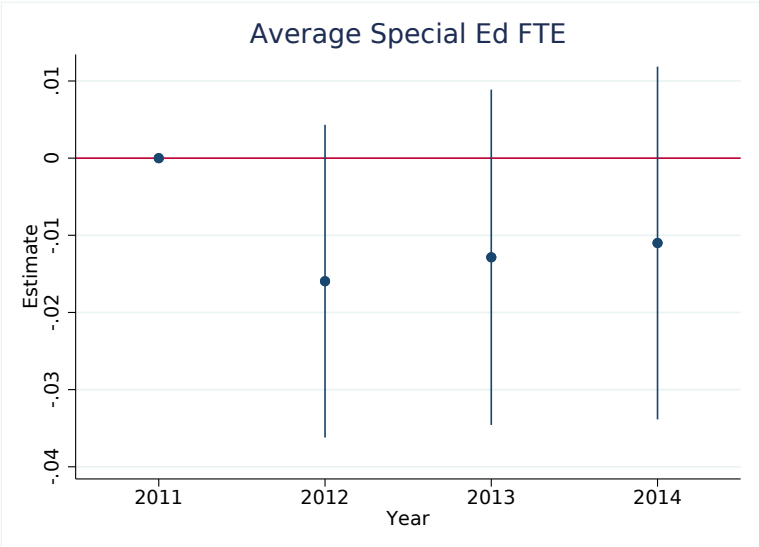
# Online Appendix: Not for Publication

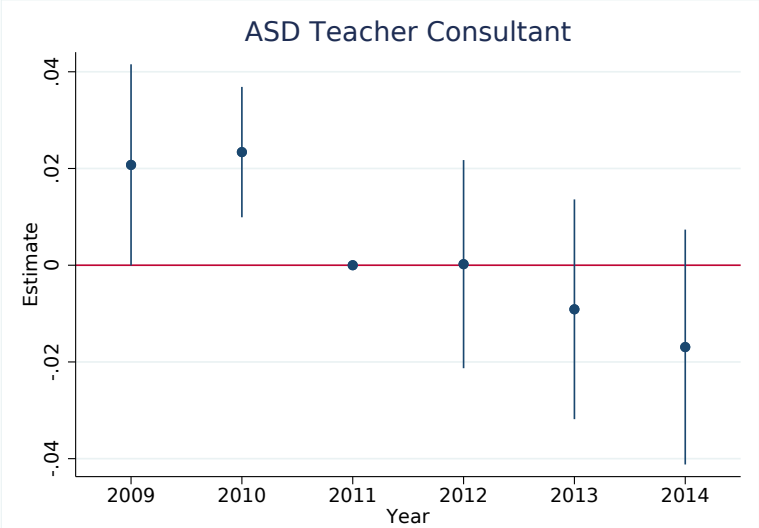
**Figure A-1: Event Study Estimates of Main Outcomes**

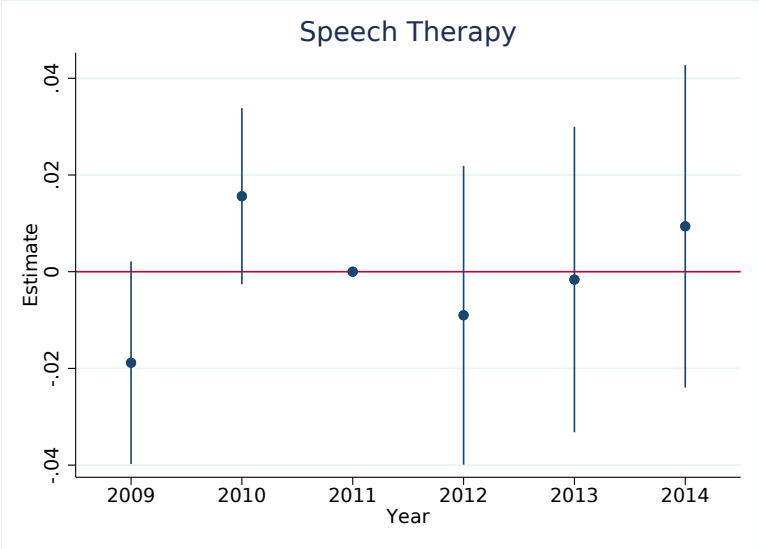


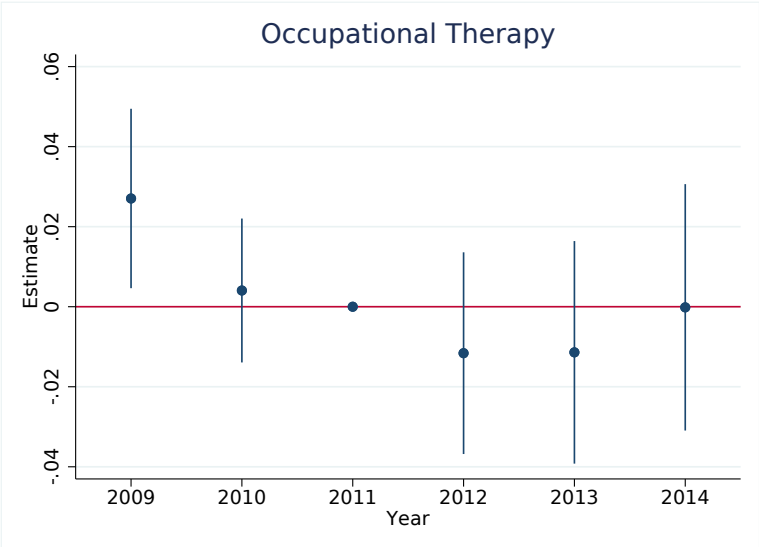

Special Ed School
Estimate
.02
.01
0
-.01
-.02
2010
2011
2012
2013
2014
Year

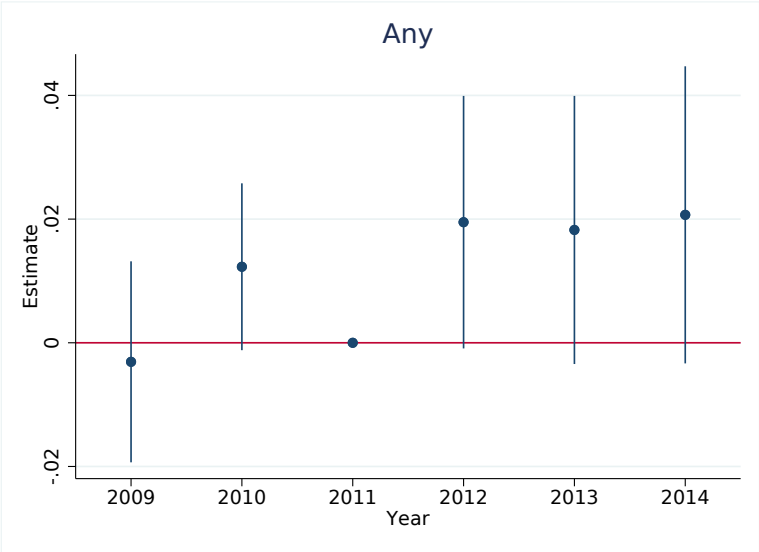

Gen Ed 80% or more
Estimate
.06
.04
.02
0
-.02
2010
2011
2012
2013
2014
Year


Average Special Ed FTE
Estimate
.01
0
-.01
-.02
-.03
-.04
2011
2012
2013
2014
Year


ASD Teacher Consultant
Estimate
.04
.02
0
-.02
-.04
2009
2010
2011
2012
2013
2014
Year


Speech Therapy
Estimate
.04
.02
0
-.02
-.04
2009
2010
2011
2012
2013
2014
Year


Occupational Therapy
Estimate
.06
.04
.02
0
-.02
-.04
2009
2010
2011
2012
2013
2014
Year




This figure plots event study estimates in which we replace $PostMandate_t \times NonPov_i \times ASD_{it}$ with $NonPov_i \times ASD_{it}$ interacted with a set of year dummies in equation (2). Year 2011 is excluded, so all estimates are relative to that year. Each point represents the point estimate and the bars extending from each point show the 95% confidence interval that is calculated from standard errors that are clustered at the school district level.

**Figure A-2: Test Scores Event Studies, using All Non-ASD Control Group**


This figure plots event study estimates in which we replace $PostMandate_t \times NonPov_i \times ASD_{it}$ with $NonPov_i \times ASD_{it}$ interacted with a set of year dummies in equation (2). Year 2011 is excluded, so all estimates are relative to that year. Each point represents the point estimate and the bars extending from each point show the 95% confidence interval that is calculated from standard errors that are clustered at the school district level.

**Figure A-3: Test Score Event Studies, using Non-Special Education Control Group**


This figure plots event study estimates in which we replace $PostMandate_t \times NonPov_i \times ASD_{it}$ with $NonPov_i \times ASD_{it}$ interacted with a set of year dummies in equation (2). Year 2011 is excluded, so all estimates are relative to that year. Each point represents the point estimate and the bars extending from each point show the 95% confidence interval that is calculated from standard errors that are clustered at the school district level.

**Table A-1: The Effect of the ASD Insurance Mandate on Disability Incidence Including All Students Who Ever Receive Free/Reduced Price Lunch**

Panel A: Including Linear Time Trend Interacted with Non-poor Status

| | Dependent Variable: | | | | | | |
|---|---|---|---|---|---|---|---|
| Independent Variable | ASD (1) | Non-ASD Disability (2) | Cognitive Disability (3) | Emotional Disability (4) | Speech Disability (5) | Learning Disability (6) | Other Health Disability (7) |
| Non-poor* | -0.00011 | -0.00072 | -0.00043 | 0.00035 | 0.00001 | -0.00092 | 0.00047 |
| Post-2012 | (0.00026) | (0.00114) | (0.00031) | (0.00033) | (0.00063) | (0.00075) | (0.00040) |
| Dep. Var. Mean | 0.010 | 0.133 | 0.011 | 0.009 | 0.035 | 0.056 | 0.016 |

Panel B: Excluding Linear Time Trend Interacted with Non-poor Status

| | Dependent Variable: | | | | | | |
|---|---|---|---|---|---|---|---|
| Independent Variable | ASD (1) | Non-ASD Disability (2) | Cognitive Disability (3) | Emotional Disability (4) | Speech Disability (5) | Learning Disability (6) | Other Health Disability (7) |
| Non-poor* | -0.00034 | 0.00149 | 0.00008 | 0.00115*** | -0.00237*** | 0.00461*** | -0.00204*** |
| Post-2012 | (0.00022) | (0.00131) | (0.00028) | (0.00029) | (0.00056) | (0.00101) | (0.00036) |

Authors estimates of equation (1) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2014-2015 school years. Each column is a separate regression; N=4,970,113. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch. All regressions include the full set of controls listed in equation (1), including whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Estimates in Panel B exclude the control for linear time trend interacted with non-poor status. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table A-2: The Effect of the ASD Insurance Mandate on Other Special Education Services**

| | Dependent Variable: Education Setting | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Independent Variable | Other Sped Program (1) | Gen Ed 40-79% (2) | Gen Ed <40% (3) | Any General Ed (4) | Non-ASD Teacher Consultant (5) | Social Worker (6) | Physical Therapy (7) | Trans-portation Services (8) |
| Non-poor*Post-2012*ASD | -0.001 | -0.005 | -0.008 | 0.001 | 0.003 | -0.015 | -0.008 | -0.003 |
| | (0.006) | (0.011) | (0.014) | (0.008) | (0.007) | (0.014) | (0.005) | (0.006) |
| Observations | 545,053 | 455,751 | 455,751 | 455,571 | 545,053 | 545,053 | 545,053 | 545,053 |
| Dep. Var. Mean | 0.031 | 0.149 | 0.207 | 0.811 | 0.091 | 0.691 | 0.031 | 0.041 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2010-2011 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include the full set of controls listed in equation (2), including controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Dependent variable means are for the ASD sample. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table A-3: The Effect of the ASD Insurance Mandate on Taking Regular Exams**

| | Math | | | Reading | | |
|---|---|---|---|---|---|---|
| Control Group: | All Non-ASD | Non-Sped | Non-ASD Sped | All Non-ASD | Non-Sped | Non-ASD Sped |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-poor*Post-2012*ASD | -0.0119 | 0.0108 | -0.0344 | -0.0170 | 0.0068 | -0.0370 |
| | (0.0263) | (0.0254) | (0.0260) | (0.0266) | (0.0254) | (0.0272) |
| Non-Poor | -5.385*** | 0.419 | -6.612 | -3.968*** | 2.124*** | -3.205 |
| | (0.807) | (0.301) | (5.003) | (0.952) | (0.475) | (5.466) |
| ASD | -0.375*** | -0.426*** | -0.229*** | -0.376*** | -0.433*** | -0.210*** |
| | (0.0301) | (0.0300) | (0.0302) | (0.0302) | (0.0298) | (0.0313) |
| Non-Poor*Year | 0.0027*** | -0.0002 | 0.0033 | 0.0020*** | -0.0011*** | 0.0016 |
| | (0.0004) | (0.0002) | (0.0025) | (0.0005) | (0.0002) | (0.0027) |
| Non-Poor*Post | 0.0099*** | -0.0000 | 0.0327*** | 0.0122*** | 0.0014*** | 0.0374*** |
| | (0.0010) | (0.0003) | (0.0063) | (0.0011) | (0.0005) | (0.0059) |
| Non-Poor*ASD | 0.0559** | 0.0873*** | 0.0136 | 0.0474* | 0.0818*** | 0.0004 |
| | (0.0276) | (0.0273) | (0.0281) | (0.0276) | (0.0272) | (0.0287) |
| Post*ASD | -0.0683** | -0.1040*** | 0.0360 | -0.0571** | -0.0951*** | 0.0544* |
| | (0.0271) | (0.0262) | (0.0269) | (0.0277) | (0.0265) | (0.0281) |
| Observations | 2,712,322 | 2,352,871 | 385,960 | 2,712,322 | 2,352,871 | 385,960 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2013-2014 school years. 2014-2015 is excluded as Michigan changed from the Michigan Assessment of Educational Progress to the M-Step exam and restructured alternative examination options. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch in all observed years of schooling and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include controls for whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. Dependent variable means are for the ASD sample. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table A-4: Heterogeneous Effects of the ASD Insurance Mandate on Test Scores, using non-Special Education Control Group**

| Panel A: Math, by Gender and Race | | | | |
|---|---|---|---|---|
| Independent Variable | Girls (1) | Boys (2) | White/Asian (3) | Black/Hisp. (4) |
| Non-poor* Post-2012 | 0.088 (0.072) | 0.003 (0.028) | 0.014 (0.029) | -0.030 (0.090) |
| Observations | 803,320 | 775,726 | 1,365,614 | 213,432 |
| **Panel B: Reading, by Gender and Race** | | | | |
| Independent Variable | Girls (1) | Boys (2) | White/Asian (3) | Black/Hisp. (4) |
| Non-poor* Post-2012 | 0.071 (0.089) | 0.016 (0.030) | 0.043 (0.031) | -0.098 (0.108) |
| Observations | 803,315 | 775,622 | 1,365,950 | 212,987 |

| Panel C: Math, by Grade | | | | | |
|---|---|---|---|---|---|
| Independent Variable | Grade 4 (1) | Grade 5 (2) | Grade 6 (3) | Grade 7 (4) | Grade 8 (5) |
| Non-poor*Post-2012 | 0.138* (0.074) | -0.073 (0.065) | -0.020 (0.058) | 0.013 (0.061) | 0.032 (0.061) |
| Observations | 298,060 | 300,174 | 309,489 | 326,170 | 343,020 |
| **Panel D: Reading, by Grade** | | | | | |
| Independent Variable | Grade 4 (1) | Grade 5 (2) | Grade 6 (3) | Grade 7 (4) | Grade 8 (5) |
| Non-poor*Post-2012 | 0.031 (0.067) | 0.076 (0.063) | -0.072 (0.066) | 0.042 (0.064) | 0.076 (0.069) |
| Observations | 298,012 | 299,973 | 309,512 | 326,192 | 343,089 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2014-2015 school years. The sample includes only students who are always or never eligible for free/reduced price lunch. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include the full set of controls listed in equation (2), including controls for whether a student is white, male, limited English proficient, as well as district and grade-by-year fixed effects. Estimates also include controls for lagged test score. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.

**Table A-5: The Effect of the ASD Insurance Mandate on Test Scores - Robustness Checks**

| Panel A: Excluding Linear Time Trend Interacted with Non-poor Status | | | | | | |
|---|---|---|---|---|---|---|
| | Math | | | Reading | | |
| Control Group: | All Non-ASD | Non-Sped | Non-ASD Sped | All Non-ASD | Non-Sped | Non-ASD Sped |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-poor*Post-2012*ASD | 0.001 | 0.014 | -0.001 | 0.029 | 0.027 | 0.014 |
| | (0.026) | (0.026) | (0.027) | (0.029) | (0.029) | (0.029) |
| Observations | 1,754,971 | 1,579,046 | 185,814 | 1,749,290 | 1,578,937 | 180,172 |
| **Panel B: Including All Students Who Ever Receive Free/Reduced Price Lunch** | | | | | | |
| | Math | | | Reading | | |
| Control Group: | All Non-ASD | Non-Sped | Non-ASD Sped | All Non-ASD | Non-Sped | Non-ASD Sped |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-poor*Post-2012*ASD | -0.012 | -0.009 | -0.023 | 0.014 | 0.010 | -0.001 |
| | (0.023) | (0.023) | (0.024) | (0.026) | (0.026) | (0.026) |
| Observations | 2,158,249 | 1,940,574 | 230,304 | 2,151,497 | 1,940,733 | 223,320 |
| **Panel C: Including All Students Who Ever Receive Free/Reduced Price Lunch and Excluding Linear Time Trend Interacted with Non-poor Status** | | | | | | |
| | Math | | | Reading | | |
| Control Group: | All Non-ASD | Non-Sped | Non-ASD Sped | All Non-ASD | Non-Sped | Non-ASD Sped |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-poor*Post-2012*ASD | -0.011 | -0.009 | -0.023 | 0.014 | 0.010 | -0.001 |
| | (0.023) | (0.023) | (0.024) | (0.026) | (0.026) | (0.026) |
| Observations | 2,158,249 | 1,940,574 | 230,304 | 2,151,497 | 1,940,733 | 223,320 |
| **Panel D: Including 2014-15** | | | | | | |
| | Math | | | Reading | | |
| Control Group: | All Non-ASD | Non-Sped | Non-ASD Sped | All Non-ASD | Non-Sped | Non-ASD Sped |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-poor*Post-2012*ASD | -0.014 | 0.001 | -0.043* | 0.032 | 0.039 | 0.016 |
| | (0.025) | (0.025) | (0.025) | (0.026) | (0.026) | (0.027) |
| Observations | 2,184,874 | 1,961,605 | 236,273 | 2,179,192 | 1,961,404 | 230,726 |

Authors estimates of equation (2) as described in the text using data on students in grades 2-8 from the 2009-2010 to the 2013-2014 school years, except where specified. The samples in Panels A and D include only students who are always or never eligible for free/reduced price lunch, while the sample in Panels B and C include all students. Each column is a separate regression. "Non-poor" is an indicator for whether the student is eligible for free/reduced price lunch and "ASD" is an indicator for whether the student has an ASD diagnosis in that year. All regressions include the full set of controls listed in equation (2), including whether a student is white, male, and limited English proficient as well as district and grade-by-year fixed effects. The estimates in Panels A and C exclude the linear time trend interacted with non-poor status. Estimates also include controls for lagged test score. Standard errors are clustered at the school district level: *,**,*** indicate significance at the 10, 5, and 1 percent level, respectively.