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On the Effectiveness of Developmental Screenings: Evidence from a Nationwide Program in Austria

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On the Effectiveness of Developmental Screenings: Evidence from a Nationwide Program in Austria

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Abstract

Early intervention is considered as the optimal response to developmental disorders in children. However, relatively little is known about the effectiveness of the standard practice of so-called developmental screenings. We evaluate a nationwide program for preschoolers in Austria. Identification of treatment effects is based on a sharp discontinuity in the eligibility for a financial incentive to participate in this program with respect to the date of birth. Assigned children are about 14 percentage points more likely to be screened. In the short-run, screening participation leads to follow-up medical treatment. This effect is substantially larger for children from families with low socioeconomic status (SES). This suggests that the program helps to identify and treat developmental disorders in particular among low SES children. In the longer run, we find weak evidence for dampening effects on health care cost.

JEL Classification: I12, J13, I18, H51, H75.

Keywords: Health screening, child development, healthcare cost.

1 Introduction

A growing body of literature across different academic disciplines traces the origins of lifecycle wellbeing to the very early stages of life (Currie and Rossin-Slater, 2015). One important aspect is early-life health. A variety of policies (such as, prenatal care, family leave, nurse home visiting or early childhood center-based interventions) have the potential to improve health conditions at different stages of early childhood. In this paper, we are concerned with medical care interventions for preschoolers with development disorders.

An estimated 14 percent of all children in the US have some form of development disorder (Boyle et al., 2011). There is widespread agreement, among medical specialists and policymakers, that an early identification of developmental disorder in children is essential for optimal intervention.¹ Development disorders (or delayed development) can be caused by specific medical conditions and may indicate an increased risk of other medical complications, as well as emotional and behavioral disorders. An early identification of developmental problems enables further evaluation, diagnosis, and treatment (Chakrabarti and Fombonne, 2001).

A successful intervention improves the well-being of families with affected children. If affected families are predominately from lower socioeconomic background, such an early intervention can be perceived as socially fair, since it helps to reduce (health) inequalities. The economic efficiency-based argument for early intervention rests on the simple comparison between the cost of intervention (today) and cost of non-intervention (later). Proponents typically assume that an early intervention is more cost effective than later remediation (Conti and Heckman, 2013).

While these theoretical arguments make a compelling case for early intervention, they do not provide guidance on how to implement an intervention. In practice, a crucial point is the identification of developmental disorders (that predates any diagnosis or treatment). Typically, developmental screening programs are used.² For instance, the *American Academy of Pediatrics* officially recommends that a standardized developmental screening test should be administered regularly at the age of 9, 18, and 30 months.³ These screening tests inspect (depending on age) the development of motor skills and coordination, visual and hearing abilities, communication and language skills, and cognitive

¹This view is in line with a growing body of literature pointing to the importance of early childhood in building the foundations for lifelong health. David J. Barker developed the argument that already the prenatal environment affects health conditions in adulthood (including heart disease and diabetes). An equivalent reasoning is documented in the literature on human capital, where the substantial benefit from early interventions arises because human capital formation is dynamic in nature (Cunha and Heckman, 2007; Almond and Currie, 2011).

²An alternative expression is well-child care.

³See, Council on Children With Disabilities, Section on Developmental Behavioral Pediatrics, Bright Futures Steering Committee and Medical Home Initiatives for Children With Special Needs Project Advisory Committee (2006), and the statement of reaffirmation for this policy in *Pediatrics* 2010, Volume 125.

abilities. Ideally, a screening identifies all developmental disorders along these dimensions and initiates a comprehensive and purposeful response. However, little is known how (cost) effective developmental screenings in practice are.

In this paper, we want to add to this literature by evaluating a nationwide developmental screening program in a high-income country with a Bismarckian healthcare system. In Austria, all parents are advised to have their children screened by medical specialists, inter alia, at the age of 24, 36, and 48 months. Parents may consult any contracted pediatrician (or general practitioner) who executes a pre-defined age-specific developmental screening procedure. This comprises physical examinations, assessment of child's mental development and the identification of behavioral problems. In case of any abnormal results, the physician will either schedule a follow-up appointment or refer the child to other professionals. The screening itself and any follow-up appointment are fully covered by statutory health insurance.

In 2000 one provincial government (Upper Austria) introduced a financial incentive to promote postnatal screening participation. Irrespective of their household income, mothers are offered €185 if their child participated in all three screenings (including some stipulated vaccinations). The only eligibility criteria is that the child was born on January 1, 2000 or later. We exploit this sharp birthday cutoff-based discontinuity in the eligibility to obtain exogenous variation in participation. Our estimates show that assigned children are 14 percentage points more likely to be screened.

To assess the cost effectiveness of this screening program, we examine two outcome dimensions both measured in high-quality administrative data. First, we look at follow-up treatments by the screening doctors and referrals to other specialists. If participation increases the likelihood of identifying a disorder (as compared to the counterfactual situation of non-participation), one would expect a positive effect on the utilization of respective (medical) services. Second, we estimate the effect on healthcare cost in the long run (up to eleven years of age). Ideally, an early intervention should lead to cost savings in the long run.

Based on our *fuzzy regression discontinuity design*, we find evidence for a sharp increase of follow-up medical treatment in the short run. These results are mainly driven by the group of low SES (socio-economic status) children. In the long run, we do not find significant effects of screening participation on healthcare costs, with the exception of low SES children whose expenditures for GP treatment decrease moderately. We offer different explanations for these findings.

The remainder of this paper is organized as follows. In Section 2 we briefly outline the theoretical determinants of the effectiveness of developmental screening programs. In Section 3 we summarize the related literature. In Section 4 we present our research design. First, we describe the institutional background including the details of the developmental screening program and the financial incentives for participation in Upper Austria. Then

we present our data sources, our estimation strategy, and discuss the identifying assumptions. In Section 5 we present our estimation results along with several robustness checks. Finally, Section 6 concludes the paper.

2 Theoretical Determinants of Developmental Screening Effectiveness

From a theoretical point of view, a necessary condition for an effective intervention is that the screening program identifies any development disorders that can be treated. Thus, if the subjects do not have any (or only non-treatable) disorders, the intervention is bound to fail. Similarly, if treatable disorders exist, but are not identified, then the intervention will also be certainly ineffective. Assuming that the screening program identifies treatable disorders, then the outcome in the counterfactual situation is decisive. It is possible that the disorder would have been also diagnosed and treated without any screening. For instance, parents could have proactively consulted a pediatrician anyway. In this case, the timing is relevant. If the screening would have caused an earlier treatment, which would have improved the child's well being (and potentially reduced future health care cost), then the intervention could be effective. If the screening had caused no (or no beneficial) earlier treatment, we would consider it as ineffective; since resources would have been wasted on subjects without any disorders. The final case of a potentially effective screening is given, if disorders would not have been diagnosed in the counterfactual situation without any screening. In the two cases where the screening leads to a (earlier) treatment of a disorder, cost effectiveness would require that long-run cost decreases outweigh the increases in short-term treatment costs including those for the screening itself. The screening costs should not only cover out-of-pocket expenditures, but also incorporate potential harm or considerable discomfort caused by the screening procedure itself, as well as, any cost due to false positive outcomes that result in anxiety and/or overtreatment.

Thus, it is ultimately an empirical question whether a certain developmental screening program is effective or not. However, one can conclude that developmental screening programs will more likely be effective,

- if they focus on subjects who are likely to have easily identifiable and treatable disorders,
- if untreated disorders cause substantial cost for the patient (and society),
- if disorders remain most likely undetected (for a long time) in the counterfactual situation without screening, and
- if screening costs are low.

3 Related Literature

So far, the literature does not provide rigorous evaluation of this type of developmental screenings for preschoolers. This is especially surprising given the extensive recommendations made by professional organizations and government agencies. Moyer and Butler (2004) conducted a systematic review of the literature for any paediatrician-based developmental screening and conclude that methodologically sound RCT (randomized controlled trials) of developmental screenings do not exist. A more recent systematic review focussing on vision screening (Chou et al., 2011) concludes that no RCT exists that would compare the effect of screening to non-screening.⁴ Cadman et al. (1987) is the only notable exception we are aware of. Based on a RCT, the authors evaluate the effectiveness of a screening program for four to five year old children that includes general health interviews, hearing tests, and vision tests administered by public health nurses. Three years after the screening, they could not detect any effect of the intervention on school performance or developmental attainment.

In contrast to screening activities in the physician’s office, there is substantial evidence on the effectiveness of two related types of programs: home visiting programs and more comprehensive preschool interventions. Both types of interventions typically focus on children at risk because of low parental income or other adverse social circumstances and often comprise a developmental screening component.

In home visiting programs trained professionals like nurses or paraprofessionals provide services for pregnant women and families with young children in their own homes. These programs aim to improve child health and development, for example, by educating and coaching families in areas of parenting, nutrition, well-child care, immunizations and appropriate care for illnesses and injuries. Recent meta analyses of RCTs show that home visiting programs in general have beneficial effects on participating families, including the cognitive and social child development, prevention of child abuse and reduction of health problems (Sweet and Appelbaum, 2004; Peacock et al., 2013; Avellar and Supplee, 2013).

Preschool interventions studied in the literature are mostly US programs that are center-based interventions focussing on education. Thus, it is hard to disentangle the effect of any developmental screening component. For instance, the *Carolina Abecedarian Project* consisted of a full-day child care setting where children underwent a systematic curriculum to enhance the development of skills in cognition, language and adaptive behavior, but also received their primary medical care on site (Campbell and Ramey, 1994). A meta analysis of Duncan and Magnuson (2013) shows that this type of preschool in-

⁴Williams, Northstone, Harrad, Sparrow and Harvey (2002) compare more intensive to less intensive screening. They focus on the detection and early treatment of amblyopia. The control group was assigned to a single intensive orthoptic screening at 37 months of age. The treatment group was screened five times (at 8, 12, 18, 25 and 37 months of age). The main result is that amblyopia was significantly less prevalent among the treatment group at the age of 7.5 years.

terventions improves child outcomes along many dimensions, although the distribution of impact estimates is extremely dispersed. While gains on achievements tests tend to fade over time, beneficial impacts on long-term outcomes such as educational attainment, teen parenthood and criminality have been documented. Considering effects on health, Campbell et al. (2014) follow the *Carolina Abecedarian Project* participants up to their mid-30s and show that the program significantly promotes adult health. Treated individuals have a lower prevalence of risk factors for cardiovascular and metabolic diseases, which are derived from measurements of blood pressure, cholesterol and obesity levels. Similarly, Carneiro and Ginja (2014) show that *Head Start* — the largest federal preschool program in the US — decreases health problems among children and lowers depression and obesity among adolescents.

4 Research Design

In this section, we first describe the institutional background including the details of the developmental screening program and the financial incentives for participation in Upper Austria. Then we present our data sources, our estimation strategy, and discuss the identifying assumptions.

4.1 Institutional Background

Austria has a Bismarckian welfare system with almost universal access to high-quality healthcare. Insurance is compulsory and in general linked to employment. Depending on the type and location of the employer, employees and their dependents are assigned to one out of 25 non-profit health insurance institutions. Thus, there is no choice. The most important institutions are the nine regional sickness funds (in German *Gebietskrankenkassen*). These are responsible for the private sector employees in the nine federal states and cover approximately 75 percent of the Austrian population.⁵

The healthcare system is predominantly funded by wage-born contributions of employers and employees.⁶ Health insurance contributions increase (up to a ceiling) proportionally with income, but are independent of the personal risk of the insured. The sickness funds cover all health care expenditures in the inpatient and outpatient sector, including the institutionalized mother-child screening program in place (see the next section for details).

⁵Non-employed individuals are also covered by the regional sickness funds. Farmers, other self-employed persons, civil servants, and the employees of the Austrian Railway Company and the mining industry have their own nationwide health insurance institutions. Moreover, there are six company-specific health insurance funds.

⁶The inpatient sector is co-financed by social security contributions and general tax revenues from different federal levels.

The OECD concludes that the Austrian healthcare system delivers good quality and easily accessible services, however, at very high cost (Gönenc et al., 2011). Both, the life expectancy and per capita of total health spending are above OECD average. Infant mortality is below the OECD average; however, significantly higher as compared to Scandinavian countries. The extensive provision of care with wide patient choice among in- and outpatient providers (i. e., there is no gate-keeping) combined with fee-for-service remuneration of doctors is prone to produce high volumes of services. It is argued that the governance and funding structure is highly fragmented and makes too much use of expensive inpatient healthcare services. In sum, the system predominantly operates on a supply-driven basis, and does not have clear mechanisms to optimize spending on a cost-benefit or cost effectiveness basis. It is concluded that the healthcare system could benefit from promoting the transition to integrated care, emphasizing healthier lifestyles and providing more information on quality and prices.

4.2 Developmental Screening Program

The developmental screening program of preschoolers arose historically from a prenatal program that was extended in scope over time. In 1974, the *Austrian Federal Ministry of Health* launched the first nation-wide prenatal screening program.⁷ This so-called *Mother-Child-Pass Examination Program* (henceforth MCPEP) consisted initially of four prenatal examinations. Over time, the aim and scope of MCPEP expanded substantially. Today it represents a comprehensive screening program that monitors the health of expectant mothers and their children over a time period of about 70 months. It starts with the first diagnosis of pregnancy (ideally before the 16th week of pregnancy) and lasts until the 6th year of the child’s life. In total, it comprises five prenatal and nine postnatal examinations of the child. Tables 1 and 2 provide the time frame, the type, and the incentive structure for the single pre- and postnatal child examinations of the Austrian MCPEP. All stipulated examinations are free of charge, even for mothers without social health insurance coverage. The examinations are generally provided by resident gynecologists, pediatricians, and general practitioners.⁸

As part of the program, expectant mothers receive the so-called mother-child pass (in German *Mutter-Kind-Pass*). This official document (issued by the *Austrian Federal Ministry of Health*) is a booklet documenting all examinations and their results. Together with the pass expecting mothers also receive an international certificate of vaccination

⁷At the time this program was launched, infant mortality was comparably high in Austria. It amounted to 24 deaths of infants under the age of one year per 1,000 live births. This was somewhat above the US figures. Since then, infant mortality rates declined continuously, they are currently well below the US rates (own calculations based on data from the *World Bank*).

⁸For risk pregnancies, hospitals provide selected services related to prenatal diagnostics. In general, the first postnatal check-up is also conducted in the hospital immediately after birth. Moreover, in case of any complications both the mother and the child are always being referred to the hospital for follow-up examinations that are beyond the scope of MCPEP.

for their child, and an additional information booklet containing advice on a variety of relevant topics. This form of documentation is important for mothers, not least due to the fact that participation in the programme is a prerequisite for receipt of financial payments (for details, see below).

The examinations do not only provide basic medical care for (expectant) mothers and their children, they have also a preventative character that promotes early detection and timely treatment of health risks. In our empirical analysis we focus on the development screening part of this program. In particular, the child's development is screened at the age of about 24, 36, and 48 months. The examinations include an anamnesis where potential behavioral disorders, previous diseases and the speech and language development of the child are covered. In a physical examination, the doctor tests the child's ears and eyes and examines its teeth and organs. Furthermore, the child's weight, height and head circumference are recorded and the motor skills, nutritional status and mental development are assessed. Measurement of the blood pressure is scheduled for the screenings at 36 and 48 months, while at 24 months, an ophthalmologist performs a comprehensive eye and vision examination.

The participation in the MCPEP was traditionally financially incentivized. However, the specific regulations varied over time.⁹ For our empirical analysis, the so-called mother-child pass bonus (in German *Mutter-Kind-Pass Bonus*) is relevant. It was introduced on January 1, 1997, and all eligible mothers who participated in the five prenatal and in the first five postnatal examinations received a one-time payment of €145. Eligibility was defined based on the parent's taxable household income in the year of birth, which must not exceed the elevenfold of the maximum contribution basis for the social insurance in a full calendar month.¹⁰ Thus, the participation in the developmental screening of preschoolers was not incentivized via the mother-child pass bonus. However, the province of Upper Austria introduced an additional subsidy payment in 2000.

Financial Incentives in Upper Austria Upper Austria was the only federal state that offered an additional financial incentive (on top of the nationwide subsidies) to mothers who underwent the stipulated examinations and certain defined vaccinations.¹¹ They introduced the so-called mother-child (MC) subsidy (in German *Mutter-Kind-Zuschuss*) for all children born on January 1, 2000 or later. This regulation was enacted by the Up-

⁹One can broadly distinguish three periods: Before 1997 all mothers were eligible for a one-time financial payment of about €1,450 to €2,900. Between 1997 and 2001 all mothers with a household income below a certain amount were eligible for a financial incentive of €145. Since 2002 the participation in the MCPEP is a prerequisite for receipt of the full childcare allowance (in German *Kinderbetreuungsgeld*).

¹⁰Further, the parent predominantly responsible for child caring at the day when the child finished his/her first year, had to have Austrian citizenship, a residence in Austria, and the child had to live predominantly in Austria. The Austrian citizenship could have been replaced by the parent living in Austria continuously for three years immediately before the child had finished his/her first year of life.

¹¹Upper Austria is one of nine provinces in Austria and comprises about one sixth of the Austrian population and work force.

per Austrian Government in November 2001. All mothers (irrespective of their household income) were eligible. The subsidy was paid in two tranches, and the application had to be filed within one year after the 2nd and 5th birthday of the child:

- First tranche: Mothers whose child was born on January 1, 2000 or later received €185 if they participated in all prenatal examinations and in the first five postnatal examinations (including vaccinations).
- Second tranche: Mothers whose child was born on January 1, 2000 or later received €185 if they participated in the sixth (Post-E6), seventh (Post-E7), and eighth (Post-E8) postnatal examination (including vaccinations).

In our empirical analysis, we exploit the sharp discontinuity in eligibility (by date of birth) for the Upper Austrian MC subsidy. We focus on the *second* tranche. This has the advantage that it creates a clear distinction between treated and control units. Mothers whose child was born before January 1, 2000 had no financial incentive to participate in Post-E6 to Post-E8.¹² In contrast, mothers whose child was born on January 1, 2000 or later (henceforth assigned mothers) received €185. As we will show below, assigned mothers are 14 percentage points more likely to participate in Post-E6 to Post-E8.

This approach exploits exogenous variation in the participation in a comprehensive self-contained series of medical examinations at the age of about two, three and four years. It allows us under very weak identifying assumptions (see below) to evaluate the effect of these preschool examinations on the subsequent health outcomes up to preadolescence.¹³

4.3 Data

In our empirical analysis, we use administrative data from the *Upper Austrian Sickness Fund*. It covers the sub-population of all private sector employees and their dependents in the province of Upper Austria. These data include among others detailed information on healthcare service utilization in the outpatient sector (i. e., medical attendance and drug use) and some inpatient sector information (e. g., the number of days of hospitalization). Thus, we observe participation in the examinations stipulated by the MCPEP, but also any other single doctor visit and each drug prescription, together with the exact date of service utilization. In the empirical analysis, we focus on children born between September 1998 and April 2000. The latest year available in our data set is 2011; we therefore observe healthcare costs for all children up to 10 and a half years of age. We complement these

¹²These mothers have some financial incentive (i. e., the nationwide subsidy) to participate in Post-E1 to Post-E5 (first tranche).

¹³In principle, one could also exploit the differential incentive between Upper Austrian mothers (who gave birth on January 1, 2000 or later) and their counterparts from other federal states. Upper Austrian mothers have (irrespective of their eligibility to the nationwide subsidy) a higher incentive to participate in the prenatal examinations and in the first five postnatal examinations (first tranche), and also to participate in the sixth, seventh, and eighth postnatal examination (second tranche).

data with information from the *Austrian Birth Register* (ABR). This includes further socio-economic information (in particular, educational attainment) for the mother, and different measures of health at birth.

To evaluate the effect of the participation in the developmental screening program, we examine two outcome dimensions. First, we look at follow-up appointments and referrals to other specialists in the short run, which is defined as the time period when the children are between 1.5 and 4.5 years old. We aggregate the expenditures over this time period for different types of resident medical specialists. Follow-up appointments cover subsequent expenditures for pediatricians and GPs whereas expenses for other specialists (such as eye specialists or orthopedists) indicate referrals. We also look at the total expenditures for outpatient medical attendance, expenditures on medical drugs, and days of hospitalization. Second, we measure healthcare expenditures in the long run defined as the age span ranging from six to eleven and a half years using the same measures for healthcare utilization.¹⁴ Obviously, the degree to which these proxies reflect individual health varies among the variables. While the number of days of hospitalization and the consumption of medical drugs can be expected to be highly correlated with a child’s health status, expenditures on outpatient medical attendance may also capture aspects of preventative care, such as costs of screening exams.

4.4 Estimation Strategy

Our estimation strategy exploits variation in the probability of screening participation of preschooler i resulting from the birthdate B_i cutoff-based discontinuity in the eligibility for a financial incentive for participation. Put differently, children born shortly before the cut-off ($B_i < c$) are less likely to get screened, as compared to children born shortly after the cutoff ($B_i > c$). Since the probability of participation does not jump from zero to one at this birthday cut-off, this represents a *fuzzy regression discontinuity design* (RDD). The design can be translated into a *two-stage least square* setup, where the birthday cut-off serves as an instrumental variable for treatment status.

In the first stage equation, the dependent variable is the treatment status S_i . This binary indicator is equal to one if preschooler i participated in the developmental screening program (i. e. has done the three examinations Post-E6, Post-E7, and Post-E8), and zero otherwise. The explanatory variable of primary interest is the instrumental variable T_i , which is equal to one if preschooler i is born after January 1, 2000 and zero otherwise ($T_i = 1$ if $B_i > c$):

$$S_i = \alpha_0 + \alpha_1 T_i + \alpha_2 (B_i - c) + \alpha_3 (B_i - c) T_i + \epsilon_i. \quad (1)$$

¹⁴We exclude children with extreme high expenditures for medication (above the 99.5 percentile in short- or long term expenditures) from the analysis.

Thus, α_1 gives us the change in the likelihood of participation because of the eligibility to the financial incentive. The remaining covariates allow for a different linear monthly trend in participation before and after the birthday cut-off. In the second stage equation, we regress our respective outcome variable O_i on the predicted \hat{S}_i screening participation from the first stage:

$$O_i = \beta_0 + \beta_1 \hat{S}_i + \beta_2 (B_i - c) + \beta_3 (B_i - c) T_i + \mu_i. \quad (2)$$

For the estimation we use a bandwidth which covers four months before and four months after the cutoff. That means, we use the sample of children born between September 1999 through April 2000. This sample comprises 4,786 observations.

Identifying Assumptions Three conditions need to hold for β_1 to be informative about the effects of screening participation. First, the eligibility for the financial incentive T_i must predict participation in the screening. The first stage relationships below show that this condition holds in our framework.

Second, families do not precisely manipulate their child’s date of birth around the eligibility cutoff. This is the key identifying assumption behind any RDD. Since the Upper Austrian government enacted the financial incentive in retrospect (on November 12, 2001), this assumption holds by definition. Accordingly, Figure 2 shows that the average number of births per day do not vary around the cutoff date.

Third, eligibility must not be correlated with any outcome-determining factor. We start by examining some observable characteristics. Figure 3 shows that neither parity, legitimacy, mother’s citizenship, nor mothers educational attainment changes discontinuously around the cutoff. The same holds true for any other pre-determined characteristics we observe. Thus, we also have no reason to expect a correlation between eligibility and any unobserved outcome-determining factor (included in μ_i). Still, to be on the safe side, we pool information from the previous turn of the year to account for any unobserved characteristics that follow a seasonal pattern.¹⁵ In particular, we use information on all births between September 1998 through April 1999, and September 1999 through April 2000 resulting in 9,516 observations. Now, we can include the dummy variables $M_{i,j}$ indicating the calendar month j of the child’s birth to control in the first and second stage equation for month fixed effects:

$$S_i = \gamma_0 + \gamma_1 T_i + \sum_{j=2}^8 \gamma_j M_{i,j} + \gamma_9 P_i + \eta_i. \quad (3)$$

¹⁵There is some evidence for the US that children born at different times of year are born to mothers with significantly different characteristics (Buckles and Hungerman, 2013). In fact, seasonality in unobserved characteristics would only constitute a threat to our identification if unobserved outcome-determining factors varied discontinuously near the cutoff (December versus January).

$$O_i = \delta_0 + \delta_1 \hat{S}_i + \sum_{j=2}^8 \delta_j M_{i,j} + \delta_9 P_i + \nu_i. \quad (4)$$

The binary variable P_i additionally captures whether the preschooler i was born between September 1998 and April 1999 or between September 1999 through April 2000. Our results do not vary across these two alternative specifications, however, the second specification gives smaller standard errors.

5 Estimation Results

5.1 The Effect of Financial Incentives on Participation

Figure 1 is a graphical representation of the first stage relationship. It depicts the developmental screening participation rate per day of birth for children born between September 1, 1999 and May 1, 2000. As expected, we observe a distinctive jump in the participation at the cutoff that can be attributed to the eligibility for the financial incentive.

Table 3 summarizes the corresponding regression results, including the estimation of equation (1) that allows for linear trends and equation (3) for the birth month fixed effects model. The coefficients indicate that the eligibility for the financial incentive (T) increases the likelihood of screening participation by 14.8 and 14.4 percentage points, respectively. The estimated effect is highly statistically significant in both specifications with large F-statistics. Thus, we can abstract from weak instrumental variable problems (Staiger and Stock, 1997).

5.2 Screening Participation and Short-Run Expenditures

The second stage results refer to the birth month fixed effect specification and show the effects of screening participation on outpatient expenditures for medical attendance, the use of medical drugs, and days of hospitalization. Table 4 includes the estimation results both for short-term (left panel) and long-term (right panel) outcomes. In addition to these aggregates, the table provides expenditures for healthcare services at general practitioners and different types of resident medical specialists. The cost categories mentioned so far include direct expenditures for developmental screening at pediatricians, GPs and ophthalmologists. The equivalent estimates that exclude direct expenditures for developmental screening can be seen in the lower part of Table 4. We present both the reduced form or intention to treat (ITT) results as well as local average treatment effects (LATE) derived from our IV framework.

As can be seen from column (3), we do not find significant short-run effects of screening participation on medication and hospital days. However, the estimation results reveal a positive and significant effect on expenditures for outpatient medical care. Treated

preschoolers have €158 higher expenditures for medical appointments in the age group from 1.5 to 4.5 years (7th to 18th quarter of life). The separate estimation for short-term expenditures in different medical fields reveals that this increase is attributable to healthcare services provided by pediatricians (€114.4) and ophthalmologists (€35.4). Estimated effects on expenditures for other medical specialists remain insignificant.¹⁶ These results are in accordance with the fact that pediatricians provide about two-thirds of all developmental screenings and ophthalmologists carry out the eye examination part of the screenings. Somewhat surprisingly, we do not observe a similar positive effect on the expenditures for consultations of GPs who conduct the remaining third of developmental screenings. A possible explanation is that the screening participation (not necessarily provided by GPs) substitutes other GP visits.

Obviously, the increase in short-term expenditures is at least partly due to direct revenues paid to doctors for carrying out the screening exams. This can be seen from the estimation results on short-term expenditures net of direct costs. Participation in developmental screening does not trigger aggregate follow-up expenditures for medical attendance in the outpatient sector. However, we do find significantly positive follow-up treatments provided by pediatricians and ophthalmologists. Pediatricians and ophthalmologists charge €80.1 and €20.8 for additional medical treatment following the developmental screening procedure which corresponds to approximately 80 and more than 100 percent of the average expenditures. The insignificant (negative) effect on GPs' subsequent medical services indicates that this group of doctors does not conduct own additional treatment. If at all, follow-up costs born by this group of doctors, arise exclusively via subsequent referrals to pediatricians and ophthalmologists. The insignificant coefficients of expenditures for other medical specialists (not shown in the table) indicate that developmental screening participation does not trigger follow-up referrals to specialists in other medical fields. A first conclusion to be drawn from our short-term estimation results is that the participation in developmental screening causes subsequent medical treatment of children at the pediatrician and the eye doctor.¹⁷

5.3 Screening Participation and Long-Run Expenditures

Next, we examine the effects of screening participation on healthcare costs in the long run. This covers the post-screening time period when the children are between 7 and 10.5 years old (25th to 42nd quarter of life). As a consequence, these cost categories can neither be directly influenced by the screening procedure itself nor by follow-up referrals to medical specialists. Changes (reductions) in long-run costs would rather indicate cost savings due

¹⁶The results are qualitatively and quantitatively very similar if we estimate the model with linear trends instead of the birth month fixed effect specification. However, the standard errors are somewhat higher.

¹⁷The ITT estimates are qualitatively identical with the IV results. However, the coefficients are substantially lower due to imperfect compliance.

to early detection and treatment of diseases as a consequence of developmental screening participation.

The IV estimation results depicted in column (6) of Table 4 reveal that developmental screening participation has almost no impact on long-term healthcare cost both in the inpatient and outpatient sector. With one single exception, the coefficients for aggregated and disaggregated expenditures and also for the days of hospitalization remain consistently insignificant. The only significant effect (at the 10 percent level) can be discerned for healthcare services provided by GPs. Developmental screening participation reduces the long-run expenditures for GP treatment by €77.8, which is equivalent to a reduction of 39 percent. The participation in developmental screening exams seems to substitute diagnostic and/or therapeutic GP services in the long-run. However, these cost savings cannot compensate the short-run increase in expenditures for the services provided by pediatricians and ophthalmologists.

5.4 Treatment Effect Heterogeneity

We further explore potential heterogeneous effects by looking at mothers and children with specific characteristics. To study the role of the mother’s socio-economic status, we analyze the outcomes separately for mothers with compulsory education only as compared to mothers with higher degrees of education. Furthermore, we distinguish between legitimate births and children born out of the wedlock, between Austrian and foreign mothers, and also between first births and higher order births. To analyze whether the health status at birth would have an influence on the results, we finally estimate separate regressions for normal and low birth weight babies.

Table 5 includes the first stage results for the heterogenous groups based on the birth month fixed effect specification. It can be seen that the first stage relationships work consistently well with highly significant instruments in the range between 0.13 and 0.16. The eligibility for the financial incentive increases the screening participation by 13 to 16 percentage points, and the F statistics are in almost all cases sufficiently large. Two exceptions must be noticed, though. The first stage coefficient for foreign mothers is very low (0.07) and only significant at the 10 percent level. Moreover, the low F statistic indicates a weak instrument for non-Austrian mothers. A similarly low F statistic (7.28) occurs for the group of low birth-weight children even though the coefficient is high and statistically significant. The sample size of 521 for this particular subgroup is obviously very low.

The second stage IV estimates for the heterogenous groups are presented in Table 6.¹⁸ As can be seen from columns (1) – (4), the results for the lower and the higher SES group of children or mothers are different. While the short-term outpatient expenditures

¹⁸Given that the instrument does not work properly for foreign mothers, we do not provide second stage results differentiating between the mother’s country of birth.

for children of mothers with compulsory schooling increase significantly, we do not find comparable effects for children whose mothers have obtained higher education. Column (1) reveals that participation in developmental screening leads to €504.4 higher expenses for doctor visits and 10.1 more days in hospitalization in the low SES group of children.¹⁹

The disaggregated figures show that the expenditures for pediatricians and ENT specialists increase by €282.4 and €37.5, respectively. A slightly positive effect can also be seen for radiology expenditures. Furthermore, the coefficients for the net cost components clearly indicate that screening participation incurs substantial short run follow-up costs in low SES children. Outpatient net expenditures for medical attendance increase by as much as €402, of which more than 50 percent are attributable to higher pediatrician expenses. We therefore conclude that resident doctors diagnose health deficits in low SES children that make substantial further medical treatment necessary. In comparison, the only significant cost component in the high SES group of children is the one for resident eye doctors. Participation in developmental screening triggers additional expenditures for ophthalmologists in the amount of €38.2 or €25.2 if direct screening costs are being deducted. Furthermore, it is noteworthy that participation in the screening exams lead to a reduction of expenditures for medical drugs by €68.6. Better educated mothers may reduce or even stop (unnecessary) medication for their children as a consequence of doctor's consultation during the screening exam. However, the effect is only significant at the 10 percent level.

Considering the long run, the only significant effect is a reduction of expenditures for GPs in the low SES group. Screening participation reduces GPs' treatments for these children. The estimated coefficient is significant at the 10 percent level only, and the cost saving of €182.1 cannot compensate for the short-term increase in outpatient expenditures and days of hospitalization.

Our baseline effect of an increase in short-term expenditures for medical attendance that is preliminary driven by higher expenses for pediatrician treatment can also be observed for the subgroups of legitimate births, higher order births and children who were born with normal or high birth weight.²⁰ The significant and positive effect on medical attendance runs from €154.6 (normal or high birth weight) to €180.7 (higher order birth) with an increase in gross expenditures for pediatricians that lies between €125.2 and €142.5. Follow-up treatments of pediatricians that do not include direct screening costs lie in an interval between €89.7 and €104.7. Significant positive effects on the expenditures for ophthalmologists can be found for children born out of the wedlock, born with normal or high birth weight, and also for those of higher birth order. The fact that aggregated outpatient expenditures for medical attendance and also those for pediatricians do not increase for out of wedlock births and first births is surprising at least. This

¹⁹The effect on time spent in hospitalization is significant at the 10 percent level only.

²⁰This latter subgroup is very similar to our total sample presented in Table 4.

is all the more so since the first stage coefficients of these two groups are very similar to those of higher order and legitimate births. One possible explanation is that the number of children might reflect to some extent the SES of the mother. If less educated mothers have *ceteris paribus* more children, the sample split in columns (9) – (12) may not reflect the differences between the first and higher order births but rather the mother’s educational level. The consistently insignificant effects for low birth weight children are due to comparably high standard errors as a consequence of the small sample size mentioned before.²¹

6 Conclusions

We have evaluated a state-wide developmental screening program in Austria, where pediatricians examine children at the age of 24, 36, and 48 months. Identification is based on a fuzzy regression discontinuity design that exploits a sharp birthday cutoff-based discontinuity in the eligibility for a financial incentive for program participation. We do find evidence that screening participation triggers follow-up medical treatment in the short-run. Net of direct screening costs, subsequent expenditures for resident pediatricians and eye doctors for children from 1.5 to 4.5 years almost double. The separate analysis of heterogeneous effects illustrates that the full sample results are mainly driven by the group of low SES children (those with mothers who finished compulsory schooling only). Their follow-up expenditures for outpatient medical care increase by more than 140 percent. This increase is predominantly generated by pediatrician treatment and to a lesser degree by further healthcare services provided by ENT specialists and radiologists. Moreover, we find a quantitatively highly relevant increase in days of hospitalization for this group of children. However, the effect of a fourfold increase in hospital days is significant at the 10 percent level only.

In the long-run (children between 7.5 and 10.5 years old), we do not find significant effects on healthcare costs with the sole exception of low SES children. For this group, we observe cost dampening effects as the expenditures for healthcare services provided by GPs decrease (at the 10 percent significance level). However, the cost savings cannot compensate the sharp increase in short-run outpatient and inpatient expenditures.

There are several explanations for our results. The general increase in expenditures for outpatient medical care indicates that doctors identify and medically treat developmental disorders in screened children. Obviously, this early medical intervention does not reduce healthcare costs in the long-run and, therefore, one is tempted to referring to the program as ineffective. Nevertheless, the treatment may bring health benefits without leaving any trace in long-term expenditures. Unlike screening programs for adults that focus on

²¹Apart from that, low birth weight babies are under close medical supervision even in the counterfactual situation such that one would not expect causal impacts of screening participation.

early detection and treatment of life-threatening and expensive diseases, developmental screening exams for children may focus on identifying and reducing developmental deficits at an early stage of childhood. An early intervention with respect to these deficits can be expected to improve the conditions for their human capital development, rather than to dampen future healthcare costs.

A plausible alternative explanation refers to supply-induced or at least supply-determined follow-up healthcare services. Health screening offers doctors the opportunity to further increase the amount of care. More detailed diagnostic and therapeutic services that obviously do not harm the children may represent a good possibility for resident pediatricians to raise their income. Whether the lion's share of the service increase is medically justified, cannot be clearly answered by our data.

For particular groups – especially for children of well-educated mothers – we do not observe an significant increase in short-term expenditures for outpatient medical care with the exception of expenses for eye doctors. One reason for this might be that the screened children do not have developmental disorders that would require follow-up treatment and the observed heterogeneity is due to differences in health between socio-economic groups. Alternatively, developmental disorders may also be identified in the counterfactual situation among children who do not participate in screening. One would expect that observant (and probably well-educated) parents identify disorders themselves and consult medical specialists proactively. It may further happen that these parents consult a GP or a pediatrician for some other medical reason (e.g., the child suffering from a cold), and the doctor identifies a developmental disorder during this consultation.

The economic conclusion to be drawn from this analysis is that the current developmental screening program in (Upper-) Austria is obviously not cost-effective in the observed time horizon. It is unable to significantly reduce long-term out of pocket healthcare costs. Given this result, a more thorough (medical) evaluation of early stage interventions seems indispensable. To continue the program and justify its substantial costs in the future would require evidence that the follow-up treatment generates medical and/or other human capital benefits beyond the exclusive consideration of costs covered by the sickness fund. A comprehensive welfare assessment of the program has to include direct health outcomes and other important developmental indicators such as school success and social skills.²²

Second, measures and guidelines that help avoid supply-induced follow-up treatment are desirable. In particular, less-educated parents with probably low health literacy, may be more directly affected by supply-induced pediatrician demand. Managed care techniques including binding treatment pathways and reviewing processes for the medical necessity of specific services may help to limit the amount of supply-determined healthcare

²²At the moment, a more thorough analysis including alternative outcomes fails at the availability of data.

services and improve the quality of care. Our results suggest that a promising way to improve the accuracy and effectiveness of developmental screening would be to focus on subjects with higher incidences of developmental disorders. For instance, the program should focus its future efforts on children with a lower socio-economic status — not so much as a matter to reduce future healthcare costs but rather to improve the starting conditions of underprivileged children as a prerequisite for a healthy and professionally successful life.

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7 Tables and Figures

Figure 1: Screening Participation Rate per Day of Birth

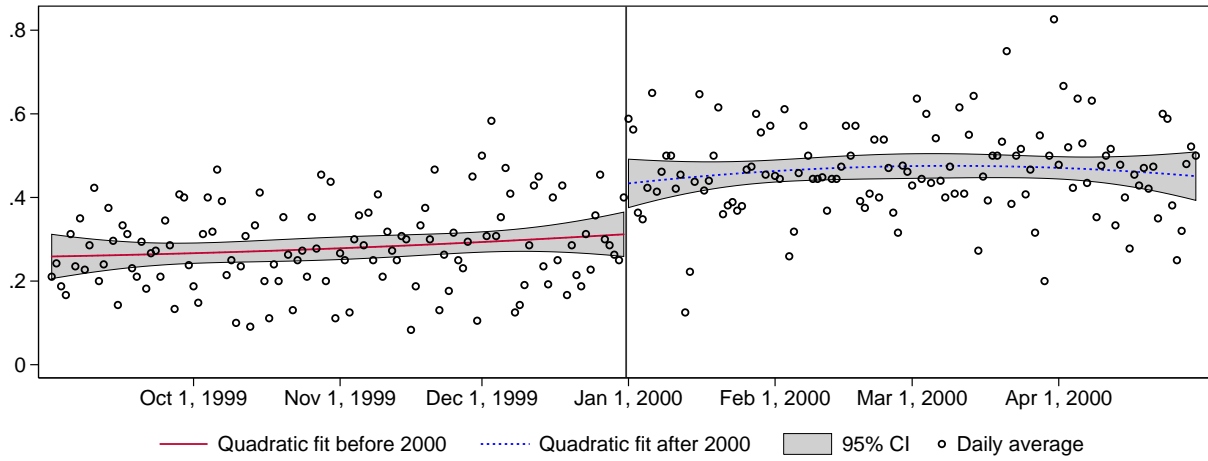


Figure 2: Number of Births per Day

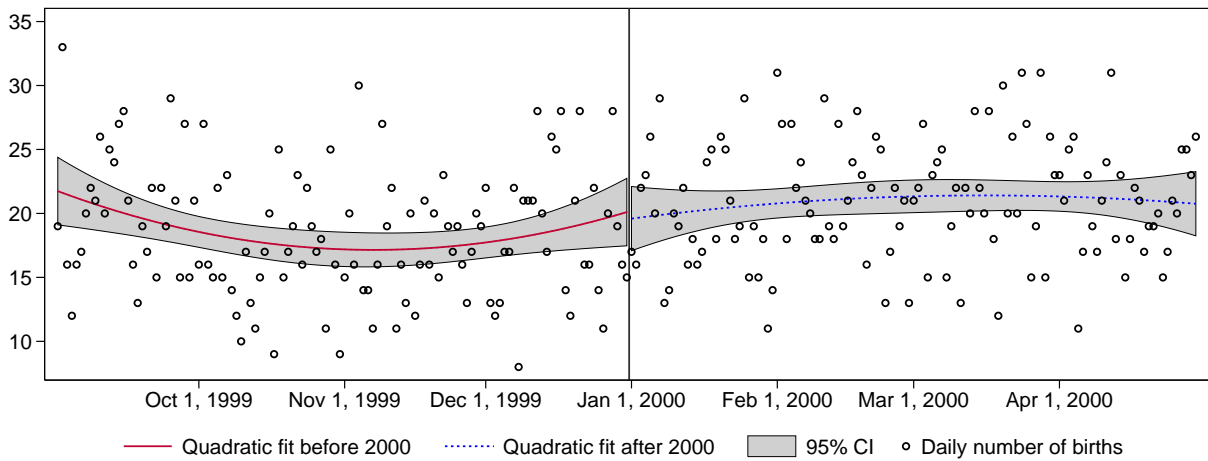


Figure 3: Daily Averages of Selected Covariates

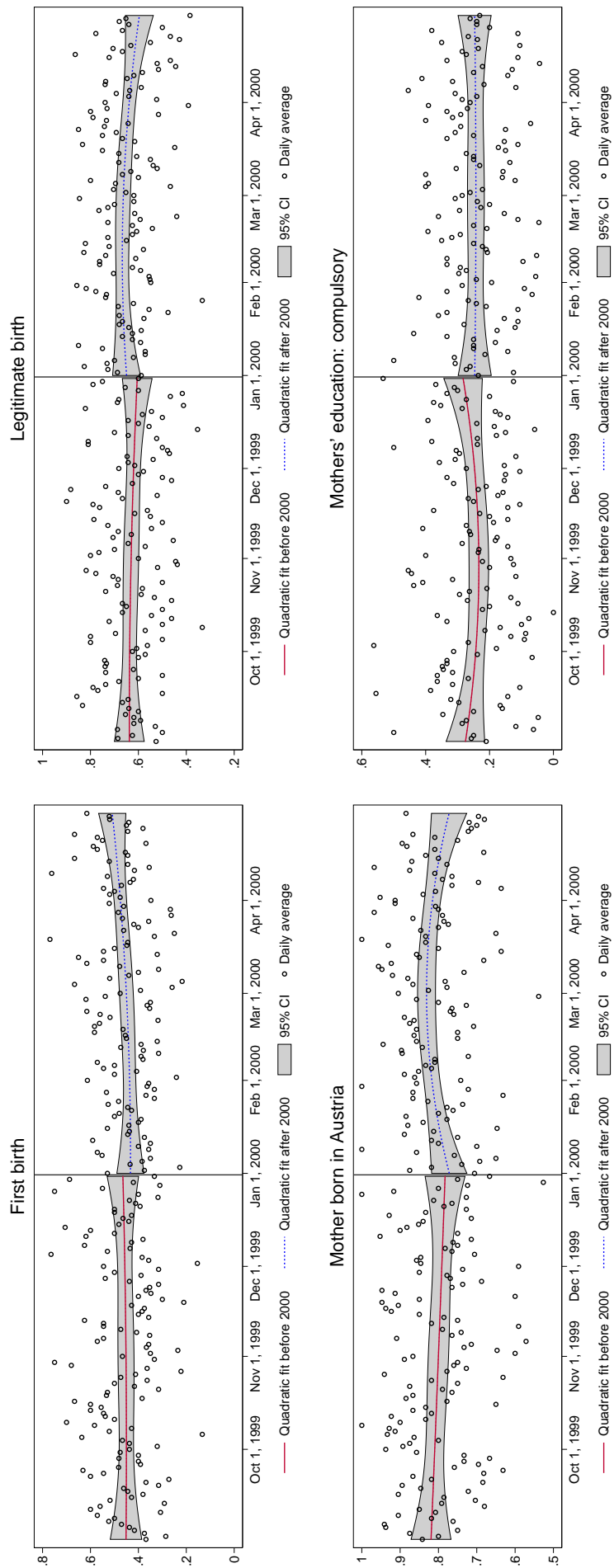


Table 1: Overview of Prenatal Examinations According to MCPEP

No.	Time	Examinations	Incentives
Pre-E1	Until 16 th week 8 th to 12 th week	Obstetric exam; laboratory tests Ultrasound ^a	B; S1
Pre-E2	17 th to 20 th week 18 th to 22 th week	Obstetric exam; internal exam Ultrasound ^a	B; S1
Pre-E3	25 th to 28 th week	Obstetric exam; laboratory tests	B; S1
Pre-E4	30 th to 34 th week 30 th to 34 th week	Obstetric exam Ultrasound ^a	B; S1
Pre-E5	34 th to 38 th week	Obstetric exam	B; S1

Notes: Overview of examinations according to the MCPEP. *B.*..prerequisite for the federal MCP-Bonus, *S1*...prerequisite for the first tranche of the Upper Austria MC-Subsidy. ^a Ultrasound exams are recommended but not required for receipt of financial payments.

Table 2: Overview of Postnatal Child Examinations According to MCPEP

No.	Time	Examinations	Incentives
Post-E1	1 st week	Child exam; hip ultrasound ^a	B; S1
Post-E2	4 th to 7 th week	Child exam; orthopedic exam	B; S1
	6 th to 8 th week	Hip ultrasound ^a	
Post-E3	3 rd to 5 th month	Child exam	B; S1
Post-E4	7 th to 9 th month	Child exam; ear, nose and throat exam	B; S1
Post-E5	10 th to 14 th month	Child exam; eye exam	B; S1
Post-E6	22th to 26th month	Child exam; eye exam	S2
Post-E7	34th to 38th month	Child exam	S2
Post-E8	46th to 50th month	Child exam	S2

Notes: Overview of examinations according to the MCPEP. B...prerequisite for the federal MCP-Bonus, S1...prerequisite for the first tranche of the Upper Austrian MC-Subsidy, S2...prerequisite for the second tranche of the Upper Austrian MC-Subsidy. ^a The hip ultrasound exams are recommended but not required for receipt of financial payments.

Table 3: First Stage Results

	Linear trends		Month fixed effects	
	(1)	(2)	(3)	(4)
T	0.145*** (0.0276)	0.148*** (0.0271)	0.148*** (0.0186)	0.144*** (0.0183)
(B-c)	0.000358 (0.000262)	0.000362 (0.000257)		
(B-c) * T	-0.000146 (0.000388)	-0.000235 (0.000378)		
P			0.0505*** (0.0127)	0.0516*** (0.0126)
Legitimate birth		0.0334** (0.0158)		0.0290*** (0.0109)
Mother born in Austria		0.0874*** (0.0183)		0.0628*** (0.0121)
Vocational/lower sec. educ.		0.0498*** (0.0171)		0.0483*** (0.0112)
Upper sec./tertiary educ.		0.0527** (0.0219)		0.0534*** (0.0149)
Preterm birth		0.0238 (0.0394)		0.00695 (0.0258)
Low birth weight		0.00175 (0.0366)		0.0140 (0.0252)
First birth		0.161*** (0.0157)		0.172*** (0.0108)
Mother's age		0.000953 (0.00145)		0.00198** (0.000964)
Constant	0.305*** (0.0192)	0.0760 (0.0479)	0.247*** (0.0146)	0.0120 (0.0329)
Calendar month of birth	No	No	Yes	Yes
N	4786	4786	9516	9516
Mean of dept.	0.378	0.378	0.313	0.313
F-statistic	27.66	29.79	63.54	62.22

Notes: This Table summarizes the first stage relationships. Columns 1 and 2 use linear time trends as control variables, columns 3 and 4 use dummy variables indicating the calendar month of birth. Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Second Stage Results

	Short-term			Long-term		
	(1) Mean	(2) ITT	(3) LATE	(4) Mean	(5) ITT	(6) LATE
Aggregate outcomes:						
Outpatient medical care	350.2	22.8** (11.0)	158.0** (70.1)	1055.5	-21.2 (44.0)	-147.0 (307.1)
Medication	64.8	-6.04 (4.06)	-42.0 (29.4)	165.4	-14.7 (14.8)	-102.2 (104.0)
Days in hospital	1.91	0.31 (0.22)	2.17 (1.58)	2.47	0.75 (0.88)	5.24 (6.11)
Medical specialists:						
Pediatrician	125.5	16.5** (6.43)	114.4*** (40.1)	69.3	2.54 (5.26)	17.7 (36.2)
General practitioner	142.2	-0.93 (6.00)	-6.46 (41.7)	198.1	-11.2* (6.58)	-77.8* (46.9)
Dentist	11.8	1.03 (1.53)	7.15 (10.6)	359.3	0.66 (22.9)	4.60 (159.2)
Ophthalmologist	25.6	5.09*** (1.51)	35.4*** (10.3)	43.7	0.67 (2.49)	4.65 (17.2)
ENT specialist	12.0	1.03 (1.61)	7.14 (11.1)	28.1	0.16 (2.81)	1.12 (19.5)
Orthopedist	3.14	0.89* (0.54)	6.16 (3.79)	5.26	0.095 (0.75)	0.66 (5.23)
Laboratory	5.46	-0.058 (0.87)	-0.40 (6.01)	9.68	1.51 (1.16)	10.5 (8.07)
Radiologist	3.04	0.42 (0.59)	2.94 (4.07)	9.04	-1.08 (1.13)	-7.51 (7.92)
Net of direct costs:						
Outpatient medical care	305.0	11.8 (10.3)	82.0 (68.3)			
Pediatrician	100.3	11.5** (5.45)	80.1** (34.9)			
General practitioner	128.9	-4.86 (5.50)	-33.8 (38.9)			
Ophthalmologist	18.9	3.00** (1.30)	20.8** (8.89)			

Notes: This table summarizes the effects of developmental screening on health care expenditures. Mean of the dependent variable is provided in columns 1 and 3, columns 2 and 5 show the ITT estimate, columns 3 and 6 the IV estimate. Each cell represents the results from a separate regression that includes covariates listed in column 4 of Table 3. Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=9516.

Table 5: Complier Characteristics: First Stage Heterogeneity

	(1)	(2)	(3)	(4)	(5)
	N	Mean	Estimate	S.E.	F-statistic
Full sample	9516	0.313	0.144***	(0.0183)	62.22
Mother's education					
Compulsory education	2347	0.242	0.144***	(0.0340)	18.04
Above compulsory education	7169	0.336	0.142***	(0.0215)	43.56
Legitimacy of birth					
Out of wedlock	3334	0.340	0.134***	(0.0318)	17.90
Legitimate	6182	0.298	0.149***	(0.0222)	44.70
Mother's country of birth					
Foreign country	1809	0.238	0.0708*	(0.0389)	3.312
Austria	7707	0.330	0.161***	(0.0206)	61.04
Birth order					
Higher Order Birth	5264	0.239	0.156***	(0.0228)	46.86
First birth	4252	0.405	0.129***	(0.0295)	19.25
Length of pregnancy					
Full term	9026	0.312	0.138***	(0.0187)	54.18
Preterm birth	490	0.327	0.232***	(0.0812)	8.132
Birth weight					
Normal or high	8995	0.311	0.140***	(0.0188)	55.44
Low	521	0.347	0.209***	(0.0773)	7.284

Notes: This table summarizes the first stage relationships for different samples. Column 1 shows the number of observations and column 2 the average participation. The first stage estimate and robust standard errors are shown in columns 3 and 4, column 5 shows the F-statistic for the instrument. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Heterogeneous Effects

	Compulsory educ.		Above compulsory		Legitimate birth		Out of wedlock		Higher order birth		First birth		Normal or high b.w.		Low birth weight	
	(1) Short	(2) Long	(3) Short	(4) Long	(5) Short	(6) Long	(7) Short	(8) Long	(9) Short	(10) Long	(11) Short	(12) Long	(13) Short	(14) Long	(15) Short	(16) Long
Aggregate outcomes:																
Outpatient medical care	504.4*** (143.9)	-580.3 (629.8)	34.3 (87.8)	-1.50 (857.7)	170.0** (81.6)	-72.7 (354.7)	135.0 (133.6)	-247.6 (583.3)	180.7** (83.0)	-191.4 (369.1)	134.9 (121.4)	-53.5 (519.6)	154.6** (71.9)	-298.1 (324.1)	34.7 (349.9)	1206.1 (1197.0)
Medication	19.7 (56.8)	-177.4 (190.0)	-68.6** (35.8)	-87.1 (125.4)	-32.4 (34.5)	-136.0 (121.4)	-69.5 (56.5)	-36.5 (195.1)	-49.9 (35.4)	-147.7 (118.1)	-27.9 (50.1)	-35.7 (189.6)	-43.1 (30.9)	-111.7 (108.2)	-43.6 (390.8)	1.49 (390.8)
Days in hospital	10.1* (5.70)	8.12 (22.7)	-0.58 (1.33)	2.50 (4.48)	3.42* (2.08)	6.74 (5.69)	-0.011 (2.34)	-0.037 (15.2)	3.02 (2.14)	9.58* (5.56)	0.84 (2.11)	-1.08 (12.9)	1.89 (1.62)	8.28 (5.36)	2.58 (6.46)	-45.2 (53.4)
Medical specialists:																
Pediatrician	282.4*** (83.4)	33.9 (73.3)	57.4 (49.1)	9.76 (42.4)	141.1*** (47.3)	30.3 (42.9)	60.5 (75.4)	-16.2 (68.2)	142.5*** (46.2)	56.6 (38.8)	73.4 (72.9)	-39.3 (71.7)	125.2*** (42.1)	35.9 (37.9)	-34.1 (152.5)	-221.8 (170.1)
General practitioner	92.1 (80.6)	-182.1* (101.1)	-42.2 (50.4)	-45.0 (53.9)	-1.65 (49.0)	-74.9 (54.5)	-13.7 (79.0)	-89.6 (89.3)	5.38 (51.2)	-89.1 (57.8)	-23.0 (70.6)	-66.0 (77.9)	-16.1 (44.4)	-93.4* (49.9)	58.9 (124.7)	80.9 (148.5)
Dentist	26.6 (22.9)	-2.96 (261.9)	-0.099 (12.1)	22.2 (196.3)	-2.98 (12.9)	81.1 (191.7)	26.8 (19.5)	-157.1 (289.8)	20.6 (14.6)	26.6 (186.6)	-12.2 (15.9)	-21.6 (281.8)	6.77 (11.4)	-63.3 (168.7)	4.89 (25.4)	848.2 (581.3)
Ophthalmologist	24.5 (19.1)	-11.4 (34.8)	38.2*** (12.4)	9.58 (20.2)	19.8* (11.8)	9.25 (21.0)	64.3*** (22.1)	-7.04 (31.0)	36.5*** (12.3)	0.61 (21.1)	35.7*** (18.0)	13.0 (29.2)	32.9*** (10.8)	1.74 (18.2)	42.7 (34.0)	46.6 (58.0)
ENT specialist	37.5*** (18.3)	6.39 (39.3)	-4.08 (14.0)	-0.60 (22.6)	8.29 (13.3)	6.15 (23.8)	3.02 (20.6)	-13.1 (34.5)	5.97 (12.6)	33.0 (21.6)	11.5 (20.3)	-43.7 (37.9)	1.27 (11.7)	-2.49 (20.7)	58.1 (43.5)	39.9 (55.4)
Orthopedist	10.1 (6.71)	-0.21 (9.77)	4.86 (4.63)	0.67 (6.23)	5.58 (4.56)	3.29 (6.40)	6.89 (6.88)	-5.14 (9.30)	9.89** (4.16)	0.56 (6.31)	0.83 (7.17)	0.98 (8.97)	4.53 (3.99)	-1.79 (5.53)	23.7* (13.5)	31.2 (20.0)
Laboratory	3.72 (9.62)	-5.46 (15.1)	-2.45 (7.50)	15.0 (9.77)	-1.12 (7.35)	18.1* (9.98)	1.31 (10.2)	-5.98 (14.5)	-0.87 (6.76)	13.4 (9.44)	1.40 (10.9)	5.51 (14.4)	-0.37 (6.35)	8.64 (8.53)	-1.55 (18.6)	30.6 (25.9)
Radiologist	13.0* (7.43)	-8.55 (16.9)	-0.69 (4.97)	-7.43 (9.10)	4.91 (4.89)	-6.03 (9.79)	-2.29 (7.46)	-10.4 (13.7)	4.79 (4.56)	-11.1 (10.1)	0.25 (7.57)	-2.60 (12.8)	3.03 (4.34)	-5.74 (8.29)	1.15 (10.9)	-35.2 (30.1)
Net of direct costs:																
Outpatient medical care	402.0*** (135.9)		-33.1 (85.8)		93.3 (79.2)		61.2 (130.8)		96.3 (80.5)		71.4 (118.6)		77.8 (70.0)		-28.4 (347.6)	
Pediatrician	233.4*** (73.4)		27.9 (42.9)		104.7** (41.2)		29.5 (65.9)		103.3** (40.2)		46.5 (63.6)		89.7** (36.7)		-53.6 (135.6)	
General practitioner	58.5 (74.2)		-67.2 (47.2)		-29.6 (45.4)		-38.3 (73.7)		-44.3 (47.9)		-44.3 (65.2)		-42.4 (41.3)		23.5 (115.4)	
Ophthalmologist	4.67 (16.9)		25.1** (10.7)		7.34 (10.3)		45.8** (18.8)		22.8** (10.7)		19.9 (15.3)		17.7* (9.31)		34.6 (29.8)	
N	2347	2347	7169	7169	6182	6182	3334	3334	5264	5264	4252	4252	8995	8995	521	521

Notes: This table summarizes the effects of developmental screening on short- and longterm health care expenditures for different samples. Each cell represents the results from a separate regression that includes covariates listed in column 4 of Table 3. Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$