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ABSTRACT

We examine the effects of a policy change in the province of Quebec, Canada which greatly expanded insurance coverage for prescription medications. We show that the change was associated with a sharp increase in the use of Ritalin, a medication commonly prescribed for ADHD, relative to the rest of Canada. We ask whether this increase in medication use was associated with improvements in emotional functioning and short- and long-run academic outcomes among children with ADHD. We find evidence of increases in emotional problems among girls, and reductions in educational attainment among boys. Our results are silent on the effects on optimal use of medication for ADHD, but suggest that expanding medication use can have negative consequences given the average way these drugs are used in the community.

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An online appendix is available at:
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Introduction

Over the past twenty years, mental disabilities have overtaken physical disabilities as the leading cause of activity limitations in children. Today, ADHD is three times more likely than asthma to be contributing to childhood disability in the United States (Currie and Kahn, 2011). Recent research indicates that children with ADHD have lower standardized test scores than others (including their own siblings) and are more likely to be placed in special education, to repeat grades, and to be delinquent (Miech et al., 1999; Nagin and Tremblay, 1999; Currie and Stabile, 2006, 2007; Fletcher and Wolfe, 2008, 2009). Moreover, untreated children with ADHD can also impose significant costs on their classmates by disrupting learning and/or diverting teacher resources (Aizer, 2009).

According to the most recent data from the Centers for Disease Control and Prevention, approximately eleven percent of U.S. children aged 4 to 17 have ever been diagnosed with ADHD and more than half of them are taking stimulant medications such as Ritalin for their condition (Schwarz and Cohen, 2013; Centers for Disease Control and Prevention, 2005).[1] Both diagnosis and treatment rates are lower outside the U.S., but have been rapidly increasing (Polanczyk et al, 2007).

Despite, or perhaps because of the millions of children taking stimulants, drug treatment for ADHD remains controversial. The National Institute of Mental Health recommends treatment with stimulants and says that they are safe if used under medical supervision (U.S. NIMH, 2012). However, concerns continue to surface about both

[1] Schwarz and Cohen tabulate data from the 2011-2012 wave of the National Survey of Children's Health. Methylphenidate (sold under the trade names Ritalin, Biphentin, and Concerta) is the most commonly used central nervous system stimulant for ADHD. Others include: dextroamphetamine (Dexedrine); and mixed amphetamine salts (Adderall) (Therapeutics Initiative, 2010).

short term side effects, and possible side effects due to long-term use. For example, the U.S. Food and Drug Administration voted in 2006 to recommend a warning label describing the cardiovascular risks of stimulant drugs for ADHD (Nissen, 2006). Other side effects can include decreased appetite, insomnia, headache, stomach ache, dizziness and mood changes including anxiety and depression (Schachter et al., 2001, NIMH, 2012). Some studies have also found growth deficits in treated children (Joshi and Adam, 2002).

Lack of evidence regarding long-term benefits of stimulant medications is a key element of this controversy. Drugs are often prescribed with the goal of helping children to be successful in school. If the drugs do not actually lead to scholastic benefits in the long run, then the case for subjecting children to even a small risk of side effects is weakened. The main problems involved in assessing the long-run efficacy of stimulant medication are first, that most drug trials follow children only for a short time (Griffin et al., 2008), and second, that families (and children) choose whether or not to seek treatment for ADHD, and whether to take medication if it is prescribed.

Our paper assesses the benefits of short and long-term treatment for ADHD with stimulant medication using longitudinal data from the National Longitudinal Survey of Canadian Youth (NLSCY), and a unique policy experiment which expanded insurance coverage for drugs in Quebec in 1997. Our study improves on the previous literature in many respects. First, we have a large sample of children who have been followed from 1994 to 2008, long enough to observe graduation from high school and whether they ever attended college. Moreover, we know whether they were taking stimulant medication as of each wave. Second, all children in the NLSCY were assessed for ADHD symptoms, so we do not have to deal with selection into diagnosis. Third, we are able to exploit exogenous variation in the availability of drugs due to the policy experiment. Fourth, we are able to use individual fixed effects to control for unobservable differences between children that might influence both treatment and outcomes.

We find that the introduction of the prescription drug insurance program increased the use of Ritalin in Quebec relative to the rest of Canada. However, we find little evidence that the performance of children with ADHD improved. In the full sample, the increase in medication use is associated with increases in unhappiness and a deterioration in relationships with parents. These emotional and social effects are concentrated among girls, who also experience increases in anxiety and depression. We also see some evidence of deterioration in contemporaneous educational outcomes including grade repetition and mathematics scores. When we turn to an examination of long-term outcomes, we find that increases in medication use are associated with increases in the probability that boys dropped out of school and with marginal increases in the probability that girls have ever been diagnosed with a mental or emotional disorder.

The rest of the paper is laid out as follows. Section 1 reviews the background literature about the consequences of ADHD and child outcomes and the controversy surrounding ADHD medications. Section 2 discusses our data and Section 3 discusses methods. The results appear in Section 4 and Section 5 concludes.

Background

In view of the importance of ADHD and the fact that stimulant medications have been used for many years, it is perhaps surprising that virtually all of the evidence regarding their efficacy relates to short time horizons. Controlled studies suggest that medication improves attention, short-term memory, performance on quizzes, homework completion, and note-taking (Douglas, 1999; Bedard et al, 2007; Pelham et al. 1993; Evans et al, 2001). It is often assumed that these improvements will translate into future academic gains, but few studies actually track children longer than a few months. Moreover Schachter et al. (2001) argue that the positive short-run effects on attention and behavior may be over-estimated given publication bias towards positive findings. An additional concern is that the doses that yield the most desirable behavior may not be calibrated to achieve the greatest possible improvement in cognitive functioning (Wigal et al., 1999).

One of the most widely known studies of the shorter-term effects of medication for ADHD is the U.S. National Institute of Mental Health 14 month Multimodal Treatment study (MTA). The MTA randomized 579 children with ADHD into four arms: Stimulants alone; behavioral therapy alone; stimulants plus behavioral therapy; or usual community care, which usually involved treatment with stimulants but with possibly less than optimal dosage. Blinded classroom observations did not find any significant differences in behavior between the four groups. At the end of 14 months, 49.8% of children reported mild side effects, 11.4% reported moderate side effects, and 2.9% reported severe side effects (The MTA Cooperation Group, 1999).

Those studies that have attempted to examine longer-term effects of stimulant therapy, provide suggestive evidence about the long-term effects of ADHD, but also illustrate why it is difficult to measure. Barbaresi et al. (2007) follow 370 children with ADHD from a 1976-1982 birth cohort study. They obtained the complete school record, as well as medical records with information about stimulant use for each child. They found that in this sample of children with ADHD diagnoses, longer duration of stimulant use reduced absences and retention in grade but had no effect on school dropout. Endogeneity of stimulant use makes these results somewhat difficult to interpret. If children with the worst attention difficulties were most likely to take medication, then any positive effects of medication would be biased towards zero. Alternatively, if children from the best backgrounds were most likely to take stimulants, then this might bias the analysis towards finding a positive effect.

Zoega et al. (2009) use registry data from Iceland, which has a measured prevalence of ADHD and use of stimulant medication that is similar to the U.S. They linked information from medical records to a data base of national scholastic examinations for children born between 1994 and 1996 who took standardized tests at fourth and seventh grade. In order to deal with the endogeneity of treatment, they include only children who were "ever treated" between the ages of 9 to 12, and focus on whether they were treated sooner or later. They find that children with ADHD suffered declines in test taking relative to other children, but ADHD children who started medication earlier experienced slower declines than those who started medication later. Arguably, this design does not fully solve the endogeneity problem. It is possible, for instance, that children start medication in response to some crisis, and then experience reversion to their mean performance.[2]

Scheffler et al. (2009) uses data from the Early Childhood Longitudinal Study—Kindergarten Class of 1998-1999 to examine the effect of medication use on standardized math and reading test scores for 594 children with ADHD. They estimate first

[2] Another issue is that the authors define the start of therapy to be the first prescription after a period of at least 11 months without previous prescriptions for ADHD. This suggests that some of the "later starters" may in fact have started ADHD drugs earlier and then stopped them again.

differenced models in order to control for constant aspects of the child's background. A limitation of their data is that questions about medications, and how long children had been taking medications were asked only in fifth grade, so it was assumed that children who were not taking medication at fifth grade had never taken it. They find that children with ADHD who took medication had higher mathematics and reading scores than other children with ADHD, though they still lagged behind their non-ADHD peers. If children with ADHD are on different trajectories then their non-ADHD peers, then it is not clear that estimating the model in first differences will adequately control for the endogeneity of medication use.

Molina et al. (2009) discuss a long-term follow up of children from the MTA study. One of their more striking results is that 6 to 8 years following the initial intervention, 62% had stopped taking medications. Moreover, they find that the ADHD group was worse off than non-ADHD comparison children regardless of whether they continued to take stimulants.

Dalsgaard et al. (2013) use Danish registry data and variation in the prescription patterns of physicians to identify the effect of ADHD medication on hospital contacts, criminal activity and a limited set of school performance measures. They find that physician treatment patterns vary significantly, and that among children who receive treatment, hospital contacts decrease as do the number of interactions with police. While they find little difference in test scores for treated versus non-treated children, they note that treated children are less likely to take the exam.

Our study provides new evidence regarding the short- and long-term effects of stimulants use for ADHD in a nationally representative sample of Canadian children by taking advantage of a policy experiment that expanded access to these drugs.[3] In 1997, the Canadian province of Quebec adopted a mandatory prescription drug insurance law[4]. Before 1997, many residents of Quebec received private prescription drug insurance from their employers while others went without drug insurance. The new law stipulated that all Quebecers had to be insured. Those who did not have insurance through their employer were required to participate in a new provincial public plan (Morgan, 1998). Premiums and deductibles were scaled according to income and some segments of the population received coverage for free including children whose parents were covered. Premiums were collected along with the filing of the Quebec tax return to ensure compliance with the law (Pomey et al 2007). Details on the premiums, deductibles and co-insurance rates over time are presented in the data appendix.

As a result of the insurance mandate and public plan, drug insurance rates rose quickly in Quebec. Using data from the National Population Health Survey and Community Health and Social Survey, both of which contain information on whether or not individuals hold prescription drug insurance, [5] we calculate coverage rates in both Quebec and in the rest of Canada. Whereas the rate of drug insurance coverage pre-reform in 1996 was 55%, it jumped to 84% in 1998 and continued to rise to 89% by 2003. Drug coverage rates in the rest of Canada averaged 65% in 1996 and rose slowly over

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[3] Cuellar and Markowitz (2007) adopt a somewhat similar identification strategy, examining the effects of increases in access to medication that occurred as a result of expansions of Medicaid coverage on rates of suicide, injury, and crime in eligible populations.

[4] Quebec implemented a subsidized day care program in September of that same year. In the first few years the program focused on older children (4-6) and expanded to include younger children later on (Baker et al 2008). To ensure that our instrument is not conflating the two programs we replicate our estimates focusing on children who are older than the day care ranges by the time the daycare program took place. Our main results are quite similar in this specification.

[5] The NPHS (1994, 1996 and 1998) and CCHS (2002, 2003) are both publicly available data sets that ask questions about prescription drug coverage. The NLSCY, the main source of data for our analysis does not ask questions on prescription drug coverage.

time to an average of 76% by 2003 (Table 1). Overall the jump in Quebec far exceeds the rise in coverage taking place in the rest of the country as Quebec was the only province that instituted a universal coverage mandate.

Our identification strategy, then, is to first explore the increase in the use of Ritalin that accompanied the increase in drug coverage[6] and then to relate the increase in drug use to medium and long-run child outcomes. The overall argument is that if an expansion in drug use is beneficial, then we should see an improvement in the performance of children with ADHD in Quebec.

Data

We use data from the NLSCY, a national longitudinal data set which began with children ages 0 to 11 and their families in 1994. 15, 871 of these children were surveyed in 1996 (a reduced sample due to budget restrictions). We use the children that appear in both the 1994 and 1996 surveys as the base sample for this study.. Follow-up surveys were then conducted biannually up to 2008, producing up to 8 potential survey responses for each child. For responses pertaining to children under age 16, the survey collected information from the person most knowledgeable (PMK) about the child, while older children (16 and older) were responsible for completing the survey themselves.

We employ two distinct approaches to evaluating the short- and long-term effects of stimulant use, and our sample depends on the approach in question. To investigate the short-term outcomes, we exploit the panel nature of the NLSCY and restrict the sample to observations collected at ages 0 through 15. For the oldest children in the sample – those

[6] Quebec's public plan formulary explicitly lists Ritalin as covered. The reimbursement for the drug the price for 100 20mg tablets was $53.06.

born in 1982 or 1983 – we are able to observe up to 3 observations per child, while we use up to 7 survey responses for the youngest children. Many of our short-term outcomes are not collected for all ages, however, and we further restrict our short-term base sample as data availability requires. [7] The data appendix provides information about the maximum number of observations potentially available for each measure, and the number actually available given attrition.

For the long-term analysis we focus on outcomes that are for the most part measured only once for each child, like high school graduation. We therefore use children aged 0-11 in 1994 tracked through 2008 with one observation per child. Variables are defined according to their last observed value; we restrict the long-term sample to children who remain in the sample until at least age 16. Due mostly to attrition, the base long-term sample is therefore composed of 9,818 of the original 15,871 children surveyed in both 1994 and 1996 and followed thereafter. [8]

We measure ADHD using questions that are asked to parents and teachers about symptoms of ADHD. ADHD is always diagnosed through the use of questions similar to those included in the survey. Parents are asked to rate on a scale of 0 to 2 how often their child demonstrates five behaviors common among those who suffer from ADHD. Answers to these five questions are summed to produce an ADHD score that ranges between 0 and 10, where high scores indicate a high level of ADHD symptoms. The

[7] Most of the short-term behavioral outcomes are only collected at ages 2 to 11 years. , The educational outcomes are only available for school-aged children, and thus are collected starting at age 6. ,

[8] By the final cycle of data collection in 2008, an additional 6,000 children had been lost to attrition. In the data appendix, we compare initial characteristics of children who stay in the sample until cycle 8 to those of children who attrit. While there are some differences in observables between the two groups, attriters do not appear to differ from those who finished the survey in ADHD symptom severity. See Appendix Table 1 for a comparison of the expected number of children for each of our main variables versus actual observations.

questions used are listed in the data appendix. One of the strengths of the NLSCY data for this analysis is that these screener questions are administered to all children aged 2 to 11 years old, rather than to only diagnosed cases. We use the average ADHD screener score for children calculated from scores obtained between ages 2 and 11 to obtain our measure of the child's ADHD symptoms. Using the average allows us to obtain the most accurate measure of symptom information for children over this age range. In addition to the parent reported score we also have a similar ADHD symptom score filled out by the child's teacher for those children in school up to age 11. We use the teacher score as an outcome variable of interest in the analysis.

Our information on Ritalin use for both the short- and long-term analyses is derived from the survey question that asks whether the child takes, "any of the following prescribed medication on a regular basis: Ritalin or other similar medication," and is asked of all children age 15 and younger. Approximately 4 percent of children in our sample report ever having used Ritalin or similar stimulants. Ritalin use has increased slowly in Canada from less than 2 percent in 1994 to around 3 percent in 2008. Figure 1a shows that in Quebec, Ritalin use tracked the rest of Canada closely prior to the policy change, but began to increase significantly following the policy change in 1997 (Figure 1a).

The increase in Ritalin use was particularly pronounced relative to other medications such as the use of inhalers for asthma which did not increase disproportionately in Quebec relative to the rest of Canada (Figure 1b). We explore the relationship between the policy change and the use of stimulants in more detail below.

The NLSCY also asks about chronic conditions, some of which could also have been affected by increased drug coverage. Specifically, the survey asks whether, "a health professional has ever diagnosed any of the following long-term conditions…:"; conditions include: any type of allergy, bronchitis, heart conditions, epilepsy, cerebral palsy, kidney conditions, mental handicaps, learning disabilities, attention deficit disorder, emotional or psychological difficulties, eating disorders, autism, migraines, or any other chronic condition. We use these questions to test the robustness of our findings in two ways. First, we exclude children who had other (physical) chronic conditions from the sample and repeat our analyses. Second, we examine children with asthma who may have gained access to, "Ventolin, inhalers or puffers for asthma" with expanded drug coverage.

We focus on outcomes that are intended to capture the child's behaviour, emotional state, and human capital accumulation in both the short and longer run. Our short-term outcomes are repeat observations over time for the same child, and capture behavior and outcomes since the previous interview. The short-term behavior outcomes include: Teacher-evaluated ADHD score, physical aggression score, depression and anxiety score, and quality ratings of the child's relationship with her teacher, parents, and siblings over the past 6 months. In the short-term, we also consider the following educational outcomes: age for grade, grade repetition and mathematics score since the last interview.

The behavior score variables we consider in our short-term analysis are all constructed in the same way as the ADHD score: each is the sum of series of questions that ask the parent to report the frequency of certain behaviors on a 0 to 2 scale. The data appendix details the behaviors that are included in each score. Finally, the relationship questions are indicators that equal 1 if the PMK has reported that the child has gotten along with the person in question "quite well" or "very well" over the previous six month period.

Grade repetition is often viewed as an important indicator because it is predictive of eventual schooling attainment. The survey asks whether the child has ever repeated a grade, and therefore produces a cumulative measure of grade repetition. Our age for grade variable assumes that children start the first grade by age 7, and penalizes children who report being in a grade lower than their expected grade given their current age. Mathematics scores are more immediate measures of schooling achievement. In the NLSCY, mathematics tests were administered in schools to children in grades two through ten and are based on the Canadian Achievement Tests. [9] We convert the test scores to Z-scores, normalized across all ages.

While the short-term analysis is conducted using multiple outcome values for each child collected over time, the long-term analysis only employs one observation for each child. As such, all outcome variables capture either the last observed value of the variable, or the value of the variable at a given age. Among the long-term behavior scores, the self-assessed depression and anxiety score is composed of twelve behavior questions asked of all respondents aged 16 and older. We average all available self-assessed scores collected as of 2008. The emotional or psychological disorder diagnosis variable is an indicator that equals 1 if, by wave 8, the youth has ever been diagnosed with such an illness. The educational outcomes measure, by wave 8, whether the child has every dropped out of high school for at least 2 weeks, whether she has graduated high

[9] The NLSCY began collecting a reading test score in its first three cycles but dropped this measure in subsequent cycles.

school and whether she has ever attended any post-secondary education (both given she is not still in high school). The test scores analysed are the age 15 mathematics score – drawn from the same Canadian Achievement Test considered in the short-run analysis – and literacy and numeracy tests, administered to survey respondents at ages 18 and 21, respectively. Descriptive statistics for the outcome variables and key independent variables are shown in Table 2.

To examine how the policy change may have affected the type of child treated with stimulant medication, we compare average values of some outcome variables by Ritalin status in both Quebec and the rest of Canada. The results of these comparisons are reported in Table 3. The values reported are the within child scores, averaged across the first five cycles of data collection, for children on Ritalin in 1994 or 1996 versus children on Ritalin in 1998, 2000 or 2002, in Quebec versus the rest of Canada. These comparisons provide some insight into differences between the type of child taking stimulant medication before and after the policy change in Quebec versus the rest of Canada. While the average ADHD score for children on Ritalin was higher in Quebec than the rest of Canada before the change in policy that expanded access to Ritalin in Quebec, the average ADHD score for those on Ritalin was lower following the policy change[10]. Changes in other scores in Quebec relative to the rest of Canada did not exhibit this type of reversal. These figures suggest that the marginal child taking Ritalin in Quebec had a lower level of ADHD symptoms after the policy change (though children taking Ritalin are still likely to have had higher ADHD scores than the average child).

[10] As we note below, the average ADHD score for all children increased in Quebec relative to the rest of Canada following the policy change. The comparison here is just for those children on Ritalin.

Methods

We begin by estimating the effect of the policy change on the use of stimulants. We use a difference-in-difference framework to examine the effect of the policy change in Quebec post 1997. Our estimating equation takes the form:

$$Stim_{it} = \alpha + \beta Post_{it-1} + \lambda Que_{it-1} + \phi Post_{it-1} * Que_{it-1} + X_{it}\Pi + \tau_t + p_i + \varepsilon_{it} \qquad (1)$$

where $Stim_{it}$ is a dichotomous variable equal to one if the PMK reports that child i is currently taking stimulant medication in year t, τ are survey year fixed effects and p are province fixed effects. $Post_{it}$ is a variable that identifies those survey responses collected from children after 1996, Que_{it} identifies responses from children in Quebec, and their interaction demarks the treatment group. In this specification, we compare children in Quebec to children in other provinces, before and after the policy change. The vector X includes family income, whether the person most knowledgeable about the child is an immigrant, whether the person most knowledgeable about the child (the survey respondent) is male or female, the sex of the child, the birth order, family size, whether there are two parents present in the family, the mother's age at birth, whether the mother had a teen birth, whether the mother has a high school degree, a depression score for the person most knowledgeable about the child and child-age dummies. To allow for some time between the policy change and changes in medication treatment as well as our outcomes of interest, we lag the policy change variable by one period (both the province of residence and the indicator for being post policy change).We expect a positive coefficient estimate on the $Post_{it} * Que_{it}$ interaction term, implying that increased access in post-reform Quebec led to expanded use of stimulant medication. We also present a version of equation (1) where the child's ADHD score at time *t* as the dependent variable to examine how scores may have changed as a function of the policy change.

We next attempt to hone-in on children most likely to demonstrate increased stimulant use in response to the policy change: those with worse ADHD symptoms. We add an additional level of interaction terms to equation (1) – the average ADHD score for the child between the ages of 2 to 11 -- to estimate a difference-in-difference-in-difference (DDD) model, comparing children with worse ADHD symptoms in post-reform Quebec to other children. Our model is specified as:

$$\begin{aligned} Stim_{it} &= \alpha + \beta Post_{it-1} + \lambda Que_{it-1} + \gamma ADHD_i \\ &+\eta Que_{it-1} * ADHD_i + \varphi Post_{it-1} * Que_{it-1} + \delta Post_{it-1} * ADHD_i \\ &+\boldsymbol{\theta Post_{it-1} * Que_{it-1} * ADHD_i} + X_{it}\Pi + \tau_t + p_{it} + \varepsilon_{it}, \end{aligned} \tag{2}$$

.

$ADHD_i$ is the child's average age 2 to 11 ADHD symptom score.[11]With this approach, we are able to isolate the effect on stimulant use of being a child with worse ADHD symptoms in post-reform Quebec, net of any pre-existing differences in stimulant use across time, geography and severity of symptoms. We are also able to better identify the effects of this particular policy change that directly affected children in need of

[11] Currie and Stabile (2007) show non-parametric Lowess plots which indicate that short-term test scores and grade repetition vary approximately linearly with ADHD scores, and that the 90th percentile of the ADHD score (which corresponds approximately to a threshold for diagnosis) is similar in Canada and the U.S . We therefore use linear average ADHD scores in our analysis.

medication for ADHD instead of other policy changes occurring around the same time. In this specification, we expect that the estimate of θ should be positive.

We also estimate versions of equations (1) and (2) including child specific fixed effects. In these models, the effects are identified through changes in stimulant use for the same child before and after the policy change. The ability to control for child fixed effects obviates concerns about possible changes in the sample of children over time.

We then use the same framework (equation (2)) to examine the effect of the policy change on a variety of behavior and educational outcomes. Assuming we uncover a positive relationship between stimulant use and the policy change, we would expect that any effects of stimulant use on behavior or educational outcomes should also be captured by the important policy change variable: if stimulant use affects outcomes, then children in the key treatment group – those with worse ADHD symptoms in post-reform Quebec – should demonstrate post-reform changes in outcomes.

Using the longitudinal component of the NLSCY we are also able to examine the longer-term effects of an increase in stimulant use through the policy change. The NLSCY allows us to document exposure to stimulants between ages 0 and 15, the ages when the PMK is asked about stimulant use for their child. We therefore estimate a first stage regression where the total number of (survey) years that a child is on stimulant medication (*StimYrs*) is the explained treatment variable. We construct a policy exposure variable that mirrors the *StimYrs* variable construction: the total number of under age 16 survey responses for the child that occurred post 1996 (*PostYrs*). We are then able to interact this lifetime exposure window variable with a Quebec indicator and the ADHD symptom score to create a parallel to (2):

$$StimYrs_i = \alpha + \beta PostYrs_i + \lambda Que94_i + \gamma ADHD_i$$

$$+\eta Que94_i * ADHD_i + \varphi PostYrs_i * Que94_i + \delta PostYrs_i * ADHD_i \quad (3)$$

$$+\boldsymbol{\theta PostYrs_i} * \boldsymbol{Que94_i} * \boldsymbol{ADHD_i} + X94_i\Pi + p94_i + \varepsilon_i,$$

Equation (3) therefore includes one observation per child and includes measures that are constructed at different periods in the child's life. Our set of controls captured in *X* are measured in 1994. The maximum number of years that a child can be either treated or on stimulants depends on their age in year 1 of the survey (1994). We include age/cohort dummies to control for the fact that different children will be observed as potentially on Ritalin or exposed to the treatment group for different lengths of time.

After estimating the relationship between lifetime stimulant use and exposure to the policy, we use equation (3) to examine the relationship between stimulant use and behavioral and educational outcomes for the child in the longer term. These include measures at different ages for the child (age 15, 18, and 20) as discussed above, as well as measures that are constructed by examining outcomes over the entire range of the panel data up to 2008. For example, we estimate a model explaining the likelihood of graduating from high school by examining whether, over the course of the panel, the child ever completed a high school degree.

There are well-documented differences between ADHD prevalence and stimulant effects between boys and girls: For example, Schwarz and Cohen (2013) find that 15% of U.S. boys and only 7% of U.S. girls have ever been diagnosed with ADHD. We therefore present all of our main specifications for all children as well as for boys and girls separately.

Finally we perform a number of robustness checks on our main estimates to control for other health and learning disabilities that the child may have, as well as to specifically control for other contemporaneous policy changes that occurred in Quebec over this period. We discuss these following the presentation of our main results.

Results

We first examine the effect of the policy change on the probability of Ritalin use in our sample as well as the relationship between the exposure to the policy change and the number of years that a child is on Ritalin. Table 4 presents the results. We estimate both difference-in-difference models of the effect on Ritalin in Quebec post policy change (equation (2)) as well as triple difference models where the third interaction is with the average ADHD score for the child between ages 2 and 11, in order to focus on the population most likely to be affected by the improved access to Ritalin (equation (3)). Columns 1 and 2 report the difference-in-differences results without and with child fixed effects. In both cases we see an increase in the probability of being on Ritalin of approximately 3 percentage points for children in Quebec after the policy change.

Columns three and four report the triple difference estimates (the D-D interacted with the child's average ADHD score). Here the estimates suggest an increase of approximately 1.4-1.8 percentage points with each one unit increase in ADHD scores. At the average ADHD score, this is a at 4 percentage point change in Ritalin use, and for children who are severely affected by ADHD (e.g. an ADHD score greater than 7 or 8), it represents a large increase in the probability of being medicated. The baseline use of Ritalin in the population is approximately 3 percent so while small, this coefficient represents a fairly sizeable increase. The final four columns present the triple difference estimates for boys and girls separately. The effect size is about the same, averaging around 1.5 percentage points.

We also estimate a similar "first stage" model for our longer-term analysis by examining the relationship between exposure to the policy change and length of time on Ritalin, as described in equation (4). These results are presented in Table 5. Our triple difference estimates suggest a 2 to 2.5 percentage point increase in the number of surveys that a child reports being on Ritalin off a base of 7 percent. Again, while this is a fairly small overall change in Ritalin use it reflects a large change relative to baseline[12].

Having established that the policy change resulted in a reasonably large change in the use of Ritalin we now turn to examining both the short and longer-term consequences of this change. Table 6 presents our results for short term behavioral and relationship outcomes. Our educational outcomes are presented in Table 7. We present estimates for the full sample, and for boys and girls separately. The first column of each panel shows the coefficient on the independent effect of the ADHD score on the outcome. The second column shows the coefficient on the triple difference. The third column shows the triple difference coefficient when child fixed effects are included (the ADHD score is an average of the scores for each child and therefore drops out of our fixed effect regressions).

The first column shows that we find a consistent negative effect of the ADHD score on all of the outcomes measured (note that for the behavioral scores, a higher

[12] We estimate a difference-in-differences model where the dependent variable is the child's ADHD score at time *t*. We find that ADHD scores were slightly higher, around 0.15-0.2 points in Quebec post policy change relative to the rest of the country. As this is simply a difference-in-difference, this change in scores could be driven by the large number of children who are not being treated and have relatively low ADHD scores. These results are presented in Appendix Table 2.

number represents a worse score). The effect is large and the magnitudes are consistent with previous work examining the direct effects of ADHD on outcomes. For example, a one point increase in the hyperactivity score is associated with a 1 percentage point increase in the probability of repeating a grade off a base line of 4 percentage points and a 8 percentage of a standard deviation decline in math test scores.

Column 2 suggests that even though the policy change was associated with increases in Ritalin use, especially among children with high ADHD scores, we find little overall improvement in outcomes. For example, while one might expect that an uptake in use would lead to lower levels of ADHD related behavior in the classroom, the coefficient estimates on “Teacher measured ADHD” are negative (better) but insignificant. The DDD estimates suggest an increase in the anxiety and depression score, an increase in the unhappiness score, and a decline in the quality of relationships with parents over the past six months.

Turning to the DDD estimates with child fixed effects Column 3, the pattern of coefficients is similar though only the effects on unhappiness remain statistically significant. The effect on unhappiness is quite large. For example, being in Quebec post policy change evaluated at the mean average ADHD score is associated with a 0.13 point increase in the unhappiness score off a base of 0.54 points, or an increase of 24 percent. Similarly, it is associated with a 5-6 percentage point decline in the child’s relationship with his or her parents off a baseline of 87 percent.

When we estimate these models separately for boys and girls we find that the behavioral effects are more concentrated among girls (a few significant coefficients remain for boys as well) suggesting that it is primarily the girls who are driving the negative relationship observed here. Now the DDD-fixed effects estimates suggest that girls have higher anxiety and depression scores, and are suffering increases in unhappiness. Overall there is no evidence of any improvement in these measures following the policy change.

We also find a negative and significant relationship between the policy change and each of the contemporaneous educational measures we examine in Table 7. The triple difference – fixed effects coefficients suggest that the policy change was associated with children with high ADHD scores being more likely to be behind in school, more likely to have repeated a grade, and having lower standardized math scores. The effects are generally stronger in the fixed effects models. The increase in the probability of repeating a grade is 1.2 percent (or 3.2 percent evaluated at the mean average ADHD score of 2.7) and the decline in math scores is estimated to be about 4.5 percent of a standard deviation. We once again estimate these models separately for boys and girls. In this case we find that the estimated effects are similar for boys and girls.

Overall, we find considerable evidence of a decline in both behavioral and educational outcomes following the increase in prescription drug coverage and the corresponding increase in Ritalin use. The effects are, in a number of cases, both statistically significant and large. In order to better assess the lasting implications of the expansion in drug coverage and associated increase in Ritalin use on behavior and educational outcomes we now turn to our outcomes that follow children for up to eleven years following the policy change.

Our long-term analysis examines the effects of extended exposure to the policy change, and therefore increased use of Ritalin, on a number of behavioral and educational outcomes. Given that treatment for ADHD generally occurs over many years, and that the ultimate goal of treatment is to have the child achieve better outcomes throughout his or her academic and future career, the longer-term effects of stimulant use are particularly relevant. We use the longitudinal component of the NLSCY look at the relationship between the number of survey years that a child is exposed to the policy change and longer run outcomes, including numeracy and literacy, ever having dropped out of high school, having completed high school, and attending any post secondary education.

Our results for longer term outcomes are presented in Table 8. The first column of Table 8 reports the direct relationship between the child's average ADHD score up to eleven years old, and future behavioral and educational outcomes. Consistent with the short-term effects, the child's average ADHD score is negatively associated with all of the outcomes we examine. Having a higher ADHD score as a child is positively related to being diagnosed with a mental or emotional disorder in young adulthood, is associated with a higher self assessed depression score, and with lower math and literacy scores measured at ages 15, 18, and 20. It is positively associated with dropping out of high school, and negatively associated with high school graduation and with attending some post-secondary education.

The second column of Table 8 shows the coefficient on the triple difference estimator (recall that we only have one long-term outcome per child, so a child fixed effects estimator is not feasible in this context). For the full sample we find few long run effects with the exception of a positive relationship between the policy change and dropping out of high school.

When we estimate the model for boys and girls separately we find stronger negative education results for boys with statistically significant coefficients for both dropping out and math scores. Our estimates imply a decline of 2.8 percent of a standard deviation in math scores for each point on the ADHD scale, or 7.5 percent at the mean average ADHD score. The increase in dropout rates is 3 percentage points at the mean ADHD score off a base of 20 percent – also a large effect.

In contrast, for girls there are no statistically significant effects except for the probability of being diagnosed with a mental or emotional disorder, which is significant at the 90% level.

We perform a number of specification checks to test the robustness of our findings. First we re-estimate our triple difference models excluding those children who have physical chronic conditions as they may have benefited from the increased access to medication, which might then affect outcomes as well. Our results are quite similar in this specification. We continue to find little evidence that outcomes improved for children with higher ADHD scores in Quebec following the policy change. We also continue to find some evidence of negative effects on math scores and grade repetition, , as well as anxiety and depression, unhappiness and the child's relationship with his/her parents. Since asthma is the most common physical chronic condition among the children in our sample, we also examine whether there was an increase in ventilator use as a dependent variable, which could indicate improvements for our targeted children in the treatment of asthma. We find insignificant coefficients on the DDD estimates for an increase in ventilator use, unlike our estimates for increases in the use of Ritalin. The results are reported in Appendix Table 3.

A second possible concern is that our triple difference, despite focusing on children who are most likely to benefit from Ritalin, could be picking up the effect of contemporaneous policy changes. One important policy change that happened around the same time was the introduction of subsidized day care in Quebec. Baker et al (2008) find negative effects of exposure to subsidized day care programs in Quebec on a number of child outcomes. To make sure that we are not confounding these two policy changes, we limit our sample to those children born in 1991 or earlier. Although we have many fewer children to work with in these models, we continue to find a negative effect on math scores and grade repetition. Our results for anxiety and depression and the child's relationship with his/her parents over the past 6 months, however, are no longer significant in these specifications. The results are reported in Appendix Table 3.

Finally we construct a type of placebo experiment by changing our DDD specification to focus on Ontario, post 1999. We find mostly insignificant results in this specification with the exception of the following: in the short run analysis we find a positive effect on not being behind in school (although this result becomes insignificant in the fixed-effect regressions) and a negative effect on the unhappiness score (Appendix Table 3). In our long run analysis we find no significant effects on any of our outcomes (Appendix Table 4). Overall, the lack of any systematic or robust relationship between the experiment and educational outcomes in the placebo context provides some confidence that we are not picking up a spurious correlation in the true policy experiment setting.

Discussion and Conclusions

This paper examines the effect of a "natural experiment" in Quebec that greatly expanded access to Ritalin, and takeup of Ritalin among children with ADHD. One might have anticipated that increases in access to medication would be associated with improved outcomes among these children. Instead, we find some evidence of negative effects. Some of these negative effects are consistent with known possible side effects of stimulant medication, especially depression and anxiety.

Perhaps more surprisingly, we find little evidence of positive effects on academic outcomes or schooling attainment. In fact, we find evidence of short-term deteriorations in academic outcomes among both boys and girls, and that boys are more likely to eventually drop out of school following the policy change. This finding raises the question of mechanisms. How is it possible that an increase in the utilization of medication for ADHD could be associated with worse academic performance? One possibility is that medication is a substitute for other types of cognitive and behavioral interventions that might be necessary to help the child learn. By making children less disruptive, ADHD medication could decrease the attention that they receive in the average classroom and reduce the probability of receiving other services.

It is important to acknowledge that this is an ecological study which does not shed light on the question of whether optimal medication use would be beneficial. It is clear that many children use medication in a haphazard manner. For example, on average, among those who ever report going on Ritalin in our data, children are on Ritalin for about 30% of the survey years we observe them. Moreover, the average child who is ever reported to be on Ritalin, switches twice over the period we observe them (between the time they are ages 4-7 and age 15 depending on how old they were in 1994). In addition, while we have no information about dosage, it seems likely that many children are taking doses of ADHD which are not calibrated to achieve optimal results, even in terms of short-term behavioral effects.

What our results do speak to, is the effect of a large increase in the use of ADHD medications in a community, given the usual standard of care available to Quebec children. In Quebec, as in the U.S. any doctor can prescribe Ritalin, and it is not necessary to have expertise treating ADHD. Hence, it is not surprising that some use is sub-optimal. Our results suggest that observers of the large increases in the use of medication for ADHD in the U.S. are right to be concerned.

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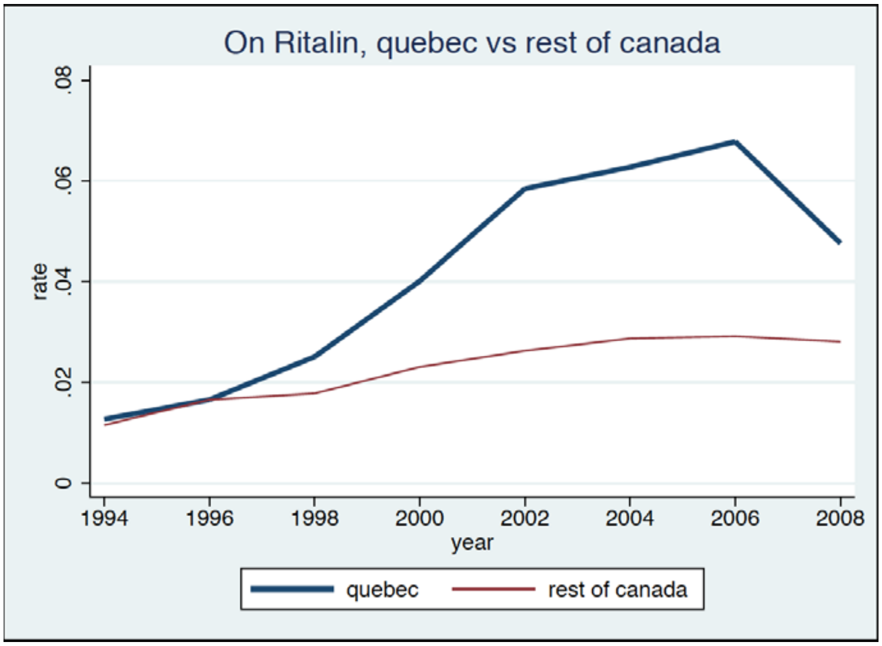
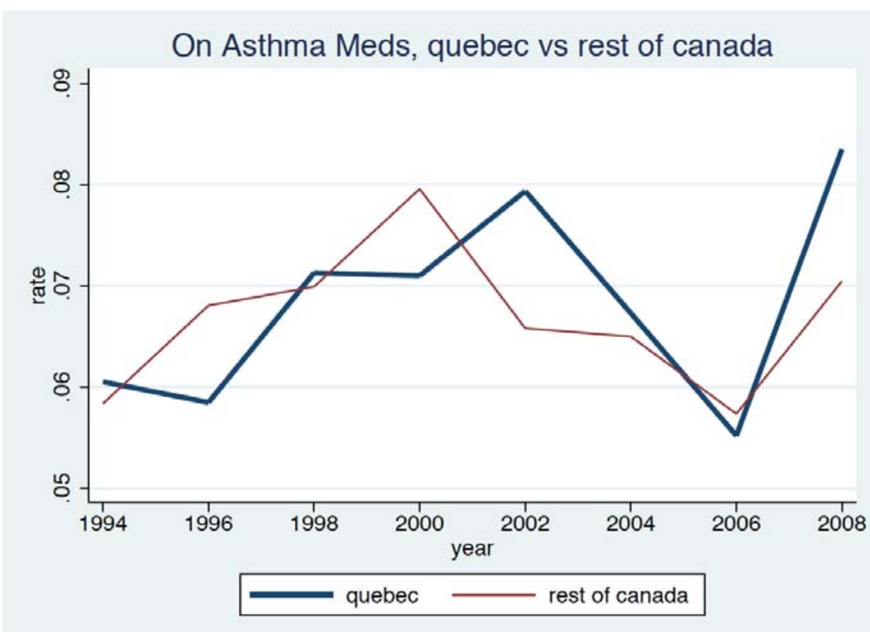
Figure 1a:



Source: Authors' calculations using NLSCY 1994-2008

Figure 1b:



Source: Authors' calculations using NLSCY 1994-2008

Table 1: Changes in Prescription Drug Insurance Take-Up in Canada and Quebec

	Pre-Reform	Post -Reform		
Year	1996	1998	2002	2003
Quebec	55%	84%	86%	89%
Rest of Canada	65%	72%	74%	76%

Source: Authors' calculations using the National Population Health Survey and Canadian Community Health Survey.

Table 2: Means and Standard Deviations of Key Variables:

Variable	Mean (s.d.)
On Ritalin	0.02 (0.1)
Ever on Ritalin	0.04 (0.2)
On Ritalin in 1996	0.01 (0.1)
ADHD score (10pt)	2.70 (2.3)
Survey responses on Ritalin	0.08 (0.4)
Surveys on Ritalin | on Ritalin	1.9 (1.2)
ADHD score, teacher response (10pt)	3.35 (3.55)
Physical aggression score (12pt)	1.02 (1.22)
Emotional disorder score (12pt)	1.80 (1.94)
Anxiety score (6pt)	1.16 (1.29)
Unhappiness score (6pt)	0.54 (0.90)
Teacher relationship	0.94 (0.23)
Parent relationship	0.87 (0.34)
Sibling relationship	0.59 (0.49)
Friend relationship	0.89 (0.32)
Math Score	-0.005(1.02)
Repeat grade	0.04 (0.2)
Not behind in School	0.79 (0.41)
Youth ever diagnosed with emotional disorder	0.06 (0.23)
Self-assessed depression score (36pt)	6.27(4.87)
Above 90th percentile depression score	0.09 (0.28)
Age 15 math score	-0.02 (0.99)
Age 18/19 literacy score (36pt)	27.55 (5.86)
Age 20/21 numeracy score (32pt)	22.85 (6.01)
Ever dropped out	0.2 (0.4)
High school grad	0.90 (0.3)
Some post secondary	0.75 (0.43)

SourceL NLSCY 1994-2008

Table 3: Key Variables Pre and Post Policy Change			
	Quebec	Canada	P value Quebec-Canada
Average ADHD Score			
On Ritalin Wave 1 or 2	6.11 (2.98)	5.63 (2.99)	0.0633
On Ritalin Wave 3,4,5	5.51 (2.84)	5.9 (2.71)	0.003
Physical Aggression Score on Ritalin			
On Ritalin Wave 1 or 2	1.47 (1.65)	1.76 (1.63)	0.0376
On Ritalin Wave 3,4,5	1.44 (1.51)	1.98 (1.65)	0.0001
Anxiety/Depression Score on Ritalin			
On Ritalin Wave 1 or 2	3.32 (2.57)	3.21 (2.77)	0.6534
On Ritalin Wave 3,4,5	2.88 (2.43)	3.11 (2.73)	0.0690
Age for Grade (Not Behind)			
On Ritalin Wave 1 or 2	0.56 (0.50)	0.75 (0.44)	0.0001
On Ritalin Wave 3,4,5	0.73 (0.45)	0.82 (0.39)	0.0001
Has Not Repeat Grade			
On Ritalin Wave 1 or 2	0.72 (0.45)	0.91 (0.29)	0.0001
On Ritalin Wave 3,4,5	0.75 (0.43)	0.91 (0.29)	0.0001

Table 4: Relationship between Ritalin Use and Quebec Policy Change

	Full Sample				Boys Only		Girls Only	
On Ritalin	1	2	3	4	5	6	7	8
	DD	DD - FE	DDD	DDD - FE	DDD	DDD-FE	DDD	DDD-FE
Quebec	-0.001	-0.014	0.004	0.036**	-0.002	0.063**	0.007	0.009
	[0.025]	[0.012]	[0.022]	[0.020]	[0.037]	[0.028]	[0.005]	[0.014]
Post 1996	-0.010**	-0.009**	-0.036**	-0.037**	-0.054**	-0.055**	-0.019**	-0.018**
	[0.002]	[0.002]	[0.004]	[0.003]	[0.007]	[0.006]	[0.004]	[0.004]
Average ADHD Score			0.015**		0.019**		0.008**	
			[0.001]		[0.002]		[0.001]	
Quebec*Post 1996	0.033**	0.027**	-0.022**	-0.016**	-0.018	-0.012	-0.022**	-0.018
	[0.005]	[0.005]	[0.008]	[0.007]	[0.013]	[0.012]	[0.010]	[0.010]
Quebec*ADHD			-0.001	-0.018**	-0.001	-0.023**	-0.004**	-0.013
			[0.002]	[0.008]	[0.003]	[0.009]	[0.002]	[0.013]
ADHD*Post 1996			0.010**	0.011**	0.012**	0.014**	0.008**	0.007**
			[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
ADHD*Post 1996*QUE			0.018**	0.014**	0.019**	0.013**	0.016**	0.014**
			[0.004]	[0.004]	[0.005]	[0.005]	[0.006]	[0.006]
Age Range	2-15	2-15	2-15	2-15	2-15	2-15	2-15	2-15
Rounded N	57000	57800	57000	57800	28900	29200	28200	28600

Notes: Controls include: Year of birth fe, age fe, province fe, permanent income, pmk immigrant, male, firstborn, log family size, two parent family, mother's age at birth, mother teen birth, mother has high school, mother is working, PMK male and indicator for maternal depression. Controls measured in 1994 unless otherwise indicated. Standard errors appear in brackets and are clustered at the child level. A ** indicates signficance at the 95% level of confidence.

Table 5: Relationship between Ritalin Use and Quebec Policy Change

	Full Sample		Boys Only	Girls Only
Years on Ritalin between 1996 and age 16	1	2	3	4
	DD	DDD	DDD	DDD
Quebec	-0.019	0.089*	0.067	0.081**
	[0.0256]	[0.047]	[0.088]	[0.032]
Eligible Years between 1996 and age 16	0.015**	-0.039**	-0.048**	-0.032**
	[0.006]	[0.008]	[0.014]	[0.010]
Average ADHD Score		0.026**	0.043**	0.002
		[0.008]	[0.013]	[0.012]
Quebec*Eligible Years	0.040**	-0.030**	-0.026	-0.022
	[0.012]	[0.023]	[0.038]	[0.014]
Quebec*ADHD		-0.053**	-0.059*	-0.035*
		[0.021]	[0.031]	[0.019]
ADHD*Eligible Years		0.020**	0.022**	0.018**
		[0.004]	[0.005]	[0.005]
ADHD*Eligible Years*QUE		0.023**	0.025*	0.016*
		[0.011]	[0.015]	[0.009]
Age Range	0-11 in 1994	0-11 in 1994	0-11 in 1994	0-11 in 1994
N	9818	9785	4918	4867

Notes: See Table 4.

Table 6: Effect of Policy Change and Ritalin Use

	1	2	3	4	5	6	7	8	9
	Full Sample			Boys Only			Girls Only		
	No FE	No FE	FE	No FE	No FE	FE	No FE	No FE	FE
Outcome	Avg. ADHD	D-D-D	D-D-D	Avg. ADHD	D-D-D	D-D-D	Avg. ADHD	D-D-D	D-D-D
Teacher measured ADHD	0.708**	-0.154	-0.024	0.777**	-0.165	0.003	0.613**	-0.157	-0.057
Aged 4-15	[0.018]	[0.111]	[0.087]	[0.024]	[0.180]	[0.122]	[0.029]	[0.158]	[0.127]
N		16600	16800		8300	8400		8300	8400
Physical Aggression Score	0.191**	0.016	0.004	0.195**	0	-0.027	0.185**	0.035	0.041
Aged 2-11	[0.006]	[0.018]	[0.019]	[0.008]	[0.025]	[0.026]	[0.009]	[0.028]	[0.028]
N		35120	35608		17794	18034		17326	17574
Anxiety and Depression Scor	0.287**	0.069**	0.037	0.285**	0.042	0.012	0.289**	0.126**	0.098**
Aged 2-11	[0.009]	[0.033]	[0.032]	[0.013]	[0.043]	[0.043]	[0.015]	[0.051]	[0.046]
N		35105	35596		17779	18020		17326	17576
Anxiety	0.159**	0.043*	0.024	0.160**	0.018	0.017	0.157**	0.091**	0.057*
Aged 2-11	[0.006]	[0.022]	[0.022]	[0.008]	[0.030]	[0.030]	0	[0.033]	[0.031]
N		35160	35651		17812	18053		17348	17598
Unhappiness	0.130**	0.055**	0.041**	0.130**	0.044**	0.017	0.134**	0.072**	0.079**
Aged 2-11	[0.005]	[0.014]	[0.015]	[0.007]	[0.020]	[0.021]	[0.008]	[0.022]	[0.021]
N		35202	35693		17842	18083		17360	17610
Relationship with Teacher	-0.020**	-0.006	0.005	-0.023**	-0.006	0.011	-0.016**	-0.003	0.001
past 6 months (Aged 4-9)	[0.002]	[0.005]	[0.006]	[0.002]	[0.007]	[0.009]	[0.002]	[0.006]	[0.006]
N		19461	19735		9869	10007		9592	9728
Relationship with Parent	-0.043**	-0.023**	-0.010	-0.040**	-0.022**	-0.004	-0.048**	-0.024**	-0.019
past 6 months (Aged 4-9)	[0.002]	[0.006]	[0.007]	[0.003]	[0.008]	[0.009]	[0.003]	[0.010]	[0.012]
N		21676	21981		10995	11147		10681	10834
Relationship with Sibling	-0.044**	-0.003	-0.002	-0.038**	-0.006	-0.004	-0.050**	0.004	0.002
past 6 months (Aged 4-9)	[0.003]	[0.009]	[0.011]	[0.004]	[0.012]	[0.014]	[0.004]	[0.015]	[0.017]
N		18853	19056		9568	9671		9285	9385

Notes: See Table 4.

Table 7: Effect of Policy Change and Ritalin Use on Contemporaneous Educational Outcomes

	1	2	3	4	5	6	7	8	9
	Full Sample			Boys Only			Girls Only		
	No FE	No FE	FE	No FE	No FE	FE	No FE	No FE	FE
Outcome:	Avg. ADHD	D-D-D	D-D-D	Avg. ADHD	D-D-D	D-D-D	Avg. ADHD	D-D-D	D-D-D
Not behind in School	-0.003**	-0.002	-0.009**	-0.003**	-0.003	-0.014**	-0.003**	0.001	0.001
Aged 7-17	[0.001]	[0.003]	[0.004]	[0.001]	[0.004]	[0.005]	[0.001]	[0.005]	[0.006]
N		45363	45957		22843	23134		22520	22823
No repeated grade	-0.010**	-0.012**	-0.018**	-0.012**	-0.013**	-0.018**	-0.007**	-0.008	-0.012*
Aged 4-15	[0.001]	[0.004]	[0.005]	[0.001]	[0.005]	[0.007]	[0.001]	[0.006]	[0.007]
N		47049	47680		23696	24006		23353	23674
Math Scores	-0.082**	-0.045**	-0.047**	-0.075**	-0.043**	-0.038	-0.084**	-0.052**	-0.063**
Aged 5-15	[0.005]	[0.014]	[0.019]	[0.007]	[0.019]	[0.025]	[0.008]	[0.021]	[0.029]
N		33954	34402		16844	17056		17110	17346

Notes: See Table 4.

Table 8: Effect of Policy Change and Ritalin Use on Future Outcomes

	1	2	3	4	5	6
	Full Sample		Boys Only		Girls Only	
Outcome:	Avg. ADHD	D-D-D	Avg. ADHD	D-D-D	Avg. ADHD	D-D-D
Diagnosed with Mental	0.012**	0.002	0.011**	-0.001	0.016**	0.005*
or Emotional Disorder	[0.005]	[0.002]	[0.005]	[0.003]	[0.007]	[0.003]
N	7271		3567		3704	
Depression Score	0.268**	-0.015	0.250**	-0.052	0.256**	0.020
(self assessed)	[0.056]	[0.043]	[0.077]	[0.050]	[0.102]	[0.087]
N	8915		4398		4517	
Normalized Math Score	-0.090**	-0.018	-0.101**	-0.028*	-0.078**	-0.001
Age 15	[0.018]	[0.012]	[0.025]	[0.017]	[0.024]	[0.015]
N	4166		2053		2113	
Literacy Score Age 18	-0.541**	-0.045	-0.519**	-0.080	-0.594**	-0.024
	[0.124]	[0.068]	[0.216]	[0.107]	[0.171]	[0.073]
N	3652		1713		1939	
Numeracy Score Age 20	-0.619**	0.040	-0.429**	0.063	-0.786**	0.063
	[0.106]	[0.086]	[0.182]	[0.113]	[0.142]	[0.102]
N	3242		1453		1789	
Never Dropped Out	-0.041**	-0.007**	-0.054**	-0.010**	-0.024**	-0.001
	[0.006]	[0.003]	[0.008]	[0.004]	[0.010]	[0.004]
N	8358		4193		4165	
Completed High School	-0.015**	-0.003	-0.019**	-0.004	-0.010**	-0.003
	[0.004]	[0.004]	[0.007]	[0.005]	[0.006]	[0.003]
N	6930		3354		3576	
Some Post Secondary	-0.021**	0.001	-0.025**	0.002	-0.018**	-0.001
	[0.005]	[0.004]	[0.009]	[0.005]	[0.008]	[0.005]
N	6447		3087		3360	

Notes: Controls include: Year of birth fe, age fe, province fe, permanent income, pmk immigrant, male, firstborn, log family size, two parent family, mother's age at birth, mother teen birth, mother has high school, mother is working, PMK male and indicator for maternal depression. Controls measured in 1994 unless otherwise indicated.
Standard errors appear in brackets. A ** indicates signficance at the
95% level of confidence.